Paths to Successful Development

Personality in the Life Course

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1 Temperament and socialization

Mary K. Rothbart and Samuel P. Putnam

Traditional approaches to successful development have focused almost entirely on socialization practices expected to lead to optimal outcomes. An implicit assumption of much research on achievement (e.g., McClelland, Atkinson, Clark, and Lowell, 1953), altruism (e.g., Hoffman, 1975), and morality (e.g., Bandura, 1977), for example, has been that parental and societal influences affect all children in a similar manner. More recent work, however, indicates that different children may respond to similar socialization efforts in predictably divergent ways, with the individual characteristics of the child influencing pathways to both successful and maladaptive outcomes. Characteristics of the child may also determine whether intervention is needed, as well as the strategies chosen by adults to influence change. Temperament research allows us to study interactions between individual and environmental influences, because it describes processes evident early in life from which social adaptations to environmental conditions develop. Whereas the child's personality will include skills, habits, and cognitive structures shaped through interaction with the environment, temperament provides the biological basis upon which these structures are built.

In this chapter, a brief introduction to temperament is presented and data from our laboratory on the developmental structure of temperament are discussed. We then review links between dimensions of temperamental variability and mechanisms of socialization. We propose that three broad temperamental systems: surgency, negative affectivity (including facets of fear and anger/frustration), and effortful control, can be seen early in life and are influential in the development of personality. In this discussion, interactions between temperament and environment that may lead to successful social development are highlighted.

Definitions of temperament

We have defined temperament as constitutionally based individual differences in reactivity and self-regulation, influenced over time by heredity

and experience (Rothbart and Bates, 1998; Rothbart and Derryberry, 1981). Temperament develops; much behavior during the early months can be seen as reactive either to immediate stimulus events or to endogenous internal changes. Later, however, more directly self-regulatory systems, including inhibitory aspects of fear and the attentional flexibility of effortful control, will develop to modulate this reactivity (Rothbart and Derryberry, 1981). We return later to these developing self-regulatory processes.

Our definition of temperament is more inclusive than several prior interpretations of the construct, including Gordon Allport's (1961) emotionality-based definition as "the characteristic phenomena of an individual's emotional nature, including his susceptibility to emotional stimulation, his customary strength and speed of response, the quality of his prevailing mood, these phenomena being regarded as dependent upon constitutional make-up" (p. 34). In our view, and in agreement with Thomas and Chess (1977), individual differences in activity and attention also have an important place within the temperament domain. Our view nevertheless goes beyond Thomas and Chess' (1977) definition of temperament as behavioral style, in that we emphasize the content of children's emotional, attentional, and activity-related characteristics as well.

Questionnaire findings

Temperament in infancy

Until recently, the domain of temperament has chiefly been seen as including the nine dimensions of individuality identified by Thomas, Chess and their colleagues in the New York Longitudinal Study (NYLS) over 30 years ago. These include Activity Level, Mood, Approach/Withdrawal, Adaptability, Intensity, Threshold, Distractibility, Attention Span/Persistence, and Rhythmicity. This set of characteristics was identified through a content analysis of parent interviews describing the behavior of their infants aged two to six months (Thomas, Chess, Birch, Herzig, and Korn, 1963).

In our initial research (Rothbart, 1981), we set out to develop a parent-report questionnaire to assess Thomas and Chess' dimensions, along with characteristics Diamond (1957) had identified as showing temperamental variability in other animal species. We also assessed characteristics identified as heritable in human behavioral genetics research, and positive affect, which had been the focus of our early research (Rothbart, 1973). Over 450 parents were asked to act as informants about their

infants' reactions (Rothbart, 1981). In developing the Infant Behavior Questionnaire (IBQ), we tried to avoid asking parents to make global judgments about events that had happened some time ago. Instead, we asked parents how frequently certain behaviors had occurred in specified contexts across the past week. For example, "When put in the bath water, how often did the baby kick and splash? When meeting a stranger, how often did the baby cry?" Parents responded using seven-point scales ranging from never, through about half the time, to always.

One of the most interesting findings from our early questionnaire research was that items comprising some of Thomas and Chess' NYLS dimensions did not co-vary as had been expected (Rothbart, 1981). For example, in the parents' reports, a child who was intense in smiling and laughter was not necessarily intense in fear or frustration, and a child rhythmic in bowel habits was not necessarily rhythmic in sleeping. The covariation of item scores across different response modalities proved to be so low that it was not possible to construct psychometrically sound scales for Intensity, Threshold, or Rhythmicity. Moreover, on the Adaptability scale, only items referring to soothability clustered together. We were thus left with six unipolar scales. The first three assessed reactivity of separable affective systems (fear, frustration, and positive affect). The other three included a dynamic aspect of negative affect (soothability), a duration of orienting scale that combined items from Thomas and Chess' Distractibility and Attention Span scales, and a scale containing items indicative of overall activity level. The original IBQ (Rothbart, 1981) thus aggregated item scores across a range of situations and eliciting conditions to yield scale scores with high internal reliability for Activity Level, Smiling and Laughter, Fear, Distress to Limitations (frustration), Soothability, and Duration of Orienting (attentional persistence).

In our review of empirical studies of the structure of infant temperament (Rothbart and Mauro, 1990), these scales showed considerable similarity to factors that had emerged from other researchers' item-level analyses of NYLS-based scales (e.g., Sanson, Prior, Garino, Oberklaid, and Sewell, 1987; Bohlin, Hagekull, and Lindhagen, 1981). These similar dimensions are particularly intriguing because characteristics of fear, frustration/anger, positive reactivity/incentive motivation, and the orienting aspects of attention have been evolutionarily conserved and are present in non-human species (Panksepp, 1998; Rothbart, Derryberry, and Posner, 1994).

