

Usefulness of the Eating Disorder Inventory-2 Japanese Version in Patients with Eating Disorders

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Objective: We produced a Japanese version of the Eating Disorder Inventory-2 (EDI-2) and investigated its reliability and validity. **Methods:** EDI-2 Japanese version was administered to 246 patients with eating disorders and 100 control subjects. The internal consistency as well as discriminant validity were examined. **Results:** The alpha reliability coefficients were high (0.71 to 0.92) in all subscales except the asceticism subscale which was rated 0.61. The anorexia nervosa binge-purging type and bulimia nervosa showed significantly higher scores in all the EDI-2 subscales when compared to the controls, and also significantly higher scores in seven EDI-2 subscales compared to anorexia nervosa restricting type (AN-R). AN-R showed significantly lower scores in the body dissatisfaction subscale. Lower scores in Japanese than Western patients for drive for thinness as well as marked difference in perfectionism and maturity fears suggested cross-cultural issues between Japan and western countries. **Conclusion:** Japanese version of EDI-2 is a measure instrument that can be expected to have a satisfactory level of internal consistency except the asceticism subscale as well as high validity as a tool for the evaluation of the psychopathology of eating disorder.

Key words: Eating Disorder Inventory-2, anorexia nervosa, bulimia nervosa, cross-cultural issue

INTRODUCTION

In 1983, Garner, Olmstead & Polivy [1] developed the Eating Disorder Inventory (EDI) as a method to evaluate the symptoms and psychopathology of eating disorder. EDI is now a widely used tool to the extent that it is recommended in the American Psychiatric Association's practice guidelines for eating disorders [2]. The inventory is a 64-item self-report measure and consists of 8 subscales. The subscales of drive for thinness, bulimia, and body dissatisfaction are items related to the diagnostic criteria of eating disorder; and subscales of ineffectiveness, perfectionism, interpersonal distrust, interoceptive awareness and maturity fears are items for evaluating psychopathologic trait commonly seen in eating disorder. Then in 1991, in response to the increase in prevalence of bulimia nervosa, Garner [3] added 27 items and three subscales of asceticism, impulse regulation and social insecurity to EDI, and developed the EDI-2. The EDI-2 has also been favorably evaluated for reliability and validity in western countries, and has been widely used in clinical studies of eating disorder for following the clinical course and evaluation of psychotherapy and pharmacotherapy; as well as in non-clinical subjects for surveying eating disorder among students and

other populations.

In Japan, several trial studies [4, 5] applying the EDI have been published, but few have evaluated the EDI-2 in non-clinical subjects. Kusano, Ehara, Nakamura et al [6] have examined the reliability, and Shimura, Horie, Kumano et al [7] have examined the factor structure of the EDI-2. However, there is no report of applying the EDI-2 to clinical cases of eating disorder.

We have prepared Japanese translations of the EDI-2 and conducted studies to verify whether it is applicable to Japanese patients. The objective of the present study was to try the EDI-2 Japanese version on patients with eating disorders and investigate its reliability and validity. In addition, we compared the differences among disease types of eating disorders, and discussed the cross culture issues of the psychopathologic characteristics of eating disorders by comparing the EDI-2 results with those reported in Western countries [3].

METHODS

Participants and Procedures

A total of 246 female patients who attended the Tokai University Hospital Psychiatric Outpatient from September 1995 through to March 2000, and were diagnosed of eating disorder by the DSM-IV [8] were

Table 1. Clinical Characteristics of Participants

	AN-R (N = 68)		AN-BP (N = 53)		BN-P (N = 94)		BN-NP (N = 31)		Control (N = 100)	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Age	18.8	5.0	22.7	4.5	21.4	3.8	21.2	3.6	20.1	1.5
Body Mass Index	13.9	1.5	14.5	1.6	19.6	2.5	21.2	3.1	20.0	2.1
Age of onset	17.0	3.4	19.5	3.9	18.2	2.7	18.2	2.7	—	—
Duration of illness	2.0	3.6	3.4	3.1	3.5	3.5	3.0	3.1	—	—

