Psychological Assessment:
A Journal of Consulting and Clinical Psychology
1991, Vol. 3, No. 1, 38-45

1040-3590/91/$3.00

Developmental Differences in the Factor Structure of the Children's Depression Inventory

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The factor structure of the Children's Depression Inventory (CDI), the most widely used self-report measure of depression for children, has been studied, but we still know relatively little about how developmental differences relate to CDI structure. Here, we evaluated whether the CDI factor structure differed in large samples of clinic-referred children versus adolescents. Our results indicated real but modest differences. Both groups produced 5 first-order factors, but the composition of the factors differed somewhat for children versus adolescents. Both groups also produced a 2nd-order, general depression factor, although items loading on the factor differed somewhat for the 2 groups: For children but not adolescents, several externalizing behavior items (e.g., *I never do what I am told*) loaded on the general factor; in contrast, for adolescents but not children, several vegetative items (e.g., *I am tired all the time*) loaded on the general factor. Overall, the child-factor pattern appeared to involve fewer CDI items than did the adolescent pattern.

Childhood depression, a syndrome once believed by many to be exceedingly rare or nonexistent, is now an area of rapidly burgeoning clinical and research activity. A growing interest in the assessment of depression in children has been paralleling this development. A number of different approaches have been used to assess childhood depression, including interview and inventory reports obtained from parents and teachers, as well as behavioral observation and biological assessments (Kazdin, 1987). As some investigators (e.g., Reynolds, Anderson, & Bartell, 1985) have noted, however, self-report assessments may be particularly important when evaluating depression, given the internal, subjective nature of many affective symptoms (e.g., sadness, feelings of worthlessness or hopelessness).

A number of depression self-report instruments have been developed for use with children (see, e.g., Harter & Nowakowski, 1987; Weissman, Orvaschel, & Padian, 1980); among these, the Children's Depression Inventory (CDI; Kovacs, 1980; Kovacs, 1985) is probably the most widely used (Kazdin, 1987). The CDI was developed as a downward extension of the adult-oriented Beck Depression Inventory (BDI; Beck & Beamesderfer, 1974); in fact, many CDI items were derived from BDI items with wording changes intended to make the language age-appropriate.

The validity of the BDI and its items has been established for adult populations (see Beck, Steer, & Garbin, 1988). However, several of the symptom areas assessed by the CDI (e.g., somatic concerns, externalizing problem behaviors) may or may not be a part of a depressive syndrome for the children of the diverse developmental levels with whom the CDI has been used (see, e.g., Helsel & Matson, 1984). It has been suggested in the revised third edition of the *Diagnostic and Statistical Manual of Mental Disorders* (*DSM-III-R;* American Psychiatric Association, 1987), for instance, that depression in children may co-occur with somatic complaints, whereas in contrast, depression in adolescents may be accompanied by externalizing, "negativistic or frankly antisocial" behavior. This suggests that as part of the ongoing validation of the CDI, it will be important to assess its internal structure separately for groups at different developmental levels to determine for which groups, if any, these various symptoms are part of depression.

Knowledge of the structure of the CDI may also provide information as to whether it is appropriate to use a single total score to summarize the CDI responses of a child of a particular

The research described here, portions of which were presented at the April, 1989 meeting of the Society for Research in Child Development, was supported in part by grants from the North Carolina Department of Human Resources, Division of Mental Health, Mental Retardation, and Substance Abuse Services (41626), and from the National Institute of Mental Health (1 R03 MH38450) to John R. Weisz.

We gratefully acknowledge the thoughtful comments of Judy Garber and Aviva Wasserman on earlier drafts of this article.

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developmental group or whether scale scores should be devised and used to reflect various groups of symptoms. In addition, knowledge of CDI's *relative* structure across different groups (e.g., whether its internal structure is equivalent across children and adolescents) will indicate whether it is appropriate to compare or combine CDI scores from such groups, because the structure of a construct must be equivalent across groups if one is to combine or compare these groups (Byrne, Shavelson, & Muthen, 1989).

The structure of the CDI has been assessed using factor analysis on a number of occasions (e.g., Helsel & Matson, 1984; Hodges, Siegel, Mullins, & Griffin, 1983; Kovacs, 1985; Saylor, Finch, Spirito, & Bennett, 1984; Weiss & Weisz, 1988). However, several key issues appear to remain unaddressed. Although there may be a number of reasons to hypothesize that correlated factors or a general depression factor, or both, underlie the CDI, most investigations in this area have used an orthogonal varimax rotation. Such an approach precludes correlated factors and makes a general factor unlikely because the varimax technique tries to equalize the variance across factors (Mulaik, 1972). Thus, our knowledge of the internal structure of the CDI may be limited by the analytic techniques that have been used.

