

Kertas Asli/Original Articles

Systematic Review on Eating Disorder Examination-Questionnaire 6.0 (EDE-Q 6.0): An Agenda for a Test Adaptation in Malaysia
(Semakan Sistematis ke atas Eating Disorder Examination-Questionnaire 6.0 (EDE-Q 6.0): Agenda Adaptasi Skala di Malaysia)

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ABSTRACT

This study aims to systematically search and review the literature on the Eating Disorder Examination-Questionnaire 6.0 (EDE-Q 6.0) across cultures, in terms of their psychometric properties. Electronic search engines and databases, namely, Scopus, OvidMedline, Google Scholar, and reference tracking were used. The search terms used were eating disorder examination-questionnaire, EDE-Q, psychometrics, reliability, validity, and utility. Studies were included if they conducted psychometric evaluations on the EDE-Q 6.0 (i.e., English version) or adapted EDE-Q 6.0. The PRISMA guideline was also applied in the selection of articles for review. Nineteen papers on EDE-Q, specifically on the sixth version were reviewed. EDE-Q 6.0 has been translated and adapted to various languages and psychometrically evaluated on Japanese, Portuguese, American, Finnish, French, Norwegian, British, Australian, Italian, Iranian, and German populations. EDE-Q 6.0 has recorded good to excellent internal reliability across languages and cultures. Mixtures of findings were found concerning its stability and validity. The factorial structure of EDE-Q 6.0 is very controversial with limited fitness into its initial theoretical four-factor structure. Nonetheless, EDE-Q 6.0 recorded high utility values. The EDE-Q 6.0 is yet to be adapted into Malay for the Malaysian population, hence, calls for further research on its adaptation and its psychometric properties.

Keywords: Systematic review; EDE-Q 6.0; test adaptation; test validation

ABSTRAK

Tujuan kajian ini dijalankan adalah untuk mencari dan mengkaji literatur mengenai Eating Disorder Examination-Questionnaire 6.0 (EDE-Q 6.0) merentasi budaya dan sifat psikometriknya secara sistematik. Enjin carian dan pangkalan data elektronik seperti, Scopus, OvidMedline, Google Scholar, dan penjejakan rujukan telah digunakan. Istilah carian yang digunakan adalah eating disorder examination-questionnaire, EDE-Q, psychometrics, reliability, validity, and utility. Artikel akan dipilih dan dikaji sekiranya artikel tersebut menjalankan penilaian psikometrik pada EDE-Q 6.0 (versi Bahasa Inggeris) atau EDE-Q 6.0 yang telah diadaptasi. Garis panduan PRISMA juga digunakan dalam pemilihan artikel. Sembilan belas artikel mengenai EDE-Q, khususnya versi keenam telah dikaji. EDE-Q 6.0 telah diterjemahkan dan diadaptasi dalam pelbagai bahasa dan dinilai psikometriknya pada populasi Jepun, Portugis, Amerika, Finland, Perancis, Norway, Britain, Australia, Itali, Iran, dan Jerman. EDE-Q 6.0 telah mencatatkan kebolehpercayaan dalaman yang baik hingga sangat baik dalam pelbagai bahasa dan budaya. Pelbagai keputusan dijumpai berkaitan dengan kestabilan dan kesahannya. Struktur faktor EDE-Q 6.0 yang ditemui sangat kontroversial jika dibandingkan dengan struktur empat faktor awal yang dibina secara teori. Walaupun begitu, EDE-Q 6.0 mencatatkan nilai utiliti yang tinggi. EDE-Q 6.0 masih belum diadaptasi ke dalam bahasa Melayu untuk penduduk Malaysia. Oleh itu, penyelidikan lebih lanjut mengenai penyesuaiannya dan sifat psikometriknya diperlukan.

