
TEMPERAMENT AND LEARNING DISABILITY

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Abstract. The link between learning problems and social-emotional difficulties is well documented and both are associated with temperamental risk factors. Whereas temperament refers to individual differences in biologically based dispositions for responding to and engaging with one's surroundings, developmental outcomes are the products of experiences as influenced by temperament in concert with other variables and the opportunities, challenges, and supports of the child's various contexts. A review of the research supports pathways between temperament and outcomes that are direct, indirect, bidirectional, and hierarchical. Interventions that are informed by temperament may address the various pathways through which temperament influences outcomes.

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Current views of learning and development recognize the complex and interactive contributions of biological, social, and psychological processes that produce both individualistic trajectories and age-related developmental patterns (see "Learner Centered Psychological Principles" suggested by the APA Task Force, 1997; also see Alexander & Murphy, 1997). A focus on the individual learner is central to the field of learning disabilities (LD), which aims to maximize academic progress by matching the learning and performance conditions to the needs of the learner. Temperament, an important source of individuality, is a general rubric subsuming individual differences in tendencies to respond to the environment on the basis of biologically rooted predispositions that are evident early in life and remain stable over time while being subject to the influence of maturation and experience (Buss & Plomin, 1984; Rothbart, 1989; Thomas & Chess, 1977).

Temperamental dispositions are often described in terms of behavioral style, or the *how* of behaviors such

as their persistence, energy level, as well as valence and intensity of emotional responses (Thomas & Chess, 1977). Although the *what* (content) and *why* (purpose) of behaviors do not fall under the purview of temperament, these aspects of behavior are often linked to temperament, directly or indirectly. For instance, temperament may be expressed as preferences to seek or avoid certain activities or experiences (what) or as efforts to regulate temperamentally rooted reactivity (why). All children are born with a set of temperamental attributes, each distributed along the normal continuum. No single temperamental trait is inherently good or bad but exerts its influence on learning and development in the context of other traits and in response to situations. The configuration of these attributes, in concert with the child's other characteristics, shapes the cumulative exchanges between the individual and the environment, thereby influencing developmental outcomes.

Various models of identifying children with LD share the two related constructs of "unexpected low achieve-

ment” and “discrepancy” while focusing on different aspects of discrepancy (see Fletcher, Morris, & Lyon, 2003). All models agree that a “discrepancy” is usually first noted as lower than expected achievement in the classroom (local norms) or on standardized tests (national norms) that is not attributable to exclusionary criteria such as lack of opportunity to learn.

In contention are the procedures for calling that discrepancy a “learning disability.” Currently, two contrasting models focus respectively on discrepant performance relative to the child’s baseline ability (intra-individual discrepancies) and expected responses to an instructional intervention (problem solving). Limitations of the problem-solving model (see Fuchs, Mock, Morgan, & Young, 2003), and dissatisfaction with implementation of the intra-individual model, call for an integration of the two approaches (Fletcher et al., 2003). This review focuses on the impact of temperament on academic learning and social development without addressing specific criteria for identifying children with a learning disability.

Temperament Constructs

Despite consensus on the general definition, there is little agreement on the number of dimensions included in the temperament rubric or on how those dimensions should be grouped. Four major approaches to the conceptualization of temperament have used different methods to identify temperament dimensions.

Content analysis of interviews. In what has come to be known as the New York Longitudinal Study (NYLS), nine dimensions of temperament were extracted from interviews with mothers about their infants: *activity level, mood, approach/withdrawal, intensity, threshold, rhythmicity, distractibility, attention span/persistence, and adaptability* (Thomas & Chess, 1977; Thomas, Chess, & Birch, 1968). Although factor-analytic studies show that these dimensions are not independent (see Teglasi, 1998a), some have resisted the call for fewer dimensions and, on the basis of their clinical utility, favor keeping all nine.

Evidence of heritability, stability, and early appearance. Criteria of heritability, stability into adulthood, and appearance prior to age two yielded three dimensions: *emotionality, activity, and sociability* (Buss & Plomin, 1984). *Novelty* or *sensation seeking* also meets the criteria of temperament; temporal stability, early appearance, and biological basis (e.g., Fulker, Eysenck, & Zuckerman, 1980; Hur & Bouchard, 1997).

