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Validating the family coping questionnaire for eating disorders for caregivers of Japanese patients with eating disorders: association between coping strategies and psychological characteristics

Seraki Miyamoto, Saki Harashima and Kazuhiro Yoshiuchi* 

Abstract

Background: Eating disorders (ED) can adversely affect the psychological health of patients' caregivers. The present study aimed to validate a Japanese version of the Family Coping Questionnaire for Eating Disorders (FCQ-ED-J) and investigate the association between the coping strategies and psychological states of the caregivers of ED patients.

Methods: The caregivers completed the FCQ-ED-J and the Profile of Mood States. The FCQ-ED measures the coping strategies of caregivers of ED patients to the ED symptom-related behaviors. As confirmatory factor analysis did not yield an adequate model fit, the factor structure of the FCQ-ED-J was analyzed using exploratory factor analysis. Subsequently, the reliability and validity of the FCQ-ED-J were examined using Cronbach's alpha and Pearson's correlation coefficients in relation to the Profile of Mood States.

Results: Data from 150 caregivers, including 91 mothers and 34 fathers, was analyzed (mean age 51.1 years, $SD = 12.0$). The FCQ-ED-J, with 13 items grouped across four subscales ["response to binge-eating" (factor 1), "response to frequent weighing" (factor 2), "response to too much physical exercise" (factor 3), and "response to abusing laxatives and/or diuretics" (factor 4)] had Cronbach's alpha values representing acceptable to good internal consistency (0.71–0.85). Each subscale of the FCQ-ED-J was significantly correlated with the Profile of Mood States subscales.

Conclusions: The FCQ-ED-J had sufficient reliability and validity. The Japanese caregivers' responses to the patient's ED symptom-related behavior were associated with their psychological states. Thus, the FCQ-ED-J may offer insight into more effective and reasonable care by caregivers for ED patients.

Plain English summary: The Family Coping Questionnaire has been used by researchers to assess the coping strategies of the relatives of patients. The present study aimed to validate a Japanese version of the Family Coping Questionnaire for Eating Disorders (FCQ-ED-J) and investigate the association between the coping strategies and psychological states of the caregivers of ED patients. Data from 150 caregivers, including 91 mothers and 34 fathers, were analyzed. The FCQ-ED-J comprised 13 items grouped into four subscales, with acceptable to good internal consistency (Cronbach's alpha values between 0.71 and 0.85). All subscales of the FCQ-ED-J were found to be statistically significantly correlated with the profile of mood states (POMS) subscales. The Japanese caregivers' responses to

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the patient's ED symptom-related behavior were associated with their psychological states. Thus, the FCQ-ED-J can be utilized to help caregivers provide more effective and reasonable psychological care and support to ED patients.

Keywords: Coping strategies, Eating disorders, Caregivers' psychological distress, Family coping strategies, Japan, Anorexia nervosa, Family coping questionnaire

Background

Previous studies reported that family members of ED patients might suffer from emotional health problem as well as patients [1, 2]. Family members are often the main caregivers for ED patients. Caregivers has been defined as those who are the most concerned about the patient, supporting the patient's care at home, preparing the patient's meals, and attending hospital visits as significant persons [3]. Previous studies have reported that many caregivers for patients with ED symptoms suffer from depression and anxiety [3–16]. In addition, caregivers occasionally use maladaptive coping strategies, such as self-blame, denial, and behavioral disengagement, to deal with their psychological burden, further amplifying their psychological distress [3, 17]. In Japan, the primary caregiver for ED patients is their mother, who spends the longest time with them [10, 18]. There are quite a few in-patient or day-patient treatment facilities in Japan that can provide specialized treatments for EDs [10, 19]. Therefore, caregivers living with the patient inevitably spend more time with the patient, a tendency that is even greater when the patient is in poor physical or mental condition [10].

