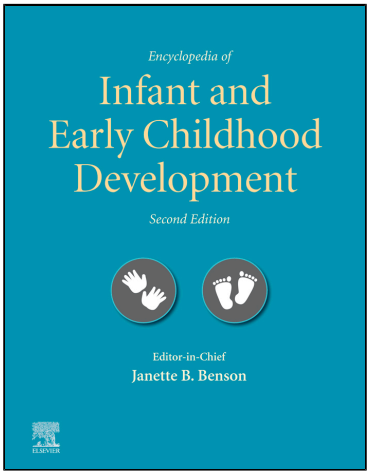

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The Development of Coping During Infancy and Early Childhood

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Introduction

Because current conceptualizations of coping were largely formulated to account for individual differences in how people deal with stressful events during adulthood, the vast majority of research focusing on phenomena labeled explicitly as "coping" does not start until early childhood. However, over the last several years, developmentally friendly conceptualizations of coping have emerged from research on children and adolescents that define coping as "action regulation under stress" (e.g., Compas et al., 2001; Eisenberg et al., 1997; Skinner and Zimmer-Gembeck, 2007). From this perspective, when individuals encounter (or anticipate encountering) challenging, demanding, or stressful situations, two subsystems are activated: (1) the relatively automatic stress reactivity subsystem, which brings the individual into readiness to act; and (2) the more intentional action regulation subsystem, which helps individuals coordinate their action with previous and future conditions and goals. Coping actions reflect the balance between these two subsystems, with constructive coping the product of low stress reactivity and/or strong action regulation, and maladaptive coping the result of high stress reactivity combined with weak, immature, or disabled regulation.

This definition creates a bridge between work on the development of coping and the rich and broad literatures on stress reactivity and regulation, including regulation of behavior, attention, emotion, motivation, cognition, and volition (e.g., Compas et al., 2017; Eisenberg et al., 2009; Murphy and Moriarity, 1976). Each of these literatures contains small strands of theorizing and research focused on age-graded progression of these processes and how they function when conditions are "hot" (i.e., stressful). When individuals engage in transactions in which valued outcomes are at stake and automatic responses no longer serve, processes of reactivity and regulation can become active. For example, attention is directed to the transaction or to means of escape, distressed emotions can be heightened or suppressed, motivation can ready action for fight or flight, cognitions can focus on options available in the interaction or be disabled by panic, behavior can be intentionally guided, suddenly freeze, or become impulsive. During these kinds of demanding encounters, the coping system has the job of listening to all these subsystems, coordinating a rapid response, and calibrating successive actions based on the outcomes of the first exchange.

Conceptualizations of coping as action regulation under stress highlight two complementary features of the coping system. On the one hand, as pictured in **Fig. 1**, it is a complex, integrated multi-layered dynamic bio-psycho-social system that incorporates processes from: (1) the *neurophysiological level*, including psychobiological sub-systems used to detect and react to stress and to regulate stress reactivity, most centrally, the sympathetic-adrenal medullary (SAM) axis, the parasympathetic nervous system (PNS); the hypothalamic-pituitary axis (HPA), the amygdala, and the prefrontal cortex (PFC), especially the anterior cingulate cortex (ACC; e.g., Hostinar and Gunnar, 2013; Lupien et al., 2009); (2) the *psychological level*, including the attentional, emotional, and

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motivational subsystems involved in stress reactivity and regulation; and (3) the *level of action*, including the behavioral, volitional, cognitive, and meta-cognitive subsystems that jointly generate action tendencies and that integrate and regulate them. As coping develops, its target can be viewed as the coordination of the bottom-up and top-down subsystems that shape stress reactivity and guide regulation.

