A Cross-Cultural Comparison of the Eating Disorder Inventory

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ABSTRACT
Objective: A systematic analysis of data collected with the Eating Disorder Inventory (EDI) was made.

Method: A literature search identified 94 sources in which the mean values of the EDI or EDI-2 subscales were reported, comprising 310 samples differing by sex, age, diagnosis, language, ethnicity, or some other relevant attribute. The total number of respondents was 43,722, from 25 different countries, having used the EDI in one of the 16 languages (1–94).

Results: The factorial structure of the aggregate means of the EDI subscales, for both clinical versus nonclinical and Western versus non-Western samples, was almost identical suggesting generalizability across languages and cultures. Non-Western participants scored higher than Western participants on virtually all EDI subscales, both in normal and eating-disordered samples. It was shown that age is a risk factor when someone is already diagnosed with an eating disorder but, in the general population, increasing age reduces the likelihood of being afflicted by eating disorders.

Discussion: Symptoms of eating disorders are more pronounced in non-Western than in Western samples. © 2008 by Wiley Periodicals, Inc.

Keywords: Eating Disorder Inventory; cross-cultural comparison; eating disorders; EDI; EDI-2


Introduction
Eating Disorders in the Cross-Cultural Perspective

Since eating-disordered behavior is more prevalent in industrialized and Western societies, culture has been assumed to be one of the major factors in the etiology of eating disorders, including anorexia nervosa (AN) and bulimia nervosa (BN).1–6 Although incidences of eating disorders appear to be lower in non-Western countries, there are also considerable differences among Western countries themselves.7 Furthermore, because these syndromes are far more common among females than males, particularly, during the last 50 years, among younger females, it is believed that they reflect Western cultural beauty ideals for women.2,4,8,9 Even though exposure to Western culture is still regarded as one of the strongest factors in eating disorder etiology,10 more and more studies have demonstrated that, in fact, eating disorders are not restricted to any particular ethnic, racial, or cultural group.2,7,10,11

Despite recognition of the key role of culture in the eating-disordered behavior, the number of available cross-cultural comparisons is surprisingly modest. Unlike sex-related behavior12 or personality dispositions,13 for example, there have been few cross-cultural studies of eating attitudes and behavior using the same measurement instrument, simultaneously administered to a sufficiently large set of cultures.14 Fortunately, several popular instruments, such as the Eating Disorder Inventory (EDI)15 and Eating Attitude Test,16 have been translated into many languages and, with their help, data have been collected from many countries. However, to our knowledge, there has been no systematic attempt to analyze cross-cultural data obtained with these standard questionnaires, either in ordinary or eating-disordered samples. This is unfortunate, as these data may contain answers to, or at least clues about, some of the cardinal questions in regard to eating disorder etiology: Are eating-related attitudes generalizable across different cultures? Are there major differences between Western and non-Western attitudes toward eating? Is the distinction between eating disordered and normal behavior identical in different cultures?
As has been stated in a recent authoritative review, the cause of eating disorders is complex and poorly understood.\(^{17}\) A systematic analysis of the available data that have been collected with the EDI from around the world, however, may reveal specific risk factors predisposing individuals to eating disorders. In particular, these data could provide tentative answers to some of the aforementioned questions regarding the role of culture in eating disorders.

**Eating Disorder Inventory**

The EDI is perhaps the most widely used self-report measure of symptoms commonly associated with AN and BM. Developed by David M. Garner, it was introduced in 1983 as a commercial test comprising 64 items on three subscales, which assess specific attitudes and behaviors concerning eating, weight, and body shape (DT, drive for thinness; B, bulimia; BD, body dissatisfaction), and five more general personality traits relevant to eating disorders (IE, ineffectiveness; P, perfectionism; ID, interpersonal distrust; IA, interoceptive awareness; MF, maturity fears).\(^{18,19}\)

The second version, EDI-2, was released by Psychological Assessment Resources Inc. in 1991.\(^{15}\) The number of items was expanded to 91 in the revised version. Twenty-seven new items were grouped into three new subscales: A, ascetism; IR, impulse regulation; and SI, social insecurity. Despite the additional items, EDI-2 can still be administered in \(\approx20\) min to individuals or groups for the identification of problems with eating attitudes and behaviors. Normative data were provided for the main diagnostic groups: AN, BN, and eating disorders not otherwise specified (EDNOS).