Physiological models. Models that relate neurobiological mechanisms to temperament center on individual differences in sensitivity to the types of stimuli that draw attention or create stress (such as novelty or riskiness, social or nonsocial, and signaling reward or

threat). Gray (1982, 1987) proposed that temperamental individuality is based on the balance between two biologically rooted motivational systems, the Behavioral Inhibition System (BIS) and the Behavioral Activation System (BAS). The BAS responds to signals of potential reward and nonpunishment (hope and relief), whereas the BIS responds to signals of punishment and nonreward (fear and frustration). The BAS activates approach behavior, increases arousal, and directs attention to positive cues. The BIS, on the other hand, prompts withdrawal from aversive stimuli or inhibits behavior, increases arousal, and directs attention towards negative cues. Research has supported the differentiation between reactivity to positive and negative affective cues (Larsen, 1991; Rusting & Larsen, 1995; Watson & Clark, 1991), as well as the differential associations of the BIS and the BAS arousal systems, respectively, with attention to cues that signal threat or reward (Derryberry & Tucker, 1991).

Theoretical and empirical relevance of constructs. Noting that not all temperament dimensions are manifested in the first two years of life but are evident by early childhood, Rothbart and her colleagues included within the temperament rubric characteristics identified by research with infants and with adults (Capaldi & Rothbart, 1992; Derryberry & Rothbart, 1988; Rothbart, Ahadi, Hershey, & Fisher, 2001), organizing the various dimensions around the central constructs of reactivity and self-regulation. *Reactivity* subsumes the arousability of motor, affective, and sensory response systems, whereas *self-regulation* comprises the processes that modulate (increase or decrease) reactivity through the mechanisms of attentional focus, inhibitory control and seeking or avoiding certain types of stimuli that call forth reactivity. Fifteen temperament dimensions offer a well differentiated set of attributes to describe positive and negative reactivity and self regulation (Rothbart et al., 2001): *activity level, anger/frustration, attentional focusing, discomfort, fear, high intensity pleasure, impulsivity, inhibitory control, low intensity pleasure, perceptual sensitivity, positive anticipation, sadness, shyness, smiling/laughter, soothability (falling reactivity)*.

Temperament Dimensions

Specific temperament dimensions described below are grouped under the rubrics of reactivity and self-regulation. Reactivity has been considered in terms of its valence (sensitivity to cues that evoke positive or negative emotional states); intensity (low or high arousal or energy or the reaction); duration (time to baseline, falling reactivity or soothability); prototypical situations that elicit reactivity (novel-familiar; social-nonsocial; reward-punishment or threat); and threshold

(response evoked by low stimulation-high stimulation). In addition, activity and emotionality are two important dimensions of reactivity as discussed below.

Activity. Activity level refers to the tempo and vigor of motoric movement (Buss & Plomin, 1984) and emerges clearly in item-level factor analyses (Martin, Wisenbaker, & Huttenen, 1994). Activity level is associated with preferences for activities that are low-key versus exciting (Rothbart & Ahadi, 1994; Tarter, Moss, & Vanyukov, 1995). High levels of activity have been associated with increased risk for externalizing behavior problems (Moss, Blackston, Martin, & Tarter, 1992). Concomitant features of high activity levels such as restlessness and irritability may predispose individuals to interpersonal and academic difficulties (Tarter, 1988). At the high end of this dimension are children characterized by boundless energy, high tempo, and impatience to start a task before hearing all of the instructions. At the low end are those who are slow to respond in class or to start their assignments or appear lethargic or unmotivated.

Emotionality. Emotional reactivity refers to the prevailing valence (positive or negative) and intensity (degree of arousal) of emotional states (Derryberry & Rothbart, 1997). Negative reactivity is defined as sensitivity to stimuli that evoke negative affect, whereas positive reactivity is defined as sensitivity to stimuli that evoke positive affect. Positive and negative emotions are largely independent of each other (Diener & Emmons, 1984; Watson, Clark, & Tellegen, 1988), are associated with different biological systems (Depue, 1996), and respond to different external variables (Clark & Watson, 1988). Moreover, positive and negative emotions are higher-order dimensions that subsume more specific affects (Diener, Smith, & Fujita, 1995; Watson & Tellegen, 1985). Thus, negative emotions encompass general distress, anger/frustration, sadness, and fear (see Rothbart et al., 2001).

