

Cognitive Reactivity and Depressotypic Information Processing in Children of Depressed Mothers

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Although high-risk research suggests that children of depressed mothers are at increased risk for psychological disorders, the mechanisms of this risk are not well understood. In the current study, the information processing of children of depressed mothers was compared with that of children whose mothers were not depressed. Half of each group received a priming induction designed to activate cognitive schemas prior to assessment. All children then completed a self-referent processing task that examined the recall of negative and positive information. Results indicate that when primed, at-risk children showed a less positive self-concept and more negative information processing than did the children in the other groups. These data may offer potential clues into the mechanisms of cognitive vulnerability in at-risk children.

Research on affective disorders has begun to focus considerable attention on potential risk or vulnerability markers for depression (Ingram, Miranda, & Segal, 1998). Although a number of psychological variables have been identified as possible vulnerability markers, assessment of the children of individuals with psychopathology has emerged as the focal point in a number of risk analyses. A critical assumption underlying this strategy is that the offspring of individuals with psychological disorders are at heightened risk for the development of disorders that are, in many cases, similar to those of their parents (e.g., Rosenthal & Kety, 1968). With respect to depression, high-risk data have shown that the children of depressed mothers evidence not only an increased incidence of psychological symptoms but also increased rates of psychiatric diagnoses, including depression (Beardslee, Bemporad, Keller, & Klerman, 1983; Blatt & Homann, 1992; Cohn & Campbell, 1992; Downey & Coyne, 1990; Gelfand & Teti, 1990; Hammen, 1991; Morrison, 1983). Although not all offspring of depressed mothers will develop psychological disorders, these data nevertheless show that these children are clearly at heightened risk for depression.

Even though offspring studies have provided important data, such data are typically more relevant to the correlates of vulnerability than they are to the mechanisms of vulnerability (Hammen, 1991; Ingram, et al., 1998; Rutter, 1986). That is, demonstrating that the offspring of depressed mothers are more likely to exhibit depression does little by itself to reveal why this is the case; without additional data it is difficult to determine which factors are

linked to the actual processes of the disorder. Additional strategies beyond determining heightened risk are therefore necessary to begin to tease out the possible mechanisms of vulnerability within the context of offspring designs. Some such strategies can be derived from cognitive theoretical models (Hammen, 1991; Ingram et al., 1998).

Cognitive models have proven particularly useful for conceptualizing psychological processes in depression (Alloy, 1988; Segal & Dobson, 1992). A central feature among most cognitive models is an emphasis on cognitive structures such as schemas (e.g., Beck, 1967; Segal, 1988) or networks (e.g., Ingram, 1984; Teasdale, 1983; Teasdale & Barnard, 1993) that are conceptualized as negatively biased information processing mechanisms that perpetuate and perhaps cause depression. With regard to children's risk considerations, a number of theorists have suggested that these depressive cognitive structures develop relatively early in life in response to stressful events. For example, Guidano and Liotti (1988) and Segal (1988) have suggested that vulnerability to depression results from exposure to painful childhood experiences, which create dysfunctional self-schemas. In a similar fashion, Beck (1967) and Ingram et al. (1998) have proposed that early adverse life experiences lead to negative self-schemas and that through collateral development, these schemas become strongly and extensively linked to negative affective structures. Thus, to the extent that negative-emotion-producing events are numerous, particularly traumatic, or chronic, they have a profound effect on the development of both affective structures and representations of the self. Vulnerable children thus develop a self-schema that is strongly tied to the experience of negative affect. Correspondingly, when individuals with these cognitive/affective links encounter sadness-producing experiences, they not only experience negative emotions, but a dysfunctional self-schema is activated that is presumed to lead to depression (Segal & Shaw, 1986).

Although research has consistently shown relationships between indexes of dysfunctional self-schemas and depressive symptomatology in children (Garber, Quiggle, & Shanley, 1990; Malcarne

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& Ingram, 1994; Robinson, Garber, & Hilsman, 1995; Whitman & Leitenberg, 1990; Zupan, Hammen, & Jaenicke, 1987), only a few studies have specifically examined cognitive risk factors in the children of depressed mothers. Compared with low-risk children, for example, Goodman, Adamson, Riniti, and Cole (1994) found lower levels of self-worth in children who were at high risk because their mothers were depressed. A more extensive study of the cognitions of children with depressed mothers was reported by Garber and Robinson (1997). After controlling for depressive symptoms, they found that high-risk children reported more self-criticism and lower levels of perceived academic competence, behavioral competence, and self-worth than did low-risk children. In addition to these deficits, they also found that children whose mothers were more chronically depressed had a more depressotypic attributional style than did both low-risk children and high-risk children whose mothers were less chronically depressed.

