



# Configural and scalar invariance of the center for epidemiologic studies depression scale in Egypt and Canada: Differential symptom emphasis across cultures and genders



Vivian Huang<sup>a,1</sup>, Shadi Beshai<sup>b,\*,2</sup>, Stephanie Korol<sup>b,2</sup>, R. Nicholas Carleton<sup>b,2</sup>

<sup>a</sup> Department of Psychology, Ryerson University, Canada

<sup>b</sup> Department of Psychology, University of Regina, Canada

## A B S T R A C T

**Background:** Depression is a significant contributor of global disease burden. Previous studies have revealed cross-cultural and gender differences in the presentation of depressive symptoms. Using the Center for Epidemiologic Studies-Depression Scale (CES-D), the present study examined differences in self-reported somatic, negative affective, and anhedonia symptoms of depression among Egyptian and Canadian university students.

**Methods:** A total of 338 university students completed study questionnaires from two major universities in Egypt (n=152) and Canada (n=186). Symptom domains were calculated based on the 14-item model of the CES-D.

**Results:** We found significant culture by gender interactions of total CES-D scores, wherein Egyptian females reported higher scores compared to their Canadian and Egyptian male counterparts.

**Limitations:** Limitations include using analogue student samples and using only one self-report measure to examine different depressive symptom domains.

**Conclusions:** Findings of this study provided support that males and females may differentially report depressive symptoms across cultures. Implications of these results are further discussed.

## 1. Introduction

Depression is a prevalent psychological disorder and a major contributor to the global burden of disease (Kessler and Bromet, 2013; WHO, 2015). Accordingly, enhancing our understanding of the etiology and presentation of depression across different cultures is imperative. The current global literature on depression suggests potential cross-cultural differences in symptom expression and reporting patterns (Kessler and Bromet, 2013). Thus, to further contribute to this growing body of research, the current exploratory study was designed to a) examine the configural and scalar invariance of a commonly used measure of depression across Egypt and Canada, and b) examine differences in self-reported symptoms of depression across these two cultures.

### 1.1. Cultural differences in depressive symptoms emphasis

Depression is a multifaceted construct that includes somatic, affective, cognitive, and interpersonal symptoms (APA, 2013). As emotional displays and self-disclosure vary between cultures (Matsumoto et al., 2008), the experience and expression of depressive symptoms may also differ across cultural groups (Marsella et al., 1973). Cross-cultural studies have revealed differences in depressive symptom profiles and presentations between Western and non-Western cultures. Specifically, several researchers suggested that depression is commonly manifested through somatic symptoms, such as headaches and pain, in non-Western cultures (e.g., Al-Krenawi and Graham, 2000; Ryder et al., 2002; Sellers et al., 2006). Conversely, Western cultures arguably emphasize cognitive symptoms, such as worthlessness and self-reproach (e.g., Ryder et al., 2008; Kalibatseva and Leong, 2011). The emphasis on somatic features among non-Western sufferers may further extend

\* Correspondence to: Department of Psychology, University of Regina, 3737 Wascana Parkway, Regina, SK. S4S0A2.

E-mail addresses: [vivian.huang@psych.ryerson.ca](mailto:vivian.huang@psych.ryerson.ca) (V. Huang), [shadi.beshai@uregina.ca](mailto:shadi.beshai@uregina.ca) (S. Beshai), [korol20s@uregina.ca](mailto:korol20s@uregina.ca) (S. Korol),

[Nick.Carleton@uregina.ca](mailto:Nick.Carleton@uregina.ca) (R. Nicholas Carleton).

<sup>1</sup> Department of Psychology, Ryerson University, 350 Victoria Street, Toronto, ON, Canada, M5B 2K3.

<sup>2</sup> Department of Psychology, University of Regina, 3737 University Parkway, Regina, SK, Canada, S4S 0A2.

to the recognition of depressive symptoms in others. For example, Karasz (2005) found evidence that South Asian immigrants were less likely than their European counterparts to recognize depression in a vignette with affective features of the disorder.

To date, only a few investigations have examined cultural differences in depressive symptom profiles in the Arab region, this is despite the predominance of somatic features – shortness of breath, agitation, and dizziness – in that region (Okasha, 1999). For example, Sulaiman et al. (2001) found evidence that Arab individuals may predominately identify somatic symptoms as the key features of depression in a vignette study. Moreover, Egyptian individuals suffering from depression may combine the affective and somatic domains in their expression of depressive symptoms, much like sufferers of Lebanese descent (Sawaya et al., 2016). In support of this, a study by Beshai et al. (2013a) found evidence that the somatic and affective factors of a self-report measure of depression loaded onto the same latent factor in a group of Egyptian university students. In contrast, the somatic and affective items of these factors typically load on separate factors for North American students samples (Radloff, 1977; Beshai et al., 2013a).

