The Usefulness of Body Image Tests in the Prevention of Eating Disorders

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Purpose : **Individual psychological factors such as mental conditions and self-esteem and family relational factors are thought to be predisposing factors in the development of eating disorders. In this study, we conducted a survey of 12-15 year-old public junior high school students to extract factors related to abnormal eating behavior and determine what information could be used by schools to prevent eating disorders.** *Method:* **Self-descriptive surveys were distributed and collected during homeroom time at school. The survey consisted of the 26-item Eating Attitude Test (EAT-26) to measure the degree of abnormal eating behavior, Stunkard, Sorensen and Schlusinger's Body Image Scale to determine predisposing factors, the Family Adaptability and Cohesion Scale III (FACES III), General Health Questionnaire (GHQ), and Rosenberg's Self-Esteem Scale. 483 students (263 boys and 220 girls) participated in the survey. School-year height and weight data was used to calculate BMI.** *Results:* **Approximately 7% of girls and 3% of boys showed clear indications of abnormal eating behavior. We found no direct relationship between abnormal eating behavior and family factors in this study, but an indirect relationship was suggested through other factors such as psychological complaints and self-esteem. There were relationships between abnormal eating behavior and the individual factors of psychological complaints, current and ideal body image, and low self-esteem. Furthermore, cluster analysis showed that there were students with high BMI who thought of themselves as fat, as well as students who perceived themselves as fat despite having average BMI. These students had a high frequency of abnormal eating behaviors, a great deal of psychological complaints, and low self-esteem.** *Discussion:* **An understanding of BMI, along with body image, is essential for students who feel that they are overweight. Schools can practice preventative education by teaching these students about healthy body weight and by screening for the eating disorders that have become so rampant in our thin-worshiping culture.**

The development of eating disorders has previously been attributed to predisposing biological factors such as serotonin dysfunction (Collier et al., 2) and genetic defects (Holland et al., 15). At the same time, there have been numerous reports about distorted body image and feelings of inadequacy (Bruch, 1), and psychological factors such as a depression and other mental illnesses (Erol et al., 8; Lorenzo et al., 19). Minuchin et al. (21) have also cited restrictive family factors such as overprotective or overly controlling parents who

inhibit separation and autonomy in their child. These family factors have also been affirmed in Japan (Nagoshi et al., 23; Tachi, 32). Although the emphasis on family factors has been questioned (Kitagawa et al., 16) and further investigations should be conducted. The general consensus is that eating disorders develop from a combination of biological and psychological predisposing individual and family factors in the socio-cultural context of a thin-worshipping society (Garner, 10). In fact, however, most studies discuss only single factors in relation to eating disorders, and there is very little comprehensive research on the interaction of multiple factors. Graber et al. (13) studied both individual and family factors, but their survey was limited to girls. In this study, we have therefore undertaken a survey of both male and female public junior high school students aged between 12 and 15 years old, the peak age range for development of anorexia nervosa (Nakai et al., 25). The survey included several scales to measure a student's degree of abnormal eating behavior as well as questions regarding psychological and family relations factors that are believed to be involved in the development of eating disorders. By extracting the factors that actually play a role in abnormal eating behavior, we can determine what information can be used by schools to prevent eating disorders. In addition to the 26-item Eating Attitude Test (11) to measure abnormal eating behavior, the survey included scales for the so-called predisposing factors of body image, family cohesion and adaptability, mental condition, and self-esteem. The specific content and results of the survey are described below.

METHOD

Subjects

483 students (263 boys and 220 girls) between the ages of 12 and 15 were given a self-descriptive questionnaire survey at a public junior high school in Kobe, Hyogo prefecture. In addition to basic sex and age information, the survey included a number of items to describe Measures.

Measures

Body Image Scale: The 18 body silhouettes (9 male, 9 female) by Stunkard, Sorensen and Schlusinger were used as measures of body image. The silhouettes were numbered 1 though 9 (1 being most thin), and students were instructed to indicate which silhouettes they thought most closely resembled their current body shape (CURRENT) and their ideal body shape (IDEAL). The contextual validity of this particular measure was previously confirmed in a study of Japanese junior high school girls conducted by Mukai (22).

