

Gibb, B.E., & Coles, M.E. (2005). Cognitive vulnerability-stress models of psychopathology: A developmental perspective. In B.L. Hankin & J.R.Z. Abela (Eds.), *Development of psychopathology: A vulnerability-stress perspective* (pp. 104-135). Thousand Oaks, CA: Sage.

CHAPTER 5

Cognitive Vulnerability-Stress Models of Psychopathology

A Developmental Perspective

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Since their introduction, cognitive vulnerability-stress theories of psychopathology (e.g., Abramson, Seligman, & Teasdale, 1978; Beck, 1967; Dodge, 1986; Williams, Watts, MacLeod, & Mathews, 1988) have spurred an enormous amount of research. These theories share the general hypothesis that one's characteristic way of attending to, interpreting, and remembering negative events contributes vulnerability to the development of psychopathology in the presence of negative life events. In this chapter, we focus on biases in attention and interpretation, given the relative paucity of research examining memory biases as vulnerability factors (for recent reviews of the role of memory in psychopathology, see Clark, Beck, & Alford, 1999; Coles & Heimberg, 2002; Gotlib & Neubauer, 2000). Specifically, we review studies evaluating whether these biases, both alone and interacting with the occurrence of negative

life events, contribute to the development of three specific types of psychopathology: depression, anxiety, and aggression. In doing so, we first review the relevant theoretical models and discuss studies testing their vulnerability hypotheses. Next, we discuss the role of development, in terms of both its impact upon the development of cognitive vulnerability itself and upon the proposed vulnerability-stress interactions. Throughout this chapter, we discuss the cognitive vulnerability-stress theories from a developmental psychopathology perspective, emphasizing prospective, longitudinal studies. To facilitate exploration of developmental differences, we have specified the ages of participants included in the studies reviewed whenever possible. Although this can be cumbersome at times, we want to emphasize any potential differences between studies that may be due to developmental factors.

DEFINITION OF COGNITIVE VULNERABILITIES

Depression

Cognitive vulnerability to depression has generally been defined as biased processing of information reflecting themes of loss and failure (see, e.g., Clark et al., 1999). For example, in the theory of Beck and colleagues (Beck, 1967, 1987; Clark et al.), cognitive vulnerability to depression is defined by the presence of maladaptive self-schemata reflecting themes of helplessness and unlovability that become activated by schema-congruent negative life events or negative moods. Although early statements of the theory (e.g., Beck, 1967) focused on the presence of dysfunctional attitudes as representations of these negative self-schemata, more recent statements (e.g., Beck, 1987; Clark et al.) have focused on sociotropy and autonomy, cognitive-personality types that are hypothesized to confer vulnerability to depression following negative events in the interpersonal and achievement domains, respectively (for a similar theory regarding the personality styles of dependency and self-criticism, see Blatt, 1974, 2004). Despite the shift in emphasis from dysfunctional attitudes to sociotropy and autonomy, Beck has been consistent in proposing that once activated, these schemata contribute to the expression of biases in attention, interpretation, and memory. Specifically, Beck has proposed that individuals who are cognitively vulnerable to depression will exhibit negative interpretation biases as well as preferential attention and memory for depression-relevant stimuli (i.e., stimuli reflecting themes of helplessness, unlovability, etc.).

Further elaborating the role of attentional biases in depression, Nolen-Hoeksema (1987, 1991) suggested that depression-prone individuals might be characterized by a specific form of attentional bias—rumination—which has been described as perseverative self-focused

attention. Specifically, Nolen-Hoeksema (1987, 1991) proposed that individuals who tend to ruminate in response to initial dysphoric moods (e.g., focusing on how bad one feels and the implications or consequences of negative moods) would develop a more severe and longer-lasting depression. In contrast, individuals who tend to distract themselves from dysphoric moods (e.g., through pleasant activities) are hypothesized to recover from dysphoric moods more quickly.

Finally, in the reformulated theory of learned helplessness (Abramson et al., 1978) and its more recent incarnation, the hopelessness theory of depression (Abramson, Metalsky, & Alloy, 1989), cognitive vulnerability is defined as a specific type of interpretation bias—attributions for the causes of negative events. In revising the original theory of learned helplessness (see Maier & Seligman, 1976), Abramson et al. (1978) sought to explain why only some individuals become depressed following the occurrence of negative life events. Abramson and colleagues (1978) proposed that a tendency to attribute negative events to internal, stable, and global causes (negative attributional style) would contribute vulnerability to the development of depression following the occurrence of negative life events. In further refining the theory, Abramson et al. (1989) de-emphasized the internality dimension of causal attributions and introduced components for the negative consequences and self-characteristics inferred from the occurrence of negative life events. Therefore, in the hopelessness theory, cognitive vulnerability (negative inferential style) is defined as the tendency to attribute negative events to stable, global causes and to infer negative consequences and negative self-characteristics following the events' occurrence. In both the reformulated theory of learned helplessness and the hopelessness theory, these cognitive

vulnerabilities (negative attributional and inferential styles) are hypothesized to contribute vulnerability to depression in the presence, but not absence, of negative life events.

Anxiety

Cognitive models of anxiety also emphasize attention and interpretation biases as vulnerability factors. For example, Beck, Emery, and Greenberg (1985) defined vulnerability to anxiety in terms of the presence of schemata reflecting themes of threat or danger. Specifically, Beck et al. proposed that individuals who are cognitively vulnerable to anxiety would exhibit preferential attention and memory, as well as schema-congruent interpretation biases, for anxiety-relevant stimuli (i.e., stimuli reflecting themes of threat or danger). Beck et al. further hypothesized specificity in terms of the content of the information-processing biases related to each anxiety disorder. For example, individuals vulnerable to panic are hypothesized to exhibit preferential attention to physiological symptoms and interpretation biases characterized by catastrophic misinterpretation of these bodily sensations.

Building upon Beck's theory, Riskind and colleagues (e.g., Riskind, 1997; Riskind & Williams, *in press*; Riskind, Williams, Gessner, Chrosniak, & Cortina, 2000) have provided detailed hypotheses regarding the type of schema likely to contribute vulnerability to anxiety, which they have termed the *looming maladaptive style*. Whereas earlier models of anxiety (e.g., Beck et al., 1985) focused on static perceptions of threat, Riskind and colleagues proposed that cognitive vulnerability to anxiety may be best characterized as a cognitive style reflecting dynamic perceptions of rapidly escalating threat. The looming maladaptive style, therefore, is hypothesized to give rise not only to attentional biases for threat-relevant information, but also to interpretation biases of threat-relevant stimuli as rapidly approaching and

accelerating in their approach, which then increase the perceived probability and cost of the threat. These attention and interpretation biases are hypothesized to mediate the link between the looming maladaptive style and both the development and maintenance of anxiety (see Riskind; Riskind & Williams). Although the looming maladaptive style has been proposed as a cognitive vulnerability common to all anxiety disorders, Riskind hypothesized that vulnerability to each anxiety disorder would be characterized by a unique cognitive content (e.g., perceptions of rapidly spreading germs among individuals vulnerable to obsessive-compulsive disorder).

In a third cognitive model of anxiety, Williams and colleagues (Williams et al., 1988; Williams, Watts, MacLeod, & Mathews, 1997) built upon Beck's theory by integrating it with network theories of human information processing (Bower, 1981). In doing so, they distinguished between strategic and automatic stages of information processing. Thus, for example, rather than proposing general attentional biases toward threat-relevant information, Williams et al. (1988, 1997) hypothesized that cognitive vulnerability to anxiety may be characterized by an automatic initial attentional bias toward threatening stimuli, followed by a rapid attentional shift away from the stimuli, which would limit further strategic processing of the threat. In addition to the interpretation biases proposed by Beck et al. (1985), this vigilance-avoidance pattern of attentional bias is hypothesized to contribute to the development of anxiety in the presence of threat-relevant stimuli (Mathews & MacLeod, 2002).