Note: 1. AN-R; anorexia nervosa-restricting, 2. AN-BP; anorexia nervosa binge-purging, 3. BN-P; bulimia nervosa purging, 4. BN-NP; bulimia nervosa non-purging; 5. Control: subjects with no history of eating disorder, SD; standard deviation

recruited for this study. During the initial visit, detailed explanation of the study was explained to each patient and informed consent was obtained to participate in the survey. The patients returned 2 weeks later for the survey. The disease types were anorexia nervosa restricting type (AN-R) in 68 patients, anorexia nervosa binge-purging type (AN-BP) in 53 patients, bulimia nervosa purging type (BN-P) in 94 patients, and bulimia nervosa non-purging type (BN-NP) in 31 patients. As controls, 100 female university students with no history of eating disorder who gave consent to participate in the survey responded to the EDI-2 Japanese version. Table 1 shows the characteristics of the participants.

Before conducting this study, we translated the EDI-2 into Japanese after obtaining permission from Psychological Assessment Resources Inc. The Japanese translations were back translated to confirm that the contents of the Japanese versions were almost the same as the original versions.

Statistical analysis

The reliability of EDI-2 was assessed from the viewpoint of internal consistency as a scale estimated by the alpha reliability coefficients. The discrimination between the eating disorder patients and non-eating disorder subjects as well as the discriminant validity using the DSM-IV diagnoses as external standard were analyzed by one-factor analysis of variance (ANOVA) comparing five groups. When significant difference was detected, then Scheffe's test was conducted. The EDI-2 subscale scores obtained in this study were also compared with those in Western countries by *t*-test.

RESULTS

Table 2 shows the item-total correlation (ITC) for each item and Cronbach's alpha for each subscale. Except for the asceticism subscale that had a Cronbach's alpha of 0.61, all other 10 subscales showed high values of 0.71 to 0.92. The ITC values showed a high correlation of 0.41 to 0.81 for 74 of 91 items, and a low correlation of less than 0.40 in 12 items. Among the items with low ITC, 10 items belonged to the three newly added subscales in the revised version, especially 5 items in the asceticism subscale had low ITC.

Table 3 shows the EDI-2 subscale scores for the 4 types of eating disorder and the control. The scores in the BN-NP, BN-P and AN-BP were significantly higher compared to the control for 10 of 11 subscales, and were significantly higher compared to the AN-R for 7 subscales. Body dissatisfaction scores ranked in descending order of BN-NP, BN-P, AN-BP and AN-R.

The bulimia score was significantly higher in BN-P than in AN-BP.

Table 4 shows the results of the comparison by *t*-test of our results with Garner's cases [3]. The first noteworthy finding is that in general AN-Restrictors in western countries and AN-Bulimics and BN in Japan tend to have more severe psychopathology, while the scores for drive for thinness are significantly lower in Japanese cases for both AN and BN. Perfectionism scores were significantly higher in western cases in all types of eating disorder as well as in controls. Maturity fear scores were significantly higher in Japanese both in eating disorder patients and in controls.

DISCUSSION

1) Reliability of EDI-2 Japanese version

Cronbach's alpha is an indicator of internal consistency, and Nunnally [9] indicated 0.7 to be an acceptable reliability coefficient for evaluation scales. In this study, apart from the asceticism subscale, all the other 10 subscales of EDI-2 had adequately high Cronbach's alphas of 0.71 to 0.92. Asceticism subscale had only a moderate alpha value of 0.61. Similar finding was also reported in the other studies. Garner [3], Eberenz & Gleaves [10], and Thiel, Jacobi, Horstmann et al [11] reported Cronbach's alphas of 0.70, 0.65 and 0.63, respectively, for the asceticism subscale. Although Garner initially developed EDI based on a standard of achieving Cronbach's alpha of 0.80 or above, he has not particularly commented on the fact that the additional subscales in the new edition do not fulfill that standard. On the other hand, the other studies [10, 11] raised doubts over the internal consistency of the asceticism subscale.