In another study assessing cognitive factors in the children of depressed mothers, Jaenicki et al. (1987) examined the offspring of unipolar mothers, bipolar depressed mothers, medically ill mothers, and nondepressed mothers. They administered measures of self-concept, attributional style, and, notably, an information-processing paradigm adapted from work on adult depressive cognition (Derry & Kuiper, 1981; Rogers, Kuiper, & Kirker, 1977). Jaenicki et al.'s (1987) study is thus the only research to date to assess information processing in addition to self-report measures of cognitions. Their results suggested that unipolar offspring had a significantly less positive self-concept, a more negative attributional style (i.e., more internal, stable, and global attributions for negative events), and less positive (although not significantly more negative) self-schema information processing than did the offspring of both of the nonpsychiatric control groups. Bipolar offspring evidenced a negative pattern that was similar to that of unipolar offspring but that was somewhat less consistent. Subsequent analyses of these data, however, have shown that a substantial proportion of the children in the study, particularly those with depressed mothers, were experiencing significant psychological symptomatology (Hammen, 1991), thus making it unclear as to whether obtained differences were a function of parental transmission of dysfunctional cognition or were instead tapping the well-documented association between negative cognition and depression (Garber & Robinson, 1997).

In research examining links between cognition and depression, it has become increasingly recognized that assessment of these variables must model the actual relationships specified by contemporary cognitive theories (Abramson, Alloy, & Metalsky, 1988; Hollon, 1992; Segal & Dobson, 1992), specifically, the fact that most contemporary cognitive models of depression are explicitly diathesis-stress models (Segal & Shaw, 1986). As noted, a key assumption of such models is that vulnerable individuals possess potentially depressogenic schemas that are available but that may not become active until they are accessed by a triggering event (Miranda & Persons, 1988; Persons & Miranda, 1992; Segal & Ingram, 1994). The diathesis-stress perspective of current cognitive theories of depression therefore suggests that triggering or activating variables be incorporated into evaluations of the vulnerability components of high-risk studies, including offspring studies. Such perspectives are similar to research investigating biological systems in adults that are hypothesized to be linked to affective disorders (Hollon, 1992). This research has established

that dysregulation in these systems is apparent only following psychological or pharmacological challenges and not under ordinary circumstances (e.g., Depue & Iacono, 1989). Thus, as viewed from a diathesis-stress standpoint, it is important to assess possible vulnerability mechanisms in children under conditions of potential cognitive activation.

Priming represents one laboratory procedure that has been used to trigger the activation of cognitive structures that are hypothesized to be both negative and reactive (Persons & Miranda, 1992; Segal & Ingram, 1994). In line with proposals suggesting a link between cognitive and affective structures, cognitive reactivity studies have typically used negative mood as a way to prime reactive schemas in putatively vulnerable individuals, although other methods are also possible (e.g., Hedlund & Rude, 1995). A growing body of empirical research has shown that such priming methods are effective in facilitating the detection of otherwise inert negative cognitive features in adults who are vulnerable to depression (Ingram et al., 1998; Segal & Ingram, 1994). Within the context of extant diathesis-stress depression models, this research suggests that priming procedures may also be appropriate to assess reactive vulnerability schemas in high-risk children.

Several methods for assessing schemas in depressed individuals, or those who are vulnerable to depression, have been reported. One particularly useful methodological paradigm is the self-referent encoding task (SRET). The SRET is an incidental recall task that has been adapted from the depth-of-processing paradigm developed in experimental cognitive psychology (Craik & Tulving, 1975). Recall patterns from this task are presumed to reflect the operation of schemas that guide the encoding and retrieval of information, and in the case of self-referent encoding, reflect the content and activity of self-schemas (Ingram, Partridge, Scott, & Bernet, 1994). The task has been used to assess information processing in a number of dysfunctional emotional states that include depression (Derry & Kuiper, 1981; Ingram, Fidaleo, Friedberg, Shenk, & Bernet, 1995) and various forms of anxiety (Ingram, Kendall, Smith, Ronan, & Donnell, 1987; Smith, Ingram, & Brehm, 1983).