Recently, the latest edition, EDI-3, was released. It retains the same number of items but groups them differently, using 12 primary scales, consisting of three eating disorder-specific scales and nine general psychological scales that are not specific to eating disorders. In addition, six composites are calculated: one that is eating disorder-specific and five that are general integrative psychological constructs.\(^{20}\) Because the EDI-3 appeared only recently on the market, there are few published studies based on it.

In all EDI versions, respondents are asked to rate whether each item applies “always,” “usually,” “often,” “sometimes,” “rarely,” or “never.” Although there are six response options, they are coded into four response categories from 0 to 3 in such a way that a zero score is assigned to the three responses farthest in the “symptomatic” direction. The ration-

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**Method**

**Search Criteria**

We used multiple methods to obtain the relevant data. First, a computerized database search of ISI Web of Science, PubMed, and PsycINFO was conducted to generate a pool of potential articles. To identify relevant articles, EDI, EDI-2, and EDI2 were used as key terms in the literature search. Search limits restricted the results to articles published in any language between the first appearance of the EDI in 1983\(^{19}\) and June 2007. Second, several reference lists were searched for relevant studies, including manuals and prior reviews of attitudes and eating-related behaviors.\(^{7,11,14,30–32}\) The main
Results

General Characteristics of the Samples

Following the established criteria, we were able to find 94 sources in which the mean values of the EDI or EDI-2 subscales had been reported. The EDI was used in 49 studies (24,783 respondents) and the EDI-2 in 45 studies (18,939 respondents). These 94 sources reported data on 310 samples of normal individuals and eating-disordered populations, differing in terms of sex, age, handedness, ethnicity, race, use of drugs, or some other relevant attribute. The total number of respondents was 43,722 from 25 different countries. In the largest number of samples, the EDI or EDI-2 had been administered in English (100 samples), followed by Spanish (42), and German (34). Of the total 310 samples, 136 had been drawn from the general population, 159 and, based on the means of these samples, computed the pairwise intercorrelation matrix for all 11 EDI subscales, which was then subjected to the principal component analysis. The first four eigenvalues were 7.21, 1.47, 0.71, and 0.40, clearly suggesting a two-factor solution. The first two factors accounted for 67% of the total variance. After normalized varimax rotation, three personality subscales (ID, MF, and IR) loaded strongly on the first factor and three body/weight subscales (DT, B, and BD) strongly on the second factor (see Fig. 1). The remaining personality subscales (IE, P, IA, A, and SI) had significant loadings on both factors.

Next, we repeated the same procedure for all normative samples (N = 130). Although the varimax-rotated two-factor structure was similar to the eating disorder structure, comparisons of factor structures are optimal when orthogonal Procrustes rotation is used to maximally align factors with the target. The factor structure of the eating-disordered samples was replicated with norm samples, with factor congruence coefficients after Procrustes rotation equal to 0.92 and 0.94 for the first and second factors, respectively. These values were above 0.90, which is usually regarded as the criterion for good replication. Figure 1 shows factor loadings for both the eating-disordered and normative samples after orthogonal Procrustes rotation. It is obvious that these two structures are indeed very similar, suggesting that the meaning of the EDI subscales is comparable among both general and eating-disordered populations.

The two-factor solution of samples classified as non-Western was very similar to the two-factor structure recovered from Western samples. When the non-Western structure was Procrustes rotated toward the Western structure, the total congruence coefficient was 0.97 suggesting an almost perfect replication of the factor structures.

The Mean Profiles

As expected, EDI scales were successful in separating the eating-disordered individuals from the general population. Samples diagnosed as eating disordered scored higher than normal samples on
On four of them (DT, IE, IA, and SI), the Cohen’s $d$ was larger than 2, and for the next four (B, BD, ID, and A), larger than 1.3. For IR, the effect size was close to one, and only for two scales, P and MF, was it in the range of 0.36–0.37.