In the present study, the slightly lower alpha reliability coefficient of the asceticism subscale is also reflected in the result of ITC. In general an ITC of 0.4 or above is considered acceptable [3]. In the present study, although the majority of the items showed high values, 17 items did not reach the acceptable level. Among these 17 items, 10 belong to the three additional subscales in the new edition; moreover over a half of the items (6 items) in the asceticism subscale had low values. In Garner's report, 16 items had ITC less than 0.4, 13 of which were included in the newly added subscales and 6 items in the asceticism subscale showed low values. However, Garner did not exclude the items with ITC less than 0.4 from the inventory. Similar results were also reported in the other studies [10, 11]. Therefore the scores of the asceticism subscale have to be interpreted with caution.

Table 2. EDI-2 Internal Consistency Reliability Estimates and Subscale Item-Total Correlations in Patients with Eating Disorder

Subscale	Item	Cronbach's alpha	Item-total correlation	Subscale	Item	Cronbach's alpha	Item-total correlation
DT		0.86		IA		0.86	
	1		0.25		8		0.61
	7		0.80		21		0.68
	11		0.68		26		0.35
	16		0.77		33		0.65
	25		0.47		40		0.53
	32		0.65		44		0.67
B	49	0.92	0.74	MF	47	0.8	0.38
	4		0.69		51		0.69
	5		0.80		60		0.67
	28		0.81		64		0.57
	38		0.75		3		0.57
	46		0.81		6		0.41
	53		0.60		14		0.63
BD	61	0.87	0.78	A	22	0.61	0.52
	2		0.40		35		0.31
	9		0.73		39		0.52
	12		0.46		48		0.63
	19		0.53		58		0.50
	31		0.46		66		0.46
	45		0.78		68		0.55
	55		0.66		71		-0.22
	59		0.79		75		0.36
	62		0.59		78		0.39
I		0.87		IR	82	0.79	0.23
	10		0.74		86		0.46
	18		0.54		88		0.30
	20		0.40		65		0.27
	24		0.49		67		0.54
	27		0.76		70		0.49
	37		0.57		72		0.41
	41		0.60		74		0.32
	42		0.52		77		0.53
	50		0.68		79		0.51
P	56	0.73	0.65	SI	81	0.79	0.13
	13		0.43		83		0.55
	29		0.44		85		0.62
	36		0.53		90		0.46
	43		0.55		69		0.57
	52		0.53		73		0.61
ID	63	0.71	0.35	SI	76	0.79	0.57
	15		0.53		80		0.56
	17		0.41		84		0.37
	23		0.54		87		0.47
	30		0.27		89		0.48
	34		0.45		91		0.36
	54		0.29				
57	0.53						

Note: DT; drive for thinness, B; bulimia, BD; body dissatisfaction, I; ineffectiveness, P; perfectionism, ID; interpersonal distrust, IA; interoceptive awareness, MF; maturity fears, A; asceticism, IR; impulse regulation, SI; social insecurity