Parameters of the SRET method are flexible enough to yield several different types of information. In the current context, the SRET paradigm has been adapted for use with children (Hammen, 1991; Hammen & Zupan, 1984; Jaenicki et al., 1987) and thus provides a suitable way to assess cognitive reactivity markers in high-risk children. For instance, *endorsement* rates of self-descriptors can provide an approximation of the self-concept in children at-risk. Alternatively, *recall* rates are widely regarded as reflecting the information-processing activity of cognitive schemas. In particular, the proportion of self-descriptive information that is recalled constitutes an indicator of self-schema-driven processes. This cognitive dimension reflects the processing of information specifically regarding the self and is the most frequently assessed data in studies using the SRET (Derry & Kuiper, 1981), including those assessing information processing in children (e.g., Jaenicki et al., 1987).

In line with these ideas, the purpose of the present study was to assess potentially reactive and depressotypic cognition in children with a unipolar depressed mother. Such depressotypic cognitive reactivity is presumed to reflect the operation of a cognitive vulnerability mechanism. To test this hypothesis, we studied two groups of children. One was defined as high risk by virtue of

having a unipolar depressed mother, whereas the other group did not have a depressed mother and was thus considered to be low risk. Half of the children in each group participated in a mood-induction priming paradigm designed to elicit the activation of reactive cognitive schemas. Following this procedure, children completed the SRET to examine both the self-concept and information-processing parameters of their self-schemas.

Method

Participants

For the depressed group, women currently in outpatient treatment for depression were recruited. To minimize any effects of transitory family crises, women were not invited to participate until at least 3 months after beginning outpatient treatment (see Hammen, 1991). The majority of depressed women had already completed at least 3 months of treatment at the time they were contacted about the study. Most women in the depressed group were recruited by psychiatrists in the community, whereas a small proportion of women were recruited through an advertisement that appeared in a newspaper. Nondepressed women were recruited from either a posted announcement or from a newspaper advertisement.

At an initial meeting for women expressing a willingness to participate in the study, they were informed about the specific requirements of the study for both herself and her child. If potential participants continued to express a willingness to participate they were then evaluated with the Structured Clinical Interview for *DSM-III-R* (SCID; Spitzer, Williams, Gibbon, & First, 1989) and the Beck Depression Inventory (BDI; Beck, 1967). If study criteria were met, an appointment was scheduled for their children to participate in the study. These appointments for their children were scheduled within 2 weeks of this initial meeting.

To qualify for inclusion in the depressed group, women had to meet criteria for a current diagnosis of major depressive disorder, dysthymia, or coexisting major depression and dysthymia (double depression). Exclusion criteria consisted of substance abuse, psychotic disorders, organic conditions, or chronic medical illness. Because the conceptual question in this study focused on unipolar depression, bipolar disorder was also excluded. For inclusion in the nondepressed group, women could not meet past or present diagnostic criteria for any *Diagnostic and Statistical Manual of Mental Disorders*, 3rd edition, revised (*DSM-III-R*; American Psychiatric Association, 1987) disorder. Additional criteria for all women included at least one biological child between the ages of 8 and 12 living at home, completion of at least eighth grade, and English as the primary language. All children were required to speak English as their native language and were excluded if there was evidence of substance abuse, psychosis, organic psychiatric disorder, or mental retardation. Only one child per family was studied.

The total sample included 86 children between the ages of 8 and 12 and their mothers. An additional 11 mother-child pairs were recruited but did not participate because of current drug or alcohol use, because the mother reported significant medical conditions, or because of meeting diagnostic criteria for a psychotic disorder or bipolar disorder. Eight additional mother-child pairs did not participate because of scheduling difficulties or deciding not to participate after obtaining additional information about the study. Although in the majority of these pairs who did not participate the mother was depressed, because data were not collected it was not possible to determine whether they differed in any systematic way from the 86 pairs who did participate in the study. Of the 86 children who participated in the study, 40 were the offspring of depressed mothers (high-risk) and 46 were the offspring of women with no current or part history (low-risk). High- and low-risk children were randomly assigned to either a neutral or induced sad-mood condition. Maternal demographic characteristics of the depressed and nondepressed groups are presented in Table 1.