More important, only one study (Weiss & Weisz, 1988) has directly assessed the impact of developmental level on CDI structure, and it was based on relatively small samples (110 children and 139 adolescents). Although a wide age range of youth have served as subjects in the studies just noted, samples have been generally overlapping across studies in regard to age, making clear developmental comparisons between studies difficult. Further, besides differing in age of the subjects, these studies have also differed in a number of other characteristics, including the clinical status of the subjects, and various factor-analytic technical dimensions (e.g., factor-extraction method used). Thus, indirect assessment of the impact of developmental level through between-study comparisons appears problematic, and within-study comparisons are needed.

Accordingly, the goal of the present study was to assess and compare the factor structure of the CDI across developmental groups, using a large sample ($N = 1,030$) of clinic-referred children and adolescents. We felt that use of a clinic sample might increase the practical value of our findings, given the applied use of the CDI in clinical settings, and recent findings suggesting that the factor structure of the CDI may not be the same for clinic and nonclinic children (Hodges et al., 1983; Kovacs, 1985). Our subjects were drawn from diverse clinical sites, with the hope of producing stable results that would be broadly generalizable. In our analyses, we first performed separate exploratory factor analyses for the two groups, using a nonorthogonal rotation. We then evaluated the degree of similarity of the factor patterns using a number of techniques, including confirmatory factor-analysis goodness-of-fit indices (Byrne, 1989).

Method

Subjects

A total of 515 children (ages 8–12 years)[1] and 768 adolescents (ages 13–16 years) seeking or receiving services at 19 different in- and outpatient mental health facilities in the states of Alabama, Louisiana, North Carolina, South Carolina, Ohio, and Virginia served as the initial pool of subjects for this study. To minimize the possibility that our results would be influenced by a priori conceptualizations regarding the structure of depression, we did not restrict our sample to children who had received an affective diagnosis.

The child sample consisted of 515 subjects (73%, male; 70%, White; 29%, Black); the initial adolescent sample contained 768 subjects (52%, male; 74%, White; 24%, Black). Because factor stability depends in part on the sample size (Humphreys & Ilgen, 1969; Guadagnoli & Velicer, 1988), subjects were dropped from the adolescent sample to equalize sample sizes. These subjects were dropped randomly, subject to two stipulations (a) that the percentage of boys be equivalent in the two samples, and (b) that the percentages of subjects from the different geographical sites be roughly equivalent in the child and adolescent samples. This also served to minimize the likelihood that actual developmental differences in the factor structure would be confounded with site or gender differences. Thus, both samples in the analyses reported below contained 515 subjects.

The overall level of depressive symptoms did not differ significantly across the two groups (the mean score on the CDI was 12.39, $SD = 8.18$, for adolescents, 12.89, $SD = 8.46$, for children). Across the age groups, the mean CDI score for girls was significantly higher than that for boys, 13.67 ($SD = 8.81$) versus 12.27 ($SD = 8.11$), respectively; $F(1, 1,026) = 5.78$, $p < .02$. However, this main effect was qualified by a significant Age × Sex interaction, $F(1, 1,026) = 6.32$, $p < .02$; the effect of sex was significant for adolescents, $F(1, 513) = 12.67$, $p < .0005$, but not for children ($p > .50$). Adolescent girls produced higher (i.e., more depressed) CDI scores than did adolescent boys, 14.49 ($SD = 8.84$) versus 11.62 ($SD = 7.80$), respectively. Viewing this interaction from another direction, we found that the effect of age was significant for the boys only, $F(1, 751) = 4.80$, $p < .03$, with the older boys producing lower CDI scores.

Child Behavior Checklist (CBCL; Achenbach & Edelbrock, 1983) scores were available for 164 of the children and 142 of the adolescents. At the time of admission, the mean Internalizing problem score was 68.39 (96th percentile; $SD = 9.77$) for the adolescents and 68.29 (96th percentile; $SD = 8.81$) for the children. The Externalizing problem score was 68.82 (97th percentile; $SD = 10.11$) for the adolescents and 70.03 (98th percentile; $SD = 9.96$) for the children. Thus, in this sample, the adolescents as well as the children appeared to have been displaying substantial levels of both internalizing and externalizing problems.