Researchers have argued that the tendency to somaticize depressive symptoms could be due to cross-cultural differences in views about the mind-body relationship. Non-Western cultures promote interconnectedness between mind and body, whereas Western cultures emphasize a mind-body distinction (Kazarian and Taher, 2010; Shin, 2010). For example, cultural practices, such as mindfulness, promote the holistic approach to the mind and body. Such practices encourage individuals to focus on bodily changes, which further promotes somatic awareness instead of emotionally vigilance (Watkins and Moulds, 2005). To that end, Ma-Kellams (2014) has suggested that somatic awareness is higher among individuals of non-Western cultures compared to individuals in Western cultures (see Ma-Kellams, 2014).

Linguistic differences, such as the availability of culturally specific idioms used to express emotions, have also been linked to the somatization of depression. For example, East Asian cultures often metaphorically express emotional distress as pain (Bernstein et al., 2008; Shin, 2010). Similarly, there may be a lack of linguistically equivalent idioms to express the psychological symptoms of depression in the Arab world and other non-Western regions (Hamdi et al., 1997).

Individuals may also alter their reports of symptoms based on symptom legitimacy. For example, Burr and Chapman (2004) found evidence that, while South Asian immigrant women in England recognized that depression is comprised of both psychological and somatic symptoms, they perceived the physical symptoms as more legitimate to disclose to their physicians and community. Chentsova-Dutton and Tsai (2009) argued that individuals across cultures experience both psychological and somatic symptoms of depression; however, there may be cross-cultural differences in the reporting, as opposed to the experience, of somatic symptoms of the disorder.

### 1.2. Gender differences in depressive symptoms emphasis

In addition to cross-cultural differences, there may also be gender differences in the experience of depression. Community studies have consistently revealed that women are twice as likely as men to experience depression (e.g., Kessler et al., 2003; Kuehner, 2003). These gender differences have consistently been found across ethnic and cultural groups (e.g., Angst et al., 2002; Alansari, 2006). Various factors may be uniquely implicated in the onset of depression among women. These may include biological (e.g., Goldstein et al., 2013; Moieni et al., 2015), psychological (e.g., Nolen-hoeksema, 2001; Goodwin and Gotlib, 2004), and social (e.g., Dalgard et al., 2006; Cruwys et al., 2013) factors.

There may also be gender differences in the presentation of depressive symptoms. For example, relative to men, women are more likely to report somatic symptoms, such as sleep disturbances, appetite/weight changes, and psychomotor difficulties (e.g., Marcus et al.,

2005; Wenzel et al., 2005; Smith et al., 2008). In an epidemiological study, Silverstein et al. (2012) found no evidence of significant gender differences in reporting of total depressive symptoms, but did find evidence that women reported more somatic symptoms than men. Similar evidence of gender differences in somatic symptom reporting has been found in other ethnocultural groups (e.g., Halbreich et al., 2007; Yusim et al., 2009). Even among non-clinical samples, women tend to report greater frequency and duration of somatic symptoms, and lower somatic well-being, when compared to men (see Barsky et al., 2001). Further, compared to men, women are more likely to attribute somatic symptoms to a more severe health issue (e.g., Lieban, 1985), and are more likely to recall such symptoms compared to psychological symptoms (e.g., Pennebaker, 1982). Barsky et al. (2001) suggested that for somatic symptoms across cultures, factors such as underlying biological and symptom appraisal differences, may contribute to these gender differences. A recent study conducted by the authors (Huang et al., 2016) found that depressed Canadian men were more likely than depressed Egyptian men to report cognitive-affective symptoms of depression.

In addition to somatic sensations, there are gender differences in the experience of emotion among healthy individuals. Previous studies have indicated that women are more likely than men to react with negative emotions, such as sadness and withdrawal, in reaction to negative personal events in comparison to men (e.g., Hess et al., 2000). Women are also more likely than men to experience and express negative emotions across cultures (Fischer et al., 2004).

Most researchers to date have focused on cross-cultural differences in the presentation of somatic symptoms. Unfortunately, very few studies have examined the interactive effects of gender and culture on various domains of depressive symptoms, especially within Arabic-speaking cultures. Given the multidimensional nature of depression, and in light of the results summarized above, studies are needed to examine the possible interaction of gender and culture when investigating differences in reporting of depressive symptom domains. Results of such studies provide information regarding the varying presentations of depression across genders and cultures, as well as may inform efforts to screen for and treat the condition in men and women across different regions. Understanding this interaction may also provide new insights of depressive symptom variations across cultures (e.g., Zhou et al., 2011), and inform patterns of stigma surrounding mental illness across cultures and genders (e.g., Halbreich and Karkun, 2006).

### 1.3. Factor structure and measurement equivalence of the CES-D

The Center for Epidemiologic Studies–Depression scale (CES-D; Radloff, 1977) is a widely used screening instrument for depression. The original 20-item CES-D has previously evidenced a 4-factor structure that represented depressed affect, somatic symptoms, anhedonia and interpersonal problems (Radloff, 1977). The CES-D has yielded a number of alternative factor solutions in the literature, which raised the question of the stability of the 4-factor structure model (see Carleton et al., 2013). Indeed, it is suggested that items of the CES-D were not designed based on the diagnostic criteria (i.e., DSM-II; APA, 1968) of depression during its development. Further, several items of the CES-D were identified as biased. For instance, “I had crying spells” has been identified as a gender biased item, resulting in inflated scores among women. Given these problematic items and unstable structure, differences between groups and genders found on the CES-D may be reflective of misrepresented responses rather than actual differences in depressive symptoms.