The family coping questionnaire for eating disorders (FCQ-ED) was originally developed in Italy to assess the coping strategies of caregivers of patients with EDs [20]. Several previous studies of caregivers for ED patients showed that while task-oriented coping strategies were associated with lower levels of anxiety and depression [21, 22], emotion- and avoidance-oriented strategies were associated with higher distress [23, 24]. Although the family member is the primary caregiver and has more contact time with the ED patient, only a few studies have analyzed the relationship between ED patient caregivers' coping strategies and their psychological states in the Japanese context [10, 18]. Furthermore, no equivalent questionnaire exists to evaluate such coping strategies.

In the present study, we developed a Japanese version of the FCQ-ED and evaluated its reliability and validity. A study of domestic caregivers of autism spectrum disorders reported higher psychological distress in Japanese caregivers than in Italian caregivers [25]. This may be related to the cultural background of Japan, which characterizes the collectivist society compared to Italy, which is more individualistic [25], and the social acceptability of emotionally negative expressions [26]. Therefore, the results of the present study could differ between the

Japanese and Italian cultures. The present study aimed to validate the FCQ-ED for Japanese caregivers of patients with ED and examine the association between caregivers' coping strategies and their psychological states. We hypothesize that FCQ-ED will extract features of Japanese ED patient caregivers' coping strategies and the coping strategies will be associated with their psychological states.

Methods

Setting

The present study was approved by the Research Ethics Committee of the University of Tokyo. Recruitment was conducted from outpatients from December 2017 to December 2019, before the COVID-19 pandemic, at the Department of Stress and Psychosomatic Medicine in the University of Tokyo Hospital, in Tokyo, Japan. The present study was conducted in accordance with the Declaration of Helsinki and the "Ethical Guidelines for Medical and Health Research Involving Human Subjects" [10, 20, 27, 28].

Participants

Because prolonged contact with a patient with ED is associated with poorer caregiver mental health, the participants had to have lived with and been actively involved in the care of a patient with ED [10]. The inclusion criteria for patients with EDs were as follows: (1) an ED diagnosis according to the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5) [29]; (2) aged between 16 and 65 years; and (3) lived with a caregiver for at least nine months during the last year, and continuously for the last three months. The inclusion criteria for caregivers were those aged between 20 and 65 years and actively involved in the patient's care. Caregivers older than 65 years were excluded based on previous research because coping styles are influenced by age even when participant characteristics are used as controlled variables [20, 30, 31].

Study procedure

First, we obtained permission to develop a Japanese version of the FCQ-ED methodology (FCQ-ED-J) from the corresponding author of the original version published in English [20]. The FCQ-ED was then translated into Japanese, and a final version was developed after further discussion and consensus among the authors, all of whom

were native Japanese speakers and had expertise in the area of EDs. This version was back-translated into English by a professional bilingual editor, proficient in both English and Japanese and without expert knowledge of EDs, to confirm that the English and Japanese versions were conceptually equivalent. The first Japanese FCQ-ED translation required only minor changes.

Eligible ED patients and caregivers who visited the Department of Stress Sciences and Psychosomatic Medicine at The University of Tokyo Hospital received an explanation of the present study. The patients who agreed to have their caregivers participate in this study provided verbal informed consent. Additionally, the caregivers who willingly agreed to participate in this study provided written informed consent. More than one caregiver could be recruited per patient. The difference in the number of caregivers participating in the present study might have yielded a sampling bias. Participating caregivers were asked to complete the FCQ-ED-J and profile of mood states (POMS) [32] on paper at home or in the hospital waiting room. Following that, a chart review provided data on the patients' and caregivers' key sociodemographic and clinical characteristics.

Measures

FCQ-ED

The FCQ-ED, which measures the coping strategies of caregivers of ED patients to the ED symptom-related behaviors, comprises 32 items grouped into six subscales: Coercion (i.e., angry and impulsive reactions to the patient's behaviors), positive communication (i.e., calming and reassuring reactions), collusion with patient's behaviors (i.e., not saying anything regarding the patient's dysfunctional eating behaviors), seeking information (i.e., seeking advice on how to behave with the patient), avoidance (i.e., avoiding situations that are a reminder of the patient's illness), and seeking spiritual help [20]. As in the original version, in this study, each item was rated on a four-point Likert scale (1: Never; 2: Rarely; 3: Sometimes; 4: Always). Higher subscale scores indicated more frequent application of the specific coping skill. The confirmatory factor analysis (CFA) in the original study identified a two-factor classification of coping strategies: Problem-oriented (coercion, collusion, avoidance) and emotion-focused (seeking information, positive communication) [20].

