



ORIGINAL ARTICLE

## Psychometric Characteristics of the Jordanian version of the Children's Depression Inventory

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<b>ARTICLE HISTORY</b> <b>Received:</b> <b>10.01.2016</b> <b>Revised</b> <b>16.01.2016</b> <b>Accepted</b> <b>29.01.2016</b>	<b>ABSTRACT</b> <i>The aim of the current study was to investigate the reliability and the validity evidences of the Jordanian version of the children's depression inventory (JVOCDI). The sample of the study composed of 702 students enrolled in grades 7 to 10 at Jordanian private and public schools. To achieve the goals of this study pearson correlation coefficient, cronbach's alpha formula, independent samples t test, and Principal Components Analysis (PCA) with varimax rotation were used. The results of the study indicated that the JVOCDI showed sufficient evidences to consider it as a reliable and valid instrument in the Jordanian cultural context.</i> <i>Keywords: Jordanian Version, children, Depression, Inventory.</i>
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### INTRODUCTION

Empirical studying of the depressive disorders in children has been challenged by controversy regarding fundamental conceptual and diagnostic issues (Knight, Hensley, & Waters, 1988). The growing recognition that the diagnostic criteria for adult depression may be applicable and suitable to children has helped to resolve much of the diagnostic confusion.

Thus, well-established and psychometrically sound instruments for assessment of depressive symptoms in children and adolescents are important (Sorensen, Frydenberg, Thastum, & Thomsen 2005). Self-report measures, which are quick and easy to administer, may be an attractive alternative to time consuming diagnostic interviews in screening for Major Depressive Disorder MDD in children. Still, the Children's Depression Inventory (CDI) which was developed by Kovacs (1985) is considered as appropriately translated and validated versions of widely used measures of depression. CDI is one of the most widely used instruments in epidemiological studies to assess children and adolescents' self report levels of depression (Samm et al., 2008), and being used at different cultures and countries around the world (Ivarsson, Svalander, & Litlere, 2006; AL-Balhan, 2006; Molina, Gómez, & Pastrana, 2009).

CDI is a self rating scale developed specifically for children modelled after, Beck Depression Inventory (BDI) was used as a adults scale. As in the BDI, the cognitive symptoms of depression are a dominant feature of the scale. The CDI combines aspects of the clinical categorical approach and of dimensional measurement (Traube, Dukay, Kaaya, Reyes, & Mellins, 2010).

The clinical/categorical approach is evidenced in that CDI covers most of the symptoms of major and minor depression according to the DSM- IV (American Psychiatric Association [APA], 1994). The dimensional nature can be seen in that the items are scored quantitatively (0-2) and that the scores are

combined to 5 sub-scales (Negative Mood, Interpersonal Problems, Ineffectiveness, Anhedonia and Negative Self-esteem) and total score.

Although the CDI was developed in 1978, it is considered CDI as one of the most utilized self-report measures of depression (Traube et al., 2010). It has the potential to be a useful instrument for screening depression among children in different part of the world. The original 27-item English version of the CDI is a self-report measure of childhood and adolescent symptomology, normalized originally on a large sample of US school children (Kovacs, 2001; Kovacs, Goldstein, & Gastonis, 1993).

According to Ivarsson, Svalander and Litlere. (2006), some Previous studies at Malaysia (Rosliwati, Rohayah, Jamil, & Zaharah, 2007), Spain (Davanzo et al., 2004), Denmark (Sorensen et al., 2005) and different parts of the world (Al- Balhan, 2006; Ghareeb & Beshai, 1989) have shown the CDI to be a reliable measure with high internal consistency with *Cronbach alphas* ranging from 0.71 to 0.89 which is similar to these reliability values reported at English version.

The CDI sub-scales have also shown good to fair internal consistency (Kovacs, 1992): Negative Mood 0.62, Interpersonal Problems 0.59, Ineffectiveness 0.63, Anhedonia 0.66 and Negative Self-esteem 0.68. The test retest reliability has ranged from correlations of 0.38 to 0.87 depending upon the time interval (from 1 week to 1 year) and whether the subjects studied have been clinical (Ivarsson, Svalander, & Litlere, 2006; Kazdin, 1987; Wierzbicki, 1987) or non-clinical. Frinch, Saylor, Edwards and McIntosh, (1987) tried to calculate CDI reliability through different intervals and found that the CDI has accepted reliability values ranged from .82 over 2 weeks to .66 and .67 for longer intervals. Ivarsson, Svalander and Litlere (2006) found that the CDI was reliable in terms of internal consistency (0.86) with a mean inter-item correlation of 0.18 and item-total score correlations ranging from 0.26 to 0.57 in Swedish samples. In addition CDI 5 sub-scales had good internal consistency values slightly above 0.60, except for subscale Interpersonal Problems with poor internal consistency (0.36).

