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Interpretation of Ambiguous Information in Girls at Risk for Depression

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Abstract Research has consistently documented that depressed individuals process information in a negatively biased manner. There is little evidence, however, concerning whether these biases represent risk factors for depression, as is hypothesized by cognitive models. In the present study we investigated whether a particular cognitive bias observed in currently depressed individuals, the tendency to interpret ambiguous information negatively, characterizes daughters of depressed mothers, a population known to be at increased risk for depression. Following a negative mood induction, young daughters of depressed and never-disordered mothers completed two information-processing tasks in which their interpretations of emotionally ambiguous stimuli were evaluated. Daughters of depressed mothers interpreted ambiguous words more negatively and less positively, and ambiguous stories more negatively, than did daughters of never-disordered mothers. These results provide support for cognitive vulnerability models of depression.

Keywords Depression · Cognitive bias · Risk for depression · Adolescents · Information processing

Major depressive disorder (MDD) is among the most prevalent of all psychiatric disorders, placing a burden of $40 billion per year on the American economy (Stewart et al. 2003). Nearly 16% of the population will experience clinically significant depression (Kessler et al. 2003), and 80% of these individuals will experience multiple episodes of the disorder (Belsher and Costello 1988; Boland and Keller 2002). This high rate of recurrence of depression likely reflects the presence of stable vulnerability factors that place some individuals at increased risk for experiencing repeated episodes of depression. In this context, investigators are focusing increasingly on factors associated with *risk* for MDD.

One promising line of research for examining factors associated with risk for depression involves the study of children of depressed mothers. Investigators have consistently demonstrated that children are adversely affected by their mothers' depression (Goodman and Gotlib 2002; Gotlib and Goodman 1999). Indeed, approximately 40% of the offspring of depressed mothers will themselves develop either depression (Gotlib and Goodman 1999) or other forms of psychopathology (Weissman et al. 2006). Why such youth are at increased risk for depression, however, remains unclear. One important mechanism by which risk for depression may be transmitted from parent to child involves maladaptive cognitive processes (Goodman and Gotlib 1999). The present study was designed to examine information processing biases and, in particular, negative interpretive bias, in a group of participants at high risk for the development of depression: never-disordered offspring of mothers with recurrent depression.

Information Processing Biases in Risk for Depression

Cognitive models describing the etiology of depression dominate the literature. These models posit that negative schemas utilized in the processing of emotional informa-

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tion, which are activated in the presence of a stressful life event or negative mood state, are central in increasing the individuals' risk for developing depression (e.g., Beck 1967; Bower 1981). Thus, cognitive theories posit that depressed individuals, and persons who are vulnerable to experiencing this disorder, selectively attend to negative stimuli, filter out positive stimuli, and perceive negative or neutral information as being more negative than is actually the case. Negative schemas, developed through adverse early experiences, are posited to be latent until they are activated when individuals experience a stressful life event or a negative mood state. These models have provided the impetus for a significant body of research examining the attentional, memory, inhibitory, and interpretive biases of individuals with depression and, more recently, of individuals at risk for this disorder.

In contrast to studies of attention to and memory for explicitly negative stimuli, research on interpretive bias examines the cognitive functioning of individuals when they are faced with ambiguous information. In this context, negative interpretive bias refers to the tendency to impose more negative or less positive interpretations on emotionally ambiguous information (e.g., Lawson et al. 2002). Interpreting ambiguous information in a negative manner, particularly when this occurs repeatedly over time, is posited by cognitive theorists to have a pernicious long-term effect on emotional state (e.g., Beck and Clark 1991).

Although investigators have not examined interpretive biases in children at risk for depression, a number of researchers have found that other types of information-processing biases may characterize youth at risk for depression and anxiety disorders. For example, Moradi et al. (1999) demonstrated that non-disordered offspring, ages 9–17, of parents with PTSD showed greater interference for threat-related words on an emotion Stroop task than did low-risk controls. Similarly, Pine et al. (Pine et al. 2005) found that, compared to their low-risk controls, offspring (ages 9–19) of adults with panic disorder and depression exhibited an attentional bias toward emotional faces. Finally, Joormann et al. (2007) found that children of depressed mothers (ages 10–14) demonstrated negative attentional biases for sad faces.

Considered collectively, these findings are consistent with the formulation that cognitive biases are a risk factor for psychopathology, in that they can be observed prior to the onset of disorder. Although it is not clear from these studies *how* non-disordered youth might develop information-processing biases, the acquisition of these biases may involve the functioning of the parents and the nature of the parent-child relationship (see, for example, Hadwin et al. 2006, for a review of possible mechanisms of intergenerational transmission of information-processing biases in anxiety disorders). Specifically, it is likely that the development of information-processing biases in offspring of depressed parents involves, at least to some extent, modeling of negative cognitive styles by the depressed parent (Alloy et al. 2001) and the presence of negative information in the family environment (Barrett et al. 1996; Field 2006). Thus, high-risk youth may acquire the types of cognitive biases assessed in the present study through their frequent exposure to such biases in their disordered parent, although certainly other mechanisms including genetic and neuroendocrine influences may also play a role (Goodman and Gotlib 1999).

Interpretive Bias and Depression

Although no research to date has examined interpretive biases in individuals at risk for depression, a number of investigations have documented the operation of a negative interpretive bias in currently depressed adults. The majority of these studies have used explicit measures of bias, in which individuals are asked to report on their interpretations of ambiguous stimuli, such as written ambiguous scenarios (Butler and Mathews 1983; Nunn et al. 1997). Generally, these investigators have found that depressed adults make more negative interpretations of ambiguous scenarios than do their nondepressed counterparts (see also Cane and Gotlib 1985; Forgas et al. 1984; Kavanagh and Bower 1985).

While these studies of interpretive bias in depression are informative, they are limited by their reliance on self-report methodologies; indeed, the results of these studies can be explained as much by a response bias as by an interpretive bias (MacLeod and Mathews 1991). That is, the higher rates of negative responses by depressed than by nondepressed individuals may be due not to differences in actual interpretations, but instead, to a greater tendency by depressed persons to endorse the more negative meaning of scenarios when queried directly about their interpretations. In order to circumvent this alternate explanation of response bias, researchers have also used indirect measures of interpretation. This body of research is in its infancy, and the results are mixed.

In two such studies with adults that examined reaction times as a measure of interpretive bias, neither patterns of priming effects obtained from high and low in depressive symptoms (Lawson and MacLeod 1999) nor times required by clinically depressed subjects and controls to comprehend disambiguating text (Mogg et al. 2006) indicated that depressed individuals interpret ambiguous information more negatively than do controls. In a third study, Lawson et al. (2002) examined eye-blink reflex as measure of emotional interpretation and found that, compared to adults low in depressive symptoms, individuals high in depressive symptoms showed augmented eye-blink reflex when presented with auditory ambiguous stimuli, suggesting that they were interpreting these stimuli negatively.

Although the results of Lawson et al. (2002) support previous findings of a negative interpretive bias in depressed adults, it is not clear whether this bias represents a risk factor for depression or, alternatively, is simply a correlate of the disorder. The present study was designed to address this question. Both direct and indirect measures of interpretive bias were used to evaluate whether and to what extent girls at high and low risk for depression (by virtue of their mothers' history of this disorder) differ in their interpretations of ambiguous information. Participants were 10–14-year-old never-disordered daughters of recurrent depressed mothers (two or more episodes: "high risk") and never disordered mothers ("low-risk"). We examined only girls in this study for two reasons. First, beginning in early adolescence, MDD is twice as prevalent in females as in males (Hammen and Rudolph 1996). Second, girls are likely to experience an earlier onset of depression than are boys (Lewinsohn et al. 1994), which is associated with poorer course and greater severity of the disorder (Lewinsohn et al. 2000; Rao et al. 1999).