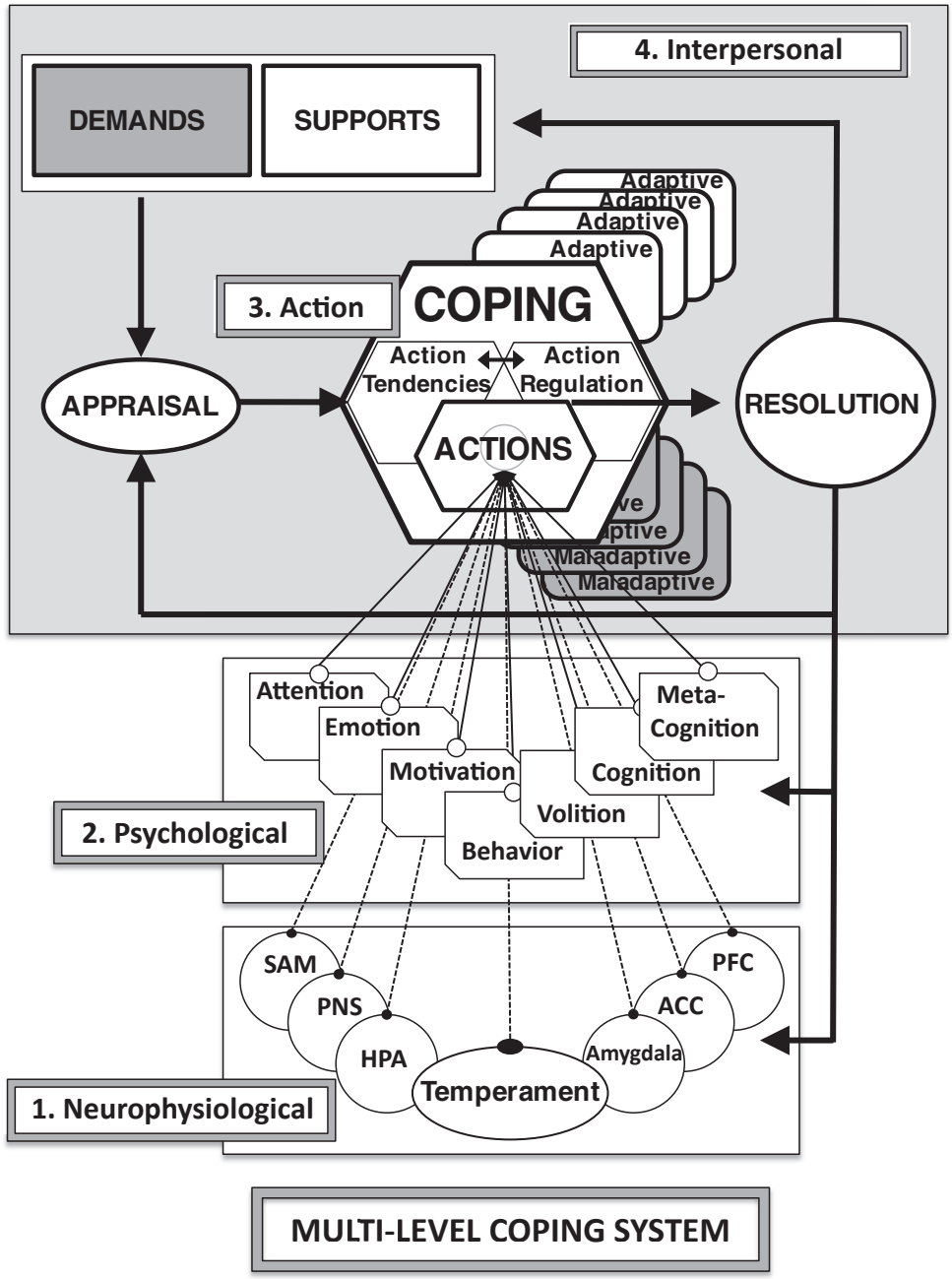

Figure 1 Integrative multi-level conceptualization of coping as bio-psycho-social process that operates at four levels: (1) the neurophysiological level, including psychobiological sub-systems used to detect and react to stress and to regulate stress reactivity, most centrally, the sympathetic-adrenal medullary (SAM) axis, the parasympathetic nervous system (PNS); the hypothalamic-pituitary axis (HPA), the amygdala, and the prefrontal cortex (PFC), especially the anterior cingulate cortex (ACC); (2) the psychological level, including the attentional, emotional, and motivational subsystems involved in stress reactivity and regulation; (3) the level of action, including the behavioral, volitional, cognitive, and meta-cognitive subsystems that jointly generate action tendencies and that integrate and regulate them; (4) the interpersonal level, including participation in coping by social partners as well as interpersonal relationships (such as with caregivers, extended family, friends, peers, and teachers) that create the interpersonal matrix within which the structure and functioning of coping's many subsystems develop. From Skinner and Zimmer-Gembeck (2016) with permission.

On the other hand, no matter how complex the system, coping serves a relatively straightforward function: To coordinate adaptive processes designed to detect and respond to challenges and threats (see Fig. 2). Hence, it can be seen as focused on accomplishing four main tasks, which can be labeled as: (1) *radar*, that is, to detect threats and appraise information about internal and external demands; (2) action *readiness*, that is, to prepare a response based on internal and external guides and capacities; and (3) action *regulation*, that is, to execute a response by coordinating action tendencies with internal and external demands and resources. Finally, in order to get better, the coping system also needs (4) *recovery* and *re-evaluation*, that is, to reestablish equilibrium and learn from stressful encounters.