The intensity of the stimulation that evokes affect has also been considered to be temperamentally rooted. For example, Rothbart and colleagues (Rothbart et al., 2001) differentiate positive emotions evoked by situations characterized by high- and low-intensity stimulation (high-intensity pleasure, low-intensity pleasure). Sociability involves positive reactions to other people (Buss & Plomin, 1984). Shyness entails negative reactivity in novel or unpredictable environments with a tendency to become inhibited or cautious and hesitant to approach unfamiliar persons or situations (Kagan, Reznick, & Snidman, 1988). Pre-existing tendencies toward high negative reactivity (low threshold for physiological arousal) in novel or ambiguous situations is a risk factor for subsequent anxiety disorder (Kagan & Snidman, 1999; Kagan, Snidman,

Zentner, & Peterson, 1999). Positive and negative reactivity are also associated with sensitivity to cues that signal potential reward or threat (BAS and BIS), respectively.

Self-regulation comprises processes that moderate reactivity, including regulation of stress reactions and maintenance of optimal arousal through the mechanism of attention, approach-avoidance, and adaptability/flexibility.

Attention. Individual differences in attentional regulation have been variously referred to as attention span, persistence, distractibility, or task orientation (Carey, 1998; Martin, 1989). Effortful control over behaviors, cognitions, and emotions is associated with attentional control (Rothbart & Ahadi, 1994). *Distractibility*, introduced in the NYLS, refers to the ease with which a baby's attention may be diverted from the source of distress (also described as "soothability" or *falling reactivity*, defined as return to baseline levels of arousal). In older children, distractibility suggests problems sustaining attention due to the draw of extraneous stimuli.

Inhibitory control, defined as the capacity to plan and inhibit responses when directed or in situations of uncertainty (Rothbart et al., 2001), is related to two attentional processes: the ability to focus attention and the ability to flexibly switch attention. Both types of attention play a supportive role in learning and adjustment (i.e., shift attention from immediately rewarding stimuli to focus on the task).

Approach avoidance. Inclinations to approach or avoid situations tend to correlate with positive and negative emotions, respectively (Clark, Watson, & Mineka, 1994; Rothbart & Mauro, 1990), and serve to maintain the preferred level of physiological/emotional arousal, thereby moderating reactivity (Losoya, Eisenberg, & Fabes, 1998; Rothbart & Derryberry, 1981; Strelau, 1983). Thus, individual differences in tendencies toward approach or avoidance reflect biologically motivated preferences in stimuli (Davidson, 1993).

Approach/avoidance has been studied in relation to aspects of situations (such as novelty or riskiness, level of intensity, social/non-social or reward/non-reward) that are salient for temperamental reactivity. For example, children with high negative reactivity usually approach new situations with caution or fearfully avoid such situations (Kagan et al., 1988), whereas those low in negative reactivity tend to seek novelty or risk to attain a desired emotional state (Zuckerman, 1983, 1994). Those who are high on *sociability* prefer to approach people regardless of whether they are familiar but sociability is not the opposite of shyness, which is associated with reactions to new people and not with preferences to be alone or to seek company of others

(Cheek & Buss, 1981). While behavioral differences in approach or avoidance come from within, the actual activities chosen are societally influenced (Oetting, Donnermeyer, Trimble, & Beauvais, 1998).

Adaptability – flexibility. The dimension of adaptability was introduced in the NYLS study to differentiate between initial tendency to withdraw from novel or unexpected stimuli and the ease of getting used to them (later called *flexibility*; Windle & Lerner, 1986). The dimension of *falling reactivity* (Rothbart et al., 2001) is relevant here as a quick return to baseline levels of arousal in a challenging situation would increase adaptability. Therefore, adaptable (or flexible) children are adept at handling situations involving change in routine or other unexpected events or transitions (new learning task, new school year, class trip). This dimension is complex and does not emerge clearly in factor-analytic studies (Martin et al., 1994; McCloskey, Hegvik, & Teglas, 1993), probably because it is broader than other temperament dimensions. That is, acclimating to new and changing circumstances most likely involves various reactive tendencies and self-regulatory resources as well as non-temperamental attributes.

