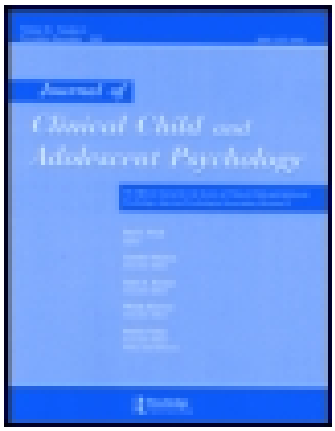

Journal of Clinical Child & Adolescent Psychology
Publication details, including instructions for authors and subscription information:
http://www.tandfonline.com/loi/hcap20

Temperament, Stress Reactivity, and Coping: Implications for Depression in Childhood and Adolescence

Bruce E. Compas , Jennifer Connor-Smith & Sarah S. Jaser
Published online: 07 Jun 2010.

To cite this article: Bruce E. Compas , Jennifer Connor-Smith & Sarah S. Jaser (2004) Temperament, Stress Reactivity, and Coping: Implications for Depression in Childhood and Adolescence, Journal of Clinical Child & Adolescent Psychology, 33:1, 21-31, DOI: 10.1207/S15374424JCCP3301_3

To link to this article: http://dx.doi.org/10.1207/S15374424JCCP3301_3

Journal of Clinical Child and Adolescent Psychology
2004, Vol. 33, No. 1, 21–31

Temperament, Stress Reactivity, and Coping: Implications for Depression in Childhood and Adolescence

Bruce E. Compas
Department of Psychology and Human Development, Vanderbilt University

Jennifer Connor-Smith
Department of Psychology, Oregon State University

Sarah S. Jaser
Department of Psychology and Human Development, Vanderbilt University

This article considers the role of temperament in the development of depression during childhood and adolescence. The features of depression in young people and aspects of temperament that are most relevant to depression are briefly reviewed. Studies that have tested the direct and indirect associations of temperament and depressive symptoms in young people are summarized. Evidence suggests that the temperamental characteristics of positive and negative emotionality, and to a lesser extent attentional control, are implicated in depressive symptoms. The role of stress, stress responses, and coping are then examined in the association of temperament and depression. Temperamental characteristics may moderate and be moderated by stress responses and coping in their effects on depression. Directions for future research are highlighted.

Why are some children and adolescents more vulnerable to the development of depression than others? This question reflects fundamental concerns regarding the etiology, early identification, and prevention of depression in young people. One potential source of vulnerability to mood disorders involves individual differences in temperament. The primary hypothesis underlying most models of temperament and psychopathology is that specific dimensions of temperament represent sources of vulnerability to specific disorders. However, temperament may function as a general risk factor for psychopathology, such that a single temperament characteristic may be implicated in more than one disorder. Moreover, whether temperament is a specific or general risk factor for psychopathology, it may function in any of several ways. Temperament may exert direct effects on psychopathology, such that particular temperamental characteristics directly increase the probability of developing a disorder. Alternatively, temperament may mediate or moderate the contribution of other factors (e.g., stress) in relation to psychopathology, or other factors (e.g., coping efforts) may mediate or moderate the role of temperament in the development of psychopathology.

Research on temperament and depression has been guided by each of these models. Much of this research has been carried out with adults, although there is a small but growing literature on temperament and depression in children and adolescents. Our focus is on depression in young people, but research with adults is included to the extent that it helps to elucidate important points. We first briefly review the basic issues in depression and temperament in childhood and adolescence and research examining the association between the two. Because research on temperament and depression in children and adolescents has been hindered by the lack of a unifying conceptual framework, we conclude by offering a framework based on stress response processes to stimulate future research on this important topic.

Requests for reprints should be sent to Bruce E. Compas, Department of Psychology and Human Development, Vanderbilt University, 230 Appleton Place, Nashville, TN 37203. E-mail: Bruce.Compas@vanderbilt.edu

Depression in Children and Adolescents

Depressive symptoms and depressive disorders, including dysthymia and major depressive disorder, represent significant mental health problems during childhood and adolescence. No nationally representative epidemiological study of psychiatric disorders in children and adolescents has been conducted in the United States; however, findings from several smaller studies indicate that the point prevalence of depression increases from childhood (2%) to adolescence (4% to 7%; e.g., Costello et al., 2002; Hankin et al., 1998). By age 18, nearly one fourth of adolescents will have experienced an episode of depression during their life-

time, making it one of the most prevalent mental health disorders in young people (Clarke, Hawkins, Murphy, & Sheeber, 1993; Lewinsohn, Hops, Roberts, Seeley, & Andrews, 1993). Although rates of depression do not differ between boys and girls during childhood, by adolescence girls are significantly more likely than boys to have a depressive disorder. For example, the Oregon Adolescent Depression Project found a significant sex difference among the adolescents with major depressive disorder, in that 68% were female, and the age of onset was lower for girls than for boys (Lewinsohn et al., 1993).

Major depressive disorder is associated with significant impairment in functioning and is highly comorbid with other disorders (Hammen & Compas, 1994). For example, Whitaker and colleagues (1990) found that rates of significant impairment were more than 85% for youth with major depressive disorder or dysthymia, higher than impairment rates for any other disorder. Depression during adolescence is also associated with extremely high rates of comorbidity with other disorders (Costello & Angold, 1996; Costello et al., 2002), with numerous studies suggesting that up to 50% of depressed adolescents also have anxiety disorders and high rates of externalizing disorders as well (Feehan, McGee, Raja, & Williams, 1994; Kovacs & Devlin, 1998; Lewinsohn et al., 1993).

Although there is considerable debate about the underlying structure of depression, evidence suggests that depression in young people is dimensional in nature with symptoms ranging along a continuum of severity, but it is qualitatively different at the extreme end of the spectrum (Compas, Ey, & Grant, 1993; Ruscio & Ruscio, 2000). That is, impairment and levels of other problems increase with quantitative increases in depressive symptoms, even at levels that do not meet diagnostic criteria for depressive disorder (e.g., Gotlib, Lewisohn, & Seeley, 1995). However, children and adolescents who meet criteria for major depression experience greater impairment and are at significantly increased risk for repeated episodes of the disorder compared with those who do not meet criteria (Lewinsohn, Rohde, Seeley, Klein, & Gotlib, 2000). This implies that if depression has both dimensional and categorical features, then theories of depression need to focus on the etiological factors associated with both the presence or absence and the severity of depression (Ruscio & Ruscio, 2000).