Throughout development, social partners play a crucial role in shaping both the structure and functioning of all the subsystems involved in coping, suggesting that close relationships are part of its "experience expectant" development (Hostinar et al., 2014). At the same time, caregivers' roles in coping also *change* over development, from one in which they are doing most of the heavy lifting involved in neonates' "coping," using information provided by infants themselves, to one of direct participation and coaching in the coping interactions of young children. A full consideration of development must explain how caregivers (and later, other social partners and contexts) participate in the emergence and consolidation of these stress reactivity systems and regulatory capacities. As depicted in Fig. 1, caregivers play an explicit role as part of this complex multilevel coping system.

At its most holistic, the development of coping can be seen as successive age-graded reorganizations in how its basic tasks (i.e., radar, readiness, regulation, recovery, and reevaluation) are accomplished. Several broad developmental phases can be identified, each of which is characterized by different mechanisms of detection, appraisal, readiness, regulation, and learning as well as different kinds of participation by social partners. As we described in our earlier work:

> Infancy would begin with stress reactions governed by reflexes, soon to be supplemented by coordinated *action schema*; during this period, caregivers would carry out coping actions based on the expressed intentions of their infants (interpersonal co-regulation). During toddlerhood and preschool age, coping would increasingly be carried out using *direct actions*, including those to enlist the participation of social partners; this would be the age at which voluntary coping actions would first appear (intrapersonal self-regulation). During middle childhood, coping through *cognitive means* would solidify, as described in work on distraction, delay, and problem-solving; children would be increasingly able to coordinate their coping efforts with those of others. By adolescence, coping through *meta-cognitive means* would be added, in which adolescents are capable of regulating their coping actions based on future concerns, including long-term goals and effects on others
>
> Skinner and Zimmer-Gembeck (2007, p. 128)