Children's Depression Inventory

All children completed the CDI (Kovacs, 1980), the most widely used self-report measure of depression in children (Kazdin, 1987). As a result of concerns expressed by some clinic administrators and human subjects committees about suggesting suicide to clinic-referred children who might not have seriously considered it, some investigators in this study excluded CDI Item 9, which pertains to suicide. Conse-

[1] Ages 12/13 were chosen to be the dividing point between children and adolescents because (a) this is the approximate age at which children transition from concrete to formal operational thinking (Piaget, 1970), (b) it is the approximate age at which changes associated with puberty begin for many children, and (c) in comparison to other age-group divisions satisfying the first two criteria, it maximized between-age-group CDI item-profile sums of squares, relative to within-group sums of squares. By maximizing within-age-group homogeneity, we felt we would maximize the likelihood that the children and adolescent groups would actually represent distinct groups.

quently, it was available only for 65% of the children and 68% of the adolescents. Because factor analysis requires that subjects with missing data be dropped from the sample, this item was not included in the factor analysis. However, its relation to the factors was assessed by regressing factor scores on the item (see below).

Procedure

The data on which this study is based were obtained through the pooling of data originally collected by different investigators (Carey, Faulstich, Gresham, Ruggiero, & Enyart, 1987; Nelson, Politano, Finch, Wendel, & Mayhall, 1987; Saylor, Finch, Spirito, & Bennett, 1984; Weiss & Weisz, 1988; Weisz et al., 1989). Because the data were collected by different investigators, there was no single collection procedure. However, all CDIs were collected within 2 weeks of intake or admission.

Results

Reliability Checks

We first assessed the internal consistency of the CDI, separately for the children and the adolescents. Coefficient alpha (Cronbach, 1951) was high for both groups (.86 for the children; .88 for the adolescents). Test–retest data were available for 132 of the adolescents and 120 of the children; average time between administrations was 3.61 months for the adolescents and 4.79 months for the children. Despite the relatively lengthy test–retest period, the Pearson product–moment correlation for total CDI score across administrations was .56 for the adolescents and .54 for the children. Because subjects received treatment during the period between CDI administrations, these correlations probably should be viewed as lower bound estimates of reliability.

Factor Analysis

To assess age-related differences in symptom patterns, two factor analyses were performed—one on the child data and one on the adolescent data. Kaiser's Measure of Sampling Adequacy (MSA; Cerny & Kaiser, 1977) statistic was in the "meritorious" range for the adolescents as well as the children (MSA = .88 for both groups). This suggests that the data were adequate and appropriate for factor analysis (i.e., that the sample size and "density" of the correlation matrix were adequate).

We used two strategies to determine the appropriate number of factors. First, we applied the *parallel analysis technique* (Gorsuch, 1983; Humphreys & Ilgen, 1969), wherein we compared the eigenvalues derived from the child and adolescent data with eigenvalues derived from a series of random correlation matrices (i.e., zero correlations plus random error). Eigenvalues from our actual data that were larger than the random eigenvalues were considered to represent actual factors; those data-based eigenvalues less than the corresponding random eigenvalues were considered random factors.

We also applied a second rule to determine the appropriate number of factors, because we expected that the relatively large sizes of our samples would result in some factors being deficient in terms of interpretability and simple structure, although significant in the sense that they were larger than their corresponding random roots. Consequently, solutions producing trivial factors (i.e., factors without at least two unique loadings above .30; Gorsuch, 1983) were rejected. Application of these two rules resulted in five-factor solutions for both the adolescents and the children. Simple structure and interpretability across solutions of varying number of factors (and rotations; discussed next) provided further evidence that the five-factor solutions were optimal.

Factors were extracted using the maximum likelihood method. As just noted, we selected an oblique rotation to allow for, but not force, correlated factors. A promax rotation (Mulaik, 1972) using a varimax target ($k = 3$) was selected for both the child and adolescent data, because it best satisfied simple structure requirements and produced the most interpretable factors. It should be noted, however, that solutions generated by other oblique rotations were similar to those generated by this promax/varimax rotation. The factor pattern, which produces smaller loadings than the factor structure because it controls for indirect relations (which occur because of correlated factors) between items and factors, is reported in Table 1; Table 2 reports interfactor correlations. Overall, 33% of the total variance in the adolescent CDI data was accounted for by the factors, whereas the factors accounted for 32% of the variance in the child data. Thus, to an equivalent degree for the children and adolescents, a sizable portion of the variance in the CDI items was not explained by the factors.