Finally, Chorpita and Barlow (1998) proposed that a specific form of interpretation bias—low perceived control—may contribute vulnerability to the development of anxiety. Specifically, providing a vulnerability-stress framework for understanding the development of anxiety, Chorpita and Barlow suggested that it is not merely the occurrence of

negative events that contributes vulnerability to the development of anxiety, but rather the person's characteristic tendency to interpret these events as uncontrollable. In contrast to the other theories, however, Chorpita and Barlow hypothesized that low perceived control may contribute to the development of depression as well as anxiety. Specifically, citing Alloy, Kelly, Mineka, and Clements (1990), Chorpita and Barlow suggested that perceptions of low control over desired outcomes may initially contribute to anxiety, but as the individuals' perceptions of control diminish into a sense of hopelessness regarding the occurrence of desired outcomes, anxiety will give way to depression (cf. Bowlby, 1973, 1980).

Aggression

Cognitive models of aggression and externalizing disorders focus on information-processing biases associated with perceived attacks or transgressions (e.g., Beck, 1976). The most well-researched cognitive model of aggression and externalizing disorders (e.g., conduct disorder) is Dodge's (1986, 1993; Crick & Dodge, 1994) social information-processing model. This model is also relatively unique in that it is one of the few cognitive vulnerability-stress models of psychopathology developed specifically for children and adolescents rather than being a downward extension of a theory developed for adults. In this model, Crick and Dodge proposed that the occurrence of negative life events (e.g., rejection) activates a series of cognitive processes: (a) encoding and (b) interpretation of event cues; (c) selection of a desired outcome for the situation; (d) generation of possible responses based upon past experience; and (e) selection of a response, followed by a behavioral reaction. These processes are hypothesized to operate in a continuous cycle (with feedback loops), interacting at each step with the child's memory and social schemata. In this model, cognitively vulnerable

individuals are hypothesized to exhibit biased attention to, and encoding of, hostile situation cues; a hostile attributional bias for these situations (tendency to attribute hostile intent to the others' behavior); preferential generation of aggressive responses to the event; and a tendency to anticipate positive outcomes for aggressive behavior (thereby making them more likely to choose an aggressive response). Dodge (1991; Dodge, Lochman, Harnish, Bates, & Pettit, 1997) has also hypothesized specific processing biases thought to differentiate reactive from proactive aggression. Specifically, reactive forms of aggression are hypothesized to be most strongly related to biases in attention, encoding, interpretation, and generation of possible responses, whereas proactive aggression is hypothesized to be most strongly associated with the tendency to anticipate positive outcomes of aggression.

Conclusions

In summary, information-processing biases in depression, anxiety, and aggression are hypothesized to center on themes of helplessness and loss, perceived threat or danger, and perceptions of being attacked or wronged, respectively (Beck, 1976; Beck et al., 1985; Clark et al., 1999). Each of the models proposes similar cognitive processes (e.g., attention and interpretation biases) that confer vulnerability to psychopathology. The key differences are the stimuli that elicit these information-processing biases as well as the specific cognitive content of each vulnerability factor. It should be kept in mind that each of the theories reviewed presents cognitive vulnerability-stress models for the development of psychopathology. That is, individuals hypothesized to be at highest risk for developing the disorder are those exhibiting the respective cognitive vulnerability who also experience corresponding forms of negative life events. We now turn

to a review of studies evaluating each of the models' vulnerability hypotheses.

EVIDENCE FOR THE COGNITIVE VULNERABILITY-STRESS MODELS OF PSYCHOPATHOLOGY

Depression

By far, the largest number of studies examining cognitive models of psychopathology has focused on depression. A variety of study designs have been used to evaluate the cognitive models of depression, including cross-sectional, retrospective, and remitted depression designs (for reviews, see Abramson et al., 2002; Clark et al., 1999; Gladstone & Kaslow, 1995; Gotlib & Neubauer, 2000; Haaga, Dyck, & Ernst, 1991; Ingram, Miranda, & Segal, 1998; Joiner & Wagner, 1995; Peterson & Seligman, 1984; Sweeney, Anderson, & Bailey, 1986). However, none of these three study designs allows an adequate test of the vulnerability-stress hypothesis, because they cannot determine whether the cognitive vulnerability temporally preceded the onset of depression (for a discussion of other limitations of remitted depression designs, see Just, Abramson, & Alloy, 2001). In this section, therefore, we will focus on results from prospective longitudinal studies, which provide the most powerful test of the cognitive theories' vulnerability-stress hypotheses.

Schemata

Prospective studies have provided mixed support for Beck's (1967, 1987; Clark et al., 1999) hypothesis that depressive schemata (as evidenced by dysfunctional attitudes, sociotropy, and autonomy) interact with negative life events to predict the development and maintenance of depression. Specifically, although the majority of prospective studies have supported the hypothesis that dysfunctional attitudes moderate the relation between

negative life events and the development of both symptoms and diagnoses of depression (e.g., Brown, Hammen, Craske, & Wickens, 1995; Hankin, Abramson, Miller, & Haefel, 2004; Joiner, Metalsky, Lew, & Klocek, 1999; Kwon & Oei, 1992; Lewinsohn, Joiner, & Rohde, 2001; Reilly-Harrington, Alloy, Fresco, & Whitehouse, 1999), other studies found only mixed support (e.g., Abela & D'Allesandro, 2002; Abela & Sullivan, 2003; Dykman & Johll, 1998; Voyer & Cappeliez, 2002), and some have provided no support (e.g., Alloy, Reilly-Harrington, Fresco, Whitehouse, & Zechmeister, 1999; Barnett & Gotlib, 1988, 1990; Kuiper & Dance, 1994).

Similar results have been found in studies examining sociotropy/dependency and autonomy/self-criticism. Specifically, the majority of prospective studies have provided either full (e.g., Fresco, Sampson, Craighead, & Koons, 2001; Hammen, Ellicott, & Gitlin, 1989; Hammen & Goodman-Brown, 1990; Robins, Hayes, Block, Kramer, & Villena, 1995) or partial (e.g., Abela & Taylor, 2003; Hammen, Marks, Mayol, & deMayo, 1985; Little & Garber, 2000; Shahar, Joiner, Zuroff, & Blatt, 2004) support for the moderating role of these vulnerability factors in the development of depression (but see also Hammen, Marks, deMayo, & Mayol, 1985; Shahar, Blatt, Zuroff, Kuperminc, & Leadbeater, 2004). In terms of Beck's (1987; Clark et al., 1999) and Blatt's (1974, 2004) event congruency hypothesis, there is some evidence that sociotropy/dependency confers vulnerability to depression following interpersonal but not achievement events, whereas autonomy/self-criticism follows the opposite pattern (Abela & Taylor; Brown et al., 1995; Hammen et al., 1989; Hammen & Goodman-Brown; Hammen, Marks, Mayol, et al.; but see also Dykman & Johll, 1998; Little & Garber; Voyer & Cappeliez, 2002). In contrast, however, some studies have found that both forms of vulnerability interacted with

both interpersonal and achievement events or with schema-noncongruent events to predict depressive symptom changes (e.g., Fresco et al.; Robins et al.).