Importance of Self-Regulation

Self-regulation may range from being automatic to requiring various degrees of effort. A distinction between automatic and effortful regulation is useful because the human capacity to engage in conscious, effortful regulation is limited (see Muraven, Tice, & Baumeister, 1998). The importance of automaticity of perceptions and cognitions in daily functioning is well established (Bargh & Chartrand, 1999; Bargh & Ferguson, 2000; Lewicki, Hill, & Czyewska, 1992).

Individuals with high reactivity and few resources for their automatic regulation have to expend deliberate effort to moderate intense emotions, control wandering thoughts (distractibility), or modulate level of activity. Effort directed at regulating basic temperamental processes diverts resources from learning more complex academic and social competencies. Thus, problems with temperamental self-regulation impede the development of social competence (Eisenberg, Fabes, Guthrie, & Reiser, 2002). In educational settings, strategic or self-regulated processing of information is highly valued but requires deliberate effort (Borkowski, Carr, & Pressely, 1987). However, deficits in processing information or in working memory associated with LD (Swanson & Saez, 2003) that impede the development of increasing automaticity in basic skills such as decoding, calculation, or grammar, make learning more effortful and strain limited resources.

The development of a set of cognitive competencies generally referred to as *executive functions* also supports

self-regulated learning. Executive functions (or metacognitive skills) serve to orchestrate basic processes of working memory, attention, and inhibitory (effortful) control as a means of planning and implementing goal-directed strategies toward desired outcomes (Lyon & Krasnegor, 1996; Zelazo, Carter, Reznick, & Frye, 1997). Inhibitory or effortful control is a key component of executive cognition, and its development relates to individuality in attentional self-regulation (Posner & Rothbart, 1998; Ruff & Rothbart, 1996). Moreover, positive emotional experiences, in reciprocal relation with working memory and attention, enhance the organization of higher-order cognitive structures that aid self-regulation (Fischer, Shaver, & Carnochan, 1990), whereas negative emotional experiences disrupt higher-order information processing (Matthews & Wells, 1999; Mogg & Bradley, 1999).

Thus, the development of increasingly complex competencies is built on increasing automaticity of lower-level self-regulatory functions and increasing development of metacognitive skills that organize automatic and effortful self-regulatory processes. Those who are disadvantaged in the ability to process information due to deficits in working memory or attention may be more vulnerable to disruption of self-regulated learning (in academic and social arenas), and their resources may be further taxed if they also have to expend effort on regulating high negative emotional reactivity or distractibility. With time, accumulating gaps in social competence and background knowledge further impede learning and development.

Temperament as Risk Factors in Social and Academic Development

Predictive relationships between temperament and adjustment have led to the view of certain temperamental attributes as increasing risk (vulnerability) or giving protection (resilience) in the face of adversity (Caspi, Henry, McGee, Moffitt, & Silva, 1995; Hinshaw, 1992). However, relationships between temperament and outcomes are probabilistic, not deterministic. That is, in line with the developmental principles of equifinality and multifinality, different constellations of temperament characteristics may result in the same outcome, and the same constellation may result in different outcomes (Cicchetti & Rogosch, 1996). Temperamental risk is not static because coping resources that moderate vulnerability continue to grow with maturation and experience (Stuss, 1992).

Links have been demonstrated between temperament and deficits in social competence (Eisenberg et al., 2002; Sanson, Hemphill, & Smart, 2004); between temperament and academic achievement (Bramlett, Scott, & Rowell, 2000; Cardell & Parmar, 1988; Martin

& Holbrook, 1985; Maziade, Cote, Boutin, Boudreault, & Thivierge, 1986; Newman, Noel, Chen, & Matsopoulos, 1998); and between LD and deficits in social competence (Morrison & Cosden, 1997; Nowicki, 2003; Swanson & Malone, 1992). Generally, low task orientation (low attention/persistence, high distractibility) and, to a lesser extent, high activity level and low approach are associated with lower academic performance. Bender (1987) characterized students with LD as being less actively engaged in learning behaviorally or emotionally and as demonstrating fewer metacognitive strategies (executive functions) to guide task completion. It is noteworthy that school-aged boys are significantly more active and less task persistent than girls (McClowry, Halverson, & Sanson, 2003), and according to DSM IV, more boys than girls tend to be identified with learning disabilities (APA, 1994).

