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A structural modeling approach to determine the effects of orthorexia nervosa and social appearance anxiety on healthy lifestyle behaviors in young adults

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ABSTRACT

Aims: The aim of this study is to examine the relationship between orthorexia nervosa (ON) and social appearance anxiety (SAA) and to investigate the effects of these variables on healthy lifestyle behaviors (HLB) in young adults aged 18-30 years.

Methods: A total of 408 young adult male and female volunteers, with a mean age of 21.7±2.95 years, participated in this study. A structural model was proposed to examine the effects of SAA and ON on HLB. To assess how well the study variables represented the underlying components, we first evaluated a confirmatory measurement model. Subsequently, we analyzed a structural model that allowed for the examination of multiple regression equations involving several dependent variables.

Results: SAA had a negative influence on HLB (std β=-0.673; t-value=-8.425), a significant negative relationship between ON, HLB was also promoted (std β=-0.554; t-value=-9.388). It was determined that there is a positive correlation between SAA, ON which is statistically significant (correlation coefficient=0.830; t-value=10.244).

Conclusion: It is concluded that the individuals with high social appearance anxiety do not adopt healthy lifestyle behaviors and are more prone to orthorexia nervosa.

Keywords: Healthy lifestyle behaviors, social appearance anxiety, orthorexia nervosa, structural equation modeling

INTRODUCTION

Over the last decade, orthorexia nervosa (ON) has been conceptualized as an obsessive preoccupation with healthy eating and dieting, leading to various emotional and psychosocial consequences.[1] Eating behavior is a complex process influenced by internal, environmental, and social factors. The emergence of nutritional dependencies often stems from emotional or environmental conditions, or impulsive-compulsive behaviors resulting from psychological dependence on nutrients. Eating disorders manifest when attitudes and behaviors around eating significantly disturb the individual. These disorders include conditions that result from excessive focus on body weight and significant changes in eating behaviors. Young adults, particularly, exhibit heightened concerns regarding body fat and body mass indexes. Understanding sociocultural and sociodemographic characteristics is crucial for preventing the escalation of these disorders among young individuals.[2]

Healthy lifestyle behaviors (HLB) have been shown to positively impact individuals' health and quality of life. Enhanced satisfaction with one's body often correlates with reduced awareness of external appearance. Negative attitudes and behaviors related to body image can lead to issues such as depression, low self-esteem, and social anxiety, significantly affecting interpersonal relationships. Misconceptions about body image and body dissatisfaction are prevalent across age groups. Moreover, recent literature suggests an increasing prevalence of eating disorders among males.[3] Valente et al.[4] noted that symptoms of ON can be attributed to perfectionism and anxiety.

Approximately one million males worldwide struggle with eating disorders, a likely underestimate.[5] Concerns about attractiveness for effective impression management, known as self-presentation, can lead to anxiety when individuals feel evaluated based on their physical appearance.[6] Social appearance anxiety (SAA) correlates with body image and self-esteem; positive body image is linked to higher self-esteem, while negative body image often leads to lower self-esteem.[7] Body image significantly influences eating behaviors, social anxiety, sexual behaviors, social relationships, and emotional well-being.[8]

Risk factors for SAA include body dysmorphic disorder (more common in women), body weight (more prevalent in obesity), and age (more frequent in adolescence or middle age).[9] Body perception involves individuals' thoughts, feelings, and

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perceptions about their bodies and their functions.[10] Changes in body perception are lifelong, with issues more prevalent during adolescence and young adulthood when body changes are significant. Increased use of social media may heighten the risk of ON, potentially an unintended consequence of promoting healthy eating habits and lifestyles.[11] However, the relationship between social media addiction and ON in adolescents is still unclear. Low body perception causes depression and obesity and negatively affects human health. Therefore, it is important to prevent obesity, which is the biggest public health problem of recent times.[12] The emergence of obsessive behaviors in consuming 'pure' foods along with healthy eating and weight loss causes ON.[13] Generally, the diets of individuals with ON include pure foods. Therefore, individuals show obsessive behaviors in food research, weighing, meal planning and meal preparation.[14] Accordingly, the diets of individuals with ON have strict rules. The formation of these rules leads to psychological problems such as perfectionism and anxiety.[15] It has also been observed that individuals with ON do not perceive themselves as obese individuals. However, individuals make excessive efforts to maintain a healthy and balanced diet.[16] Their concerns about food quality and obsessive behaviors resemble the same psychological problems in anorexia nervosa.[17]

Although ON is not formally classified as a psychiatric disorder in DSM-5 or ICD-10, ongoing debate surrounds its classification as a behavioral/lifestyle phenomenon versus a psychiatric condition. Some studies highlight specific clinical features associated with ON.[18] This study aims to explore the relationship between SAA and ON within the 18-30 age group, proposing a structural model to assess the impacts of SAA and ON on healthy lifestyle behaviors (HLB).