Adolescent Factors

The five adolescent factors can be described as follows:

1. Negative Affect (sad, upset) With Somatic Concerns. The first adolescent factor appears to reflect affective problems, such as feeling upset, sad, and lonely, with the three largest loadings on the items *I feel like crying every day, I am sad all the time,* and *Things bother me all the time.* A second cluster of items appears to involve somatic complaints, with loadings on *I worry about aches and pains all the time; Most days I do not feel like eating; I have trouble sleeping at night;* and *I am tired all the time.*

2. Negative Self-Image. Factor 2 appears to be a cognitive factor, involving negative perceptions of the self, with loadings on items reflecting a belief that one is a "bad" person (*All bad things are my fault; I am bad all the time; I can never be as good as other kids*), and on an item reflecting general negative feelings towards oneself (*I hate myself*).

3. Anhedonic, Socially Isolated. Factor 3 apparently involves feelings of social isolation (*I do not want to be with people at all; I do not have any friends*), as well as anhedonia (*Nothing is fun at all; I never have fun at school*).

4. Externalizing Problems. Factor 4 appears to reflect a perception that one is noncompliant (*I never do what I am told*), aggressive (*I get into fights all the time*), and oppositional (*I am bad all the time*).

5. School Problems. This factor appears to reflect perceptions that one is having problems at school: The three highest-loading items were *I have to push myself to do my schoolwork; I never have fun at school;* and *I do badly in (school) subjects I used to be good in.*

Table 1
Factor Pattern Matrix for First- and Second-Order Factors

CDI item	Factor												
	Adolescents							Children					
	I:1	I:2	I:3	I:4	I:5	$\hat{h}^2$	II:1	I:1	I:2	I:3	I:4	I:5	$\hat{h}^2$	II:1
1. Frequent sadness	*52*	28	11	−09	−09	57	61	*52*	00	−14	05	28	44	37
2. Hopelessness	15	*31*	17	−02	09	32	48	06	02	18	29	07	24	41
3. Can't do anything right/ incompetent	01	*31*	*34*	14	−04	36	48	22	*39*	−06	09	02	31	41
4. Anhedonia	10	00	*48*	07	00	33	44	28	−07	12	15	−01	15	26
5. Sees self as "bad"	−07	*35*	−07	*41*	07	34	26	−03	*46*	00	19	07	36	46
6. Worries that bad things are going to happen to self	*32*	18	03	15	01	28	44	28	22	−02	00	02	18	28
7. Self-hatred	10	*47*	14	00	02	40	52	−03	02	−01	*80*	01	65	63
8. Guilt	−01	*60*	−20	25	02	41	34	−20	*45*	15	17	16	45	50
10. Frequent crying	*71*	09	−12	−14	−05	50	47	16	04	02	−06	*66*	52	42
11. Bothered by things	*66*	05	01	18	−08	54	57	09	01	12	09	*50*	41	46
12. Doesn't want to be with people	−02	03	*44*	04	−04	20	30	17	12	−01	19	05	17	34
13. Indecisive	06	*31*	01	04	26	27	38	−11	02	*33*	07	18	20	29
14. Feels ugly	01	*34*	16	00	01	22	37	15	15	11	25	00	25	43
15. School motivation problems	02	12	−11	11	*47*	29	23	−03	15	*54*	−05	03	36	34
16. Trouble sleeping	*45*	00	−04	−02	24	29	41	20	−15	22	02	*33*	26	31
17. Fatigue	*38*	00	15	08	06	28	44	*42*	07	−14	09	08	26	29
18. Poor appetite	*45*	−14	−07	00	27	24	30	−04	12	11	21	08	16	33
19. Concerned about aches and pains	*38*	−16	11	15	06	20	32	*41*	02	06	−16	10	19	17
20. Feels lonely	*40*	14	20	−05	03	41	55	*51*	11	00	−02	15	38	37
21. Doesn't have fun at school	00	04	*34*	−05	*35*	33	37	09	−10	*51*	14	08	37	40
22. Doesn't have friends	00	00	*53*	00	00	29	36	*40*	−02	14	11	−07	24	30
23. School failure	07	04	08	17	*33*	25	30	25	13	*40*	01	−14	32	35
24. Feels inferior to other kids	−04	*35*	07	−10	29	26	34	−04	*32*	29	−05	11	26	33
25. Feels unloved	16	28	20	−14	04	29	45	08	10	02	*52*	−09	36	48
26. Noncompliant	03	00	03	*54*	03	32	18	19	*54*	11	−04	−08	42	42
27. Frequenty gets into fights	01	−01	*31*	*46*	00	36	32	28	*44*	00	02	−14	34	36
Variance explained:														
Ignoring other factors	4.40	3.86	3.53	1.50	1.78			2.97	3.33	2.52	3.51	2.42		
Eliminating other factors	1.33	1.00	0.87	0.90	0.70			1.36	0.96	0.92	0.81	0.85		
Total				8.58 (33%)							8.32 (32%)			

