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Psychometric Properties of the Children's Depression Inventory-2 among a Community-Based Sample of Korean Children and Adolescents

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Childhood depression is a disorder with negative and long-lasting effects through to adulthood. At present, the Children's Depression Inventory is the most globally used tool for evaluating depression in a pediatric group, and the Children's Depression Inventory-2 (CDI-2) was developed considering a birth-cohort effect. The current study has two main objectives: (a) to investigate the psychometric properties of the self-rated version of the CDI-2 and (b) to investigate its factorial structure in Korean nonclinical children and adolescent populations. A convenient sample considering age, sex, and area was used. The total sample comprised 1,036 children and adolescents aged 7 to 17 years living in 3 different areas. The psychometric properties of the CDI-2, including internal consistency, interrater reliability, and concurrent validity, were evaluated. Exploratory structural equation modeling (ESEM) analysis was also conducted to determine the internal structure of the CDI-2 for Korean children and adolescents. The gender difference was is significant, and age also affected the total score. The interaction effect of age and sex in the total score is statistically significant. The Korean CDI-2 appeared to have good internal consistency. Correlations among the CDI-2 scores of self-report, parent-report, and teacher-report forms were statistically significant and moderate in size. ESEM analysis demonstrated that a two-factor structure could be a best-fit model for our sample. The sample of the study consisted entirely of non-clinical children and adolescents, and therefore more researches targeting the clinical population are necessary to generalize these results. Future studies could identify a cut-off score or predictive validity.

Keywords: child depression inventory, korean adolescent, childhood depression, CDI-2

Childhood depression is a disorder with negative and long-lasting effects through to adulthood(Luby, Gaffrey, Tillman, April, & Belden, 2014). Early-onset depression is more severe and persistent than later-onset depression(Kovacs & Lopez-Duran, 2010; Zisook et al., 2007). Although children may recover from depression, there is still a risk that the depression may reoccur, or that other disorders may develop. Depression in children and adolescents can also result in other issues including poor academic achievements, interpersonal problems, substance abuse, and suicidal attempt(Garber & Rao, 2014). Also, an epidemiologic study showed that 12-month prevalence of major depressive disorder or dysthymia was up to 8.2% in 13-17 years old youth(Kessler et al., 2012). However, it is estimated that less than half of these youths who suffer from depression seek help(Reavley, Cvetkovski, Jorm, & Lubman, 2010). According to a prevalence survey using the Center for Epidemiologic Studies Depression scale(CES-D) in an adolescent population in Korea, 17.4% of boys and 2.6% of girls had definite depression symptoms with cut-off score 25(Cho et al.,

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2001). Given previous studies, early identification and intervention of depression in youth are essential to protect them from secondary psychosocial problems as well as depressive symptoms themselves(Saluja et al., 2004).

Referring to information from various sources is part of an effort to understand childhood depression. Parents and children are often in disagreement on children's states or feelings, which a moderate correlation has been found(Moretti, Fine, Haley, & Marriage, 1985; Weissman, Orvaschel, & Padian, 1980). Parents may pay more attention to the externalizing problems such as conduct and attentional disorder or view them as part of growth(Saluja et al., 2004). Moreover, children of school age may behave differently depending on the context, such as home, school, and peer relationship(De Los Reyes et al., 2015). Due to informant discrepancies, there is no gold standard to gauge children's depression, and clinicians are encouraged to integrate information from multiple informants(De Los Reyes & Kazdin, 2005).

Nevertheless, self-report questionnaires are useful for evaluating one's subjective and internal state of depression. Research has shown that children and adolescents can report their emotional state as reliably and accurately as adults(Moretti et al., 1985). However, manifestations of depression may be different depending on a child's developmental stage(Weiss & Garber, 2003; Zalsman, Brent, & Weersing, 2006). For example, anhedonia is a cardinal symptom of depression regardless of age, but expression appears to vary by age. An anhedonic child shows decreased interest in play or increased boredom, while an anhedonic adult reports loss of sexual pleasure(Carlson & Kashani, 1988). Young girls reported more depressive symptoms than boys, and therefore sex can be a risk factor for depression(Roelofs et al., 2010; Weiss et al., 1992). The interaction between age and gender is also observed, which it occurs as the prevalence of depression increases with age, particularly in girls(Roelofs et al., 2010). For this reason, the importance of evaluating tools specifically designed for depressed children and adolescents is now being recognized.