Clinical characteristics of depressed mothers. As assessed by the

Table 1
Maternal Demographic Characteristics

Variable	Depressed		Nondepressed	
	No.	%	No.	%
Ethnicity				
Caucasian	32	80.0	37	80
African American	1	2.5	0	0
Hispanic	1	2.5	6	13
Asian	3	7.5	2	5
Native American	1	2.5	0	0
Other	2	5.0	1	2
Marital status				
Single	1	2.5	1	2
Married	18	45.0	30	65
Divorced	15	37.5	14	31
Separated	6	15.0	1	2
Income (\$)				
Less than 15,000	8	20.0	2	4
15,000-25,000	10	25.0	10	22
25,000-35,000	5	12.5	5	11
35,000-45,000	8	20.0	5	11
45,000-60,000	4	10.0	9	20
Greater than 60,000	5	12.5	15	32
Education level				
High school graduate	14	35.0	12	26
Some college	13	33.0	9	20
Associate's degree	5	12.5	8	17
Bachelor's degree	5	12.5	9	20
Some graduate school	2	5.0	3	6
Graduate degree	1	5.0	5	11

Note. For depressed participants, $n = 40$. For nondepressed participants, $n = 46$.

SCID, depressed women reported a median of 6 lifetime episodes of depression, with 35% reporting that they had experienced more than 10 episodes during their lifetime. Recurrent episodes of depression were experienced by 60% of the sample, 18% suffered from dysthymia, and 23% experienced double depression. A minority of women also experienced a comorbid anxiety disorder (15%). The majority of the sample were being treated with antidepressant medication. The median number of hospitalizations was one with 35% of the sample being hospitalized more than once. The median age of onset for depression was 19 ($SD = 8.60$). The mean BDI (Beck, 1967) score was 14.25 ($SD = 13.28$) with 15% of the sample reporting scores between 19 and 29 and another 13% reporting scores greater than 29. Descriptive characteristics for all mothers and children are presented in Table 2.

Measures

Several measures were given as part of a larger study on the characteristics of children at-risk for depression. Those relevant to the conceptual questions addressed by this study are presented here, and none of these other measures were empirically related to the results reported here.

Diagnostic assessment. The SCID provides for assignment of diagnoses based on a structured interview corresponding to *DSM-III-R* criteria. The SCID includes two versions: one for patients and one for nonpatients. We used both versions in this study to interview depressed and nondepressed mothers, respectively. All interviews were taped for the current study. Thirty taped interviews were randomly selected and were independently rated by another interviewer. No diagnostic information was gathered for children. Mothers were asked, however, whether their child had any history of any psychiatric problems.

Degree of adult depression. Although the SCID provides diagnostic

Table 2
Sample Descriptive Characteristics

Variable	Depressed	Nondepressed
Mothers		
BDI		
<i>M</i>	14.25	3.26
<i>SD</i>	13.28	3.60
Age		
<i>M</i>	36.45	37.91
<i>SD</i>	4.44	6.06
Number of children		
<i>M</i>	2.48	2.41
<i>SD</i>	1.04	1.05
Children		
Gender		
No. of boys	25	20
No. of girls	15	26
Age		
<i>M</i>	10.13	9.87
<i>SD</i>	1.22	1.47
CDI		
<i>M</i>	7.58	4.30
<i>SD</i>	5.54	4.15
PPVT percentile		
<i>M</i>	72.25	66.48
<i>SD</i>	25.46	27.54
Psychological problem <i>N</i>	6	2

Note. BDI = Beck Depression Inventory; CDI = Children's Depression Inventory; PPVT = Peabody Picture Vocabulary Test; Psychological problem = number of children reported to have a problem by their mothers.

information, it is less informative regarding the degree of depressive symptomatology present. To assess depressive symptoms in the mothers, we administered the BDI (Beck, 1967). The BDI is the most widely used measure of depressive symptoms currently in use and contains 21 items that describe various symptoms occurring over the course of the past week. Each item is scored on a 3-point, scale ranging from 0 (*no depressive symptoms*) to 3 (*strong presence of a symptom*). Scores range from 0 to 63. Reliability and validity of the BDI have been examined in numerous studies and are quite adequate (Beck, Steer, & Garbin, 1988).

Children's Depression Inventory. The Children's Depression Inventory (CDI; Kovacs & Beck, 1977) is a widely used self-report measure of depressive symptoms in children. Modeled after the BDI, the CDI is a 27-item self-report inventory designed to measure depressive symptoms in children between the ages of 8 and 17. Each item inquires about a depressive symptom within the last 2 weeks and is scored on a 3-point, scale ranging from 0 (*lack of the symptoms*) to 3 (*presence of a severe symptom*). Scores range from 0 to 54. The CDI evidences good reliability and validity (Kazdin, French, Unis, & Esveldt-Dawson, 1983; Saylor, Finch, Spirito, & Bennett, 1984).