The possibility that temperamental characteristics may play a role in the etiology of depression is suggested in part by evidence of a significant genetic contribution to depressive symptoms and depressive disorders in childhood and adolescence (e.g., Happonen et al., 2002; Rice, Harold, & Thapar, 2002; Silberg, Rutter, & Eaves, 2001). However, these studies also suggest that it is unlikely that inherited differences in temperament alone account for the development of depression, as shared environmental factors have also been found to contribute significantly to depression in young people (e.g., Rice et al., 2002; Silberg et al., 2001). Stressful life events and chronic stress are important features of both the shared and nonshared environment that contribute to depression in childhood and adolescence (Compas, Grant, & Ey, 1994; Hankin & Abramson, 2001). Moreover, genetic and environmental factors interact in their relation with depression. Findings from recent brain imaging studies suggest that some individuals may have a biological predisposition to depression, characterized by relatively less left frontal lobe activation, and to have a heightened response to negative, stressful events, resulting in depression (Reid, Duke, & Allen, 1998). Reid et al. suggested that significant differences in frontal activation between depressed and nondepressed individuals may be linked to individual differences in temperament and coping style.

Temperament

Temperament is broadly defined as individual differences in emotional and behavioral style that appear early in life, are consistent over time and across situations, and are presumed to have a biological basis (Rothbart & Bates, 1998; Shiner, 1998). An underlying assumption of most conceptualizations is that temperamental characteristics are genetic in origin but may be modified by experience. Temperament is presumed to be multidimensional or multifactorial, although there is little consensus on what the primary dimensions of temperament are. Furthermore, similar to the debate about the nature of depression, there has been disagreement regarding the continuous versus categorical nature of temperament characteristics. Recent research suggests that at least some temperamental characteristics are categorical rather than continuous in nature. For example, Woodward, Lenzenwager, Kagan, Snidman, and Arcus (2000) found that behaviorally inhibited temperament (or reactivity) is best represented by a qualitative category (a taxon) rather than by a continuous dimension. Whether other temperamental characteristics are categorical or continuous has not been established.

Models of temperament that have developed since the initial seminal work of Thomas and Chess (1977) have encompassed a wide range of traits. Although a great deal of research linking temperament or personality to depression has focused on lower order traits (e.g., sociotropy), higher order traits (e.g., negative emotionality) are important for several reasons. First, higher order traits can facilitate the synthesis of findings across studies based on different models and measures of temperament. Second, organizing findings based on higher order traits can simplify comparisons from infancy through adolescence and adolescence

through adulthood. And third, higher order traits have been more clearly linked to underlying neurobiological systems than lower order traits, which is helpful in identifying connections to research on the role of brain structure and function in depression.

Three higher order temperamental traits appear most promising for understanding depression in children and adolescents: positive emotionality, negative emotionality, and constraint–attentional control. The centrality of these traits has been emphasized by Rothbart and colleagues (Derryberry & Rothbart, 1988; Rothbart & Bates, 1998) in their exploration of reactivity and self-regulation in children and by Tellegen and colleagues (e.g., Shiner, Masten, & Tellegen, 2002; Tellegen, 1985) in work with adults. These dimensions involve emotionality or affectivity, approach versus withdrawal from novel or arousing stimuli, and the capacity for effortful control of attention and other cognitive and emotional processes.

Positive emotionality, or surgency, reflects the extent to which an individual is receptive to reward, sociable, sensation seeking, and actively involved with his or her environment (Rothbart & Bates, 1998). Gray (1991) suggested a neurobiological basis for positive emotionality, the Behavioral Activation System (BAS), which is sensitive to reward cues and is associated with approach toward goals and reward orientation but not with more general hedonic style. (BAS is also related to frustration and irritability in nonreward situations.) Positive emotionality is related to extraversion, to measures of activity and sociability in the Emotionality–Activity–Sociability–Impulsivity model (Buss & Plomin, 1984), and to measures of activity and approach originally identified in the New York Longitudinal Study (Thomas & Chess, 1977).

Negative emotionality, which is conceptually related to neuroticism, involves a tendency toward discomfort, fear, anger, sadness, and low soothability. Anxiety and threat sensitivity are specifically linked to the Behavioral Inhibition System (BIS; Gray, 1991), which is responsible for processing information related to threat or punishment. BIS sensitivity leads to vigilance, heightened emotional and physiological arousal, and restricted behavior. Negative emotionality is reflected in the emotionality dimension of the Emotionality–Activity–Sociability–Impulsivity model (Buss & Plomin, 1984), in the concept of "difficult" temperament (Thomas & Chess, 1977) and in studies of behavioral inhibition (Kagan & Snidman, 1991). Although negative emotionality can be differentiated into separate dimensions of fearful distress and irritability (Rothbart & Bates, 1998; Shiner, 1998), discriminating between these two facets may not be essential in the attempt to understand depression, which involves components of both sadness and irritability.

The distinction between positive and negative emotionality is consistent with the tripartite model of anxiety and depression (Clark & Watson, 1991). According to the tripartite model, negative affect is common to both depression and anxiety, low positive affect is linked specifically to depression, and physiological hyperarousal is linked specifically to anxiety. Theory predicts that the temperamental trait of negative emotionality will be positively related to depressive symptoms, increasing the risk for depression, along with the risk for other emotional and behavioral problems. Positive emotionality should be negatively related to depression, with high levels of positive emotionality protecting against depressive symptoms such as anhedonia. This model has received extensive support in research with children and adolescents (e.g., Anthony, Lonigan, Hooe, & Phillips, 2002; Chorpita, 2002; Phillips, Lonigan, Discroll, & Hooe, 2002).