Some positive correlations have been found between the CDI results and Kiddie Schedule for Affective Disorders and Schizophrenia for Children – Present and Lifetime version (KSADS- PL) and negative correlations with Children's Global Assessment Scale (CGAS) (Sorensen et al., 2005). CDI has a suitable and strong correlations with some accredited and well-known instruments of depression (e.g. Revised Children's Manifest Anxiety Scale –RCMAS and the Center for Epidemiological Studies Depression Scale - CES-DS) (Ollendick & Yule, 1990) and Children's Depression Rating Scale (CDRS) (Wierzbicki, 1987). Kovacs (1992) and Carey, Faulstich, Gresham, Ruggiero and Enyart, (1987) have argued that it is difficult to show the CDI having criterion validity in a comparison of clinical cases with depressive disorders and a non-clinical comparison group. These arguments are consisted with other results (Ivarsson, Svalander, & Litlere, 2006) which shown that CDI has some, but as of yet not sufficient indications of being a valid and reliable measure of depression in adolescence and scores can be used to indicate, though not prove the absence or presence of depression.

For Arabic nation, there are different attempts for having some psychometric properties of DCI in Kuwait (AL-Balhan, 2006) and Egypt (Ghareeb & Beshai, 1989). Al- Balhan (2006) found that CDI can be used in Arabic settings for its accepted psychometric properties; the CDI shows reliability and internal consistency for use within Kuwaiti culture as a measure of childhood depression. Ghareeb and Beshai, (1989) results indicated that the Egyptian version has an accepted test – retest reliability. The convergent validity was calculated through the correlations between the BDI, the Arabic version of anxiety scale by Costello and Comray (1967).

CDI is an instrument that has not been adequately translated or implemented to Jordanian culture. The original version (i.e., 27-item scale English version) of the CDI is a self-report measure of childhood and adolescent depressive symptomatology, originally normalized on a large sample of school children American culture (Kovacs, Goldstein, & Gastonis, 1993). The aim of this study was to translate and test the internal validity, reliability and factorial analysis of the CDI at a Jordanian culture within adolescent's sample.

## METHOD

### Sample of the study:

The sample of this study consisted of 702 students enrolled in Grades 7 to 10 at Jordanian private and public schools in Amman and Zarqa in the second semester 2012/2013. Table 1 shows the number of students at each grade level for both males and females.

Table 1: Demographic properties of the participants

Grade	N	Per
Grade		
7 <sup>th</sup> grade	111	32.6%
8 <sup>th</sup> grade	86	26.2%
9 <sup>th</sup> grade	66	21.7%
10 <sup>th</sup> grade	58	19.5%
Total	702	%100
Gender		
Male	321	45.7%
Female	381	54.3%
Total	702	100%

### Instrument.

The present study has used Kovacs' 27-item self report questionnaire, which contains items regarding cognitive, emotional and behavioral aspects of depression in children. The CDI quantifies a range of symptoms of depression including 5 different dimensions: Negative Mood, Interpersonal Problems, Ineffectiveness, Anhedonia and Negative Self-esteem (Kovacs, 1992). In the present study a 26-item questionnaire was used to represent the original CDI 27-item. The item that indicates to suicidal tendencies was excluded to avoid the possibility that consciousness about a previously unconscious suicidal idea could raise in the child's mind (Moilanen, 1990). Some previous studies (Samm et al., 2008) used the CDI 26-item version for the same reason.

*Translation of the CDI.* CDI was translated from English to Arabic and back with high coincidence by accredited two translators. Then, team of bilingual psychiatrist, two psychologists, and two social workers worked on checking out the translation accuracy. A bilingual psychologist epidemiologist (JD) leaded and coordinated the translation process.

