Case Study 1: A Behaviorally Inhibited Child

A 2-year-old boy, Bobby, sits on his mother’s lap in the laboratory patiently waiting for the next “game” to start. He just finished playing with a basket full of toys with his mother, so today has been a pretty good visit to the lab so far. Across the room from Bobby and his mother stands a small puppet theater. After a short delay, two animal puppets appear, greet each other, and introduce themselves to Bobby. The puppets want Bobby to join them in their fun games. As is typical for most 2-year-olds, Bobby sits and watches the puppets interact. However, as the puppets continue, he does not warm up and approach to play with the puppets. Instead, Bobby is frozen on his mother’s lap and becomes increasingly nervous, showing signs of muscle tension and mildly fearful facial expressions. Bobby strongly resists his mother’s efforts to get him to approach. He becomes fussy, cries, and clings to her when she attempts to put him down so he can go get a sticker from the puppets. He never warms up, which is an extreme response relative to most 2-year-olds.

The rest of the visit to the laboratory is very stressful for Bobby, and this pattern of fearful, avoidant, and distress behavior is repeated across most of the tasks, including interactions with friendly strangers and novel objects (e.g., large mechanical spider). Bobby’s pattern of fearful behavior and avoidance is particularly interesting because it is highly stable, as is evident when he returns to the laboratory at age 5 to interact with unfamiliar people. For instance, when interacting with an unfamiliar male research assistant, Bobby is very hesitant to speak, speaks very quietly, fails to make eye contact, and even turns his back to the stranger during the conversation. In another stranger encounter later in the visit, Bobby is so afraid of a female research assistant trying on a Halloween mask that he leaves the room. His behavior with unfamiliar peers in the laboratory is equally stressful for him. He spends most of the time either sitting by himself (while the other boys play) or stands across the room and watches them play but remains unoccupied and appears anxious.

Reflecting the behavioral descriptions, Bobby’s parents and teachers also rate him very high on wariness, avoidance, and social anxiety measures in preschool and kindergarten. He and his mother both note that he is still very socially
anxious 10 years later, and this anxiety is starting to interfere with his ability to make friends now that he is in middle school.

**Case Study 2: An Exuberant Child**

Two-year-old Torrie begins the first portion of the visit on her mom’s lap, where she immediately becomes aware of the stage and puppets on the opposite side of the room. Unlike most toddlers, who may naturally stay with mom as they enter a novel setting, Torrie runs out to meet the puppets as soon as they introduce themselves and announce they will play games. As the puppets engage Torrie in a series of tasks (e.g., throwing a ball), she is very open and happy to interact with them and help when needed. Although she initially returns to her mom’s proximity frequently, as the episode unfolds, Torrie becomes more immersed in playing with the puppets and seems less and less dependent on her mom for reassurance.

Throughout the rest of the visit, Torrie’s high approachability is evident in her resistance to staying on her mom’s lap when presented with novel toys (e.g., talking robot in the corner) and her impulse to touch the toys and interact with them even before she receives any instructions. Her desire to approach and interact is also evident in social circumstances. In fact, when a stranger enters the room, Torrie greets him and stays engaged and close in proximity for the extent of the task. Furthermore, in a usually fearful episode in which a large, mechanical black spider sits in a corner of the room, Torrie’s immediate response upon entering is to run toward the spider and touch it.

Similar to Bobby’s fearful behavioral pattern, Torrie’s pattern of high approach and positive affect seems to show considerable stability. Although at age 5 she no longer has problems waiting for instructions or impulsively running into the experimental room for every episode, she is happy to engage a stranger even when alone in the room. For example, Torrie not only responds happily to the stranger’s questions but also initiates lively conversations on new topics, and actually becomes the active leader of the social dyad. She also displays this pattern of high engagement and social interaction when interacting with peers of the same age, as well as the experimenter during other episodes in the visit. Torrie’s parents and teachers rate her as a very sociable, outgoing child, albeit somewhat impulsive and easily frustrated when things don’t go her way. Although Torrie doesn’t self-report any difficulties, her mother notes that the transition to middle school has been challenging, with a few episodes of acting out and some minor conflicts with peers at school.