We have now also revisited the IBQ (the IBQ-R; Gartstein and Rothbart, in preparation), writing additional scales to assess infant forms of reactivity and self-regulation that we have explored at older ages. In addition to the six scales listed above, the following eight scales were

found to possess satisfactory reliability and validity: Approach (rapid approach, excitement, and positive anticipation of pleasurable activities), Cuddliness (enjoyment and molding of the body to being held by a caregiver), Falling Reactivity (rate of recovery from peak distress, excitement, or general arousal), High Intensity Pleasure (enjoyment of situations involving high intensity stimuli), Low Intensity Pleasure (enjoyment of situations involving low intensity stimuli), Perceptual Sensitivity (detection of slight or low intensity stimuli from the external environment), Sadness (negative affect and diminished energy related to personal suffering, physical state, disappointment, and object loss), and Vocal Reactivity (vocalization during daily activities).

Particularly intriguing are the results of factor analysis investigating higher-order relationships among these fourteen scales. We have now carried out factor analyses for the full sample of 360 three- to twelve-month-old infants and also separately for three- to eight-month-olds and nine- to twelve-month-olds. In these analyses, as well as other factor analyses reported in this chapter, we have used principal axis factoring with oblique rotation of the extracted factors. For the full sample, scales with primary loadings on the first factor included Activity Level, Smiling and Laughter, High-Intensity Pleasure, Perceptual Sensitivity, Approach, and Vocal Reactivity. This factor, which we have labeled Surgency, appears similar in content to adult personality dimensions of Extraversion and Positive Emotionality. It also demonstrates high loadings for an orienting scale (Perceptual Sensitivity) that in adult research has been linked to the personality trait of Openness (Rothbart, Ahadi, and Evans, 2000). The second factor was defined by positive loadings for Distress to Limitations, Fear, Sadness, and a negative loading for Falling Reactivity. The relations among different forms of negative affect shown in this factor are similar to the broad adult dimensions of Negative Emotionality and Neuroticism. Finally, the third factor was defined by loadings for Duration of Orienting, Low-Intensity Pleasure, Soothability, and Cuddliness, with a substantial secondary loading for Smiling and Laughter. These scales appear to index both orienting tendencies and capacities to enjoy and to be comforted by low-intensity stimulation. We have tentatively named this factor Affiliation/Orienting.

Temperament in toddlerhood

In recent years, our additions to Goldsmith's Toddler Behavior Assessment Questionnaire (TBAQ; Goldsmith, 1996) have led to development of a highly differentiated interim instrument for the measurement of temperament in toddlers, which we refer to as the Early Childhood Behavior

Questionnaire, or ECBQ. This measure, unlike the IBQ-R, contains separate scales for shyness and non-social fear. Additional scales found in the toddler measure, but not the IBQ-R, are based on children's growing ability to effortfully control their attention and behavior. These scales include Inhibitory Control (capacity to plan and to suppress inappropriate action), Attention Shifting (capacity to shift from one activity to another), Attention Focusing (capacity to maintain attention on tasks) and Impulsivity (speed of response initiation). Additional scales included on the ECBQ include Positive Anticipation (excitement in anticipation of expected pleasurable activities) and Discomfort (negative affect related to sensory qualities of stimulation).

To date, we have collected toddler data for 166 of the 360 children whose parents had filled out the IBQ-R. The ages of these children at the time of completion of the ECBQ ranged from 18- to 30-months. Factor analysis of the instrument yielded three factors showing some similarity to those found among infants. A Surgency factor with primary loadings for Activity Level, High-Intensity Pleasure, Impulsivity, and Positive Anticipation and secondary loadings for Perceptual Sensitivity and (negatively) Shyness emerged. A Negative Affectivity factor was characterized by high loadings for Fear, Discomfort, Sadness, Shyness, Anger/Frustration, and (negatively) Soothability. As in infants, Cuddliness and Low-Intensity Pleasure have primary loadings on a third factor. In toddlers, however, the third factor is further defined by the self-regulatory scales of Attention Focusing, Attention Shifting, Inhibitory Control, and Perceptual Sensitivity, with secondary contributions from Soothability, and (negatively) Anger/Frustration. We have labeled this factor Effortful Control. In both infants and toddlers, high scores on the third factor, Affiliation/Orienting for infants and Effortful Control for toddlers, are associated with low levels of Negative Affectivity (see Table 1.1). Low-intensity and calming social stimulation may decrease infants' negative emotionality, and effortful control may also serve that function in toddlers.

In our sample of 166 children, we also examined stability and predictability from infancy through toddlerhood. As can be seen in Table 1.1, Surgency and Negative Affectivity were both significantly positively correlated across the two ages. In addition, the infant Affiliation/Orienting and toddler Effortful Control factors were positively related. Interestingly, the Effortful Control factor in toddlers was also predicted by infant Surgency, although infant Affiliation/Orienting was not related to toddler Surgency. In addition, when infant Surgency and Affiliation/Orienting were entered as predictors of Effortful Control using multiple regression, both of the infant factors were significant. This finding suggests an important role

Table 1.1 *Concurrent and longitudinal correlations between broad infant (IBQ-R) and toddler (ECBQ) factors*