We recruited participants in this age range for two primary reasons. First, we set the upper age limit at 14 years because daughters of depressed mothers older than 14 are likely to have already experienced a depressive episode themselves (Angold et al. 1998). This fact would make it difficult to find never-disordered high-risk girls who are older than 14 years of age, and might bias the sample given that older high-risk girls who have remained disorder-free are likely to be resilient. Second, we set the lower age limit at 10 given mounting evidence that stable cognitive vulnerabilities do not emerge until early adolescence, around fifth or sixth grade (age 10–11; e.g., Nolen-Hoeksema et al. 1986, 1992; Turner and Cole 1994). Therefore, we would not expect to see risk-associated cognitive biases in younger children because stable cognitive biases have not yet emerged.

Study Overview

Two tasks were administered to assess negative interpretive bias. In the first task, participants listened to auditory presentations of ambiguous stimuli. Each stimulus was an acoustical blend of word pairs that differed by only one phoneme (e.g., cry–dry, joy–boy). Participants were instructed to select the word they thought they heard from two presented choices. We hypothesized that, compared to low-risk participants, high-risk daughters would select a greater number of negative words from the presented negative–neutral pair choices and a smaller number of positive words from the presented positive–neutral pair choices. In the second task we examined response latencies to text comprehension as an index of interpretive bias. Participants were presented with short stories in which the emotional valance remained ambiguous until the final word was presented. In half of the trials, the target word resolved the ambiguity in either a positive or negative manner (target trials); in the other half of the trials, a grammatically impossible foil was presented (foil trials). Participants were instructed to indicate with a key press whether the word presented "fit" (i.e., was grammatically correct), and response latencies were recorded. We hypothesized that, compared with low-risk girls, high-risk participants would have shorter response latencies to negative targets (reflecting their expectation that a negative ending would resolve the ambiguity) and longer response latencies to positive targets.

Method

Screening and Selection of Potential Participants

Participants were 39 girls ages 10 to 14 who were screened to determine inclusion in one of two groups of never-depressed girls: daughters of mothers with recurrent episodes of MDD during the daughters' lifetime (high-risk, n=16) and daughters of never-disordered mothers (low-risk, n=23). Participants were recruited through advertisements posted in numerous locations within the local community (e.g., internet bulletin boards, university kiosks, supermarkets). Potential participants were first screened over the telephone to determine whether both mothers and daughters were fluent in English and whether daughters were between 10 and 14 years of age. Daughters were excluded if they had experienced severe head trauma, if they had learning disabilities, and if they had current or past depression. Screening was also used to briefly evaluate mothers' psychiatric history and to identify mothers who were likely either to have no psychiatric history or to meet criteria for recurrent depression during their daughter's lifetime. Those pairs who were considered likely to be eligible for participation (approximately 20% of those screened) were invited to come to the laboratory for more extensive diagnostic interviews.

At the subsequent interview session, diagnostic status of the daughters and mothers was confirmed using the Schedule for Affective Disorders for School-Age Children—Present and Lifetime version (K-SADS-PL; Kaufman et al. 1997) and the Structured Clinical Interview for DSM-IV (SCID; First et al. 1996). The K-SADS-PL was administered to the daughters; their mothers completed the same interview with reference to their daughters. Mothers were interviewed using the SCID to establish whether they met criteria for two discrete episodes of MDD within their daughter's lifetime. Daughters in the high-risk group were eligible to participate in the study if: (1) they did not meet criteria for any past or current Axis-I disorder according to both the parent and child K-SADS-PL and if they did not meet the recommended cut-off score for clinical depression on the Children's Depression Inventory; and (2) their mothers met the Diagnostic and Statistical Manual of Mental Disorders, 4th edn. (DSM-IV; APA 1994) criteria for at least two discrete episodes of MDD since the birth of their daughters but did not currently meet criteria for MDD or any other Axis-I disorder (they could have a past diagnosis). Daughters in the low-risk group were eligible to participate if: (1) they did not meet criteria for any past or current Axis-I disorder based on both the parent and child K-SADS-PL; and (2) their mothers did not meet criteria for any Axis-I disorder during their lifetime. Additional exclusionary criteria included any diagnosis of substance or alcohol abuse/dependence within the past 6 months or evidence of impaired mental status, mental retardation, or psychosis. Of those participants who were invited to the laboratory for this interview session, 88% (51 of 58) agreed to attend and, of those, 81% (41 of 51) were eligible for inclusion in the study; of those eligible to participate, only two refused to do so, one RSK and one CTL, resulting in the final sample of 39 participants.

Diagnostic Interviews and Questionnaires

Clinical Interviews The K-SADS-PL, a 1.5- to 2-h structured clinical interview used to diagnose children according to DSM-IV criteria, was administered to all daughters by trained interviewers. This interview has a long history of use in diagnosing youth, and has been found to have strong construct and predictive validity (Ambrosini 2000) and to generate reliable and valid psychiatric diagnoses (Kaufman et al. 1997). The K-SADS-PL was also administered to the mothers of the participants, with mothers answering with respect to their daughters' functioning. The full interview, assessing current and lifetime diagnoses for affective, psychotic, anxiety, behavioral, substance abuse, and eating disorders was administered. Because of time constraints, and because we were interviewing only girls, the Tic Disorders and ADHD screeners were not administered (both of these disorders are more prevalent in boys; Gadow et al. 2002).

The SCID was administered to all mothers by trained interviewers in order to assess their psychiatric histories. The SCID is a 1.5- to 2-h structured clinical interview for adults designed to facilitate psychiatric diagnosis. Supplementary structured interview modules were used to assess mothers' lifetime history of depressive and anxiety disorders. The SCID has demonstrated good reliability for the majority of the disorders covered in the interview (Skre et al. 1991; Williams et al. 1992).

The K-SADS-PL and SCID interviewers had previous experience administering structured clinical interviews and were trained specifically to administer these interviews. To assess inter-rater reliability, independent trained raters who were blind to group membership evaluated 20% of the SCID and K-SADS-PL interviews by randomly selecting audiotapes of equal numbers of high-risk and low-risk pairs. In all cases, diagnoses of former depressive episodes in high-risk mothers, no history of depressive episodes in low-risk mothers, and absence of any current or previous Axis-I disorder in the girls matched the diagnosis made by the original interviewer, $\kappa=1.00$. This indicates excellent inter-rater reliability, although we should note that the interviewers used the "skip out" strategy, which may have reduced the opportunities for the independent rater to disagree with the diagnoses.

Symptom Checklists Daughters completed the ten-item version of the Children's Depression Inventory (CDI-S; Kovacs 1985), a self-report measure of depressive symptoms for children ages 8 to 17. The CDI-S is derived from the 27-item CDI; the long and short forms have been found to yield comparable results (Kovacs 1992). This measure asks participants to report on their mood and functioning during the past 2 weeks. A cut-off score of eight is suggested to identify potentially clinically depressed individuals (Kovacs 1985); girls were included in the study only if they did not meet this cut-off score. Extensive psychometric studies of the CDI indicate that this measure has high levels of internal consistency, test-retest reliability, and predictive, convergent, and construct validity (e.g., Kazdin et al. 1983; Kovacs 1981). In this study, Cronbach's alpha for the CDI was 0.85. The Beck Depression Inventory-II (BDI-II; Beck et al. 1996) was administered to mothers as a self-report measure of symptom severity, and the total BDI score was used in the current study. The BDI-II is a 21-item, self-report measure of severity of depressive symptoms over the past two weeks. Like the CDI, the BDI-II has undergone numerous psychometric evaluations and has been found to have high reliability and validity (Beck et al. 1996). Cronbach's alpha for the BDI in this study was 0.88.