Kata kunci: semakan sistematik; EDE-Q 6.0; penyesuaian ujian; pengesahan ujian

INTRODUCTION

There is an exhaustive list of screening tools being developed in Western countries to measure eating disorders. However, very few were being validated to assess the psychopathology of eating behaviour of Malaysian adults. Some examples of screening tools used internationally are the Eating Disorder Examination Questionnaire (EDE-Q; Fairburn & Beglin 1994), Eating Attitudes Test-26 (EAT-26; Garner, Olmsted, Bohr, & Garfinkel, 1982), and Eating Disorder Inventory-II (EDI-II; Garner 1991). EDE-Q is a self-administered questionnaire version of the Eating Disorder Examination (EDE). EDE, on the other hand, is an investigator-based interview and it is considered as a 'gold standard' assessment for eating disorders. Due to the significant relationship between EDE-Q and EDE (Fairburn & Beglin, 1994), the EDE-Q has been widely used in both clinical and research settings. Besides, EDE-Q is rated as in concordance with EDE interview in terms of its content, and it is also rated as the most convenient yet comprehensive self-report measure, especially on its cost and time effectiveness (Quick & Byrd-Bredbenner 2013).

EDE-Q has been adapted into several languages and its psychometric soundness has been studied in several populations, for example, in Japan (Mitsui et al. 2017), France (Carrard et al. 2015), Italy (Calugi et al. 2016), and also in Malaysia (Ramli et al. 2008). EDE-Q also has good and well-established psychometric properties (Musa et al. 2016). However, EDE-Q has been updated into several versions with the latest being the sixth version, i.e., EDE-Q 6.0. The EDE-Q 6.0 consists of 28 items that measure the attitude of eating pathology on a seven-point rating scale. It has four theoretical components, namely, *Restraint*, *Eating Concern*, *Shape Concern*, and *Weight Concern* (Fairburn & Beglin 2008). The only difference between EDE-Q 6.0 and the original EDE-Q is the original EDE-Q includes the measures of behavioural frequency of abusing diuretics and subjective binge eating (Gideon et al. 2016), where version 6.0 did not.

The EDE-Q 6.0 is yet to be adapted and validated for the Malaysian sample although one study has adapted the earlier version of EDE-Q into Malay and psychometrically evaluated it (i.e., Ramli et al. 2008). Additionally, a systematic review on eating disorder scales is still very

