Commentary: Differentiated Measures of Temperament and Multiple Pathways to Childhood Disorders

Mary K. Rothbart
University of Oregon

Provided is a commentary on articles written for a special section on temperament and childhood disorders. Temperament’s contributions to the development of childhood disorders are considered both generally and specifically. Questions are raised about the use of terminology in the field, particularly the term difficult. Differentiation of outcomes and predictors is discussed, with a view to identifying multiple pathways to adaptation or disorder.

At the 1978 International Conference on Infant Studies, Jack Bates posed a set of questions to characterize the early state of our work: “Infant temperament: How shall we define the concept, measure it, and apply it in practice?” In the 25 years since that meeting, considerable progress has been made in measures, constructs, and communication of information about temperament, although major issues in measurement remain. With the publication of the articles in this special section, it is clear that new and more refined questions have now been posed, further integrating temperament with the development of behavior problems.

Temperament identifies variations in affective-motivational and attentional adaptations that are both genetically inherited and shaped by experience (Derryberry & Rothbart, 1997). We have defined temperament as constitutionally based individual differences in reactivity and self-regulation, observed in the domains of emotionality, motor activity, and attention (Rothbart & Derryberry, 1981). By reactivity, we mean characteristics of the individual’s responsivity to changes in stimulation shown at multiple levels (e.g., behavioral, autonomic, neuroendocrine) and through parameters of latency, rise time, peak intensity, and recovery time of reaction. By self-regulation, we mean processes modulating this reactivity, including approach, avoidance, inhibition, and attentional self-regulation. As children develop, initially more reactive systems become increasingly regulated, as systems like fearful inhibition and attentional effortful control develop.

In an earlier attempt to summarize research on development and psychopathology (Rothbart, Posner, & Hershey, 1995), we speculated about ways in which temperament might be involved in development of risk for psychopathology. The list included

1. Individual differences in temperament that in the extreme may constitute the psychopathology or a disposition toward it.
2. Temperament characteristics evoking reactions in others that can increase or buffer the risk of psychopathology.
3. Characteristics influencing the person’s choice of settings and relationships that may create greater or lesser risk for psychopathology.
4. Temperamental differences influencing the form of a disorder, its course, the likelihood of its recurrence, or a combination of these.
5. Temperamental biases in information processing that can influence cognitions about the world, self, and others.
6. Temperamental regulation or buffering against the effects of risk factors or stress.
7. Heightened or lower responsiveness to environmental events.
8. Interaction among temperamental characteristics that can influence outcomes as temperament develops.
9. Different temperamental dispositions that may shape different developmental pathways to a given outcome, and individual dispositions that may influence multiple outcomes (Cicchetti & Cohen, 1995).
10. Temperament characteristics and caregiving environments that may make independent contributions to outcomes, or may interact in increasing or decreasing risk of disorder.
11. Dysfunctional states themselves that may change aspects of temperament and create further risk.

Requests for reprints should be sent to Mary K. Rothbart, 1227 University of Oregon, Eugene, OR 97403–1227. E-mail: maryroth@darkwing.uoregon.edu
fer to items in the list by number in the following. In addition to these topics, the articles in this section stress issues of emotional regulation and dysregulation that I believe will be basic to future advances in the field. A focus on emotion regulation suggests these kinds of questions: When fear and avoidance are elicited, how may their expression be reinforced or regulated? How can soothing of negative affect occur from others (Harman, Rothbart, & Posner, 1997) or from the self (Rothbart, Ziaie, O'Boyle, 1992)? What kinds of coping can modulate or enhance emotional reactions? When does the coping itself become maladaptive?

Difficult Temperament: Confusion in Terminology

Before discussing the articles in this section individually, I would like to comment on the use of the “difficult child” construct in several of the articles. Please consider these concerns along with the excellent ones voiced by Frick and Morris in their article (this issue). Thomas, Chess, and associates (Thomas, Chess, & Birch, 1968; Thomas, Chess, Birch, Hertzig, & Korn, 1963), in their groundbreaking work on temperament, identified nine dimensions of temperament along with three categories of infants, designated as “easy,” “difficult,” and “slow to warm up.” The difficult and easy categories were based on a factor analysis of data from the original New York Longitudinal Study, which identified a cluster of five temperament dimensions: (a) approach–withdrawal, (b) mood, (c) intensity, (d) adaptability, and (e) rhythmicity, that they labeled difficult (Thomas et al., 1963). In algorithms for assessing difficulty developed by Carey and McDevitt (1978), Fullard, McDevitt, and Carey (1984), and others, “difficult” and “easy” are derived from extreme scores on all of these five dimensions.