Kovacs(1992) developed the Children's Depression Inventory (CDI) in light of the targeted age range, through modifying the Beck Depression Inventory. At present, this scale is the most globally used tool which has consistently shown good psychometric properties(Kovacs & Staff, 2011). Further, it has had clinical utility as a screening tool for depression(Fristad, Emery, & Beck, 1997; Timbremont, Braet, & Dreessen, 2004). In Korea, the Korean form of the Kovacs' Children's Depression Inventory, which was adapted by Cho and Lee(1990), has been widely used. In a recent study on a cut-off score of Korean adolescents, the total CDI score of 20 was identified as optimal, with .83 of sensitivity and .89 of specificity was .89(Bang, Park, & Kim, 2015). According to the previous studies, the mean scores tended to be higher in Korean samples, but the cut-off score is similar to Western samples (Bang et al., 2015; Cho & Lee, 1990).

As research on pediatric depression has been accumulated, the need for updating the norm has been raised because of a birth-cohort effect(Twenge & Nolen-Hoeksema, 2002). Accordingly, the Children's Depression Inventory-2(CDI-2) was developed(Kovacs & Staff, 2011). As part of this procedure, the item content of the inventory was also reviewed. However, to date, there have been no studies on the CDI-2 and normative data is required for clinical decision making, diagnosing, or evaluating patient's current state and treatment effects(Roelofs et al., 2010). To our knowledge, this is the first study to validate and examine the psychometric properties of the CDI-2.

Moreover, the results of the original CDI's factor structure were completely mixed. Authors of the original CDI suggested a five-factor structure, which included negative mood, interpersonal problems, ineffectiveness, anhedonia, and negative self-esteem. However, following studies failed to replicate these five factors (Garcia, Aluja, & Del Barrio, 2008; Poli, Sbrana, Marcheschi, & Masi, 2003). Confused findings may be due to methodological problems or sample dependency(Steele et al., 2006). Nevertheless, lots of previous studies reported three of the five factors, including negative mood/dysphoria, low self-esteem, and interpersonal problems or externalizing/oppositional behavior, whereas the other factors, ineffectiveness, and anhedonia, remained uncertain (Cole, Hoffman, Tram, & Maxwell, 2000; Drucker & Greco-Vigorito, 2002; Lee, Krishnan, & Park, 2012). Kovacs and Staff(2011) suggest a new conceptual model with developing the CDI-2, which composed of higher order problem domains and second-order(i.e., more specific) symptom dimensions. In other words, the CDI-2 includes two dimensions: emotional problems and functional problems, and each dimension is subdivided into two subscales la-

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beled negative mood/physical symptoms, negative self-esteem(emotional problems), ineffectiveness, and interpersonal problems(functional problems). This underscores the importance of identifying the factor structure of the CDI-2.

Some studies have been carried out using the original CDI, and therefore evidence of the reliability and validity of the CDI-2 is insufficient. Moreover, the newly suggested factor structure must be verified. Hence, the present study has two main objectives: (a) to investigate the psychometric properties of the self-rated version of CDI-2 and (b) to investigate its factorial structure in Korean non-clinical children and adolescent populations.

Methods

Participants

A convenient sample considering age, sex, and area was used. We initially planned to collect a total sample of 1,100 children and adolescents, 100 per each age group, with the same ratio of sex. The final sample consisted of 1,036 children and adolescents aged 7 to 17 years living in 3 different areas(Seoul, Cheongju, and Jinju). They were recruited from the general community. A written consent form was obtained from their parents, and cosigned by the children and adolescents. After completing the survey, they received compensation. To assess test-retest reliability, the CDI-2 was administered to a separate sample of 96 children twice over a 4-week period. 4 to 6th grade students were recruited from an elementary school in Jinju. 52 children(54.2%) were boys and the mean of age was 11.84(*SD* = .73) in the sample. This study was approved by the Institutional Review Board of the Samsung Medical Center.