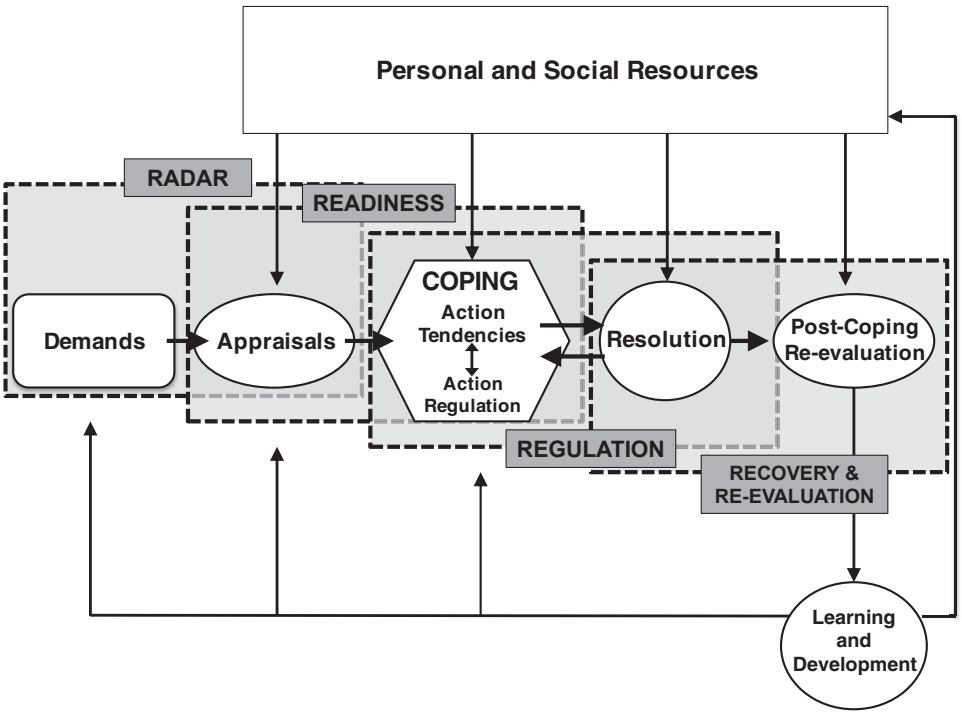

Figure 2 The coping system as a set of adaptive processes designed to detect and respond to challenges and threats, comprising four functions: (1) radar or threat detection and appraisal; (2) readiness or coordination of responses to threat or challenge; (3) regulation or adapting responses to changes in ongoing conditions; and (4) recovery and reevaluation, or revitalization while learning from encounters with stress. From Skinner and Zimmer-Gembeck (2016) with permission.

In the following sections, we lay out four age-graded phases in the development of coping, namely, newborn (first three months), infancy (3 months to the end of the first year), toddlerhood (the second year), and early childhood (ages 3–5), and describe for each the central developments in the means through which coping is carried out and the role of social partners in this process. We focus on how shifts in the coping system are scaffolded by the development of neurophysiological subsystems, in combination with changes in the demands and supports provided by social partners, and especially caregivers. As individuals develop, they add means of coping, moving from biobehavioral, to interpersonal, then co-regulated, cooperative, and voluntary actions. These developments provide children with an increasingly differentiated repertoire of tools for detecting and dealing with stressful transactions. At the same time, for coping to remain constructive, the functioning of these developing layers must be well integrated. Infants and children must maintain access to their authentic neurophysiological states, their genuine preferences, and their trusted social partners. Hence, while current developments build on previous accomplishments, they must also bring them forward through successive developmental shifts.

In creating depictions of the normative developmental phases through which coping progresses from birth to early childhood, we rely on theories and research from a wide variety of traditions that have considered how humans detect, appraise, react to, deal with, and learn from stressful encounters, and most especially work on the development of the attentional, emotional, behavioral, and cognitive regulatory processes. For more details, please see Skinner and Zimmer-Gembeck (2016); for details about the non-normative development of coping and its links to psychopathology, see also Zimmer-Gembeck and Skinner (2016).

Development of "Coping" in Newborns: Neurophysiological Stress Reactivity and "External Coping" via the Caregiver

It is clear that newborns do not "cope" in the same way that toddlers and young children do. Nevertheless, as befits a system tasked with survival, infants are born with a great deal of equipment that can be used to detect and respond to threats (Nagy, 2011), built into their neurophysiology and fused to their actions via reflexes. The multi-layered neurophysiology of stress has been developing prenatally, and at birth three integrated circuits are functioning (Porges and Furman, 2011). At the deepest level, the "reptilian" circuit, which subserves the "freeze" response, is coordinated by the unmyelinated vagal system. At the next level, the "fight-flight" response is orchestrated by the SAM. The third circuit, subserved by the PNS, specifically, the myelinated vagus system, is called the "social engagement" system.