Peabody Picture Vocabulary Test. The Revised Peabody Picture Vocabulary Test (PPVT-R; Dunn & Dunn, 1981) is an individually administered, untimed test of verbal ability that we used to control for any differences in children's basic understanding of standard American English vocabulary. The test is designed to be used for individuals between the ages of 2.5 and 40. Children are required to express their understanding of a spoken vocabulary word by pointing to one of four drawings that best represented the meaning of the word. The psychometric properties of the PPVT-R are quite adequate (McCallum, 1985). Percentile scores were calculated for each participant.

Mood manipulation check. To assess the adequacy of the mood induction, we used a method previously used by several investigators (e.g., Barden, Garber, Duncan, & Masters, 1980; Lay, Waters, & Park, 1989).

Children were presented with a page containing drawings of five facial expressions that varied in intensity: two smiling faces, one neutral face, and two frowning faces. They were asked to point to the expression that best indicated how they were feeling.

Self-referent encoding task. As previously noted, this task was adapted from that used by Hammen and Zupan (1984) to assess schematic processing in children. Hammen and Zupan (1984) chose self-descriptive words that were considered to be of common usage (Carroll, Davies, & Richman, 1971). Children were presented with 20 positive (e.g., smart) and 20 negative (e.g., bad) personal adjectives. To control for recency and primacy effects, we considered two words at the beginning and two words at the end of the task fillers and did not use them in the scoring. Participants were shown a booklet containing 3×5 index cards. Each card contained a printed word separated by a blank index card. Participants were then read aloud each word, and they were asked the question "Is this word like you" or "Does this word describe you?" They then circled a *yes* or a *no* for each question on an answer sheet they had been provided. After the rating task, they were then given 5 min to recall as many adjectives as they could. To do this, they told the experimenter each word that they recalled, who then recorded the child's response.

Procedure

On arrival for the experiment, children were administered the PPVT-R and the CDI. Children then participated in either the control neutral condition or the mood induction. Following Potts, Morse, Felleman, and Masters (1986), in the sad-mood condition children were asked to think of something that had happened to them and that made them feel bad. They were asked to dwell on these thoughts for approximately 30 s and then to describe what they had thought about. In the neutral condition, children were asked a series of nonaffective questions (e.g., how they got to school or did they bring their lunch from home). Following either the neutral- or the sad-mood induction, children completed the SRET procedure. To counteract the negative-mood induction, following completion of the SRET procedure, we asked children in this condition to talk about something that made them happy. In addition, all children were given several POGS (small toys) to take home.

Results

Diagnostic Interrater Reliability

Interrater reliability was calculated on the basis of the 30 SCID interviews that were rated by another interviewer. Interrater reliability was quite high. Agreement on specific depressive diagnoses was .97, and there was a 100% agreement on assignment to groups (depressed vs. nondepressed).

Mood Manipulation Check

The mood manipulation check indicated that the mood induction was effective for all children receiving the induction. There was no overlap between the mood-induction group and the control group in their choices of sad versus neutral or happy faces; that is, regardless of their risk status, all children who received the mood induction selected one of the two frowning facial expressions. Alternatively, no children in the control group selected either of the frowning facial expressions. To confirm the statistical significance of these choices, we coded faces on a 5-point Likert scale ranging from 1 (*the saddest face*) to 5 (*the happiest face*). A 2 (high vs. low risk children) \times 2 (neutral vs. negative mood induction) analysis of variance (ANOVA) showed only a signifi-

Table 3
*Patterns of Endorsement and Recall on the Self-Referent Encoding Task by Group,
 Word Content, and Induction Condition Adjusted by CDI Scores*

Mood induction	High risk				Low risk			
	Endorsement		Recall		Endorsement		Recall	
	No.	%	No.	%	No.	%	No.	%
Positive content words								
Negative								
<i>M</i>	8.27	.41	2.53	.30	16.55	.83	4.94	.30
<i>SD</i>	1.44			.13	2.61			.15
Neutral								
<i>M</i>	16.97	.85	5.10	.29	17.49	.87	5.17	.29
<i>SD</i>	2.20			.12	2.33			.13
Negative content words								
Negative								
<i>M</i>	4.69	.25	2.50	.52	5.03	.26	2.08	.39
<i>SD</i>	2.64			.25	3.34			.27
Neutral								
<i>M</i>	5.11	.26	1.53	.32	2.90	.15	1.31	.45
<i>SD</i>	4.71			.29	1.94			

Note. CDI = Children's Depression Inventory.

cant main effect for the mood induction variable, $F(1, 82) = 420.50, p < .001$.