Measures

CDI–2

The CDI-2 is a 28-item self-report measure designed to assess depressive symptoms in children aged 7 to 17 years. It includes affective, cognitive, motivational, and neurovegetative features of depression as well as examples of functional impairment secondary to the symptoms. Items are scored between 0 and 2 as follows: 0 reflecting no symptom, 1 reflecting a definite although not a disabling symptom, 2 reflecting a clinically significant symptom. The time frame for scoring is the past two weeks, and the total score ranges from 0 to 56, with higher scores reflecting the more depressive state. With the permission of the publisher, we used an internationally accepted methodology to create a Korean version of the CDI-2 from the Psychological Corporation. Two independent licensed clinical psychologists translated the original English version of the CDI-2 into Korean and confirmed the content of the questionnaire together. Next, another blinded bilingual person with M.A. in clinical psychology re-translated it to English and researchers compared the back-translated version to the original version. Finally, the authors reviewed the discrepancy between the two versions and revised it where necessary to create the final version.

Children's Depression Inventory–2 Parent and Teacher Form(CDI–2: P, CDI–2: T)

The CDI-2 provides another two versions, one for parents(or alternate caregivers), and one for teachers. The parent and teacher-rated forms of the CDI-2 consist of items reflecting observable aspects of depression that is overt behaviors or verbalization by their child. The total number of items are 17 and 12 respectively. Items of these versions are rated on a 4-point Likert scale from 0(not at all) to 3(much or most of the time). Similar to the self-rated version, high scores indicate that the child could be depressed to the extent of clinical concern. The procedure to create culturally adapted versions of CDI-2: P and CDI-2: T is the same as the CDI-2 self-rated version. Reliability of the CDI-2:P and the CDI-2:T were .80 and .88 in this study.

Youth Self Report(YSR)

The Korean YSR is the companion version of Child Behavior Checklist for adolescents(Oh, Ha, Lee, & Hong, 2007). This scale assesses behavioral and emotional problems over the past six months of the adolescent's life. Youth between the ages of 11 to 18 years should answer 112 items, each with a 3-point scale ranging from 0(not at all) to 2(often). The YSR has eight syndrome scales as follows: withdrawn, somatic complaints, anxious/depressed, social problems, thought problems, attention problems, delinquent behavior and aggressive behavior. This scale was administered only to the participants between the ages of 11 to 18 considering the applicable age range. The YSR has been reported to have

adequate psychometric properties(Ivarsson, Gillberg, Arvidsson, & Broberg, 2002; Oh et al., 2007). In this study, the internal consistency was .83 for the total scale.

Statistical Analysis

Descriptive statistics were calculated using Statistical Package for Social Sciences version 21(SPSS ver. 21), and the exploratory structural equation modeling(ESEM) was conducted using Mplus version 6.1 software. If there are two or more missing responses in the total 28 items, we regarded them as missing data and removed from the start. Our sample size was large and missing rate was very low, from .3 to 1.2 percent, and therefore pairwise deletion was used for missing data in all analyses. We first computed the means and standard deviations and tested the effect of age and sex. Next, multivariate analysis of variance(MANOVA) was performed to the interaction effect of age and sex. The interpretation of interaction effect using partial η^2 followed for Cohen's guidance(1988): .01–.05 is small, .06–.13 is medium, .14 or more is larger. Next, the internal consistency reliability, test-retest reliability, and interrater reliability of the CDI-2 were examined. In order to identify the factorial structure of the inventory, we performed an ESEM to evaluate the structure of the CDI-2. Weighted least squares means and variance adjusted(WLSMV) estimation with oblique rotation was used. The fit indices of the tested model were examined using three commonly used practical fit indices: the root mean square error of approximation(RMSEA), Tucker-Lewis fit index(TLI) and the comparative fit index(CFI). The guidelines suggested by Hu and Bentler(1999) are that RMSEA values of .06 or less be taken as a good fit, values >.06 to .08 be considered moderate fit, values >.08 to .10 be considered marginal fit, and values >.10 be considered poor fit. For the TLI and the CFI, values of .95 or higher are taken as indicating good model data fit, values of .90 and <.95 are taken as acceptable fit, and values <.90 as poor fit. Factor loadings greater than .40 were considered significant.