METHODS

The study was approved by the Gazi University Ethics Committee (Date: 27.01.2016, Decision No: 11663). All procedures were carried out in accordaance with the ethical rules and the principles of the Declaration of Helsinki. All patients signed the free and informed consent form.

Research Aims and the Model

The aims of this paper are to investigate at the relationship between SAA and ON and how these factors affect HLB. This study focuses on investigation of two important associations: One is the association between ON and HLB and the other is the association between SAA and HLB. The causal relationships between three variables, SAA, ON, and HLB are demonstrated with path diagrams in Figure 1. In this model,

In the proposed models, SAA, ON and HLB are each considered as latent variables. In these models, HLB is defined as an endogenous variable that is affected by other variables; that is, ON and SAA function as exogenous variables that affect only HLB independently of other variables.

The following are the hypotheses that are developed in accordance with the causal connections established in the study model:

H1: SAA directly affects the changes in HLB.

H2: ON directly affects the changes in HLB.

H3: SAA and ON are correlated with each other.

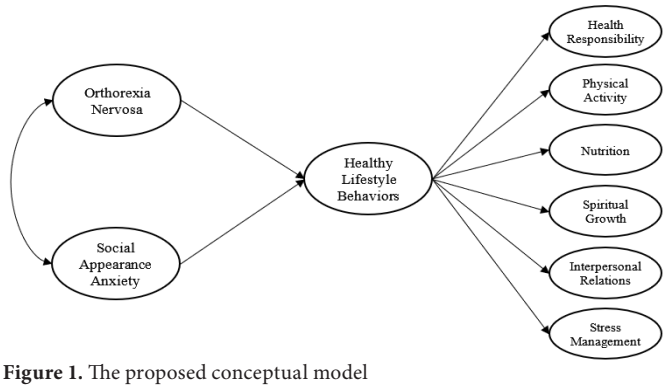

Figure 1. The proposed conceptual model

Participants

Participants in this study were young adults in four Turkish cities: Ankara, İstanbul, İzmir, and Eskişehir, between the ages of 18 to 30. Data was collected using a cross-sectional method through in-person interviews with 408 individuals between March and June 2019. In the beginning, 50 people participated in a pilot research where the period of the interview, the clarity of the questions, and the response options were assessed.

Instrumentation

The scales related to social appearance anxiety, ON status and healthy lifestyle behaviors used in this study were adapted from other researchers. The questionnaire in the study consists of 5 sections:

- **A demographic section**
- **SAA scale:** This scale, developed by Hart et al.[19] in 2008, aims to measure the behavioral, emotional and cognitive concerns of the individual about his/her appearance. The Social Appearance Anxiety Scale is a five-point Likert-type scale (1) Not at all appropriate, (2) Not appropriate, (3) Somewhat appropriate, (4) Appropriate, (5) Fully appropriate and consists of a total of 16 items. Social Appearance Anxiety Scale is evaluated in a single dimension. The minimum score that can be obtained from the scale is 16 and the maximum score is 80. The 1st item of the Social Appearance Anxiety Scale is reverse scored.
- **ON scale:** he ON-15 Likert-type scale was prepared by Donini et al.[1] It is a 15-item self-report questionnaire that determines the frequency of obsessive behaviors related to healthy eating. In the ORTO-15 scale, a score of "1" is given to answers that are considered to be distinctive for the diagnosis of orthorexia and a score of "4" is given to answers indicating a tendency towards normal eating behavior. The items in the scale that would indicate the opposite situation for orthorexia were scored as 4-3-2-1. If the scores obtained are "low", it indicates orthorectic tendency. Donini et al. evaluated ORTO-15 score ≤40 as orthorectic and >40 as normal.

