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## ORIGINAL ARTICLE

### Factors Associated with Eating Disorder Tendency in University Students after the COVID-19 Pandemic

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#### ABSTRACT

University students are at a vulnerable age to develop eating disorders, particularly owing to the impact of the COVID-19 pandemic. Hence, identifying the factors related to eating disorder tendencies among university students is necessary for early intervention. This study aimed to identify the factors associated with eating disorder tendencies among university students after the COVID-19 pandemic in Japan. A questionnaire survey, in both offline and online form, was administered to 561 students from four universities. Eating disorder tendencies, depressive symptoms, narcissistic vulnerability, stress management, self-esteem, and the impact of COVID-19 on their life were assessed and analyzed. The characteristics of students with eating disorder tendencies were related to gender, social networking service interaction, club/circle activity status, depressive symptoms, narcissistic vulnerability, stress coping, and self-esteem. In addition, depressive symptoms and characteristics of "distraction" and "planning" also influenced eating disorder tendencies. Our findings clarified that university students with eating disorder tendencies were characterized by depressive symptoms, narcissistic vulnerability, and low stress coping and self-esteem. Owing to their tendency to seek support to alleviate distress and achieve emotional stability, self-help groups and peer support activities are suggested in universities for early intervention and to deter these tendencies from reaching a clinical stage.

*Keywords:* COVID-19, Depression, Eating disorder tendencies, University students.

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## 1. Introduction

Eating disorders, such as anorexia nervosa, are characterized by low body mass index (BMI) of  $\leq 18.5$  kg/m<sup>2</sup>, a strong fear of obesity, and impaired self-perception of weight, which leads to a feeling of being fat despite being thin and frequent weigh-ins<sup>1</sup>). In Japan, the estimated number of patients with eating disorders during a one-year period from 2014 to 2015 was 24,506, and the number has remained high since the 2000s<sup>2</sup>). Despite the high incidence, the number of patients may have been underestimated owing to a large number of undiagnosed cases<sup>3</sup>). A sub-clinical group of young people may not meet the diagnostic criteria for eating disorders; however, they present partial symptoms, such as extreme food restriction, overeating, or vomiting, and can be described as having eating disorder tendencies<sup>4,5</sup>). There are more people with eating disorder tendencies than those who meet the diagnostic criteria for eating disorders<sup>6</sup>). Those with eating disorder tendencies, although thin, may not experience significant difficulties in their current daily lives and present themselves clinically to avoid being diagnosed. Hence, it is also important to consider not only eating disorders but also eating disorder tendencies as a disease<sup>7</sup>). Furthermore, the characteristics of those with eating disorder tendencies are related to the characteristics of those with eating disorders<sup>8</sup>). Given the increasing incidence for both eating disorders<sup>3,9</sup>) and eating disorder tendencies among youths<sup>5,10</sup>), examining eating disorder tendencies in university students would be useful. Eating disorders are a complex interplay of cultural and social factors, such as a diet culture shaped by a disdain for obesity and desire to be thin; biological factors, such as dysfunction of central eating behavior regulatory mechanisms; and psychological factors, such as personality and body image disorders, cognitive distortions, obsessive-compulsiveness and adherence, and perfectionistic onset<sup>5,11-13</sup>). They are often accompanied by depressive symptoms<sup>11,14,15</sup>), sensitivity to others' evaluation, vulnerability and high need for approval<sup>16-18</sup>), emotional restlessness, maladaptive behaviors during stressful situations<sup>8,19</sup>), and low self-esteem<sup>11</sup>). University students are at the most vulnerable age for developing eating disorders and have higher depressive symptoms<sup>20</sup>) and narcissistic vulnerability<sup>21</sup>). Self-affective vulnerability is defined as vulnerability in processing anxiety and hurt and maintaining positive self-esteem and psychological stability<sup>22</sup>). Those with high self-affective vulnerability are less likely to regulate and alleviate their anxiety and emotions and seek regulation and alleviation from others<sup>22,23</sup>). In addition, university students often experience stressful situations and tend to have unstable self-esteem<sup>24</sup>). Hence, these factors are closely associated with eating disorders and eating disorder tendencies.