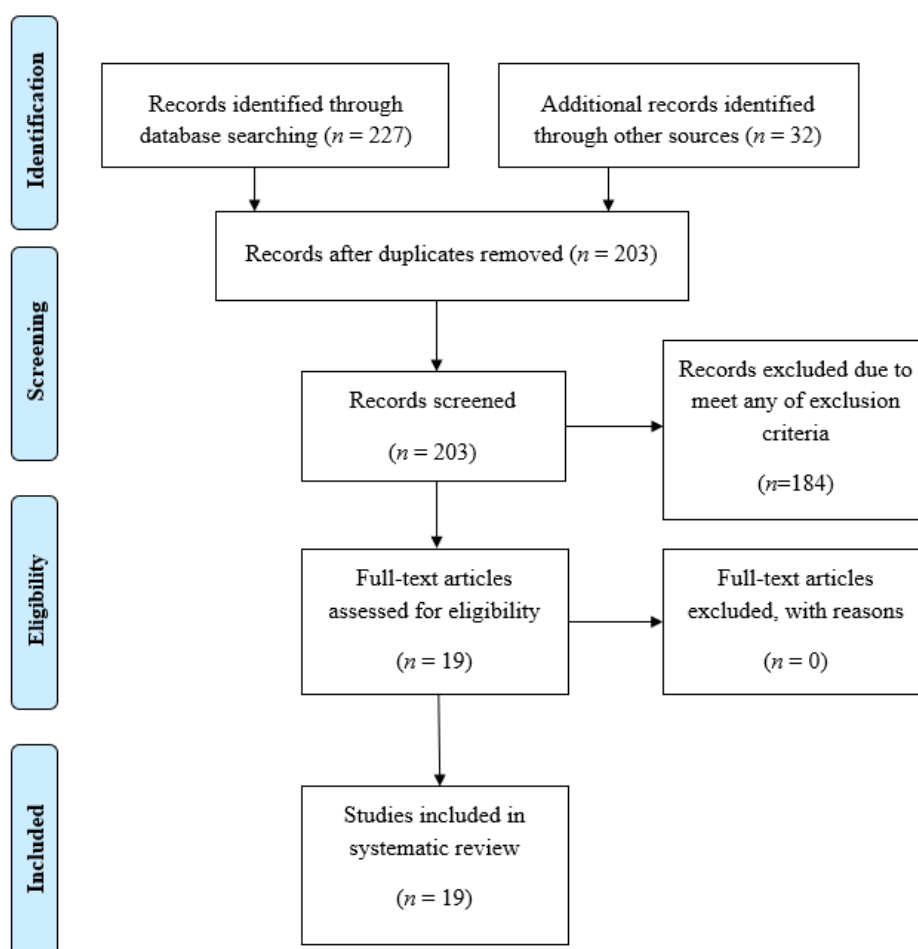


Figure 1 Search Strategies and Selection of Articles using PRISMA's Flowchart

scarce, although, one study has systematically reviewed an earlier version of EDE-Q and EDE (Berg et al. 2012). Therefore, the objective of this paper is to systematically review the existing literature on psychometric properties of EDE-Q 6.0 from diverse languages and cultures.

METHOD

Electronic search engines and databases, namely, Scopus, OvidMedline and Google Scholar as well as reference tracking were used to locate the relevant articles. These three search engines have been selected due to their coverage on both indexed and non-indexed journals, hence, adequate to generate a comprehensive list of references. Combinations of relevant keywords with Boolean operators (*and* and *or*) and the Wildcards (* and ?) were used to refine the search results and for the inclusion of both American and British spellings. The PRISMA guideline (Figure 1) was also applied in search strategies and the selection of articles for review. The literature search used *eating disorder examination-questionnaire, EDE-Q, psychometrics, reliability, validity, and utility* keywords to locate studies on EDE-Q 6.0 across cultures. Studies were included if they conducted psychometric evaluations on the EDE-Q 6.0 (i.e., English version) or adapted EDE-Q 6.0. The evaluations are either internal consistency, test-retest reliability, alternate form reliability, inter-rater reliability, content validity, criterion validity, construct

validity, sensitivity, specificity, and/or factor structure of the EDE-Q 6.0. The studies were excluded when the studies: (1) used child, youth, or the adolescent version of EDE-Q, (2) use the short or online version of EDE-Q, (3) used earlier versions of EDE-Q, (4) used EDE-Q to validate other instruments, and (5) studies with a research question to study only the norms of EDE-Q data without any psychometric evaluations. Two reviewers carried out a quality appraisal of all the papers under study. Study characteristics were then extracted by them independently, later compared and encoded into data extraction form as per table Table 1.

RESULTS

A total of 19 articles were included for the systematic review from an initial screening of 259 articles. These 19 articles were summarised into the table of the psychometric properties of EDE-Q 6.0 across cultures ($n=19$, Table 1). The results were encoded into the study's aim, sample, methods/analysis, and key findings. The language to which EDE-Q 6.0 was translated is also added into Table 1 to assess the psychometric effectiveness of EDE-Q 6.0 in measuring psychopathological eating behaviour in various countries. The results were also arranged based on (1) the studies on psychometric properties of the original English EDE-Q 6.0, and (2) the validation studies on the psychometric properties of the adapted EDE-Q 6.0 based

Table 1 Summary of Research on Psychometric Properties of EDE-Q 6.0

EDE-Q 6.0	Sample	Methods/Analysis	Key Finding(s)
1. EDE-Q 6.0 in the United Kingdom (Barnes et al., 2012)	Adult students (n = 403)	Cronbach's Alpha	Internal reliability: (a) $\alpha = .96$ for global score, and (b) $\alpha = .83$ to $.94$ for each individual factor.
	Non-adult students (n = 166)	Confirmatory Factor Analysis (CFA)	Construct validity: CFA showed a three-factor model (i.e., Shape/Weight, Eating Concern, and Restraint) best fit both group.
2. EDE-Q 6.0 in the United Kingdom (White et al., 2014)	Community based adolescents (n = 917)	CFA	CFA on the four-factor model produced an inadmissible model with poor fit.
		Exploratory Factor Analysis (EFA)	EFA produced an alternative three-factor model (i.e., <i>Shape and Weight Concerns, Restrictions, and Preoccupation and Eating Concern</i>).