	Infant factors[a]			*Toddler factors*[b]		
	Surgency	Negative affectivity	Affiliation/ orienting	Surgency	Negative affectivity	Effortful control
Infant factors[a]						
Surgency	–	.11	.32*	.36*	.10	.45*
Negative affectivity		–	−.26*	.02	.50*	−.10
Affiliation/orienting			–	.02	−.09	.40*
Toddler factors[b]						
Surgency				–	.02	.03
Negative affectivity					–	−.22*
Effortful control						–

Note: IBQ-R Surgency = mean of activity level, smiling and laughter, high-intensity pleasure, approach, and vocal reactivity scales. IBQ-R negative affectivity = mean of distress to limitations, fear, sadness and reverse-scored falling reactivity scales. IBQ-R affiliation/orienting = mean of duration of orienting, low-intensity pleasure, soothability, and cuddliness scales. ECBQ surgency = mean of impulsivity, high-intensity pleasure, activity level, and positive anticipation scales. ECBQ negative affectivity = mean of fear, discomfort, sadness, frustration, shyness, and reverse-scored soothability scales. ECBQ effortful control = mean of attention shifting, low-intensity pleasure, inhibitory control, cuddliness, attention focusing, and perceptual sensitivity scales.

[a] $n = 360$.

[b] $n = 166$.

* $p < .05$.

for early Surgency in the development of self-regulatory abilities. One possibility is that children who are highly attuned to rewarding aspects of the environment may call on such cues in the service of controlling their attention and behavior. Although more research is required to address this possibility, this finding casts new light on the relationship between positive approach tendencies and self control.

Temperament in preschool and middle childhood

The Children's Behavior Questionnaire (CBQ) was designed to measure temperament characteristics of preschool and early school age children (Rothbart, Ahadi, Hershey, and Fisher, in press). Dimensions assessed by the CBQ derived from those identified in our adult research (Derryberry and Rothbart, 1988), and from dimensions of temperament already measurable in infancy (Rothbart, 1981), and toddlerhood (Goldsmith, 1996).

Because the ECBQ was strongly based on the CBQ, the two instruments share the majority of their scales. Cuddliness, included on the toddler measure but not the CBQ, reflects our recent interest in systems of affiliation. Smiling and Laughter, appearing on the CBQ, was omitted from the ECBQ, in favor of more situation-specific scales measuring positive affect.

Structurally, the 15 scales of the CBQ reliably cluster into three large factors similar to two of those found in infants, and three of those found in toddlers. The first, labeled Surgency/Extraversion, is defined primarily by loadings for the scales of Impulsivity, High Intensity Pleasure, Activity Level, and, loading negatively, Shyness, with substantial loadings for the Positive Anticipation and Smiling and Laughter scales. It is similar to the Surgency factors identified in infancy and childhood and to the broad adult factor of Extraversion. Although the Positive Anticipation scale loads on this factor as expected, it also consistently loads on a second factor, Negative Affect. A relation between positive anticipation and negative affect would be consistent with Panksepp's (1998) suggestion that unsuccessful reward-related activities may activate anger and frustration.

A second large factor, Negative Affectivity, is defined primarily by loadings for the scales of Sadness, Discomfort, Anger/Frustration, Fear, and, loading negatively, Falling Reactivity/Soothability. This pattern of loadings is consistent with the broad dimension of Negative Affectivity/Neuroticism found in adult investigations of personality structure and also seen in the infant and toddler data. The third broad dimension, Effortful Control, is defined primarily by loadings for Inhibitory Control, Attentional Focusing, Low Intensity Pleasure, and Perceptual Sensitivity. These characteristics appear to share the child's voluntary regulation of attention and behavior, along with aspects of perceptual and reward sensitivity. We have suggested that Effortful Control may be developmentally related to the broad dimension of Conscientiousness/Constraint/Superego Strength/Psychoticism identified in other structural models of personality (Ahadi and Rothbart, 1994).

Results of a recent investigation to map these temperament dimensions onto Big Five personality factors in adults support the hypothesized connections put forward above (Rothbart, Ahadi *et al.*, 2000). Adult subjects completed the Adult Temperament Questionnaire (Evans and Rothbart, 1999) as well as the minimarker measure of the Big Five (Saucier, 1994). The Adult Temperament Questionnaire yielded a four-factor structure including dimensions similar to those found in children as well as a fourth factor labeled Orienting Sensitivity. As expected, temperamental and Big Five Extraversion were positively correlated, temperamental Negative

Affectivity was related to Big Five Neuroticism, and Effortful Control was linked to Conscientiousness. In addition, Orienting Sensitivity was associated with the personality construct of Intellect/Openness.

In the factor structure of our scales, the broad groupings of Surgency and Negative Affectivity can be seen in infancy and beyond, whereas Effortful Control, appearing in toddlerhood and during the childhood period, may be a precursor to Conscientiousness in adults. Our research team is currently collecting temperament data in adolescents to further test the robustness of these dimensions (Ellis and Rothbart, in preparation). Preliminary findings indicate a similar factor pattern, with the addition of a fourth factor similar to the Orienting Sensitivity factor found in our adult temperament measure.

Developmental studies

Having introduced these temperament variables, we are now able to address the early development of temperament in more detail. Wherever possible in this review, we cite research investigating interactions between temperament and socialization in child development. The idea that the temperamental predispositions do not directly determine developmental outcomes, but occur in interaction with the environment is not a new one. Thomas and Chess (1977; Thomas, Chess, and Birch, 1968) emphasized the notion of "goodness of fit," arguing that adaptive and maladaptive patterns of behavior were determined by the match between an individual's temperament and the demands of specific contexts. Wachs (Wachs and Gandour, 1983; Wachs and Gruen, 1982) elaborated on this theme, using the term "organismic specificity" to describe the differential effects that similar environments may have on temperamentally dissimilar children.