Family Adaptability and Cohesion Scale III: The Family Adaptability and Cohesion Scale III (FACES III) is the third version of a method developed by Olson et al. (27) to evaluate how family systems function. It consists of five-point evaluations on a 10-item cohesion scale, measuring a family's emotional connection, and a 10-item adaptability scale, measuring a family's ability to cope and act as a flexible unit. In this study, we used a translation of FACES III by Kusada et al. (18). Cronbach's coefficient alphas were high at .88 for cohesion and .74 for adaptability. Factor analysis (principal factor method, varimax rotation) showed a two-factor construction, confirming factorial validity (Kusada, 17). Low scores on the cohesion scale indicated an isolated family environment, while high scores indicated a close family environment. Low scores on the adaptability scale indicated a rigid family environment, while high scores indicated a more liberal family environment.

Eating Attitude Test: The 26-item Eating Attitude Test (EAT-26) is an abridged version of the 40-item Eating Attitude Test originally developed by Garner et al. (12), based on clinical symptoms observed in patients with anorexia nervosa. High scores indicate abnormal eating behavior. We used Mukai's (22) Japanese translation of EAT-26 for the purposes of

this study. This Japanese version of EAT-26 had a high Cronbach's coefficient alpha of .84 for junior high school girls, and demonstrated strong concurrent validity. Like Mukai, we used a six-point Likert scale for scoring (Wells et al., 34) to calculate averages and statistics, considering that the survey participants were average, mostly healthy, junior high school students. We also used a 0～3 point scale suggested by Garner, so that students who scored over 20 would be categorized as having distinct abnormal eating behaviors.

General Health Questionnaire: The General Health Questionnaire (GHQ) is a questionnaire developed by Goldberg for the purpose of assessing, understanding, and diagnosing mental illness. The 60-item General Health Questionnaire (GHQ-60) has been translated into Japanese and confirmed that it is a highly reliable instrument with confirmed concurrent and discriminate validity, that is, it is able to discriminate between people who are healthy and people with mental illness (Nakagawa et al., 24). For this study, we have employed a 12-item General Health Questionnaire (GHQ-12) adapted by Doi et al. (5) that uses the exact same statements in the Japanese version of GHQ-60. Because we have used the Likert method for scoring, scores range from 0 (no symptoms of mental illness) to 36 (pronounced symptoms of mental illness).

Rosenberg Self-Esteem Scale: The Rosenberg Self-Esteem Scale is a 10-item scale that was developed to allow adolescents to evaluate their own feelings of self-worth and self-acceptance. In this study, we have relied on a translation by Yamamoto et al. (35). According to the results of principal component analysis, the Japanese version of the Self-Esteem Scale had a high contribution ratio of 43％ for the first factor, indicating a high internal consistency. The second factor had a low contribution ratio of 13％, suggesting a high construct validity considering the single factor construction. The questions for the 10 items are answered according to a five-point scale; higher scores indicate high self-esteem.

Procedure

Teachers distributed and collected the self-descriptive questionnaires during homeroom class. Student could choose to participate or not participate after reading the request printed on the questionnaire. For those students who agreed to participate, BMI was calculated based on school-year height and weight data.

SPSS 10.1.4 J was used to calculate the means and standard deviations of the weight, height, BMI, Body Image, Scale, Faces III, Eat-26, GHQ-12, and the Rosenberg Self-Esteem Scale data for all participants as well as their breakdown by sex. Furthermore, t-tests were carried out according to sex differentiation. Additional t-tests were carried out on the participants' current actual silhouette (CURRENT), and their idealized silhouette (IDEAL). In addition, Pearson's correlation coefficient was used to examine the relationship between each of the measures. A cluster analysis was applied using BMI and CURRENT. Moreover, a one-way analysis of variance was conducted on the differences between the groups derived from the cluster analysis, followed by a bonferroni multiple comparison. Data from both males and females were used in the Pearson's correlation coefficient, cluster analysis, and the one-way analysis of variance in order to track the overall trends.