A number of points should be made about these studies. The most notable is that there are few prospective longitudinal studies examining the schema vulnerability-stress hypothesis, particularly among children and adolescents. Despite the relatively small number of studies conducted in younger samples, these studies have provided preliminary support for the vulnerability-stress hypothesis. Given the developmental focus of this chapter, however, we should also note that there is some evidence for age-related differences in the findings. Specifically, of the four prospective studies we found in relatively younger samples (i.e., children in elementary or middle school) one study found unequivocal support for the vulnerability-stress hypothesis (Hammen & Goodman-Brown, 1990), one found no support (Shahar, Blatt, et al., 2004), and the remainder found mixed support.¹ In contrast, among studies including older participants, we found 11 providing full support (Brown et al., 1995; Fresco et al., 2001; Hammen et al., 1989; Hammen, Marks, Mayol, et al., 1985; Hankin et al., 2004, studies 1, 2, and 3; Joiner et al., 1999; Kwon & Oei, 1992; Reilly-Harrington et al., 1999; Robins et al., 1995) compared with only 6 providing no support (Alloy et al., 1999; Barnett & Gotlib, 1988, 1990; Hammen, Marks, deMayo, et al., 1985; Kuiper & Dance, 1994; Lewinsohn et al., 2001). Despite this general pattern, however, there is variability in the observed results across all age groups. Given Beck's hypothesis that schemata remain latent until primed by a negative event or negative mood, it is possible that some of the nonsignificant results were due to a failure to activate the schema prior to the assessment. This possibility must remain speculative, however, because we are aware

of no prospective studies to directly compare the predictive ability of primed versus unprimed schema in the development of depression (but see Abela & Brozina, 2004; Abela, Brozina, & Seligman, 2004; and Beevers & Carver, 2003, for priming studies of interpretation and attentional biases).

Interpretation Biases

Studies focusing more specifically on the role of interpretation biases have also provided tentative support for the hypothesis that they moderate the relation between negative life events and the development of depressive symptoms. One group of these studies has focused on children's perceptions of their competence in a variety of domains and has suggested that negative self-perceptions of competence contribute to the development of depressive symptoms (Cole, Martin, & Powers, 1997; Hoffman, Cole, Martin, Tram, & Seroczynski, 2000; Tram & Cole, 2000; but see also McGrath & Repetti, 2002). However, it appears that perceptions of competence may mediate rather than moderate the link between negative life events and the development of depressive symptoms (Tram & Cole).

There is also evidence that attributional/inferential styles moderate the link between negative life events and the development of depressive symptoms. These studies are fairly evenly split, however, between those providing full support for the vulnerability-stress hypothesis (Alloy & Clemons, 1998; Alloy et al., 1999; Hankin et al., 2004; Hilsman & Garber, 1995; Joiner, 2000; Metalsky, Halberstadt, & Abramson, 1987; Metalsky & Joiner, 1992, 1997; Needles & Abramson, 1990; Reilly-Harrington et al., 1999) and those providing partial support (Abela, 2001, 2002; Abela & Brozina, 2004; Abela et al., 2004; Abela & Payne, 2003; Abela & Sarin, 2002; Abela & Seligman, 2000; Alloy, Just, & Panzarella, 1997; Conley,

Haines, Hilt, & Metalsky, 2001; Dixon & Ahrens, 1992; Hankin, Abramson, & Siler, 2001; Houston, 1995a, 1995b; Hunsley, 1989; Metalsky, Joiner, Hardin, & Abramson, 1993; Nolen-Hoeksema, Girgus, & Seligman, 1986, 1992; Panak & Garber, 1992; Priester & Clum, 1992; Prinstein & Aikins, 2004; N. S. Robinson, Garber, & Hilsman, 1995). There are also some studies, however, that have failed to support the vulnerability-stress hypothesis entirely (Bennett & Bates, 1995; Follette & Jacobson, 1987; Hammen, Adrian, & Hiroto, 1988; Lewinsohn et al., 2001; Ralph & Mineka, 1998; Spence, Sheffield, & Donovan, 2002; Swendsen, 1997).

Similar to studies examining depressive schemata, there is some evidence that the predictive ability of the attributional/inferential vulnerability-stress interaction may be stronger among adults compared with children. Specifically, whereas we found only two studies with younger participants (i.e., elementary or middle school-aged children) that fully supported the attributional/inferential vulnerability-stress hypothesis (Hilsman & Garber, 1995; Joiner, 2000), three others provided no support (Bennett & Bates, 1995; Hammen et al., 1988; Spence et al., 2002). In contrast, we found 10 studies among adults supporting the vulnerability-stress hypothesis (Alloy & Clements, 1998; Alloy et al., 1999; Hankin et al., 2004, studies 1, 2, and 3; Metalsky et al., 1987; Metalsky & Joiner, 1992, 1997; Needles & Abramson, 1990; Reilly-Harrington et al., 1999), compared to only 4 providing no support (Follette & Jacobson, 1987; Lewinsohn et al., 2001; Ralph & Mineka, 1998; Swendsen, 1997). Further support for age-related differences comes from a 5-year longitudinal study of third and fourth graders in which life events and depressive symptoms were assessed every 6 months (Nolen-Hoeksema et al., 1992). In this study, the attributional vulnerability-stress interaction significantly predicted

depressive symptom changes at four of the last five follow-ups, but none of the first four follow-ups. Although far from conclusive, these studies provide some evidence that the predictive ability of the attributional/inferential vulnerability-stress interaction may increase with age.

There is also some evidence that the mixed results obtained in studies examining the attributional/inferential vulnerability-stress hypothesis may be due, at least in part, to variations in levels of self-esteem among the participants. Specifically, there is a growing body of research suggesting that levels of self-esteem may moderate the attributional/inferential vulnerability-stress interaction in predicting changes in depressive symptoms (Abela, 2002; Abela & Payne, 2003; Conley et al., 2001; Metalsky et al., 1993; Ralph & Mineka, 1998; N. S. Robinson et al., 1995). That is, individuals at highest risk for developing depression may be those with negative attributional/inferential styles combined with high levels of negative life events *and* low levels of self-esteem. It should also be noted that these findings have been consistently obtained in children and adults. Future studies are needed to determine whether there is something unique about self-esteem or whether the presence of any number of cognitive vulnerabilities may augment the predictive ability of the attributional/inferential vulnerability-stress interaction.

Complementing the results of studies examining the development of depressive symptoms, there is also research supporting the cognitive models in predicting the onset of depressive disorders. For example, individuals in the Temple-Wisconsin Cognitive Vulnerability to Depression (CVD) Project (Alloy & Abramson, 1999) at high cognitive risk for depression as defined by *both* Beck's (1967, 1987) theory and the hopelessness theory (Abramson et al., 1989) were more likely to exhibit first onsets as well as recurrences of major depression over a 2- to 5-year

follow-up than were those at low cognitive risk (Alloy et al., 2000, 2004). Further, these results were maintained even after statistically controlling for participants' initial depressive symptom levels. Because analyses of CVD Project data, to date, have been limited to the main effects of cognitive risk status, however, they have not yet provided a full test of the cognitive theories' vulnerability-stress hypothesis. Indeed, we were able to find only two published prospective studies examining the hypothesis that attributional/inferential styles moderate the relation between negative life events and the onset of depressive disorders (Hankin et al., 2004; Lewinsohn et al., 2001). Although both studies found support for the vulnerability-stress hypothesis, they obtained different patterns for the interaction. Consistent with the cognitive theories of depression (e.g., Abramson et al., 1989), Hankin et al. (2004) found that inferential styles were most strongly related to the onset of depressive disorders (major depression or dysthymia) among undergraduates reporting relatively *high*, compared to low, levels of negative life events during a 2-year follow-up. Contrary to predictions, however, Lewinsohn et al. (2001) found that attributional styles were most strongly related to the onset and recurrence of major depression over a 14-month follow-up among adolescents reporting relatively *low*, rather than high, levels of negative life events during the follow-up.² Despite this latter unexpected result, there is a growing body of research suggesting that negative attributional/inferential styles moderate the relation between negative life events and the development of both depressive symptoms and diagnoses.