Despite the theoretical importance of interactional effects, relatively few examples of interactions can be found in the empirical literature. There are at least two reasons for this scarcity. First, there have been few testable models of temperament/environment interactions. For instance, although Thomas and Chess provided case studies exemplifying mismatches between the child and environment, more general conceptions of what constituted a good or poor fit were not specified. A second reason is methodological. Studies relating caregiver and child behavior often measure the two constructs concurrently, resulting in ambiguity about causal direction, a problem compounded when the sole source of information for parenting practices and temperament is parent report. In addition, when researchers have used independent sources of information and uncovered separable effects of temperament and parenting for a

given outcome, many have not taken the additional step of testing for multiplicative relations between the two, whereas others have included multiplicative effects without first statistically controlling for main effects (Rothbart and Bates, 1998; Sanson and Rothbart, 1995). In our review, we include recent studies we believe to be exemplary in their demonstration of interactions between temperament and the environment.

Positive affect and approach (surgency/extraversion)

We have noted above continuities from infancy to adulthood of a surgency dimension including activity level, impulsivity, and positive affect in response to highly stimulating situations. Appetitive motivational systems underlying positive affect and motor activity have also been proposed within a number of neurological theories (e.g., Depue and Collins, 1999; Gray, 1992; Panksepp, 1998). Individual differences in surgency appear to be based on sensitivity to cues of reward and manifested as orientation to and exploration of novelty, as well as expressions of positive affect. When rewards are blocked, high levels of surgency may also result in aggressive actions to overcome obstacles.

In observational studies, behavior indicative of surgency can be observed by the age of two to three months, in a cluster of reactions including vocal activity, motor movement, and positive affect (Kistiakovskaia, 1965). We have assessed surgency using laboratory observation and questionnaire measures in a longitudinal study of infants at the ages of three, six, ten, and thirteen months (Rothbart, Derryberry, and Hershey, 2000). Infants were videotaped during presentation of non-social (e.g., small squeezable toys, a mechanical dog, a rapidly opening parasol) and social stimuli (e.g., experimenter's speech, a peek-a-boo game). Smiling and laughter to these stimuli were coded for latency, intensity, and duration, and these ratings were aggregated into positive affect scores. Behavioral approach was assessed through infants' latency to grasp low intensity toys, and activity level was measured via 13-month-olds' movement among toys distributed across a grid-lined floor. Activity level was positively related to parent-reported Smiling and Laughter, negatively related to Fear, and associated with more rapid laboratory approach to the toys (Rothbart, Derryberry *et al.*, 2000).

Individual differences in approach become increasingly salient as motor control develops over the first year. We have successfully separated approach and inhibition tendencies by measuring infants' latencies to grasp two sets of toys, one set familiar and low in intensity, the other novel and intense (Rothbart, 1988). Rate of approach to the low-intensity toys was expected to be governed chiefly by appetitive, but not inhibitory

tendencies, and was found to be related to smiling and laughter. In addition, individual differences in approach to the low-intensity toys were stable from six to thirteen months. In contrast, response to the more intense toys was believed to involve input from both the behavioral approach and inhibition systems. Because the inhibition system undergoes rapid development over the second half of the first year, we predicted and found that latencies to approach the novel toys increased from six to ten months, were not stable from six to thirteen months, and were related to fear at six, ten, and thirteen months (Rothbart, 1988).

Individual differences in surgency can also be seen in infants' positively toned activity level. For instance, although activity level occurring in conjunction with negative affect during early infancy is related to later inhibition (Kagan and Snidman, 1991), the combination of high motor activity and positive affect is associated with bold behavior in later childhood (Calkins, Fox, and Marshall, 1996). Activity level as an aspect of surgency can be seen even in the earliest days of life, so long as the measure is separated from distress-related activity: Korner *et al.* (1985) found levels of non-distress motor activity in the neonate to be a predictor of high approach scores at ages four–eight years.

We have documented stability of approach tendencies from infant laboratory assessments through seven years in a small sample of children (Rothbart, Derryberry *et al.*, 2000). Children who exhibited rapid approach during infancy through their short latencies to grasp low-intensity toys were high in parent-rated Positive Anticipation and Impulsivity, and low in Sadness at seven years. Positive affect, measured both with the IBQ and in the laboratory, was predictive of seven-year Positive Anticipation and Impulsivity. Although our more highly reactive IBQ Activity Level measure was not related to the later measures, more intentional locomotion observed in the laboratory predicted high Positive Anticipation, Impulsivity, and low Sadness at seven years.

Stability in approach behavior has been found in other studies as well. Putnam (1999) found approach at 12 months, measured via latencies to reach for low-intensity objects, to predict surgency during a battery of laboratory tasks at two years. Pedlow, Sanson, Prior, and Oberklaid (1993) found parent-reported approach to be stable from infancy through eight years. Long-term stability of surgency has also been reported by Caspi and Silva (1995), who found that children rated by experimenters as high on approach at three years of age described themselves as impulsive, spontaneous, careless, and reckless at age eighteen.