The broad trait of constraint–attentional control involves effortful control of emotions and behaviors, self-regulation, task persistence, and attentional focus, all of which can modulate the expression of positive and negative emotionality. Constraint is related to the impulsivity construct in the Emotionality–Activity–Sociability–Impulsivity model, which includes components of self-control, persistence, and planfulness (Buss, 1995), to New York Longitudinal Study traits such as distractibility and persistence, and to the Big Five personality trait of conscientiousness (Shiner, 1998). Constraint is also related to the concept of ego resiliency (Block & Block, 1980), which reflects the ability of an individual to flexibly regulate levels of self-control to match environmental demands. Although the temperamental trait of constraint is most commonly linked to externalizing disorders, interactions of constraint with other temperamental traits may be important in understanding depression. For example, self-regulation and attentional control may serve a protective function, decreasing the risk associated with high negative emotionality by increasing persistence in difficult situations or improving coping skill selection and implementation (Rothbart et al., 1995). Although coping falls within the broad category of self-regulation, it is important to distinguish between coping and the temperamental trait of constraint (discussed later).

Recent research has begun to elucidate some of the biological substrates of temperamental characteristics. Aspects of brain structure and function have been identified that are linked to temperament and, most pertinent to this discussion, that may be related to depression as well. For example, the anterior attention network described by Posner and Rothbart (1998), and perhaps most important the anterior cingulate, plays a central role in the effortful regulation of attention. Patterns of attentional control and attentional shift are related to levels of emotional arousal, specifically to the level of negative emotion that is experienced in response to external stimuli (Posner & Rothbart). Asymmetry in the relative activation of the right and left frontal hemi-

sphere is hypothesized to reflect children's underlying motivational disposition to approach or withdraw from novelty or potential threat, that is, to individual differences in behavioral inhibition (Calkins & Fox, 2002).

Temperament and Depression

Several dimensions of temperament and their biological substrates have direct implications for understanding depression. The propensity to experience high levels of negative affect, and concomitantly low levels of positive emotion, map directly onto the dysphoric and anhedonic symptoms of depression. Heightened arousal, in the right as contrasted with the left frontal lobe, is linked both to behavioral inhibition and depression. Behavioral withdrawal, although most closely linked to anxiety, is also characterized in depression by patterns of social withdrawal. Poor regulation of attention is a nonspecific symptom of psychopathology but is included as a hallmark symptom of depression. Thus, there is ample reason to expect that these temperamental traits may be implicated in the development of depression.

Several methodological issues are important to consider when examining research on temperament and depression. First, the method used to assess temperament and depression, including the informant or source of information, has been problematic (e.g., Kagan, Snidman, McManis, Woodward, & Hardway, 2002). The most widely used approach to the measurement of temperament has relied on parents' (typically mothers') reports of their children's behavior. When parent (or child) reports are used to assess both temperament and a child's depression, the possibility of shared method variance is highly likely. The use of multiple measures allows for tests of convergent validity and for controls for method (source) variance (e.g., Phillips et al., 2002). Second, concerns have been raised about possible overlap or confounding between measures of temperament and psychopathology (Lengua, West, & Sandler, 1998). For example, if a temperament scale includes items reflecting negative mood, associations between this scale and measures of depression may be due at least in part to item confounding. Third, cross-sectional, rather than prospective, designs are used most often. Although they represent a reasonable starting point for research in this area, cross-sectional designs make it impossible to disentangle the direction of the relations between temperament and depression.

Models of Relations Between Temperament and Depression

Temperament and depression could be related in several possible ways. Clark, Watson, and Mineka (1994) described four ways in which temperament could influence adjustment: (a) a *vulnerability model*, in which temperament places individuals at risk for experiencing depression; (b) a *pathoplasty model*, in which temperament shapes the course of a disorder, perhaps by influencing environments or interactions with others or determining the specific symptoms experienced; (c) a *scar model,* in which the experience of a depressive episode changes personality; and (d) a *spectrum or continuity model,* in which depression simply represents the extreme endpoint of a trait. All of these models raise issues regarding the continuous versus categorical approaches to understanding depression and temperament.

Relations between temperament and depression can also be classified as direct linear effects, indirect linear effects (mediation), interactions between temperament and the environment (moderation), or interactions between various temperamental traits (Rothbart & Bates, 1998; Rothbart, Posner, & Hershey, 1995). Direct effects, consistent with the vulnerability and the spectrum or continuity models, include the possibility that depression simply reflects extreme negative emotionality or that temperament influences the specific depressive symptoms experienced. Indirect effects, as reflected in the pathoplasty model, include the influence of temperament on the environment, reactions from others, information processing, and interactions between aspects of temperament. For example, negative emotionality may lead to overly negative interpretations of events or trigger rejection by others, increasing social isolation and the risk for depression. In temperament by environment interactions, positive emotionality or constraint may serve as a buffer against risk factors, or negative emotionality may heighten reactivity to stressful events. In temperament by temperament interactions, one trait may help protect against risks related to other traits. For example, positive emotionality may balance negative emotionality, or constraint may modulate the expression of negative emotionality. Of course, it is unlikely that any single model of relations between temperament and adjustment fully explains pathways from temperamental traits to depressive symptoms. Multiple factors may influence depressive symptoms or the onset and course of a depressive episode, and the relative influence of temperament and environment may differ across individuals (e.g., boys vs. girls).

Studies of Temperament and Depression

The most rudimentary studies of temperament and depression have used self-reports to measure both constructs at a single point in time. Several studies have reported correlations between temperamental characteristics and depressive symptoms and disorders in college students and adults, with reviews showing a consistent positive relation between depression and negative affectivity and a consistent

negative relation between depression and positive affectivity (Enns & Cox, 1997; Klein, Durbin, Shankman, & Santiago, 2002). These findings appear to hold up across cultures; for example, depression is associated with higher levels of neuroticism and lower levels of extraversion in Spanish adolescents (del Barrio, Moreno-Rosset, Lopez-Martinez, & Olmeda, 1997). Adult studies have linked depression to high levels of harm avoidance and low levels of self-directedness in American (Klein et al., 2002) and Japanese samples (Naito, Kijima, & Kitamura, 2000; Tanaka, Kijima, & Kitamura, 1997). Unfortunately, the majority of existing studies rely on cross-sectional analyses of self-reports, which, as noted previously, leaves correlations between temperament and symptoms of depression subject to both temporal and method confounds.