Even though there was no overlap between mood groups, it is possible that high- versus low-risk children differed in the intensity of mood expression they chose. Data suggest, however, that this was not the case. For instance, in the control condition, only 2 children in the low-risk group and 3 children in the high-risk group chose a neutral face; all of the remaining children selected one of the happy faces. To further ensure that choices did not vary according to children's risk groups, several additional analyses were conducted.¹ Within the group of participants who received the mood induction, there was no difference in the intensity of sad mood reported between high- ($M = 1.30$) and low-risk participants ($M = 1.40, p > .50$). Similarly, in the control group, there was no significant difference in mood intensity between high-risk ($M = 4.10$) and low-risk ($M = 4.42$) participants ($p > .40$). The correlation between CDI scores and face choices was a nonsignificant $-.16$, providing further evidence that sad mood was influenced by the mood induction rather than the risk group.

Schema Activation

Self-concept. We assessed self-concept data by examining the endorsement of adjectives. A 2 (high- vs. low-risk children) \times 2 (neutral- vs. negative-mood induction) \times 2 (positive vs. negative adjectives) mixed ANOVA with a within factor on the last variable was calculated on endorsement scores. The ANOVA indicated a significant three-way interaction, $F(1, 82) = 9.57, p < .01$. As can be seen in Table 3, positive content words were endorsed less by high-risk children in the negative-mood condition than by any other group (all simple effects $ps < .001$). Additionally, negative-content adjectives were endorsed less frequently by low-risk children in the neutral condition than by any other group (all simple effects $ps < .01$).

Information processing. Following a number of investigators

who have reported data from the SRET designed to assess self-schematic cognition, we assessed information processing by calculating the proportion of endorsed words that were recalled by the children. That is, as reported by Derry and Kuiper (1981), Ingram et al. (1987), and Jaenicke et al. (1987), the index of information processing consisted of the percentage of words that the children endorsed as true and that they later recalled. Thus, for example, 2 children who endorsed 4 and 8 words, respectively, and recalled 2 and 4 words, respectively, would both receive scores of .50. An ANOVA on these proportion scores indicated a significant main effect for adjective content, $F(1, 82) = 15.17, p < .001$, and a significant Risk Group \times Induction-Condition interaction, $F(1, 82) = 5.09, p < .05$. These results were qualified by a significant three-way interaction, $F(1, 82) = 4.06, p < .05$. Simple effects analyses revealed that the Group \times Induction interaction was only significant for negative and not positive words, $F(1, 82) = 5.73, p < .02$, and that high-risk children in a negative mood recalled a significantly higher proportion of negative words than did high-risk participants not in a negative mood, $F(1, 38) = 5.54, p < .025$. No other differences were significant.

Effects of Sample Characteristics on Cognitive Findings

Children's verbal ability and depressive symptoms. To assess the possibility of confounding because of differences in verbal ability, we compared differences between PPVT-R percentile scores between high- and low-risk children. This difference did not approach significance and was therefore not considered further.

To assess differences in depressive symptomatology, we as-

¹ These analyses differ from the ANOVA in that they were conducted within the mood-induction groups rather than comparing high- and low-risk children collapsed across the mood condition, as is the case in the ANOVA main-effect test for the risk variable.

essed the CDI scores of the high- and low-risk children in an ANOVA. Only a main effect for risk group was found, $F(1, 82) = 9.64, p < .01$. No other effects approached significance (e.g., mood-induction effect, $p > .75$). Consistent with the idea that the children of depressed mothers are at heightened risk for depression, this analysis indicated that high-risk children reported significantly more depressive symptoms ($M = 7.58, SD = 5.5$) than did low-risk children ($M = 4.30, SD = 4.2$). It must be noted, however, that even though these groups differed, their symptom levels were still within the normal range on the CDI.