Finally, given the high rate of comorbidity of depression and anxiety disorders (Kessler 2002), daughters completed the Multidimensional Anxiety Scale for Children (MASC; March 1997), a 39-item screening questionnaire for anxiety problems in children and adolescents between the ages of 8 and 19 (once again, the total score was used in all analyses). Studies have shown good reliability and validity of the MASC (March et al. 1997). Cronbach's alpha for the MASC in the present study was 0.82.

Verbal Intelligence The vocabulary subscale of the verbal subtest of the Wechsler Intelligence Scale for Children-III (WISC-III; Wechsler 1991) was administered to the daughters to assess knowledge of word meanings and language development, and to ensure that any group differences in the processing of emotional information are not a function of differences in verbal ability.

Computer Tasks Assessing Interpretive Bias

Ambiguous Words Daughters completed two information-processing tasks assessing interpretive bias. In the first task, modeled after that used by Lawson et al. (2002), participants listened to presentations of ambiguous auditory stimuli that were constructed by acoustically blending valenced and neutral minimal word pairs (pairs of words that differ by only one phoneme). After listening to each stimulus, participants selected the word they thought they heard from two presented choices.

We developed enough stimuli for this study to have a full set of age-appropriate test and control stimuli. Test stimuli were acoustic blends of negative–neutral (e.g., sad–sand) and positive–neutral (e.g., joy–boy) word pairs. These ambiguous test stimuli were generated by pairing unambiguous valenced words with neutral matches. Each word was spoken by a female adult, and the resulting recordings were transferred to an IBM-compatible personal computer. The ambiguous test stimuli were constructed by using sound editing software (Audacity 1.2.3; open-source software, http://audacity.sourceforge.net) to combine the members of each word pair, averaging the distinct waveforms of each component word. The resulting waveforms were combined into a single audio output to achieve each final ambiguous stimulus. Twenty negative-neutral blends and 20 positive neutral blends comprised the final set of test stimuli. In addition, the 20 negative–neutral blends were further categorized as either depressotypic–neutral blends (e.g., sad–sand; $n=10$) or social threat–neutral blends (e.g., hated-heated; $n=10$).

The resulting ambiguous stimuli were then subjected to pilot testing to ensure that they allowed equally for two different interpretations. Sixteen undergraduates were presented with 40 trials during which they were asked to listen to an auditory stimulus through headphones and then write down the word they heard. Responses for each blend were examined and revealed that, for both positive-neutral and negative-neutral blends, the chance of participants writing down the valenced source word was near 50% (range of 47–53%), indicating that the chance of interpreting each stimulus as either the original valenced or neutral word was near chance.

In addition to these test stimuli, three sets of control stimuli were developed: non-blended neutral (e.g., along; $n=20$), negative (e.g., grief; $n=10$), and positive words (e.g., good; $n=10$). The forced choice in these cases was between the word heard and an unused match word (e.g., along–alone, grief–brief, good–could). To assess the word that participants believe they heard, negative and positive control items were presented with neutral matches; neutral control words were presented with either negative or positive matches (e.g., along–alone and could–good, respectively). To ensure that these control stimuli were not acoustically different from the blended test stimuli, each control stimulus consisted of two recordings of the same word combined into a single audio output.

Stimuli were presented on an IBM-compatible personal computer and a Dell 17-inch color monitor. E-Prime software was used to control stimulus presentation and record responses. Noise-canceling headphones were used to minimize interfering effects of ambient noise. Each of the test and control items was presented once for each participant, resulting in a total of 80 trials per participant. Order of presentation of test and control stimuli was fully randomized for each participant. Each trial began with the display of a white fixation cross in the middle of the screen for 500 ms, followed by the presentation of an auditory stimulus over the headphones. Following the offset of the auditory stimulus, two words appeared in the screen and remained on the screen until the participant pressed a key on the keyboard. The valenced (positive or negative) word choices appeared equally often on the right and left side of the screen with the matched neutral word of each pair appearing in the other position.

Participants responded by pressing the 'm' key (labeled "right") if they believe the word they heard matched the choice on the right side of the screen and the 'c' key (labeled "left") if the word they heard matched the choice on the left. Given the nature of the stimuli, only one response was correct for control items. For the ambiguous test items, however, either response was technically correct because each ambiguous stimulus was a blend of the two choices. For these items, participants' responses were converted into a percentage score reflecting the proportion of time the valenced source word was selected. Thus, interpretive bias was operationalized as a deviation from the expected (50%) rate of choosing the emotional versus the neutral source word.

Ambiguous Stories In the second task, derived from procedures used by Mathews and his colleagues (Hirsch and Mathews 1997; Mathews and Mackintosh 2000), daughters were presented with short stories in which the emotional valence of the story remained ambiguous until the final word was presented, resolving the ambiguity. In some trials, the target word resolved the ambiguity in either a positive or negative manner (target trials), while in other trials, a grammatically impossible foil was presented (foil trials). Participants were instructed to indicate with a key press whether the word presented "fits" (is grammatically correct), and response latencies to the key press were recorded.

Participants were presented with a total of 66 three-sentence stories, written in a self-referent, second-person narrative ("You are…"). We composed the stories in a self-referent narrative, because investigators have found that information-processing biases in depression are stronger when stimuli are self-referent (e.g., Dineen and Hadwin 2004). Each story was presented one sentence at a time, and progress through each story was self-paced; participants pressed the space bar when they were ready to see the next sentence. For each story, the final word was missing from the third sentence, and subjects were encouraged to think of an ending for each story. Once they had an ending in mind, participants were instructed to press the space bar, at which point a single probe word appeared on the screen; participants were instructed to indicate whether the word was a grammatically possible ending to the story by pressing the 's' key (labeled "yes") or the 'l' key (labeled "no"). Following each probe word, a comprehension question was presented that was unrelated to the presented ending, and participants answered yes or no to this question as well using the same keys. Answers to these comprehension questions were followed by feedback ('Right!' or 'Wrong, try again next time') in order to emphasize the importance to the participant of reading and understanding each story.

Stimuli were divided into two categories: test and control items. For control items (n=16), the emotional valence of the story was unambiguously neutral and the final word was either a neutral possible ending to the story (n=5) or a grammatically impossible foil (n=10). The number of possible and impossible endings within control items was unequal in order to balance for possible/impossible endings across the entire set of stories. As an example, one control story read as follows:

1. You have planned to meet a friend at the mall.
2. When you arrive, she's not there, so you call her cell phone to find out where she is.
3. She explains that her mom was late picking her up because she got stuck in ___________.
4. Probe word: traffic (In this case, the participant would press the 'yes' key.)
5. Comprehension check: Did you call your friend to find out where she was? (Yes)

For test items, the emotional valence of the story was ambiguous and could be interpreted in either a positive or negative manner. For two-thirds of these ambiguous stories (n=33 or 34, depending on randomization), the presented probe word was grammatically possible and resolved the story in either a negative or a positive manner. For the remaining one-third of these stories, the presented probe word was a grammatically impossible foil. An example of a test item is as follows:

1. In PE, your teacher informs the class that she is starting a softball tournament.
2. Your teacher picks four team captains and tells them to take turns picking teammates.
3. You are certain that you will be picked ____________.
4. Probe word: First ('first'—positive ending; or 'last'—negative ending; or 'front'—grammatically impossible foil)
5. Comprehension check: Did your classmates choose team captains? (No)

These stimuli were first evaluated in a pilot study to ensure that the control stimuli were indeed unambiguous and that the test stimuli were amenable to both positive and negative interpretations. Ten undergraduates were presented with all 66 stories and were asked to fill in the blank at the end of each story. Pilot responses to control stories were completely consistent with the developed endings, with the participants writing down the expected ending 100% of the time. Responses to test (ambiguous) stories showed that alternate interpretations were possible, with participants writing down identical or similar positive and negative endings 64% and 36% of the time, respectively.