*Data collection Procedure.* The authors had a meeting with 12 school counselors; the counselors received a short training concerning to CDI implementation and basic rules. Our criteria for school selection were: counseling services availability and having not less than 150 students for the targeted grades at targeted school. The counselors were requested to select out one class within the study target (between 7<sup>th</sup> – 10<sup>th</sup> grades) randomly, all counselors could select different grades at the same school. The children filled in the questionnaire during a counseling class lesson and were asked to endorse one of the two statements that best described the way he or she had felt and thought during the preceding 2 weeks, on each item of the questionnaire. The counselors have instructions to provide assistance in case the participants face difficulties at answering, through slowly reading out the separate items to the whole class, while each subject read along silently on his/her own copy and marked the answers. According to Kovacs (1985) it is allowed to the professional during CDI implementation to provide assistance for those adolescents with reading and writing or attention problems. The adolescents had the possibility to ask questions if they did not understand an item, which were then clarified by the counselor. The implementation process took place between the 5<sup>th</sup> of October 2012 and 11<sup>th</sup> of April 2013.

### Statistical analysis.

For the purpose of examining the reliability and the validity of CDI different statistical procedures were used. To estimate the stability and the internal consistency coefficients, for each dimension and for the entire instrument (all of the items), of CDI Pearson correlation and Cronbach's alpha procedures were utilized respectively. Furthermore, factor analysis procedure or Principal Components Analysis (PCA) with varimax rotation of the factors was used to examine the construct validity of CDI. Finally, In order to check the discriminant validity of CDI, Independent samples t- test and ANOVA statistical procedures were used. So, the differences between the means of participants' total scores on CDI according to the variables gender and grade level were conducted.

## RESULTS AND DISCUSSION.

*Stability and internal consistency coefficients of CDI.* The stability coefficient of the scale was examined via utilizing test-retest procedure. By taking into account the results of Frinch and his colleagues (1987) study which revealed that the CDI has accepted reliability values ranged from 0.82 over 2 weeks to 0.66 and 0.67 for longer intervals. The instrument was applied twice on stratified experimental sample of

students ranged from 7<sup>th</sup> to 10<sup>th</sup> grades with two weeks interval between the two applications. The mentioned sample was consisted from 200 Children selected randomly from schools did not participate in the final sample of the current study. The results of the previous method indicated that stability coefficients across all the dimensions of CDI were differ according to the variable grade level. So, the higher grade levels the higher the reliability coefficient. These results were expected since the Children become more stable when they become older. The stability coefficients values for CDI sub-scales were: Negative Mood (0.97); Interpersonal Problems(0.75); Ineffectiveness(0.83); Anhedonia(0.87) and Negative Self-esteem(0.82). In addition the stability coefficient for the entire instrument was 0.82.

Moreover, applying CDI in Jordanian context shows that it could be considered as a reliable measure in terms of its internal consistency since the value of Cronbach's alpha coefficient was (0.81). This result has consistency with previous results (Rosliwati et al., 2007; Ivarsson, Svalander, & Litlere, 2006; Sorensen et al., 2005; Davanzo et al., 2004), which have shown the CDI to be a reliable measure with suitable internal consistency coefficients ranging from (0.71) to (0.89).

The CDI sub-scales have also shown good to suitable internal consistency coefficients Negative Mood (0.67); Interpersonal Problems (0.57); Ineffectiveness (0.73); Anhedonia (0.72) and Negative Self-esteem (0.69). It could be observed from the previous sub- internal consistency coefficients values that most of them were more than .65, however the internal consistency coefficient for Interpersonal dimension was slightly less than 0.60. The result of the current study support the results of Swedish study (Ivarsson, Svalander, & Litlere, 2006) which showed that CDI sub-scales had good internal consistency values slightly above 0.60, except for subscale interpersonal problems which pointed to poor internal consistency (0.36). Also the reliability results of the Jordanian version of CDI support the results of those studies which conducted in Arab countries and show that CDI could be consider as a reliable measure of childhood depression in Arabic cultural context (AL-Balhan, 2006; Ghareeb & Beshai, 1989).

#### *Factor Analysis Results:*

Regarding examining the construct validity evidences of CDI, PCA factor analysis was used. By taking into account using Kaiser Criterion to retain the factors, the results of PCA with varimax rotation revealed that the items of CDI were loaded on 5 factors. Those factors were able to explain 74.1% of the total variance. Table (2) revealed extraction and rotations sum of squares loadings that associated with each factor.