Table 3. EDI-2 Subscale Scores for Participants

EDI-2 Subscales	1. AN-R (N = 68)		2. AN-BP (N = 53)		3. BN-P (N = 94)		4. BN-NP (N = 31)		5. Control (N = 100)		Significant difference detected in comparison of two groups, $p < .05$
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	
Drive for Thinness	7.0	5.9	12.5	6.3	13.5	5.2	15.4	3.9	5.7	4.7	4, 3, 2 > 1, 5
Bulimia	1.4	3.0	11.7	6.6	14.2	5.3	12.6	5.7	2.0	2.6	3, 4, 2 > 5, 1; 3 > 2
Body Dissatisfaction	10.4	5.2	14.2	5.9	18.6	6.9	23.0	4.5	14.3	6.8	4 > 3 > 2, 5 > 1
Ineffectiveness	8.8	5.4	16.6	7.7	16.1	6.9	15.5	7.7	6.0	4.9	2, 3, 4 > 1, 5
Perfectionism	4.1	4.1	6.0	4.6	6.0	4.3	6.6	4.0	3.2	2.9	4, 2, 3 > 5
Interpersonal Distrust	5.0	3.2	8.1	4.7	7.1	4.7	6.7	4.7	3.5	2.9	2, 3, 4 > 5; 2, 3 > 1
Interoceptive Awareness	5.9	5.7	16.2	7.7	14.4	7.4	13.6	7.4	3.1	4.1	2, 3, 4 > 1, 5
Maturity Fears	8.1	4.9	10.7	6.4	9.6	5.5	10.4	7.3	6.3	4.1	2, 4, 3 > 5
Asceticism	4.2	3.1	8.5	4.2	8.7	4.5	9.6	4.6	3.4	2.7	4, 3, 2 > 1, 5
Impulse Regulation	4.8	4.7	11.4	7.0	9.4	6.4	9.6	5.2	2.8	4.2	2, 4, 3 > 1, 5
Social Insecurity	7.2	4.2	10.6	5.8	10.2	5.3	10.1	4.8	6.0	3.3	2, 3, 4 > 5; 2, 3 > 1

Note: 1. AN-R; anorexia nervosa-restricting, 2. AN-BP; anorexia nervosa binge-purging, 3. BN-P; bulimia nervosa purging, 4. BN-NP; bulimia nervosa non-purging; 5. Control: subjects with no history of eating disorder, SD; standard deviation

Table 4. Comparison of EDI-2 scores between Japanese sample and Garner’s sample by *t*-test

EDI-2 Subscales	Anorexia Nervosa Restrictors		Anorexia Nervosa Bulimics		Bulimia Nervosa		Control	
	Japan (N=68)	Garner (N=129)	Japan (N=53)	Garner (N=103)	Japan (N=125)	Garner (N=657)	Japan (N=100)	Garner (N=205)
DT	7.0 (5.9)***	11.3 (7.0)	12.5 (6.3)*	15.0 (5.6)	14.0 (5.0)*	15.0 (5.0)	5.7 (4.7)	5.5 (5.5)
B	1.4 (3.0)	1.8 (3.5)	11.8 (6.8)**	8.9 (5.8)	13.8 (5.4)***	10.8 (5.4)	2.0 (2.6)**	1.2 (1.9)
BD	10.4 (5.2)	11.9 (7.9)	14.2 (5.9)	14.4 (8.5)	19.7 (6.7)**	17.9 (7.9)	14.3 (6.8)*	12.2 (8.3)
I	8.8 (5.4)**	11.4 (8.4)	16.6 (7.7)*	13.1 (8.7)	16.0 (7.2)***	11.0 (7.5)	6.0 (4.9)***	2.3 (3.6)
P	4.1 (4.1)***	8.9 (5.3)	6.0 (4.6)***	9.5 (5.1)	6.2 (4.2)***	8.8 (4.8)	3.2 (2.9)***	6.2 (3.9)
ID	5.0 (3.2)**	6.9 (5.3)	8.1 (4.7)	7.3 (4.9)	7.0 (4.7)***	5.3 (4.5)	3.5 (2.9)***	2.0 (3.1)
IA	5.9 (5.7)***	9.2 (6.9)	16.2 (7.7)*	12.9 (7.5)	14.2 (7.4)***	11.1 (6.8)	3.1 (4.1)	3.0 (3.9)
MF	8.1 (4.9)***	4.8 (5.1)	10.7 (6.4)***	4.6 (4.9)	9.8 (6.0)***	4.4 (4.6)	6.3 (4.1)***	2.7 (2.9)
A	4.2 (3.1)*	8.0 (6.8)	8.5 (4.2)	7.6 (4.5)	8.9 (4.5)	8.5 (4.0)	3.4 (2.7)	3.4 (2.2)
IR	4.8 (4.7)	5.6 (5.1)	11.4 (7.0)**	5.8 (5.6)	9.5 (6.1)***	6.1 (5.4)	2.8 (4.2)	2.3 (3.6)
SI	7.2 (4.2)*	9.6 (5.5)	10.6 (5.8)	9.1 (5.8)	10.1 (5.2)*	8.2 (4.5)	6.0 (3.3)***	3.3 (3.3)