POMS

The caregivers' psychological states were assessed using the POMS [32]. The POMS is a self-report instrument composed of six mood subscales (tension-anxiety, depression-dejection, anger-hostility, vigor, fatigue, and confusion) validated on clinical populations. The Japanese version has been regarded as adequately reliable and

valid based on previous research indicating a Cronbach's alpha coefficient ranging between 0.779 and 0.926 for the mood subscales [33]. Vigor denotes a positive mood, while the others denote negative moods. Higher subscale scores for all but vigor indicate a poorer mood.

Statistical analysis

The level of significance was set at 5% ($p < 0.05$). The analyses were performed using statistical package for the social sciences (SPSS) version 20.0 and SPSS Amos version 22.0.

Reliability based on the original subscales

The reliability of each item for five of the FCQ-ED-J subscales was measured using Cronbach's alpha values to assess the internal consistency of the instrument [34, 35]. The spiritual help subscale (one of the six subscales of the original FCQ-ED) was excluded because it comprised only one item.

Confirmatory factor analysis

To confirm the factor structure of the FCQ-ED-J, we ran a CFA to test the fit of the higher-order factor model that was reported [9]. The extracted factors were used as latent variables in the CFA, while the items belonging to them were used as observation variables, followed by a covariance structure analysis. The comparative fit index (CFI) and the root mean square error of approximation (RMSEA) were used to evaluate model adequacy [36, 37].

Exploratory factor analysis

To reconsider the underlying factor structure in the FCQ-ED-J, exploratory factor analysis (EFA) was performed as the original five-subscale model did not indicate a good fit. The Kaiser–Meyer–Olkin (KMO) and Bartlett's test of sphericity values verified the appropriateness of the factor analysis. The number of factors was determined by the scree plot of the factors and the cumulative contribution rate before rotation. The EFA was performed by the maximum likelihood and promax rotation methods, with a factor loading of 0.50 or more as a reference [38], based on the Kaiser–Guttman criterion that meaningful factors should be associated with eigenvalues greater than 1.0 [39, 40].

Reliability based on the new subscales

The reliability of each item on the new FCQ-ED-J subscales was also measured with Cronbach's alpha to assess the internal consistency of the instrument [34, 35].

Validity

Concurrent validity for the FCQ-ED-J and POMS was assessed using Pearson's correlation coefficients. The evaluations of the Pearson's correlation coefficients were based on Cohen's criteria ($0.10 \leq r < 0.3$: weak correlation, $0.3 \leq r < 0.5$: moderate correlation, $r \geq 0.5$: strong correlation) [41]. Multivariate analysis after adjusting for potential confounding factors was not performed in the present study.

Results

Participants

One hundred seventy eligible caregivers received the explanation of this study. Of these, 154 caregivers completed FCQ-ED-J (90.6%), of which eight caregivers refused to participate; five caregivers' patients were transferred to other hospitals or stopped visiting; two caregivers lost the FCQ-ED-J, and one caregiver did not submit the FCQ-ED-J. Four caregivers had to be excluded owing to missing data, leaving 150 caregivers to be included in the study.

We obtained data from 109 patients (107 female, 2 male). The patients' diagnoses were as follows: 56 diagnosed with anorexia nervosa restricting type (AN-R), 40 with anorexia nervosa binge-eating/purging (AN-BP), 10 with bulimia nervosa (BN), 2 with binge-eating disorder (BED), and 1 with other ED.

The participants (98 female, 52 male) consisted of 150 caregivers (91 mothers, 34 fathers, 14 spouses, 7 siblings, 3 children, and 1 partner); the distribution was as follows: 80 AN-R (53.3%), 52 AN-BP (35.7%), 15 BN (10.0%), 2 BED (1.3%), and 1 other ED (0.7%). The mean age of the caregivers was 51.1 ± 12.0 years. The sociodemographic characteristics of the patients and caregivers are reported in Table 1.