**Figure 2** shows the mean profiles (the sum scores divided by the number of items) for normal and eating-disordered samples separated into two groups according to their classification as either Western or non-Western. In both samples, non-Western scored higher than Western groups on almost all EDI subscales. ANOVA revealed that, in the majority of cases, non-Western scores (marked by asterisks) were significantly higher than Western scores ($p < .05$). When effects of the extraneous variables (sample size, age, and sex) were controlled for the adjusted means they were not significantly different from the unadjusted means. Although the classification of respondents according to the degree of Westernization can be perceived as somewhat arbitrary, it is clear that in both normal and eating-disordered samples, participants from non-Western cultures had a tendency to score higher on most of EDI-2 subscales when compared with participants from typical Western countries.

Sufferers from bulimia scored higher than sufferers from anorexia on each of the EDI-2 subscales. According to a one-way ANOVA, differences on six subscales (DT, B, BD, ID, IA, and MF) were statistically significant ($p < .05$).

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**Correlations with Age**

Do symptoms associated with eating-disordered behavior increase with respondents’ age? Among the eating-disordered samples, the correlation between three eating disorder-specific scales (DT, B, and BD) and the participants’ mean age was positive (Table 1). A relatively strong association remained even if the cultural background of the participant (Western or non-Western) was controlled for. For example, the product moment correlation between body dissatisfaction (BD) and the mean age ($r = .44$) increased to 0.47 when the influence of cultural background was partialled out. From eight more general personality traits relevant to eating disorders, two, IE and IA, also demonstrated a tendency to increase with the patient’s mean age. Conversely, maturity fears (MF) seemed to diminish as eating-disordered patients grew older.

The correlation pattern was remarkably different among the normal samples. The mean scores of 9 out of 11 subscales had the tendency to decrease with respondents’ age. Only body dissatisfaction and perfectionism appeared to remain at approximately the same level as the respondents’ age increased.

**Correlations with BMI**

As expected, among eating disordered participants, increase in body weight (BMI) was positively associated with scores on three eating disorder-specific scales but also on the scale of interoceptive aware-
ness (Table 1). The maturity fears of eating-disordered patients appeared to diminish with their BMI.

Body weight appeared to have some effect on normal samples. Participants with smaller BMI were more aware of their interoceptive processes (IA) and more concerned about their maturation (MF).

Correlations with the Time of the Study

The EDI has been in use for about a quarter of a century. Certain changes can be expected to have taken place during this period. Unfortunately, only in a minority of studies, the exact period of data collection was reported. In all other cases, we used the year of publication. Some of the significant correlations are shown in Table 1. Ascetism of eating-disordered participants, for example, appeared to be smaller in \( r = -.38 \) more recent samples and there was a tendency for greater interoceptive awareness and social insecurity among normal samples.

### Discussion

Many popular psychological assessment instruments developed originally in English have been translated into a number of languages and are now commonly used throughout the world. For psychologists seeking to investigate attitudes and psychological traits across cultures, one of the most demanding problems has centered around the issue of whether measures possess conceptual equivalence across cultures or not.\(^{123}\) When comparing the mean scores of different cultures on a psychological or psychopathological trait scale, any observed difference may be not only due to real cross-cultural variation but also due to inappropriate translation, biased sampling, or the distinct response styles of people from different cultures.\(^{124}\) One of the most common methods for establishing the cross-cultural comparability of measures is to show their internal reliability and thereafter factorial structure invariance across languages and cultures. Although reports about internal reliability are rather common, most studies have failed to report

