Depressive Symptoms among Adolescents in Lebanon: A Confirmatory Factor Analytic Study of the Center for Epidemiological Studies Depression for Children

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Abstract

The purpose of this study was to examine the psychometric properties of the Lebanese-Arabic translation of the Center for Epidemiological Studies Depression Scale for Children (CES-DC) in preadolescents, early and late adolescents in Lebanon. The CES-DC is a 20 item self-report scale developed to measure depressive symptoms in children and adolescents. A total of 650 pupils ranging in age from 10–18 years, participated in this investigation. Participants were also asked to complete two questionnaires the Spence Children's Anxiety Scale (SCAS) and the Strength and Difficulties Questionnaire (SDQ). The CES-DC Lebanese-Arabic version for this study demonstrated high internal consistency (Cronbach Alpha=0.90). It was found that the four-factor structure model suggested by Radloff can be replicated in Lebanon. The CES-DC total scores correlated significantly with the SCAS total scores and the SDQ emotional symptoms subscale, providing support for its convergent validity. To conclude, the CES-DC proved to be a reliable and valid measure of depressive symptoms in the Lebanese context. Scores of depressive symptoms differed significantly by age, gender and were higher than scores of adolescents in other countries.

Keywords: Depression; Preadolescents; Adolescents; Center for Epidemiological Studies Depression Scale for Children (CES-DC); Psychometric properties

Introduction

Adolescence is an important developmental stage in the lifespan and is characterized by many changes among which are physical and psychosocial. In Western countries 13-25% of adolescents will experience a mental disorder in their life time [1,2]. Adolescence seems to be a high-risk period for depression and anxiety disorders [3,4]. Research from developing countries indicates similar ranges [5-8]. Depression is one of most common psychological disorders in adolescence [9,10]. Depression in adolescence is associated with poor academic performance, substance abuse, attempted or completed suicide, and an increased risk for recurrence in adulthood [11,12]. During adolescence, satisfaction in life is decreased [13]. Assessment during this high-risk period can make the difference in early intervention and prevention of depression or a prolonged life of suffering.

In some, but not all studies, there is a significant correlation between the prevalence of depression and age [10,14-16]. In most studies, after puberty, girls report significantly higher levels of depressive symptoms than boys [17-19]. Using the CES-DC, a consistent finding is readily established; girls score higher than boys on depressive symptoms [20-24].

Notwithstanding, depression is often unnoticed and the use of screening instruments assists in receiving early intervention and access to professional help. This highlights the need to identify clinically depressed adolescents at the early stages of depression in order to provide appropriate treatment. The effectiveness of this recommendation is based on the availability of sound screening tools for depression. At present, few resources are directed to addressing adolescent mental health in Lebanon. Moreover, WHO [25] reports that 13% of Gross Domestic Product

(GDP) goes to the Ministry of Health in Lebanon and of that 6% is directed towards mental health, most of which is devoted to adult mental health. However, this distribution does not match the country's demographics, as 30% of the population in the country is under the age 19.[1]

As reported in previous studies depressive symptoms are hypothesized to correlate significantly with measures of other child and adolescent psychopathology [21,26-28]. The last aim of this study is to evaluate age and gender patterns of depressive symptoms. In line with previous studies, girls have higher scores on depressive symptoms [19-22]. However, in research examining pre-adolescents, researchers report two trends. Either there are no gender differences in depressive scores, or higher scores of depressive symptoms among males in comparison with females [3,4]. That said, these studies compare females to males, and do not compare scores within the same sex across age brackets. In this study, we compare pre-adolescent male's depressive scores to older males.

The last aim of this study is to evaluate age and gender patterns of depressive symptoms. In line with previous studies, girls have higher scores on depressive symptoms [19-22]. However, in pre-adolescence, researchers report either no gender differences or higher scores of depressive symptoms for males [3,4]. In addition to lacking material resources, diagnostic tools in Lebanon are lacking. Given the advantages of self-report questionnaires, numerous self-report instruments for the assessment of depressive symptoms in children and adolescents have been developed, but these are based largely on Western models. For example, a reliable and validated version of an internationally used measure of depression such as the Center for Epidemiological Studies Depression Scale for Children (CES-DC) is lacking in Lebanon.