The association between learning and social emotional difficulties may be grounded in their common links with temperament. Temperament may amplify difficulties with processing information, and thus contribute to being identified with LD, and difficulties with information processing make it harder to deal with the challenges of adverse temperamental dispositions. Considering the connection between children's daily functioning and their academic progress (e.g., Welsh, Parke, Widaman, & O'Neil, 2001), it is not sur-

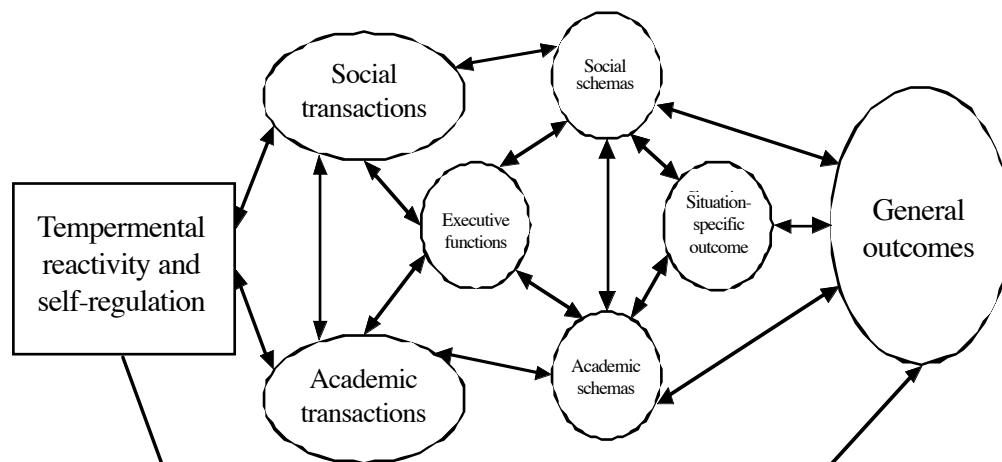
prising that school-based interventions that effectively address children's social and emotional needs also improve academic performance (for a review, see Graczyk et al., 2000).

Temperament and Developmental Processes

As shown in Figure 1, temperamental reactivity and self-regulation, associated with the biological systems of the brain, set down the patterns of reactions to stimuli, but it is the continuous process of learning through interactions with social and academic environments that shapes outcomes. Risks associated with temperament and with LD identification team up. Transactions with the environment are influenced by the combination of learning and temperamental difficulties because others respond to this combination and because the child responds to the surroundings on the basis of this combination. Accordingly, viewing the emotional needs of children with LD as stemming from learning problems may be less appropriate than viewing the individual in terms of a set of basic dispositions that include temperament and learning processes that reciprocally influence one another (Abrams, 1991).

Regulation of attention moderates behavioral self-control and buffers individuals against the adverse impact of other temperament dimensions such as high negative emotional reactivity (Belsky, Friedman, & Hsieh, 2001; Rothbart & Ahadi, 1994). Generally, the prediction of adverse outcomes involves configurations

Figure 1. Temperament and the developmental process.



of temperamental attributes. For instance, negative emotionality and high activity level, often cited as risk factors (see Rothbart & Ahadi, 1994; Rothbart & Bates, 1998), together with short attention span were associated during early childhood with a set of “undercontrolled” behaviors that were predictive of behavior problems during adolescence (Caspi et al., 1995) and of impaired interpersonal functioning at age 21 (Newman, Caspi, Moffitt, & Silva, 1997).