- **HLB scale:** The HLB scale was developed by Walker et al.[20] in 1987 based on Pender's Health Promotion Model and is a scale that measures health-promoting behaviors in relation to the healthy lifestyle of the individual. The scale was revised in 1996 and named as the HIBS-II scale.[21] It consists of health responsibility (HR), physical activity (PA), nutrition (N), spiritual development (SD), interpersonal relations (IR) and stress management (SM) sub-factors.[22] The HLB-II scale is based on a four-point Likert scale with the following responses: 1=never, 2=sometimes, 3=frequently and 4=regularly. It consists of 52 positive items. An increase in the scores obtained from the scale indicates that the individual applies the specified health behaviors at a high level.
- **Anthropometric measurements:** Anthropometric measurements were performed by an expert dietician. Height measurements were taken to the nearest 0.1 cm using a stadiometer without shoes. Participants' head position, body and arm postures were standardized in detail. Weight measurements were taken to the nearest 0.1 kg in light clothing and without shoes. All measurements were performed in the morning on an empty stomach and overnight fasting. Body-mass index (BMI) was calculated from the weight and height measurements of the participants and classified into underweight, normal and overweight groups according to World Health Organization (1989) and Gibson (2005) criteria.[23,24]

Statistical Analysis

Structural equation modelling (SEM), including a large number of statistical techniques, for testing theories and developing new models is a statistical analysis. In non-experimental research, it was created to test models of causality and the processes underlying behaviours. For this reason, structural equation modelling is a comprehensive statistical method that enables the testing of hypotheses about the relationships between observed and latent variables.[25,26] The ability to assess indirect effects between two variables, including direct effects from one variable to another and indirect effects between two variables with the influence of an intermediary variable, is another factor contributing to SEM's extensive use in scientific research. SEM applications can be done more easily with the use of computer software in testing multivariate models.[27] In this study, hypotheses were evaluated using the Maximum Likelihood approach through IBM AMOS software. First, the Anderson and Gerbing test was used, which proposes a two-stage procedure confirmatory measurement model.[28] In these stages, the accuracy of the observable variables in describing the underlying constructs was demonstrated with this model. Subsequently the validity and reliability of the measurement items and components were assessed. This study examined three different types of reliability: item, construct, internal consistency and convergent validity.

In the second stage, the structural model that allows the analysis of multiple regression equations of multiple dependent variables was tested. Parameter estimates and their significance were calculated separately for each regression model.Test statistics and their significance values are used in many test statistics as indicators of goodness of fit in SEM. In this study, X^2/df, comparative fit index (CFI), goodness of fit index (GFI), adjusted goodness of fit index (AGFI) and root mean square error of approximation (RMSEA) were selected as fit indices.[29]

RESULTS

Table 1 shows the participants' anthropometric classification and demographic data based on the study's findings. Men were 41.2% of the participants, while women were 58.8%. The age range of half of the participants (50%) was 18 to 21 years old. The participants' mean BMI was determined to be 22.6±3.4 kg/m². According to Table 1, 70.3% of the participants were a BMI that categorized them as normal, 15.0% obese, and 14.7% underweight.

Table 1. Characteristics of participants

Variable		n	%
Gender	Male	87	21.3
	Female	321	78.7
Age (year)	18-21	232	56.9
	22-24	109	26.7
	25-27	38	9.3
	28-30	29	7.1
Body-mass index	Thin	60	14.7
	Normal	287	70.3
	Obese	61	15.0
Total		408	100.0

This study aims to evaluate the overall fit of observed data to the hypothesized model by simultaneously estimating two separate models using structural equation modeling (SEM). Since the validity of the structural model directly depends on the validity of the measurement model, the measurement models must first be validated. In this context, measurement models for scales such as SAA, ON and HLB were evaluated using confirmatory factor analysis (CFA). CFA is a widely used method of analysis to identify conceptual factors underlying observed variables and to assess the extent to which these factors fit the data. The evaluation of measurement models allows for the verification of the factors underlying each scale and the examination of the relationships of these factors with the observed variables. This step is critical for valid and reliable evaluation of the structural model at later stages.

In order to remove valid items for the SAA, ON and HLB scales, the items with factor loadings greater than 0.50 were selected. Thus, it was decided to remove 3 items from SAA, 6 items from ON, and 12 items from HLB, totaling 20 items. Kaiser-Meyer-Olkin (KMO) sample adequacy measures for SAA, ON and HLB with the selected items were 0.953, 0.860 and 0.875 (>0.60), respectively. In addition, measurements of compliance well-being were used to assess the alignment of the measurement model. Compliance of the measurement model was assessed using measures of compliance well-being.