The (CES-DC) has been used by many studies because of its sound psychometric properties and convenience of administration as a self-report screening instrument. This instrument was not developed especially for children and adolescents, but was based on CES-D developed by Radloff [1] and later made child friendly by Weissman et al. [29].

The main aim of this study is to explore the psychometric properties of the CES-DC and its factor structure when used with preadolescents, early and late adolescents in Lebanon. The internal consistency of the CES-DC is hypothesized to be good. Furthermore, the result is expected to provide support for a four-factor model as reported in previous studies. A secondary goal of this study is to examine the relationship of depressive symptoms with other child and adolescent psychopathology. The last aim of this study is to evaluate age and gender patterns of depressive symptoms. In line with previous studies [19-22], girls are hypothesized to have higher scores on depressive symptoms; however, in pre-adolescence, no gender differences or higher scores of depressive symptoms should be found for males [3,4].

[1]https://www.cia.gov/library/publications/the-world-factbook/geos/le.html

Methods

Participants

The present study was conducted in Lebanon, with a total a sample of 650 drawn from private and public schools from rural and urban areas. Participants were contacted through their schools. The Ministry of Education provided us with a list of public schools. Participants were recruited from three public schools and five private schools. Participants were 43% males or 272, and 50.7% were females or 378. They ranged in age from 10 to 18 years (mean=14.45, SD=1.99). Most of participants came from intact families.

Internal Review Board approval (IRB) from the Lebanese American University was obtained, as was school approval and parental written informed consent was required before participation in the study; adolescents' participation was voluntary. Parents were contacted through the schools by sending a briefing sheet with a consent form for parents to sign giving their child permission to participate in the study. Only adolescents whose parent(s) have signed the consent form were approached to engage in the research. Participants were living with both parents. Data was collected during the spring of 2014 and fall 2015.

Instruments

The participants completed three scales, as well as additional questions needed to ascertain demographic characteristics. The instruments were the Center for Epidemiological Studies Depression Scale for Children (CES-DC), the Strengths and Difficulties Questionnaire (SDQ), and the Spence Children's Anxiety Scale (SCAS).

1. The CES-DC is a 20-item scale intended to measure depression in those between the ages of 6-17. Each item is rated on a 4-point scale in terms of frequency of occurrence in the last week, from "not at all=0" to "a lot=3." To control for response bias, there are four items phrased in a positive fashion and reversely scored when calculating CES-DC scores. Higher CES-DC score indicate more severe depressive symptoms. A cut-off score of 15 and above has been set as indicative of depressive symptoms in children and adolescents by the adapters [29]. The CES-DC has acceptable validity and reliability in different cultural contexts such as China [23], Germany [20], Iran [21], U.S. [24] and Sweden [22]. The CES-DC demonstrated high correlations with other depression instruments such as Child Depression Inventory (CDI) (r=0.58) and the Beck Depression Inventory (BDI) r=0.81 [20]. CES-DC scores range from 0 to 60. After its publication, the CES-DC has been used in both clinical and community settings and in multiple cultures with different cultural orientations such as China [23], Germany [20], Iran [21], U.S. [24], and Sweden [22]. Indeed, the internal consistency of the CES-DC has been reported to range from good to excellent, with Cronbach Alphas ranging from 0.71 to 0.91 [20,21,23]. Within the subscales of the CES-DC, the highest Cronbach Alpha was found for depressed affect and the lowest for positive affect. According to Radloff [1] factor analysis, the most important components of the CES-DC

are: Depressed affect, positive effect, somatic complaints and interpersonal problems. Radloff's four-factor model has been replicated in multiple studies concerning children and adolescents cross-nationally [18,19,21,22]. However, it is unknown whether this finding could be replicated in Lebanon.