Anthony et al. (2002) and Phillips et al. (2002) have examined the relations of temperamental characteristics related to positive affect–surgency and negative affect–neuroticism with symptoms of depression (and anxiety) in children and adolescents using reports of parents, children, and peers. These studies have been informative in disentangling the role of method–informant effects in the relations between temperament and depressive symptoms. Using confirmatory factor analysis, Phillips et al. identified separate negative affect–neuroticism factors based on parent reports and child reports and a single positive affect–surgency factor that combined parent and child reports. Although the pattern of findings was somewhat affected by informant, negative affect–neuroticism was related to both anxiety and depression, whereas positive affect–surgency was primarily related to depression (Phillips et al., 2002). Similarly, Anthony et al. found that negative temperament and negative affect were related to symptoms of both anxiety and depression, but positive temperament and positive affect were uniquely associated with depressive symptoms. These findings are consistent with the tripartite model of Clark and Watson (1991) and suggest that there are direct and both specific (for positive affect–surgency) and nonspecific (for negative affect–neuroticism) relations between temperament and depressive symptoms.

A small number of studies have examined the relation between temperamental traits and future depressive symptoms using prospective designs. Consistent with the vulnerability model described previously, individuals showing high levels of negative affectivity as toddlers are more likely to have elevated rates of depressive symptoms and disorders as adults (Caspi, Moffit, Newman, & Silva, 1996; Gjerde, 1995). Windle and Davies (1999) examined the relation between temperament and depressive symptoms and heavy alcohol use in adolescence. The authors found that a group of adolescents who were characterized by high depressive symptoms only (as compared with those who were high in alcohol use only, high in both depressive symptoms and alcohol use, or low in both) were higher in traits characteristic of difficult temperament, including behavioral inflexibility, lower rhythymicity, greater withdrawal, lower positive mood, and low task orientation (poor concentration). In a related study, Davies and Windle (2001) examined difficult temperament as a source of vulnerability to parental conflict and discord. Depressive symptoms were correlated both within time and across time with poorer task orientation (concentration), low rhythmicity, and low adaptability. Furthermore, higher depressive symptoms were predicted by the interaction of parental marital discord and low task orientation, findings that are consistent with the pathoplasty model. Although this study is methodologically stronger than most previous studies in that marital discord was measured by parent report, both temperament and depressive symptoms were measured by adolescents' self-reports. Taken together, the results of these studies suggest that depressive symptoms are associated with several temperamental characteristics related to emotionality, attentional control, and general dysregulation of behavior.

Other studies have examined mediated and moderated relations involving temperament and depressive symptoms. For example, Lengua and colleagues studied the relation between temperament and emotional and behavioral problems, including symptoms of depression, in children of parents undergoing a divorce. They examined the interactive effects (moderation) of temperament and parents' style of parenting (Lengua, Wolchik, Sandler, & West, 2000) and the direct and indirect effects (mediation and moderation) of temperament, threat appraisals, and coping style (Lengua & Long, 2002; Lengua, Sandler, West, Wolchik, & Curran, 1999) in predicting symptoms of depression and conduct problems. Lengua and Long (2002) found that the temperamental characteristic of negative emotionality was related to greater appraisals of threat, greater use of avoidance coping, and higher levels of both internalizing and externalizing problems. In analyses of moderation effects, Lengua et al. (2000) found that children's temperamental levels of positive emotionality interacted with parental rejection in predicting depressive symptoms; specifically, parental rejection was related to more depressive symptoms in children who were low in positive emotionality, whereas high levels of positive emotionality protected children from the adverse effects of parental rejection. There was also an interaction between child impulsivity (poor attentional control) and parental inconsistent discipline, such that the association between inconsistent discipline and child depressive symptoms was highest for children who were also high in impulsivity (Lengua et al., 2000). Tests of coping and appraisals as mediators of temperament based on mothers' reports yielded direct

effects of positive emotionality and impulsivity on depressive symptoms. However, no evidence for mediation of these effects was found, and appraisals and coping were independently and directly related to depressive symptoms (Lengua et al., 1999). In analyses using children's reports, negative emotionality was directly related to depressive symptoms, but the effects of positive emotionality and impulsivity were both mediated by active coping (Lengua et al., 1999). Thus, evidence for mediation in this study was method-specific and therefore difficult to interpret.

There is also evidence that the effects of temperament on depression may be mediated by other factors, including cognitive and contextual variables. For example, Beevers and Meyer (2002) examined the role of positive experiences and positive expectations as mediators of the relation between BAS responsiveness and depressive symptoms. In a sample of college undergraduates, they found that low levels of BAS were associated with the anhedonic symptoms of depression. However, individuals low in BAS were also less likely to report positive experiences in their daily lives and less likely to expect positive events in the future. When positive experiences and expectancies were included, the association between BAS and depressive symptoms was no longer significant. These findings suggest that low BAS is a source of vulnerability for depression that is mediated by both experiences with the environment and expectations about the future. These results suggest that depression may not develop until there is a cognitive capacity to negatively interpret past experiences and generate negative expectancies about future experiences (see also Nolen-Hoeksema, Girgus, & Seligman, 1992). Again, however, this study relied on self-reports to measure temperament, depressive symptoms, and their mediators.

Summary. Several studies have examined the direct, mediated, and moderated relations between temperament characteristics and depressive symptoms in children and adolescents. Several temperament traits are related to depressive symptoms, including negative and positive emotionality, behavioral activation, and attentional control. Evidence has been found for direct effects of temperament on depressive symptoms (consistent with the vulnerability model) and for interactions between temperament and sources of stress and other individual difference factors (consistent with the pathoplasty model). However, these studies have been limited by methodological problems and by the absence of a framework for understanding the processes through which temperament and depression are linked. We now turn to research on stress, stress responses, and coping as a framework for understanding the links between temperament and depression.

Temperament, Stress Reactivity, Coping, and Depression

Depression in childhood and adolescence is related to a host of risk factors, including psychological, biological, and social sources of risk. One of the most consistent and robust predictors of depression is exposure to stressful life events and chronic stressful circumstances. Relations between acute and chronic stressors and depressive symptoms in childhood and adolescence have been well established in prospective longitudinal studies (see Grant, Compas, Thurm, & McMahon, 2003, for a review). Furthermore, the ways that children and adolescents respond to and cope with stress are important in the development of depressive symptoms in young people (Compas, Connor-Smith, Saltzman, Thomsen, & Wadsworth, 2001).