These case studies highlight the individual differences in behavior, reflecting the perspective that underlying temperamental biases, as marked by variation in emotion reactivity and regulation, shape personality development (Rothbart, 2011). Particularly, we argue that by examining early reactivity and regulation, we may maximize the probability of understanding developmental trajectories to specific personality traits in adulthood.

Although myriad potential temperamental profiles likely exist, we focus on two that have received the greatest attention in the literature: fearful temperament, most often studies of behavioral inhibition (Kagan, Reznick, Clarke, Snidman, & Garcia-Coll, 1984), and exuberance or surgency (Fox, Henderson, Rubin, Calkins, & Schmidt, 2001). Fearful and exuberant temperaments have been linked to distinct personality traits in adulthood, neuroticism (Muris et al., 2009) and extraversion (Grist & McCord, 2010), respectively. As such, these temperamental profiles allow us to best illustrate how emotional reactivity and regulation during childhood may constrain eventual personality development.

Prior to delving into the specifics of particular temperamental profiles and personality outcomes, we feel it is important to discuss the trajectories of temperament to personality as a whole. Thus, this chapter comprises three central sections. First, we examine how temperamental profiles may be linked to later personality traits. Second, we describe early-emerging temperamental fear and exuberance. Finally, we address the role that emotion regulation plays in bridging early temperament to later personality.

**Temperamental Links to Personality**

We take the perspective that early temperament alone does not determine developmental outcomes. Rather, temperament traits interact with internal (e.g., neural processes and cognitive control functions) and external (e.g., parenting and family environment) factors to influence an individual’s risk and resilience to events and contexts that shape developmental trajectories. Particular temperaments are therefore likely
to lead to specific personality profiles. In attempting to link early temperament to later personality, the field must initially deal with two main concerns: (1) long-rooted differences in methodology and procedure and (2) assessment of the developmental appropriateness of some central personality constructs (e.g., openness to experience).

With respect to methodology, there are two central traditions in the temperament literature: direct observation of behavior and measurement of biological substrates. Together, these sources of information have been used to create typologies that are then observed over time. As we note below, these information streams, when coupled together, are particularly useful in trying to tease apart the role of emotional processes in current behavior and later outcomes. However, this general approach is quite different from the traditional, self-report model used in personality psychology. Here, individuals are typically asked to report across a broad set of behaviors and motivations (Zuckerman, Kuhlman, Joireman, Teta, & Kraft, 1993).

When bridging the gap between temperament typologies and personality traits, much of the initial work drew conceptual or theoretical links (Chen & Schmidt, 2015). For example, Caspi and Shiner (2008) suggested that temperament traits can be linked to later personality in the Big Five umbrella, such that positive emotionality would lead to extraversion, negative emotionality to neuroticism, effortful control to conscientiousness, and sociability to agreeableness. In this formulation, openness to experience would have a less direct link to early traits. Children high in negative affect may also rank high in neuroticism as adults, without assuming that the expression of a single, stable latent construct has led to this relation (Kandler, 2012).

The earliest manifestations of temperament are thought to be reactive, unconscious, and typically out of the child’s control. In this case, genetics and neural maturation may be the driving force in observed behavior and underlying physiology. Of course, with time, more complex and conscious temperament traits emerge, along with the temperament-based tools needed to regulate initial reactivity. However, again, these constructs can sometime be crude (e.g., visual orienting) (Sheese, Rothbart, Posner, White, & Fraundorf, 2008; Sheese, Voelker, Posner, & Rothbart, 2009). In contrast, many personality traits emerge from sophisticated cognitive and emotional processes that consolidate after social experiences (Briley & Tucker-Drob, 2014). Thus, young children have neither the capacity nor the opportunity to display the rich personality traits seen in adults.