Attention Biases

Studies have also supported the hypothesis that attentional biases may contribute vulnerability to depression. For example, there

is increasing evidence that rumination (i.e., self-focused perseverative attention) contributes vulnerability to both the development and maintenance of depression. Although the majority of these studies have focused on adult samples (e.g., Just & Alloy, 1997; Nolen-Hoeksema, 2000; Nolen-Hoeksema & Morrow, 1991; Nolen-Hoeksema, Morrow, & Fredrickson, 1993; Spasojevic & Alloy, 2001; but see also Lara, Klein, & Kasch, 2000), there is also preliminary evidence that rumination contributes vulnerability to depression in adolescents (Schwartz & Koenig, 1996) and children (Abela, Brozina, & Haigh, 2002; Abela, Vanderbilt, & Rochon, 2004) as well.

A limitation of each of the studies discussed thus far is that the assessment of cognitive vulnerability (both interpretation and attentional biases) was based upon participants' self-report. The problem with this is the reliance upon participants' awareness of their depressive cognitions, many of which are hypothesized to operate outside the person's awareness (particularly attentional biases; Gotlib & Neubauer, 2000). Given this, relatively recent research has focused on measures of attentional bias that do not rely on participants' conscious report of the process. A common paradigm for measuring attentional biases is the dot-probe task (MacLeod, Mathews, & Tata, 1986), in which participants' reaction times to identify probes (e.g., dots) following emotional versus neutral stimuli (e.g., words or faces) are measured (see Gotlib & Neubauer, 2000, for a review). Results from dot-probe studies of attention mirror results found in studies using self-report methods to examine cognitive vulnerability to depression. Specifically, studies of adults using dot-probe tasks have generally found that depressed individuals exhibit preferential attention to depression-relevant information compared to neutral information (Bradley, Mogg, & Lee, 1997; Gotlib, Krasnoperova, Yue, & Joorman,

2004; Mathews, Ridgeway, & Williamson, 1996; Westra & Kuiper, 1997; but see also Hill & Dutton, 1989; MacLeod et al., 1986). However, this relationship has not been observed in children (Neshat-Doost, Moradi, Taghavi, Yule, & Dalgleish, 2000).

Despite the strengths of studies employing the dot-probe paradigm to examine attentional biases, the majority have been limited by their cross-sectional design and by the fact that they have not considered the potential effects of negative life events. Therefore, they do not address the hypothesis that attentional biases will interact with the experience of negative life events to predict the development of depression. To our knowledge, only one study has prospectively examined whether attentional biases to depression-relevant material assessed using reaction times interact with negative life events to predict changes in depressive symptoms (Beavers & Carver, 2003). In this study, initially nondepressed undergraduates' attentional biases were assessed before and after a mood induction using the dot-probe task (with depression-relevant vs. neutral words as the stimuli). Consistent with Beck's (1967, 1987; Clark et al., 1999) theory, attentional biases assessed following, but not prior to, the mood induction interacted with levels of negative life events reported over a 1-week follow-up to predict changes in depressive symptom levels over this time (even after statistically controlling for pre-mood induction attentional bias scores). Thus, in contrast to the hypothesis of Williams et al. (1988, 1997), there is some evidence that attentional biases may contribute vulnerability to depression in the presence of negative life events.

Anxiety

In contrast to studies of depression, prospective cognitive vulnerability-stress studies examining the development of anxiety are rare. In addition, the majority of work has examined either the impact of the cognitive vulnerability or stress, separately,

with few studies looking at their interaction. However, the data that do exist are largely consistent with cognitive conceptualizations of vulnerability to anxiety.

Schemata

Studies examining the looming vulnerability model of anxiety (Riskind et al., 2000) have provided fairly consistent support for its role in anxiety. Specifically, these studies have suggested that the looming maladaptive style is distinct from other anxious cognitions (e.g., anxiety sensitivity and worry) and that it is related specifically to anxiety, rather than depression (for a review, see Riskind & Williams, in press). In addition, there is evidence that a looming maladaptive style prospectively predicts the development of anxiety (Riskind et al.). Supporting its role as a danger schema, there is also evidence that it may contribute to the expression of anxiety-related attentional and interpretation processing biases (Riskind & Williams; Riskind et al.)

Interpretation Biases

Studies have also supported the role of interpretation biases in anxiety. For example, retrospective studies have supported the link between low perceived control and the presence of both symptoms and diagnoses of posttraumatic stress disorder (PTSD) following traumatic experiences (i.e., war-related traumas and motor vehicle accidents; Ginzburg, Solomon, Dekel, & Neria, 2003; Hickling, Blanchard, Buckley, & Taylor, 1999). There is also evidence from prospective longitudinal studies that cognitive appraisals of traumatic events, and one's responses to the trauma, prospectively predict changes in PTSD symptoms over time (Dunmore, Clark, & Ehlers, 2001). Finally, there is a relatively large body of research indicating that the tendency to interpret physical symptoms as threatening (i.e., anxiety sensitivity) prospectively

predicts subsequent panic attacks (Hayward, Killen, Kraemer, & Taylor, 2000; Maller & Reiss, 1992; Schmidt & Lerew, 2002; Schmidt, Lerew, & Jackson, 1997). Indeed, Schmidt and colleagues (1997) found that anxiety sensitivity uniquely predicted the development of panic symptoms, over trait anxiety, during a period of heightened stress (military basic training).

A final line of evidence supporting the role of interpretation biases in the development and maintenance of anxiety comes from studies in which these processing biases are induced. In these studies, computerized experimental paradigms are used to induce interpretation biases by requiring the participant to repeatedly make threatening interpretations of ambiguous stimuli. Researchers have found that these experimentally induced interpretation biases predict subsequent responses to stress such that participants with the induced biases for threat exhibited greater anxiety following stress than did participants induced to make benign interpretations (Mathews & Mackintosh, 2000; Mathews & MacLeod, 2002).

Attentional Biases

Studies supporting the role of attentional biases in anxiety have primarily been cross-sectional in design. Despite the limitations of cross-sectional designs, these studies have consistently shown that both adults and children with either elevated anxiety symptom levels or diagnosed anxiety disorders exhibit preferential attention to threat-relevant stimuli compared with nonanxious controls (for reviews, see Vasey & MacLeod, 2001; Williams et al., 1997). In addition, paralleling the findings from induced interpretation biases, participants in whom attentional biases for threat have been induced exhibit heightened anxious responses to subsequent stress compared with participants trained to attend to neutral stimuli (MacLeod, Rutherford, Campbell, Ebsworthy, & Holker, 2002; Mathews & MacLeod, 2002). Finally, studies have also provided

preliminary evidence that attentional biases for threat-relevant information predict changes in anxiety from before to after the occurrence of negative life events (MacLeod & Hagan, 1992; Verhaak, Smeenk, van Minnen, & Kraaimaat, 2004).

Aggression

Studies have also provided consistent support for Dodge's (1986, 1993; Crick & Dodge, 1994) social information-processing model of aggression and externalizing disorders (for reviews, see Crick & Dodge; Yoon, Hughes, Gaur, & Thompson, 1999). Although the majority of these studies have been cross-sectional comparisons of aggressive and nonaggressive children's information processing, there is also some evidence that these social information-processing biases (e.g., hostile attributional biases) prospectively predict the development of aggression (e.g., Dodge, Pettit, Bates, & Valente, 1995). Studies have also supported Dodge's (1991) hypothesis that reactive forms of aggression would be most strongly related to biases hypothesized to occur in earlier stages of information processing, whereas proactive aggression would be related to later-stage processing biases. Specifically, as hypothesized, it appears that reactive aggression is more strongly related to biases in attending to, encoding, and interpreting event cues, whereas proactive aggression is more strongly related to the tendency to predict positive outcomes for aggressive responses (for reviews, see Crick & Dodge; Dodge, 1993; see also Crick & Dodge, 1996; Dodge et al., 1997).