To establish a stable and valid factor structure of the CES-D, Carleton et al. (2013) conducted a confirmatory factor analysis using several clinical and non-clinical samples. They found a 14-item, 3-factor model of the CES-D, which consisted of negative affect, anhedonia, and somatic symptoms. The aforementioned factors were found to be more reflective of the current diagnostic criteria of

depression. Furthermore, the 14-item model evidenced higher validity as it had several biased items removed. It appeared that the 14-item, 3-factor model as an optimal CES-D structure compared to the original 20-item model.

When making comparisons between cultural groups, researchers often assume the self-report measures that are used are valid and equivalent across groups (Chen, 2008). That is, the instruments are assessing the same construct across cultural groups in the same way. It is suggested that once the equivalence is established, more meaningful group comparisons and results can be interpreted (Meredith, 1993). Recent cross-cultural studies have emphasized using several statistical methods to demonstrate equivalence across cultural groups. A number of cross-cultural and cross-ethnic studies have examined the utility of the CES-D for ethnic minority and non-Western populations (Williams et al., 2007; Li and Hicks, 2010); specifically, researchers have examined the instrument's configural (i.e., cross-cultural stability of its factor structure), metric (i.e., cross-cultural stability of the degree of association between items and full scale score), and scalar (i.e., cross-cultural stability of subscale and full scale scores; Steenkamp and Baumgartner, 1998) stability across cultures. However, few studies have determined the optimal factor structure of the CES-D (i.e., original 4-factor compared to other factors), as well as examined the configural and scalar equivalence of the CES-D across the Egyptian and Canadian cultures.

#### 1.4. The Current Study

Despite the prevalence of depression in Arabic-speaking countries (Okasha, 1999; Kessler and Bromet, 2013), researchers have not examined the equivalence of CES-D response patterns across English-Speaking and Egyptian samples, nor the interaction with gender therein. The current study was design to assess the configural and scalar invariance of the CES-D, as well as the cross-cultural and gender differences in reporting of somatic and affective symptoms of depression among a group of Egyptian and Canadian university students. First, we determine the optimal factor model (i.e., configural equivalence) of the CES-D (4-factor model vs. 3-factor model) across both cultural groups. Second, the scalar equivalence of the CES-D was examined across both cultures. Based on the measurement invariance results, the cross-cultural and gender differences in depressive symptoms reporting were examined among Egyptian and Canadian university students using the CES-D.

Based on previous findings (e.g., Okasha, 1999), we hypothesized that Egyptian students would report higher scores on the somatic subscales of the CES-D compared to their Canadian counterparts. Secondly, we hypothesized females (both Egyptians and Canadian) would report greater somatic symptoms on the CES-D than males. Third, we hypothesized a nationality by gender interaction within the current samples on two subscales of CES-D. Specifically, we hypothesize that Egyptian women would report greater somatic symptoms than Canadian women, whereas Egyptian men would endorse less cognitive symptoms than their Canadian counterparts.

## 2. Method

Data from a total of 152 Egyptians and 186 Canadians from a larger trial (Beshai et al., 2012) were used for the purposes of this study. Participants had a mean age of 21.57 (SD=2.96; range=18–52; 57.1% females). A detailed summary of sample characteristics, stratified by country is presented in Table 1. Study participants were recruited from either the University of Calgary, Canada, using the Psychology Research Participation System, or from the Department of Medicine at Cairo University, Egypt. In order to be eligible for participation in the Canadian sample, participants reported being at least third generation European, at least second generation Canadian, and identified English as their primary language. To be eligible for participation

**Table 1**  
Sample and descriptive statistics of the Egyptian and Canadian samples.

	Egyptian (n=152)	Canadian (n=186)
Age:		
Mean (SD)	22.36 (.86)	20.92 (3.79)
Gender (%):		
Male	46.7	39.8
Female	53.3	60.2
Religion:		
Christianity	1.3	47.8
Islam	85.5	0
Agnostic/Atheistic	0	34.4
Other	13.2	17.7
CES-D (SD)	21.64 (10.72)	12.56 (8.91)
CES-D 14-item total	16.06 (7.81)	10.19 (7.32)
CES-D somatic symptoms	6.21 (3.62)	4.95 (3.09)
CES-D negative affect symptoms	4.80 (3.25)	2.50 (2.64)
CES-D anhedonia symptoms	5.05 (2.65)	2.75 (2.62)

Note. CES-D=Center for Epidemiologic Studies–Depression Scale.

in the Egyptian sample, participants were required to be at least third generation Egyptian and identify that Arabic was their primary language. After providing informed consent, eligible participants completed a demographic information form and a series of questionnaires, which included the CES-D (Radloff, 1977). The current research was approved by the Conjoint Faculties Research Ethics Board at the University of Calgary in Calgary, Canada (File #6192).