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3. EDE-Q 6.0 in the United States of America (Rose et al., 2013)	Male students (n = 47) Female students (n = 44)	Cronbach's Alpha	Internal reliability Global EDE-Q: (a) Time 1, $\alpha = .89$ (b) Time 2, $\alpha = .90$
		Test-retest reliability at mean= 6.88 days	Test-retest reliability Global EDE-Q: $r = .92$
4. EDE-Q 6.0 in the United States of America (Darcy et al., 2013)	Male university students (n=661) Female university students (n= 973)	EFA	Construct validity: EFA revealed an only three-factor structure
		CFA	CFA four-factor model failed to demonstrate a good fit
5. EDE-Q 6.0 in United States of America (Rand-Giovannetti et. al.,2017)	Students (n=940)	CFA	The data fit the four-factor model (i.e., Dietary Restraint, Preoccupation and Restriction, Weights and Shape Concerns, and Eating Shame) by Friborg et. al (2013)
6. EDE-Q 6.0 in the United States of America (Serier et. al, 2018)	Hispanic women (n=336) and non-Hispanic White (n=225)	CFA	7-item 3-factor model (i.e., Dietary Restraint, Shape/ Weight Overvaluation, and Body Dissatisfaction) provide an acceptable fit in both samples
7. Slightly modified EDE-Q 6.0 in Australia (Parker et al., 2015)	Post laparoscopic adjustable gastric banding patients (n = 108)	CFA EFA	Construct validity: CFA revealed a poor fit of the four-factor model and EFA showed a four-factor solution after the removal of 8 items.
		Cronbach's Alpha	Internal reliability: (a) Original sub-scale ($\alpha = .47$ to $.94$) and (b) Revised EDE-Q scale ($\alpha = .76$ to $.98$)
		Convergent validity	Convergent validity: The revised EDE-Q scale has adequate convergent validity with measures of psychological well-being and impairment.
8. Finnish EDE-Q 6.0 (Isomaa et al., 2016)	Eating disorder patients (n = 52) Non-patients: Adolescents (n= 242) and adults (n = 133)	Cronbach's Alpha	Internal reliability: Individual subscales varied from $\alpha = .69$ to $.95$
9. French EDE-Q 6.0 (Carrard et al., 2015)	Women with sub-threshold criteria for binge eating disorder (BED), (n=116) Women without BED (n = 161)	Cronbach's Alpha CFA	Internal reliability: Individual subscales varied from $\alpha = .71$ to $.95$ for both groups Construct validity: CFA revealed a three-factor model (i.e., Dietary Restraint, Shape/ Weight Overvaluation, and Body Dissatisfaction) provided an adequate fit of data and not four-factor.