Note: DT; drive for thinness, B; bulimia, BD; body dissatisfaction, I; ineffectiveness, P; perfectionism, ID; interpersonal distrust, IA; interoceptive awareness, MF; maturity fears, A; asceticism, IR; impulse regulation, SI; social insecurity
Values shown are means with standard deviations in parentheses

*: Significant difference in EDI-2 score compared with Garner’s samples; *t*-test, $p < .05$

**: Significant difference in EDI-2 score compared with Garner’s samples; *t*-test, $p < .01$

***: Significant difference in EDI-2 score compared with Garner’s samples; *t*-test, $p < .001$

2) Discriminant validity of EDI-2 Japanese version

ANOVA comparing five groups showed significant differences for all the subscales. These results are mainly attributed to the great differences in mean subscale scores between the three groups consisting of AN-BP, BN-P & BN-NP and the two groups consisting of AN-R & control. Specifically, AN-BP, BN-P and BN-NP showed significantly higher scores in 10 of 11 subscales when compared with the controls, and in 7 of 11 subscales compared with AN-R. In addition, AN-BP and BN-P showed significantly higher scores than AN-R on the interpersonal distrust and social insecurity subscales. The three disease types (AN-BP, BN-P and BN-NP) with bulimic symptoms tended to have significantly different scores on the bulimia and body dissatisfaction subscales. These results indicate the Japanese edition of EDI-2 has adequate discriminant validity.

In almost all the EDI-2 subscales, AN-R and the other three types of eating disorder showed score

distributions markedly different from each other. This result suggests that patients with bulimia commonly have more severe psychopathology than patients without bulimia. The fact the AN-R shows a low pathologic level has been often attributed to a strong tendency of denial characteristic of AN-R [1]. Although the results of our study do not contradict this point of view, the significantly low score for body dissatisfaction subscale compared to the controls is a noteworthy finding reflecting a sense of success over dieting possessed by the AN-R patients. In addition, a tendency of higher pathologic level ($p < 0.1$) for ineffectiveness and interoceptive awareness subscales in AN-R patients compared to controls is also an interesting finding showing the characteristic psychopathology of AN-R.

Although AN-BP and the two BN types showed similar traits for all the EDI-2 subscales, it is possible to find distinct features for each disease type. Sunday et al [12] and Nakai [5] divided bulimic patients into AN and BN by DSM-III-R and reported similar findings

as the present study for the bulimia and body dissatisfaction subscales. In this study, since we analyzed the data by dividing the bulimic patients into three types using DSM-IV, it was possible to make more detailed observations considering the symptomatic and/or body weight differences. Especially, it is noteworthy that BN-P showed more severe pathology than AN-BP on the bulimia subscale, and BN-NP, BN-P and AN-BP showed significantly different severity on the body dissatisfaction subscale, in descending order of severity. These results suggest that even among patients showing the same binge and purging behaviors, a stronger impulse of binge may result in weight gain and increase the distress (body dissatisfaction) of the patient. This finding may also support that the purging behavior serves for patients to deal with distress resulting from body weight gain due to binge.

3) Eating disorders and cross-cultural issues

We compared the EDI-2 results obtained in the present study with those reported in western countries. Table 3 shows the results of the comparison by *t*-test of our results with Garner's cases [3]. The first noteworthy finding is that in general AN-Restrictors in western countries and AN-Bulimics and BN in Japan tend to have more severe psychopathology, while the scores for drive for thinness are significantly lower in Japanese cases for both AN and BN. Lee, Chiu & Che [13] studied females in Hong Kong and reported that the fear of fatness was not strong in many of the AN patients, and stated that in nonwestern countries drive for thinness probably does not constitute the central psychopathological feature. Other Japanese reports [4, 5] also indicated drive for thinness scores of 4.7 to 8.1 in AN, which were lower than those in western countries. In the present study, drive for thinness scores were significantly higher in AN-BP and BN compared to controls, showing that drive for thinness is also undoubtedly an important psychopathology in our country, but the difference in degree of drive for thinness between Japanese and western patients is interesting. The difference in body weight among the general female population between Japan and western countries may be one of the possible reasons. Considering the fact that the difference in body weight reflects the social environment, these results are of great interest in terms of the social background of eating disorder.