The self-description of low levels of caution and planfulness among high-surgency individuals in Caspi and Silva's report suggests that approach tendencies may hold some risk. Our data are supportive of this

idea: children showing short latencies to grasp low-intensity toys in the laboratory were described at age seven as showing greater Impulsivity, Anger/Frustration and Aggression, and lower Attentional Focusing and Inhibitory Control. In addition, activity level observed at 13 months predicted negative affect dimensions such as Anger/Frustration, Aggression, and low Soothability/Falling Reactivity. These findings suggest that, in addition to contributing to positive emotionality, strong approach tendencies may contribute to externalizing problems as well (Derryberry and Reed, 1994; Rothbart, Ahadi, and Hershey, 1994). Also supporting an association between surgency and a lack of self-control are multiple studies relating sensation seeking to externalizing difficulties in school-aged children and young adolescents (e.g., Arnett, 1995; Frick, O'Brien, Wotton, and McBurnett, 1994; Gabel, Stabler, Born, Shindledecker, and Bowden, 1994; Kafry, 1982; Russo *et al.*, 1993).

More positive aspects of surgency can be seen in the relation between infant positive affect and scores on the Bayley scales of development (see review by Matheny, 1989). A meta-analysis of school-age children has found positive interest to compose approximately 10 percent of variance connected with achievement (Schiefele, Krapp, and Winteler, 1992). Finally, Putnam (1996) found high levels of self-reported sensation seeking, a form of surgency that has typically been studied in adults, to be associated with low levels of internalizing behaviors in a sample of five-year-old boys.

Because traditional research and theory on temperament has tended to consider approach/positive affect and withdrawal/negative affect as opposite poles of a single continuum and often focused on withdrawal, there have been very few examples in the literature referring to interactions between surgency and parenting. One study addressing an aspect of surgency, however, is Wachs' (1987) examination of the development of mastery motivation. Relations between social interaction and mastery behavior differed for toddlers who were rated by parents as being either high or low in activity level. For 12-month old infants who were low in activity, high levels of parent mediation (object naming) were associated with more advanced object mastery. In contrast, when children were highly active, similar caregiver behaviors were related to lower mastery of the environment. Similar results were reported by Gandour (1989), who found exploration competency in 15-month-olds to be promoted by maternal attention focusing among children who were low in activity level, whereas attention focusing was associated with lower exploration scores for highly active children.

Contemporary resources for new parents often mention activities such as pointing out and naming objects as a tool for aiding intellectual

development. The results of Wachs (1987) and Gandour (1989), however, suggest that, whereas children low in surgency may not seek out or actively explore new stimuli and thus would benefit from parental direction, this may not be the case for children higher in temperamental approach. For such children, the well-intentioned focusing of attention by parents may actually distract the child and interfere with his/her active learning process.

Temperamental surgency thus appears to represent both liabilities and assets for the developing child. Pathways to beneficial and detrimental outcomes are not likely to be direct ones. Rather, they are influenced by the developmental environment and by interactions with other components of temperament. We now consider the second broad dimension of temperament: negative affectivity.

Negative affect: fear and frustration

Although the negative emotions often fall into the same broad factors in factor analyses of temperament and personality, fear and frustration contain unique, as well as common, origins. In our longitudinal research, infants' distress to situational elicitors of fear (novel, intense, and unpredictable stimuli) and frustration (placement of attractive toys out of reach or behind a Plexiglass barrier) were coded, and between six and thirteen months we found that fear and frustration in the laboratory were increasingly uncorrelated. Fox (1989) has also reported dissociations between fear and frustration: frustration to arm restraint at five months was related more to 14-month approach than to withdrawal from strangers and novel events (indicators of fear). Lemery, Goldsmith, Klinnert, and Mrazek (1999) have found that parent-report measures from three to eighteen months loaded on separate (but correlated) factors representing fear and anger-distress, and separate fear and frustration factors are commonly identified in infancy research (see review by Rothbart and Mauro, 1990).

Temperament and environment interactions have often been studied using temperamental dimensions based on general negative emotionality. A number of these studies do not distinguish between components of fear and anger, relying instead on overall dimensions of infant/child difficultness. For instance, Wachs (1987) found that the number of persons in the home was not related to the mastery behavior of easy infants, but was negatively related to the performance of difficult children. Similar findings were reported by Sanson, Oberklaid, Pedlow, and Prior (1991) in a sample of children aged four–five. Although difficult temperament status alone was only slightly related to elevated incidence of problem behaviors, when this temperamental variable was considered in combination with

low socio-economic status, poor mother-child relationship, or mothers' perception of the child as difficult, substantially stronger prediction of both externalizing and internalizing problems was obtained. A final example of this recurrent pattern are the results of Maziade (1989), who found temperamentally difficult children were not particularly likely to have developed behavior disorders at seven years of age unless they were raised in an environment characterized by poor family functioning. These findings fit within Sameroff and Chandler's (1975) developmental model in which possibly negative constitutional factors may be ameliorated through positive transactions within the family or exacerbated through dysfunctional patterns of interaction.

Frustration The appropriateness of making an additional distinction between frustration/anger and fear can be seen in their differing patterns of developmental relationships. In our research, laboratory frustration observed at six and ten months predicted seven year Anger/Frustration, as well as other components of negative affectivity, including high Discomfort, low Soothability, and high Guilt/Shame (Rothbart, Derryberry *et al.*, 2000). Infant frustration in the laboratory was also related to seven year surgency, as reflected in high CBQ Activity Level, Positive Anticipation, Impulsivity, Aggression, and High Intensity Pleasure. IBQ Frustration predicted later Positive Anticipation, High Intensity Pleasure, Impulsivity, and low Sadness. The only relation found between infant frustration and childhood fear was a negative one, between early IBQ Frustration and later Fear. These relations again suggest a link between anger/frustration and approach tendencies. Conceptually replicating our findings are results reported by Lemery *et al.* (1999), who found that distress-anger was positively related to activity level, whereas fear and activity level were independent.