The general compliance indexes of the first DFA model are appropriate.[25,30] (X^2/DF=2.044, RMSEA=0.051, CFI=0.897, GFI=0.909, with AGFI=0.917. Table 2, Table 3 and Table 4 show the findings of the significance test of the predicted mold coefficients and all factor loads at a meaningfulness level of 0.05 (i.e., t-value >±1.96) In addition, estimates of normalized values, including, he revealed that every prediction of the proper sign and size is compatible with the basic theory.

ON and HLB, respectively, indicate an acceptable level. The standardized loadings, test statistics, and composite reliability (CR) results of the SAA, ON, and HLB measurement models are shown in Table 2, Table 3 and Table 4. SAA scale of item reliabilities of the measured variables in the model; Between 0.640 and 0.846, ON scale; Between 0.533 and 0.932, HLB scale; The fact that it is between 0.510 and 0.976 indicates that the item reliability is good. Composite reliabilities were

Table 2. Measurement model results for SAA scale

Item	Standardized loading	S.E.	t-value*	CR	AVE
S4. I am concerned people would not like me because of the way I look.	0.640	0.052	14.398	0.940	0.549
S5. I worry that others talk about flaws in my appearance when I am not around.	0.698	0.048	16.202		
S6. I am concerned people will find me unappealing because of my appearance.	0.649	0.043	14.671		
S7. I am afraid that people find me unattractive.	0.744	0.045	17.757		
S8. I worry that my appearance will make life more difficult for me.	0.752	0.045	18.021		
S9. I am concerned that I have missed out on opportunities because of my appearance.	0.771	0.045	18.737		
S10. I get nervous when talking to people because of the way I look.	0.767	0.044	18.758		
S11. I feel anxious when other people say something about my appearance.	0.746	0.047	17.829		
S12. I am frequently afraid I would not meet others' standards of how I should look.	0.793	0.043	19.572		
S13. I worry people will judge the way I look negatively.	0.800	0.044	19.835		
S14. I am uncomfortable when I think others are noticing flaws in my appearance.	0.735	0.052	17.419		
S15. I worry that a romantic partner will/would leave me because of my appearance.	0.661	0.052	15.011		
S16. I am concerned that people think I am not good looking.	0.846	-	-		

SAA: Social appearance anxiety, -These values could not be calculated for model identification purposes, *All factor loadings are at the p=0.05 level

Table 3. Measurement model results for ON scale

Item	Standardized loading	S.E.	t-value*	CR	AVE
O3. In the last 3 months, did the thought of food worry you?	0.819	-	-	0.907	0.526
O4. Are your eating choices conditioned by your worry about your health status?	0.757	0.135	8.826		
O5. Is the taste of food more important than the quality when you evaluate food?	0.784	0.126	7.322		
O6. Are you willing to spend more money to have healthier food?	0.622	0.118	6.634		
O9. Do you think your mood affects your eating behavior?	0.533	0.121	6.762		
O10. Do you think that the conviction to eat only healthy food increases self-esteem?	0.693	0.150	9.065		
O11. Do you think that eating healthy food changes your life-style (frequency of eating out, friends, …)?	0.552	0.133	7.988		
O12. Do you think that consuming healthy food may improve your appearance?	0.744	0.136	7.913		
O13. Do you feel guilty when transgressing?	0.932	0.149	8.643		

ON: Orthorexia Nervosa, -These values could not be calculated for model identification purposes, *All factor loadings are at the p = 0.05 level

After the compliance well-being indexes were found, the reliability and validity of the measurement model were evaluated. In this study, three different types of reliability were calculated: substance reliability, structure reliability and internal consistency reliability.[31,32]

When the item reliability values of the measured variables in the model are examined; The values between 0.640 and 0.846 for the SAA scale, between 0.533 and 0.932 for the ON scale, and between 0.510 and 0.976 for the HLB scale are evidence of good item reliability.

Composite reliabilities are above the 0.70 threshold (0.762 to 0.940), indicating high reliability for all constructs. In addition, alpha coefficients of 0.939, 0.794 and 0.893 for SAA, determined to be above the threshold value of 0.70 (between 0.762 and 0.940), indicating high reliability for all constructs. In addition, alpha coefficient values of 0.939, 0.794 and 0.893 for SAA, ON and HLB, respectively, were found to be at an acceptable level.