#### 2.1. Measures

The Center for Epidemiologic Studies – Depression Scale (CES-D; Radloff, 1977) was administered to evaluate the frequency and severity of depressive symptoms over the previous week amongst all study participants. The CES-D is a 20-item self-report measure that captures various domains of the disorder, including depressive affect, somatic symptoms, positive affect, and interpersonal domains. Items are answered on a 4-point Likert scale, ranging from 0 (rarely or none of the time/less than 1 day) to 3 (all of the time/5–7 days). Total scores ranged from 0 to 60, with higher scores indicating more frequent and severe depressive symptomology. Previous studies have demonstrated excellent reliability of the original CES-D among university populations, including Arabic samples (e.g., Devins et al., 1988; Ghubash et al., 2000; Herman et al., 2011; Beshai et al., 2013a; Amer et al., 2014). Furthermore, the Arabic version of the 20-item CES-D has produced adequate concurrent validity with other measures of depressive symptoms in previous research (Beshai et al., 2012, 2013a). For the 14-item CES-D, Carleton et al. (2013) have demonstrated excellent reliability and validity of the 14-item model in several clinical and non-clinical samples. However, there are no studies to date that have examined the psychometric properties of the Arabic version of the 14-item model.

The multi-group confirmatory factor analysis (CFA) comparisons are extensions of extant work with CFAs (as described by Byrne, 2001, 2004) that use the processes to compare model fit across groups rather than only assessing model fit within groups. We compared the original 4-factor structure proposed by Radloff (1977) with the 3-factor structure proposed by Carleton et al. (2013).

#### 2.2. Translation

All materials used in Egypt were translated into Arabic according to guidelines by the World Health Organization (WHO, 2007). The translation process was carried out in two phases. In the initial phase, two professional translators were involved: a translator who forward translated the English materials into Arabic, and another translator who back translated the Arabic translation to English. In the next

phase, the second author, who can speak, read and write Arabic fluently, reviewed and compared the back-translation with the original scale to ensure the equivalence of the English and Arabic versions of the scale, and the cultural appropriateness of the latter.

### 2.3. Statistical analyses

There were four CFAs conducted separately in the Canadian and Egyptian samples to establish the configural equivalence of the English and Arabic versions of the CES-D, based on two previously proposed structures of the scale. The first set of analyses examined the original factor structure established by Radloff (1977): items 1, 2, 5, 7, 11, 13, and 20 represented the somatic symptoms; items 3, 6, 9, 10, 14, 17, 18 represented depressed affect; items 4, 8, 12, 16 represented positive affect; and item 15 and 19 represented interpersonal problems. The second set of analyses examined the 14-item, 3-factor model established by Carleton et al. (2013). The Carleton et al. (2013) model included items 1, 2, 5, 7, 11, and 20, representing somatic symptoms; items 3, 6, 14, and 18 representing negative affect; and items 4, 8, 12, and 16, which represented anhedonia. The CFAs were performed on AMOS version 22 (IBM, Chicago, USA) and each sample was inputted in a maximum likelihood estimation procedure. The current study applied several criteria to determine the goodness-of-fit: 1) chi-square statistics ( $\chi^2$ ) should not be significant; 2) the normed chi-square ( $\chi^2/df$ ) should be less than 3; 3) the comparative fit index (CFI) must be greater than .90; 4) the root mean square error of approximation (RMSEA) values should be between .05 and .08; 5) standardized root mean square (SRMR) should be less than .10.

In order to establish scalar invariance of the English and Arabic versions of the CES-D, a multi-group CFA procedure (as described by Byrne (2001), (2004)) was conducted using AMOS, for the two previously described factor structures of the CES-D (20-item and 14-item). Separate multi-group CFAs for the 20-item and 14-item factor structures allow for the detection of measurement invariance across Canadians and Egyptians for both factor structures. AMOS was used to test whether the Canadian and Egyptian samples met an assumption of equality by examining whether the 20-item and 14-item structures of the path coefficients were invariant. Differences in fit between nesting models were assessed using chi-square analyses per Byrne (2004) as well as assessing CFI and RMSEA as recommended for samples with  $n > 300$  by Chen (2007); specifically, invariance is demonstrated with non-significant chi-square results as well as a decreasing change of more than .005 in CFI accompanied by an increasing change of .010 in RMSEA indicates non-invariance. Per Byrne (2004), the focus for a multi-group invariance analysis should be on the chi-square analyses. If the measurement weights significantly differ between the two samples (using  $\chi^2$  statistics), for the 20-item structure or the 14-item structure, the result would suggest the response patterns cannot be assumed to be comparable across the two samples (Canadian and Egyptian). If the measurement weights do not significantly differ for one factor structure (e.g., 14-item structure), but not the other (e.g., 20-item structure), the lack of difference evidences scalar invariance of the English and Arabic versions of the CES-D for that factor structure. In other words, the scalar invariant structure has a more robust fit to the data for comparisons across the two samples (Canadian and Egyptian). Byrne (2004) recommends measuring scalar invariance across groups in order to understand the performance and item quality of measurement factors.