Conclusions

In summary, studies have generally supported the cognitive vulnerability-stress models of depression, anxiety, and aggression. Despite this, however, there are some notable gaps in the literature. First, few studies have provided prospective tests of the cognitive

models of anxiety and aggression, and even fewer studies have tested the vulnerability-stress hypotheses. Second, although Beck (1967, 1987; Clark et al., 1999) proposed that schemata remain latent until primed by a negative mood or negative life event, few studies have examined this hypothesis. Among studies of cognitive vulnerability to depression, however, there is some evidence that cognitive vulnerabilities assessed after a priming procedure (e.g., mood induction) exhibit greater predictive utility than do assessments of the cognitive style prior to the priming (e.g., Abela & Brozina, 2004; Abela et al., 2004; Beevers & Carver, 2003). Some of the mixed results reviewed, therefore, may have been due, at least in part, to variations in the degree to which participants' cognitive styles were naturally primed during their participation. Given the small number of prospective studies to test the priming hypothesis, however, this possibility remains speculative and should be explored in future studies. Third, there are relatively few prospective evaluations of the cognitive theories in children. The only exceptions to this are studies testing Dodge's (1986, 1993; Crick & Dodge, 1994) social information-processing model and studies testing the reformulated learned helplessness and hopelessness models of depression (Abramson et al., 1978, 1989). Prospective studies of the helplessness/hopelessness theories in children have provided less consistent support for the vulnerability-stress hypotheses than have studies of adults. Possible reasons for this pattern of findings among children will be discussed below (see section on "Developmental Differences in the Expression of the Vulnerability-Stress Relation").

DEVELOPMENT OF COGNITIONS IN CHILDREN

A limitation of many of the cognitive vulnerability-stress models of psychopathology is

that they were developed for adults (Dodge's [1986, 1993; Crick & Dodge, 1994] social information-processing model of aggression is a notable exception). Although this in itself is not a problem, many of these models have been applied to the development of childhood psychopathology without a thorough consideration of the potential need for revisions to the theory. It is likely, however, that many of the vulnerabilities featured in the cognitive models develop over time as a function of both the accumulation of experience as well as increasing cognitive capacities. Although a comprehensive review of the cognitive development literature is beyond the scope of this chapter, we will briefly discuss two aspects of cognitive development that are particularly relevant to cognitive models of psychopathology—developmental differences in cognitive capacities and the increasing rigidity of cognitive processes over time (see also Crick & Dodge, 1994). We also highlight the likely interplay between experience and development in influencing cognitive processing.

In terms of cognitive capacities, there is evidence that children's ability to make internal and stable attributions for events increases across development. There is a large body of work showing that children's interpretations of behavior become increasingly internal, or psychological, with age (Barenboim, 1981; Shirk, 1988). Indeed, Barenboim proposed a developmental sequence of person perception, starting with behavioral comparisons and progressing through psychological constructs to psychological comparisons. In support of this model, research with children from ages 6 through 19 has shown that older children are more likely to attribute behaviors to inferred stable attributes. Research also shows that self-concepts develop with age, starting with the development of self-representation and theory of mind around age 4 (Nelson & Fivush, 2004; Nelson et al., 2003). Theory of mind is conceptualized

as a child's ability to recognize a causal relationship between mental states and actions and to recognize that beliefs can be false. Development of theory of mind serves as a foundation for inferring internal and stable attributions for behavior and for associated developments, such as the emergence of autobiographical memory (Nelson & Fivush).

In addition to the increasing internality of attributions, there is also evidence that attributions become more stable across childhood (Ruble & Rholes, 1981). This may be because stable attributions require the ability to integrate information across time, a skill that is not well developed in younger children (see Rose & Abramson, 1992). In addition, younger children are less likely to incorporate experiences into working knowledge that informs predictions (Rholes, Blackwell, Jordan, & Walters, 1980). Instead, young children appear to be more reactive to current circumstances, tending to focus on current or recent states (for a review, see Shirk, 1988). This is contrasted with research suggesting that by middle childhood, children recognize the enduring effects of emotional events (Shirk).

Finally, in addition to the development of cognitive capacities, theorists have hypothesized that cognitive processes may become more generalized and rigid across development (e.g., Crick & Dodge, 1994; Gotlib & MacLeod, 1997). Support for increasing rigidity of processing over time comes from the literature on the self-perpetuating nature of interpretation biases (e.g., Hill, Lewicki, Czyzewska, & Boss, 1989; Hill, Lewicki, & Neubauer, 1991; Lewicki, Hill, & Sasaki, 1989). These studies have demonstrated that once an unconscious interpretative bias is acquired, new information is then interpreted in a manner consistent with this bias. The repetition of interpreting new material in this same way thereby strengthens the bias over time. Regarding the increasing generalizability of cognitive processes, we are not

aware of any studies specifically testing this hypothesis. However, this type of investigation could have important implications for cognitive models of psychopathology. Indeed, it seems likely that attention and interpretation biases for specific stimuli generalize over time to entire classes of stimuli (cf. Crick & Dodge; Gotlib & MacLeod). For example, a child with a physically abusive parent may initially exhibit preferential attention to the parents' facial expressions of anger, hoping to avoid further abuse. Over time, however, this attentional bias may generalize to people other than the child's parents (e.g., peers), and, when any anger is perceived, the child may interpret the other person as exhibiting a hostile intent toward the child. With repetition, these attention and interpretation biases may become more resistant to disconfirmatory evidence. Though speculative, this is clearly an important line of future research.

DEVELOPMENT OF COGNITIVE VULNERABILITY

Given evidence for the cognitive models of psychopathology, researchers have begun investigating how cognitive vulnerabilities develop. In this section, we review studies that have examined the development of these vulnerabilities.

Depression

Arguably the most well-developed model for the development of cognitive vulnerability to depression is that proposed by Rose and Abramson (1992). In this model, Rose and Abramson provided a developmental framework by which negative events in childhood may contribute to the development of a cognitive vulnerability to depression. Specifically, they suggested that when negative events occur (e.g., father yelling at the child), the

child initially makes hopefulness-inducing attributions and inferences about its occurrence (e.g., "He must just be in a bad mood today"). However, with the repeated occurrence of these negative events (e.g., chronic maltreatment), the child's hopefulness-inducing attributions are repeatedly disconfirmed, and the child may begin to make hopelessness-inducing attributions and inferences (e.g., "I'm a bad kid and I deserve it"). Further, Rose and Abramson hypothesized that over time, these event-specific attributions and inferences would generalize to other forms of negative life events and eventually culminate in a general negative attributional/inferential style for negative events. Finally, Rose and Abramson proposed that experiences of childhood emotional maltreatment or other forms of verbal victimization (e.g., teasing) would be more likely to contribute to the development of a cognitive vulnerability to depression than would other types of negative life events, because with emotional maltreatment and verbal victimization, the negative cognitions (e.g., "I'm worthless") are directly supplied to the child by the abuser. In contrast, with other negative life events, the child must supply his or her own explanations for the events and, therefore, may have greater opportunity to make more benign attributions and inferences for their occurrence.

A number of studies have supported Rose and Abramson's (1992) developmental model. For example, there is growing evidence that negative events in childhood may contribute to the development of a cognitive vulnerability to depression (e.g., Garber & Flynn, 2001; Nolen-Hoeksema et al., 1992). In addition, a number of studies have supported the relation between reports of childhood maltreatment, particularly childhood emotional maltreatment, and the presence of negative attributional/inferential styles (for a review, see Gibb, 2002; see also Gibb, Abramson, & Alloy, 2004), dysfunctional attitudes (Gibb,

Alloy, & Abramson, 2003), autonomy (Mendelson, Robins, & Johnson, 2002), and other forms of self-referent information-processing biases (e.g., Steinberg, Gibb, Alloy, & Abramson, 2003). Further, there is evidence that levels of verbal victimization by peers, parents, or both prospectively predict changes in children's attributional styles (Gibb, Alloy, et al., 2004). Finally, consistent with Rose and Abramson's model, there is evidence that negative cognitive styles mediate the relation between childhood emotional, but not physical or sexual, maltreatment and the development of both symptoms and diagnoses of depression (e.g., Gibb, Alloy, et al., 2004; Gibb et al., 2001; Gibb, Alloy, Abramson, & Marx, 2003; Hankin, 2004).