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10. German translation EDE-Q 6.0 (Hilbert et al., 2012)	Non-clinical sample (n = 2520)	Cronbach's Alpha	Internal reliability: Acceptable to excellent ($\alpha = .70$ to $.94$) across men and women sample
		Principal Component Analysis (PCA)	Construct validity: PCA produced support for only a three-factor structure.
11. Italian EDE-Q 6.0 (Calugi et al., 2016)	Patients with an eating disorder (n=264) Controlled participants (n=216)	Cronbach's Alpha	Internal reliability: (a) Global score ($\alpha = .94$), and (b) Sub-scales score ($\alpha = .79$ to $.88$)
		Test-retest reliability estimation at mean=10.1 days	Test-retest reliability was good to excellent ($r = .66$ -.83)
		CFA	Construct validity: CFA showed a good fit for a seven-item three-factor structure
		Criterion validity	Good criterion validity between global EDE-Q and subscale scores, and eating disorder behaviours.
12. Japanese EDE-Q 6.0 (Mitsui et al., 2017)	Study 1: Undergraduate students (n = 1, 430)	Study 1: EFA and Cronbach's Alpha	Study 1: Construct validity: EFA revealed four factors but did not follow Fairburn's original factor structure Internal reliability of the subscales: $\alpha = .71$ to $.91$.
	Study 2: Undergraduate students (n = 558)	Study 2: Convergent validation with EAT-26 and EDI-II using Pearson's correlation	Study 2: Convergent validity: Moderate correlation with EAT-26 and with EDI-II at subscales level.
	Study 3: Female undergraduate students (n = 225)	Study 3: Relationship between derived body image-related subscales of the EDE-Q with other psychological measures (i.e., self-esteem, depression, self-consciousness, and perfectionism scale)	Study 3: Both subscales correlated significantly
13. Norwegian EDE-Q 6.0 (Rø et al., 2015)	Non-clinical female control participants (n = 1, 845) Women with eating disorder diagnoses (n=620)	Receiver operating characteristics (ROC) analysis	The area under the curve (AUC) of .93 Sensitivity of .86 Specificity of .86 Global EDE-Q score showed high discriminant validity
14. Norwegian EDE-Q 6.0 (Friborg et. al., 2013)	Community women (n= 1076)	Cronbach's Alpha	Good to very good for all subscales ($\alpha = .78$ to $.93$)
		EFA	Four-factor solution but did not follow Fairburn's original factor structure
		CFA	Better fit in four-factor solution based on the Kaiser's criterion and not the simplest model, original factor model, or the EFA three-factor model

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15. Norwegian EDE-Q 6.0 (Rø et al., 2010)	Young adult women (n=670)	Cronbach's Alpha	Internal reliability: (a) individual subscales ranged from $\alpha = .75$ to $.90$, and (b) global score is $\alpha = .94$
		Test-retest reliability within a 1-week duration	Test-retest reliability: $r = .93$ for global score and $r = .82$ to $.91$ for subscales score
16. Norwegian EDE-Q 6.0 (Reas et al, 2012)	Male students (n=250) Female students (n=282)	Cronbach's Alpha	Internal reliability: (a) individual subscales ranged from $\alpha = .82$ to $.93$, and (b) global score for men is $\alpha = .89$ and for women is $\alpha = .96$
17. Persian EDE-Q 6.0 (Mahmoodi et al., 2016)	Female students (n= 516)	Cronbach's Alpha	Internal reliability: (a) Global score ($\alpha = .91$), and (b) Sub-scales score ($\alpha = .58$ to $.81$)
		Convergent validation with Clinical Impairment Assessment (CIA) and Binge Eating Scale (BES) using Pearson's correlation	Convergent validity: Moderate to a strong positive correlation with CIA and BES ($r = .33$ to $.61$)
		Discriminant validation by using Univariate Analysis of Variance	Discriminant validity: EDE-Q successfully discriminate underweight, healthy weight, and overweight students
18. Portuguese EDE-Q 6.0 (Machado et al., 2014)	Study 1: Community sample, i.e., high school students and college students (n = 4091)	Study 1: Cronbach's Alpha	Study 1: Internal reliability: (a) high school sample, $\alpha = .94$ for global score and $\alpha = .72$ to $.90$ for subscales (b) college students sample, $\alpha = .97$ for global score and $\alpha = .84$ to $.92$ for subscales
	Study 2: Clinical sample (n = 416) and women seeking obesity treatment (n = 138)	Study 2: Utility study using receiver operating characteristic validity (ROC) analysis	Study 2: Construct validity: EFA revealed only a three-factor structure
			Study 2: Utility power (AUC= $.83$)
19. Portuguese EDE-Q 6.0 (Machado et al., 2018)	Non-clinical female student (n = 4117) Clinical participants with eating disorders (n = 609)	CFA on original and a modified 7-item 3-factor structure (i.e., <i>dietary restraint, shape/weight overvaluation, and body dissatisfaction</i>)	Original EDE-Q factor structure: poor model fit Modified EDE-Q factor structure: good model fits

on alphabetical order. This table was then used to review the reliability, validity, utility, and factor structure of EDE-Q 6.0 across cultures.