Given the difference between high- and low-risk children in CDI scores, it is possible that results might have been influenced by differences in depressive symptoms. To assess this possibility, we conducted analyses of covariance (ANCOVAs) controlling for these differences. The ANCOVA indicated that CDI scores were not significantly related to the obtained results (all $ps > .15$). CDI adjusted mean recall scores for endorsement and recall scores are presented in Table 3. Self-concept and information-processing scores were virtually unchanged by the inclusion of this covariate. Thus, effects appear to be due to accessing vulnerability structures rather than to preexisting differences in depressive symptoms.

Demographic characteristics. Demographic and descriptive characteristics are presented in Tables 1 and 2. Analyses were performed to examine differences between depressed and nondepressed mothers on ethnicity, marital status, income level, age, and education. Although the ethnicity and age differences were not significant, the differences in maternal education status ($p = .07$) and in marital status ($p = .06$) approached significance. Additionally, the differences for income level were significant ($p = .006$). Education, marital status, and income were assessed as covariates in ANCOVAs for both self-concept and information-processing measures. Results indicated that they were not significant factors, and hence, the original results were unaltered by the inclusion of these covariates.

Age and gender. Although age did not significantly differ between high- and low-risk groups or between mood-induction groups, because there was a range of ages within each risk group (8 to 12), we conducted ANCOVAs to determine whether differences in age might influence results. Similar to the results with the other sample characteristics, the ANCOVAs revealed that age was not a significant covariant (e.g., $p > .80$) and thus did not alter results. Likewise, although the proportion of male and female children were different across the risk groups, child gender did not contribute significantly to, or alter, the cognitive results.

Discussion

Results of the current study demonstrated few differences between high- and low-risk children under ordinary mood conditions. In a negative-mood state, however, characteristics indicative of cognitive vulnerability emerged for high-risk children. For example, whereas high-risk children were able to maintain adequate levels of positive self-referent information processing in a negative-mood state, they displayed an enhanced processing of negative self-referent information when in a negative mood. These data suggest the presence of dysfunctional cognitive self-structures in high-risk children that are dormant until activated by sadness-producing events. As such, these findings are generally consistent with the adult literature that has demonstrated cognitive reactivity

for some variables in vulnerable individuals (e.g., Segal & Ingram, 1994). Judging from the current results, apparently this reactivity process starts in children who are as young as 8 years old.

An interesting pattern emerged for the self-concept data. In the control condition, high- and low-risk children looked virtually identical with regard to positive aspects of the self. That is, there were no differences in the number of positive adjectives they endorsed. However, in this same control condition, high-risk children endorsed more negative self-descriptors than did low-risk children. In the negative-mood condition, two findings emerged. First, high-risk children endorsed positive self-descriptors at about half the rate of the other groups. Second, low-risk children endorsed enough negative self-descriptors (unadjusted $M = 5.0$) to bring them to a level similar to that of high-risk children (unadjusted $M = 4.91$). It therefore appears that under conditions evoking a negative-mood state, high-risk children begin to think less positively about themselves, whereas low-risk children tend to think somewhat more negatively about themselves but also continue to maintain a positive self-image. It is tempting to speculate on the function of this continued positive self-image for low-risk children in the face of a negative-mood state. For instance, such a positive self-representation may serve as a coping buffer against the negative self-thoughts that naturally occur with the experience of a sad mood.

It must be noted that the negative word recall of low-risk children in the control condition was similar to that of high-risk children in the mood-induction condition. It is unclear why this was the case, although it is possible that this represented a salience effect. That is, low-risk children endorsed an average of only 2.9 negative words as self-descriptive, which represented the fewest words endorsed by any group in any condition. It may be that these particular words had a great deal of meaning for them and, because of their unusual saliency, were thus recalled with a somewhat higher frequency. Although the overall pattern of data clearly shows significant negative schema reactivity in high-risk children, this one anomalous finding for low-risk children deserves further research consideration.

Several of the implications of these findings for high-risk children may be examined within the context of mood base rates. Whereas low-risk children in a negative mood show only a modest increase in negative self-concept aspects, when a negative mood activates cognitive structures for high-risk children, they think of themselves in less positive self-concept terms and increase their processing of negative information about themselves. Even if low-risk children may experience some mildly ill effects from the experience of a negative-mood state, they should encounter relatively fewer negative mood states. On the other hand, high-risk children not only experience cognitive effects that are more negative, but because of the stress associated with living with a depressed mother (Hammen, 1991), they will also quite likely encounter more frequent negative-mood states along with the negative cognition that corresponds to these states. Such a process may provide clues into the risk creation process in that cognitive vulnerability may be magnified not only by cognitive reactivity and the negative effects that follow from this but also because negative self-structures are activated with a high frequency. Hence, each time a negative mood state is encountered, high-risk children may be developing, accumulating, strengthening, and consolidating the reservoir of information in the dysfunctional

self-referent cognitive structures that will guide their views of themselves and how information is processed when adverse events evoke these structures in the future.