Results

Descriptive Statistics

A total of 1,036 youths agreed to participate in the study and mean age of the sample was 12.36(*SD* = 2.97). Of these participants, 548(52.7%) were girls and 488(47.3%) were boys. The mean CDI-2 score in this study was 9.81(*SD* = 6.85) and seemed to be higher than the original study(*M* = 6.69)(Kovacs & Staff, 2011). This score also seemed to be higher than the average score of the CDI-2: P and the CDI-2: T, which were 8.47(*SD* = 5.53) and 5.46(*SD* = 5.21) respectively.

The Effects of Age and Sex

A series of analyses were conducted to investigate the effects of age and sex. Age was dichotomized as younger(7–12 years old children, $N = 503$, $M_{age} = 9.77$ years, $SD_{age} = 1.80$) vs. older(13–17 years old adolescents, $N = 533$, $M_{age} = 14.79$ years, $SD_{age} = 1.36$) group. Table 1 presents the means and standard deviations of each item by sex and age. The highest mean is found in item 12(I cannot make up my mind about things) among all groups.

First, gender difference is significant: the score of female participants was higher than males($M_{male} = 9.32$, $SD_{male} = 6.32$, $M_{female} = 1.19$, $SD_{female} = 7.27$, see Table 1). Also age affected the total score, indicating that adolescents are more depressed than children ($M_{younger} = 8.99$, $SD_{younger} = 7.01$, $M_{older} = 1.59$, $SD_{older} = 6.00$, see Table 2).

The interaction effects of age and sex in the total score and emotional problems are statistically significant($F(1, 1,026) = 4.132$, $p = .042$, $F(1, 987) = 5.451$, $p = .020$), but is it not in functional problems($F(1, 1,000) = 1.811$, $p = .179$). Namely, younger and older boys tend to report mostly the same levels of depressive symptoms while the scores of females increased significantly with age. However, the partial η^2 values are .004 and .005, very small in range.

Table 1. *Sex Differences in CDI-2 Self-Report*

	Male		Female		*t*	*p*
	M	*SD*	*M*	*SD*		
Total score	9.32	6.32	1.19	7.27	-2.05	.041
Emotional problems	4.89	3.59	5.70	4.23	-3.23	.001
Functional problems	4.50	3.34	4.58	3.53	-.35	.730

Table 2. *Age Differences in CDI-2 Self-Report*

	Children		Adolescent		*t*	*p*
	M	*SD*	*M*	*SD*		
Total score	8.99	7.01	1.59	6.00	3.80	.000
Emotional problems	4.90	3.96	5.74	3.92	3.36	.001
Functional problems	4.16	3.54	4.93	3.29	3.60	.000

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Table 3. *Means, Standard Deviations, Corrected-Item Total Correlations, Cronbach's Alpha of the Korean CDI-2 (N = 1,036)*