In the indicator set, validity measures accurately indicate the degree of fit of the latent construct.[33] Convergent validity is assessed by the average variance value (AVE) for a construct, which must exceed 0.50.[32,34]

In Table 2, Table 3 and Table 4, the AVE values are between 0.519 and 0.630, indicating that convergent validity has been achieved in this context.

Table 4. Measurement model results for HLB scale

	Item	Standardized loading	S.E.	t-value*	CR	AVE
HR	K3. Report any unusual signs or symptoms to a physician or other health professional	0.563	-	-	0.914	0.549
	K9. Read or watch TV programs about improving health	0.831	0.102	7.066		
	K15. Read or watch TV programs about improving health	0.701	0.124	9.907		
	K21. Get a second opinion when I question my health care provider's advice	0.731	0.118	9.305		
	K27. Discuss my health concerns with health professionals	0.628	0.114	9.271		
	K33. Inspect my body at least monthly for physical changes/danger signs	0.850	0.116	7.308		
	K39. Ask for information from health professionals about how to take good care of myself	0.630	0.125	9.298		
	K45. Attend educational programs on personal health care	0.976	0.113	7.629		
	K51. Seek guidance or counseling when necessary	0.666	0.118	7.509		
PA	K4. Follow a planned exercise program	0.973	-	-	0.922	0.601
	K10. Exercise vigorously for 20 or more minutes at least three times a week (such as brisk walking, bicycling, aerobic dancing, using a stair climber)	0.736	0.107	12.228		
	K16. Take part in light to moderate physical activity (such as sustained walking 30-40 minutes 5 or more times a week)	0.674	0.105	11.428		
	K22. Take part in leisure-time (recreational) physical activities (such as swimming, dancing, bicycling)	0.756	0.091	8.098		
	K28. Do stretching exercises at least 3 times per week	0.800	0.095	10.354		
	K34. Get exercise during usual daily activities (such as walking during lunch, using stairs instead of elevators, parting car away from destination and walking)	0.705	0.099	7.249		
	K40. Check my pulse rate when exercising	0.880	0.094	10.060		
	K46. Reach my target heart rate when exercising	0.621	0.092	10.671		
N	K20. Eat 2-4 servings of fruit each day	0.881	-	-	0.871	0.630
	K26. Eat 3-5 servings of vegetables each day	0.854	0.172	6.129		
	K32. Eat 2-3 servings of milk, yogurt or cheese each day	0.734	0.198	6.046		
	K38. Eat only 2-3 servings from the meat, poultry, fish, dried beans, eggs, and nuts group each day	0.690	0.194	6.233		
SG	K6. Feel I am growing and changing in positive ways	0.847	0.116	8.448	0.913	0.576
	K12. Believe that my life has purpose	0.576	0.128	8.740		
	K18. Look forward to the future	0.925	0.128	9.202		
	K24. Feel content and at peace with myself	0.678	0.120	8.757		
	K30. Work toward long-term goals in my life	0.777	0.124	8.749		
	K36. Find each day interesting and challenging	0.807	0.103	6.799		
	K42. Am aware of what is important to me in life	0.841	0.117	8.385		
	K52. Expose myself to new experiences and challenges	0.533	-	-		
IR	K1. Discuss my problems and concerns with people close to me.	0.847	0.128	7.110	0.924	0.609
	K7. Praise other people easily for their achievements.	0.795	0.128	8.587		
	K13. Maintain meaningful and fulfilling relationships with others.	0.886	0.149	9.285		
	K19. Spend time with close friends.	0.648	0.137	9.011		
	K25. Find it easy to show concern, love and warmth to others.	0.865	0.150	9.131		
	K31. Touch and am touched by people I care about.	0.774	0.141	8.399		
	K37. Find ways to meet my needs for intimacy.	0.842	0.133	7.053		
	K49. Settle conflicts with other through discussion and compromise.	0.510	-	-		
SM	K23. Concentrate on pleasant thoughts at bedtime.	0.704	0.120	8.820	0.762	0.519
	K29. Use specific methods to control my stress.	0.807	0.093	6.526		
	K35. Balance time between work and play.	0.639	-	-		

HLB: Healthy Lifestyle Behaviors, HR: Health Responsibility, PA: Physical Activity, N: Nutrition, SG: Spiritual Growth, IR: Interpersonal Relations, SM: Stress Management, -These values could not be calculated for model identification purposes, *All factor loadings are at the p = 0.05 level

In the second step, a structural model relating the SAA, ON and HLB variables was created. Figure 2 shows the standardized results we estimated with ML for the relationship between social SAA and ON and the impact of these variables on HLB. Accordingly, the hypothesized model for SAA, ON and HLB was found to be in good agreement with the data. Therefore, the model was verified and analyzed with the SEM technique (X^2/df=1.810, RMSEA=0.045, CFI=0.993, GFI=0.974, AGFI=0.923).