2. The Spence Children's Anxiety Scale (SCAS) [30] is a 38-item measure of anxiety symptoms in children and adolescents. The SCAS items reflect symptoms of the DSM-IV anxiety disorders, including separation anxiety, social phobia, and obsessive–compulsive disorder (OCD), panic/agoraphobia, physical injury fears, and Generalized Anxiety Disorder (GAD). Each item is rated on a 4-point scale in terms of frequency from ''never'' (0) to ''always'' (3). The 0-3 ratings of the items are summed to yield a total score, with higher scores reflecting higher levels of anxiety symptoms. The SCAS has yielded more than adequate alpha coefficients and has been used in different cultural setting. The SCAS is a widely used self-report questionnaire instrument used to gauge perception of the frequency with which adolescents' experience symptoms relating to generalized anxiety disorder, separation anxiety disorder, social phobia, panic disorder and agoraphobia, obsessive–compulsive disorder, and fears of physical injury among children and adolescents. The SCAS has increasingly been used in a variety of settings and cultures, including in Australia, Japan, Spain, Brazil, Iran, and Malaysia [21,31-36]. The Cronbach alpha for SCAS in the present study showed an excellent value of 0.93.

3. The Strengths and Difficulties Questionnaire (SDQ) [37] is used to assess general difficulties and positive attributes. The 25 questions are divided into five scales of five items each, which generate scores for conduct problems, hyperactivity-inattention, emotional symptoms, peer relationship problems, and prosocial behavior. Each of the items is rated on a 3-point scale, ranging from ''not true'' (0) to ''certainly true'' (2). Five items are reverse scored, and there stare positively scored. The total difficulties score can be obtained by adding the items of the four problem scales (excluding the prosocial behavior scale). Similar to the CES-DC and SCAS, the higher the score, the more severe are the difficulties. The SDQ has been shown to be highly correlated with other measures of child and adolescent psychopathology. The CES-DC interpersonal problems subscale in this study significantly correlated with total SCAS, total SDQ, and all of its subscales, including prosocial behavior. The SDQ has high internal consistency and has been shown to be highly correlated to the Beck anxiety scale (r=54). The Cronbach alpha for the total SDQ in this study was in the good range of 0.81.

These three instruments translated by two bilingual translators from English to Arabic and back to English. Differences in the back-translation were resolved by the concurrences of both translators. The SDQ was recently used in Beirut, Lebanon by Kerbage et al. [37] to screen for emotional and behavioral problems among youngsters (between the ages of 11-16).

Data Analysis

Since this was the first report of the Lebanese version of CES-DC, confirmatory factor analysis was conducted to examine whether the 4-factor structure reported by Radloff [1] could be applied to the present data. As is common when measuring depressive symptoms in a community sample [20,21], the distributions of the observed variables were positively skewed, except for items 12 and 16, which showed a negative skew. Thus, least squares robust method was used as an estimation method that does not rely on the normal distribution model. Model fit was evaluated based on NFI, NNFI, CFI, and RMSEA. Higher values (>0.90) of NFI, NNFI, and CFI, and lower value (<0.05) of RMSEA is indicative of satisfactory fit [38,39]. EQS ver. 6.1 was used for analysis.

Subsequently, the alpha coefficient of the CES-DC, as well as the correlations between CES-DC, SCAS, and SDQ were calculated. Differences in scores between sex and ages were also examined. These analyses were conducted using IBM SPSS Statistics ver. 20.

Results

Psychometric properties of the CES-DC

Four-factor inter-correlation model was examined by confirmatory factor analysis. Item 4, which was hypothesized to load onto the "positive affect" factor, failed to correlate with the other items of this subscale (items 8, 12 and 16). Previous studies using the CES-DC in other countries (e.g., factor loading=0.31 [21]), as well as a study conducted within Lebanon using CES-D (factor loading=0.24 [40,41]) also showed a relatively low factor loading for this item; thus, in the present study, item 4 was omitted from further analysis. Otherwise, all items showed factor loadings of >0.35, and it was confirmed that items of the Lebanese CES-DC adequately measure the designated factors. The final 19-item model yielded a fit of NFI=0.900, NNFI=0.926, CFI=0.937, and RMSEA=0.048. Overall, model fit reached satisfactory standard, and it was concluded that the four-factor structure proposed by Radloff [1] can essentially be replicated in the Lebanese data. Factor loadings and inter-factor correlations are indicated in **Table 1**. Inter-factor correlations for somatic complaints, depressed affect, and interpersonal problems were high, ranging from r=0.82 to 0.99. Correlations for positive affect factor and the other three factors were comparatively low, ranging from r=0.16 to 0.21. These results suggest that lack of positive affect is an independent facet compared to the other principal symptoms of depression.