The COVID-19 pandemic resulted in major changes in people's daily life, particularly students' university life, such as the implementation of online classes and changes in club and circle activity patterns<sup>25,26</sup>). This may have led to an increase in their dissatisfaction<sup>27</sup>). Furthermore, compared to before the COVID-19 pandemic, the number of first-time outpatients and new inpatients with anorexia nervosa increased approximately 1.6 and 1.4 times, respectively, in 2020<sup>9</sup>). In a survey by the Japanese Eating Disorders Association<sup>28</sup>), approximately 30% of the patients with anorexia nervosa reported decreased food intake compared to the pre-COVID-19 period. Furthermore, more than half of the patients with bulimia nervosa reported increased overeating and discharging behaviors and worsened eating disorder symptoms. In addition to eating behavior problems, anxiety and depression had also increased in approximately 50% to 70% of the patients, which suggested that COVID-19 had a significant impact on eating disorders<sup>28</sup>). Given the similarity in the characteristics of those with eating disorder tendencies and those with eating disorders<sup>8</sup>), the COVID-19 pandemic was assumed to have also affected eating disorder tendencies. A similar trend was observed overseas. Jennifer Wildes, an associate professor of psychiatry and director of an outpatient eating disorder program at the University of Chicago Medicine, stated that patients with eating disorder had nearly doubled compared to before the COVID-19 pandemic and that the pandemic had created

treacherous conditions for the development of eating disorders<sup>29</sup>). Hence, this study aimed to determine the factors associated with eating disorder tendencies among university students after the COVID-19 pandemic.

## **2. Methods**

### **2.1. Participants**

The participants were university students from four comprehensive universities in Japan, aged 18 years or older, who agreed to cooperate. The number of faculties ranged from two to 10, including the faculties of science, humanities, and medical courses.

### **2.2. Survey methodology**

A cross-sectional survey was conducted using a self-administered, unmarked questionnaire or an online questionnaire via Google Forms between July to October 2022. The survey required approximately 15 minutes to complete.

### **2.3. Survey contents**

#### **2.3.1. Participants' background**

Responses were obtained regarding participants' gender, age, grade, eating habits, height, and weight as well as the impact of COVID-19. Questions regarding eating habits were based on Shiba and Mori's questionnaire<sup>30</sup> and elicited information about their meal partner, meal preparation, concern for nutritional balance, and thoughts regarding eating. Questions regarding the impact of COVID-19 were based on the National Federation of University Co-operative Associations' questionnaire<sup>31</sup> and included their club, club activity status, method of interacting with friends (face-to-face/social networking service [SNS]), and so on.

#### **2.3.2. Eating disorder tendency**

The Japanese version of the Eating Attitudes Test-26 (EAT-26) by Mukai et al.<sup>32</sup> measured eating disorder tendency. The  $\alpha$  coefficient was .79, which ensured internal consistency<sup>32</sup>. In total, 26 questions, which included "I want to lose weight" and "I feel fat," were answered on a six-point scale, and the total score was calculated. Higher total scores indicated a higher tendency toward eating disorders.

#### **2.3.3. Depressive symptoms**

The Japanese version of the Quick Inventory of Depressive Symptomatology (QIDS-J) by Fujisawa et al.<sup>33</sup> assessed depressive symptoms. The  $\alpha$  coefficient was .86, which ensured internal consistency<sup>33</sup>. In total, 16 items were rated on a scale from 0 to 3. Higher total scores indicated a higher degree of severity.

#### **2.3.4. Narcissistic vulnerability**

The Narcissistic Vulnerability Scale short version (NVS short version) by Kamiji and Miyashita<sup>34</sup> measured narcissistic vulnerability. The  $\alpha$  coefficients were .79–.86, which ensured internal consistency<sup>34</sup>. The following four types of narcissistic vulnerabilities were identified: "Self-Expression Suppression" or the tendency to suppress self-revelation unnaturally due to shame; "Self-Relaxation Deficiency" or the tendency to have weak self-regulatory abilities for anxiety

and depression, expecting others to relieve them; "Latent Sense of Privilege" or the desire for special treatment and consideration from others; and "Approval/Admiration Hypersensitivity" or hypersensitivity to recognition and praise from others and the tendency to be hurt when expected recognition is not received. The scale consisted of 20 items in total, five for each of the four subscales. Responses were rated on a five-point Likert scale that ranged from 1 (not at all) to 5 (often). Scores for each subscale and the total score were calculated. Higher scores indicated higher propensity and narcissistic vulnerability on each subscale.

### **2.3.5. Stress management**

The Tri-Axial Coping Scale (TAC-24), a coping strategy scale based on Kamimura et al.'s three-dimensional model<sup>35</sup>, was used to measure stress coping. The  $\alpha$  coefficients were .65–.84, which ensured internal consistency<sup>35</sup>. The scale comprised eight subscales that assessed the following coping strategies: "Information Gathering," which involved seeking strategies for problem solving from others; "Abandonment/Giving up," which involved making cognitive judgments to avoid problem solving; "Positive Interpretation," which involved recognizing the positive aspects of the problem situation; "Planning," which involved making efforts to solve the problem; "Avoidant Thinking," which involved trying not to recognize the problem; "Distraction" to forget the problem by performing different activities with others; "Catharsis" to solve the problem by listening to others; and "Responsibility Shifting" to escape from the problem. The questionnaire consisted of 24 items, with three items for each of the eight subscales. The higher the score, the higher the tendency to cope with stress on each subscale.