Based on the factor model that best fits the current Canadian and Egyptian samples, subscale scores were then calculated to assess differences in depressive symptoms domains measured by the CES-D. To assess nationality and gender differences of depressive symptom domains, a series of two-way analyses of variance (ANOVA) and multivariate analysis of variance (MANOVA) were conducted. All analyses were performed on SPSS 21.0 (IBM, Chicago, USA). An alpha level of .05 was used to determined statistical significance for all

**Table 2**  
Associated CFA fit indices.

Factor structure	$\chi^2$	df	$\chi^2/df$	CFI	RMSEA (90% CI)	SRMR
<i>Egyptians</i>						
Radloff 20-item	289.05	164	1.76	.87	.07 [.06, .08]	.07
Carleton et al. 14-item	120.77	74	1.63	.92	.07 [.04, .09]	.07
<i>Canadians</i>						
Radloff 20-item	324.28	165	1.96	.88	.07 [.06, .08]	.07
Carleton et al. 14-item	140.03	74	1.89	.94	.07 [.05, .09]	.06

Notes.  $\chi^2$ =Chi-square;  $\chi^2/df$ =Chi-square/df ratio; CFI=Comparative fit index; RMSEA=Root mean square error of approximation; CI=Confidence interval; SRMR=Standardized root mean square residual.

analyses. First, we conducted a two-way analysis of variance (ANOVA) to examine the cross-national and gender differences in the CES-D total scores. The correlations between subscale and total scores of the appropriate CES-D factors of each subsample were examined using Pearson correlation with bootstrap method. To test main hypotheses, we conducted a multivariate analysis of covariance (MANOVA) in order to test gender and cultural differences on subscale scores of the CES-D.

### 3. Results

#### 3.1. Configural analyses: CFA results

The fit indices for each of the structural models with data from each sample are presented in Table 2. The interpreted results suggested that the 3-factor model proposed by Carleton et al. (2013) was a better fit for both nationalities than the original model proposed by Radloff (1977). The 3-factor model included the somatic complaints, negative affect, and anhedonia subscales of the CES-D. Subsequent analyses were conducted using subscale scores based on the 3-factor model. The internal consistencies for the total scores of the 3-factor model among the Egyptian and Canadian samples ( $\alpha=.85$  and  $\alpha=.89$ , respectively), the somatic complaints subscale ( $\alpha=.70$  and  $\alpha=.70$ , respectively), the negative affect subscale ( $\alpha=.81$  and  $\alpha=.86$ , respectively), and anhedonia subscale ( $\alpha=.68$  and  $\alpha=.80$ , respectively) were all within acceptable ranges.

#### 3.2. Scalar invariance

Multi-group CFA tests for scalar invariance were conducted for the 20-item and 14-item factor structure, in order to assess whether the number of factors and pattern of indicator-factor loadings was equivalent for the Canadian ( $n = 186$ ) and Egyptian ( $n = 152$ ) samples. When using Radloff's (1977) 20-item factor structure, the multi-group CFA procedure evidenced statistically significant differences between Egyptian and Canadian measurement weights and structural covariances (Table 3). The statistically significant results suggested that Egyptian and Canadian response patterns are not invariant for the 20-item, 4-factor structure, meaning that the factor loadings were not equivalent across the Egyptian and Canadian samples with the 20-item factor structure. When using the 14-item 3-factor model supported by Carleton et al. (2013), there were no statistically significant differences

**Table 3**  
Multi-group analyses results.

Factor structures	Comparison groups	Measurement weights	Structural covariances
Radloff 20-item	Canadian-Egyptian	$\chi^2(16)=4.58, p=.001$	$\chi^2(9)=48.77, p < .001$
Carleton et al. 14-item	Canadian-Egyptian	$\chi^2(11)=15.18, p=.175$	$\chi^2(6)=12.44, p=.053$



**Table 4**  
Nationality by gender ANOVA on 14-item CES-D total scores.

	F	df	p	Partial $\eta^2$
Nationality	52.89	1, 334	< .001	.14
Gender	6.18	1, 334	.01	.02
Nationality X gender	5.19	1, 334	.02	.02

between Egyptians and Canadians based on measurement weights or structural covariances (Table 3). The statistically non-significant result suggested the constraints of the 14-item factor structure were equivalent across groups and no scalar invariance was detected. Accordingly, the results suggested that Egyptian and Canadian response patterns were only invariant for the 14-item three-factor structure, further supporting the use of that model.

### 3.3. Nationality, gender, and total CES-D scores

A two-way ANOVA was conducted to examine possible cross-national and gender differences on total scores of the CES-D. Given that the raw 14-item total CES-D scores violated the assumption of normality, the analysis was conducted with square root transformed 14-item total CES-D scores. The results indicated a significant main effect for nationality, wherein Egyptian participants reported higher total CES-D scores than Canadian participants. The analysis also found a significant gender effect, wherein women reported higher depressive symptoms on the CES-D than men. Furthermore, the results indicated a significant nationality by gender interaction. See Table 4 for detailed ANOVA statistics. Post hoc *t*-tests using the transformed score indicated that Egyptian men reported significantly higher total scores the CES-D than their Canadian male counterparts. Similar results were found for women, wherein Egyptian women reported more frequent and severe depressive symptoms than their Canadian counterparts. When examining the gender differences within each nationality, there were no significant gender differences in CES-D total scores among Canadians; however, there were significant gender differences within the Egyptian sample, whereby women reported significantly higher CES-D total scores than males. See Table 5 for detailed post hoc *t*-tests statistics.