Alpha coefficient for the total scale was 0.90, which was higher than most values reported in previous studies (0.82-84; 0.87; 0.87-0.91; 0.82-0.85; 0.77-0.86) [21-24]. The internal consistency for somatic complaints, depressed affect, positive effect, and interpersonal problems subscale were 0.78, 0.86, 0.57 and 0.70, respectively. Although the value for positive affect was relatively low, these numbers were predominantly high compared to similar studies conducted in other countries.

Table 1 Results of confirmatory factor analysis for the Lebanese CES-DC.

	F1 (SOMA)	F2 (DEP)	F3 (POS)	F4 (INTER)
Bothered by things [1]	0.54	-	-	-
Not feel like eating [2]	0.63	-	-	-
Couldn't pay attention [5]	0.61	-	-	-
Too tired to do things [7]	0.56	-	-	-
Sleep was restless [11]	0.62	-	-	-
More quiet [13]	0.36	-	-	-
Hard to get started [20]	0.69	-	-	-
Wasn't happy [3]	-	0.66	-	-
Felt down and unhappy [6]	-	0.70	-	-
Things didn't work out [9]	-	0.58	-	-
Felt scared [10]	-	0.61	-	-
Felt lonely [14]	-	0.67	-	-
Feel like crying [17]	-	0.68	-	-
Felt sad [18]	-	0.76	-	-
Something good will happen [8]	-	-	0.99	-
Was happy [12]	-	-	0.39	-
Had a good time [16]	-	-	0.35	-
Kids not friendly [15]	-	-	-	0.66
Felt people disliked me [19]	-	-	-	0.81
Inter-factor correlations	-	-	-	-
F2	0.99	-	-	-
F3	0.21	0.16	-	-
F4	0.82	0.87	0.16	-

CES-DC: Center for Epidemiological Studies Depression Scale for Children; DEP: Depressed Affect; INTER: Interpersonal Problems; POS: Positive Effect; SOMA: Somatic Complaints.

Correlations between CES-DC and other psychopathology

Table 2 shows the correlations between the CES-DC, the SCAS, and the SDQ. Total CES-DC score significantly correlated with total SCAS and its subscales, and with total SDQ and its subscales with the exception of prosocial behavior. Correlations between total CES-DC and total SDQ was r=0.74, and between total SCAS was r=0.75. Similar results were obtained for the CES-DC subscale; somatic complaints and depressed affect significantly correlated with total SCAS, total SDQ, and all of its subscales, excluding prosocial behavior. Correlations for somatic complaints ranged from 0.33 for SDQ subscale of hyperactivity to 0.71 of total SCAS score. The correlation for depressed affect subscale ranged from 0.35 for OCD and SDQ subscale of hyperactivity, to 0.67 for total SCAS. The CES-DC positive affect subscale significantly correlated with total SCAS all of its subscales, and total SDQ, but not some of the SDQ subscales (e.g., emotional symptoms, conduct problems, and peer problems) had no correlation. The correlation coefficient ranged from 0.11 to 0.16. The CES-DC interpersonal problems subscale significantly correlated with total SCAS and each of the subscales, total SDQ, and all of its subscales, including prosocial behavior. Correlations ranged from -0.09 (prosocial behavior) to 0.62 (total SCAS). The correlation coefficients in this study were generally higher than those found in prior study [21].

Gender and age differences

Mean and standard deviation of CES-DC total score and its subscales for the total sample, for boys and girls, and for pre-adolescents (ages 10-12), early adolescents (ages 13-15), and late adolescents (ages 16-18) are depicted in **Table 3**. A series of 2-way ANOVAs with gender and age as independent variables and CES-DC total score and each of the subscales as dependent variables were conducted. The interactive effect in terms of gender and age was significant for the depressed affect subscale (F (2,523)=3.99, p<0.05). Subsequent analyses using the Bonferroni method showed that boys in their late adolescence scored higher than boys in pre-adolescence or early adolescence (p<0.01), and within the late adolescence group, boys scored lower than girls. No other interactive effect was observed for either the total CES-DC or the remaining subscales.