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**TABLE 1. Correlations between EDI subscales and participant age, BMI, and time when study was conducted**

| EDI-2 Subscales | Eating Disordered | | | Normal | | | | |
|-----------------|-------------------|-----------------|---|-------------------|-----------------|---|
| Drive for thinness | \( r \) = .253 | .296 | -.035 | =-.237 | -.053 | -.0475 |
| \( N \) | 120 | 102 | 159 | 83 | 81 | 135 |
| \( p \) | .005 | .002 | .659 | .031 | .641 | .584 |
| Bulimia | \( r \) = .433 | .554 | .098 | -.109 | -.171 | .156 |
| \( N \) | 120 | 102 | 159 | 83 | 81 | 135 |
| \( p \) | .000 | .000 | .219 | .327 | .128 | .070 |
| Body dissatisfaction | \( r \) = .445 | .618 | .079 | .069 | .032 | .039 |
| \( N \) | 120 | 102 | 159 | 83 | 81 | 133 |
| \( p \) | .000 | .000 | .321 | .539 | .777 | .653 |
| Ineffectiveness | \( r \) = .276 | .060 | -.089 | -.291 | -.378 | .130 |
| \( N \) | 119 | 101 | 151 | 83 | 81 | 132 |
| \( p \) | .002 | .594 | .276 | .008 | .001 | .136 |
| Perfectionism | \( r \) = -.106 | -.060 | -.022 | -.161 | -.129 | .098 |
| \( N \) | 120 | 102 | 158 | 81 | 81 | 132 |
| \( p \) | .248 | .551 | .785 | .152 | .250 | .264 |
| Interpersonal distrust | \( r \) = .170 | .012 | -.047 | -.353 | -.306 | .038 |
| \( N \) | 120 | 102 | 158 | 80 | 75 | 128 |
| \( p \) | .063 | .907 | .555 | .001 | .008 | .672 |
| Interoceptive awareness | \( r \) = .307 | .196 | .007 | -.466 | -.292 | .231 |
| \( N \) | 120 | 102 | 158 | 83 | 81 | 134 |
| \( p \) | .001 | .049 | .926 | .000 | .008 | .007 |
| Maturity fears | \( r \) = -.332 | -.273 | .111 | -.592 | -.465 | .176 |
| \( N \) | 119 | 101 | 151 | 83 | 81 | 132 |
| \( p \) | .000 | .006 | .176 | .000 | .000 | .043 |
| Ascetism | \( r \) = .015 | .004 | -.378 | -.252 | -.062 | .163 |
| \( N \) | 53 | 46 | 62 | 46 | 56 | 79 |
| \( p \) | .914 | .978 | .002 | .091 | .650 | .151 |
| Impulse regulation | \( r \) = -.039 | -.016 | -.142 | -.703 | -.303 | .333 |
| \( N \) | 54 | 47 | 69 | 46 | 56 | 81 |
| \( p \) | .781 | .913 | .245 | .000 | .023 | .002 |
| Social insecurity | \( r \) = .122 | .043 | -.297 | -.547 | -.163 | .328 |
| \( N \) | 50 | 43 | 59 | 46 | 56 | 79 |
| \( p \) | .400 | .783 | .022 | .000 | .229 | .003 |
factorial structure. As an alternative approach, we used aggregated-level data and found that the factorial structure obtained from the aggregate means was almost identical to the structure derived from individual data. Taking into account the fact that the factor structure of eating-disordered samples replicated the factor structure obtained from the general nonclinical population with reasonable accuracy, it is relatively safe to claim that the pattern of cross-correlation between EDI subscales is rather robust and remains invariant in both Western and non-Western samples. This also provides some support for the notion that the two-factor structure of the EDI is generalizable across different languages and cultures.

Researchers have debated whether clinically diagnosed eating disorders are best conceptualized as one extreme of a continuum or as qualitatively different from less severe eating disturbances. So far, taxometric analysis, a set of procedures that assesses the structure of a given disorder by detecting whether a latent taxon exists among its indicators, has provided mixed results: some studies are more indicative of a dimensional solution while others have demonstrated that eating disorders may involve one or more latent taxons. The similarity of factorial structures derived from clinical and nonclinical populations seems to favor a dimensional model: the responses of eating-disordered and normal respondents were possible to project onto the same conceptual space with a strikingly similar configuration.

One of the most surprising results of this meta-analysis was that non-Western participants scored higher than Western participants on most of the EDI subscales, both in normal and eating-disordered samples. Contrary to the widely held belief that symptoms of eating disorders are more pronounced in samples influenced by Western ideals of body shape, it was non-Western participants who most emphasized such symptoms.