### 3.4. Correlation between CES-D total and subscale scores

Pearson's correlations with bootstrapping method were used to examine the relationships between CES-D symptom domains and total CES-D scores. The 14-item total scores significantly correlated with the original 20-item total scores among Egyptian and Canadian samples. Thus, it suggested that the 14-item was a valid measure of depressive symptoms within the current Egyptian and Canadian samples. All subscale scores were significantly and positively correlated with the 14-item and 20-item total CES-D scores among both Egyptians and

**Table 5**  
Total scores of 14-item CES-D comparison by gender and nationality.

	M	SD	t (df)	p	Cohen's d
CADM	2.97	1.12	-3.41 (143)	.001	.57
EGYM	3.57	.98			
CADF	3.00	1.15	-7.11 (191)	< .001	1.04
EGYF	4.14	1.03			
	M	SD	t (df)	p	Cohen's d
CADM	2.97	1.12	-.15 (184)	.88	
CADF	3.00	1.15			
EGYM	3.57	.98	-3.48 (150)	.001	.57
EGYF	4.41	1.03			

Notes. All statistics reported are square-root transformed scores. CADM=Canadian male; EGYM=Egyptian male; CADF=Canadian female; EGYF=Egyptian female.

Canadians, as well as between genders (see Table 6). Fisher's *r* to *z* transformation evidenced that the relationships of anhedonia and the 20-item CES-D total scores ( $z=2.04, p=.02$ ), anhedonia and the 14-item CES-D total scores ( $z=2.31, p=.01$ ), anhedonia and somatic subscale ( $z=1.77, p=.04$ ), as well as anhedonia and negative affect subscale ( $z=2.07, p=.02$ ) were significantly stronger among Canadian men in comparison to the same relationships among Egyptian men. Similarly, the relationships between somatic subscale and the 14-item CES-D total scores ( $z=1.83, p=.03$ ), as well as the relationship between somatic subscale and negative affect subscales ( $z=2.11, p=.02$ ) were significantly stronger among Canadian women in comparison to the same relationships among Egyptian women.

### 3.5. Nationality, gender, and CES-D symptom domains

To examine the effects of nationality and gender on the three symptom domains of the 14-item CES-D, a two (nationality) by two (gender) MANOVA was conducted, using square root transformed subscale scores. The analysis revealed a significant overall main effect for nationality ( $\Lambda=.80, F(3, 332)=27.324, p<.001, \eta_p^2=.20$ ) and gender ( $\Lambda=.97, F(3, 332)=3.79, p=.01, \eta_p^2=.03$ ), whereby Egyptians evidenced higher total scores on the CES-D than Canadians, and women evidenced higher total scores than men. There was a trending multivariate interaction between gender and nationality ( $\Lambda=.98, F(3, 332)=2.07, p=.10$ ); however, given that the significance value was greater than the *a priori* level, subsequent subscale scores ANOVAs were not interpreted.

Subsequent ANOVAs results indicated a significant main effect for nationality on somatic symptoms, negative affect, and anhedonia (see Table 7). Egyptian participants reported higher means on all three subscales than Canadians. Furthermore, the ANOVAs also revealed a significant gender effect for the somatic and negative affect subscale, but not for the anhedonia subscale (see Table 5). Women reported higher scores on the somatic and negative affect subscales than men across both nationalities.

## 4. Discussion

Few studies have been designed to examine depressive symptoms among Egyptian participants, limiting our understanding of depressive symptoms therein. The current results help to bridge the gap in the existing literature (Beshai et al., 2016). The current research examined the cross-cultural configural and scalar invariance of the CES-D among Egyptian and Canadian students. Cross-cultural and gender differences in CES-D subscale scores (i.e., somatic symptoms, negative affect, and anhedonia) were also assessed. The results indicated a significant culture by gender interaction for CES-D total scores. Specifically, Egyptian women reported higher overall depressive symptoms than their Canadian counterparts; however, the interaction was not significant for any of the CES-D subscale scores. As hypothesized, Egyptian participants endorsed higher scores on all three subscales compared to Canadian students. The current results also indicate gender differences in depressive symptom reporting. For example, consistent with the hypotheses, women across both cultures reported more somatic symptoms and negative affect than did men. The current results further evidence depression as a multifaceted construct that should be examined as such, particularly across cultures and genders.