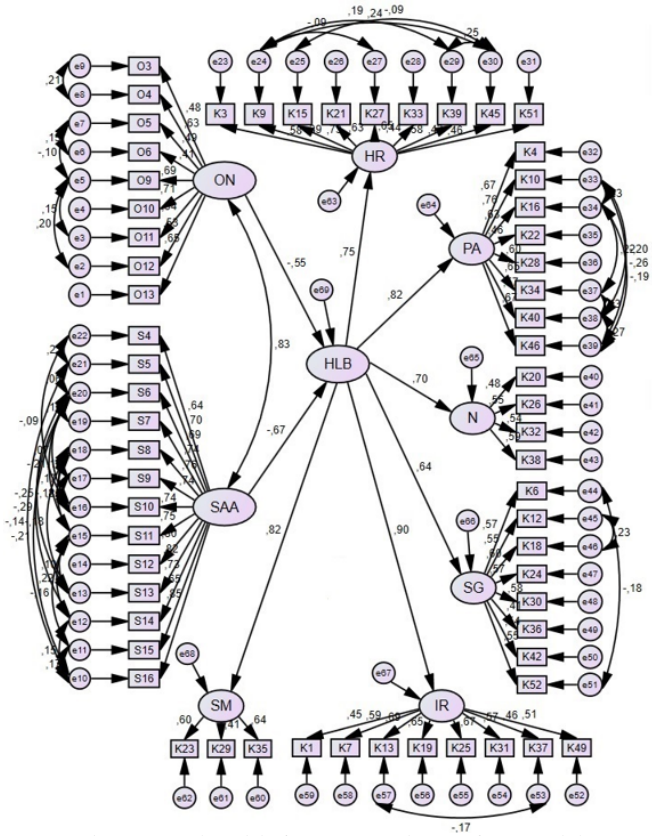

Figure 2. The structural model of SAA, ON and HLB of young adults

SAA: Social appearance anxiety, ON: Orthorexia nervosa, HLB: Healthy lifestyle behaviors

Table 5 and Figure 2 show the standardized path coefficients of the structural model, which determine the strength of the relationships between the constructs. The first hypothesis established between SAA and HLB was confirmed, thus a statistically significant negative effect of SAA on HLB was found (std β=-0.673; t-value=-8.425). The second hypothesis was confirmed, that is, a significant negative relationship was found between ON and HLB (std β=-0.554; t-value=-9.388). Additionally, the findings in the study supported the model in Figure 2, which suggests that SAA and ON are interrelated (correlation coefficient=0.830; t-value=10.244).

Table 5. Hypothesis testing of the relationships among SAA, ON and HLB

Hyp.	Paths			Std. coef. estimate	SE	t-value	p*
H1	SAA	→	HLB	-0.673	0.028	-8.425	0.000
H2	ON	→	HLB	-0.554	0.046	-9.388	0.000
H3	SAA	↔	ON	0.830	0.034	10.244	0.000

SAA: Social appearance anxiety, ON: Orthorexia nervosa, HLB: Healthy lifestyle behaviors, *All standardized coefficient estimates are significant at p<0.05

The first hypothesis formed between SAA and HLB was approved, so SAA had a negative effect on HLB which was statistically significant (std β=-0.673; t-value=-8.425). The second hypothesis was also approved, so there was a significant negative relationship between ON and HLB (std β=-0.554; t-value=-9.388). Additionally, findings of the study supported the model given via Figure 2 which suggested that SAA and ON were correlated with each other (correlation coefficient=0.830; t-value=10.244).