Reliability of the original FCQ-ED subscales

The Cronbach's alpha values ranged between 0.66 and 0.45 for the original five FCQ-ED subscales (coercion, 0.66; positive communication, 0.62; collusion, 0.45; seeking information, 0.50; avoidance, 0.46).

Confirmatory factor analysis

CFA results for the original five-subscale model indicated inadequate model fit (CFI = 0.41; RMSEA = 0.10) [36, 37]. Therefore, the underlying factor structure of the FCQ-ED-J was reconsidered using EFA.

Exploratory factor analysis

The KMO test confirmed moderate sampling adequacy (0.68). In addition, Bartlett's test of sphericity yielded statistically significant results ($p < 0.01$), indicating that the correlation matrix was suitable for factor analysis. In

Table 1 Socio-demographic and clinical characteristics

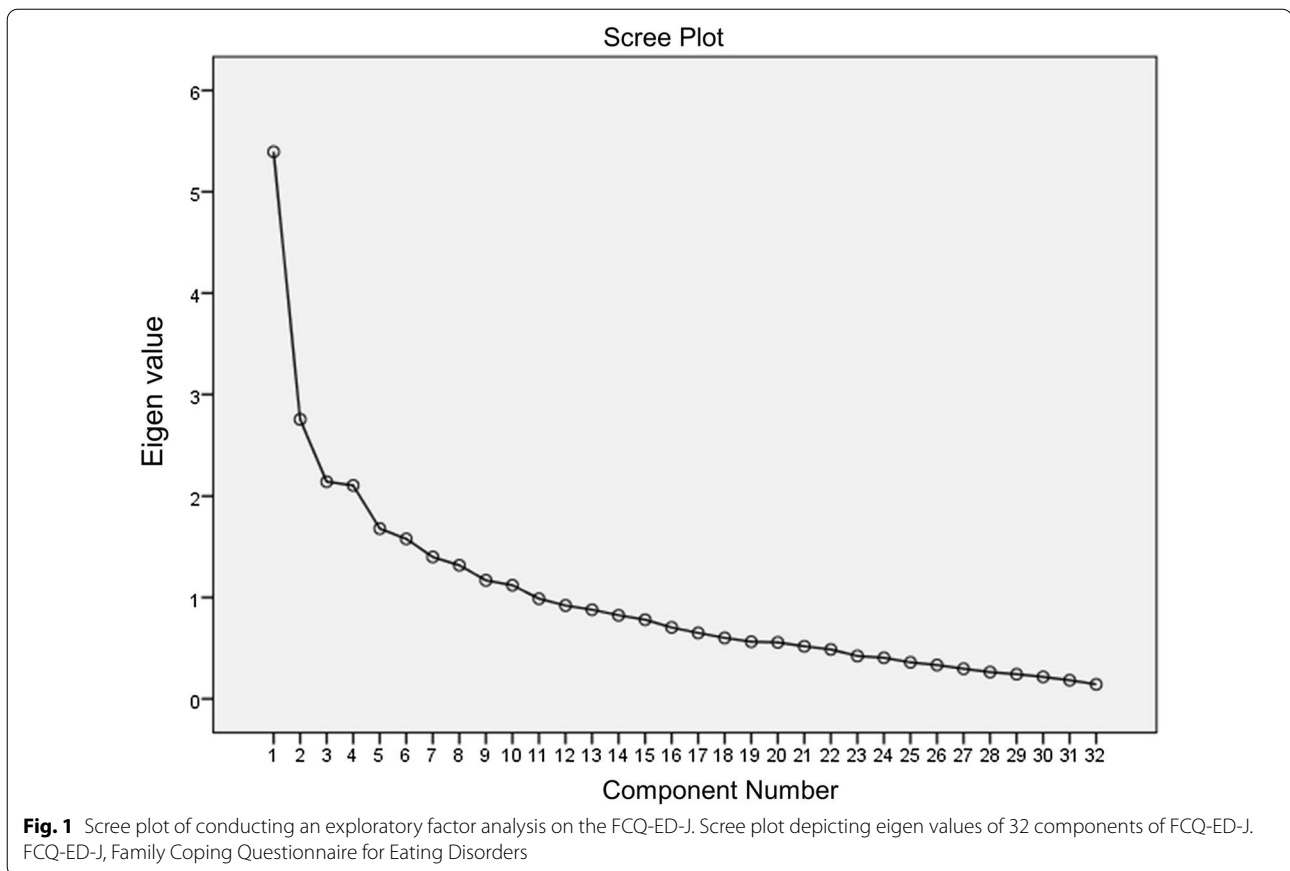
Patients' socio-demographic and clinical characteristics (N = 109)	
Gender, F, % (N)	98.2 (107)
Age, M (SD)	24.6 (9.6)
Duration of the illness, months, M (SD)	70.8 (77.9)
BMI, kg/m ² , M (SD)	15.6 (3.9)
Age of onset, M (SD)	18.6 (7.2)
Caregivers' socio-demographic characteristics (N = 150)	
Gender, F, % (N)	65.3 (98)
Age, M (SD)	51.1 (12.0)
Relationship with the patient, % (N)	
Mother	60.7 (91)
Father	22.7 (34)
Spouse	9.3 (14)
Sibling	4.7 (7)
Child	2.0 (3)
Partner	0.7 (1)
Diagnosis of patients being cared for by Caregivers (N = 150), % (N)	
Anorexia nervosa restricting type (AN-R)	53.3 (80)
Anorexia nervosa binge-eating/purging (AN-BP)	34.7 (52)
Bulimia nervosa (BN)	10.0 (15)
Binge-eating disorder (BED)	1.3 (2)
Others	0.7 (1)