And yet, with a nod to rank-order stability and developmental considerations, recent work has made progress toward bridging the divide between temperament and personality. In this regard, the work of Rothbart (2011) has been at the vanguard. At a methodological level, Rothbart and colleagues have designed and validated a comprehensive set of parent- and self-report measures designed to capture variations in reactivity and regulation across the lifespan. The set of six questionnaires, spanning infancy to adulthood, share a broad three-construct structure, reflecting temperamental negative affect, positive affect, and effortful control, that modulates with development.

The Infant Behavior Questionnaire (IBQ; Gartstein & Rothbart, 2003; Rothbart, 1981), for example, uses early markers of negative affect (crying, vocal reactivity), positive affect (smiling, cooing) and effortful control (visual orienting). By childhood, the Children’s Behavior Questionnaire (CBQ; Rothbart, Ahadi, Hershey, & Fisher, 2001) assesses variation in sadness and fear, smiling and laughter, and inhibitory control. Finally, the Adult Temperament Questionnaire (ATQ; Evans & Rothbart, 2007) most closely resembles the factors seen in the personality literature, with superordinate constructs of negative affect, extraversion/surgency, effortful control, and orienting sensitivity. In parallel, social behavior morphs from cuddliness (IBQ) to sociability (ATQ). In this way, the Rothbart model morphs across the affect-laden Big Five structure and the regulatory focus of the Big Three model.

Muris, Meesters, and Blijlevens (2007) had adolescents (ages 9–13) self-report on individual traits using both the Early Adolescent Temperament Questionnaire (EATQ; Capaldi & Rothbart, 1992) and the Junior version of the Eysenck Personality Questionnaire (EPQ-J; Eysenck, Eysenck, & Barrett, 1985). They found strong relations between Rothbart’s three high-order factors and the Big Three model, such that negative affect and extraversion were highly and positively correlated with neuroticism and extraversion, respectively. By the same token, effortful control showed a negative association with neuroticism and psychoticism. This is in line with Rothbart’s own work (Rothbart, Ahadi, & Evans, 2000), showing a link between...
temperament traits (shyness, self-regulation, and positive affect) with later personality profiles.

While promising, there is of course the concern that similarities emerge from a simple methodological artifact—that the instruments used to measure temperament and personality rely on overlapping items, thereby creating a shared construct; that is, there are only so many ways we can distinguish temperamental sociability (e.g., “I often enjoy talking to strangers” from the ATQ) and the personality trait of extraversion (e.g., “Do you enjoy meeting new people?” from the EPQ). Direct observation of behavior, coupled with biomarkers, can help address this methodological and conceptual concern.

A prominent example comes from the work of Caspi and Moffitt. The Dunedin Multidisciplinary Health and Development Study (Silva, 1990) has followed a full cohort of infants born in the early 1970s through today. Temperament was assessed at age 3 via direct observation in the laboratory. Cluster-analytic methods were used to characterize children based on three behavioral styles marked by lack of control, approach, and sluggishness (Caspi & Silva, 1995). Then, using a typological approach and cluster analysis, profiles were created based on patterns across behavioral styles. Five groups emerged: Undercontrolled, Inhibited, Confident, Reserved, and Well-Adjusted.

At age 18, the same individuals self-reported on their personality using the Multidimensional Personality Questionnaire (MPQ; Tellegen, 1982). While the effect sizes were small (Caspi & Silva, 1995), connections between observed behavior and self-report were evident across the 15-year span. As young adults, Undercontrolled children scored high on measures of impulsivity, danger seeking, aggression. In contrast, Inhibited children scored low on measures of impulsivity, danger seeking, aggression, and social potency; Confident children scored high on impulsivity; Reserved children scored low on social potency; and Well-Adjusted children presented as “typical” young adults.