All study participants read all 66 stories. Positive, negative, and impossible endings were randomized across participants, and the order of presentation of stories was fully randomized for each participant. Stimuli were presented in three blocks, each consisting of 22 trials, on an IBM-compatible personal computer and a Dell 17-inch color monitor. E-Prime software was used to control stimulus presentation and record responses. Participants' interpretation of the ambiguous stories was operationalized in terms of response latencies on target trials. Participants should be slower to respond 'yes' to grammatically possible endings that are *inconsistent* with their interpretation of the story than to grammatically possible endings that are consistent with their interpretation (see MacLeod and Cohen 1993). Thus, the primary conditions of interest were response latencies on test trials on which participants responded 'yes' to negative endings and 'yes' to positive endings.

Mood Inductions

Prior to engaging in each information-processing task, participants underwent a negative mood induction. A key assumption of cognitive models of depression is that individuals who are vulnerable to depression are characterized by depressogenic schemas that are activated by a negative event or mood. Thus, negative schemas should be observable in individuals who are at risk for depression following a "priming" procedure, for example, through a negative mood induction (Scher et al. 2005). In a meta-analysis of mood induction, Westermann et al. (1996) concluded that film clips with explicit instructions to enter a specific mood state are the most effective form of induction. Thus, 3-min film clips were used to induce a negative mood state in all daughters before they participated in each interpretive bias task. *The Champ* (Zefirelli 1979) depicts a young boy watching his father die in a hospital room, and *Bambi* (Hand 1942) depicts a young deer learning of his mother's death. A positive mood clip from *Milo and Otis* (Hata 1999) was shown after the tasks were completed. Guided imagery was presented for two minutes following each clip instructing the participants to think about how they would feel if they experienced the situation they had just viewed. To examine the effectiveness of the mood inductions, participants' mood was assessed before and immediately after each mood induction using a five-point scale consisting of drawn face pictures ranging from very sad (1) to very happy (5)

Procedure

All participants were administered the clinical interviews and then completed the questionnaires. If eligible, daughters returned for a second session in which they participated in the two computer tasks assessing interpretive bias. Participants were told that the experiment was designed to assess how they process emotional information. This second session began with a mood assessment followed by the first mood induction and a second mood assessment. This was followed by either the ambiguous words task or the ambiguous stories task. After the daughters completed the first task, the second mood induction film clip was presented and mood was reassessed. This was followed by the second interpretive bias task. Finally, the positive mood induction film clip was presented and a final mood measurement was administered. The orders of the two negative-mood-induction film clips and the two information-processing tasks were counterbalanced. The interview session lasted about 2 h, and the second session, conducted within a week, lasted about 75 min. Mother–daughter pairs were paid $25 per hour.

Results

Participant Characteristics

Demographic and clinical characteristics of the two participant groups (low-risk controls, CTL; high-risk, RSK) are presented in Table 1. There were no significant group differences in age, $t(37)<1$, WISC-III vocabulary subtest scaled scores, $t(37)<1$, MASC scores, $t(37)=1.25$, CDI-S scores, $t(37)<1$, or ethnicity, $\chi^2(3)=1.51$, all ps> 0.05. In addition, the mothers of the RSK girls did not differ from mothers of the CTLs with respect to their scores on the BDI-II, $t(37)<1$. Finally, although none of the mothers had a current diagnosis, four of the mothers in the RSK group were diagnosed with a past disorder besides MDD: two with obsessive-compulsive disorder, one with post-traumatic stress disorder, and one with an eating disorder.

Table 1 Demographic and Clinical Characteristics of Participants

	RSK	CTL
N	16	23
Age	12.83 (1.84)	13.29 (1.54)
WISC-III Vocabulary	10.24 (2.86)	9.96 (3.10)
CDI-S	2.63 (2.19)	2.09 (2.84)
MASC	43.69 (12.00)	46.95 (10.32)
BDI-II (Mothers)	4.25 (7.24)	5.96 (8.88)

Standard deviations are shown in parentheses.
RSK High-risk participants, *CTL* low-risk/control participants, *WISC-III Vocabulary* Wechsler Intelligence Scale for Children Vocabulary scaled scores, *CDI-S* Child Depression Inventory, *MASC* Multidimensional Anxiety Scale for Children; *BDI-II* Beck Depression Inventory

Mood Induction

To evaluate the effectiveness of our mood induction procedures, we conducted a repeated-measures analysis of variance (ANOVA) on the mood ratings with group as the between-subjects factor and time (before mood induction, after first negative mood induction, after second negative mood induction, and after positive mood induction) as the within-subject factor. This ANOVA yielded a significant main effect of time, $F(3, 111)=51.41$, $p<0.01$, but no main effect of group, $F(1, 37)<1$, and no group by time interaction, $F(3, 111)<1$. The means of the mood ratings are presented in Table 2. Follow-up tests indicated that, compared to their mood before the negative mood inductions, the participants reported significantly more negative mood after the first, $t(38)=11.04$, $p<0.01$, and second, $t(38)=10.89$, $p<0.01$, mood inductions. Moreover, the positive mood induction was effective at restoring participants' mood to initial levels, as evidenced by a nonsignificant difference between mood ratings prior to any mood induction and mood ratings following the positive mood induction, $t(38)=1.70$. Thus, the mood inductions were equally effective in both participant groups.

Ambiguous Words Task

Before analyzing group differences on the test (i.e., ambiguous) trials of the ambiguous words task, we analyzed participants' responses to the control (unambigu-

Table 2 Mean Mood Ratings Before and After Mood Inductions

	RSK	CTL
Mood rating before induction	4.13 (0.17)	4.22 (0.14)
Mood rating after 1st mood induction (negative induction)	2.44 (0.20)	2.48 (0.17)
Mood rating after 2nd mood Induction (negative induction)	2.13 (0.22)	2.22 (0.19)
Mood rating after 3rd mood induction (positive induction)	4.19 (0.14)	4.44 (0.12)

Standard deviations are shown in parentheses.
RSK High-risk participants, *CTL* low-risk control participants

ous) trials. First, we computed the number of correct and incorrect responses to control stimuli within each of the four control conditions (neutral unambiguous words presented with neutral and positive choices; neutral unambiguous words presented with neutral and negative choices; positive unambiguous words presented with positive and neutral choices; and negative unambiguous words presented with negative and neutral choices) to yield four scores reflecting the percentage of items answered correctly. Percentages of correct responses ranged from 95 to 98. Not surprisingly given this high level of accuracy, a repeated-measures ANOVA conducted on the accuracy scores with group as the between-subjects factor and control condition as the within-subject factor yielded nonsignificant main effects for group, $F(1, 37)<1$, and condition, $F(3, 111)<1$, and a nonsignificant group × condition interaction, $F(3, 111)<1$. These results indicate that participants' responses to control items did not vary as a function of group or condition. More importantly, these data indicate that high-risk participants do not show an overt tendency to endorse negative responses on unambiguously neutral trials, a finding that will be important in interpreting results, presented below, with respect to group differences on the ambiguous trials.

We then analyzed responses to ambiguous test trials to test the hypothesis that high-risk participants will be more likely than low-risk girls to impose negative interpretations, and less likely than low-risk girls to impose positive interpretations, on ambiguous information. Responses to ambiguous test stimuli were aggregated within each of the three test conditions (positive–neutral word blends; depressotypic–neutral word blends; and social threat–neutral word blends) to yield three proportion scores. In contrast to the control conditions discussed above, there are no right or wrong answers on these ambiguous test trials. Therefore, a response indicating the selection of the emotional word in each forced choice situation was coded "1" and the selection of the neutral word was coded "0." Once aggregated across individual trials in each condition, each participant's score thus reflects the proportion of responses in which she selected the emotional rather than the neutral word.