In a study of temperament/socialization interaction, Bates, Pettit, Dodge, and Ridge (1998) examined resistant temperament as it interacted with restrictive parenting style in the development of externalizing difficulties. Resistant temperament includes aspects of both surgency and negative affectivity. As discussed above, approach tendencies may lead to high frustration and aversive behaviors when goals are blocked. Bates *et al.* (1998) suggest that resistance to control may also be linked to deficiencies in effortful control. Parental restrictive control referred to behaviors meant to stop or punish the child such as negative commands, removing objects, scolding, and spanking. In two separate samples of elementary school children, resistant temperament was more strongly related to externalizing problems when parents were low in restrictive control than when parents were highly controlling. This relation was found

whether infant temperament ratings were made retrospectively or concurrently, and whether teacher- or mother-rated outcomes were predicted.

Implications of resistant temperament for possible externalizing difficulties are clear. The findings of Bates *et al.* (1998) indicate, however, that parents may modify the relationship between early resistance and later problem behavior. Bates and his colleagues suggest that for a child high in resistance to control, parents who are consistently restrictive may shape the child's responsivity to socially-imposed limits. For children low in resistance, lower amounts of parental control may allow the child opportunities for autonomy, allowing the child to learn to meet social demands independently.

Fear Late in the first year, infants begin to demonstrate their fear in inhibited approach to unfamiliar and intense stimuli. Once fearful inhibition is established, individual differences in the relative strength of approach versus inhibition in novel or intense situations appear to be relatively enduring aspects of temperament (see review by Rothbart and Bates, 1998). When motor inhibition is incorporated into the fear reaction, a differentiation of fear and frustration may result. Although frustration can invigorate approach tendencies (Newman, 1987), fear involves a more consistent inhibition of approach. Fear can thus be seen to serve an important, yet relatively reactive, form of regulatory control, and we have identified it as one of the major control systems in the developing child (Derryberry and Rothbart, 1997; Rothbart, 1989; Rothbart and Bates, 1998). Fearful inhibition is surely adaptive, in that it helps protect the infant from inadvertent approach responses to stimuli that may be dangerous. It is also a system well adapted to early socialization, in that it is related to sensitivity to punishment and the internalization of guilt reactions (Dienstbier, 1984; Kochanska, 1993; Kochanska, DeVet, Goldman, Murray, and Putnam, 1994).

As with approach tendencies, fear-related inhibition shows considerable stability across childhood and even into adolescence (Kagan, 1998). Longitudinal research indicates stability of fearful inhibition from two to four years (Lemery *et al.*, 1999), two to eight years (Kagan, Reznick, and Snidman, 1988), and from the preschool period to age eighteen (Caspi and Silva, 1995). In our longitudinal sample (Rothbart, Derryberry *et al.*, 2000), both observed laboratory and IBQ fear predicted CBQ Fear and Shyness at seven years. Fear also predicted later Sadness and Low Intensity (non-risk taking) Pleasure. Neither IBQ nor laboratory fear measures predicted Frustration/Anger in childhood.

A good deal of work on temperamental fear has emphasized its possible role in the development of maladaptive behavior patterns such as social withdrawal (Rubin and Asendorpf, 1993). Other sources, however,

support our view of fear as affording possibly beneficial control over approach-related problem behaviors. In our studies, high laboratory fear at 13 months predicted low Positive Anticipation, Impulsivity, Activity Level, and Aggression at age seven. These relationships are consistent with models such as Gray and McNaughton's (1996), where an anxiety-related behavioral inhibition system inhibits an approach-related behavioral activation system. Dominance of the surgency/approach system over behavioral inhibition has been proposed as an underlying mechanism for a variety of clinical disorders including attention deficit disorder (Quay, 1988), mania (Depue, Krauss, and Spoont, 1987; Fowles, 1988), drug abuse (Cloninger, 1987a) and histrionic, passive-aggressive, and explosive personality disorders (Cloninger, 1987b).

Additional findings provide evidence of the beneficial aspects of fear. Pliszka (1989) found children with concurrent ADHD and anxiety to show reduced impulsivity relative to those with ADHD alone, and aggressiveness appears to decrease between kindergarten and first grade for children who show internalizing patterns of behavior (Bates, Pettit, and Dodge, 1995). A recent study found that a group of children who were uninhibited at 21 months of age exhibited greater levels of delinquent and aggressive behavior at 13 years than did adolescents who were inhibited as toddlers (Schwartz, Snidman, and Kagan, 1996). In our longitudinal study, we found evidence that infants with greater fear had higher parent-reported empathy and guilt/shame and lower aggression during childhood (Rothbart *et al.*, 1994).

In an impressive body of work connecting temperament, parenting and successful social development, Kochanska (1991, 1995, 1997) found temperamental fearfulness to be a source of both main and interaction effects in children's developing internalization of the rules of conduct. Kochanska's model of moral development was influenced by a theory advanced by Hoffman (1983) and Dienstbier (1984). Prior to Hoffman, fear and anxiety had been strongly implicated in the development of moral conduct. Hoffman modified this view by positing that gentle socialization techniques would elicit an optimal level of arousal, allowing the child to effectively encode the parental message. In contrast, more power-assertive forms of discipline would produce higher arousal and distress, interfering with the socialization message and leading the child to attribute their compliance to external, rather than internal, causes. Dienstbier further contributed to this framework by proposing that temperamentally fearful children would be more responsive to gentle discipline strategies, given their intrinsically high levels of arousal.