RESULTS

Averages and male and female comparisons for each item

Table 1 shows the resulting means for each item and the t-test comparisons between the sexes. As the weight, height, and BMI data for four participants were unavailable, the total data set consisted of 479 participants (response rate 99.2%). The total average height was 156.07 (SD = 8.14), with male average of 157.92 (SD= 9.57) and a female average of 153.86 (SD= 5.23). Thus, the males were on average taller than the females (p < 0.01). However, a

significant sex-difference in weight and BMI was not found. The total average weight was 47.41 (SD= 9.60), with a male average of 48.09 (SD= 10.54) and a female average of 46.61 (SD= 8.29). For BMI the average score was 19.35 (SD= 3.00), with a male average of 19.12 (SD= 3.01), and a female average of 19.62 (SD= 2.97).

Table1. Mean and standard deviation (SD) on all variables and comparison by sex

	Total (N=483)		Male (N=263)		Female (N=220)		t-value
	Average		Average		Average		
	(SD)	N	(SD)	N	(SD)	N	
Age	13.90 (0.84)	483	13.86 (0.84)	263	13.94 (0.85)	220	-1.059
Height	156.07 (8.14)	479	157.92 (9.57)	261	153.86 (5.23)	218	5.882**
Weight	47.41 (9.60)	479	48.09 (10.54)	261	46.61 (8.29)	218	1.721
BMI	19.35 (3.00)	479	19.12 (3.01)	261	19.62 (2.97)	218	-1.837
Current Body-image	4.25 (1.90)	476	3.81 (1.98)	259	4.78 (1.66)	217	-5.778**
Ideal Body-image	3.37 (1.18)	475	3.67 (1.21)	256	3.02 (1.03)	219	6.312**
FACES III Cohesion	25.26 (7.59)	472	23.95 (7.33)	257	26.83 (7.61)	215	-4.180**
FACES III Adaptability	25.65 (5.29)	472	25.19 (5.22)	256	26.19 (5.35)	216	-2.058*
EAT-26	47.45 (14.95)	465	44.62 (15.59)	253	50.83 (13.42)	212	-4.553**
GHQ-12	13.63 (5.14)	468	12.64 (5.18)	256	14.83 (4.84)	212	-4.708**
Self-esteem	29.80 (7.22)	471	30.93 (7.16)	258	28.43 (7.03)	213	3.814**

*P<.05，**P<.01

Of the participants, 476 responded about their CURRENT silhouette (response rate 98.6%) and 475 responded about their IDEAL silhouette (response rate 98.3%). The total mean for CURRENT was 4.25 (1.90), with a male average of 3.81 (1.98) and a female average of 4.78 (1.66). The average score for IDEAL was 3.37 (1.18), with a male mean of 3.67 (1.21), and a female mean of 3.02 (1.03). Comparing the results of males and females reveals that although girls had higher averages for CURRENT (p < .01), their averages for IDEAL were much lower (p < .05). Furthermore, the results of a t-test on the relationship between CURRENT and IDEAL revealed that a significant difference is apparent between girl's CURRENT and IDEAL images and the overall CURRENT and IDEAL images (p < .01). However, a significant difference was not revealed among the boys.

Complete answers on the family measures of cohesion and adaptability were gained from 472 respondents (response rate, 97.7%). The overall average cohesion score was 25.26 (7.59), with a male mean of 23.95 (7.33) and a female mean of 26.83 (7.61). Females' scores were on average significantly higher (p < .01). Overall, the average adaptability score was 25.65 (5.29), with males averaging 25.19 (5.22), and females averaging 26 .19 (5.35). Here, also, girls' scores were significantly higher (p < .01).

Complete answers concerning EAT-26 were collected from 465 participants (response rate 96.3%). The average score was 47.45 (14.95), with a male mean of 44.62 (15.59) and a female mean of 50.83 (13.42). Of the participants, 468 gave complete answers concerning

GHQ-12 (response rate 96.9%). The average score was 13.63 (5.14), with a male average of 12.64 (5.18) and a female average of 13.83 (4.844). Complete answers on self-esteem were gained from 471 participants (response rate 97.5%), with an overall mean of 29.80 (7.22), a male mean of 30.93 (7.155), and a female mean of 28.43 (7.033). The difference between boys and girls was significant for EAT-26, GHQ-12, and self-esteem (p < .01).