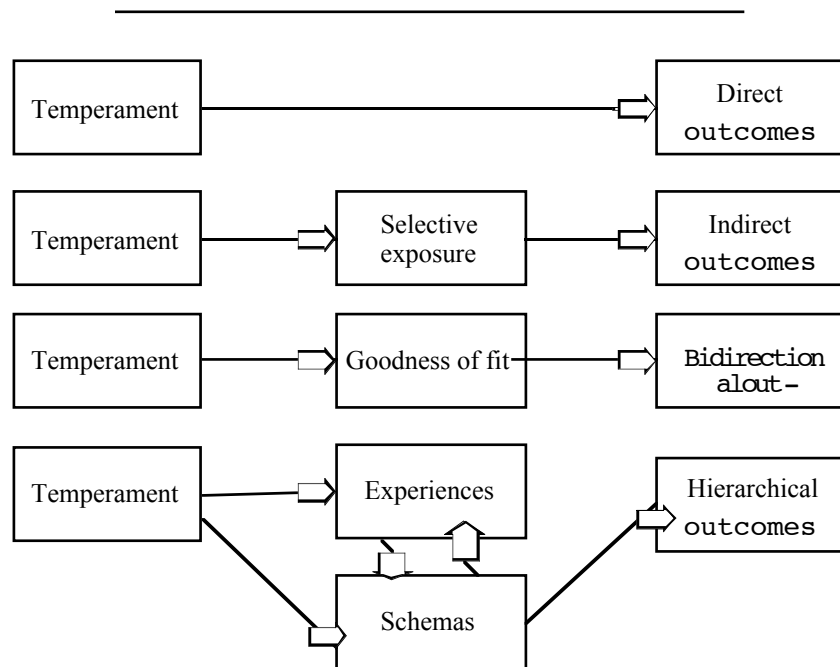
All of the variables within the child, including various aspects of temperament, motivation, learning processes, and abilities, reciprocally influence one another and, together, these internal characteristics face encounters with the environment. As depicted in Figure 1, individuals build mental models or schemas from the cumulative synthesis of these encounters, in line with growing executive functions. These models, based on prior encounters, are called forth to inform current transactions (task-related and interpersonal). For instance, although negative emotional reactivity has temperamental roots, developing mental models that connect emotional reactions with situational cues and with intentional actions to resolve the distress contributes to adjustment (Lohr, Teglasi, & French, 2004).

It has been suggested that assessment of temperament adds important information to cognitive measures such as tests of intelligence or achievement, thereby providing a broader range of attributes to be considered in making determinations about school readiness (Pianta & Walsh, 1996) or interventions (Keogh, 2003). The assessment of schemas for social problem solving (Teglasi, 1998b) would further enhance our understanding of children’s developmental needs. As development proceeds, it is expected that responses to the environment become increasingly self-regulated and “filtered” through the lens of prior learning rather than directly evoked by impinging stimuli. Therefore, it is important to study individual differences in the qualities and developmental paths of these filtering mechanism or schemas as well as their operation in various domains (Teglasi, 2001).

Multiple Pathways of Temperamental Influence on Learning and Adjustment and Implications for Intervention

Temperament influences outcomes in ways that may be described as direct, indirect, bidirectional, and hierarchical (Teglasi & Epstein, 1998), and interventions

Figure 2. Multiple pathways to outcomes.



may be conceptualized in relation to these rubrics (see Figure 2).

Direct. A wide range of variability in the expression of temperamental individuality is considered normal. However, at the extremes, temperamental dispositions may be directly expressed in behaviors that may be characterized by one or more of the three D's: *disrupted* learning and development of self or others; *dysfunctional* relationships with families, peers or teachers; or *distressing emotions*.

Repeatedly unregulated expression of some temperamental characteristics such as extremely high activity level or intense emotions may be viewed as dysfunctional, particularly if the behaviors do not change in response to interventions. Even when temperamental dispositions such as extremely high negative reactivity are not behaviorally expressed, the stress or distressing emotions that they engender confer risk for maladaptive outcomes (Strelau, 1995), including school phobia, test anxiety, social withdrawal, somatic complaints, or depressive episodes (Sears & Milburn, 1990). The chronic arousal of intense emotions in the classroom setting impedes learning or social functioning as the child may be too overwhelmed (high arousal, overstimulation) or preoccupied with thoughts to focus on the tasks at hand. For example, a highly reactive child may be more upset by not knowing the answer when called on than a less reactive peer, and this reactivity may promote anticipatory stresses that further impede learning and performance. Anticipation of emotional distress increases worry or anxiety, further distracting the individual from learning.