Item		Male		Female		Children (7–12 years)		Adolescent (13–17 years)		Total		Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
		M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*		
1	I am sad all the time	.10	.33	.17	.40	.13	.38	.14	.36	.14	.37	.46	.86
2R	Nothing will ever work out for me	.54	.56	.56	.57	.54	.60	.57	.53	.55	.56	.50	.85
3	I do everything wrong	.35	.49	.35	.50	.32	.48	.39	.51	.35	.49	.48	.85
4	Nothing is fun at all	.36	.50	.38	.49	.35	.49	.40	.51	.37	.50	.42	.86
5	My family is better off without me	.12	.35	.15	.40	.13	.36	.14	.39	.14	.37	.45	.86
6R	I hate myself	.17	.43	.20	.44	.13	.38	.25	.47	.19	.43	.55	.85
7R	All bad things are my fault	.39	.59	.35	.56	.41	.60	.34	.54	.37	.57	.31	.86
8	I want to kill myself	.29	.49	.36	.51	.29	.50	.36	.51	.33	.51	.52	.85
9R	I feel like crying every day	.13	.36	.28	.51	.18	.45	.23	.46	.21	.45	.49	.85
10R	I feel cranky all the time	.51	.57	.67	.58	.56	.59	.64	.56	.60	.58	.46	.85
11	I do not want to be with people at all	.14	.39	.15	.40	.16	.43	.13	.36	.15	.40	.29	.86
12R	I cannot make up my mind about things	.63	.57	.69	.56	.58	.57	.74	.54	.66	.56	.35	.86
13	I look ugly	.20	.45	.30	.57	.19	.46	.32	.56	.26	.52	.48	.85
14R	I have to push myself all the time to do my schoolwork	.47	.66	.39	.62	.39	.63	.47	.65	.43	.64	.36	.86
15R	I have trouble sleeping every night	.33	.61	.29	.57	.36	.65	.27	.53	.31	.59	.32	.86
16	I am tired all the time	.53	.66	.62	.71	.44	.65	.71	.70	.58	.69	.50	.85
17R	Most days I do not feel like eating	.27	.51	.22	.45	.27	.50	.22	.46	.24	.48	.26	.86
18	I worry about aches and pains all the time	.31	.58	.27	.53	.32	.58	.26	.53	.29	.56	.28	.86
19	I fell alone all the time	.20	.47	.26	.47	.20	.47	.26	.48	.23	.47	.53	.85
20R	I never have fun at school	.28	.52	.23	.46	.26	.49	.24	.49	.25	.49	.41	.86
21	I do not have any friends	.40	.57	.37	.53	.40	.57	.36	.53	.38	.55	.40	.86
22	I do very badly in subjects I used to be good in	.55	.65	.52	.64	.33	.59	.72	.65	.53	.65	.39	.86
23R	I can never be as good as other kids	.39	.60	.39	.61	.39	.61	.39	.60	.39	.60	.44	.86
24R	Nobody really loves me	.43	.55	.40	.52	.45	.56	.39	.51	.42	.53	.53	.85
25	I get into arguments with friends all the time	.12	.35	.10	.32	.15	.39	.07	.28	.11	.34	.37	.86
26R	I fall asleep during the day all the time	.33	.55	.47	.59	.23	.49	.58	.60	.41	.58	.18	.86
27R	Most days I feel like I can't stop eating	.38	.61	.47	.67	.40	.62	.45	.66	.43	.64	.22	.86
28	It is very hard to remember things	.51	.58	.60	.60	.51	.59	.61	.59	.56	.59	.38	.86

Note. Reverse-scored items are noted with (R). N varies by item due to missing data.

Internal Consistency

The Korean CDI-2 appeared to have good internal consistency, α = .86, which is similar to that of the original CDI-2(α = .91) and original CDI in the normative sample(α = .86)(Kovacs & Staff, 2003, 2011). Examination of the corrected item-total correlation coefficients showed that each item contributed substantially to the total CDI-2 score(range = .18 to .55, see Table 3). Item 26("I fall asleep during the day all the time") showed the lowest item-total correlation.

Test–Retest Reliability

The CDI-2 demonstrated good 4-week period repeatability, with a Pearson correlation coefficient of .84($p < .001$).

Table 4. *Correlations Among the CDI-2 Self-, Parent-, and Teacher-rated Scores*

	1	2	3
1. SR	1		
2. PR	.430**	1	
3. TR	.354**	.344**	1

**$p < .01$.

Inter–rater Reliability

Table 4 shows correlations among the CDI-2 scores of self-report, parent-report, and teacher-report forms. As expected, all correla-

tion coefficients were statistically significant($p < .01$) and moderate in size. Intraclass correlation coefficient is also statistically significant and indicates substantial agreement among three-raters(ICC = .61, 95% CI = .53–.67, $p < .01$). Contrary to the original CDI-2 validation study with the strongest correlation between teacher-report and parent-report($r = .58$), the lowest correlation is found in this study($r = .34$).

Concurrent Validity

The CDI-2 score was positively and significantly correlated with all syndrome scores from the YSR, as shown in Table 5. The associations were particularly high between the CDI-2 total score, the YSR total score($r = .73$) and the internalizing score($r = .69$).

Construct Validity

We ran an exploratory structural equation modeling analysis to test the factor solutions of the CDI-2(see Table 6). Potential one to four factors were supposed considering the eigenvalues. All chi-squared scores of the four models were statistically significant. RMSEA values ranged between .052 and .032 indicating good fit. Also, all models had acceptable or good model-data fit of the TLI(.914, .942, .959, and .975) and CFI(.907, .932, .948, and .965, respectively). Two factors with good fit of RMSEA and acceptable fit of the TLI and CFI were retained, taking into account the contents of the items included in each factor, although four factors model showed the best-fit indices. Table 7 depicts the pattern of standardized factor loadings for the two-factor structure.

Discussion

The aim of the study was to examine the psychometric properties of the self-rated CDI-2 in a Korean non-clinical sample of children and adolescents.