Table2 shows the results of 0-3 point scoring on EAT-26. The percentage of students showing probable abnormal eating behavior, indicated by a score of 20 or more, was 4.9% of the total. By sex, the percentage was 3.2% for boys and 7.1% for girls.

Table2. Proportion of EAT-26 scores by sex

| | | EAT-26 score | | | | |
| | | 0-9 | 10-14 | 15-19 | 20-24 | 25- |
Sex	N	N (%)	N (%)	N (%)	N (%)	N (%)
Total	465	357 (76.8)	53 (11.4)	32 (6.9)	8 (1.7)	15 (3.2)
Male	252	207 (81.8)	25 (9.9)	13 (5.1)	1 (0.4)	7 (2.8)
Female	212	150 (70.8)	28 (13.2)	19 (9.0)	7 (3.3)	8 (3.8)

Correlation between items

Table 3 shows the correlations (using Pearson's correlation coefficients) between BMI, CURRENT, IDEAL, difference between CURRENT and IDEAL (current silhouette minus the ideal silhouette), family cohesion and adaptability, EAT-26, GHQ-12, and self-esteem. There was a strong correlation between the three items for BMI, CURRENT, and CURRENT-IDEAL (BMI & CURRENT: r = .702, BMI & CURRENT-IDEAL: r = .585, CURRENT & CURRENT- IDEAL; r = .810). There was also a correlation with EAT-26, GHQ-12, and self-esteem for each of these same three items. There was a strong correlation between GHQ-12 and self-esteem (r = -.455). GHQ-12 and self-esteem were both correlated with BMI, CURRENT, CURRENT-IDEAL, cohesion and adaptability in FACES III, and EAT-26. Although we have discussed certain aspects of EAT-26 already, we also note that EAT-26 was correlated with BMI, CURRENT, IDEAL, CURRENT-IDEAL, GHQ-12, and Self-esteem.

Table3. Correlation matrix of nine variables

| | Variable | | | | | | | | |
Variable	1	2	3	4	5	6	7	8	9
1. BMI	—								
2. CURRENT	.702**	—							
3. IDEAL	.165**	.271**	—						
4. CURRENT-IDEAL	.585**	.810**	-.345**	—					
5. Cohesion	-.040	-.031	-.031	-.005	—				
6. Adaptability	-.018	.012	.031	-.006	.560**	—			
7. EAT-26	.207**	.194**	-.129**	.256**	.012	.037	—		
8. GHQ-12	.132**	.247**	.011	.232**	-.199**	-.142**	.155**	—	
9. Self –esteem	-.132**	-.257**	-.046	-.235**	.200**	.131**	-.183**	-.455**	—

* *P<.01

Grouping students by BMI and CURRENT values

To group together students with similar BMI and CURRENT values, we input BMI and CURRENT data as variables for cluster analysis using Ward's method and square Euclidean distance. This resulted in four groups with distinct differences between BMI and CURRENT values (Responses from 472 participants (97.7%) on both BMI and CURRENT were employed in this section of the analysis.). Table 4 displays the mean values (SD) of BMI and CURRENT for each group as well as the bonferroni multiple comparison results from a one-way analysis of variance of the difference in averages.

The results for BMI in Groups I through IV were 24.56 (2.12), 17.04 (1.09), 19.81 (1.12), and 19.93 (2.89), respectively. Groups III and IV had significantly lower values than Group I (P< .05) and significantly higher values than Group II (P< .05). The results for CURRENT in Groups I through IV were 6.86 (1.07), 2.79 (1.07), 3.75 (0.50), and 5.99 (1.90), respectively. There were significant differences in all four groups (P< .05). Based on these results, Group I was labeled the Fat-Fat group with high scores for both BMI and CURRENT. Group II was labeled the Thin-Thin group with low scores for both BMI and CURRENT. Group III was labeled the Normal-Thin group with average scores for BMI and below-average scores (P< .05) for CURRENT. Finally, Group IV was labeled the Normal-Fat group with average BMI scores (same as Group III) and above-average CURRENT scores (P< .05).