Note. Decimal points for loadings and communalities have been omitted (e.g., 29 = 0.29). I:1 = first-order factor #1; II:1 = second order factor #1, etc. First order loadings > 0.30 are in italics. $\hat{h}^2$ = communality estimates, based on first-order factor analysis.

Child Factors

The five child factors can be described as follows:

1. Negative Affect (sad, lonely), With Somatic Concerns. The first child factor, like the first adolescent factor, appears to comprise a cluster of items involving negative affect (e.g., feelings of sadness and loneliness, as reflected by items *I am sad all the time; I feel alone all the time*), and a cluster of items involving somatic concerns (*I am tired all the time; I worry about aches and pains all the time*). The first child factor, however, differed from its adolescent counterpart in that the negative affect appears to involve loneliness (i.e., the child factor included *I do not have any friends,* whereas the adolescent did not) rather than feeling upset (i.e., the adolescent factor included *I feel like crying every day; Things bother me all the time* whereas the child factor did not).

2. Externalizing Problems and Negative Self-Image. The second factor for the children appears to involve two clusters of items. The first cluster involves oppositional, aggressive behavior (*I never do what I am told; I get into fights all the time; I am bad all the time*). The second cluster appears to involve a negative self-image, focusing particularly on feelings of guilt or self-blame (*All bad things are my fault; I do everything wrong*).

3. School Problems. This factor appears to reflect perceptions that one is having problems at school: The three highest-loading items were *I have to push myself to do my schoolwork; I never have fun at school;* and *I do badly in (school) subjects I used to be good in.*

4. Unloved. This factor apparently involves feelings that one is unloved by others (*Nobody really loves me*) as well as by oneself (*I hate myself*).

5. Negative Affect (upset). Like the first child factor, this fac-

Table 2
Interfactor Correlations and Second-Order General Factor Loadings For Children and Adolescents

	Factor					
Factor	1	2	3	4	5	GFL
1	—	.34	.19	.35	.28	.47
2	.55	—	.38	.48	.30	.63
3	.55	.44	—	.41	.23	.52
4	.11	.20	.16	—	.45	.78
5	.21	.27	.31	.22	—	.53
GFL	.77	.69	.69	.23	.36	—

Note. Interfactor correlations for children are above the diagonal, correlations for adolescents are below the diagonal. GFL = Loading on second-order general factor.

tor appears to involve affective problems. However, in contrast to the first factor, which involves sad and lonely affect, this factor appears to involve feeling upset: The two largest loadings for this factor were on *I feel like crying every day* and *Things bother me all the time.* Thus, it appears that sad and lonely affect are somewhat distinct from feeling upset in the children, because they formed separate factors. The third largest loading on this factor was on sleep problems, which suggests that sleep difficulties may be related to feeling upset.

Second-Order Factor Analysis

The high internal consistency in both age groups suggests that a general factor might underlie these first-order factors. On the other hand, the nature of the first-order factors suggests the possibility of second-order internalizing and externalizing factors. It is also possible that no clearcut second-order factors existed in these data. To determine the relative validity of these two hypotheses, we performed second-order factor analyses, based on the first-order interfactor correlations, shown in Table 2.