The mean of the total CDI-2 score was higher than that of initial study, but this tendency in a Korean sample was previously reported(Cho & Lee, 1990). Also, the self-rated score exceeded the parent- or teacher-rated score. This means that subjective depression is apt to be higher than observation by a caregiver or problematic behavior. The CDI-2 total score was substantially related to externalizing sub-score as well as internalizing sub-score of the

Table 5. *Correlations Among the CDI-2 and Youth Self Report*

	CDI-2 total	YSR total	Inter-nalizing	Exter-nalzing	Anxious/ depressed	Withdrawn/ depressed	Somatic complaints	Social problem	Thought problem	Attention problem	Rule-breaking behavior	Aggressive behavior	Other problem
CDI-2 total	1												
YSR total	.729**	1											
Internalizing	.691**	.888**	1										
Externalizing	.581**	.846**	.608**	1									
Anxious/depressed	.613**	.734**	.803**	.478**	1								
Withdrawn/depressed	.546**	.610**	.739**	.345**	.610**	1							
Somatic complaints	.405**	.603**	.717**	.413**	.524**	.493**	1						
Social problem	.507**	.649**	.595**	.452**	.658**	.486**	.383**	1					
Thought problem	.455**	.690**	.597**	.536**	.562**	.499**	.438**	.463**					
Attention problem	.496**	.556**	.402**	.457**	.422**	.286**	.192**	.374**	.350**	1			
Rule-breaking behavior	.341**	.551**	.369**	.659**	.307**	.190**	.326**	.361**	.451**	.334**	1		
Aggressive behavior	.161**	.637**	.454**	.745**	.477**	.237**	.376**	.377**	.489**	.444**	.509**	1	
Other problem	.338**	.604**	.421**	.552**	.413**	.199**	.334**	.497**	.417**	.425**	.437**	.551**	1

Note. YSR = Youth Self Report.
** $p < .01$, two-tailed.

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Table 6. *Fit Indices for Estimated Models of the CDI-2 (N = 1,036)*

	χ^2	*df*	RMSEA	CFI	TLI
1-Factor	1,276.035***	350	.052	.914	.907
2-Factor	947.918***	323	.044	.942	.932
3-Factor	734.613***	297	.039	.959	.948
4-Factor	545.536***	272	.032	.975	.965

Note. χ^2 = chi square goodness of fit statistic; *df* = degrees of freedom; RMSEA = Root-Mean-Square Error of Approximation; CFI = Comparative Fit Index; TLI = Tucker Lewis Index.
*** $p < .001$.

YSR in the correlation analysis, and therefore clinicians have to pay attention to a complaint by children and adolescents.

In this study, both gender and age affected the CDI-2 total score. This is a robust founding that has been replicated by many international studies, rather than the CDI-2 manual, which showed no significant effect of sex(Al-Balhan, 2006; Piko & Fitzpatrick, 2003; Poli et al., 2003). As reported by Twenge and Nolen-Hoeksema(2002)'s meta-analysis, girls are likely to maintain high depression score even after becoming a teenager, while boys show the unchanged score. Our results are consistent with existing findings cautioning about the risk of the sex(Breslau et al., 2017; Maxwell, Fineberg, Drabick, Murphy, & Ellman, 2017). Nevertheless, it is important to be careful when interpreting due to the very small effect size.

Overall, the results showed good internal consistency, which is in line with the previous studies performed in other populations using the original CDI. Although the CDI is known to measure a state rather than a trait, test-retest reliability in our study was good. In other studies using community sample, such high test-retest reliability has been observed. Saylor, Finch, Spirito, and Bennett(1984) reported a Cronbach's alpha of .83 with a 1-week interval and Kovacs(1992) also reported .84 with a 2-week interval. Given that test-retest reliability was considerably lower, with a Cronbach's alpha of .54, at a 6-month follow-up(Weiss & Weisz, 1988), this result could be attributed to the short interval and the sample difference.

In addition, the CDI-2 was significantly associated with other rating forms, but not strong in size. The correlation between the parent-report and the teacher-report was lowest in our study(r = .34). This is not an unpredictable result since low cross-informant correlations problems have often been founded, ranging from .20 to .27(Cole et al., 2017). Explanations about the reasons for low multi-informant agreement are as follows: random measurement error, the degree of focus on observable behaviors, symptom severity, cognitive development differences and so on(Cole et al., 2017; De Los Reyes et al., 2015).