Furthermore, the answers for BMI, CURRENT, and IDEAL of 469 participants who completed the items (response rate 97.2%) were used to assess CURRENT – IDEAL) for each of the four groups. As before, the mean (SD) was calculated for each group, and a multiple comparison was carried out using one-way analysis of variance and bonferroni multiple comparison. Significant results (p <0.05) were gained for groups I through IV, respectively, 2.99 (1.58), -0.37 (1.46), 0.63 (0.95), and 2.26 (1.55).

Table4. Average and SD of BMI, CURRENT and CURRENT - IDEAL in four groups

Groups	BMI[a]		CURRENT[b]		CURRENT- IDEAL[b]	
	Average(SD)	N	Average(SD)	N	Average(SD)	N
I. Fat-Fat group	24.56 (2.12)	71	6.86 (1.07)	71	2.99 (1.58)	71
II. Thin-Thin group	17.04 (1.09)	212	2.79 (1.07)	212	-0.37 (1.46)	210
III. Normal-Thin group	19.81 (1.12)	93	3.75 (0.50)	93	0.63 (0.95)	93
IV. Normal-Fat group	19.93 (2.89)	96	5.99 (1.90)	96	2.26 (1.55)	95

Result of multiple comparison: a; 1 > 3 & 4 > 2 (*P*<.05),   b; 1 > 4 > 3 > 2 (*P*<.05)

FACES III, EAT-26, GHQ-12, and Self-esteem results by group

Table 5 displays the mean values SD of FACES III, EAT-26, GHQ-12, and Self-esteem for the four groups, as well as the one-way analysis of variance and the bonferroni multiple comparison as tests of average difference. Analysis was conducted on each of the following: cohesion measure of FACES III for 463 participants (95.9%), as well as the adaptability measure of FACES III for 464 participants (96.1%), EAT-26 for 458 participants (94.8%), GHQ-12 for 460 participants (95.2%), and Self-esteem for 463 participants (95.9%).

One-way analysis of variance was conducted for the differences between the four groups, and bonferroni multiple comparisons were used for consequent tests. The results of FACES III were 24.47 (7.59), 25.22 (7.36), 26.64 (7.75), and 24.99 (7.80) for cohesion and 25.54

(4.81), 25.58 (5.32), 26.09 (5.96), and 25.39 (5.00) for adaptability for Groups I through IV, respectively. There was no significant difference found between the four groups for either cohesion or adaptability. Results were 53.01 (19.05), 44.59 (12.28), 46.90 (14.85), and 49.98 (15.09) for EAT-26 and 14.53 (5.05), 12.61 (4.88), 13.43 (5.11), and 15.34 (5.16) for GHQ-12 for Groups I through IV, respectively. The results of multiple comparisons for EAT-26 and GHQ-12 showed significant differences between the low-scoring Thin-Thin group and the high-scoring Fat-Fat group and the Normal-Fat group (P< .05). The scores for self-esteem were 27.20 (7.01), 30.57 (7.35), 31.88 (5.72), and 28.15 (7.67) for Groups I through IV, respectively. Multiple comparison showed significant differences (P< .05) between the upper two groups (Thin-Thin group & Normal-Thin group) and the lower two groups (Fat-Fat group & Normal-Fat group).

Table5. Average and SD of FACESⅢ,EAT-26, GHQ-12 and Self-esteem in four groups

Groups	Cohesion [a]		Adaptability[a]		EAT-26 [b]		GHQ-12 [b]		Self-esteem[c]	
	Average		Average		Average		Average		Average	
	(SD)	N	(SD)	N	(SD)	N	(SD)	N	(SD)	N
I. Fat-Fat group	24.47 (7.59)	70	25.54 (4.81)	70	53.01 (19.05)	70	14.53 (5.05)	70	27.20 (7.01)	71
II. Thin-Thin group	25.22 (7.36)	209	25.58 (5.32)	209	44.59 (12.28)	205	12.61 (4.88)	206	30.57 (7.35)	209
III. Normal-Thin group	26.64 (7.75)	92	26.09 (5.96)	92	46.90 (14.85)	92	13.43 (5.11)	91	31.88 (5.72)	91
IV. Normal-Fat group	24.99 (7.80)	92	25.39 (5.00)	93	49.98 (15.09)	91	15.34 (5.16)	93	28.15 (7.67)	92