Before considering their implications for the relation between temperament and depression, it is important to briefly summarize the important features of stress responses and coping. Responses to stress are characterized by two sets of processes, one of which is automatic and a second set that is controlled (Compas et al., 2001). Automatic and controlled responses to stress can be further distinguished as involving engagement with versus disengagement from sources of stress and one's emotional responses to stress (Connor-Smith, Compas, Thomsen, Wadsworth, & Saltzman, 2000). Automatic processes in responses to stress include physiological arousal, emotional arousal, intrusive thoughts, automatic biases in attention, impulsive responses, and involuntary escape behavior (Compas et al., 2001).

In contrast to automatic processes, controlled responses to stress are reflected in coping that is defined as "conscious volitional efforts to regulate emotion, cognition, behavior, physiology, and the environment in response to stressful events or circumstances" (Compas et al., 2001, p. 89). Engagement coping responses are further distinguished as primary control (or active) coping responses (problem solving, emotional expression, emotional modulation) and secondary control (or accommodative) coping (acceptance, cognitive restructuring, positive thinking, distraction). Disengagement coping includes avoidance, denial, and wishful thinking (Connor-Smith et al., 2000).

Temperamental traits are typically conceptualized as broad, stable characteristics of individuals that influence behavior across a wide range of situations, including those that are not challenging or stressful. However, the functional significance of temperament may be greatest in its influence on responses to stress (Strelau, 2001). Automatic stress responses are those behaviors that are enacted in response to threat or challenge and are hypothesized to be driven by temperamental differences in arousal, reactivity, and recovery in response to threat, and by learning and conditioning

(Compas et al., 2001). The selection of voluntary, controlled coping responses is also hypothesized to be influenced by temperament traits, including the temperamental characteristic of effortful control (Fickova, 2001; Gomez, Holmberg, Bounds, Fullarton, & Gomez, 1999; Lengua et al., 1999), and coping may interact with temperamentally based automatic stress responses. The measurement of temperament and stress responses as distinct constructs is challenging, however, especially when both are measured in the reports of a single informant.

Stress, stress responses, and coping may play a role in the relation between temperament and depression in several ways. First, temperamental characteristics may be related to depression through their effects on both automatic and controlled responses to stress. Different aspects of temperament may facilitate some types of coping and stress responses and impede others. For example, children who are high in attentional control may be better able to use coping responses that involve the controlled shifting of attention, such as involvement in distracting tasks to reduce emotional distress. Alternatively, children high in negative affectivity may have greater difficulty in coping efforts that are intended to modulate emotional arousal (e.g., the regulated expression of emotion). Thus, coping and stress responses may represent important ways that temperamental characteristics are put into action under conditions of heightened risk, specifically, under conditions of stress. Second, temperamental characteristics may interact with automatic and controlled responses to stress in their associations with depression. The same coping and stress responses may affect depression differently as a function of individual differences in temperament. Cognitively reframing a situation to focus on its positive aspects may have beneficial effects in a child who is high in positive affect but may be relatively ineffective in a child who is low in this trait. And third, coping responses may be aimed at regulating temperamentally based automatic responses to stress. That is, some coping efforts may be intended to manage one's own temperament under stress, in particular one's level of negative emotionality.

Coping and Stress Responses as Mediators and Moderators of Temperament and Depression

Several recent studies have begun to examine the role of stress, stress reactivity, and coping in the relation between temperament and depressive symptoms. For example, in a study cited by Davies and Windle (2002), a significant source of stress (level of parental discord) interacted with children's level of task orientation in predicting depressive symptoms. It is plausible that this association was the result of the effects of temperamental differences in task orientation on coping efforts, particularly secondary control coping such as distraction and acceptance. Lengua et al. (2000) have examined the role of coping and cognitive appraisals in the context of the stress associated with parental divorce. They found that temperamental characteristics interacted with parental rejection and parental inconsistent discipline in relation to depressive symptoms.

Individual differences in temperament may also influence several aspects of automatic, involuntary processes of reaction. For example, the temperamental characteristic of attentional control and constraint may be linked to automatic attentional processes in response to stress. In a study of children with recurrent abdominal pain, Boyer et al. (2003) examined attentional biases to pain and social anxiety related words that were presented wither supraliminally (1250 msec) or subliminally (20 msec). Relative to their attention to neutral words, children with recurrent abdominal pain showed a bias to avoid both pain and social anxiety words at the supraliminal level but a bias to attend to both types of threats words at the subliminal levels (Boyer et al., 2003). The pattern of greater attention to words presented subliminally is reflective of a rapid, automatic component of attention in children with a chronic pain syndrome. Furthermore, subliminal bias to attend to social-anxiety words was correlated with greater negative affect, pain, and somatic symptoms (Boyer et al., 2003).

Temperament may both facilitate and constrain controlled, voluntary efforts to cope with stress. The temperamental characteristic of attentional control may be related to the ability to purposively employ more complex, voluntary types of coping. In path analyses of parents' reports of children's temperament, coping, and symptoms in a sample of children with recurrent abdominal pain, Thomsen, Compas, Colletti, Stanger, and Boyer (2003) found that poor attentional control was related to higher symptoms of anxiety and depression. However, this association was fully mediated by secondary control coping (distraction, acceptance, cognitive restructuring, positive thinking). That is, children with temperamentally higher levels of attentional control used more secondary control coping and had lower symptoms of anxiety and depression. Greater control over attentional processes may facilitate the use of more complex cognitive coping processes by allowing children to shift their attention away from their pain, reinterpret the situation in more benign terms, selectively attend to positive thoughts and stimuli, and, as a result, experience lower levels of depressed and anxious emotions. Langrock, Compas, Keller, Merchant, and Copeland (2002) found that secondary control coping played a critical role in depres-

sive symptoms in a sample of children of depressed parents who were coping with parental withdrawal and parental intrusiveness. Although these investigators did not measure temperament in this study, the findings highlight the potential importance of investigating secondary control coping and associated temperamental characteristics in children of depressed parents, because these children are at extraordinarily high risk to develop depression themselves (Goodman & Gotlib, 2002).