Building from the "scar hypothesis" (Lewinsohn, Steinmertz, Larson, & Franklin, 1981), studies have also examined the possibility that childhood experiences with depression may contribute to the development of negative cognitive styles. According to the scar hypothesis, episodes of depression may lead to lasting psychological changes, such as increasingly negative attributional styles. Consistent with this prediction, studies focusing on child and adolescent samples have found consistent support for the hypothesis that elevations in depressive symptoms contribute to the development of negative attributional styles (e.g., Bennett & Bates, 1995; Gibb, Alloy, et al., 2004; Nolen-Hoeksema et al., 1986, 1992) as well as perceived competence (Hoffman et al., 2000).

Finally, another commonly discussed hypothesis for the development of negative attributional/inferential styles is that children may follow the model of either their parents' own attributional styles or their parents' attributions for events in the children's lives. However, there is little support for this hypothesis. First, there is little consistent evidence for a relationship between children's and their parents' attributional styles (e.g., Alloy et al., 2001; Seligman et al., 1984; but

see also Garber & Flynn, 2001; Kaslow, Rehm, Pollack, & Siegel, 1988; Oliver & Berger, 1992). Second, although studies have supported the cross-sectional relationship between children's attributional styles and their parents' attributional styles for child-relevant events (e.g., Alloy et al., 2001; Garber & Flynn; Gibb, Alloy, et al., 2004; Turk & Bry, 1992), there is no evidence that parents' attributions for children's events prospectively predict changes in children's attributional styles (Garber & Flynn; Gibb, Alloy, et al., 2004).

Anxiety

Although there is mounting evidence that cognitive vulnerabilities may contribute to the development of anxiety, little is known about how these cognitive vulnerabilities develop. However, limited bodies of work have examined the etiology of low perceived control and other specific cognitive styles characteristic of anxiety disorders (e.g., anxiety sensitivity, inflated responsibility beliefs). For example, there are some data to suggest that certain parenting styles (i.e., overprotection and excessive criticism) may contribute to the development of control-related beliefs (i.e., low perceived control), a hypothesized vulnerability to anxiety. Indeed, patients with panic disorder and generalized anxiety disorder have been shown to rate their parents as more overprotective than do control subjects (Silove, Parker, Hadzi-Pavlovic, Manicavasagar, & Blaszynski, 1991). Further, other work has demonstrated a relationship between parental overprotection and the presence of an anxiety disorder (Bennet & Stirling, 1998). Studies with unselected child samples also support a link between parenting style and control beliefs. For example, Chandler and colleagues (Chandler, Wolf, Cook, & Dugovics, 1980) found that fifth graders who demonstrated high levels of internal locus of control had parents who were more accepting and rewarding of independence. Similarly, using a behavioral observation task,

second graders who were classified as high on internal locus of control had mothers who were rated as warmer, less critical, and more supportive of working independently than mothers of children high on external locus of control (Gordon, Nowicki, & Wichern, 1981). Finally, parents whose reactions are contingent on their child's behavior and whose reactions are enacted in a consistent manner, have children with higher levels of internal locus of control (for a review, see Chorpita & Barlow, 1998). Consistent with Chorpita and Barlow's hypothesis, therefore, these findings suggest that high levels of parental overprotection or criticism may provide early experiences with a lack of control, contributing to the development of a cognitive style characterized by interpretations of an external locus of control, which then contributes vulnerability to the development of anxiety. These findings are also consistent with the work of Beck and colleagues (1985), in that experiences with parental overprotection may contribute to core beliefs of vulnerability.

Whereas low perceived control is hypothesized to contribute vulnerability to anxiety generally, other work has focused on the origins of cognitive biases hypothesized to be associated with specific anxiety disorders. For example, recent empirical work has examined the origins of anxiety sensitivity, a cognitive vulnerability to panic. These studies have provided evidence for both genetic (Stein, Jang, & Livesley, 1999) and environmental (Schmidt, Lerew, & Joiner, 2000; Stein et al.; Watt, Stewart, & Cox, 1998) contributions to the development of anxiety sensitivity. Specifically, two of the three components of anxiety sensitivity—physical and social concerns—appear to have a strong heritable component. However, preliminary data suggest that the third component of anxiety sensitivity—psychological concerns (e.g., worry about physical symptoms reflecting mental illness, feeling scared to be nervous)—is not significantly influenced by genetic factors but is influenced by shared and nonshared

environmental factors (Stein et al.). Evidence for the influence of environmental factors on anxiety sensitivity shows that both general stress and the specific stress of a panic attack contributed to increased levels of anxiety sensitivity (Schmidt et al., 2000). Schmidt and colleagues (2000) discuss a transactional interplay between stress, anxiety, and anxiety sensitivity that could increase over time and lead to the development of panic disorder.

Finally, theoretical work has begun to address the origins of specific cognitive biases associated with obsessive-compulsive disorder (OCD). For example, given the centrality of beliefs reflecting inflated responsibility in OCD (see Salkovskis & Forrester, 2002), Salkovskis, Shafran, Rachman, and Freeston (1999) hypothesized five specific pathways to the development of inflated responsibility beliefs: (a) heightened responsibility as a child; (b) rigid and extreme codes of conduct as a child; (c) lack of experience with responsibility (i.e., overprotection) as a child; (d) incidents where one's actions or inactions contribute to a serious misfortune; and (e) incidents where it appears that one's actions, inactions, or thoughts contribute to a serious misfortune. In a preliminary test of this hypothesis, all five proposed pathways were significantly correlated with OCD symptoms in an undergraduate sample (Coles & Horng, 2004). Further, there was initial evidence for the specificity of some of the pathways to OCD symptoms in contrast to depressive symptoms.

Aggression

In discussing the development of social information-processing biases (e.g., encoding and interpretation of cues, as well as generation and selection of responses), Dodge and colleagues have emphasized the role of early adverse interpersonal experiences (particularly childhood physical maltreatment and rejection or aggression from peers; see Crick & Dodge, 1994; Dodge, 1993; Dodge

et al., 2003; Dodge et al., 1995). Supporting this hypothesis, studies have supported the link between the presence of social information-processing biases and a history of either harsh physical discipline (Weiss, Dodge, Bates, & Pettit, 1992) or physical abuse (Dodge et al., 1995) during childhood. Similarly, physically abused children have been shown to exhibit both attention and interpretation biases for angry facial stimuli compared with nonabused children (Pollak & Kistler, 2002; Pollak & Tolley-Schell, 2003). Studies have also suggested that experiences of peer rejection prospectively predict the development of these social information-processing biases (e.g., Dodge et al., 2003). Supporting the distinction between reactive and proactive aggression, there is some evidence that these negative interpersonal experiences are more strongly related to the development of reactive than proactive aggression (Dodge et al., 1997). Finally, studies have supported the hypothesis that these information-processing biases partially mediate the relation between early adverse experiences and the development of aggression (Dodge et al., 1995, 2003; Weiss et al.). Indeed, there is also evidence for a transactional relationship between interpersonal difficulties and social information processing such that early biases (e.g., hostile attributional bias) contribute to peer rejection, which then exacerbates the processing biases, contributing to the development of aggressive behavior (Dodge et al., 2003).