Result of multiple comparison
a; n.s.
b; 1 & 4 > 2 (*P*<.05)
c; 1 & 4 > 2 & 3 (*P*<.05)

DISCUSSION

Eating behaviors

We used EAT-26 with a 0-3 point scoring method as a scale to measure the degree of abnormal eating behaviors that are strongly related to eating disorders. 4.9% of the total students surveyed scored above 20, indicating clear abnormal eating behavior. By sex, 3.2% of boys and 7.1% of girls scored over 20. We compared these results with the findings of Nishizawa et al. (26). Using the Japanese version of EAT-26, Nishizawa et al. reported that 2.4% of boys and 11.2% of girls scored over 20, indicating probable abnormal eating behavior. Although there is only a slight difference for the data reported for boys, our survey yielded a somewhat lower percentage for girls. However, the study by Nishizawa et al. surveyed high school students (15-17 year olds), and it is quite possible that the percentage of students with abnormal eating behaviors would increase with age. This means that we should pay careful attention to the fact that approximately 3% of boys and approximately 7% of girls already show signs of abnormal eating behavior as junior high school students (12-15 year olds).

Family factors (FACES III) and eating behavior

We used FACES III as an instrument to evaluate the functioning of family systems. The results for the cohesion scale were an average of 23.95 (7.33) for boys and 26.83 (7.61) for girls, with a total average of 25.26 (SD=7.59). On the adaptability scale, scores averaged 25.19 (5.22) for boys and 26.19 (5.35) for girls, with a total average of 25.65 (5.29). Girls gave higher evaluations of their family's adaptability and cohesion than boys did. In a comparison with the results of other similar studies in Japan, our survey yielded generally lower scores for both cohesion and adaptability. Specifically, Kusada (17) reported 31.99 (7.00) for cohesion and 29.11 (5.14) for adaptability in a survey of students at technical schools and universities, and Sadaki et al. (30, 31) reported 29.47 (7.14) for cohesion and 29.92 (4.97) for adaptability in a survey of high school students. A possible explanation for these differences may be that the surveys by Kusada and Sadaki et al. were conducted over ten years ago, and that our survey focused on younger junior high school students (12-15 year olds). If this is the case, we might say that junior high school students today have the impression that their families are not very close and are lacking in flexibility. In any case, it will be important to administer the Japanese version of FACES III across an even wider range of age groups to understand how the family system is perceived by each cohort.

In terms of a relationship between family systems and abnormal eating behavior, our survey did not produce any significant correlations with EAT scores for either cohesion or adaptability. These results did not corroborate the findings of Graber et al. (13), who reported that adolescent girls (average age: 16 years old) who had high EAT scores and high depression scores stated that their families had many conflicts and high cohesion. However, we did find a significant correlation between both cohesion, adaptability and GHQ-12, self-esteem. Students who gave low marks for their family's cohesion and adaptability reported more psychological complaints and tended to have lower self-esteem. Psychological complaints and low self-esteem were in turn correlated with abnormal eating behaviors. In other words, although we did not find a direct correlate between abnormal eating behavior and family relationship, our study suggested the indirect involvement through mental problems and low-self esteem.

Psychological complaints and eating behaviors

Our survey yielded an average score of 12.64 (SD=5.18) for boys and 14.83 (4.84) for girls on the GHQ-12, used to measure the presence of psychological complaints in an individual. In similar studies conducted in Australia, Graetz (14) reported an average of 9.38 for boys and 10.76 for girls in a survey of 16-19 year olds, and Tait et al. (33) reported an average of 9.9 (5.4) for boys and 12.6 (6.6) for girls among 11-15 year olds. Girls scored higher than boys in our survey just as they did in the Australian studies.

Although, our survey produced higher scores than Australian studies, that does't mean Japanese students have a lot of mental problems. As when the GHQ (60 items) is scored according to the traditional method (0-0-1-1), 16/17 is set as the point of discrimination between healthy and unhealthy states in Japan, while other countries set this point at 11/12 (24). Therefore, we cannot categorically conclude that students in Japan necessarily deal with more psychological complaints, but we can say that differences by sex are present in all countries. There was also a significant correlation between GHQ and EAT scores in our study, indicating a relationship between psychological complaints and abnormal eating behavior. These results do not conflict with previous research (Mann et al., 20; Cooper et al., 3; Mukai, 22) and they reconfirm the existence of a relationship between psychological complaints and abnormal eating behavior.