Eight years later, the same individuals reported on their perceived personality traits (Caspi et al., 2003), and close “informants” rated the cohort members. As they note, the intervening time represents a marked change in the environmental demands place on individuals and the social relationships they were likely to take on. Undercontrolled children were negative, unreliable, and also more likely to show anti-social behavior (Moffitt, Caspi, Dickson, Silva, & Stanton, 1996). In contrast, Inhibited children were overcontrolled, nonassertive, and more likely to show internalizing difficulties as young adults (Caspi, Moffitt, Newman, & Silva, 1996).

Even with the descriptive links between temperament and personality, we are still left with open questions regarding the mechanisms by which these relations emerge. In this next section, we focus on the two best-supported temperamental markers of later personality, fear and exuberance, with an eye to potential processes that shape developmental trajectories.

**Early Temperament, as Illustrated by Fear and Exuberance**

The most obvious, and earliest, markers of temperament are evident in the infant’s response to environmental triggers. Some infants, when confronted with a new object or person, respond with acute negative affect—crying, arching the back, and thrashing limbs (Kagan & Snidman, 1991). If capable, the next response is often to withdraw, either as reflex or in an active attempt to regulate their initial emotional response (Buss, 2011). In contrast, when presented with the identical stimulus, another infant might display a starkly different result, often characterized as positive affect, if not glee (Hane, Fox, Henderson, & Marshall, 2008). The next step, in line with the initial reactivity, is often to approach and engage. In our typological approach, one infant would be characterized with a fearful temperament, while his or her counterpart would have an exuberant temperament. In our opening case study, Bobby’s behavior reflects underlying mechanisms of a fearful temperament, while Torrie is his exuberant, nonfearful, counterpart.

Fearful temperament is marked by a unique neural, physiological, and cognitive profile that is readily differentiated from an exuberant temperament. Fearful temperament is most evident in response to environmental and social stressors. For example, one form of fearful temperament, behavioral inhibition (BI), is characterized by hypervigilant and withdrawal behavior in response to unfamiliar people and situations in toddlerhood and childhood (Garcia-Coll, Kagan, & Reznick, 1984; Kagan et al., 1984). Kagan and colleagues (1984) suggested
that BI is rooted in individual differences that are evident in early infancy as elevated negative affective and motor reactivity in response to unfamiliar stimuli. These characteristics, in turn, increase the likelihood that the infant will show BI in childhood. Dysregulated fear (DF), another form of fearful temperament, is marked by a profile of heightened fear responses in both high- and low-threat contexts (Buss, 2011).

Unlike the traditional personality literature, temperament research has specifically focused on underlying biological substrates. As such, fearful temperament, although initially characterized via direct behavioral observation, is accompanied by distinct biological profiles as well. Rooted in the limbic response to novelty and threat (Fu, Taber-Thomas, & Pérez-Edgar, 2017), the profile is marked by distinct patterns of functioning across multiple systems, both at rest and in response to environmental probes. Fearful temperament is reflected in an initial hyperactive response in the amygdala to novelty and threat, evident in both childhood and adulthood (Pérez-Edgar et al., 2007; Schwartz, Wright, Shin, Kagan, & Rauch, 2003). The temperament profile is also marked by distinct patterns of functioning across multiple systems, both at rest and in response to environmental probes (Guyer et al., 2006). In addition, there are variations in the functional connectivity of neural regions, supporting distinct network profiles that extend across cortical and subcortical regions, encompassing fear, reward, and regulatory systems (Roy, Dennis, & Warner, 2015; Taber-Thomas & Pérez-Edgar, 2015). Building on this foundation, temperamentally fearful children show right-frontal electroencephalographic (EEG) asymmetry (Fox, 1992) that appears to be relatively stable, which is accompanied by withdrawal responses (Buss et al., 2003) and indicative of future internalizing behaviors (Smith & Bell, 2010) and personality (Jones & Fox, 1992).