There are a number of problems in the use of the difficulty construct in temperament research (see also Plomin, 1982; Rothbart, 1982). One is the wide variability of operationalizations of the construct. For example, factor analyses of data collected on the New York Longitudinal Study dimensions have frequently failed to replicate loadings of rhythmicity on the difficulty factor (Bates, 1980). As a result, studies often delete rhythmicity measurements or use varying composites to assess a difficult temperament, depending on the outcome of their own factor analysis. This inconsistency in the use of difficulty creates serious problems for knowing what is meant by the term in any given study.

Bates (1980) argued that the core variable of measures of difficulty is the presence of negative emotionality, and his work utilized measures assessing this variable. Factor-analytic work by Bates and others also identified two kinds of negative emotionality in infancy: (a) negative affect related to children’s responses to novelty and (b) more general irritability or distress proneness (Bates, Freeland, & Lounsbury, 1979). General irritability predicted later externalizing and internalizing problems; fear of novelty predicted internalizing problems to a greater degree than externalizing problems (see review by Rothbart & Bates, 1998). Bates’s research indicated that the two varieties of negative emotionality are differentially related to specific behavior problems that develop later, and this important distinction is lost in the more general construct of difficultness as often operationalized.

Another way of looking at difficulty is to say that some children are labeled by their caregivers as problem children at an early age, and this labeling is likely influenced by the child’s temperament. The terms easy and difficult may be also used by parents of more than one child to compare children (i.e., “the first was easy, but the second was difficult”). The terms may be applied in an endearing way, or in an attempt to identify the source of problems in family relationships. In addition, however, labels communicated to the child may contribute to the quality of the child’s adaptation. The study of social attributions, values, and labeling is important, but it takes us to a level of analysis beyond the simple measurement of temperament.

Over recent years, the list of nine dimensions of temperament (activity level, mood, intensity, threshold, approach–withdrawal, attention span–persistence, distractibility, adaptability, and rhythmicity) proposed by Thomas, Chess, and their associates has undergone revision (Rothbart & Bates, 1998). Recent research, for example, has identified a general structure of temperament in childhood that includes broad factors of surgency–extraversion, negative affectivity, and effortful control (Rothbart, Ahadi, Hershey, & Fisher, 2001). In our research, surgency–extraversion is defined primarily by scales assessing positive emotionality and approach, including positive anticipation, high-intensity pleasure (sensation-seeking), activity level, impulsivity, smiling and laughter, and a negative loading from shyness. A negative affectivity factor includes positive loadings for shyness, discomfort, fear, anger–frustration, and sadness, and a negative loading from soothability-falling reactivity. The effortful control factor is defined by positive loadings from inhibitory control, attentional focusing, low intensity (non–risk-taking) pleasure, and perceptual sensitivity. These broader factors suggest a hierarchical structure to temperament, with more specific characteristics related to each other at a higher level in the hierarchy.

A Comment on the Articles in this Special Section

Lonigan, Vasey, Phillips, and Hazen (this issue) have reported extraction of similar factors to those de-
scribed previously, from childhood self-reported items assessing emotionality and attention. In turn, Lonigan et al. have found that measures of temperament show differential relations to measures of depression and anxiety, with negative affectivity predicting both depression and anxiety and effortful control predicting lower levels of both problems. Surgency—positive affectivity predicts unique variance of depression only, with lower levels of surgency predicting more likelihood of depression. Like other studies with adults reviewed in Lonigan et al.’s article, their research indicates that both reactive (positive and negative affect) and regulative (effortful control) temperament characteristics are related to psychopathology (1 and 8 in the previous list). Lonigan et al. also bring up the automatic attentional biases linked to negative affectivity, which may influence both the daily experiences of children and their proneness to future negative experiences (5 and 7). Lonigan et al.’s important findings further raise the question of how these dispositions may interact in influencing development of internalizing outcomes. It also will be of interest to link problem outcomes to affect at lower levels of the hierarchy (e.g., fear, anger, sadness, soothability) and to specific experiences of the child and related cognitions.