The most interesting finding in the consideration of the socio-cultural background of eating disorder is the marked difference in perfectionism and maturity fears. The degree of perfectionism is significantly stronger in western cases in all types of eating disorder as well as in controls. The perfectionism subscale is composed of items measuring sense of accomplishment and narcissistic exhibition, and the results suggest a difference in cultural value in the importance attached to sense of

accomplishment. Another aspect of cross-cultural interest is the comparison of maturity fears. Maturity fear scores were significantly higher in Japanese both in eating disorder patients and in controls. These results suggest that the developmental struggle of dependence versus independence is stronger in Japanese female adolescents, and that this may characterize the onset and course of eating disorder. This characteristic tendency concerning perfectionism and maturity fears in Japan and western countries has also been reported by the other studies [5, 6] of nonclinical subjects. As a speculative theory from this cross-cultural viewpoint, it may be said that the pursuit of a sense of accomplishment and the expectation of narcissistic exhibition impact the development of eating disorder in the western society, whereas the difficulties concerning the independence of women characterize the eating disorder in the Japanese society where dependence is more acceptable. The cross-culture issues of the clinical picture of eating disorder will be a topic of future study.

REFERENCES

- 1) Garner DM, Olmstead MP, & Polivy J: Development and Validation of a multidimensional eating disorder inventory for anorexia nervosa and bulimia. *International Journal of Eating Disorders*, 2, 15-34, 1983.
- 2) American Psychiatric Association: Diagnostic and statistical manual of mental disorders (4th ed.). Washington DC, 1994.
- 3) Garner DM: Eating Disorder Inventory-2: Professional Manual. Psychological Assessment Resources, Odessa, Florida, 1991.
- 4) Nagata T, Kiriike N, Matsunaga H, et al: Clinical trial of the Eating Disorder Inventory (EDI) in patients with eating disorders. *Japanese Journal of Clinical Psychiatry*, 23, 897-903, 1994.
- 5) Nakai Y: Eating Disorder Inventory scores in eating disorders. *Clinical Psychiatry*, 39, 47-50, 1997.
- 6) Kusano M, Ehara Y, Nakamura K, et al: Eating behavior research on a Japanese non-clinical group using the Eating Disorder Inventory-2: A cross-cultural validity study. *Japanese Bulletin of Social Psychiatry*, 9, 171-181, 2000.
- 7) Shimura M, Horie H, Kumano H, et al: Factor structure analysis of the Japanese version of the Eating Disorder Inventory-91. *Japanese Journal of Behavioral Therapy*, 20, 62-69, 1994.
- 8) American Psychiatric Association: Practice guideline for eating disorders. *American Journal of Psychiatry*, 150, 207-228. 1993.
- 9) Nunnally JC: Psychometric theory, 2nd ed, McGraw Hill, New York, 1978.
- 10) Eberenz KP & Gleaves DH: An Examination of the Internal Consistency and Factor Structure of the Eating Disorder Inventory-2 in a Clinical Sample. *International Journal of Eating Disorders*, 16, 371-379. 1994.
- 11) Thiel A, Jacobi C, Horstmann S, et al: Eine deutschsprachige Version des Eating Disorder Inventory EDI-2. *Psychother Psychosom Med Psychol*, 47, 365-376, 1997.
- 12) Sunday SR, Halmi KA, Werdann L, et al: Comparison of body size estimation and eating disorder inventory scores in anorexia and bulimia patients with obese, and restrained and unrestrained controls. *International Journal of Eating Disorders*, 11, 133-149, 1992.
- 13) Lee S, Chiu HFK & Che CN: Anorexia nervosa in Hong Kong: why not more in Chinese? *British Journal of Psychiatry*, 154, 683-688, 1989.