An initial study by Kochanska (1991) provided empirical support for these ideas. Temperamental fearfulness was assessed in the laboratory when children were between eighteen months and three and a half years

of age. Maternal discipline strategies were determined using both observational and self-report measures. When these children were seen again five to six years later, their internalized conscience was measured through their completion of narratives focusing on various moral dilemmas. Consistent with expectations, there was a main effect for fear, in that fearful children showed higher levels of conscience. In addition, Kochanska (1991) found support for the proposed interaction between fearfulness and parenting. For temperamentally fearful children, rearing techniques that were low in power assertion (i.e., authoritative or democratic strategies such as rational guidance, empathy induction, and open expression of affect) were associated with high levels of conscience at the later age, whereas highly power assertive techniques (i.e., authoritarian practices including physical punishment, prohibitions, and discouragement of emotion expression) were related to low levels of internalized conscience. In contrast, among children who were relatively fearless, socialization was not consistently related to later conscience.

Kochanska's later work (e.g., Kochanska, 1995, 1997) built upon her earlier effort both methodologically and theoretically. Conscience in toddlers and preschoolers was operationalized through children's observed compliance with maternal requests and refusal to "cheat" on games or touch a forbidden object when unsupervised, and expression of empathic and prosocial themes to projective stories. Measurement of maternal discipline was similarly expanded: observations of mother behavior were made in two challenging laboratory contexts and a large battery of self-report measures were used to assess socialization attitudes and practices. As in the earlier (Kochanska, 1991) study, discipline based on low power assertion was successful in promoting moral conduct and orientation at three and four years of age in fearful, but not relatively fearless, children. This interactional relation, however, had largely disappeared by the time the children were five years old, perhaps due to the increasing influence of other sources of socialization such as peers or to the greater regulative function of effortful control, discussed later in this chapter.

An alternative pathway to conscience was proposed and supported for children low in fear. In reference to the work of Maccoby (1983), who indicated the importance of responsive and positive parent–child interaction for internalization of the parents' agenda, Kochanska (1995) suggested that this type of cooperative relationship may be especially influential in the development of conscience among fearless children. To examine this possibility, two different aspects of positive mother–child orientation were measured: children's attachment security was assessed via Q-sort, and maternal responsiveness to the child was coded from videotapes of

naturalistic interactions. These aspects of mothering were not found to be related to morality in fearful children. For children who were relatively fearless, however, security of attachment was associated with the ability to refrain from cheating and to adopt prosocial themes in response to hypothetical moral dilemmas when they were four years old. Observed maternal responsiveness was successful in promoting these positive outcomes at five years for fearless, but not fearful, children (Kochanska, 1997).

Kochanska's findings indicate that motivational characteristics of individual children can be used to help parents guide parenting techniques. Children high in anxiousness respond strongly to gentle discipline, which elicits sufficient amounts of fear to allow the child to effectively internalize their parent's goals. This strategy is relatively ineffective for children who are less motivated by fear. In contrast, temperamentally fearless children appear to be motivated more strongly by reward than by punishment and thus respond more strongly to parenting efforts based on positive anticipation.

This interpretation evokes an additional theoretical and empirical issue. Might the children identified as fearless in the work of Kochanska also be high on surgency? Since surgency is believed to be based in sensitivity to reward, the effectiveness of reward-based socialization for these children suggests that this may indeed be the case. It has long been reasoned that approach/withdrawal behavior can be considered a function of two separate, opposed systems (Schnierla, 1959). Although the continuous nature of approach/withdrawal has typically been emphasized in psychological research (including that of Kochanska), our work (Rothbart, 1988; Putnam, 1999) suggests that it is possible to disentangle reward-oriented approach from fear-based withdrawal. Future work separating the two tendencies in order to investigate temperament/socialization interactions may prove fruitful.

In this section, we have discussed some of the beneficial aspects of fear. The fact that fear can be directed toward a positive outcome may seem paradoxical, in that fear is often viewed as maladaptive. As was the case for surgency, however, this is consistent with our view that any given behavioral profile may contain both costs and benefits (Rothbart, 1982; Sanson and Rothbart, 1995). The motor inhibition associated with fear may aid in the constraint of impulsivity or, alternatively, it may lead to rigid over-controlled patterns of behavior that can limit the individual's experiences (Block and Block, 1980; Kremen and Block, 1998). Similarly, as suggested above, although surgency may in some cases lead to difficulty in controlling aggressive urges, in other cases this same mechanism can motivate exploration and triumph over obstacles to achievement. The

expression of these relatively reactive aspects of temperament may be in large part determined by the activity of a third, less reactive, component of temperament: effortful control.

Effortful control

Temperamental effortful control, based on the executive attention system, makes major contributions to successful social development (Kochanska, Murray, and Harlan, 2000; Posner and Rothbart, 1998). Individuals high in effortful control are able to voluntarily regulate their emotional state by deploying their attention, and can suppress initial reactive tendencies to conform to situational demands successfully. As described above, the ECBQ and CBQ contain a broad factor of Effortful Control which is distinct from Surgency and Negative Emotionality. In addition, we have uncovered relationships between the abilities to focus attention, restrain dominant impulses, and shift attention in adults (Derryberry and Rothbart, 1988). Although a factor likely to be based on effortful control (Conscientiousness) often emerges in models of adult personality (Digman, 1990), our conceptualization of attention in relation to behavioral control is relatively recent and goes beyond definitions limiting temperament to individual differences in emotional experience and expression (e.g., Allport, 1961; Goldsmith and Campos, 1982).