Conclusions

In summary, studies have identified a number of developmental antecedents of cognitive vulnerability to depression, anxiety, and aggression. Not surprisingly, these studies have focused almost exclusively on childhood events, particularly childhood maltreatment and maladaptive styles of parenting. To date, however, there are relatively few studies

prospectively examining the development of these vulnerability factors. In addition, little is known about the specificity of developmental pathways. Specifically, more research is needed to determine whether certain childhood experiences are more strongly related to the development of one form of cognitive vulnerability versus another. Studies should also examine whether certain factors may moderate the relation between childhood experiences and the development of these vulnerabilities. For example, experiences of childhood emotional maltreatment may be most likely to contribute to the development of a cognitive vulnerability to depression among children who also have a genetic vulnerability to depression (e.g., a depressed parent).

DEVELOPMENTAL DIFFERENCES IN THE EXPRESSION OF THE VULNERABILITY-STRESS RELATION

Depression

As reviewed earlier, there is some evidence that ability of cognitive styles to moderate the relation between negative life events and the development of depression increases with age. Although far from conclusive, this pattern of findings has been observed across a range of cognitive vulnerability factors (e.g., dysfunctional attitudes, attributions, attentional biases). In addition to the general factors noted above that could contribute to mixed findings across all age groups (e.g., failure to adequately prime the vulnerabilities before assessment), there are at least three potential reasons for mixed findings of studies examining the cognitive vulnerability-stress theories of depression in children. First, as Cole and Turner (1993; Turner & Cole, 1994) have suggested, there may be a point in children's cognitive development before which their cognitive patterns have not yet stabilized into traitlike "styles." While these

cognitive styles are still developing, children's cognitions may mediate rather than moderate the effects of negative life events upon the development of depression. Thus, although there is no evidence for age-related differences in the cross-sectional relationship between attributional styles and depressive symptoms (see Garber, Weiss, & Shanley, 1993), there may be differences in the extent to which attributional styles moderate the effects of negative life events. Supporting this hypothesis, Cole and Turner (1993; Turner & Cole, 1994) found that attributional styles mediated the cross-sectional relation between negative life events and depressive symptoms among fourth and sixth graders and served as a moderator only for eighth graders. Similarly, Tram and Cole (2000) found that ninth graders' levels of perceived competence across a variety of domains (academics, social acceptance, athletics, physical appearance, and behavioral conduct) mediated, rather than moderated, the relation between negative life events and the development of depressive symptoms over a 6-month follow-up. In addition, although not formally testing the mediation hypothesis, there is evidence that a variety of cognitive variables (e.g., sociotropy, autonomy, and attributional styles) predict changes in depressive symptoms even after statistically controlling for the influence of negative life events (Abela & Payne, 2003; Conley et al., 2001; Little & Garber, 2000; Nolen-Hoeksema et al., 1986, 1992; Panak & Garber, 1992; N. S. Robinson et al., 1995; Spence et al., 2002). However, an equal number of studies have not found significant main effects for the cognitive variables (Abela, 2001; Abela & Sarin, 2002; Abela & Sullivan, 2003; Abela & Taylor, 2003; Bennett & Bates, 1995; Dixon & Ahrens, 1992; Hainmen et al., 1988; Hankin et al., 2001; Hilsman & Garber, 1995; Joiner, 2000). Therefore, although there is some support for Cole and Turner's developmental hypothesis, the

evidence is far from conclusive and is in need of further investigation. Specifically, longitudinal studies are needed in which the mediational versus moderational role of the cognitive variables is explicitly examined as a function of children's age.

A second hypothesis for mixed results in child samples has been offered by Abela (e.g., Abela & Payne, 2003; Abela & Sarin, 2002), who suggested that various forms of cognitive vulnerability may develop at different rates for different children. According to this "weakest link" hypothesis, until the different forms of cognitive vulnerability coalesce into a more global negative cognitive style, children's cognitive vulnerability to depression is determined by their most negative cognitive style (e.g., inferences about causes, consequences, or self-characteristics). Supporting this hypothesis, Abela and Sarin found that although seventh-graders' inferential styles (combination of inferences for causes, consequences, and self-characteristics) did not interact with negative life events to predict changes in depressive symptoms over a 10-week follow-up, their "weakest link" (most negative score on measures of the three types of inferences considered individually) did. Similar results were obtained in a 6-week prospective study of third and seventh graders, although the vulnerability-stress interaction was further moderated by children's sex and levels of self-esteem such that the vulnerability-stress effects were strongest among boys with low self-esteem and among girls with high self-esteem (Abela & Payne). Abela and Payne also reported that the bias identified as the children's weakest link varied across development. Specifically, attributions were more likely to be the weakest link for seventh graders than for third graders, whereas inferences about the self were more likely to be the weakest link for third graders than for seventh graders. This suggests that attributional styles for causes may develop as a vulnerability factor later than do inferences about self-characteristics, and this finding supports the hypothesis that previous

mixed findings of studies evaluating the attribution vulnerability-stress hypothesis may have been due to differences across studies in the proportion of children for whom attributional styles for causes were the weakest link.

A third possible reason for mixed findings in child samples is the way in which children's cognitive styles are typically measured. Specifically, the majority of studies evaluating the helplessness/hopelessness theories (Abramson et al., 1978, 1989) in children have used the Children's Attributional Style Questionnaire (CASQ; Kaslow & Nolen-Hoeksema, 1991; Seligman et al., 1984). Despite the strengths of this measure, it also exhibits fairly low reliability (e.g., α 's of .45 to .61; Thompson, Kaslow, Weiss, & Nolen-Hoeksema, 1998). This low reliability limits researchers' ability to detect significant effects even when they are present (i.e., it increases type II errors). Supporting this hypothesis, recent investigations using more reliable measures of children's attributional styles have found more support for the cognitive theories' vulnerability-stress hypothesis (e.g., Brozina & Abela, 2003; Conley et al., 2001; Hankin & Abramson, 2002).

Anxiety

There is also mounting support for the cognitive vulnerability-stress theories of anxiety, particularly for the hypothesis that attention or interpretation biases can confer vulnerability to the development of anxiety. However, it is important to consider that the expression of such cognitive vulnerabilities may differ across developmental levels. For example, paralleling data from the depression literature, there is evidence that the cognitive vulnerability of control beliefs may *mediate* the relationship between parenting and anxiety earlier in development but *moderate* the relationship later in development. Specifically, in a sample of children from ages 6 to 15, Chorpita, Brown, and Barlow

(1998) found that levels of perceived control *mediated* the relationship between parental control and negative affect (anxiety and depression). In contrast, using an older sample (ages 11 to 14), Muris, Meesters, Schouten, and Hoge (2004) found that perceived control *moderated*, rather than mediated, the relationship between parental style and anxiety. Muris and colleagues propose that the age differences between their study and that of Chorpita et al. may reflect developmental differences in the stability of cognitive constructs and thereby explain the divergent findings. These findings are notably similar to the depression review described above, suggesting the possibility that during childhood, cognitive biases may be more of a consequence or reflection of negative life events than a stable vulnerability factor.

In addition, differences in the observation of cognitive biases in anxious children may reflect how these biases are typically measured. For example, the reliability and validity of specific tasks assessing information-processing biases are likely to vary with age and developmental level (Vasey, Dalgleish, & Silverman, 2003). Reliability may be influenced by developmental differences in susceptibility to fatigue and the ability to comprehend instructions, whereas validity may be influenced by factors such as developmental differences in the content of fears or reliance on cognitive skills required to perform the task (e.g., inhibitory skills). For example, attentional biases in anxiety (as measured by the Stroop emotional task) are more consistently observed in older children than younger children (Vasey & MacLeod, 2001). Existing data suggest that this relative inconsistency of observing attentional biases to threat in young children may be influenced by the extent to which the task requires the capacity to inhibit attention to distracting information, a skill that is not well developed in young children (see Vasey & MacLeod). Future efforts should seek to clarify whether information-processing biases are less easy to detect in

younger samples because such biases are not yet developed or because the tasks that are being used are not sensitive enough to detect existing biases (Vasey & MacLeod).