Table 7. *Factor Loadings (ESEM-2-factor, N = 987)*

	Item	F1	F2	R^2
1	I am sad all the time	.707**	.046	.540
8	I want to kill myself	.664**	.106	.534
3	I do everything wrong	.658**	-.024	.414
5	My family is better off without me	.654**	.139	.553
13	I look ugly	.564**	.231**	.523
28	It is very hard to remember things	.501**	-.099	.203
4	Nothing is fun at all	.488**	.058	.274
16	I am tired all the time	.476**	.198**	.375
22	I do very badly in subjects I used to be good in	.346**	.266**	.298
19	I fell alone all the time	.296**	.568**	.607
21	I do not have any friends	.219**	.375**	.284
18	I worry about aches and pains all the time	.216**	.190**	.131
11	I do not want to be with people at all	.053	.605**	.406
17R	Most days I do not feel like eating	.047	-.643**	.381
15R	I have trouble sleeping every night	-.002	-.623**	.390
25	I get into arguments with friends all the time	-.076	.870**	.686
20R	I never have fun at school	-.091	-.687**	.552
27R	Most days I feel like I can't stop eating	-.141**	-.289**	.151
24R	Nobody really loves me	-.206**	-.601**	.548
7R	All bad things are my fault	-.268**	-.232**	.199
26R	I fall asleep during the day all the time	-.327**	.110	.077
12R	I cannot make up my mind about things	-.372**	-.134**	.215
23R	I can never be as good as other kids	-.395**	-.193**	.283
14R	I have to push myself all the time to do my schoolwork	-.431**	-.020	.196
10R	I feel cranky all the time	-.485**	-.186**	.375
9R	I feel like crying every day	-.747**	.005	.553
2R	Nothing will ever work out for me	-.750**	.113	.476
6R	I hate myself	-.834**	.050	.649

Note. Reverse-scored items are noted with (R).
** $p < .01$, two-tailed.

As expected, the CDI-2 scores were strongly correlated with the internalizing score on the YSR. This tendency between self-reported depression and the psychopathological problems measured by the YSR is congruent with the data obtained in previous reports(Figueras Masip, Amador-Campos, Gomez-Benito, & del Barrio Gandara, 2010; Ivarsson et al., 2002). The high correlation between depression measured by the CDI-2 and all problematic behaviors and emotion states measured by the YSR might reflect characteristics of children's or adolescent's depression. In other words, manifestations of depression in children or adolescents may differ from those of adults as mentioned above(Weiss & Garber, 2003; Zalsman et al., 2006). Masked depression is a term referring to this phenomenon(Glaser, 1967). Researchers asserted that the YSR provides a broad range of information about youths experiencing depression(Ivarsson et al., 2002; Roelofs et al., 2010). The findings of the current study also suggested that the more depressed children and adolescents, the more problematic behaviors they have.

We next investigated the factor structure via ESEM. The overall fit of the two-factor model was acceptable. To our knowledge, there is no research using the CDI-2, so it is hard to make a direct comparison. Based on factor loading patterns, two factors were retained. These results are roughly consistent with earlier findings of Kovacs and Staff(2011), which suggested that the CDI-2 includes two dimensions: emotional problems and functional problems. Factor 1 included the expressions of sadness, anhedonia, and low self-esteem, while factor 2 consisted of interpersonal problems and vegetative symptoms. Three items(7, 18, and 27) had cross-loadings. Guilty feeling, concern about somatic symptom, and an increase in appetite may not reflect typical features of emotional or functional problem in Korean children and adolescent group.

It should be noted there are certain limitations in this study. Firstly, the sample of the present study consisted entirely of non-clinical children and adolescents, and therefore more researches targeting the clinical population are necessary to generalize these results. Future studies could identify a cut-off score or predictive validity. Factor structure suggested by this study should also be replicated using another sample.

Nevertheless, this is the first study to standardize and examine the psychometric properties of the CDI-2. Also, we recruited large sample for validating the CDI-2. The present study revealed that the CDI-2 could be a reliable and valid tool for evaluating depression in Korean children and adolescents group.

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