Preventive classroom interventions include minimizing (a) the likelihood of a child becoming overwhelmed by intense negative reactivity by fostering feelings of safety to counter the perception of the classroom as "risky;" and (b) disruption by offering opportunities to release pent-up energy such as well-timed breaks and activities (errands, recess). When problematic emotions (frustration, anger, anxiety) or behaviors are evident, interventions should be prompt in (a) removing the stressor, helping the child calm down, and normalizing feelings; and (b) instituting judicious management techniques that are sensitive to the self-regulatory functions of the behavior for the child but do not contribute to maladaptive cycles. For instance, time-out from learning may come as a relief when the work is frustrating.

Indirect. The indirect effects arise from the cumulative impact of temperament on what draws attention and what is approached or avoided. The tendency to focus selectively either on signals of threat (avoidance motivation) or signals of reward (approach motivation) associated, respectively, with the BIS and the BAS

(Derryberry & Reed, 1994) determines what occupies awareness. A child with learning difficulties with a highly active BIS may focus on failure without giving much weight to success, whereas a child with an active BAS may call to mind the most encouraging experiences and may continue to seek positive goals. Relatively basic attentional biases to signals of embarrassment or threat associated with shyness may explain situation-specific individual differences in more complex cognitions such as attributional biases (Teglas & Hoffman, 1982).

Temperament influences learning due to variations in tendencies to persist on tasks, to resist distraction, and to process information effortfully. With the passage of time, tendencies toward minimal processing of information or rushing through homework limit the depth of knowledge acquired. Problems with self-regulation of emotion have an adverse impact on learning if the emotions chronically leave the individual distracted by preoccupations, disinterested in the learning tasks, ineffective in responding to social surroundings, or frustrated in response to challenges.

In such situations, the focus of intervention is on averting the long-term negative impact on the development of selective attention, minimal information processing, and approach-avoidance by (a) fostering positive experiences and interpersonal bonds by encouraging activities or interactions that bring out the best in the child, including the pursuit of hobbies or interests; (b) reducing the threat value of stimuli, and hence avoidance, by helping the child gain insight and resources to anticipate, plan, and cope with temperamental reactivity; and (c) encouraging activities that are counter to the temperamental grain but necessary to master important skills. In so doing, it is important to respect the child's individuality and gear demands incrementally to capacities to meet them.

Bidirectional. The concept of "goodness of fit" captures the two-way influences between the child and the environment (Lerner & Lerner, 1983). A poor fit occurs when a child's temperamental proclivities are at odds with the learning or behavioral demands of settings considered important for development and when behavioral styles evoke negative responses from others. Configurations of temperament dispositions that foster poor fit have been referred to as "difficult" because they promote negative interactions. The concept of "difficultness" is general across cultures, but the attributes that are problematic may be specific to certain cultures (De Vries, 1987).

The behaviors of children with difficult temperaments, particularly negative emotional reactivity, high activity, or low task orientation, may elicit responses from others that maintain or increase their negative

reactions and further disorganize behavior or disrupt thinking. Thus, children with “difficult” dispositions often receive negative messages from others, including peers (Walker, Berthelsen, & Irving, 2001), and become embroiled in repeated hassles within their families (Teglasi & MacMahon, 1990). In contrast, children with positive temperamental characteristics elicit more favorable responses from peers and adults (Rutter, 1987; Thomas & Chess, 1977). Children are rated by their teachers as more “teachable” when they are high in task orientation and adaptability to changes, attributes that are valued in the classroom (Bender, 1986). Indeed, among children with LD, temperament was more strongly related to teachability ratings than were students’ cognitive abilities (Keogh, 1983). Further, teacher ratings of their relationships with students predict children’s subsequent academic and social development (Hamre & Pianta, 2001; Ladd & Burgess, 2001), but such bidirectional influences need further investigation. It has been suggested that it would be helpful if educators became aware of how their own temperaments influence their responses to students’ individuality (Richardson & Shupe, 2003).