To assess group differences in responses to these test trials, we conducted a repeated-measures ANOVA on the proportion scores with group as the between-subjects factor and stimulus condition as the within-subject factor. The results of this analysis are depicted in Fig. 1. The ANOVA did not yield a significant main effect for group, $F(1, 37)<1$. There was, however, a significant main effect for condition, $F(2, 74)=27.51$, $p<0.05$; participants were significantly less likely to choose the emotional option in the social threat-neutral word blends condition than in either the depressotypic-neutral word blends, $t(38)=5.87$, or the positive-neutral word blends condition, $t(38)=7.34$, both ps<0.01. This main effect of condition was qualified, however, by a significant interaction of group and condition, $F(2, 74)=4.34$, $p<0.05$. The effect size ($\varpi^2=0.06$) for this interaction was moderate (Keppel et al. 1992), and the observed power was 0.76. Follow-up tests indicated that, for depressotypic–neutral word blends, the RSK participants selected the depressotypic option significantly more often than did the CTL participants, $t(37)= 2.06$, $p<0.05$. Moreover, for positive-neutral word blends, the CTL participants selected the positive option significantly more often than did the RSK participants, $t(37)=2.13$, $p<0.05$. Finally, to compare each groups' response rate in these two conditions to the expected response rate of 0.5 (chance), we conducted four single-sample t-tests. For depressotypic-neutral word blends, RSK participants selected the negative option significantly more often than chance, $t(15)=3.46$, $p<0.01$; CTL participants' response rate did not differ significantly from chance, $t(22)<1$. In contrast, for positive-neutral word blends, CTL participants selected the positive option significantly more often than chance, $t(22)=3.49$, $p<0.01$; RSK participants' response rate did not differ from chance, $t(15)<1$. Thus, for ambiguous stimuli constructed from depressotypic and neutral words, RSK participants were more likely than were CTL participants to impose negative interpretations. In contrast, for ambiguous stimuli constructed from positive and neutral words, RSK participants were less likely than were CTLs to impose positive interpretations.

Ambiguous Stories

In order to provide an additional test of the hypothesis that high-risk participants will be more likely than low-risk

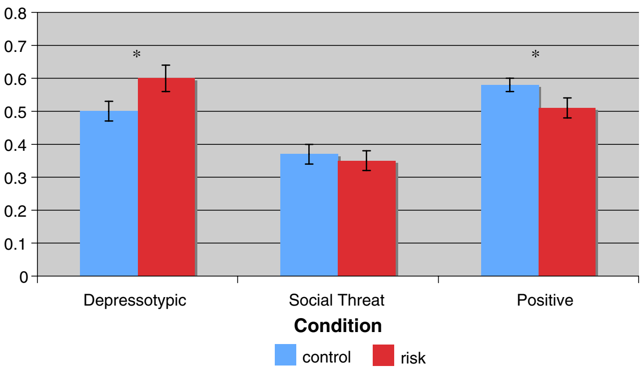

Fig. 1 Means and standard errors of the proportion scores on test (ambiguous) trials of ambiguous words task in high-risk and low-risk/control groups; *$p<0.05$

controls to impose negative interpretations and less likely than low-risk girls to impose positive interpretations on ambiguous information, we analyzed participants' response latencies in the ambiguous stories task. Only response latencies from items with correct responses for both the target word and the comprehension question were analyzed. Error rates across all conditions were quite low (mean for target word accuracy=0.07; mean for comprehension accuracy=0.06) and did not differ significantly between RSK and CTL groups [accuracy for target words, $t(37)<1$; accuracy for comprehension questions, $t(37)=1.70$]. Furthermore, in order to prevent outlier data from unduly influencing participant and group means, latencies greater than three standard deviations above and below each participant's mean were excluded. In addition, response latencies lower than 300 ms were considered anticipation errors and were also excluded from further analyses, and response latencies greater than 3,000 ms were excluded because they likely reflect lapses in concentration. The proportion of data lost due to outliers was inspected for each participant; based on these data, one RSK and one CTL participant were excluded due to an unusually high number of response latencies classified as outliers (51% for the CTL participant, 29% for the RSK participant). The proportion of data lost due to outliers for the remaining 37 participants was less than 3% and did not differ significantly between groups, $t(35)<1$. These rates of data lost due to errors and outliers are comparable to those found by Mogg et al. (2006) using a similar text comprehension paradigm.

To evaluate the hypothesis that high-risk participants will be more likely than low-risk controls to impose negative interpretations, and less likely than low-risk girls to impose positive interpretations, on ambiguous information, we analyzed the two conditions in which the stories were ambiguous and the target word was either a possible positive ending or a possible negative ending by conducting a repeated-measures ANOVA on response latencies, with group as the between-subjects factor and condition as the within-subject factor. Data from the control items and from the items with an impossible ending were not analyzed as part of these analyses because they are not central to the question of interpretation of ambiguous information. Nevertheless, we should note that we conducted preliminary analyses to examine whether RSK and CTL participants differed on overall reaction times and whether participants as a whole responded more rapidly in affirmative conditions than in conditions in which the 'no' response was correct. The two groups did not differ significantly in overall reaction times across conditions, $t(35)=1.08$. Moreover, participants in this study respond more quickly in the affirmative conditions than in the conditions in which a 'no' response was indicated, $t(36)=3.82$, $p<0.001$.

Results of the two-way (group×condition) repeated measures ANOVA are presented in Fig. 2. This analysis did not yielded a significant main effect for group, $F(1, 35)=2.23$, but did yield a significant main effect for condition, $F(1,35)=8.50$, $p<0.01$; participants responded significantly faster when the target word was a possible positive ending than when the target word was a possible negative ending. This main effect of condition was qualified, however, by a significant interaction of group and condition, $F(1, 35)=6.53$, $p<0.05$. The effect size ($\varpi^2=0.07$) for this interaction was again moderate (Keppel et al. 1992), and the observed power was 0.70. Follow-up tests indicated that RSK participants responded more quickly to negative endings than did CTLs, $t(35)=2.07$, $p<0.05$; there was no significant group difference for response latencies to positive endings, $t(35)<1$. From a somewhat different perspective, whereas CTL participants were significantly slower to respond to negative endings than they were to positive endings, $t(21)=3.98$, $p<0.001$, RSK participants' response latencies to ambiguous stories with positive and negative endings did not differ significantly from each other, $t(14)<1$. Thus, whereas RSK and CTL participants exhibited equivalent expectations for positive endings, the RSK girls responded more quickly than did the CTL girls to negative endings, indicating that they were more likely to impose negative interpretations on the stories.

Discussion

In studies using both direct and indirect measures, depressed adults have been found to exhibit a negative bias in their interpretation of ambiguous stimuli (e.g., Butler and Mathews 1983; Lawson et al. 2002; Nunn et al. 1997). No research to date, however, has examined whether this bias also characterizes healthy individuals at elevated risk for depression. The present study was

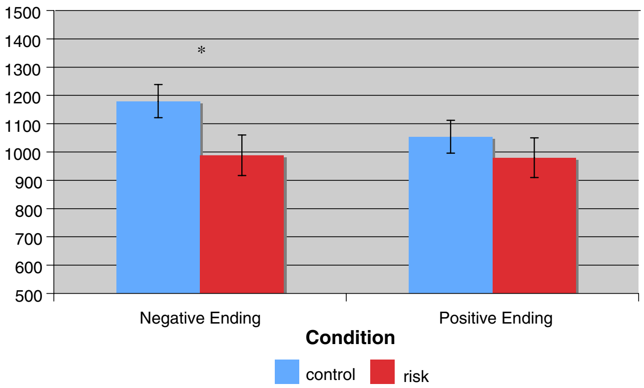

Fig. 2 Means and standard errors of response latencies on test (ambiguous) trials of ambiguous stories task in high-risk and low-risk/control groups; *$p<0.05$

designed to assess biases in the interpretation of emotionally ambiguous stimuli in never-disordered daughters of depressed mothers, a population known to be at elevated risk for developing depression. Given the importance of priming negative cognitive schemas, we induced a sad mood in the girls before we assessed interpretive biases. As we hypothesized, high-risk girls showed consistent evidence of an interpretive bias; they interpreted ambiguous words more negatively and less positively than did their low-risk counterparts, and were also more likely to impose negative interpretations on ambiguous stories.