### **2.3.6. Self-esteem**

The Japanese version of the Rosenberg Self-Esteem Scale (RSES-J) by Mimura and Griffiths<sup>36</sup> was used to measure self-esteem. The  $\alpha$  coefficient was .81, which ensured internal consistency<sup>36</sup>. In total, 10 questions were answered on a four-point Likert scale that ranged from 1 (strongly disagree) to 4 (strongly agree). The total scores were calculated. Higher scores indicated higher self-esteem.

## **2.4. Survey procedures**

At the target facilities, the researchers posted posters or distributed instructions and questionnaires to recruit participants. Students who wished to participate online were asked to scan the QR code on the poster, read the instructions in the Google Form, and decide. Students who wished to respond on paper were given an explanation of the study's purpose, survey content, methods, and ethical considerations on the instruction sheet. If they agreed to participate and wished to respond online, they were asked to submit their data by checking the consent box in the Google Form before they completed the questionnaire. For those who responded on paper, a self-administered, unmarked questionnaire was administered. Collection boxes, the contents of which were not visible, were placed in designated locations within each facility, and the individual response forms were collected so that they could not be identified. IBM SPSS Statistics version 28 was used for data analysis, with a statistical significance level of 5%.

### **2.4.1. Participants' background**

Descriptive statistics of participants' gender, age, grade, eating habits, and changes in life due to COVID-19 were calculated to understand their personal background. For physical data based on gender, the median, mean, and standard deviation of their height, weight, and BMI were calculated; for BMI, descriptive statistics were calculated according to the criteria defined by the World Health Organization (WHO) and Japan Society for the Study of Obesity, with a BMI of <18.5, 18.5–25.0, and  $\geq 25.0$  defined as thin, standard, and obese, respectively. The following statistics were calculated. Questions regarding the impact of COVID-19 included students' club, club activity status, and method of interacting with friends (i.e., face-to-face or via SNS).

#### **2.4.1.1. Relationship between eating disorder tendency and participant background.**

In accordance with Nakai's<sup>2)</sup> cutoff, two groups were classified as per their EAT-26 scores: >15 (group with eating disorder tendency) and <15 points (group without eating disorder tendency). Chi-squared tests were conducted for the two groups and gender, age, grade, eating habits (meal partner, meal preparation, concern for nutritional balance, and thoughts regarding eating), face-to-face and SNS interactions with friends, and club and circle activity status.

#### **2.4.1.2. Comparison of depressive symptoms, narcissistic vulnerability, stress coping, and self-esteem due to eating disorder tendencies.**

To examine the association between eating disorder tendency and each variable, comparisons were made between the scores of the two groups on the QIDS-J, NVS short version, TAC-24, and RSES-J via a Mann–Whitney U test.

#### **2.4.1.3. Factors influencing eating disorder tendency.**

To examine factors that influenced eating disorder tendency, the EAT-26 scores of the two groups were used as dependent variables, and the QIDS-J; NVS short version subscales of "Self-Expression Suppression," "Self-Relaxation Deficiency," "Latent Sense of Privilege," and "Approval/Admiration Hypersensitivity"; TAC-24 subscales of "Information Gathering," "Abandonment/Giving up," "Positive Interpretation," "Positive Interpretation," "Planning," "Avoidant Thinking," "Distraction," "Catharsis," and "Responsibility Shifting"; and RSES-J were used as independent variables. Logistic regression analysis was conducted. A correlation analysis confirmed that there were no problems with multicollinearity, and the forced entry method was used.

### **2.5. Ethical considerations**

This study was approved by the Ethics Committees of the University of ○○○○ (Notice No. blinded for review) and the institute where the research was conducted. The study purpose and voluntary participation were explained to the participants in writing. Responses were obtained anonymously, and those who checked the consent box icon were deemed to have provided consent.

### **3. Results**

A total of 715 students from four universities responded. After excluding those who did not consent to the survey and those with missing responses on the scales and for height and weight, 561 participants (valid response rate 78.5%) were included in the analysis.