Physiological indicators can be used throughout childhood to help define the fearful temperament profile, allowing for comparisons into adulthood. For example, Garcia-Coll and colleagues (1984) demonstrated that fearful infants exhibited higher heart rates when presented with novel stimuli than when presented with familiar stimuli. Similarly, Kagan and colleagues (1984) showed that young children, labeled as reactive during infancy, exhibited consistently high heart rate during peer interactions, unlike their nonreactive peers who displayed lower heart rates. Similarly, markers of respiratory sinus arrhythmia (RSA) reflect the individual’s attempt to regulate in the face of threat and mount an appropriate response. Prior work suggests that RSA may be either suppressed (Buss, Goldsmith, & Davidson, 2005; Calkins, 1997; Stifter & Fox, 1990) or augmented (Buss, Davis, Ram, & Coccia, 2017) in fearful temperament, depending on the environmental context the child is navigating. Specifically, Buss and colleagues (2017) have shown that infants displaying high fear exhibited higher RSA (i.e., consistent with a failure to suppress). However, this only held true when the infants were high in fear during low-threat situations (Buss et al., 2017), suggesting the importance of context for understanding physiological patterns underlying BI and future personality development.

Distinct profiles are also evident in the electrophysiological response to errors (McDermott et al., 2009) and novel stimuli (Marshall, Reeb, & Fox, 2009; Reeb-Sutherland et al., 2009), the hormonal response to stress (Kertes et al., 2009; Mackrell et al., 2014), and the individual’s automatic response to unexpected events (Barker et al., 2015; Barker, Reeb-Sutherland, & Fox, 2014; Schmidt, Fox, Rubin, & Sternberg, 1997). Thus, there is an emergent and coherent profile that encompasses cascading processes from the central nervous system to the periphery. Given that the fearful profile involves both overt behavior and underlying biology, it is not surprising that variations in cognitive mechanisms are often evident, bridging biology and behavior.

Attention is the most studied cognitive marker of fearful temperament. Particularly, researchers have shown that BI in toddlerhood, coupled with a bias toward threat in childhood, leads to greater social withdrawal during early childhood and adolescence (Pérez-Edgar et al., 2010, 2011; White et al., 2017). Similarly, Morales, Pérez-Edgar, and Buss (2015) showed that young children who showed high fear in low-threat situations during infancy (DF) exhibited social withdrawal only when also displaying a bias toward threat. The same relation is evident even when examining temperamental traits, such as negative affect, in isolation (Cole, Zapp, Fettig, & Pérez-Edgar, 2016). These findings suggest that cognitive processes may work to tether initial temperamental profiles into adolescence (Pérez-Edgar et al., 2010), thus impacting emergent personality.

If fearful temperament grows out of an initial withdrawal response when novelty is taken as
a marker of threat (e.g., Bobby), then exuberant temperament reflects approach to novelty as a marker of opportunity (e.g., Torrie). Early positive affect and approach is later associated with boldness and sociability into childhood (Fox et al., 2001; Putnam & Stifter, 2005). Exuberance remains relatively stable over time (Degnan et al., 2011; Stifter, Putnam, & Jahromi, 2008) and can be measured by distinctive neural, physiological, and cognitive outcomes.

Neural markers for later exuberance are first apparent in infancy and include left-frontal EEG asymmetry (Davidson & Fox, 1989; Fox et al., 2001) and increased electrophysiological responses to novelty (Marshall et al., 2009). Additionally, researchers have suggested that these biological markers are related to consistency in exuberant temperament throughout development (Coan & Allen, 2003). For example, Degnan and colleagues (2011) showed that exuberant infants with left frontal EEG asymmetry, but not right frontal EEG asymmetry, showed increased social competence in early childhood. This early foundation may then set the stage for the adult profile of extraversion. Again, in parallel with fearful temperament, RSA in response to environmental triggers is associated with positive reactivity and affect (Calkins, 1997), linking early exuberance to patterns of externalizing behaviors for some children (Morales, Beekman, Blandon, Stifter, & Buss, 2015). This pattern suggests that for both fearful temperament and temperamental exuberance, RSA marks the child’s response to the environment and his or her allostatic load (Buss, Davis, & Kiel, 2011). The specific developmental manifestation, however, is rooted in the child’s initial temperament-linked idiosyncratic biases.