Measures of the relative activation of the BIS and BAS have also been found to be related to coping processes in several college student samples. For example, in analyses of data from a college sample ($n = 61$) reported by Connor-Smith and Compas (2002), BIS was positively correlated with symptoms of anxiety and depression ($r = .55$, $p < .001$). Furthermore, BIS was correlated with lower reports of secondary control coping ($r = -.35$, $p = .006$), and higher levels of involuntary engagement ($r = .48$, $p < .001$) and involuntary disengagement ($r = .35$, $p = .006$) responses to stress. Thus, higher levels of activation of the BIS were associated with decreased use of coping and self-regulation skills aimed at adaptation to a stressor, higher levels of stress reactivity, and higher symptoms of depression.

The results of these studies suggest that both voluntary coping responses and automatic responses to stress may be influenced by temperamental traits that can influence the association between stress and depression. Research testing a comprehensive model of stress response processes is in its early stages, but these and other findings suggest that both automatic and controlled stress response processes are important mediators and moderators of the stress–depression relation. Understanding the influence of temperament in facilitating and constraining both of these processes is a high priority for continued research.

Conclusion and Future Directions

Individual differences in temperament show considerable promise as an important source of vulnerability to depression. The temperamental characteristics of negative and positive emotionality, and to a lesser extent attentional control, have been shown to be related to depressive symptoms in children and adolescents. Furthermore, there is some evidence that the relations between temperament and depression are mediated and moderated cognitive appraisals, automatic stress responses, and effortful coping responses. High levels of temperamental negative affect are associated with the use of avoidance coping, and attentional control may be related to the ability to utilize complex forms of cognitive coping that involve secondary control. In spite of these initial encouraging findings, a number of issues are in need of continued research.

First, improvement in research methodology in this field is sorely needed. Methods for the measurement of temperament need to be expanded beyond paper-and-pencil inventories. The use of standardized laboratory paradigms for the measurement of temperamental characteristics such as behavioral inhibition will be important to overcome the methodological confounds that result from using self- or parent reports of both temperament and depressive symptoms. In studies using paper-and-pencil measures, it is essential that multiple informants are used to overcome problems with common method variance when single informants are used. An important next step will involve the use of multiple informants to create latent indicators of temperament, stress responses, coping, and depression. With regard to research design, more research is needed using prospective designs that take developmental level into account.

Second, the relation between temperament and depression may be best understood within the context of stressful events and chronically stressful circumstances. Temperamental characteristics may exert their greatest influence on the emergence of depressive symptoms under conditions of stress. Both automatic and controlled stress response processes appear to be influenced by temperament. These findings warrant replication and further testing using more rigorous multi-informant, prospective research designs. It will also be important to continue to test interactions of temperament with stress responses and coping. Certain temperamental characteristics may facilitate some forms of coping whereas other traits may impede coping efforts. These types of interactions would have important implications for interventions, as they would suggest that children with certain types of temperament may be able to learn specific coping strategies whereas children with other temperaments may have great difficult in learning these same ways of coping.

Third, several recent studies suggest that it will be important to continue to examine biological substrates that are common to temperamental characteristics, stress responses, coping, and depression. For example, relative activation of the left and right hemispheres of the prefrontal cortex appears to be important in all of these processes, and measurement of these processes in studies of temperament and depression should be a high priority (e.g., Calkin & Fox, 2002; Henderson, Fox, & Rubin, 2001; Posner & Rothbart, 1998; Reid et al., 1998).

Fourth, because existing studies have emphasized relations between dimensional measures of temperament and depression, additional attention should be given to categorical measures of temperament (see Woodward et al., 2000) and *Diagnostic and Statistical*

Manual of Mental Disorders (4th ed.; American Psychiatric Association, 1994) mood disorder diagnoses. None of the studies of temperament that we identified used structured diagnostic interviews to assess current or lifetime history of depressive disorders. Thus, all of the findings to date are based on the assessment of depressive symptoms and may not readily generalize to major depressive disorder or dysthymia. Depressive symptoms and disorders are highly comorbid with other symptoms and disorders, most importantly with anxiety. The degree of specificity in the role of temperament and depression as contrasted with anxiety will be important to better understanding processes that may lead to the co-occurrence of these important problems.

References

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

Anthony, J. L., Lonigan, C. J., Hooe, E. S., & Phillips, B. M. (2002). An affect-based, hierarchical model of temperament and its relations with internalizing symptomatology. *Journal of Clinical Child and Adolescent Psychology, 31,* 480–490.

Beevers, C. G., & Meyer, B. (2002). Lack of positive experiences and positive expectancies mediate the relationship between BAS responsiveness and depression. *Cognition & Emotion, 16,* 549–564.

Block, J. H., & Block, J. (1980). The role of ego-control and ego resiliency in the organization of behavior. In W. A. Collins (Ed.), *The Minnesota symposium on child psychology* (Vol. 13, pp. 39–101). Hillsdale, NJ: Lawrence Erlbaum Associates, Inc.

Boyer, M. B., Compas, B. E., Stanger, C., Colletti, R. B., Konik, B., Morrow, S. B., & Thomsen, A. H. (2003). *Supraliminal and subliminal attentional biases in children with recurrent abdominal pain.* Manuscript submitted for publication.

Buss, A. H. (1995). *Personality: Temperament, social behavior, and the self.* Boston: Allyn & Bacon.

Buss, A. H., & Plomin, R. (1984). *Temperament: Early developing personality traits.* Hillsdale, NJ: Lawrence Erlbaum Associates, Inc.

Calkins, S. D., Fox, N. A., & Marshall, T. R. (1996). Behavioral and physiological antecedents of inhibited and uninhibited behavior. *Child Development, 67,* 523–540.

Caspi, A., Moffitt, T. E., Newman, D. L., & Silva, P. A. (1996). Behavioral observations at age 3 predict adult psychiatric disorders: Longitudinal evidence from a birth cohort. *Archives of General Psychiatry, 53,* 1033–1039.

Chorpita, B. F. (2002). The tripartite model and dimensions of anxiety and depression: An examination of structure in a large school sample. *Journal of Abnormal Child Psychology, 30,* 177–190.

Cicchetti, D., & Toth, S. (1998). The development of depression in children and adolescents. *American Psychologist, 53,* 221–241.

Clark, L. A., & Watson, D. (1991). Tripartite model of anxiety and depression: Psychometric evidence and taxonomic implications. *Journal of Abnormal Psychology, 100,* 316–336.