This is the first demonstration of a negative interpretive bias in healthy individuals at risk for depression. This is also the first study to show evidence of an interpretive bias associated with depression or risk for depression in children, as prior research in this area has been conducted exclusively with adults. Several studies of interpretive bias in depressed adults, largely conducted using self reports, have found a depression-associated preference for negative interpretations of ambiguous information (e.g., Butler and Mathews 1983; Nunn et al. 1997); our finding that high-risk girls are more likely than their low-risk counterparts to endorse negative interpretations of ambiguous auditory word blends is consistent with these findings. Interestingly, this result is specific to interpretations of ambiguous stimuli generated by blending *depressotypic* and neutral words. This was not a result that explicitly hypothesized prior to execution of this research. However, it is not at all surprising that there observed effects were specific to the depressotypic words given that these were daughters of depressed mothers. In contrast, both the low- and high-risk participants were significantly more likely than chance to select the neutral interpretation of ambiguous stimuli that were generated by blending *social threat* and neutral words. It is possible that the bias of all girls away from negative interpretations of social threat stimuli is due to the centrality of social acceptance to children at this developmental stage. It remains for future research to examine this formulation explicitly.

Although studies of interpretive bias using self-report methodologies have been informative, their results can be explained by biased responding, as opposed to biased interpretation (MacLeod and Mathews 1991). In the present study, we made two methodological adjustments in order to reduce the viability of this alternative explanation. First, within the word-pairs task, we included unambiguous control stimuli that were experientially similar to the ambiguous test stimuli but that permitted an explicit examination of response bias by giving participants the opportunity to endorse a negative option when the neutral response was correct. We found no evidence of a response bias; both low- and high-risk girls selected the correct negative, positive, or neutral option on over 95% of the trials. Second, consistent with recent studies of interpretive bias that have used indirect, rather than self-report, measures to assess interpretive bias (Lawson and MacLeod 1999; Lawson et al. 2002; Mogg et al. 2006), we included a task in which we assessed bias through latencies to respond to disambiguating story endings. As we hypothesized, high-risk participants showed evidence of an interpretive bias; they were faster than were low-risk participants to respond to negative endings that disambiguated short stories, reflecting a negative interpretation of these stories. Interestingly, the high-risk and low-risk girls did not differ in their interpretation of positive endings. In fact, it appears that whereas the low-risk girls were clearly more likely to impose positive than negative interpretations on the endings of ambiguous stories, the high-risk girls responded similarly to positive and negative endings, indicating that they were equally prepared for either outcome.

This evidence of an interpretive bias in children at risk for depression adds to a small but equivocal body of research using indirect measures of bias. We conceptually paralleled and extended to a high-risk sample the findings of Lawson et al. (2002) that higher levels of depressive symptoms are associated with more negative interpretations of emotionally ambiguous stimuli. Our results stand in contrast, however, to findings from two other studies that used reaction times to assess interpretive bias in depression. In these studies, neither patterns of priming effects obtained with participants high and low in depressive symptoms (Lawson and MacLeod 1999) nor times required by clinically depressed subjects and controls to comprehend disambiguating text (Mogg et al. 2006) indicated that depressed adults interpret ambiguous information more negatively than do nondepressed individuals. Two specific methodological differences among these studies are important and may explain, at least in part, these inconsistent findings. First, in neither previous study were the textual scenarios self-referential, a critical point given demonstrations that self-referent information facilitates information-processing biases in depression (e.g., Bradley and Mathews 1983). Second, Mogg et al. assessed comprehension latencies for entire sentences, which increases variability in reaction times. This high variability, compounded by the fact that depressed individuals tend to exhibit variable reaction times in general (Byrne 1976), may have attenuated group differences in response latencies. In contrast, the text stimuli used in the present study were explicitly self-referential, and latencies used to examine group differences were in response to a single word that completed each three-sentence story, thus reducing variability in reaction times.

As is the case in other research examining information-processing biases in high-risk individuals, this study does not address the question of how non-disordered youth acquire cognitive biases. It is likely that the development of information-processing biases in offspring of depressed parents involves the nature of the parent-child interactions and relationship (e.g., Hadwin et al. 2006). In this context, depressed parents have been found to model negative cognitive styles to a greater extent than do nondepressed parents (Alloy et al. 2001). Children's information-processing biases can also be influenced by the presence of negative information in the environment (Field 2006) and by family members' discussions (Barrett et al. 1996). Thus, it is plausible that high-risk youth acquire the types of cognitive biases observed in the present study through their frequent exposure to such biases in their disordered parent.

We should note four limitations of the present study. First, although we carefully diagnosed mothers and daughters to ensure that daughters had no current or lifetime diagnoses and mothers had no current Axis-I diagnosis, four of the 15 mothers with a history of recurrent depression also met diagnostic criteria for another past Axis-I disorder. It is possible, therefore, that the cognitive biases found in the daughters are related to the greater incidence of lifetime diagnoses other than depression in their mothers. Moreover, although depression is the most likely form of psychopathology to develop in daughters of depressed mothers (Weissman et al. 2006), other disorders might also eventually develop in this sample. Thus, the interpretive biases observed in these daughters may not be specific to depression. It is also important to note that, based on prior findings of cognitive biases in high-risk children (e.g., Jaenicke et al. 1987; Joormann et al. 2007; Taylor and Ingram 1999), we induced negative mood in all participants. Consequently, we do not know if we would have obtained similar results without using a mood induction. Finally, including only mothers and daughters limits the generalizability of our findings; extending this research to boys and fathers is an important direction for future studies. Indeed, although we might expect to see a similar pattern of biased interpretation in male offspring of depressed parents, it is possible that any biases would be less pronounced given that the ultimate incidence of depression in a sample of boys at risk for this disorder would be lower than what we expect in the current sample of girls.

Despite these limitations, the present study is important in demonstrating that, as predicted by cognitive models of depression, never-disordered individuals at risk for depression are characterized by specific cognitive biases. While numerous studies of depressed adults have provided support for the basic tenets of cognitive formulations of depression (Gotlib and Krasnoperova 1998; Williams et al. 1997), studies examining whether information-processing biases precede the onset of the disorder are rare. In the present study we found that even though the high-risk girls were free of current and lifetime diagnoses of any Axis-I disorder, they nevertheless exhibited bias in their interpretations of emotionally ambiguous information. These results thus carry important implications for programs aimed at the prevention of depression in high-risk individuals. By identifying vulnerability factors that are specifically associated with increased risk for MDD, the focus of prevention programs can become more targeted. Moreover, these findings suggest that such cognitive biases are more than a mere byproduct of the depressed state, and thus are worthy of increased attention in treatment programs for actively depressed individuals as well as therapies aimed at preventing relapse. However, whether these dysfunctional patterns of information processing predict the onset of depressive disorders in these high-risk daughters and what mechanisms underlie the transmission of such biases from one generation to the next remain to be verified. Further work investigating the predictive value of information-processing biases is clearly needed to accurately inform the development of programs designed to prevent and treat depression.

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References

Alloy, L. B., Abramson, L. Y., Tashman, N. A., Berrebbi, D. S., Hogan, M. E., Whitehouse, W. G., et al. (2001). Developmental origins of cognitive vulnerability to depression: Parenting, cognitive, and inferential feedback styles of the parents of individuals at high and low cognitive risk for depression. *Cognitive Therapy and Research*, *25*(4), 397–423. doi:10.1023/A:1005534503148.