Indicators of effortful control first appear late in the first year in the form of infants' ability to inhibit and correct the course of visually controlled movement (Posner and Rothbart, 1998; Ruff and Rothbart, 1996). During the infancy and preschool periods, attentional capacities can be seen in the ability to inhibit forbidden behaviors. Kochanska and her colleagues, for example, recently reported relations in nine-month-olds between focused attention and voluntary restraint from touching a prohibited toy (Kochanska, Tjebkes, and Forman, 1998).

The effortful control system continues to develop during early childhood, becoming more sophisticated as children develop the use of language-based forms of regulation. Using a Stroop-like marker task, we have recently documented rapid improvement between 27 and 36 months in children's ability to inhibit a dominant response in order to execute a nondominant response in a conflict situation (Gerardi-Caulton, 1998; Posner and Rothbart, 1998). Individual differences in this skill appear to reach beyond the laboratory, because children who perform well are also described by their parents as more skilled at attentional control, less impulsive, and less prone to frustration reactions. Using a very similar task with adults, Derryberry and Reed (1999) have found that individuals who perform well in a conflict task tend to be low in anxiety and high on self-reported attentional control.

Kochanska and her associates have devised a series of innovative methods to assess effortful control throughout early childhood (Kochanska, Murray, Jacques, Koenig, and Vandegeest, 1996; Kochanska, Murray, and Coy, 1997; Kochanska, Murray, and Harlan, 2000). In addition to delay-of-gratification tasks and a Stroop-like procedure which requires the recognition of small shapes hidden within a dominant large shape, they measure children's ability to slow down motor activity (draw a line slowly), suppress initiated responses (go-no-go games), and lower the voice. Beginning at age two and a half, children's performance becomes highly consistent across these tasks, suggesting they are measuring an underlying process that develops over time.

Once effortful control has been established, it appears to be relatively stable throughout the preschool period, childhood, and adolescence. Kochanska found nine-month measures of attentional and behavioral control to predict compliance to maternal demands at 14 months and performance on a battery of effortful control tasks at 22 months, but these relations were relatively modest. In the later preschool years, however, individual differences in inhibitory control as measured by the tasks listed above, become remarkably consistent, with internal consistency coefficients as high as .42 from 22 to 33 months and .65 from 46 to 65 months (Kochanska *et al.*, 1998; Kochanska *et al.*, 2000). The stability findings of Mischel and colleagues are also impressive: the duration of time preschool children were able to wait for a physically present reward predicted parent-reported attentiveness, ability to concentrate, and control of negative emotions assessed over a decade later (Mischel, 1983; Shoda, Mischel, and Peake, 1990).

We would expect effortful control to be linked to other important competencies such as sensitivity and understanding in social relationships, regulation of antisocial behavior, critical thinking skills, problem solving skills, flexibility in the application of information-processing strategies, and facility in the use of resources for learning and problem solving. Many of these skills require flexibility in thinking and the use of mental strategies such as planning and error detection related to executive function (Posner and Rothbart, 1998). Other skills are related to the development of personality characteristics that promote positive interactions with others. We now consider research related to these connections.

In our research, six- to seven-year-old children high in Effortful Control were also high in Empathy, Guilt/Shame, and low in Aggressiveness (Rothbart *et al.*, 1994). Eisenberg and her colleagues have also found that four- to six-year-old boys with good attentional control tend to deal with anger by using nonhostile verbal methods rather than overt aggressive methods (Eisenberg, Fabes, Nyman, Bernzweig, and Pinulas, 1994). Effortful control may support empathy by allowing attention to the

thoughts and feelings of others without becoming overwhelmed by one's own distress. Similarly, Guilt/Shame in six- to seven-year-old children is positively related to Effortful Control and Negative Affectivity (Rothbart *et al.*, 1994). Negative emotionality may contribute to guilt by providing the individual with strong internal cues of discomfort, increasing the probability that the cause of these feelings is attributed to an internal rather than external cause (Dienstbier, 1984; Kochanska, 1993). Effortful control may further contribute by providing the flexibility needed to notice these feelings and relate them to feelings of responsibility for one's own actions and possible negative consequences for another (Derryberry and Reed, 1994, 1996).

Recent findings by Kochanska provide further evidence of the powerful role played by effortful control in the development of social competencies (Kochanska *et al.*, 1996, 1997, 1998, 2000). In two separate samples, this work has documented both concurrent and longitudinal relations between effortful control and a host of positive outcomes, including children's committed compliance to parental agendas, morality, and regulation of emotion.

Kochanska *et al.* (1996) measured young children's internalization of standards using a number of tasks. Children were observed in situations in which they were asked to refrain from touching a prohibited toy, to complete an unpleasant task, or to keep from "cheating" in games while not under surveillance by parents or experimenters. High levels of both toddler and preschool effortful control were concurrently related to a lack of misbehavior in both the observational tasks and maternal ratings. In addition, effortful control during toddlerhood was predictive of internalization at preschool age. A follow-up of these children at age five showed children high on effortful control as toddlers continuing to exhibit higher levels of internalization. In addition, when given hypothetical dilemmas contrasting selfish and helping acts, children high on effortful control were more likely to respond with prosocial answers (Kochanska *et al.*, 1997).

An especially exciting finding in Kochanska *et al.* (2000) concerns possible parental influence on effortful control. In response to previous research showing relations between sensitive, responsive parenting and child qualities similar to effortful control, it was reasoned that this aspect of parenting may promote effortful control in young children. Maternal responsivity assessed at 22 months, using measures of promptness, sensitivity, engagement and acceptance, was associated with higher levels of effortful control at both 22 and 33 months. Importantly, the effects of parenting were found to contribute significantly even after regressing out earlier temperamental attention and effortful control.