Body image and eating behavior

Using the body silhouette images developed by Stunkard, Sorensen and Schlusinger, we found that boys scored an average of 3.81 (1.98) for CURRENT and 3.67 (1.21) for IDEAL while girls scored an average of 4.78 (1.66) for CURRENT and 3.02 (1.03) for IDEAL. Other Western studies of university students using the same 1-9 point scoring method (Fallen et al., 9; Rozin et al., 28; Zellner et al., 36) reported scores in and around 4 for both CURRENT and IDEAL among boys, and around 3.5 for CURRENT and slightly less than 3 for IDEAL among girls. Of course, it is difficult to make a comparison based simply on CURRENT and IDEAL scores alone since these western studies did not include BMI data as subjective indicators of the body shapes of those surveyed. However, both our results and the results of these other studies indicate that while there was no significant difference between CURRENT and IDEAL body images among boys, girls gave significantly higher values to CURRENT compared to IDEAL. It is also interesting to note that Japanese junior high school girls and western women university students had very similar ideal body images.

In determining the relationship between body image and abnormal eating behavior, we used Pearson's correlation and found that, just as in the survey by Zellner et al. (36), individuals with high EAT scores tended to evaluate themselves as overweight and had very slim silhouette as their ideal body shape. The higher the EAT score, the greater the gap between CURRENT and IDEAL body image (CURRENT-IDEAL). We perceive this gap as an individual's dissatisfaction with his or her body, our data supports the findings of Mukai (22) and Rukavina et al. (29). Furthermore, our survey showed that the CURRENT-IDEAL gap was correlated not only with abnormal eating behavior, but also with psychological complaints and low self-esteem. There is some debate over whether there is a causal relationship between CURRENT-IDEAL gaps and abnormal behavior and low self-esteem and depression and other mental illness. For example, Darnall et al. (4) determined via path analysis that the gap between current and ideal body image caused self-esteem to drop, and that this then led to abnormal eating behavior, and in a longitudinal study conducted by Eisenberg et al. (6), it was reported that initial dissatisfaction with body image had an influence on low self-esteem and depression five years down the road. However, neither of these studies discussed the relationship between the individual's actual body shape and his or her imagined body image. This issue has yet to be fully explored in the literature, leading us to conduct a cluster analysis in our study using the variables of BMI, representing actual body shape, and CURRENT scores. Our analysis resulted in four distinct groups, the characteristics of which are described below.

BMI, body image, and eating behavior

The four groups derived from cluster analysis of BMI and CURRENT scores are the: 1) Fat-Fat group, with an average (SD) BMI of 24.56 (2.12) and an overweight CURRENT body image, 2) Thin-Thin group, with an average (SD) BMI of 17.04 (1.09) and a thin CURRENT body image, 3) Normal-Thin group, with an average (SD) BMI of 19.81 (1.12) and a thin CURRENT body image, and 4) Normal-Fat group, with an average (SD) BMI of 19.93 (2.89) and an overweight CURRENT body image. Although we did not discover any groups with extreme gaps in body image perception, that is, students who were actually overweight but thought of themselves as thin, or students who were actually thin but thought of themselves as fat, we did find that there were groups of students who perceived themselves as either thin or fat even though they actually fell within the average weight range. Furthermore, we found that both the Fat-Fat group and the Normal-Fat group had over a two-point gap between current and ideal body images (CURRENT-IDEAL); the average (SD) for the group of overweight students who recognized themselves as overweight was

2.99 (1.58) and the average (SD) for the group of students who were average but perceived themselves as overweight was 2.26 (1.55).