There are several competing theories that could explain the disparity between Western and non-Western samples. One such explanation is the geographic distribution of personality traits, which demonstrates a clear contrast between the European and American cultures on the one hand, and the Asian and African cultures on the other. The former are higher in extraversion and openness to experience and lower in agreeableness. A second dimension reflects, primarily, differences in the mean level of neuroticism. It is well documented that sufferers of anorexia and bulimia have, compared with normal individuals, a significantly elevated level of neuroticism. The correlation between EDI subscales and neuroticism is generally so strong that it is possible to consider eating disorder symptoms an aspect of neurotic personality dispositions. In culture-level analysis, several non-Western cultures such as the Japanese, Koreans, and the Chinese score very high on the dimension related to neuroticism, while many prominent Western cultures such as Americans, the Dutch, and Swedes score low on neuroticism. Thus, it seems very likely that the high scores of non-Western cultures on EDI subscales are determined by their greater level of neuroticism. Unfortunately, the number of countries from which reliable EDI data can be obtained is still too small to thoroughly test this hypothesis.

Although eating disorders know no age barriers, they most severely afflict teenagers: female teenagers experience anorexia at a rate five times that of any other age group of women. A relatively early onset of eating disorders, especially AN, seems to implicate young age as a risk factor. This analysis, however, provided the somewhat paradoxical finding that symptoms of eating disorders became more pronounced with age in clinically diagnosed groups. For example, body dissatisfaction was systematically larger in older rather than younger samples. The opposite tendency was observed in normal samples: all symptoms of eating disorders measured by the EDI drop off as the mean age increases. Thus, age is a risk factor when someone is already diagnosed with an eating disorder, but, in the general population, it decreases the likelihood of being afflicted by one.

The main diagnostic criterion for AN is that the individual refuses to maintain a minimally normal body weight, most reliably assessed by his or her weighing less than 85% of the weight considered normal for his or her age and height; or by BMI equal to or below 17.5 kg/m. Therefore, it was expected that the mean BMI would be strongly associated with scoring high on the primary subscales assessing specific attitudes and behaviors concerning eating in clinical samples but not in the general population.

Although it is sometimes believed that the prevalence of eating disorders is increasing, evidence from population-based epidemiological studies over the last half a century appears to suggest that incidences of AN and BN have, in fact, not increased significantly. All observed changes can be accounted for by modifications in diagnostic and referral practices that have likely increased the numbers of patients treated in specialized centers. Similarly, we were able to find only a modest association between attitudes toward eating and the time when the study was carried out. It seems
that eating-disordered patients have become less concerned with ascetism over time and the younger generation, in general, is less subject to maturity fears.

Like all meta-analytic studies, this study has several limitations. Only sample mean-level data were available, the division into Western versus non-Western samples was provisional, and the equivalence of translations to the original EDI was mostly assumed and not demonstrated. Also a potential moderating role of economic wealth was not considered. Nevertheless, a sufficiently large set of independent samples replicated a general rule that non-Western participants scored higher than Western participants on most EDI subscales.

References


89. Manara F, Manara A, Todisco P. Correlation between psychometric and biological parameters in anorexic and bulimic patients during and after an intensive day hospital treatment. Eat Weight Disord 2005;10:236–244.


95. Mizuta I, Inoue Y, Fukunaga T, Ishi R, Ogawa A, Takeda M. Psychological characteristics of eating disorders as evidenced by the combined administration of questionnaires and two projective methods: The Tree Drawing Test (Baum Test) and the Sentence Completion Test. Psychiatry Clin Neurosci 2002;56:41–53.


105. Połdasm J. The Correlation Between Eating Behaviour And Psychological characteristics of eating disorders as evidenced by the combined administration of questionnaires and two projective methods: The Tree Drawing Test (Baum Test) and the Sentence Completion Test. Psychiatry Clin Neurosci 2002;56:41–53.
121. Wunderlich U, Gerlinghoff M, Backmund H. Eating disturbances in siblings of patients with eating disorders. Eat Weight Disord 2004;9:258–263.