this model, four factors, representing 30.89% of the total variance, were extracted based on eigenvalues ≥ 1 and the scree plot (Fig. 1) [39, 40]. The 13 items in the four-factor solution were considered appropriate by examining the magnitude and rate of change in eigenvalues. Promax rotation was used for the factor solution interpretation (Table 2). Items with factor loadings < 0.5 and those with more than one were excluded [38].

Using EFA, we obtained four important factors: "response to binge-eating" (factor 1), "response to frequent weighing" (factor 2), "response to too much physical exercise" (factor 3), and "response to abusing laxatives and/or diuretics" (factor 4). Contrary to the original FCQ-ED subscales, which corresponded to caregivers' coping strategies, the FCQ-ED-J subscales were interpreted as patients' behavioral categories based on the items.

Reliability based on the four new subscales

The Cronbach's alpha coefficients for the four new subscales—0.71 for "response to binge-eating" (factor 1), 0.85 for "response to frequent weighing" (factor 2), 0.85 for "response to too much physical exercise" (factor 3), and 0.79 for "response to abusing laxatives and/or diuretics" (factor 4) (Table 2)—were indicative of acceptable to good internal consistency [42, 43].



Validity

The correlations between each FCQ-ED-J subscale and the six POMS mood subscales (Table 3) were as follows. Response to binge-eating was statistically significantly positively correlated with anger-hostility ($r=0.21$, $p=0.013$); response to frequent weighing was statistically significantly positively correlated with tension-anxiety ($r=0.19$, $p=0.024$) and anger-hostility ($r=0.19$, $p=0.023$); response to too much physical exercise was positively correlated with almost all subscales ($r=0.20$ – 0.32 , $p=0.000$ – 0.016), except vigor ($r=-0.14$, $p=0.095$); and response to abusing laxatives and/or diuretics was statistically significantly positively correlated with tension-anxiety ($r=0.17$, $p=0.039$) and depression-dejection, ($r=0.27$, $p=0.001$) and negatively correlated with vigor ($r=-0.21$, $p=0.012$).

With regard to the required sample sizes (power analysis), 85 and 194 participants were estimated to be enough to detect correlation coefficients of 0.3 and 0.2 respectively at 5% level of the type I error with 80% power [41].