These three circuits are involved, not only in stress reactivity, but also in the maintenance of homeostatic functioning, such as sleep-wake cycles, eating and digestion, temperature regulation, and social interaction (e.g., Porges and Furman, 2011). They are also involved in regulating energy and attention during interesting, but not stressful, transactions with the social and physical context. Hence, their integrated functioning operates on a continuum from the kind of down regulation that facilitates calm activities (like digestion and sleep), to a more awake, alert, and focused state that facilitates active interactions (such as feeding and social engagement), all the way to distressed states, as expressed through diffuse body movements and crying. In fact, infants learn to smoothly transition from one state to the other, based on internal and external conditions. For example, infants can slip the vagal brake off the SAM in order to provide the energy needed for the demanding activity of feeding, and then replace the vagal brake when it is time for digestion. This repeated up and down regulation can be considered an important "exercise" that fosters the coordinated functioning of the stress reactivity and regulatory systems, thereby strengthening the regulatory "muscles" involved in coping.

Development of Coping Neurophysiology Relies on Social Partners

Two major reorganizations in the coping system occur during the first three months after birth. Since before birth, these functions have been operating within the mother's womb, so a first developmental task for the newborn is to establish these basic homeostatic functions outside this sheltered environment (Nagy, 2011; Porges and Furman, 2011). This task is negotiated within the protective environment created by a sensitive, responsive caregiver. As described in detail in work on attachment, the role of caregivers is to interpret newborns' states and needs, and acting in accordance with infants' expressed preferences, to comfort, calm, and otherwise meet those needs (e.g., Sroufe, 1996). These actions, taken on the infant's behalf, have been called "external emotion regulation" or "external coping" because they reduce distress and solve the problems encountered by newborns in the course of their everyday activities (e.g., Nachmias et al., 1996).

The healthy development of the neurophysiological subsystems that underlie coping (i.e., the limbic-HPA axis, the amygdala, hippocampus, and sympathetic and parasympathetic nervous systems) depends on the external coping actions of caregivers (Gunnar and Hostinar, 2015; Lupien et al., 2009; Tottenham, 2012). Over time, as these neurobiological subsystems operate within the expected environment of a secure attachment, they become tuned to a safe and predictable world. For example, if the infant experiences a caregiving environment in which needs are reliably met and expressions of emotions and distress are responded to dependably, the HPA-axis goes into a period of hyporesponsivity by about 3 months of age (Gunnar and Quevedo, 2007). Under these same social conditions, the amygdala exhibits suppressed reactivity, including delayed engagement with dangerous and stressful aspects of the environment, and protracted development of its integration with prefrontal circuitry (Gee et al., 2013). Similarly, the parasympathetic nervous system develops a high resting vagal tone, accompanied by the capacity to quickly remove the vagal

brake to allow the SAM to provide resources when they are needed to deal with demanding encounters, and then reinstate it to allow speedy SAM recovery when demands are over (Propper and Holochwost, 2013; Tottenham, 2012).

When encouraged to operate in concert with their expected social partners, these integrated neurophysiological systems appear to show a normative trajectory over the first three to six months, in which, over time and with experience, each of these stress reactivity subsystems starts to slowly ramp down its responsivity—raising the threshold for the levels of stress needed to trigger the release of its many stress mediators, "turning down the volume" of its levels of activation, and augmenting the speed of its down-regulation after a stressor has safely passed. It is as if stress reactivity systems have learned that the infant is in a safe environment and will not need the high vigilance and quick responding with which it negotiated the first months of life.