### 3.1. Participants' characteristics

#### 3.1.1. Basic attributes

Of the 561 participants, 107 (19.1%) were men, and 449 (80.0%) were women. Furthermore, 187 (33.3%) and 369 (65.8%) were in their teens and 20s or older, respectively. Of these, 134 (23.9%), 179 (31.9%), 132 (23.5%), 113 (20.1%), 1 (0.2%), and 1 (0.2%) were in the first, second, third, fourth, fifth, and sixth grade of study, respectively. Regarding eating habits, 286 (51.0%) ate alone, and 267 (47.6%) had a dining partner. Regarding meal preparation, 315 (56.1%) prepared their own meals or purchased meals, 168 (29.9%) had family members prepare meals, and 53 (9.4%) ate out or used other methods (e.g., dormitory food). In addition, 330 (58.8%) were concerned about their nutritional balance, while 231 (41.2%) were not. Furthermore, 226 (40.3%) felt that their overall dietary habits were good, while 335 (59.7%) felt they were bad. Regarding changes due to COVID-19, 334 (59.5%) were enrolled in club and circle activity, while 225 (40.1%) were not. Compared to before the COVID-19 pandemic, face-to-face interaction with friends increased, remained the same, and decreased for 61 (10.9%), 189 (33.7%), and 309 (55.1%) respondents, respectively, after the COVID-19 outbreak. SNS interaction with friends increased, remained the same, and decreased for 209 (37.3%), 318 (56.7%), and 32 (5.7%) respondents, respectively.

#### 3.1.2. Physical data

Mean (M) and standard deviation (SD) for height (cm), weight (kg), and BMI (kg/m<sup>2</sup>) were calculated by gender. Men's height, weight, and BMI were M = 171.3 (SD = 5.3), M = 58.8 (SD = 7.5), and M = 20.0 (SD = 2.3), respectively. For women, they were M = 158.0 (SD = 5.5), M = 50.6 (SD = 6.0), and M = 20.3 (SD = 2.1), respectively. Of the total participants, 113 (20.1%) were thin, 433 (77.2%) were standard, and 15 (2.7%) were obese. Among men, 22 (20.6%) were thin, 82 (76.6%) were standard, and three (2.8%) were obese. Among women, 90 (20.0%) were thin, 347 (77.3%) were standard, and 12 (2.7%) were obese.

#### 3.1.3. Relationship between eating disorder tendency and participants' background

Of the total participants, 95 (16.9%) had eating disorder tendencies, and 466 (83.1%) did not. A chi-squared test was performed to examine the association between the two groups and participants' background (Table 1). Eating disorder tendencies were associated with gender, and the "no eating disorder tendency" and "eating disorder tendency" groups had more men and women, respectively ( $\chi^2=4.332$ ,  $df=1$ ,  $p=.037$ ). Eating disorder tendencies were associated with changes due to COVID-19, and more participants in the eating disorder tendency group had increased "SNS interactions with friends" ( $\chi^2=5.951$ ,  $df=1$ ,  $p=.015$ ). However, more participants in the "without eating disorder tendency group" were members of "club and circle activities" ( $\chi^2=9.987$ ,  $df=1$ ,  $p=.002$ ). No association was found between eating disorder tendencies and age, grade, meal partners, meal preparation, concern for nutritional balance, thoughts regarding eating habits in general, and face-to-face interaction with friends.

Table 1. Associations between Eating Disorder Tendencies and Participant Background

	Eating habits																
	Meal partner			Meal preparation				Concern for nutritional balance			Thoughts regarding eating						
	Alone	With partners	<i>p</i>	Self-catering or Purchase	Family	Eating out or Other	<i>p</i>	Do not care	Care	<i>p</i>	Bad	Good	<i>p</i>				
														<i>n</i>	<i>n</i>	<i>n</i>	<i>n</i>
<b>EAT-26</b>																	
No eating disorder tendency	460	240	220	.633	443	259	143	41	.409	466	199	267	.104	466	274	192	.327
Eating disorder tendency	93	46	47		93	56	25	12		95	32	63		95	61	34	

	Changes due to COVID-19											
	Face-to-face interaction with friends			SNS interaction with friends			Club and circle activities					
	No change or Decreased	Increased	<i>p</i>	No change or Decreased	Increased	<i>p</i>	Did not join	Joined	<i>p</i>			
										<i>n</i>	<i>n</i>	<i>n</i>
<b>EAT-26</b>												
No eating disorder tendency	465	414	51	.926	464	<b>301</b>	163	.015	464	173	<b>291</b>	.002
Eating disorder tendency	94	84	10		95	49	<b>46</b>		95	<b>52</b>	43	

Note. N=536~561; Chi-square test; EAT-26: Eating Attitudes Test-26; SNS: Social Networking Service; p: p-value