Discussion

This study aimed to validate the FCQ-ED for Japanese caregivers of ED patients and examine the association between caregivers' coping strategies and their psychological states. We developed a Japanese version of the FCQ-ED (FCQ-ED-J) and confirmed its reliability and validity.

The CFA in the present study did not support the original structure. The EFA revealed that the FCQ-ED-J comprised a 13-item scale with four factors: "response to binge-eating" (factor 1), "response to frequent weighing" (factor 2), "response to too much physical exercise" (factor 3), and "response to abusing laxatives and/or diuretics" (factor 4), all with acceptable to good ranges of calculated Cronbach's alphas, despite the limited number of items in each category. Binge-eating, frequent weighing, too much physical exercise, and the abuse of laxatives and/or diuretics are almost uncontrollable behaviors for caregivers. Japanese caregivers for ED patients may have similar responses to these uncontrollable behaviors.

Table 2 Factor loadings of FCQ-ED-J following exploratory factor analysis with maximum-likelihood estimation and promax rotation; and subscales of the FCQ-ED-J and the reliability

FCQ-ED item	Factor 1 Response to binge-eating	Factor 2 Response to frequent weighing	Factor 3 Response to too much physical exercise	Factor 4 Response to abusing laxatives and/or diuretics
When I saw that S was trying to avoid eating a lot, I told him/her that I was glad and encouraged him/her to do so. (PC)	0.73	−0.04	−0.04	−0.12
I managed to keep calm even when S had emptied the fridge or the cupboard or bought too much food on his/her own. (PC)	0.63	−0.08	0.01	0.13
I hid the food to S to prevent he/she ate too much. (CE)	0.51	0.06	−0.01	−0.07
When I saw that S was preparing large amounts of food to eat, I got angry and told him/her off. (CE)	0.50	−0.03	0.27	−0.06
When S checked his/her body weight too frequently, I shouted. (CE)	−0.05	0.84	0.03	−0.05
When S has frequently checked his/her weight, I calmly tried to convince him/her not to do it again. (PC)	−0.06	0.76	−0.02	0.05
When S checked his/her body weight too frequently, I hid the weight scale. (CE)	−0.002	0.70	0.04	−0.02
When S has frequently checked his/her weight, I did not say anything and pretended nothing had happened. (CL)	0.07	0.70	−0.06	0.10
When S checked his/her body weight too frequently, I reacted angrily. (CE)	0.03	0.61	0.06	0.11
When S has done too much physical exercise, I tried calmly to convince him/her not to do it again. (PC)	−0.12	0.05	0.90	−0.04
When S has done too much physical exercise, I did not say anything and pretended nothing had happened. (CL)	−0.14	−0.08	0.85	0.06
When S has abused laxatives and/or diuretics, I did not say anything and pretended nothing had happened. (CL)	0.01	0.006	−0.02	0.90
When S has abused laxatives and/or diuretics, I calmly tried to convince him/her not to do it again. (PC)	0.08	0.07	0.10	0.66
When I saw that S was vomiting, I reacted angrily. (CE)	0.46	−0.002	0.004	0.15
When I saw that S was eating everything that came to hand very quickly, I reacted angrily. (CE)	0.44	0.07	0.06	−0.04
When S did not want to meet the doctor, I preferred not to force him/her. (CL)	0.41	0.01	−0.11	0.03
When I saw that S was vomiting, I calmly tried to convince him/her not to do it again. (PC)	0.40	0.05	−0.07	0.22
When I saw that S got locked in the bathroom to vomit, I shouted him/her to get out. (CE)	0.38	−0.02	−0.09	0.05
When S has refused to take medication and/or to meet the psychiatrist or psychologist, I have not done anything to make him/her change his/her. (CL)	0.37	0.04	−0.03	−0.08
When I saw that S was alone, I tried to get him/her to meet his/her friends. (PC)	0.34	0.28	0.05	−0.30
Whenever S was nervous or anxious, I asked him to sit with me and tell me what was wrong and I tried to reassure him/her. (PC)	0.29	−0.18	0.19	−0.07
When S was aggressive with me, I managed to keep calm. (PC)	0.19	0.08	0.14	−0.06
I prayed and I confided to a priest so that the situation would improve. (SH)	0.16	0.11	−0.02	−0.01
I tried to get information on S' disorder. (SI)	−0.05	−0.24	−0.23	−0.14
I managed to stay calm even when S had eaten little or nothing all day. (PC)	0.04	0.10	0.38	−0.02
I sought advice on how to behave with S. (SI)	−0.06	−0.18	−0.22	0.04
I avoided to have lunch alone with S. (A)	−0.16	−0.03	−0.17	−0.02
I met with relatives and friends to avoid thinking about S situation. (A)	−0.10	−0.04	−0.16	0.15
I looked for new interests to avoid thinking about S situation. (A)	−0.13	0.04	−0.15	0.08