Table (2): Extraction and rotation sum of squares loadings that associated with each factor

Component	Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	6.488	24.954	24.954	6.309	24.265	24.265
2	4.491	17.272	42.226	4.361	16.773	41.038
3	4.047	15.567	57.793	3.473	13.357	54.395
4	2.489	9.574	67.368	3.012	11.587	65.982
5	1.752	6.740	74.108	2.113	8.126	74.108

According to table (2) results, the eigenvalues that associated with the rotated solution ranged from (2.11) to (6.3), so the highest eigenvalue was able to explain (24.265%) from the total variance, while the lowest eigenvalue was able to explain only around (8.126%) from the total variance. It could be observed also from above results that the differences between extraction and rotation eigenvalues were very tiny. The results showed that CDI items were loaded strongly on the five factors even before using the rotation procedure. However, the researchers preferred to use the rotation technique for the purpose of maximizing the loading of CDI items on the selected variables, so that each item loads significantly only on one factor. The mentioned results of table (2) have an agreement with construct validity results of CDI that have been achieved via the implementation of CDI in different countries over the world (Ivarsson, Svalander, & Litlere, 2006). It was very necessary to examine whether the items of CDI loaded on the suitable factors. Consequently, the rotated factor loadings of CDI items were reported, the table (3) shows these loadings.

Table (3): Rotated factor loadings of CDI items.

	Component				
	1	2	3	4	5
q1	.699	.054	.120	-.152-	.052
q2	.896	.081	.051	-.056-	.010
q3	.784	-.014-	.075	-.096-	.011
q4	.769	.091	.061	-.086-	.010
q5	.787	.002	.066	-.025-	-.011-
q6	.869	.046	.054	-.137-	.013
q7	.818	.075	.062	-.102-	.066
q8	.889	.064	.072	-.099-	.016
q9	.905	.049	.059	-.120-	.027
q10	-.134-	.729	.512	-.082-	.023
q11	-.177-	.776	.531	-.048-	.012
q12	-.163-	.745	.532	-.078-	.005
q13	-.151-	.751	.505	-.045-	.021
q14	-.150-	.780	.516	-.041-	.054
q15	.060	-.043-	.111	.061	.544
q16	.095	-.116-	.167	.173	.506
q17	.064	-.066-	.169	.164	.543
q18	.111	-.067-	.129	.049	.472
q19	.193	.397	-.372-	.513	-.273-
q20	.204	.233	-.381-	.537	-.293-
q21	.229	.124	-.373-	.562	-.303-
q22	.198	.039	-.415-	.549	-.284-
q23	.065	-.234-	.685	.211	-.030-
q24	.049	-.171-	.711	.286	-.295-
q25	.054	-.075-	.701	.254	-.286-
q26	.074	-.167-	.711	.256	-.282-

Table (3) shows that items 1-9 were loaded on the same factor (Anhedonia) the loadings of this factor ranged from (0.69) to (0.905). According to Stevens (1996) the required critical values that should be used to determine whether the loading is significant or not at ( $\alpha = 0.01$ ) (two- tailed test) with sample sizes between 600 and 800 are (0.21) and (0.18) respectively. Since the sample size of this study was 702, critical value between (0.21) and (0.18) that is (0.20) , which can be considered as very good approximation, can be used to determine whether the loading is sufficient or not. However, the researchers decided to use (0.30) as a critical value. The reason for the last decision was to ensure that the correlation coefficients between the items and the factors (loadings) were not only correlates significantly but also have a sufficient effect size level. According to Cohen (1988) the squared value of *Pearson* correlation coefficient, which is indicate to the size of effect or the explained variance, should be considered as small effect size if  $r^2$  around (0.01), medium if  $r^2$  around (0.06) and large if  $r^2$  around (0.14). As a result with factor loadings equal (0.3) or larger the expected effect size will be at least around the medium level.

Regarding the second factor it can be seen that items from10 to14 have significant loadings on that factor since their loadings ranged from (0.72) to (0.78). The mentioned factor represents the Ineffectiveness domain of CDI. Moreover, according to factor loadings results, items from15 to18 can be classified into the same factor because they have significant loadings ranged from (0.47) to (0.54) on that factor which corresponds to negative self-esteem domain in CDI. In addition the loadings of items from 19 to 22 which ranged from (0.51) to (0.56) can be considered as items connected with interpersonal problems domain in CDI. Items from 23 to 26 loadings which ranged from .68 to .71 pointed to the negative mood domain in CDI.

The loadings of CDI items on the mentioned five factors confirm that the Jordanian version of CDI has a sufficient construct validity evidences. In terms of construct validity evidences, the results of this study are matching construct validity results of CDI in different cultural contexts (Molina, Gómez, & Pastrana,

2009; Steele et al., 2006; Ivarsson, Svalander, & Litlere, 2006; Ghareeb & Beshai, 1989). Moreover, factor analysis results in Arabic environment consisted with the results that have been achieved by different researchers who indicated that CDI can be used in Arabic context for its accepted psychometric properties (Samm et al., 2008; Ghareeb, Beshai, 1989; AL-Balhan, 2006).