Preliminary analyses, including the scree test, indicated that the most appropriate solution for both the adolescent and child data involved a single factor. For the adolescents, the second eigenvalue was only .19; for the children, it was .05. For the children, all first-order factors loaded strongly ($l > 0.45$) on the general factor (see Table 2); for the adolescents, however, Factor IV (Externalizing Problems) did not load ($l < 0.25$) on the general factor. This suggested that the externalizing-behavior component was less involved in adolescent than in childhood depression. This impression was substantiated when we computed the CDI item loadings for the second-order factors (Gorsuch, 1983): All three of the CDI externalizing items (Items 5, 26, and 27) loaded more heavily on the child general factor than on the adolescent general factor (see Table 1).

Comparison of Child and Adolescent Solutions

Intergroup factor correlations. One approach to evaluating the similarity of factor solutions derived from two different groups is to compute correlations between the factors produced by the two solutions (Gorsuch, 1983). In essence, this is achieved by (a) obtaining the factor-scoring matrix for each group (i.e., for the children and for the adolescents); (b) for each subject, computing two factor scores for each factor (i.e., Factors 1–5), one based on the child scoring matrix, one based on the adolescent scoring matrix; and (c) correlating these factor scores.[2] Thus, the correlations (reported in Table 3) reflect the degree of similarity between factors, across groups: The higher the correlation between an adolescent and child factor, the more similar the two factors.[3]

For instance, the adolescent and child "school concerns" factors (Factors 5 and 3, respectively) were very highly correlated, suggesting that these two factors were quite similar; inspection of the loadings substantiates this impression. Likewise, the adolescent and child "externalizing" factors (Factors 4 and 2, respectively) were correlated highly, although not as highly as the school concerns factors; in fact, the child "externalizing" factor appears to also contain elements of adolescent Factor 2 (Negative Self-View).

The correlation matrix presented in Table 3 may be used to describe relations between sets of factors. For instance, it suggests that, taken together, Child Factors 1 and 5 are roughly equivalent to Adolescent Factors 1 and 3 and that the areas of negative affect that these factors measure (i.e., sadness, loneliness, and feeling upset) were split differently for the children and adolescents. For the children, sadness co-occurred with loneliness in Factor 1, whereas feeling upset was represented by Factor 5. In contrast, for the adolescents in Factor 1 sadness co-occurred with feeling upset, whereas feeling socially isolated or lonely was represented by Factor 3. Thus, in the children, sadness apparently was associated with loneliness, whereas in the adolescents it was associated with feeling upset. In general, with the exception of the school concerns factors, most factors correlated with more than one factor in the other solution, which suggests that although there was a fair degree of similarity across the children and adolescents, there were also differences.

Inspection of communality estimates. We next compared the communality estimates, which represent the portion of variance of each CDI item accounted for by the factors, for the adolescents and children (see Table 1). In this analysis, each CDI item contributed one pair of communality estimates (one from the children and one from the adolescents); these pairs were then correlated across the 26 CDI items. Thus, this correlation

[2] Cross-sample factor correlations were computed using the formula $R_{ca} = S_c^{-1} W_c' R W_a S_a^{-1}$, where R_{ca} is the cross-sample factor correlation matrix, S_i is the matrix of factor score standard deviations for the child or adolescent data, W_i is the scoring weight matrix for the child or adolescent data, and R is the CDI item correlation matrix for the total sample.

[3] Because clinicians using the CDI would normally use unitary weighting of items to compute scale scores, we considered using scale scores based on unitary weighting of items for these analyses rather than factor scores. However, as the purpose of the analyses was theoretical rather than practical, we chose to use factor scores. Nevertheless, we did also perform the analyses using scale scores. As might be expected, the correlations between scale and factor scores were quite high (r ranged from 0.87 to 0.97). The intergroup correlations were quite similar (although not identical) when computed by the two methods.

Table 3
Correlations Between Adolescent and Child Factors

Child factor	Adolescent factor				
	1	2	3	4	5
1	*.78*	.55	*.84*	.37	.32
2	.44	.74	.48	*.80*	.50
3	.37	.56	.48	.44	*.92*
4	.63	*.85*	.66	.34	.49
5	*.87*	.71	.43	.13	.27

Note. $r > 0.75$ are in italics.

represents the extent to which the ordering of the communality estimates was the same across the two groups (i.e., the extent to which the CDI items were similarly involved in depression across the two groups). The correlation between the adolescent and child communality estimates was high ($r = .71$, $p < .00001$), with a mean difference between the adolescent and child communality estimates of 0.01, $t(26) = .64$, $p > .50$. However, whereas there were six CDI items relatively uninvolved in overall CDI depression (i.e., having a communality estimate as well as all first-order loadings less than .30) for the children, there was only one such item for the adolescents. In sum, there was a general equivalence across age groups in the extent to which individual CDI items were involved in depression, although it does appear that depression as measured by the CDI was somewhat less symptomatically complex for the children (i.e., fewer CDI items were involved in the factor pattern).