### 3.1.4. Comparison of each scale by eating disorder tendency

Table 2 shows the results of the comparison of the QIDS-J, NVS short version, TAC-24, and RSES-J in the two eating disorder propensity groups. Scores on the QIDS-J were significantly higher ( $p < .001$ ) in the group with eating disorder tendency (Mdn=8.0, SD=5.1) than in the group without (Mdn=4.0, SD=4.0). For the total score on the NVS short version, the group with eating disorder tendency (Mdn=62.0, SD=18.2) scored significantly higher than the group without (Mdn=55.0, SD=16.3;  $p = .001$ ). In addition, scores on all of the subscales were significantly higher in the group with eating disorder tendency (Mdn=12.0–18.0, SD=5.6–6.1) than in the group without (Mdn=10.0–16.0, SD=4.3–5.6;  $p = .003$ –.030). TAC-24 scores on the subscales of "Information Gathering," "Planning," "Distraction," and "Catharsis" were significantly higher in the group with eating disorder tendency (Mdn=11.0–12.0, SD=3.0–3.3) than in the group without (Mdn=9.0–11.0, SD=2.8–3.0;  $p < .001$ –.016). No significant differences were found for the subscales "Abandonment/Giving Up," "Positive Interpretation," "Avoidant Thinking," and "Responsibility Shifting." The RSES-J scores were significantly lower in the group with eating disorder tendency (Mdn=25.0, SD=6.3) than in the group without (Mdn=26.0, SD=4.9;  $p = .005$ ).

Table 2. Comparison of Each Scale by Eating Disorder Tendencies

	QIDS-J				NVS short version												RSES-J					
	<i>n</i>	<i>Mdn</i>	<i>M</i>	<i>p</i>	Total scores			Self-expression suppression			Self-relaxation deficiency			Latent sense of privilege			Approval/Admiration hypersensitivity			<i>Mdn</i>	<i>M</i>	<i>p</i>
<b>EAT-26</b>					<i>Mdn</i>	<i>M</i>	<i>p</i>	<i>Mdn</i>	<i>M</i>	<i>p</i>	<i>Mdn</i>	<i>M</i>	<i>p</i>	<i>Mdn</i>	<i>M</i>	<i>p</i>	<i>Mdn</i>	<i>M</i>	<i>p</i>	<i>Mdn</i>	<i>M</i>	<i>p</i>
No eating disorder tendency	466	4.0	5.3	<.001	55.0	53.9	.001	16.0	15.8	.003	14.0	14.1	.012	10.0	10.5	.005	14.0	13.5	.030	26.0	25.8	.005
Eating disorder tendency	95	8.0	8.7		62.0	60.4		18.0	17.6		15.0	15.7		12.0	12.3		15.0	14.8		25.0	24.1	

  

	TAC-24																								
	<i>n</i>	Information gathering			Abandonment/giving up			Positive interpretation			Planning			Avoidant thinking			Distraction			Catharsis			Responsibility shifting		
<b>EAT-26</b>		<i>Mdn</i>	<i>M</i>	<i>p</i>	<i>Mdn</i>	<i>M</i>	<i>p</i>	<i>Mdn</i>	<i>M</i>	<i>p</i>	<i>Mdn</i>	<i>M</i>	<i>p</i>	<i>Mdn</i>	<i>M</i>	<i>p</i>	<i>Mdn</i>	<i>M</i>	<i>p</i>	<i>Mdn</i>	<i>M</i>	<i>p</i>	<i>Mdn</i>	<i>M</i>	<i>p</i>
No eating disorder tendency	466	9.0	9.3	<.001	8.0	7.7	.401	11.0	10.7	.834	10.0	10.2	<.001	9.0	8.9	.317	10.0	9.9	.001	11.0	10.3	.016	6.0	6.0	.851
Eating disorder tendency	95	11.0	10.5		7.0	7.5		11.0	10.8		12.0	11.4		9.0	9.2		11.0	11.0		11.0	11.0		6.0	6.2	

Note. N=561; Mann-Whitney U test; Mdn: Median; M: Mean; p: p-value; EAT-26: Eating Attitudes Test-26; QIDS-J: The Japanese version of the Quick Inventory of Depressive Symptomatology; NVS: Narcissistic Vulnerability Scale; RSES-J: The Japanese version of the Rosenberg Self-Esteem Scale; TAC-24: The Tri-Axial Coping Scale

### 3.1.5. Factors influencing eating disorder tendencies

Logistic regression analysis was conducted using the two groups as dependent variables. The results are shown in Table 3. The QIDS-J (B=0.18,  $p<.001$ ) had the strongest effect on eating disorder tendency with an odds ratio (OR) of 1.195 at 95% confidence interval (CI): 1.120–1.275. The TAC-24 subscales "Planning" (B=0.13,  $p=.030$ ) and "Distraction" (B=0.14,  $p=.010$ ) had an OR of 1.137 (95% CI: 1.012–1.277) and 1.149 (95% CI: 1.034–1.277), respectively, and influenced eating disorder tendency. The results of the Hosmer–Lemeshow test showed  $p=.190$ , which indicated a good fit for the model.