Clark, L. A., Watson, D., & Mineka, S. (1994). Temperament, personality, and the mood and anxiety disorders. *Journal of Abnormal Psychology, 103,* 103–116.

Clarke, G. N., Hawkins, W., Murphy, M., & Sheeber, L. B. (1993). School-based primary prevention of depressive symptomatology in adolescents. *Journal of Adolescent Research, 8,* 183–204.

Compas, B. E., Connor-Smith, J. K., Saltzman, H., Thomsen, A. H., & Wadsworth, M. E. (2001). Coping with stress during childhood and adolescence: Progress, problems, and potential in theory and research. *Psychological Bulletin, 127,* 87–127.

Compas, B. E., Ey, S., & Grant, K. E. (1993). Taxonomy, assessment, and diagnosis of depression during adolescence. *Psychological Bulletin, 114,* 323–344.

Compas, B. E., Grant, K. E., & Ey, S. (1994). Psychosocial stress and child/adolescent depression: Can we be more specific? In W. M. Reynolds & H. Johnston (Eds.), *Handbook of depression in children and adolescents* (pp. 509–523). New York: Plenum.

Connor-Smith, J. K., & Compas, B. E. (2002). Vulnerability to social stress: Coping as a mediator or moderator of sociotropy and symptoms of anxiety and depression. *Cognitive Therapy and Research, 26,* 39–55.

Connor-Smith, J. K., Compas, B. E., Thomsen, A. H., Wadsworth, M. E., & Saltzman, H. (2000). Responses to stress: Measurement of coping and reactivity in children and adolescents. *Journal of Consulting and Clinical Psychology, 68,* 976–992.

Costello, E. J., & Angold, A. (1996). Developmental psychopathology. In R. B. Cairns, G. H. Elder, Jr., & Costello, J. E. (Eds.), *Developmental science. Cambridge studies in social and emotional development* (pp. 168–189).

Costello, E. J., Pine, D. S., Hammen, C. M., John, S., Plotsky, P. M., & Weissman, M. (2002). Development and natural history of mood disorders. *Biological Psychiatry, 52,* 529–542.

Davies, P. T., & Windle, M. (2001). Interparental discord and adolescent adjustment trajectories: The potentiating and protective role of intrapersonal attributes. *Child Development, 72,* 1163–1178.

del Barrio, V., Moreno-Rosset, C., Lopez-Martinez, R., & Olmedo, M. (1997). Anxiety, depression, and personality structure. *Personality and Individual Differences, 23,* 327–335.

Derryberry, D., & Rothbart, M. K. (1988). Arousal, affect, and attention as components of temperament. *Journal of Personality and Social Psychology, 55,* 958–966.

Enns, M. W., & Cox, B. J. (1997). Personality dimensions and depression: Review and commentary. *Canadian Journal of Psychiatry, 42,* 274–284.

Fickova, E. (2001). Personality regulators of coping behavior in adolescents. *Studia Psychologica, 43,* 321–329.

Feehan, M., McGee, R., Raja, S. N., & Williams, S. M. (1994). *DSM–III–R* disorders in New Zealand 18-year-olds. *Australian and New Zealand Journal of Psychiatry, 28,* 87–99.

Gjerde, P. F. (1995). Alternative pathways to chronic depressive symptoms in young adults: Gender differences in developmental trajectories. *Child Development, 66,* 1277–1300.

Gomez, R., Holmberg, K., Bounds, J., Fullarton, C., & Gomez, A. (1999). Neuroticism and extraversion as predictors of coping styles during early adolescence. *Personality and Individual Differences, 27,* 3–17.

Goodman, S. H., & Gotlib, I. H. (Eds.). (2002). *Children of depressed parents: Mechanisms of risk and implications for treatment.* Washington, DC: American Psychological Association.

Gotlib, I. H., Lewinsohn, P. M., & Seeley, J. R. (1995). Symptoms versus a diagnosis of depression: Differences in psychosocial functioning. *Journal of Consulting and Clinical Psychology, 63,* 90–100.

Grant, K. E., Compas, B. E., Thurm, A., & McMahon, S. (2003). *Stressors and child/adolescent psychopathology: Measurement issues and prospective effects.* Manuscript submitted for publication.

Gray, J. A. (1991). The neuropsychology of temperament. In J. Strelau & A. Angleitner (Eds.), *Explorations in temperament:*

International perspectives on theory and measurement (pp. 105–128). New York: Plenum.

Hammen, C., & Compas, B. E. (1994). Unmasking unmasked depression in children and adolescents: The problem of comorbidity. *Clinical Psychology Review, 14,* 585–604.

Hankin, B. L., & Abramson, L. Y. (2001). Development of gender differences in depression: An elaborated cognitive vulnerability–transactional stress theory. *Psychological Bulletin, 127,* 773–796.

Hankin, B. L., Abramson, L. Y., Moffitt, T. E., Silva, P. A., McGee, R., & Angell, K. E. (1998). Development of depression from preadolescence to young adulthood: Emerging gender differences in a 10-year longitudinal study. *Journal of Abnormal Psychology, 107,* 128–140.

Happonen, M., Pulkkinen, L., Kaprio, J., Van der Meere, J., Viken, R. J., & Rose, R. J. (2002). The heritability of depressive symptoms: Multiple informants and multiple measures. *Journal of Child Psychology and Psychiatry and Allied Disciplines, 43,* 471–480.

Henderson, H. A., Fox, N. A., & Rubin, K. H. (2001). Temperamental contributions to social behavior: The moderating roles of frontal EEG asymmetry and gender. *Journal of the American Academy of Child and Adolescent Psychiatry, 40,* 68–70.

Kagan, J., & Snidman, N. (1991). Infant predictors of inhibited and uninhibited profiles. *Psychological Science, 2,* 40–44.

Kagan, J., Snidman, N., McManis, M., Woodward, S., & Hardway, C. (2002). One measure, one meaning: Multiple measures, clearer meaning. *Development and Psychopathology, 14,* 463–475.

Klein, D. N., Durbin, C. E., Shankman, S. A., & Santiago, N. J. (2002). Depression and personality. In I. H. Gotlib & C. L. Hammen (Eds.), *Handbook of depression and its treatment* (pp. 115–140). New York: Guilford.