Cognitive markers of exuberance have been less studied; however, recent research from Morales, Pérez-Edgar, and Buss (2016) suggests that attention to reward may be important to the developmental trajectory of exuberant temperament. Specifically, they found that exuberance during infancy predicted attention bias to reward and externalizing behaviors during early childhood. Additional research is needed to examine how attention bias to reward predicts personality outcomes later in life. For example, attention to reward may shape differential trajectories to adult personality, in the context of foundational temperamental profiles; that is, while attention to reward may buffer fearful children from negative affect (Forbes et al., 2010), and perhaps neuroticism, the same attention pattern may exacerbate initial profiles in exuberant children (Morales et al., 2016).

**Emotion Regulation Shapes the Transition from Temperament to Personality**

Across measures and constructs, the available data suggest that continuities are identifiable between early temperament and later personality (Caspi & Shiner, 2008; Chen & Schmidt, 2015). At the same time, by no means do we find easy one-to-one correlations across development. As we discuss, the noted relations seem to hold for broad constructs (e.g., positive affect to exuberance), rather than more fine-grain behaviors. In addition, our strongest data point is to rank-order stability, rather than homotypic continuity.

This pattern of findings suggests that additional individual difference and context measures are likely to impact and modulate early temperament. Social and contextual factors play a large role, often crossing broad levels of analysis to incorporate culture, parenting, and socialization (Chen & Schmidt, 2015). Indeed, there is the suggestion that personality is, at its core, the profile that emerges when temperament confronts the environment (Rothbart et al., 2000). Emotion regulation, one facet of temperament, may be particularly relevant for understanding how these temperament–environment interactions constrain personality development.

Emotion regulation is a complex and varied construct in the literature. Here we define how emotions both are regulators and are regulated (Cole, Martin, & Dennis, 2004), and how these variations in emotion experience may cue researchers into important individual temperament differences that may lead to particular personality traits. When we say emotions are regulators, we are describing a set of relatively automatic processes deployed to elicit changes in internal or external states, whereas when we say emotions are regulated, we are suggesting more controlled processes designed to alter emotional states. For example, a baby’s continuous negative affect driving a mother to address the baby’s needs would be emotion as regulator, whereas a child acting grateful when a research assistant gives him or her a broken toy to play with would be an example of emotion as regulated. Importantly, both types of emotion regu-
loration are related to temperamental profiles and personality outcomes.

During infancy, we expect to see more instances of emotion as regulator than emotion as regulated. Infants are born with preorganized and innate emotions, believed to be triggered by an array of environmental stimulation (Damasio, 1994). The temperament literature additionally suggests that infants display biologically based or genetically influenced individual differences in levels of reactivity for basic systems of functioning, one of these systems being emotion (Kagan & Fox, 2006; Rothbart & Bates, 2006). From very early on (1–3 months), infants also develop what seem to be innate or reflexive mechanisms to regulate their emotional reactivity, such as sucking, head turning, and self-soothing (Kopp, 1989). During early infancy, the role of emotions as regulating seems to be more prevalent, perhaps because higher-order mechanisms such as attention and behavior have yet to emerge (Rothbart, Ziaie, & O’Boyle, 1994). The temperament literature addition-ally suggests that infants display biologically based or genetically influenced individual differences in levels of reactivity for basic systems of functioning, one of these systems being emotion (Kagan & Fox, 2006; Rothbart & Bates, 2006). From very early on (1–3 months), infants also develop what seem to be innate or reflexive mechanisms to regulate their emotional reactivity, such as sucking, head turning, and self-soothing (Kopp, 1989). During early infancy, the role of emotions as regulating seems to be more prevalent, perhaps because higher-order mechanisms such as attention and behavior have yet to emerge (Rothbart, Ziaie, & O’Boyle, 1994) as sources of regulatory strategies.