DISCUSSION

Individuals attach importance to body building and aesthetic appearance with the pressures of society and media. These pressures on the individual can lead to eating disorders or can cause the individual to eat more food according to the psychological state. As the increase in the desire to eat increases the tendency to obesity, it also changes eating attitudes and behaviors.[10]

In recent years, the dietary habits of young adults have been changed; thus, overweight and obesity are increasingly being observed among young adults. In this study, in order to examine the relationship between SAA and ON of young adults, and to investigate the effect of these variables on HLB, a structural model was proposed. According to various goodness of fit indices, the proposed SAA, ON and HLB model was evaluated and validated with SEM. These results showed that all hypotheses were supported and also provided strong overall validation for the research model.According to the SEM results, all parameters were found to be statistically significant (Table 2, Table 3 and Table 4).

The first hypothesis formed between SAA and HLB was approved, so SAA had a negative influence on HLB (std β=-0.673; t-value=-8.425). Levinson and Rodebaugh (2016) reported that SAA is the most important factor causing eating disorders.[35] Negative thoughts about appearance further increase the risk of eating disorders.[36] In another study, SAA in women was determined as one of the most important triggers of obstructive eating disorder.[37] Studies show that high physical appearance perfectionism is an important determinant of social physical anxiety. These individuals perceive their own appearance as imperfect and compare it with the physical ideals of society. If their appearance is far from these ideals, they tend to experience social physical anxiety. In this context, physical appearance perfectionism is a critical factor in understanding social physical anxiety.[38,39] Research shows that the high standards that individuals with high physical appearance perfectionism set for their own bodies often do not match their physical reality and this may increase their dissatisfaction with their bodies. These individuals often experience low self-esteem and feelings of inadequacy. They are also extremely concerned about being evaluated negatively and therefore prefer avoidance-oriented coping strategies.[40,41] Body compassion helps individuals accept their bodies, build social relationships and regulate their emotional processes. Therefore, it functions as an important protective and regulating factor between physical appearance perfectionism and social physical anxiety.[42]

It was also reported that there is a negative correlation between body image and social physical anxiety. As people become more satisfied with their physical appearance, the social physical anxiety decreases. Moreover, women's body image dissatisfaction, the frequency of dieting practices, the probability of identifying themselves as fat was found to be higher than men.[43] Women are more concerned, criticized and dissatisfied with their physical appearance than men. Society and social media value youth, beauty and thinness more than ever before, leading to the belief that those who are obese are unattractive. It also causes body dissatisfaction and worsening mood among young women after being exposed to thin ideal images.[44]

From the findings of this study, a significant negative correlation was found between ON and HLB and the second hypothesis was also supported (std β=-0.554; t-value=-9.388). Accordingly, it can be concluded that individuals who are overly anxious about food cause psychological distress by increasing obsessive behaviors. High scores were often associated with abnormal eating habits and a pathological or impaired eating attitude.[45,46] Healthy eating behaviors can cause one to lose control over one's own life, and it can pose a serious threat to mental and physical health by restricting individual and social life. However, healthy eating behavior is not a disorder in itself, it is a something that everyone should pay attention to, but some people can become obsessed with it. Along with the imbalance caused by obsessions to certain foods, changes in nutritional habits of individual may lead to introversion and orthorexia.[16]

Many people exhibit different forms of highly sensitive eating behavior. Due to their efforts to reach perfection, they tend to aggravate their diet. In orthorexia, only the desire to consume pure and healthy foods is at the forefront. This desire to become mentally and behaviorally extreme resembles obsessive-compulsive disorder. The positive effect of healthy eating on human life is a fact, but the number of individuals who exaggerate it and impair their social relations, unfortunately is increasing day by day.[47] Orthorectics can spend most of their time thinking about food, shopping, preparing and consuming food which are assumed to be healthy. According to[16] orthorexia is a pathological obsession for proper eating, and the aim is to maintain and improve health. People who are overly fond of pure nutrition are suffering from intense body weight loss because they pay attention to the quantity of nutrients rather than to the quality. Regarding whether weight loss is important in ON, it is stated that there is no desire to lose weight as a defining criterion of ON.[48]

However, it has been suggested that adopting an overly healthy diet may lead to anorexia, or that combining low-calorie and healthy foods focuses on weight loss in the majority of people with ON.[49] Healthy eating habits are not actually pathological. However, when exaggerated and in case of long continuance, it can lead to personality and behavior disorders by causing negativity in daily life. Understanding these psychological factors is critical for early recognition, prevention and treatment of ON. Understanding the underlying mechanisms that lead to this complex eating disorder and addressing cognitive patterns enables tailored interventions.[2]