As with virtually all extant investigations of the offspring of depressed parents, these data are limited to the children of unipolar mothers. Generalization of these findings must therefore be limited accordingly. Aside from the issue of generalizability, however, the issue of limiting research to maternal offspring requires comment. There are a multitude of both theoretical as well as practical reasons for limiting data to maternal samples (Hammen, 1991; Ingram et al., 1998). Nevertheless, fathers unquestionably play an important role in the production of vulnerability and psychopathology in their children (Phares, 1996; Phares & Compas, 1992). The nature of this role has largely been neglected in research efforts to understand vulnerability to psychopathology, but the role of fathers, both individually and in interaction with mothers, clearly deserves empirical attention. Another issue deserving of empirical attention concerns the specificity of these results to the children of depressed mothers. Because a control group of mothers with other types of impairment was not included (e.g., bipolar disorder), it is unclear whether these results are specific to depressive symptomatology or may characterize other types of psychological problems as well. Future research will need to clarify this issue.

Overall, the results of the current study offer further support for the idea that at least some aspects of dysfunctional cognitive structures are present but latent in vulnerable individuals, even when these vulnerable individuals are children. Research in the adult arena has begun to consistently document processes that remain inert until they are activated by affectively charged events (Segal & Ingram, 1994) and, further, that these processes may predict relapse in treated patients (Segal, Gemar, & Williams, 1999). Whereas cognition is conceptually treated by cognitive models as "first among equals" (Haaga, Dyck, & Ernst, 1991), in the broadest sense these data also offer support for conceptual approaches that view cognition and affect as intricately embedded within associative webs with each affecting the other. Indeed, several models of depressive psychopathology have hypothesized that mood structures are situated at the core of maladaptive cognitive structures and that when activated are thought to be linked to the cognitive deficits and other symptoms that are seen in depression (e.g., Bower, 1981; Ingram, 1984; Ingram et al., 1998; Izard, 1993; Teasdale, 1983; Teasdale & Barnard, 1993). The experience of negative mood thus turns on otherwise difficult-to-detect structures that are responsible for the deficits that emerge when the vulnerable individual becomes depressed.

Although the results of the current study are consistent with adult data on the activation of cognitive structures in depression-prone individuals, it is important to note that not all adult studies have found evidence of this accessibility. For instance, in a recent priming study examining the accessibility of dysfunctional attitudes, Dykman (1997) was unable to detect mood-related differences in the dysfunctional attitudes of formerly depressed and never-depressed individuals. Inasmuch as a number of studies have found that dysfunctional attitudes are linked to the experience of negative mood in vulnerable individuals (e.g., Miranda, Gross, Persons, & Hahn, 1998; Miranda & Person, 1988; Miranda, Persons, & Byers, 1990; Roberts & Kassel, 1996), it is possible that these differences are due to methodological inconsistencies (e.g.,

discrepancies in samples, the use of diagnostic inclusion criteria, mood inductions, previous depression severity). It is also important to note that research on depression-vulnerable children has not always had to rely on mood-priming inductions to detect negative cognitive characteristics (e.g., Garber & Robinson, 1997). It may be the case that although some negative cognitive features are evident without priming in vulnerable children, variables that are linked to information processing must be accessed in some fashion before they become evident. Future research will need to more clearly map which reputed cognitive vulnerability variables must be primed before emerging in high-risk individuals, as well as which methodological parameters are associated with findings on the accessibility of variables such as dysfunctional attitudes.

In summary, the results of this study point to the importance of the self-schema construct in conceptualizing and assessing information processing in high-risk children. In general, these data suggest that schema-based processing, with its capacity to generate negative cognition and perhaps dysfunctional affect and behavior, is in place in children as young as 8 years of age. These results are also broadly in line with various cognitive diathesis-stress models of depression; the findings suggest that some of the information-processing functions of negative self-schemas may be latent until activated by affectively laden circumstances. Finally, from a methodological perspective, these data suggest that it may be important to consider incorporating activating stimuli in the assessment of at least some cognitive vulnerability mechanisms.

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