Goodness of fit. Because it is possible only to directly compare factor solutions that are hierarchical (Byrne, 1989), and because the child and adolescent solutions do not represent hierarchical models, it was not possible to directly compare their fit. Instead, we attempted to determine how well the child-factor solution fitted the adolescent data and how well the adolescent-factor solution fitted the child data. Toward this end, we first computed goodness-of-fit indices for the just-mentioned solutions and then fitted each group's data to the other group's parameter estimates, again computing the fit indices. Thus, we obtained estimates of how well the child-factor solution explained the adolescent data and vice versa. Some decrease from the original level in the goodness-of-fit indices is inevitable with this approach, because the solution for each group fitted to its own parameter estimates involves capitalization on chance. However, a decrease of the fit indices into the inadequate range would suggest that the child solution does not adequately explain the adolescent data and vice versa (i.e., the two solutions are different).

When the adolescent data were fitted to their own parameter estimates (i.e., factor-pattern loadings, interfactor correlations, and communality estimates) the goodness-of-fit indicator (GFI), a measure of the relative amount of variance and covariance accounted for by the model (Cole, 1987), equaled .959, well above the .90 marker for a good fit. The root mean residual (RMR) was .027, within the .05 level considered to be the maximum RMR for adequately fitting models. When the adolescent data were fitted to the parameter estimates derived from the child data, the GFI dropped below the .90 level to .885, and the RMR increased to .084. Similarly, when the child data were fitted to their own parameter estimates, the GFI was .956 and the RMR was .029; when fitted to the parameter estimates derived from the adolescent data, the GFI decreased to .872 and the RMR increased to .083. In sum, these comparisons suggest that there were real differences between the child and adolescent factor patterns.

Relation Between Suicide Item and Factors

As noted previously, the CDI item pertaining to suicidal ideation was not included in the factor analysis because it was available for only a subsample of the subjects. To determine the relation between this item and the factors, first-order factor scores were regressed on the suicide item, and standardized betas were computed; the relation between the second-order general factor and the suicide item was assessed separately. We first, however, assessed whether inclusion of the suicide item influenced subjects' responses to the other CDI items. We compared CDI total score (excluding Item 9) for subjects who received the CDI suicide item with the total score of subjects who did not receive the item. Neither the adolescents' nor the children's scores were significantly influenced by inclusion of the item, $F(1, 513) = 0.74$, $p > 0.35$; $F(1, 513) = 0.23$, $p > 0.50$, respectively.

We then regressed the factor scores on the suicide item. A Bonferroni correction was used to control for the number of tests, resulting in an adjusted alpha of .004. For the adolescents, Factor 1 (Negative Affect With Somatic Concerns) showed a significant relation with the suicide item, $\beta = 0.25$, $F(1, 345) = 9.65$, $p < 0.004$, as did the general factor, $\beta = 0.35$, $F(1, 349) = 49.60$, $p < 0.0001$. For the children, Factor 5 (Unloved) showed a significant relation with the suicide item, $\beta = 0.24$, $F(1, 327) = 9.16$, $p < 0.004$, as did the general factor, $\beta = 0.26$, $F(1, 331) = 24.93$, $p < 0.0001$.

Discussion

In this study, we sought to determine whether the factor structure of the CDI was different for children and adolescents. Our results suggest that it was. However, our results also suggest that the extent of the differences was modest: The impact of age on the goodness-of-fit indices, as well as on the more subjective developmental comparisons, was moderate. Furthermore, certain similarities across the two age groups were evident. Both groups produced five-factor solutions with a virtually identical "school" factor and several other moderately similar first-order factors. In addition, we found a single, second-order general depression factor for both age groups, although the items loading on this factor differed somewhat across groups. Finally, the amount of variance accounted for by the factor model was relatively modest for both groups; this suggests that, at least in our clinic-referred samples, much of what the CDI measures is unrelated to its underlying factor structure (i.e., much of what each item measures is unique to the item).