Ambrosini, P. J. (2000). Historical development and present status of the Schedule for Affective Disorders and Schizophrenia for School-Age Children (K-SADS). *Journal of the American Academy of Child and Adolescent Psychiatry*, *39*(1), 49–58. doi:10.1097/00004583-200001000-00016.

Angold, A., Costello, E., & Worthman, C. (1998). Puberty and depression: The roles of age, pubertal status and pubertal timing. *Psychological Medicine*, *28*(1), 51–61. doi:10.1017/S003329179700593X.

APA (1994). *Diagnostic and statistical manual of mental disorders* (4th ed.). Washington, DC: American Psychiatric Association.

Barrett, P. M., Rapee, R. M., Dadds, M. M., & Ryan, S. M. (1996). Family enhancement of cognitive style in anxious and aggressive children. *Journal of Abnormal Child Psychology*, *24*(2), 187–203. doi:10.1007/BF01441484.

Beck, A. T. (1967). *Depression: Clinical, experimental, and theoretical aspects*. New York, NY, US: Harper and Row.

Beck, A. T., & Clark, D. A. (1991). Anxiety and depression: An information processing perspective. In R. Schwarzer, & R. A. Wicklund (Eds.), *Anxiety and self-focused attention* (pp. 41–54). Amsterdam, The Netherlands: Harwood.

Beck, A. T., Steer, R. A., & Brown, G. K. (1996). *Manual for the Beck Depression Inventory - II*. San Antonio, TX, USA: Psychological Corporation.

Belsher, G., & Costello, C. G. (1988). Relapse after recovery from unipolar depression: A critical review. *Psychological Bulletin*, *104*(1), 84–96. doi:10.1037/0033-2909.104.1.84.

Boland, R. J., & Keller, M. B. (2002). Course and outcome of depression. In I. H. Gotlib, & C. L. Hammen (Eds.), *Handbook of depression* (pp. 43–60). New York, NY, USA: Guilford.

Bower, G. H. (1981). Mood and memory. *The American Psychologist*, *36*(2), 129–148. doi:10.1037/0003-066X.36.2.129.

Bradley, B. P., & Mathews, A. (1983). Negative self-schemata in clinical depression. *The British Journal of Clinical Psychology*, *22*, 173–181.

Butler, G., & Mathews, A. (1983). Cognitive Processes in Anxiety. *Advances in Behaviour Research and Therapy*, *5*, 51–62. doi:10.1016/0146-6402(83)90015-2.

Byrne, D. (1976). Choice reaction times in depressive states. *The British Journal of Social and Clinical Psychology*, *15*(2), 149–156.

Cane, D. B., & Gotlib, I. H. (1985). Depression and the effects of positive and negative feedback on expectations, evaluations, and performance. *Cognitive Therapy and Research*, *9*(2), 145–160. doi:10.1007/BF01204846.

Dineen, K. A., & Hadwin, J. A. (2004). Anxious and depressive symptoms and children's judgements of their own and others' interpretation of ambiguous social scenarios. *Journal of Anxiety Disorders*, *18*(4), 499–513. doi:10.1016/S0887-6185(03)00030-6.

Field, A. P. (2006). Watch out for the beast: Fear information and attentional bias in children. *Journal of Clinical Child and Adolescent Psychology*, *35*(3), 431–439. doi:10.1207/s15374424jccp3503_8.

First, M. B., Spitzer, R. L., Gibbon, M., & Williams, J. B. W.(1996). *Structured Clinical Interview for DSM-IV Axis I Disorders - Patient Edition (SCID-I/P, Version 2.0)*. Biometrics Research Department, New York State Psychiatric Institute.

Forgas, J. P., Bower, G. H., & Krantz, S. E. (1984). The influence of mood on perceptions of social interactions. *Journal of Experimental Social Psychology*, *20*(6), 497–513. doi:10.1016/0022-1031(84)90040-4.

Gadow, K. D., Nolan, E. E., Sprafkin, J., & Schwartz, J. (2002). Tics and psychiatric comorbidity in children and adolescents. *Developmental Medicine and Child Neurology*, *44*(5), 330–338. doi:10.1017/S001216220100216X.

Goodman, S. H., & Gotlib, I. H. (1999). Risk for psychopathology in the children of depressed mothers: A developmental model for understanding mechanisms of transmission. *Psychological Review*, *106*(3), 458–490. doi:10.1037/0033-295X.106.3.458.

Goodman, S. H., & Gotlib, I. H. (2002). Transmission of risk to children of depressed parents: Integration and conclusions. In S. H. Goodman, & I. H. Gotlib (Eds.), *Children of depressed parents: Mechanisms of risk and implications for treatment* (pp. 307–326). Washington, DC, USA: American Psychological Association.

Gotlib, I. H., & Goodman, S. H. (1999). Children of parents with depression. In W. K. Silverman, & T. H. Ollendick (Eds.), *Developmental issues in the clinical treatment of children* (pp. 415–432). Needham Heights, MA, USA: Allyn & Bacon.

Gotlib, I. H., & Krasnoperova, E. (1998). Biased information processing as a vulnerability factor for depression. *Behavior Therapy. Special Issue: Behavior Therapy Development and Psychological Science*, *29*(4), 603–617.

Hadwin, J. A., Garner, M., & Perez-Olivas, G. (2006). The development of information processing biases in childhood anxiety: A review and exploration of its origins in parenting. *Clinical Psychology Review. Special Issue: Anxiety of childhood and adolescence: Challenges and opportunities*, *26*(7), 876–894.

Hammen, C., & Rudolph, K. D. (1996). Childhood depression. In E. J. Mash, & R. A. Barkley (Eds.), *Child psychopathology* (pp. 153–195). New York, NY, USA: Guilford.

Hand, D. D. (Writer) (1942). Bambi.

Hata, M. (Writer) (1999). Milo and Otis.

Hirsch, C., & Mathews, A. (1997). Interpretive inferences when reading about emotional events. *Behaviour Research and Therapy*, *35*(12), 1123–1132. doi:10.1016/S0005-7967(97)00069-7.

Jaenicke, C., Hammen, C., Zupan, B., Hiroto, D., Gordon, D., Adrian, C., et al. (1987). Cognitive vulnerability in children at risk for depression. *Journal of Abnormal Child Psychology*, *15*(4), 559–572. doi:10.1007/BF00917241.

Joormann, J., Talbot, L., & Gotlib, I. H. (2007). Biased processing of emotional information in girls at risk for depression. *Journal of Abnormal Psychology*, *116*(1), 135–143. doi:10.1037/0021-843X.116.1.135.

Kaufman, J., Birmaher, B., Brent, D., Rao, U., Flynn, C., Moreci, P., et al. (1997). Schedule for affective disorders and schizophrenia for school-age children—present and lifetime version (K-SADS-PL): Initial reliability and validity data. *Journal of the American Academy of Child and Adolescent Psychiatry*, *36*(7), 980–988. doi:10.1097/00004583-199707000-00021.

Kavanagh, D. J., & Bower, G. H. (1985). Mood and self-efficacy: Impact of joy and sadness on perceived capabilities. *Cognitive Therapy and Research*, *9*(5), 507–525. doi:10.1007/BF01173005.

Kazdin, A. E., French, N. H., & Unis, A. S. (1983). Child, mother, and father evaluations of depression in psychiatric inpatient children. *Journal of Abnormal Child Psychology*, *11*(2), 167–180. doi:10.1007/BF00912083.

Keppel, G., Saufley, W. H., & Tokunaga, H. (1992). *Introduction to design and analysis: A student's handbook* (2nd ed.). New York, NY: Freeman.

Kessler, R. C. (2002). Epidemiology of depression. In *Handbook of depression* (pp. 23–42). New York, NY: Guilford.