*Gender differences results.* For extra information concerning the degree to which CDI can be considered as an appropriate scale to measure the depression levels in Arabic samples, the researchers have been utilized the discriminate validity procedure. More specifically, they noticed that most of research results that have been conducted about CDI point to a significant differences between Children according to the variable gender (Samm et al., 2008; Davanzo et al., 2004; Ghareeb & Beshai, 1989). These studies indicated that the degrees of depression for females were higher than the depression degrees of their counterparts of males. So, the researchers of this study decided to examine whether the Jordanian version of CDI is able to differentiate the depression degrees according to gender. Independent samples t- test was used as a statistical procedure to examine whether there are significant differences between the depression means according to gender variable.

**Table(4): Descriptive statistics and *t* test results**

Group Statistics				<i>t</i> - test for equality of means		
Gender	<i>M</i>	<i>N</i>	<i>SD</i>	<i>t</i>	<i>df</i>	<i>Sig</i> (2tailed)
Male	23.0405	321	8.336	-5.933	700	*.000
Female	26.8084	381	8.419			

\*Significant at  $p \leq 0.000$

The above table points significant differences ( $p \leq 0.05$ ) between the means according to gender, females' depression degrees were higher than males' degrees. These results are consistent with the results that were reported in the literature regarding gender differences on CDI (Traube et al., 2010; Samm et al., 2007; Ivarsson, Svalander., & Litlere, 2006; Ghareeb, Beshai, 1989). Consequently, it could be concluded that the Jordanian version of CDI is able to discriminate between the respondents due to their gender and these results can serve as an addition reliability evidence of CDI in Jordanian culture. Twenge and Nolen-Hoeksema, (2002) indicated that girls seem to report slightly lower CDI scores than boys' before age 12, but higher from the age of 13.

*Grade levels differences results.* As another way to support the validity evidences of CDI in Jordanian culture the differences among children's' scores on CDI according to their grade levels were targeted by using the analysis of variance ANOVA, The hypothesis that has been addressed by the researchers in this regard was that there are no significant differences in children's scores on CDI according to their grade levels. The rationale of that hypothesis was based on that depression trait is not associated with Childs' growth. Tables (5) and (6) represent the descriptive statistics and ANOVA results respectively.

**Table (5): The means and standard deviation of the sample on CDI according to the grade levels variable**

<i>Grade</i>	<i>Mean</i>	<i>Std. Deviation</i>	<i>N</i>
Seventh grade	25.3493	8.76798	229
Eighth grade	24.5815	8.63427	184
Ninth grade	25.0395	8.59607	152
Tenth grade	25.3723	8.24711	137
Total	25.0855	8.58397	702

As table (5) shows that the means of the sample according to grade variable are very close to each other. The last results indicate that the children's depression mean scores on the deferent grade levels can be described as a moderate. Moreover, standard deviation values on table (6) indicate that the variances among children's scores on the different grade levels can be assumed as equal.

Table (6): ANOVA results of the effect of the variable grade levels on Childs scores on CDI

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Grade	74.264	3	24.755	.335	0.800
Error	51578.607	698	73.895		
Total	51652.872	701			

Table (6) results support researcher's hypothesis regarding the relationship between the variables grade levels and children scores on CDI. As table (6) reveals Children's' scores on CDI do not affected by their grade level ( $p = 0.05$ ). This result confirmed the previous results (Samm et al., 2008; Murphy, Marelich., & Hoffman, 2000; Orvaschel, Beeferman, & Kabacoff, 1997; Frinch et al., 1987) which showed that depression scores did not differ significantly according to the variable "age".

## CONCLUSION

The internal consistency and reliability of the Jordanian Version of CDI (JVODCI) were sufficient and similar to the internal consistency in the English version (Brooks & Kutcher, 2001), which may supports the ability to use it within Jordanian population. The PCA results of the construct validity evidences revealed that JVODCI is sufficient and suitable. In addition, independent samples t test and ANOVA results coincided with the hypotheses that have been presented by the researchers of the current study in terms of the relationship between Jordanian Children's scores on (JVODCI) and the gender and grade levels variables. Generally speaking, the results of the current study have an agreement with the results of the psychometric characteristics Of CDI in different cultural contexts. All of these results confirm that CDI can be considered as an accurate and authentic measure of children levels of depression.

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