Aggression

In contrast to studies testing cognitive models of depression and anxiety, the majority of studies evaluating Dodge's (1986, 1993; Crick & Dodge, 1994) model of aggression have been conducted among a fairly narrow age range of children (i.e., 9- to 12-year-olds; Crick & Dodge). This said, the results of a recent meta-analysis suggested that the strength of the relation between social information-processing biases and aggression did not differ significantly between younger (kindergarten through sixth-grade) and older (sixth- through twelfth-grade) children (Yoon et al., 1999). Thus, it appears that the association between social information-processing biases and aggression may be relatively stable across development. Despite this, however, it may be that developmental differences would be observed in more fine-grained analyses. Specifically, as Crick and Dodge suggested, it may be that developmental differences would be observed for social information-processing biases elicited by developmentally relevant social tasks (e.g., the importance of empathy and social comparisons should increase as children age; cf. Crick & Dodge). Future longitudinal studies are needed to test these more fine-grained hypotheses.

Conclusions

In summary, studies have suggested important avenues of future research on the impact of development upon cognitive vulnerabilities and their potential interaction with negative life events. First, though far from conclusive, there is some evidence that before a certain age, the vulnerabilities featured in the cognitive models may be more reflective of reactions to negative life events than a stable risk factor that would interact

with the events' occurrence to predict the onset of psychopathology. Relatedly, the different cognitive vulnerabilities may develop at different rates depending on the salience of particular developmentally relevant experiences. Future research is needed to clarify the impact of development on the vulnerability-stress relationship. These studies should focus on repeated assessments of the hypothesized vulnerability factors and experiences of negative life events, as well as symptoms of psychopathology, across time. Studies should seek to follow the same individuals across development to examine the hypothesized increasing stability of information-processing biases and whether there is a shift from mediating to moderating the relation between negative life events and the development of psychopathology.

A second important line of future research is developing developmentally appropriate measures of cognitive vulnerability in children (cf. Conley et al., 2001; Hankin & Abramson, 2002). Specifically, reliable and valid measures of the hypothesized vulnerability factors are needed before adequate tests of the cognitive vulnerability-stress theories can be conducted in child samples. Paradigms and measures used in adult samples will likely need modifications for use in younger samples. For example, stimuli (e.g., words) used in adult studies of attentional bias may be too complex or may not tap the appropriate target constructs for children (cf. Neshat-Doost, Moradi, Taghavi, Yule, & Dalgleish, 1999). Only when developmentally appropriate measures and paradigms are utilized can researchers begin to clarify the existence and stability of children's information-processing styles and their relationship to psychopathology.

CONCLUSIONS AND FUTURE DIRECTIONS

In this chapter, we have provided an overview of research evaluating cognitive models of

depression, anxiety, and aggression. By reviewing studies of multiple forms of psychopathology together in the same chapter, our goal was to highlight similarities in findings across domains and to delineate common areas for future research. In general, our review showed that studies have provided considerable support for these theories' vulnerability hypotheses. Specifically, there is increasing evidence that individuals' characteristic ways of attending to and interpreting negative life events contribute vulnerability to the development of psychopathology. Despite this evidence, however, there are a number of important lines of future research.

The most important area of future research is the need for more prospective longitudinal studies of the cognitive vulnerability-stress models. These studies should take a developmental perspective and evaluate the adequacy of existing models across the range of development, so that we can better determine what modifications may be needed to the theories to make them developmentally appropriate. For example, finer-grained studies are needed to determine how the cognitive vulnerabilities develop and the process by which event-specific cognitions or a single "weakest link" generalizes into a general maladaptive cognitive style or schema. On the opposite end of the spectrum, more research is needed among older adults to determine the adequacy of current cognitive models of psychopathology among this segment of the population (cf. Mazure & Maciejewski, 2003).

Another important line of future research is the examination of interactions among the different vulnerabilities proposed. For example, do attentional and interpretation biases interact to increase risk for the development of psychopathology, or do they act relatively independently? As mentioned above, there is growing evidence that, in the presence of negative life events, levels of self-esteem interact with other forms of cognitive vulnerability to predict the onset of depressive

symptoms (Abela, 2002; Abela & Payne, 2003; Conley et al., 2001; Metalsky et al., 1993; N. S. Robinson et al., 1995). There is also preliminary evidence that levels of rumination may interact with other cognitive vulnerabilities to predict onset of depression (e.g., M. S. Robinson & Alloy, 2003). Future research is needed to determine whether other forms of information-processing biases interact to predict not only depression but also other forms of psychopathology.

A related question is whether, as Beck (1967; Clark et al., 1999) has suggested, the activation of maladaptive schemata also activate the entire range of information-processing biases (i.e., attention, interpretation, and memory; see Riskind et al., 2000), or are certain biases more likely than others to be activated for certain individuals? At present, there is some evidence for the interrelationships of these biases. For example, studies have shown that people induced to ruminate (an attentional bias) also exhibit more interpretation and memory biases (Lyubomirsky, Caldwell, & Nolen-Hoeksema, 1998; Lyubomirsky & Nolen-Hoeksema, 1995) compared with individuals induced to distract. Similarly, individuals at high cognitive risk for depression (defined by high levels of dysfunctional attitudes and negative inferential styles) have been shown to be more likely to exhibit self-referent information-processing biases than individuals at low cognitive risk for depression (Alloy, Abramson, Murray, Whitehouse, & Hogan, 1997). If

these results are maintained and replicated for other forms of cognitive vulnerability, it would then be important to know when in development this coordination of activation occurs.

A final area for future research is to explore the ability of cognitive models to explain the occurrence of symptom and diagnostic comorbidity. That is, although the cognitive vulnerabilities featured in these models have demonstrated relatively good specificity for the disorder of interest (see, for example, Alloy et al., 2000, 2004; Hankin et al., 2004; Riskind & Williams, in press; Riskind et al., 2000), it is unclear how these models would be adapted for the prediction of comorbid forms of psychopathology. For example, are there specific cognitive patterns that predict symptom and diagnostic comorbidity, or is symptom and diagnostic comorbidity best predicted by the presence of comorbid vulnerabilities?

In conclusion, therefore, studies have provided strong initial support for the cognitive vulnerability-stress theories of psychopathology. Despite the weight of evidence accumulated thus far, however, prospective longitudinal studies remain rare, particularly those taking a developmental perspective in terms of the development of the cognitive vulnerability as well as the nature of the vulnerability-stress relation. We feel that this developmental focus should be an integral component of future research and that it is essential to the further refinement of our theories.

NOTES

1. Although we recognize that the cutoff used is somewhat arbitrary, it provides a useful way of comparing studies given that most, if not all, of the studies reviewed in this chapter included participants on one side or the other of the middle school-high school transition.
2. It is possible that the pattern of results observed in the study by Lewinsohn et al. (2001) is due to the presence of suppressor effects (cf. Cohen & Cohen, 1983). Supporting this hypothesis, the zero-order relationship between attributional styles and onsets of major depression during the follow-up was positive (though non-significant). However, the valence of the relation became negative once attributional

styles were included in the regression model, predicting onsets of depression along with other variables. A similar reversal was also found for the relationship between a past history of depression and the prediction of new depressive episodes. Specifically, whereas the correlation analyses supported the well-replicated finding that individuals with a prior history of depression are more likely to experience depression in the future (for a review, see Boland & Keller, 2002), results from the regression analyses in which history of depression was entered along with a number of other predictor variables suggested that those with a history of depression were actually less likely to experience new depressive episodes. This reversal of effects can be a sign of suppression, suggesting that the results may reflect an artifact of the predictor's relation with other variables in the model.

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