As a result of correlation analysis, it was determined that there is a positive correlation between SAA and ON which is statistically significant (correlation coefficient=0.830; t-value=10.244). Individuals with ON pursue their life within the framework of strict rules about healthy eating. Ortorectics tend to restrict their diets gradually because of efforts to achieve perfection, and this can result in reduction of nutrient diversity in their diet.[50] It has been stated that there is a positive correlation with body dissatisfaction, distorted body image perception, frequent dieting, application of inappropriate weight loss methods, and psychological problems such as depression, anxiety, and inadequate and unbalanced eating habits.[51] Therefore, obese individuals with eating disorders have a higher rate of social anxiety than the general population.[37] Especially negative comments about appearance increase the risk of eating disorders more.[36]

In conclusion, SAA, HLB and ON which were found to be related to each other are known to have a significant effect on the nutritional status of individuals. Healthy eating obsession can create negative effects on the body perception progressively. Existing studies in the literature have also demonstrated that an increase in social appearance anxiety increases the risk of ON and obsessive-compulsive behavior.[3,52] Due to increased tendency of orthorexia as body weight increases, it is possible to say that having normal body weight and maintaining it may be protective against orthorectic tendencies. ON is a condition characterized by excessive obsession and obsessive thoughts about healthy eating. It is thought that ON is related to body image. Especially anxiety about being obese and obsession with body appearance are effective in the emergence of ON.

It was found that the risk of ON was higher in individuals with high scores on the body image scale,[53] and in another study, it was emphasized that individuals with orthorexia tendency have strict ideas not only about healthy eating but also about healthy body image These findings in the literature suggest that there is a positive correlation between body image and ON.[54] Accordingly, knowing the relationship between body image and healthy eating has an important role in the etiology of orthorexia nervosa.

Toth-Kiraly et al.[3] observed that health anxiety increased as orthorexia tendencies increased. In this context, as individuals become more concerned about their health and body functioning, they practice healthy lifestyles, such as following a strict diet and increasing regular physical activity. It reflects a pattern of behavior that is fueled by individuals' fear of losing control over their health and their bodies. It should not be ignored that this may lead to negative health consequences for individuals in their pursuit of a perfect body image.

In addition, orthorexia can lead to impairments in psychological and social functioning over time and is considered a serious health problem that needs to be treated.

Limitations

It is important to emphasize that the design of our study is relatively small sample. Utilizing a larger sample would yield more reliable results. The study covers the age range of 18-30 years. Future studies may include a wider range of age groups.

CONCLUSION

In this article, CFA was used to show how accurately the observed variables represent the underlying structures and the relationship between them. The results of all fit indices of the first CFA model were found to be satisfactory. Therefore, the factor structures of the SAA, ON and HLB scales were confirmed by SEM. Additionally, estimation of standardized regression coefficients interpreted as factor loadings were correct sign and size and consistent with the underlying theory. Three reliability measurement tests were used to assess the adequacy of single items and their compositions. These were item reliability, construct reliability, internal consistency reliability and convergent validity tests. Accordingly, the reliability and validity of SAA, ON and HLB scales were satisfied. In order to examine the relationship between SAA and ON, and to investigate the effect of these variables on HLB, a structural model was proposed in this study. Various goodness of fit indices were used to investigate model adequacy requirement. Accordingly, the proposed model of SAA, ON and HLB was verified by SEM. It was determined that individuals with high social appearance anxiety do not adopt healthy lifestyle behaviors, and are more prone to orthorexia.

Consequently, it is clear that the structural equation model used in this study gained a different perspective on the field. Future research of this structural modeling should be applied to children, adolescents, and adults from various socio-demographic, anthropometric and biochemical backgrounds. It is also important to recognize and understand ON because this condition has significant impacts on individuals' health and lifestyle choices. While it is important to focus on healthy eating and lifestyle goals, excessive health concerns and obsessions can lead to unhealthy outcomes and must therefore be managed carefully in medical nutrition therapy.

ETHICAL DECLARATIONS

Ethical Committee Approval

The study was initiated with the approval of the Gazi University Ethics Committee (Date: 27.01.2016, Decision No: 11663).

Informed Consent

The patient signed and free and informed consent form.

Referee Evaluation Process

Externally peer-reviewed.

Conflicts of Interest Statement

The authors have no conflicts of interest to declare.

Financial Disclosure

The authors declared that this study has received no financial support.

Author Contributions

All of the authors declare that they have all participated in the design, conduct and analysis of the work, and that they have approved the final version.

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