Kessler, R. C., Berglund, P., Demler, O., Jin, R., Koretz, D., Merikangas, K. R., et al. (2003). The epidemiology of major depressive disorder: Results from the National Comorbidity Survey Replication (NCS-R). *JAMA. Journal of the American Medical Association*, *289*(23), 3095–3105. doi:10.1001/jama.289.23.3095.

Kovacs, M. (1981). Rating scales to assess depression in school-aged children. *Acta Paedopsychiatrica: International Journal of Child and Adolescent Psychiatry*, *46*(5-sup-6), 305–315.

Kovacs, M. (1985). The Children's Depression Inventory (CDI). *Psychopharmacology Bulletin*, *21*, 995–1124.

Kovacs, M. (1992). *The Children's Depression Inventory manual*. New York, NY: Multi-Health Systems.

Lawson, C., & MacLeod, C. (1999). Depression and the interpretation of ambiguity. *Behaviour Research and Therapy*, *37*(5), 463–474. doi:10.1016/S0005-7967(98)00131-4.

Lawson, C., MacLeod, C., & Hammond, G. (2002). Interpretation revealed in the blink of an eye: Depressive bias in the resolution of ambiguity. *Journal of Abnormal Psychology*, *111*(2), 321–328. doi:10.1037/0021-843X.111.2.321.

Lewinsohn, P. M., Clarke, G. N., Seeley, J. R., & Rohde, P. (1994). Major depression in community adolescents: Age at onset, episode duration, and time to recurrence. *Journal of the American Academy of Child and Adolescent Psychiatry*, *33*(6), 809–818. doi:10.1097/00004583-199407000-00006.

Lewinsohn, P. M., Rohde, P., Seeley, J. R., Klein, D. N., & Gotlib, I. H. (2000). Natural course of adolescent major depressive disorder in a community sample: Predictors of recurrence in young adults. *The American Journal of Psychiatry*, *157*(10), 1584–1591. doi:10.1176/appi.ajp.157.10.1584.

MacLeod, C., & Cohen, I. L. (1993). Anxiety and the interpretation of ambiguity: A text comprehension study. *Journal of Abnormal Psychology*, *102*(2), 238–247. doi:10.1037/0021-843X.102.2.238.

MacLeod, C., & Mathews, A. M. (1991). Cognitive-experimental approaches to the emotional disorders. In *Handbook of behavior therapy and psychological science: An integrative approach* (pp. 116–150). Elmsford, NY: Pergamon.

March, J. S. (1997). *Multidimensional Anxiety Scale for Children: Technical manual*. Toronto, ON: Multi-Health Systems.

March, J. S., Parker, J. D. A., Sullivan, K., Stallings, P., & Connors, C. K. (1997). The Multidimensional Anxiety Scale for Children (MASC): Factor structure, reliability, and validity. *Journal of the American Academy of Child and Adolescent Psychiatry*, *36*(4), 554–565. doi:10.1097/00004583-199704000-00019.

Mathews, A., & Mackintosh, B. (2000). Induced emotional interpretation bias and anxiety. *Journal of Abnormal Psychology*, *109*(4), 602–615. doi:10.1037/0021-843X.109.4.602.

Mogg, K., Bradbury, K. E., & Bradley, B. P. (2006). Interpretation of ambiguous information in clinical depression. *Behaviour Research and Therapy*, *44*(10), 1411–1419. doi:10.1016/j.brat.2005.10.008.

Moradi, A. R., Neshat-Doost, H. T., Taghavi, R., Yule, W., & Dalgleish, T. (1999). Performance of children of adults with PTSD on the Stroop color-naming task: A preliminary study. *Journal of Traumatic Stress*, *12*(4), 663–671. doi:10.1023/A:1024721218869.

Nolen-Hoeksema, S., Girgus, J. S., & Seligman, M. E. (1986). Learned helplessness in children: A longitudinal study of depression, achievement, and explanatory style. *Journal of Personality and Social Psychology*, *51*(2), 435–442. doi:10.1037/0022-3514.51.2.435.

Nolen-Hoeksema, S., Girgus, J. S., & Seligman, M. E. (1992). Predictors and consequences of childhood depressive symptoms: A 5-year longitudinal study. *Journal of Abnormal Psychology*, *101*(3), 405–422. doi:10.1037/0021-843X.101.3.405.

Nunn, J. D., Matthews, A., & Trower, P. (1997). Selective processing of concern-related information in depression. *The British Journal of Clinical Psychology*, *36*(4), 489–503.

Pine, D. S., Klein, R. G., Mannuzza, S., Moulton III, J. L., Lissek, S., Guardino, M., et al. (2005). Face-Emotion Processing in Offspring at Risk for Panic Disorder. *Journal of the American Academy of Child and Adolescent Psychiatry*, *44*(7), 664–672. doi:10.1097/01.chi.0000162580.92029.f4.

Rao, U., Hammen, C., & Daley, S. E. (1999). Continuity of depression during the transition to adulthood: A 5-year longitudinal study of young women. *Journal of the American Academy of Child and Adolescent Psychiatry*, *38*(7), 908–915. doi:10.1097/00004583-199907000-00022.

Scher, C. D., Ingram, R. E., & Segal, Z. V. (2005). Cognitive reactivity and vulnerability: Empirical evaluation of construct activation and cognitive diatheses in unipolar depression. *Clinical Psychology Review*, *25*(4), 487–510. doi:10.1016/j.cpr.2005.01.005.

Skre, I., Onstad, S., Torgersen, S., & Kringlen, E. (1991). High interrater reliability for the Structured Clinical Interview for DSM-III–R Axis I (SCID-I). *Acta Psychiatrica Scandinavica*, *84*(2), 167–173. doi:10.1111/j.1600-0447.1991.tb03123.x.

Stewart, W. F., Ricci, J. A., Chee, E., Hahn, S. R., & Morganstein, D. (2003). Cost of lost productive work time among US workers with depression. *JAMA. Journal of the American Medical Association*, *289*(23), 3135–3144. doi:10.1001/jama.289.23.3135.

Taylor, L., & Ingram, R. E. (1999). Cognitive reactivity and depressotypic information processing in children of depressed mothers. *Journal of Abnormal Psychology*, *108*(2), 202–210. doi:10.1037/0021-843X.108.2.202.

Turner, J. E., & Cole, D. A. (1994). Development differences in cognitive diatheses for child depression. *Journal of Abnormal Child Psychology*, *22*(1), 15–32. doi:10.1007/BF02169254.

Wechsler, D. (1991). *Wechsler Intelligence Scale for Children-III*. San Antonio, TX: The Psychological Corporation.

Weissman, M. M., Wickramaratne, P., Nomura, Y., Warner, V., Pilowsky, D., & Verdeli, H. (2006). Offspring of Depressed Parents: 20 Years Later. *The American Journal of Psychiatry*, *163*(6), 1001–1008. doi:10.1176/appi.ajp.163.6.1001.

Westermann, R., Spies, K., Stahl, G., & Hesse, F. W. (1996). Relative effectiveness and validity of mood induction procedures: A meta-analysis. *European Journal of Social Psychology*, *26*(4), 557–580. doi:10.1002/(SICI)1099-0992(199607)26:4<557::AID-EJSP769>3.0.CO;2-4.

Williams, J. B., Gibbon, M., First, M. B., Spitzer, R. L., Davies, M., Borus, J., et al. (1992). The Structured Clinical Interview for DSM-III–R (SCID): II. Multisite testetest reliability. *Archives of General Psychiatry*, *49*(8), 630–636.

Williams, J. M. G., Watts, F. N., MacLeod, C., & Mathews, A. (1997). *Cognitive psychology and emotional disorders* (2nd ed.). Oxford, England: Wiley.

Zefirelli, F. (Writer) (1979). The Champ.