Table 3. Factors Associated with Eating Disorder Tendencies

Independent variables	Partial regression coefficients	Odds ratio	95% COI	<i>p</i>
<b>QIDS-J</b>	0.18	1.195	1.120-1.275	<.001
<b>NVS short version</b>				
Self-expression suppressio	0.01	1.014	0.958-1.073	.625
Self-relaxation deficiency	0.01	1.007	0.945-1.072	.836
Latent sense of privilege	0.05	1.056	0.985-1.132	.128
Approval/Admiration hypersensitivity	-0.05	0.948	0.885-1.015	.122
<b>TAC-24</b>				
Information gathering	0.06	1.060	0.950-1.183	.295
Abandonment/Giving up	-0.11	0.895	0.798-1.005	.060
Positive interpretation	-0.10	0.904	0.798-1.023	.111
Planning	0.13	1.137	1.012-1.277	.030
Avoidant thinking	0.03	1.030	0.927-1.145	.584
Distraction	0.14	1.149	1.034-1.277	.010
Catharsis	0.01	1.012	0.900-1.137	.842
Responsibility shifting	0.04	1.040	0.914-1.183	.555
<b>RSES-J</b>	0.02	1.015	0.959-1.075	.604

Note. N=561; Logistic regression analysis with forced entry method; Hosmer-Lemeshow test  $p=.190$ ; Judgmental success rate 84.3%; QIDS-J: The Japanese version of the Quick Inventory of Depressive Symptomatology; NVS: Narcissistic Vulnerability Scale; TAC-24: The Tri-Axial Coping Scale; RSES-J: The Japanese version of the Rosenberg Self-Esteem Scale



## **4. Discussion**

### **4.1. Research survey period**

The survey period was from July to October 2022. The number of newly infected COVID-19 cases gradually began to increase in early July 2022 and reached a record high in August 2022 in Japan. However, beginning in late August, the cases gradually decreased and remained between 30,000 and 40,000 during October<sup>37)</sup>. No behavioral restrictions were required during this period<sup>38)</sup>, and some universities resumed face-to-face classes, while others held school festivals and events for the first time in three years<sup>39,40)</sup>. Thus, the gradual increase in face-to-face interactions, although not as much as before the COVID-19 pandemic, may have impacted university students' eating disorder tendencies.

### **4.2. Participant characteristics**

#### **4.2.1. Basic attributes**

In a previous study before the pandemic, approximately 38.7% of the respondents ate alone<sup>41)</sup>. However, our study showed that approximately half of the respondents ate alone, 60% catered for their own meals and paid attention to nutritional balance, and only 40% felt that their overall dietary habits were good. Thus, the tendency to eat alone increased post-pandemic. As concern for nutritional balance, feelings regarding one's diet in general, and actions to improve one's diet are related<sup>30)</sup>, they may have had an effect on university students' eating habits, as one group prepared their own meals and were concerned regarding their eating habits. Regarding the changes due to COVID-19, our participants were university students affected by COVID-19 and consequently faced decreased face-to-face interactions with friends and increased SNS interactions.

#### **4.2.2. Relationship between eating disorder tendency and participants' background**

Our study confirmed an association between eating disorder tendency and gender, with more men and women in the groups "without eating disorder tendency" and "with eating disorder tendency," respectively. Previous studies reported that women were more likely to be patients with eating disorders and have eating disorder tendencies than men<sup>42,43)</sup>. An association between eating disorder tendency and life changes due to COVID-19 was confirmed as those with eating disorder tendency showed increased social networking with friends. Patients with eating disorders had a strong desire for support<sup>17)</sup>, as did those with eating disorder tendencies<sup>8)</sup>. Hence, they sought connection with others. Although COVID-19 restrictions were relaxed during this study's investigation period, face-to-face interaction may not have occurred to the same extent as before the pandemic. It was likely that more people interacted with their friends via SNS. More students in the group "without eating disorder tendency" were members of clubs and circle activities compared to those with such tendencies. A previous survey reported that many students found their school life unfulfilling as they could not participate in club and circle activities due to COVID-19<sup>27)</sup>. This lack of a sense of fulfillment in school life and poor relationships because of school closures could trigger the onset of dieting and development of eating disorders<sup>44)</sup> and may be the reason why those with eating disorder tendencies were not involved in club or circle activities.