The main effect of gender and age was significant for total CES-DC (gender: F(1,469)=5.84, p<0.01; age: F(2, 469)=8.78, p<0.001), somatic complaints (gender: F(1,524)=5.58, p<0.05; age: F(2,524)=6.43, p<0.01), and depressed affect (gender: F (1,523)=6.70, p<0.05; age: F(2,523)=5.60, p<0.01). Only the main effect of age was significant for interpersonal problems (F (2,560)=17.19, p<0.001). Neither the main effect of age or gender was significant for positive affect. Overall, females had higher scores of depressive symptoms than males, and early adolescents scored lower than pre-adolescents on all scales excluding positive affect.

Discussion

The primary aims of this study were to examine the psychometric properties of the Arabic-Lebanese translation of the CES-DC, focusing on its internal consistency, factor structure, and

Table 2 Correlations between the CES-DC, SCAS, and SDQ.

	Total CES-DC	SOMA	DEP	POS	INTER
Total SCAS	0.75***	0.71***	0.67***	0.16**	0.62***
SAD	0.53***	0.46***	0.46***	0.13**	0.44***
SOCPH	0.52***	0.44***	0.45***	0.11*	0.47***
OCD	0.42***	0.40***	0.35***	0.10*	0.37***
PANIC	0.72***	0.67***	0.63***	0.11*	0.60***
FEARS	0.50***	0.42***	0.45***	0.11**	0.39***
GAD	0.66***	0.62***	0.57***	0.11*	0.46***
Total SDQ	0.74***	0.68***	0.66***	0.15**	0.59***
EMOT	0.71***	0.67***	0.66***	0.02	0.56***
COND	0.50***	0.47***	0.45***	0.03	0.41***
HYPER	0.36***	0.33***	0.35***	-0.09*	0.27***
PEER	0.55***	0.47***	0.54***	-0.05	0.56***
PROSOC	-0.05	-0.04	-0.08	0.14**	-0.09*

CES-DC: Center for Epidemiological Studies Depression Scale for Children; SOMA: Somatic Complaints, DEP: Depressed Affect; POS: Positive Affect; INTER: Interpersonal Problems; SCAS: Spence Children's Anxiety Scale; SAD: Separation Anxiety Disorder; SOCPH: Social Phobia; OCD: Obsessive-Compulsive Disorder; PANIC: Panic Disorder; FEARS: Physical Injuries Fears; GAD: Generalized Anxiety Disorder; SDQ: Strength and Difficulties Questionnaire; EMOT: Emotional Symptoms; COND: Conduct Problems; HYPER: Hyperactivity-Inattention; PEER: Peer Problems; PROSOC: Prosocial Behavior. *p>0.05, **p>0.01, ***p>0.001

Table 3 Mean and SD of the Lebanese CES-DC by gender and age group.

	Total CES-DC	SOMA	DEP	POS	INTER
Total sample (N=650)	23.36 (11.73)	8.31 (4.70)	8.26 (5.60)	4.77 (2.21)	2.21 (1.92)
Male					
Ages 10-12 Pre-adolescents	25.19 (10.00)	9.00 (4.09)	8.94 (4.75)	4.91 (2.01)	3.00 (1.67)
Ages 13-15 Early adolescents	23.43 (11.74)	8.13 (4.36)	8.25 (5.56)	4.78 (2.21)	2.39 (1.90)
Ages 16-18 Late adolescents	16.73 (9.47)	6.15 (4.27)	5.30 (4.78)	4.40 (2.40)	1.50 (1.69)
Female					
Ages 10-12 Pre-adolescents	24.48 (12.12)	8.83 (4.27)	8.97 (5.62)	4.16 (2.00)	2.66 (1.85)
Ages 13-15 Early adolescents	26.35 (12.79)	9.39 (4.88)	9.12 (5.66)	5.16 (2.29)	2.55 (2.05)
Ages 16-18 Late adolescents	23.69 (10.42)	8.39 (4.86)	8.80 (5.72)	4.73 (2.15)	1.71 (1.71)

Values outside the parenthesis indicate mean; Values inside the parenthesis indicate SD.
CES-DC: Center for Epidemiological Studies Depression Scale for Children; SOMA: Somatic Complaints; DEP: Depressed Affect; POS: Positive Effect; INTER: Interpersonal Problems.