Table 2 (continued)

FCQ-ED item	Factor 1 Response to binge-eating	Factor 2 Response to frequent weighing	Factor 3 Response to too much physical exercise	Factor 4 Response to abusing laxatives and/or diuretics
When I saw that S was vomiting, I did not say anything and pretended nothing had happened. (CL)	0.34	-0.07	-0.03	0.35
After every meal, I lock the bathroom to prevent S from vomiting. (CE)	-0.12	0.07	-0.12	0.34
I avoided to have lunch with friends or relatives in the presence of S. (A)	-0.05	-0.07	-0.01	-0.11
Cronbach's alpha	0.71	0.85	0.85	0.79

Exploratory analysis with promax rotation was used to interpret the factor solution. This four-factor solution was considered appropriate by examining the magnitude and rate of change in Eigen values. Original subscale allocations are shown in brackets. Bold values in this table show that they are included in "Factor 1", "Factor 2", "Factor 3", and "Factor 4" columns respectively

CE coercion, PC positive communication, CL collusion, SI seeking information, A avoidance, SH spiritual help

Table 3 The Correlations between the FCQ-ED-J and the POMS ($p < 0.05$)

POMS	T-A	D	A-H	V	F	C
<i>FCQ-ED-J</i>						
Response to binge-eating	0.13	0.16	0.21*	0.02	0.11	0.12
Response to frequent weighing	0.19*	0.09	0.19*	0.01	0.08	0.12
Response to too much physical exercise	0.24**	0.20*	0.20*	-0.14	0.27**	0.32***
Response to abusing laxatives and/or diuretics	0.17*	0.27**	0.13	-0.21*	0.07	0.12

T-A tension-anxiety, D depression-dejection, A-H anger-hostility, V vigor, F fatigue, C confusion

* < 0.05, ** < 0.01, *** < 0.001

Dysregulated ED behaviors have been positively and significantly associated with the burden of care for ED patients [44]. Previous studies have shown that increasing the burden of long-term care exacerbated the psychological burden on the caregivers of ED patients [10, 15]. Therefore, the present study's factor structure of the FCQ-ED-J can explain the relationship between dysregulated ED behaviors, difficulty in providing care, and the psychological burden of caregivers. Also, intrusive symptoms of an ED can trigger emotionally-driven responses such as criticism, hostility, and over-protectiveness in caregivers [45].

Three subscales of the FCQ-ED-J ("response to frequent weighing," "response to too much physical exercise," and "response to abusing laxatives and/or diuretics") were weakly positively correlated with tension-anxiety [46, 47]. Additionally, two FCQ-ED-J subscales ("response to too much physical exercise" and "response to abusing laxatives and/or diuretics") were weakly positively correlated with depression-dejection. In previous findings, parents of patients with AN presented with higher levels of anxiety and depression [21]. Although we did not compare our data with that of the healthy control group, our results were consistent with the finding that caregivers for ED patients were more likely to report anxiety

and depression [3-16]. Our findings regarding the relationships between "response to abusing laxatives and/or diuretics" and psychological distress substantiate several previous studies, which found that caregivers of patients who purge reported a stronger burden of care [1, 48]. Specifically, "response to too much physical exercise" was highly correlated with almost all POMS subscales in the present study. Previous research has shown that nutrition is the best predictor of anxiety and depression [2]. Considering the large number of AN caregivers included in our sample (88%), excessive exercise by patients with low body weight or inadequate nutrition may increase the psychological burden of their caregivers.