In the design of academic instruction, it is important to consider the characteristics within the child in relation to various task demands and conditions of learning and performance. For example, Case, Speece, and Molloy (2003) found that children’s responsiveness to an instructional intervention (RTI) could not be explained by the quality of instruction alone but required consideration of the students’ ability to “access” or become engaged with the curriculum. The children’s “access” was attributed by the authors to the joint influence of individual difference (which they termed “persona”) and the instructional environment, a conclusion that is consistent with the well-established principle of goodness of fit within the temperament field. In a similar vein, Mayer (2004), noting the “fallacy” of an exclusive focus on instruction, argued that the effectiveness of “constructivist instruction” as a way to promote discovery learning (i.e., hands-on activities and group discussion) cannot be judged apart from the cognitive processing of the learners (to select, organize and integrate knowledge).

Hierarchical. Temperament is a building block of higher-order competencies, including executive functions and social skills, that influence other outcomes. For instance, peer acceptance is related to the development of social competence, including the ability to understand, use, and regulate emotions appropriately (Cassidy, Parke, Butkovsky, & Braungart, 1992; Hubbard & Coie, 1994). Social competence, in turn, is related to lower temperamental reactivity and higher self-control of attention and behavior (Eisenberg et al., 1997).

Temperamental assets such as task persistence and emotional self-regulation (including positive emotionality), associated with more effective coping (Prior, Sanson, Smart, & Oberklaid, 1999) and resilience (Smith & Prior, 1995), contribute to the development of a wide range of competencies that cumulatively enhance the developmental trajectory. For instance, attentional control (persistence and duration of orienting) and positive affectivity (smiling/laughter) at 13 months predicted language production and comprehension at 20 months (Dixon & Smith, 2000). In contrast, difficult temperamental dispositions may disrupt the development of higher-order competencies needed to keep pace with increasing demands for self-regulation with advancing age (Rothbart & Ahadi, 1994; Zeidner, Matthews, Roberts, & MacCann, 2003). Among elementary school children, negative emotionality has been associated with less organized, less complex, and less accurate cognitive self-regulatory structures which, in turn, were associated with adjustment problems (Bassan-Diamond, Teglasi, & Schmitt, 1995; Lohr et al., 2004).

To the extent that interventions addressing the direct, indirect, and bidirectional influences of temperament are effective, they would also be expected to have a beneficial impact on the cumulative development of academic and social problem-solving schemas. Additionally, specific programs have been developed to bypass previous impediments to learning social skills, social problem-solving or emotional regulation (anger management), and these have been reviewed elsewhere in this issue. Future research is needed on how such programs may be more responsive to temperamental individuality. The STORIES program uses the story as the language of experience to help children organize the various dimensions of social problem solving in ways that integrate emotions and other sources of individuality (Rahill & Teglasi, 2003; Teglasi & Rothman, 2001).

In sum, children with adverse temperamental dispositions and deficits in processing information face greater challenges in acquiring the increasingly complex academic and social competencies expected with development. Intervention strategies that are informed by temperament are grounded in four assumptions.

First, the aim is not to change a child’s basic dispositions but to work with them to minimize potential adverse impact of temperament and maximize the development of higher-order protective factors by promoting long-term self-regulatory resources that moderate the expression of temperament. Second, temperament is understood as a configuration of dimensions that reciprocally interplay with one another and with variables that do not fall under the temperament

rubric, such as LD. All of the child's inner attributes, including learning abilities and disabilities, are part of the "team" that interfaces with the environment. Third, temperamental dispositions express themselves differently across situations and tasks according to the salience of the demands for the child's temperamental attributes (distractibility and extraneous stimuli). Acknowledging the situation-specific influences of temperament is the foundation for directing interventions at the "big picture" of the developmental trajectory. The demands of situations and tasks change with development, and implications of interventions should be viewed in light of the current demands of various contexts and anticipated demands of future contexts. Fourth, interventions should be based on an understanding of the multiple ways in which temperament places individuals at risk for problems in learning and adjustment.

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