validity in both discriminant and convergent terms. This is the first research to examine the psychometric properties of the Arabic-Lebanese version of CES-DC, and our study supported its reliability. The Cronbach Alpha of the CES-DC in the present study was 0.90 for the total CES-DC score. In keeping with prior research, the CES-DC subscales scores were lowest for positive affect and highest for depressed subscales, respectively [20,23]. Second, our findings supported the four-factor model as originally proposed by Radloff [1]. The internal consistency for somatic complaints, depressed affect, positive effect, and interpersonal problems subscale were 0.78, 0.86, 0.57, and 0.70, respectively. Third, the CES-DC correlated significantly with the SCAS and the SDQ scales. In substantive terms, this indicates that high levels of depressive symptoms are associated with a high frequency of emotional and behavioral problems. The findings are in line with existing work: preadolescents with high levels of depressive symptoms also reported high levels of anxiety, conduct disorder, negative self-image, and ADHD symptoms [27,41]. Overall, these findings provide support for the convergent validity of the CES-DC.

Another main finding was that compared to boys, girls had significantly higher total CES-DC scores, as well as higher scores on somatic complaints and depressed affect subscales. This gender difference in the frequency of depressive symptoms and somatic complaints replicated previous studies showing that more girls are more affected by depression, than boys. Though there are a number of explanations for this, in the Lebanese traditional context, it could be that girls are generally expected to be more subdued and acquiescent than boys, as it is in a heavily patriarchal society.

A contributing factor to the high scores of depressive symptoms and elevated scores on the SCAS and the SDQ could be the number of displaced Syrian youth enrolled in public schools. Owing to the ongoing civil war, many Syrians have fled to Lebanon, and lost pre-existing lifestyles. Upon arrival to Lebanon, many families have settled in compromising living conditions, with relatives or in over-crowded apartments. Some Syrian youngsters have access to Lebanese public schools who have limited resources in terms of mental health services. There are no school psychologists or

school counselors in public schools. Preadolescents, early and late adolescents who undergo these experiences are expected to show elevated signs of depression, as they have witnessed armed conflict, suffered displacement, have vulnerable housing arrangements and low SES [37].

Limitations of the Study

Naturally, this study is not without its limitations. Primarily, the generalizability of our findings to other age cohorts is limited, as only 10–18 year olds were included in our study. Moreover, the participants were not recruited from a clinical sample and no diagnostic interview was used; this was a study conducted on the basis of self-report. Further tests of convergent and discriminate validity should be conducted via parent or teacher report.

These limitations not with-standing, our findings support the usefulness of the CES-DC as an efficient way of screening for depression in children and adolescents in Lebanon. Reliable diagnostic interview schedules are available to evaluate the symptoms of depression, but they are time consuming to administer, and require trained interviewers in order to be effective.

Conclusion

These findings indicate the reliability and validity of the Arabic-Lebanese translation of the Center for Epidemiological Studies Depression Scale for Children (CES-DC) in children and adolescents in Lebanon, including its internal consistency, and factor structure. A total of 650 child and adolescent aged 10-18 years that participated were recruited from public and private schools, urban and rural areas in Lebanon. All participants also completed the Spence Children's Anxiety Scale (SCAS), a measure of anxiety symptoms, and the Strength and Difficulties Questionnaire (SDQ), a measure of general difficulties and positive attributes. The CES-DC showed high internal consistency (Cronbach Alpha=0.90).

Confirmatory factor analyses revealed the same four factor structure proposed by Radloff: depressed affect, positive effect, somatic complaints and interpersonal problems can be applied to the Lebanese context. Pre-adolescent (10-12) and early adolescent (13-15) participants scored higher on scales of depression than older participants (16–18 years). Girls also scored significantly higher on scales of depression. Girls

displayed significantly higher levels of depressive symptoms than boys. Due to its ease of administration, CES-DC seems to be a useful instrument for screening for depression in both clinical and epidemiological settings. While the ease of administration of CES-DC allows it to be readily employed as screening tool, its use in clinical settings should be tested in future studies.

Acknowledgement

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