Several studies have suggested that the emotional reactions of caregivers to EDs (e.g., high levels of stress, anxiety, depression, and hostility) resulted in perpetuating EDs [49, 50]. In our study, "response to binge-eating," "response to frequent weighing," and "response to too much physical exercise" were also positively correlated with anger-hostility. According to a previous ED caregivers' study, mothers who felt that they received higher levels of social support felt less isolated and/or depressed [18], and affective support was significantly associated with decreased severity of the patients' symptoms [10]. The FCQ-ED-J can act as an effective tool for detecting

the psychological burden of caregivers and increasing social support for them. Healthcare providers can discuss the 13 coping strategies identified in the FCQ-ED-J, and share the associations between these coping strategies and their psychological burden with caregivers.

The present study is one of the few to investigate the psychological characteristics of caregivers of patients with EDs in Japan. This study is also the first to develop the Japanese version of the FCQ-ED and demonstrate the relationship between Japanese caregivers' responses to ED behaviors and their psychological states.

This study was also subject to some limitations. First, the number of male participants in the study sample was low, and our sample size was not enough to detect a weak correlation coefficient. A larger sample size is also necessary to extract gender- or relation-specific differences. Second, the FCQ-ED-J was evaluated using a self-reported instrument, and the participants' responses may have been influenced by the social desirability effect or an underreporting bias [51, 52]. For example, during the present study, a patient reported that her parents usually accused her of binge-eating and abusing laxatives; however, her parents did not reveal the same in their FCQ-ED-J responses. Third, caregivers' demographics including, education level, occupation, or income, were not collected. We have not performed multivariate analysis after adjusting for potential confounding factors in the present study.

In order to improve these limitations, we aim to perform a large sample size study involving more male caregivers. It is necessary to obtain actual ED behaviors, and the demographic data from not only patients but also caregivers. Future study is needed to investigate how ED behaviors and caregiving directly affects the caregiver's mental health using a scale that measures the burden of caregiving.

Conclusions

To summarize, the FCQ-ED-J utilized four new factors, different from the original FCQ-ED methodology, and demonstrated sufficient reliability and validity. The FCQ-ED-J can help healthcare providers and caregivers understand what caregivers' responses to ED behaviors make their psychological burden. Therefore, the FCQ-ED-J may be used as one of the means of providing more effective and reasonable care by the caregivers for patients with ED by providing the chance to consider other coping strategies to ED behaviors.

Abbreviations

FCQ-ED: Family coping questionnaire for eating disorders; FCQ-ED-J: Japanese version of the family coping questionnaire for eating disorders; POMS: Profile of mood states; ED: Eating disorder; DSM-5: Diagnostic and statistical manual

of mental disorders, fifth edition; CFA: Confirmatory factor analysis; CFI: Comparative fit index; RMSEA: Root mean square error of approximation; EFA: Exploratory factor analysis; KMO: Kaiser–Meyer–Olkin; AN-R: Anorexia nervosa restricting type; AN-BP: Anorexia nervosa binge-eating/purging; BN: Bulimia nervosa; BED: Binge-eating disorder.

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Authors' contributions

All authors contributed to the study conception and design. Material preparation, data collection, and analysis were performed by SM. The first draft of the manuscript was written by SM, and all authors commented on previous versions of the manuscript. All authors read and approved the final manuscript.

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Availability of data and materials

The datasets generated and/or analyzed during the current study are not publicly available due to ethical restrictions, but are available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate

All procedures performed in the present study were in accordance with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards. In addition, the present study protocol was approved by the Ethics Committee of the Graduate School of Medicine of The University of Tokyo.

Consent for publication

Not applicable.

Competing interests

The authors declare that they have no competing interests.

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