The current study was the first to examine the 14-item, 3-factor model of the CES-D between a group of Egyptian and Canadian university students. The current findings substantiated the cross-cultural configural and scalar invariance of the 14-item model supported by Carleton et al. (2013). Specifically, the 3-factor model produced better fit indices than the original 4-factor structure among both cultural groups. The 3-factor, 14-item model also evidenced scalar equivalence across the samples. Construct validity is a broad and encompassing term that is intricately tied to the overarching idea of

**Table 6**  
Correlations between CES-D subscales and total scores within two subsamples.

Canadian males	20-item CES-D Total (SE)	14-item CES-D Total (SE)	Somatic symptoms (SE)	Negative affect (SE)	Anhedonia (SE)
20-item CES-D Total	1.00	.98 (.01)	.82 (.05)	.86 (.04)	.82 (.05)
14-item CES-D Total		1.00	.84 (.05)	.86 (.04)	.84 (.04)
Somatic			1.00	.57 (.10)	.52 (.11)
Negative affect				1.00	.65 (.09)
Anhedonia					1.00
<i>Egyptians males</i>					
20-item CES-D Total	1.00	.97 (.01)	.79 (.05)	.82 (.04)	.67 (.07)
14-item CES-D Total		1.00	.82 (.05)	.85 (.03)	.68 (.07)
Somatic			1.00	.60 (.09)	.27 (.11)
Negative affect				1.00	.40 (.11)
Anhedonia					1.00
<i>Canadians females</i>					
20-item CES-D Total	1.00	.99 (.003)	.89 (.02)	.92 (.02)	.85 (.03)
14-item CES-D Total		1.00	.91 (.02)	.92 (.02)	.85 (.03)
Somatic			1.00	.79 (.05)	.64 (.06)
Negative affect				1.00	.70 (.06)
Anhedonia					1.00
<i>Egyptians females</i>					
20-item CES-D Total	1.00	.98 (.004)	.83 (.04)	.90 (.02)	.64 (.07)
14-item CES-D Total		1.00	.85 (.03)	.89 (.03)	.69 (.06)
Somatic			1.00	.64 (.08)	.33 (.09)
Negative affect				1.00	.51 (.09)
Anhedonia					1.00

**Table 7**  
Follow-up ANOVA for main effects of nationality and gender.

CESD-D Subscale	F	df	Partial η <sup>2</sup>
<b>Somatic symptoms</b>			
Nationality	11.10**	1, 334	.03
Gender	10.44**	1, 334	.03
<b>Negative affect</b>			
Nationality	49.32***	1, 334	.13
Gender	4.23*	1, 334	.01
<b>Anhedonia</b>			
Nationality	65.72***	1, 334	.16
Gender	.37	1, 334	.001

Note. Omnibus MANOVA and subsequent ANOVA were conducted using square root transformed to correct for violation of assumption of normality of subscale scores.

\* p < .05.  
\*\* p < .01.  
\*\*\* p < .001.

validity, and is defined as the ability of a measure (e.g., CES-D) to examine and predict relationships in the nomological network of a construct (e.g., depression; Cronbach and Meehl, 1955). Factorial validity (i.e., stability of a measure's factor structure across time and groups) is a central feature of construct validity (Peter, 1981). If the factor structure of a scale is inconsistent across groups, the scale's construct validity becomes questionable. Factorial instability of a measure across cultures may also suggest that a culture-related factor (or multiple factors) is altering the latent variable (i.e., depression) in a way that is inconsistent with its intended audience, which may suggest that the scale should not be used in the same way across cultural groups (Helmes and Nielson, 1998; Tran, 1997; Bolton, 2001). Accordingly, and if the scale is intended for use with multiple groups, it is important for developers and researchers to examine the stability of a scale's structure across-cultures. As such, our results here demonstrated the factorial validity of the CES-D among Canadians and Egyptians.

As Carleton et al. (2013) indicated, the 3-factor structure demonstrated a better fit and deemed as a more valid structure than the 4-factor model within the same cultural groups. Conversely, the Radloff's (1977) original 4-factor model contains poor construct validity, even

within the same cultural group. The current results further support the robust stability and replicability of the 3-factor, 14-item model across cultures, highlighting the original 4-factor model as less valid when being used to assess cross-cultural differences of depression. For instance, Williams et al. (2007) found support for the configural, but not scalar, invariance of the CES-D among a large sample of African American women. Future research should test the generalizability of the 14-item CES-D model with other Egyptian samples (e.g., those suffering from clinical depression) and in other cultures.

Consistent with previous studies, the current results suggest Egyptian university students report higher somatic subscale scores relative to their Canadian counterparts (e.g., Okasha, 1999; Abdel-Khalek, 2004). The tendency to emphasize and present depressive symptoms through somatic complaints among Arabs (Al-Krenawi and Graham, 2000) may be attributable to the lack of linguistic idioms to express psychological symptoms and greater somatic awareness in that region of the world (Hamdi et al., 1997; Beshai et al., 2013b; Makellam, 2014). There was also unanticipated evidence that Egyptian participants reported more negative affect and anhedonia than Canadians. The higher scores were consistent with previous research. For example, undergraduate recruited from 19 Islamic nations were likely to endorse psychological symptoms (e.g., guilty feelings, sadness, self-criticism, and anhedonia; Alansari, 2005), when assessed the Beck Depression Inventory-II (Beck et al., 1996). Similarly, Arabic descended community members from Australia readily expressed their psychological symptoms via self-report measures of depression, and were more reluctant to express such symptoms via a diagnostic interview (Matthey et al., 1997). The current results also suggest differential reporting of depressive symptoms may depend on assessment methods. For example, non-Western individuals are more likely to report somatic symptoms via oral report, possibly due to perceptions of symptom legitimacy interacting with stigma (e.g., Burr and Chapman, 2004); however, when written self-report assessments are used, Egyptian participants appear to report psychological symptoms (i.e., negative affect, anhedonia) at least as readily as Canadians.