Compas, Connor-Smith, and Jaser (this issue) begin to fill in possible developmental pathways to depression by examining basic links between stress, coping, and adaptive and maladaptive outcomes. They demonstrate relations between negative affectivity and relatively automatic avoidance coping (3 and 5) and suggest that attentional control may be related to the use of secondary coping, such as cognitively reframing a situation or intentionally buffering more automatic stress reactions (6). Their work brings up basic issues of emotion regulation that are also discussed in other articles in the section. Compas et al. also point out that temperament can directly influence the experiences of children, with stronger dispositions to negative affect mapping onto dysphoric symptoms and low positive affectivity mapping onto anhedonic symptoms (1). Children prone to negative affect, for example, will experience stronger stress reactions than less highly distress-prone children, given the same environmental stressor (7). These observations are related to an important point made by Escalona (1968) about “effective experience”: measuring an environmental stressor is not sufficient for us to understand what a child is experiencing, given temperamental variability and variability in the use of coping. Future research is likely to make more direct links between affectivity, coping, and the cognitive appraisals that have been linked to depression (Beck, 1976). Issues of emotion regulation and dysregulation thus appear to be of major importance for the development of psychopathology, and information about coping at all stages of reactivity (prior to aspects of the reaction, at peak, and in relation to duration) is basic to our understanding. These studies also have much to offer to our general understanding of development.

It is likely that differential predictions of psychopathology using the two kinds of negative affect found by Bates et al. (1979) will add further understanding (9). For example, research increasingly suggests that one kind of negative affect—fear—can act as a protective factor for development of the externalizing disorders (Rothbart & Bates, 1998), and Frick and Morris (this issue) present data to suggest this is the case (8). In addition, links between conduct disorder and depression suggest that a developmental analysis of the order of appearance of symptoms will be important.

The article by Frick and Morris (this issue) makes excellent use of what is currently known about temperament, demonstrating the effectiveness of considering differentiated outcomes as well as differentiated temperamental predictors to describe possible multiple pathways to conduct problems (4 and 9). They distinguish between reactive and more instrumental aggression, suggesting that emotional reactivity and lack of emotional regulation are likely to be closely tied to the reactive symptoms. They also note that the development of conscience is linked to regulation of instrumental aggression and that Kochanska’s (1995) demonstration of connections between temperamental fear, effortful control, and the development of conscience has identified important links between temperament and the development of morality. Frick and Morris’ observation that affective aspects of conscience can counteract callous and unemotional responses to others is very helpful. Although temperamental building blocks like effortful control can provide the capacity to regulate action, the direction of that regulation is not specified: It will depend on the values and goals of the person, one of which is the desire not to hurt others. The values and goals of the child will also be influenced by the culture (Putnam, Sanson, & Rothbart, 2002) and by the set of experiences and relationships the child has had.

Nigg, Goldsmith, and Sachek (this issue) also consider more differentiated outcomes as well as more differentiated negative affectivity predictors of attention deficit hyperactivity disorder (ADHD). These authors make important strides in identifying possible multiple pathways (9), stressing the importance of development in shaping both temperament and psychopathology (8). Their brief review of genetics findings suggests that shared environment may be relatively unimportant in the development of ADHD, but important for ADHD with conduct disorder. This is an intriguing finding, suggesting socialization studies comparing the two outcomes.

If we put together the analysis of Frick and Morris (this issue) with the review of Nigg et al. (this issue), we can see that studies on the development of conduct
disorder in relation to the attentional capacities of the child will be of great interest. Differentiating anger and irritability from fear will also lead to interesting questions about fear as a control mechanism: Is fear control mainly inhibitory, or is avoidance also involved? What is the role of punishment in fear control? Kochanska (1995) and Asendorpf (1990) have already made important advances in looking at fear in the development of conscience and the possibility of two kinds of shyness, one more temperamental and one likely related to social punishment. Thinking of fear as a control system does not neatly fit within our heuristic distinction between reactivity and self-regulation (Rothbart & Derryberry, 1981). Fear is a reactive system, but it includes regulatory aspects. Effortful control, on the other hand, is chiefly self-regulatory, and the inhibition or avoidance of fear and surgery reactions is often accomplished through effortful control.