In contrast, the students in the Thin-Thin group and Normal-Thin group had averages (SD) of -0.37 (1.46) and 0.63 (0.95), showing very little difference between CURRENT and IDEAL, and indicating that students felt their current body shape was close to their ideal body image for the most part. Looking at scores for Eat-26, GHQ-12, and self-esteem across each group, the Fat-Fat group and the Normal-Fat group had significantly high scores (*P*< .05) compared to the lowest-scoring Thin-Thin group on EAT-26 and GHQ-12. For self-esteem, the Fat-Fat group and the Normal-Fat group had significantly low scores (*P*< .05) compared to the Thin-Thin group and Normal-Thin group. Regardless of the characteristics indicated by these four groupings, students who perceived themselves as fat, whether or not they were actually overweight, tended to have a gap between reality and their ideal body image, and tended to be unsatisfied with their body image. We also found that students who perceived themselves as fat tended to have abnormal eating behavior, psychological complaints, and low self-esteem. Our findings differed from those of Erermis et al. (7), who reported that overweight children had abnormal eating behavior and tendencies toward depression, as well as low self-esteem.

If we take into account the characteristics of the four groups and the causal relationship between dissatisfaction with body image and psychological complaints, self-esteem, and abnormal eating behavior suggested in studies by the previously mentioned Darnall et al. and Eisenberg et al., there seems to be a tendency for individuals who perceive themselves as fat to have more psychological complaints and low self-esteem. Certainly, it is possible that these issues may lead to abnormal eating behavior. In particular, the junior high school students (12-15 years old) we surveyed in this study were in the middle of a mental and physical growth period, making them especially susceptible to the influence of a thin-worshipping culture. An overweight self-image may have a negative influence on mental stability and self-esteem during the process of growth and development. Once children believe they are fat, they may attempt strict diets and try to control eating at a period of growth in their lives when appetites should be especially strong.

However, schools and other educational organizations are capable of teaching students not only about BMI, but also about body image. Children who exaggerate and think that they are fat even though they are not can be informed about body weights appropriate for their height. Overweight children who recognize that they are overweight can learn what their weight should be and figure out how much weight they need to lose. Rather than skipping meals, doing harsh exercises, or following extreme dietary restrictions, children who need to lose weight should be taught long-range weight-loss methods that are not harmful to their bodies. Junior high school students are in the middle of their development and at an age when proper education can be very effective. In addition to measuring for obesity with BMI, it would be easy for schools to test for body image with very little additional burden on students. Understanding the self-images students have of their bodies would be extremely useful in early screening for eating disorders and preventative education in schools.

Conclusion and Future theme

The purpose of this study is to investigate how individual psychological factors and family relational factors are concerned with the development of eating disorders. Our survey of 12-15 year olds at a public junior high school revealed that approximately 7% of girls and approximately 3% of boys had clear signs of abnormal eating behavior. More than boys, girls tended to have abnormal eating behavior related to potential eating disorders, and they tended to have more psychological complaints. We also found that girls had a gap between

reality and ideal body images, tended to have an exaggerated image of their actual body shape and tended to have low self-esteem. At the same time, girls rated family cohesion and adaptability higher than boys did. However, the scores were generally low for both cohesion and adaptability compared to other studies, and it is possible that the boys in our survey thought their families were not close and were too rigid.

In this study, we did not find a direct relationship between family factors and harmful eating behaviors related to eating disorders. However, it was suggested that there is an indirect relationship in the influence of psychological issues and self-esteem. Our results also showed that individual factors such as psychological complaints, gaps between reality and ideals, exaggeration of reality, and low self-esteem were all related to harmful eating behaviors. In particular, students who thought of themselves as fat, regardless of their BMI, tended to report more psychological problems, have low self-esteem, and are at risk for abnormal eating behavior.

In Japan, junior high school is part of compulsory education. 12-15 years old undergo bewildering changes in their height and weight and develop an increased interest in their bodies during this growth period. They may also be strongly influenced by their education during this time. Schools need to teach about height-appropriate weight to students who are not overweight but who tend to exaggerate and think of themselves as fat. Likewise, students who are overweight and recognize this fact should be taught about their weight and appropriate diet methods. By investigating both actual obesity levels and the body images held by students, we can screen for eating disorders early on and take preventative measures.

In further research we intend to more closely examine eating behavior by conducting a factor analysis with the EAT-26 data. In the current study, we examined only overall trends in the analysis of correlations among each of the scales and the cluster analysis. We hope to expand on this work in the future by including an examination of sex-differences in the correlations and cluster analysis.

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