The current scale equivalence analyses results provided important information regarding cultural invariance in depression symptom presentation using the CES-D. Egyptian participants reported higher

total symptoms overall, and higher scores on the three subscales than Canadian participants. The magnitudes of the correlations between total and subscale scores were stronger among Canadian participants than Egyptian participants. In particular, the anhedonia subscale produced the weakest correlations with the other CES-D subscales for Egyptian participants, regardless of gender. This pattern suggests that anhedonia may be differentially related to the latent depression construct among people of different cultures. Despite the different relationships, growing evidence underscores the importance of anhedonia, and in some cases hopelessness, for Arabic speaking persons (Sawaya et al., 2016).

Egyptian participants in the current study reported greater overall depressive symptoms than Canadians; similarly, Ibrahim et al. (2012) found that 71% of their Egyptian student sample endorsed elevated symptoms of depression, whereas only 10–60% of students from other nations endorsed such elevations. Some (e.g., Jadoon et al., 2010), but not all (e.g., Bayram and Bilgel, 2008), studies have evidenced older students as having higher depressive symptoms prevalence. The current Egyptian sample was slightly older than the Canadian sample, which may have meant greater concerns regarding employment and finances, therein explaining the heightened depression symptoms (Ibrahim et al., 2012).

Women in the current study reported greater scores on the somatic and negative affect CES-D subscale. Contrasting the hypothesis, there was a trending omnibus multivariate culture by gender interaction effect when examining the subscale scores. Given that the significance value was greater than the *a priori* level, we did not interpret the subsequent ANOVA analyses for each subscale score. It is plausible that the null interaction effect in the MANOVA was reflective of low statistical power in the current study. Future studies should use a larger sample size to further examine the nationality by gender interaction of depressive symptoms emphasis among Egyptians and Canadians. Several previous studies have evidenced gender differences in the presentation of depressive symptoms (e.g., Carragher et al., 2011; Silverstein et al., 2012), and these differences were robust across cultures (e.g., Van de Velde et al., 2010; Lorenzo-Blanco et al., 2012). Several culture-related factors (e.g., education, work, marriage and domestic violence) may contribute to the higher prevalence of depressive symptoms among women in Islamic countries (Douki et al., 2010); moreover, somatic symptoms may be predominantly endorsed by women in Islamic nations because of culturally related stigma, whereas affective symptoms may be initially denied (Halbreich et al., 2007).

The current research contributes to the existing literature in several ways. First, the current research assessed cross-cultural and gender differences in depressive symptom domains between Egyptians and Canadian university students. Second, the CES-D translation adhered to the protocol suggested by the WHO to ensure linguistic accuracy. The CES-D produced excellent psychometric properties with the Egyptian sample data (see Beshai et al., 2012, 2013a), emphasizing the success of the translation. Third, scalar invariant analyses supported cross-cultural invariance of the scale. Fourth, the CES-D is a widely and globally used depression scale, designed to assess depressive symptoms frequencies in community samples (Radloff, 1977); therefore, the current results can be directly compared with results from studies across the globe. Finally, the Carleton et al. (2013) 14-item CES-D factor structure, with gender-biased items removed (e.g., “I had crying spells.”), was validated in several clinical and non-clinical samples. Accordingly, the evidenced differences between genders and cultures in depressive symptom reporting are likely meaningful and robust.

The current research also has several limitations that offer direction for future research. First, the current research design replicated earlier studies by assessing cross-cultural and gender differences in the presentation of depressive symptoms; however the sample comprised of analogue student participants. Second, the current research design relied on self-report symptom domains from only one self-report

measure. Future researchers should consider using a diagnostic clinical interview alongside diverse self-report measures; however, structured diagnostic interviews, such as the Structure Clinical Interview for the DSM-IV (First et al., 1997), have not yet been translated into Arabic. Future researchers should also assess diverse and increasingly specific depression symptom domains (Dere et al., 2013). Third, the current research design assessed depression in accordance with the Western conceptualization; as such the definition and results may not be appropriate for Egyptian samples, and thus, future researchers should consider alternative conceptualizations.

Despite the limitations, the current study provided preliminary support for cross-cultural and gender differences in the endorsement of somatic, negative affect, and anhedonia features of depression among Egyptian and Canadian students. Given the prevalence and impact of depression, understanding variations in disorder expression between cultures and genders may be critical for improving assessment and treatment of this disorder.

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