#### **4.2.3. Narcissistic vulnerability, stress coping, and self-esteem characteristics of those with eating disorder tendencies**

Yamatsuta et al.<sup>45)</sup> noted that those with higher narcissistic vulnerability were more likely to engage in extreme and risky

dieting, be more obsessed with food, and transition to an eating disorder. In this study, those with eating disorder tendencies had higher total scores on the NVS short version and all the subscales than those without eating disorder tendencies, which suggested that narcissistic vulnerability was related to eating disorder tendencies.

Those with eating disorder tendencies scored higher on the "Information Gathering" subscale of the TAC-24 than those without, which indicated that they gathered information from others to solve their problems. While "Information Gathering" is an adaptive stress-coping strategy<sup>35)</sup>, it includes seeking advice from others to solve problems. Patients with eating disorders may suffer from brain atrophy due to low body weight and nutritional status, which could result in decreased attentional focus, reaction time, and cognitive speed<sup>11)</sup> and extensive cognitive dysfunction<sup>46)</sup>. Thus, they may also experience widespread problems in thinking<sup>17)</sup>. Given that those with eating disorder tendencies may also exhibit similar characteristics due to low body weight, it is likely that they sought advice from others regarding coping strategies for stress-causing problems rather than thinking of them on their own. Those with eating disorder tendencies scored higher on the TAC-24 subscale "Catharsis" than those without. Catharsis is an attempt to bring on emotional venting<sup>47)</sup>, which is triggered through the expression of feelings and verbalization of thoughts<sup>48)</sup>. Higher scores indicated that people expressed their mentally painful feelings to others and acted in search of support. Those with eating disorder tendencies had difficulty handling mental problems on their own and sought support from others<sup>8)</sup>; hence, they might have had higher scores on "Catharsis." Evaluating their ability to cope with stress even if it was by relying on others and supporting them in finding a partner or a place to express their mentally painful feelings is necessary.

Patients with eating disorders had low self-esteem, and they sought to enhance their self-esteem by gaining a sense of self-control by controlling their weight and body shape<sup>11)</sup>. A study on female university students reported that students with moderate and severe eating disorder tendencies had lower self-esteem than healthy students<sup>49)</sup>. Our results were also consistent with previous findings in that those with eating disorder tendencies showed low self-esteem and RSES-J scores. Furthermore, low narcissistic vulnerability, "Information Gathering" and "Catharsis" stress coping, and low self-esteem were not directly associated with eating disorder tendencies. However, the Mann–Whitney U test showed significant differences in these variables between the two groups, suggesting that these factors may be associated as characteristics of those with eating disorder tendencies.

#### **4.2.4. Factors influencing eating disorder tendencies**

Logistic regression analysis showed that higher scores on the QIDS-J, that is, more depressive symptoms, had the strongest effect on the tendency to have an eating disorder. The association between eating disorders and depressive symptoms have been described in previous studies<sup>11,14)</sup>. Under the influence of COVID-19, among patients with eating disorders, more than half experienced worsened original anxiety, and approximately 70% experienced increased depressive symptoms<sup>28)</sup>. This indicated that COVID-19 made their eating behavior problems increasingly apparent<sup>50)</sup>. Furthermore, COVID-19 reportedly increased depressive symptoms in college students<sup>51)</sup>, which suggested that anxiety and depressive symptoms could lead to eating behavior problems and influence eating disorder tendencies in college students. In a comparative study, those with eating disorder tendencies had higher scores on the QIDS-J and more depressive symptoms than those without. Depressive symptoms appeared as a physiological response to starvation due to low body weight and anxiety and were caused by inadequate nutrition to the brain due to low nutritional intake<sup>52,53)</sup>. Thus, eating disorders and depressive symptoms were interrelated, and our results also supported previous research.

Logistic regression analysis indicated that higher scores on the TAC-24 subscale "Distraction" had an effect on the tendency to have an eating disorder. In addition, a comparison of stress coping showed that those with eating disorder tendencies scored higher on this subscale than those without. The "Distraction" scale consisted of "enjoying sports and trips," "killing time by shopping, gambling, and chatting," and "having drinks and eating favorite foods with friends," which indicated the tendency to take actions to forget stress through distraction by interacting with others and is categorized as emotion-focused stress coping<sup>19,34,54</sup>). Patients with eating disorders and university students with a high tendency for eating disorders have been reported to have emotion-focused stress coping<sup>19,55</sup>). Based on these findings, we hypothesized that stress coping using "Distraction" influenced eating disorder tendency. Moreover, "Distraction"—understood as acting to avoid problems—represents a tendency to act to forget stress through distraction by interacting with others. It is a positive behavior of coping with one's problems<sup>19</sup>). Distraction by shopping or enjoying hobbies with others is considered to be an adaptive and effective stress-coping behavior for an individual<sup>54</sup>). Thus, observing those engaging in "Distraction" stress coping and evaluating their stress-coping behaviors, such as engagement in hobbies and interaction with others to avoid problems, as well as introducing peer support activities are essential to encourage them to adopt more adaptive stress-coping behaviors<sup>56</sup>).