Kovacs, M., & Devlin, B. (1998). Internalizing disorders in childhood. *Journal of Child Psychology & Psychiatry & Allied Disciplines, 39,* 47–63.

Langrock, A. M., Compas, B. E., Keller, G., Merchant, M. J., & Copeland, M. E. (2002). Coping with the stress of parental depression: Parents' reports of children's coping, emotional, and behavioral problems. *Journal of Clinical Child and Adolescent Psychology, 31,* 312–324.

Lengua, L. J., & Long, A. C. (2002). The role of emotionality and self-regulation in the appraisal–coping process: Tests of direct and moderating effects. *Journal of Applied Developmental Psychology, 23,* 471–493.

Lengua, L. J., Sandler, I. N., West, S. G., Wolchik, S. A., & Curran, P. J. (1999). Emotionality and self-regulation, threat appraisal and coping in children of divorce. *Development and Psychopathology, 11,* 15–37.

Lengua, L. J., West, S. G., & Sandler, I. N. (1998). Temperament as a predictor of symptomatology in children: Addressing contamination of measures. *Child Development, 69,* 64–181.

Lengua, L. J., Wolchik, S. A., Sandler, I. N., & West, S. G. (2000). The additive and interactive effects of parenting and temperament in predicting adjustment problems of children of divorce. *Journal of Clinical Child Psychology, 29,* 232–244.

Lewinsohn, P. M., Hops, H., Roberts, R. E., Seeley, J. R., & Andrews, J. A. (1993). Adolescent psychopathology: I. Prevalence and incidence of depression and other *DSM–IV–III–R* disorders in high school students. *Journal of Abnormal Psychology, 102,* 133–144.

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. *American Journal of Psychiatry, 157,* 1584–1591.

Naito, M., Kijima, N., & Kitamura, T. (2000). Temperament and Character Inventory (TCI) as predictors of depression among Japanese college students. *Journal of Clinical Psychology, 56,* 1579–1585.

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

Phillips, B. M., Lonigan, C. J., Driscoll, K., & Hooe, E. S. (2002). Positive and negative affectivity in children: A multitrait–multimethod investigation. *Journal of Clinical Child and Adolescent Psychology, 31,* 465–479.

Posner, M. I., & Rothbart, M. K. (1998). Attention, self-regulation and consciousness. *Philosophical transactions of the Royal Society of London, B, 353,* 1915–1927.

Reid, S. A., Duke, L. M., & Allen, J. J. B. (1998). Resting frontal electroencephalographic asymmetry in depression: Inconsistencies suggest the need to identify mediating factors. *Psychophysiology, 35,* 389–404.

Rice, F., Harold, G. T., & Thapar, A. (2002). Assessing the effects of age, sex and shared environment on the genetic aetiology of depression in childhood and adolescence. *Journal of Child Psychology & Psychiatry & Allied Disciplines, 43,* 1039–1051.

Rothbart, M. K., & Bates, J. E. (1998). Temperament. In W. Damon (Series Ed.) & N. Eisenberg (Vol. Ed.), *Handbook of child psychology: Vol. 3. Social, emotional, and personality development* (5th ed., pp. 105–176). New York, Wiley.

Rothbart, M. K, Posner, M. I., & Hershey, K. L. (1995). Temperament, attention, and developmental psychopathology. In D. Cicchetti & D. Cohen (Eds.), *Developmental psychopathology: Vol. 1. Theory and methods* (pp. 315–340). New York, Wiley.

Rothbart, M. R., Posner, M. I., & Boylan, A. (1990). Regulatory mechanisms in infant development. In J. T. Ennes (Ed.), *The development of attention: Research and theory. Advances in psychology* (pp. 47–66). New York: Elsevier.

Ruscio, J., & Ruscio, A. M. (2000). Informing the continuity controversy: A taxometric analysis of depression. *Journal of Abnormal Psychology, 109,* 473–487.

Shiner, R. L. (1998). How shall we speak of children's personalities in middle childhood? A preliminary taxonomy. *Psychological Bulletin, 124,* 308–332.

Shiner, R. L., Masten, A. S., & Tellegen, A. (2002). A developmental perspective on personality in emerging adulthood: Childhood antecedents and concurrent adaptation. *Journal of Personality and Social Psychology, 83,* 1165–1177.

Silberg, J. L., Rutter, M., & Eaves, L. (2001). Genetic and environmental influences on the temporal association between earlier anxiety and later depression in girls. *Biological Psychiatry, 49,* 1040–1049.

Strelau, J. (2001). The role of temperament as a moderator of stress. In T. D. Wachs & G. A. Kohnstamm (Eds.), *Temperament in context* (pp. 153–172). Mahwah, NJ: Lawrence Erlbaum Associates, Inc.

Tanaka, E., Kijima, N., & Kitamura, T. (1997). Correlations between the Temperament and Character Inventory and the Self-Rating Depression Scale among Japanese students. *Psychological Reports, 80,* 251–254.

Tellegen, A. (1985). Structure of mood and personality and their relevance to assessing anxiety, with an emphasis on self-report. In A. H. Tuma & J. D. Maser (Eds.), *Anxiety and the anxiety disorders* (pp. 681–706). Hillsdale, NJ: Lawrence Erlbaum Associates, Inc.

Thomas, A., & Chess, S. (1977). *Temperament and development.* New York: Brunner/Mazel.

Thomsen, A. H., Compas, B. E., Colletti, R. B., Stanger, C., & Boyer, M. (2003). *Individual differences in coping and temperament in children with recurrent abdominal pain.* Manuscript submitted for publication.

Whitaker, A., Johnson, J., Shaffer, D., Rapoport, J. C., Kalikow, K., Walsh, B. T., et al. (1990). Uncommon troubles in young people: Prevalence estimates of selected psychiatric disorders in a nonreferred adolescent population. *Archives of General Psychiatry, 47,* 487–496.

Windle, M., & Davies, P. T. (1999). Depression and heavy alcohol use among adolescents: Concurrent and prospective relations. *Development and Psychopathology, 11,* 823–844.

Woodward, S., Lenzenweger, M. F., Kagan, J., Snidman, N. C., & Arcus, D. (2000). Taxonic structure of infant reactivity: Quantitative evidence from a taxometric perspective. *Psychological Science, 11,* 296–301.

Received January 7, 2003
Accepted June 5, 2003