RELIABILITY OF EDE-Q 6.0 ACROSS CULTURES

Internal consistency - Thirteen out of 19 studies on EDE-Q 6.0 reported the internal reliability of EDE-Q 6.0 in various regions ranging from English, Japanese, Portuguese, Italian, French, Germany, and Finnish to the Norwegian

language (Table 1). English EDE-Q 6.0, which is, the original version for EDE-Q 6.0 has been psychometrically examined in the United States of America (USA; Rose et al. 2013), United Kingdom (UK; Barnes et al. 2012) and Australia (Parker et al. 2015), and results demonstrated excellent internal reliability ranging from $.89$ to $.96$ for global EDE-Q 6.0 score. The Japanese (Mitsui et al. 2017), Norwegian (Friborg et al. 2013; Reas et al. 2012; Rø et al. 2015), Portuguese (Machado et al. 2014), Italian (Calugi et al. 2016), French (Carrard et al. 2015) and German (Hilbert et al. 2012) versions of EDE-Q 6.0 also recorded acceptable internal reliability between $.58$ to $.97$ at both global and subscales levels.

Test-retest reliability - Only three pieces of literature have examined the test-retest reliability of EDE-Q 6.0, which are, on USA sample (Rose et al. 2013), Italian sample (Calugi et al. 2016), and Norwegian sample (Rø et al. 2010). In the USA sample, test-retest reliability was conducted on students ($n=91$) at the interval of seven days. The study globally scored EDE-Q 6.0 and recorded an excellent test-retest reliability coefficient of .92. The Italian version of EDE-Q was administered to 264 patients with eating disorders with an interval of 7-22 days (mean 10.1 days) and recorded good test-retest reliability of global score ($r = .80$) and all the subscales (coefficients ranging from $r = .66$ to .83).

THE VALIDITY OF EDE-Q 6.0 ACROSS CULTURES

Construct validity - Thirteen out of 19 pieces of literatures examined the factor structure of English ($n = 6$) and the translated versions of EDE-Q 6.0 ($n = 7$). None of the studies supported the initial theoretical four-factor structure (i.e., *Restraint*, *Eating Concern*, *Shape Concern* and *Weight Concern*) reported in Fairburn and Beglin (1994). However, there is a good fit in terms of statistics when EDE-Q 6.0 was examined on the three-factor model in Australian (Parker et al. 2015), the USA (Darcy et al. 2013), UK (Barnes et al. 2012; White et al. 2014), Italian (Calugi et al. 2016), French (Carrard et al. 2015) and German (Hilbert et al. 2012) samples.

Convergent validity - Three studies have examined the convergent validity of EDE-Q. The Japanese version of EDE-Q subscales (Mitsui et al. 2017) converged with EDI-II's and EAT-26's subscales, with moderate correlations. In the Australian sample, Parker and colleagues (2015) explored the convergent validity between their slightly modified EDE-Q 6.0 with measures of psychological well-being and impairment, and results showed adequate convergent with both psychological well-being scale and with impairment scale. While the Persian version of EDE-Q 6.0 converged moderately with CIA and BES with a positive correlation.

Discriminant validity - Only one study by Mahmoodi and colleagues (2016) has conducted discriminant validity of the Persian version of EDE-Q 6.0 by using Univariate Analysis of Variance. The results suggested that Persian EDE-Q 6.0 and its subscales able to discriminate against underweight, healthy weight, and overweight women successfully. The highest score of EDE-Q is endorsed by the overweight group while the lowest score was reported by the underweight group.

THE UTILITY OF EDE-Q 6.0 ACROSS CULTURES

In the Portuguese sample, Machado and colleagues (2014) reported the utility of the Portuguese version of EDE-Q 6.0 as having good utility power with $AUC = .83$, which means, there is an 83% likelihood of the randomly selected people with eating disorder to score high at the adapted test. Another study by using the Norwegian version of EDE-Q 6.0 in the Norwegian sample generated an AUC of .93 with sensitivity and specificity of .86 (Rø et al., 2015). This means the Norwegian version of EDE-Q 6.0 can correctly identify those with an eating disorder and correctly identify those without an eating disorder. Other studies, however, did not examine the utility of EDE-Q 6.0.