That is, emotions may act as regulators of arousal levels more than being regulated by organism-initiated strategies. Additionally, emotions also trigger external regulation by signaling adults to intervene (Cole, Michel, & Teti, 1994). For example, when highly aroused, an infant may express negative affect through crying, which will trigger maternal responsibility to soothe and down-regulate the infant’s high arousal. According to some researchers (Cole et al., 1994, 2004), the elicited emotion and its expression modulate the mother’s behavior and emotional responding. Based on this interpretation, infants’ use of external sources (e.g., maternal behavior) as a means to emotion regulation represents direct support for the role of emotions as regulating. Similarly, the role of emotions as regulating could also serve to explain the influence that mother–child interactions have on later patterns of observed behaviors across contexts (Morris et al., 2011).

These interactions have been widely studied through caregiver–child dyads, in which infants are thought to synchronize with their mothers in cuing and being cued for emotional expressions and the regulation of emotional states (Beebe et al., 2011; Feldman, 2012; Gianino & Tronick, 2013; MacLean et al., 2014). Parent–child dyads promote socialization of emotion regulation, contributing to development of adaptive strategies and increases in initiation and modulation of emotions (Cole et al., 1994). However, other researchers (Eisenberg & Spinrad, 2004) argue that these external sources of regulation may not entirely fit the definition of emotion regulation, and should be differentiated from emotion regulation that is internally initiated by the organism.

Across infancy, behavioral and attentional mechanisms allow for higher-order and more refined mechanisms of emotion regulation (Buss & Goldsmith, 1998; Mangelsdorf, Shapiro, & Marzolf, 1995). During this time, infants consistently grow more sophisticated and effective in their emotion regulation capabilities, from directing attention away from emotional stimulus (3-month-olds), to more readily sustaining attention allocation or withdrawal once fixated (9-month-olds), and engaging in behavioral strategies such as physically moving object of distress or seeking information (e.g., facial cues) from the caregiver.

More sophisticated regulatory mechanisms, typically placed under the umbrella of executive functions, emerge and strengthen throughout childhood and adolescence. Executive functions are often thought of as top-down mechanisms that modulate initial reactivity in order to maintain goal-directed functioning (Diamond, 2013; Zelazo, Müller, Frye, & Marcovitch, 2003). For example, one component of executive functioning, effortful control, can be defined as the ability to inhibit a dominant response in the service of performing a subdominant response (Rothbart & Rueda, 2005). A child playing Simon Says must carefully regulate his or her behavior in order to perform (or avoid performing) as needed. Effortful control is also invoked when individuals must detect errors during, or must engage in planning in anticipation of, performance. Effortful control, which is seen as a core tool in the child’s arsenal, is needed to both self-regulate and integrate oneself as an adaptive member of the larger social environment. Thus, individual differences in effortful control have been associated with the emergence of conscience and empathy (Kochanska, Barry, Jimenez, Hollatz, & Woodard, 2009; Kochanska, Murray, & Coy, 1997), levels of academic success (Checa & Rueda, 2011), and the quality and quantity of peer relationships (Valiente, Lemery-Chalfant, Swanson, & Reiser, 2008). These profiles have, in turn, been linked to variations in personality (Kochanska et al., 2009). Thus, any stability in Bobby’s and Torrie’s initial emotional responses to the laboratory experience is in part due to their ability...
to regulate initial responses and conform to contextual expectations for emotional expression and social behavior.

Often, discussions of executive functioning and emotion regulation hold closely to the proposition that higher levels of control and regulation, and the underlying skills leading to regulation, are necessarily positive influences on the course of development. This, indeed, is generally the case. However, as with most aspects of development, the impact of a particular skill or trait must be assessed within the context in which it is manifested (Pérez-Edgar, 2015). This is seen in the previously discussed profiles that noted both overcontrolled and undercontrolled patterns of functioning, which each lead to difficulties in personality and adjustment (Caspi et al., 2003).