Elsewhere (Rothbart, 1999), I have commented that one of the most confusing aspects of applying temperament constructs has been the tendency for different researchers to use different names for the same process. In a volume on fear, shyness, and social phobia, I found that five different chapters used five different terms describing individual differences in fear (Rothbart, 1999). Nigg et al.’s negative approach term is an example of this phenomenon. There are important concurrent and longitudinal links between anger and surgency–extraversion (Rothbart, Derryberry, & Hershey, 2000), but combining approaching aspects of surgency with the kind of affect (anger) that occurs when our goals are blocked is not very helpful. I strongly believe, however, that if we address the kinds of differentiating questions suggested by Nigg et al., and those listed previously, we will be better able to assign terms to our constructs so that we can know what they mean when we use them.

Wills and Dishion (this issue) put forward a differentiated model specifying temperament and self-control as moderators for the relations between parenting, peer groups, and substance use (3, 10). They have found temperamental positive mood and task orientation to be related to supportive relationships with parents and low substance abuse, whereas negative emotionality and activity level are related to parent–child conflict and substance abuse, and inversely related to parent support (2). Wills and Dishion differentiate between self-control and poor self-control and further differentiate those constructs from extraversion–surgency and effortful control. Nevertheless, there appear to be overlap among these constructs. Wills and Dishion define self-control as involving “self-monitoring, planning, future orientation, delay of gratification, and emotional regulation.” We (Posner & Rothbart, 1998) have proposed that effortful control is supported by the executive attention system, and both executive attention and effortful control are involved in planning, self-monitoring, future orientation, emotional regulation, and delay of gratification. Thus, it is not clear whether the differences between Wills and Dishion’s self-control and temperamental effortful control are more than terminological. Their construct of poor self-control, however, is defined by “aspects of impatience, impulsiveness, orientation toward the present, inability to delay gratification, and coping with problems through anger.” This is clearly a more complex personality construct, although surgent–extraverted characteristics and low effortful control may serve as developmental building blocks for it. This construct appears to be linked to low emotional and behavioral regulation and is likely related to the expressive aspects of conduct disorder described by Frick and Morris.

Questions about relations between temperament and attachment have been considered for many years (see review by Rothbart & Bates, 1998). Zeanah and Fox (this issue) raise a new set of issues about the possible relation between temperament and reactive attachment disorder. Reactive attachment disorder is an unusual disorder, in that a history of pathogenic care is critical to diagnosis and is evidently assumed to be causal. An added criterion is the presence of one of two types of symptoms: (a) highly inhibited behavior, ambivalent or contradictory behavior to the caregiver; and (b) indiscriminate sociability to a wide range of adults and lack of selectivity to attachment figures. Zeanah and Fox suggest that the first set of syndromes maps onto negative affectivity, and the second set possibly onto surgency–extraversion (4). They suggest that individual differences in irritability may be the basic motivator of avoidance. However, the symptoms described seem closer to individual differences in fearful inhibition. They make the point that empirical research in this area will be valuable, and this research may well profit from a differentiated approach to assessing negative affect. Zeanah and Fox note that temperament itself may be affected by pathogenic rearing environments (11), citing studies of institutionalized children described as higher in negative affect, more shy, and less active and sociable than home-reared children. In addition, they note attentional problems that appear to be associated with neglect in caregiving (2).

Summary of Critical Issues and Future Directions

1. By differentiating within broad temperament dimensions, or even within more narrow temperament dimensions such as fear, we may advance our understanding of the development of psychopathology.

2. Temperament may be linked to multiple pathways to childhood disorders, and differentiating symptoms of the disorders facilitates this effort.
developing attention-training interventions

Given the importance of executive attention and effortful control in so many developmental processes, attention-based interventions may prove helpful in preventing or helping to treat childhood disorders. Michael Posner and I have now completed a trial of an attention-training program with normal 4-year-olds. We developed a computerized joystick-controlled program based on primate attention training originally developed by Washburn and Rumbaugh (1992). In our first test of the approach with a small sample of children, we found that training was related to increases in children’s IQ, especially their matrix performance, not found for controls (Rothbart & Rueda, 2003). There were further indications that children’s performance on conflict tasks had improved. Future research will investigate whether these results replicate and whether they are helpful for children whose attentional functioning has been compromised. One feature of this approach is that it is based on a neuroscience analysis of the processes involved in executive attention, and this approach may prove helpful for others in the area of diagnosis and treatment.

references


COMMENTARY: DIFFERENTIATED MEASURES OF TEMPERAMENT


Received April 20, 2003
Accepted August 26, 2003