Logistic regression analysis also indicated that higher scores on the TAC-24 subscale "Planning" had an effect on the tendency to have an eating disorder. In addition, a comparison of stress coping between those with and those without eating disorder tendency showed that those with eating disorder tendency scored higher on this subscale, which indicated that they made detailed plans to solve their problems<sup>35</sup>). While planning is an adaptive stress-coping strategy<sup>35</sup>), it could also be interpreted as a tendency to stick to one thing. Patients with eating disorder can be stubborn, inflexible, and have a high tendency to adhere and low flexibility<sup>17,57</sup>). In addition, stubbornness was observed as an over-adaptive approach to studies and club activities without cutting corners and a first-time attitude toward university entrance exams<sup>58</sup>).

Furthermore, university students may feel more worthy and experience higher self-esteem in being able to control their weight by acting systematically and making plans to lose weight<sup>15,59</sup>). Similar to previous studies' findings, those with eating disorder tendencies were found to have higher levels of stubbornness and adherence tendencies as well as to be more systematic in their planning to lose weight. These characteristics can also be understood as taking a "Planning" stress-coping approach<sup>15</sup>). However, it is necessary to observe those with these characteristics to identify whether they are overly obsessive about food and weight to prevent the development of eating disorders.

### **4.3. Implications for health guidance for university students**

#### **4.3.1. Assistance in seeking support to solve problems**

Increased depressive symptoms were strongly associated with eating disorder tendency, and those with eating disorder tendencies sought support to alleviate depressive symptoms and achieve emotional stability. Hence, it is important to utilize close friends and family as support resources<sup>60,61,9</sup>). Self-help groups for eating disorder patients may provide emotional support and improve symptoms by sharing experiences<sup>62</sup>). In addition, activities at universities were important to support students who developed eating disorders and prevent the prolongation of their symptoms<sup>56</sup>). Thus, providing a place where those with eating disorder tendencies can seek support from others, such as a university health center, can enable early intervention and deter them from reaching a clinical stage.

### **4.3.2. Responding to others' interactions**

People with eating disorder tendencies sought connection and interaction with others, and as the COVID-19 pandemic increased the incidence of patients with eating disorders due to decreased connection with others<sup>28)</sup>, active engagement with others is important to prevent the worsening of symptoms<sup>50)</sup>. In universities, peer support activities among students<sup>56)</sup> and both face-to-face and SNS interactions<sup>63)</sup> could help students with eating disorder tendencies gain emotional support from each other.

### **4.3.3. Support for adherence**

As people with eating disorder tendencies are characterized by a high degree of adherence<sup>15,17,57)</sup>, persistence in solving problems may cause a sense of inferiority when things do not work out or a sense of inadequacy when efforts are not recognized<sup>64)</sup>. Underlying the increased adherence is the fear of losing control over weight, appetite, and so on, and such fear arises from low self-esteem and lack of self-confidence, which prevents them from expressing their thoughts and feelings. Hence, waiting until a person expresses their feelings in words rather than engaging in a directive manner is important. This approach could help patients gain self-confidence and alleviate the fear of loss of control, which, in turn, could lead to a reduction in adherence.

## **4.4. Limitations and future implications**

As college students are at the prime age when eating disorders develop, particularly owing to the impact of COVID-19, it is necessary to identify related factors among college students for early intervention. The present study contributed to providing evidence. However, some limitations must be considered. First, the participants were predominantly women. Hence, the generalizability of the results is limited. In the future, students from various faculties should be surveyed to consider the gender differences and devise a method that will reflect college students with eating disorder tendencies in general.

Second, as this was a cross-sectional survey, it was not possible to compare the characteristics of those with eating disorder tendencies before the COVID-19 pandemic. Future studies should consider a longitudinal survey based on our results and examine the effects of changes due to the COVID-19 pandemic to clarify the relationship between COVID-19 and eating disorder tendencies in further detail. This would allow us to examine more effective intervention methods for those with eating disorder tendencies.

## **5. Conclusion**

This study aimed to determine the factors associated with eating disorder tendencies among university students after the COVID-19 pandemic. The results indicated that eating disorder tendency was associated with gender, club/collective activity status, SNS interaction with friends, and purpose of SNS use. Those with eating disorder tendencies were characterized by depressive symptoms, narcissistic vulnerability, stress coping, and self-esteem.

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