Perhaps the most notable developmental difference in our sample was the extent to which externalizing behavior was a part of CDI depression. Inspection of the factor-pattern loadings suggests that in the children negative cognitions about the

self appeared closely tied to self-reported misbehavior (i.e., they loaded on the same factor). In adolescents, on the other hand, self-cognitions were relatively independent of self-reported misbehavior, as was affect. This suggests that for the adolescents, externalizing problems were less a part of CDI depression than for the children.

The adolescents also appeared to differ from the children in the number of CDI items involved in the factor pattern. Whereas there was only one item relatively uninvolved in overall CDI depression for the adolescents, there were six such items for the children. Such differences could make developmental comparisons problematic, in that such comparisons would involve items that apparently have little to do with depression, for one group or the other. This suggests that it might be useful, when making developmental comparisons, to compute a "core symptom" score using only items loading on the general factor for *both* the children and adolescents. However, in our samples such a score proved to be highly correlated with the conventional total score ($r = 0.97$); thus, such a core symptom score does not appear to have much practical value.

In considering the findings just reported, it is important to recall that the internal consistency and test–retest reliability estimates were virtually identical for the children and adolescents. Thus, it is unlikely that the child–adolescent group comparisons structured here were biased by age-related differences in the reliability of the CDI. There are, however, several limitations to the present study that should be considered in interpreting the results. First, deletion of the CDI suicide item, in response to clinic administrators' concerns, may have influenced subjects' response patterns. Although the total score for subjects who received the item did not differ significantly from that of subjects who did not receive the item, it is possible that inclusion of the item influenced responding in some complex way not reflected by the total score.

Because the focus of this study was on developmental differences, we chose to remove the potential effect of sex, by matching the gender composition of the adolescent sample to that of the child sample, and then collapsing across boys and girls within each age group. Consequently, the results for our adolescent sample may not be representative of what one would find with an adolescent sample that had not been restricted in this manner. In regard to developmental differences, however, it is likely that if one did not match, one would find *larger* differences between the children and adolescents, in so far as there were an effect for gender on the factor pattern.

One final caveat should be noted. Because our results were based on clinic populations, it is possible that the between-group differences we found may at least in part be a result of differences in referral patterns for children and adolescents, rather than representing true developmental differences. That is, the differences between our child and adolescent samples may have in part resulted from different types of children and adolescents being referred to clinics. Our sample was obtained from 19 mental health sites; however, so idiosyncratic referral patterns of any particular site are not likely to have had too great an impact on the results. Further, both the adolescent and child groups showed moderate-to-high levels of internalizing and externalizing behavior problems, which suggests some rough equivalence for type of referral problem. Still, more specific information (e.g., diagnoses, narrow-band factors) might have revealed differences in our samples. Such information would also help to more clearly define the generalizability of our results.

Although it would be useful to compare our findings with those of other studies, most relevant investigations have used a subject sample with an age range sufficiently different from ours to preclude comparisons. The one apparent exception to this is Hodges et al. (1983), who used clinic and nonclinic samples of children aged 7 to 12 years. None of the CDI factors produced by Hodges' et al. (1983) clinic sample appear to parallel to any real degree the factors found in our child sample. Although these investigators did find a "cognitive, negative self-view" factor, a number of the items that loaded on this factor did not load on our Externalizing Problems/Negative Self-Image factor. Nor did Hodges et al.'s (1983) cognitive factor contain the externalizing behavior component that was a major part of our child cognitive factor. Other factors produced by the Hodges et al. (1983) clinic sample appeared at least as equally dissimilar from the factors found in the present study; the nonclinic sample produced a two-factor solution, which appeared even more dissimilar to our child sample results. Overall, it appears that our children were at least as similar to our adolescents as they were to Hodges et al.'s clinic sample. This may have been a function of different analytic decisions made by these investigators (e.g., principal-factor analysis followed by an orthogonal rotation, in contrast to our maximum-likelihood factor analysis followed by an oblique rotation), or sample characteristics. These between-study differences highlight the importance of within-study comparisons when assessing developmental effects and the need for replication.

Finally, it is worthwhile to consider whether our findings are applicable to nonclinic samples. Previous research focusing on single age groups suggests that the CDI factor pattern may not be the same for clinic and nonclinic children (Hodges et al., 1983; Kovacs, 1985), although not all findings (e.g., Carey et al., 1987) in this area have been consistent. Thus, whether our results may be applied to nonclinic youth remains to be determined by future research.

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Received January 17, 1990
Revision received April 29, 1990
Accepted May 10, 1990 ■