DISCUSSION

The majority of the studies on psychometric properties of EDE-Q 6.0 had reported internal reliability values. EDE-Q 6.0 has recorded good to excellent internal reliability across languages and cultures. Hence, EDE-Q 6.0 can be concluded as a homogenous test. EDE-Q 6.0 is also found to be a stable test at both global and sub-scales levels for 7 to 10 days in American (Rose et al. 2013), the Norwegian sample (Rø et al. 2015), and Italian (Calugi et al. 2016) samples.

Construct validity of EDE-Q 6.0 on its factorial structure is very controversial with limited fitness into its initial theoretical four-factor structure. All thirteen studies on a factorial structure in either students or patients with eating disorders provided more fitness into a three-factor structure. This evidence, hence, provides solid support for the three-factor instead of the four-factor model. However, there appear to be slight differences in the three-factor model. For example in the UK (Barnes et al. 2012) the three factors are known as *Shape/Weight*, *Eating Concern*, and *Restrain*, whereas, in the US (Serier et al. 2018) the three factors that fit are known as *Dietary Restraint*, *Shape/Weight Over-evaluation*, and *Body Dissatisfaction*. Despite these differences, overall, the themes merged as three-factor across studies are a combination of shape concern, eating concern, weight concern, and restraint with shape and weight combined as one factor instead of two separate factors. There is a possibility that shape and weight are perceived as a similar concern, i.e., if you are big (shape) then you are fat (weight), if you are small (shape), then you are thin (weight).

This also calls for a re-examination of the EDE-Q factor structure in the Malaysian sample, especially when an early study in Malaysia found support for a four-factor model on the original 36-item version of EDE-Q (i.e., Ramli et al., 2008). Thus, the Malay version of EDE-Q also needs to be updated to version 6.0, and further study is needed to adapt and validate EDE-Q 6.0 into Malay. Additionally, since only one study has been conducted in Asian countries for EDE-Q 6.0 namely Japan by Mitsui and colleagues (2017), there is a need for a psychometric study of EDE-Q 6.0 from other Asian countries, Malaysia included. This is especially true given the notion that eating disorder is unique to western culture is now challenged (Nasser 2009). Besides, since the presentation of an eating disorder may be sensitive to specific culture (Miller & Pumariega 2001), it is then important to have a culturally-based EDE-Q 6.0 to have a valid and reliable assessment. Furthermore, more evidence of psychometric properties in the clinical population is needed since most of the studies have been carried out in either school or university settings. Although there is possible intracultural variation in eating disorders between urban and rural populations (Nasser 2009), future studies may target rural communities in validating EDE-Q 6.0 to ensure the rural population is not being left out.

There is also a need for more meticulous evaluations in examining the adapted version of EDE-Q 6.0, e.g., the equivalence reliability, criterion-related validity as well as the utility of the adapted version, also, possible psychometric evaluations using an advanced method like multigroup factor analysis (MGFA) and to greater extent using item response theory (IRT) to examine test information function (TIF) and differential item functioning (DIF). Last but not least, EDE-Q 6.0 showed moderate correlation with EDI-II, EAT-26, and BES thus, providing support for its convergent validity, but more evidence is needed for its divergent validity. Another avenue for future research is predictive validation given that none of the studies examined the concurrent validity and predictive validity of the EDE-Q 6.0 of their translated version, hence, warrant further research on these standards of psychometric evaluations.

CONCLUSION

In conclusion, this systematic review has demonstrated that EDE-Q 6.0 is a good screening tool that can reliably differentiate between individuals with eating disorders and those without eating disorders. Additionally, the psychometric soundness of EDE-Q 6.0 has been established across cultures. Therefore, there is a need to adapt and translate the sixth version of EDE-Q on the Malaysian sample.

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