For example, infants selected for increased temperamental negative reactivity (Fox et al., 2001) and at increased risk for fearful temperament show increased error monitoring (McDermott et al., 2009) and rigid attention Henderson (2010) in adolescence. These data suggest that temperamentally fearful children may demonstrate an overcontrolled behavioral style. Here, the subcomponents of effortful control, rather than freeing the child to flexibly and nimbly respond to environmental demands, may lock the child into a rigid response pattern (Henderson & Wilson, 2017; Wong et al., 2006). Over time, early fearful temperament, coupled with overcontrol, may increase the probability of heightened levels of neuroticism and less openness to experience as adults (Caspi et al., 2003).

Levels of effortful control are also associated with broad patterns of exuberance, leading to high levels of sociability and extraversion when deftly regulated, or externalizing behavior, such as aggression, when undercontrolled (Degnan et al., 2011); that is, low levels of effortful control are associated with greater reactive aggression, particularly in children prone to high levels of anger (Eisenberg, Champion, & Ma, 2004). This may be due to poor emotional regulation and the inability to inhibit initial reactive tendencies. In contrast, high levels of effortful control are associated with proactive aggression, when coupled with contextual factors that encourage aggressive behavior (Rathert, Fite, & Gaertner, 2011). Here, goal setting, planning, and performance monitoring are drawn in support of planful acts of aggression. Finally, in a powerful demonstration of the long-term effects of regulation on personality development and a range of outcomes, Moffitt, Poulton, and Caspi (2013; Moffitt et al., 2011) found that childhood self-control continues to predict variation in adult outcomes approximately 25 years later.

In summary, both emotion as regulator and emotion as regulated create individualized patterns of responses that reflect both the immediate circumstances and the individual’s history of interactions. In this sense, emotion as regulator and emotion as regulated are partners in the evolution from initial temperament to personality. Regulation, in reflecting the slow accumulation of new modulatory processes, is often more sensitive to environmental constraints; that is, the environment can dictate what behaviors and emotions need to be regulated and why. As an intermediary between reactivity and the environment, regulatory mechanisms may translate temperament into personality—for better and for worse.

Conclusions and Next Steps

In this chapter, we have discussed the broad literature of two temperaments, exuberance and BI, in order to articulate the development of personality. We make the argument that temperament constrains personality development. BI and exuberance are defined by both reactive and regulatory processes (Rothbart et al., 2000); are relatively stable (Degnan et al., 2011; Stifter et al., 2008); can be delineated through neural, physiological, and cognitive mechanisms (Fox, Henderson, Marshall, Nichols, & Ghera, 2005); and often lead to externalizing and internalizing behaviors later in life (Buss et al., 2013; Chronis-Tuscano et al., 2009; Degnan et al., 2011; Morales et al., 2016; Pérez-Edgar & Fox, 2005). Specifically, many but not all infants exhibiting high BI, and even some infants exhibiting low BI, go on to have social anxiety disorder later in life (Schwartz, Snidman, & Kagan, 1999). Similarly, many, but not all, children displaying high levels of exuberance go on to show conduct issues later in life (López-Romero, Romero, & Luengo, 2012).

Some of these differences in trajectories are likely due to environmental and contextual factors interacting with variations in neural, physiological, and cognitive profiles within individual temperaments; however, it is also important to consider regulatory difference within individuals. Although particular regulatory strategies have been related to both external-
izing and internalizing behaviors, understanding variations in regulatory capacity within the temperamental profiles that lead to externalizing and internalizing behaviors is important in understanding specific personality outcomes. In the chapter, we have described how regulatory capacities within the confines of temperament protect against, or enhance, the probability of developing internalizing or externalizing behaviors later in life, thereby affecting future personality development.

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