Development of Caregiver Attunement Relies on Neurophysiological Systems

A second major reorganization is represented by a shift from strictly neurophysiological reactivity, regulation, and recovery, to the beginnings of interpersonal regulation of these systems by caregivers. Just as the healthy development of infant neurophysiology relies on a secure attachment relationship, the healthy functioning of the attachment system depends on the neurophysiological systems that underlie coping. The caregiver learns how to provide sensitive responsive care by attending to the initially diffuse signals orchestrated by the infant's stress reactivity system. These systems broadcast an accurate account of the newborn's states and preferences, and it is these cues that the caregiver uses to figure out what is needed to fix the stressful problem (e.g., feed a hungry infant or change a wet diaper) and to calm and comfort the distressed infant. Through caregiver attunement, external coping is fully integrated with newborn neurophysiology, and authentically responsive to infant expressed needs and genuine preferences. This allows the nascent "coping" system to remain well-coordinated with infant neurophysiology while also beginning to lift off more automatic processes, like those orchestrated by reflexes, and turn the task of detecting and dealing with threats over to the emerging interpersonal coping system.

Goal-Directed Communication and the Capacity to Be Comforted

These thousands of experiences of effective external coping, in which caregivers respond to infants' distress with attuned strategies for relief, set the stage for three more important shifts that take place during the first three months after birth. First, based on processes of contingent learning, newborns begin to direct their expressions of distress to caregivers. This allows them to communicate their needs and provides a foundation for the emergence of subsequent coping appraisals, based on an awareness of one's own distress and preferences. A second important capacity also emerges during this time, namely, the capacity of the infant's neurophysiology to be down-regulated by the caregiver (Hostinar et al., 2014). It is the openness of this system to the ministrations of trusted others that allows external coping to be effective (Porges and Furman, 2011). This emerging interpersonal capacity also opens a channel for future developments, when the young child will (eventually) take on this role via their own coping actions. A third crucial milestone during this developmental period is the emergence of the omnibus coping strategy of proximity seeking (Kobak et al., 2006). This action, in which infants turn to caregivers when they are distressed, likely serves as the foundation for the development of all families of constructive coping, most obviously the families of help- and comfort-seeking, but also for other families as well. For example, ways of coping from the problem-solving family or the family of emotion regulation also emerge from the kind of joint interpersonal coping described by proximity seeking.

By the end of the first three months of life, infants' coping equipment, which started as a diffuse set of undirected expressions of distress and reflexive reactions fused to a vigilant and reactive neurophysiological system, has become an integrated stress reactivity and regulatory system that is tuned to safety and thus hyporesponsive—capable of supporting homeostatic functions and characterized by a high threshold, low responsivity, and quick recovery in the face of stressful transactions. Crucial to the progressive reorganization of these systems is the development of a secure attachment relationship, in which caregivers respond to infants' initially undifferentiated expressions of distress, protest, and other negative emotions, using increasingly more effective external coping strategies for repair and comfort. As part of this relationship, infants develop the capacity to be comforted by caregivers and so begin to rely on an omnibus coping strategy, namely, proximity seeking. Although prototypical proximity-seeking behavior involves locomotion, attempts to make contact with the caregiver, which is the hallmark of proximity seeking, can be seen at younger ages—for example, seeking contact with the caregivers via gaze, head turning, gripping, or huddling.

These emergent systems must, on the one hand, be well-integrated with existing neurophysiology, so that they can access accurate information and suggestions for action generated by those systems, and so they can also rely on these more automatic systems as fallbacks. On the other hand, they must also "lift off" from neurophysiological processes, so that they can begin to work autonomously from them in a growing space that allows more flexible appraisal and intentional action regulation. One way of thinking about the developmental tasks of this initial period is the notion that the dyad must cooperate to build out from newborns' stress neurophysiology in order to create a stable biobehavioral platform for infants on the level of reactivity and regulation that will support the subsequent development of coping systems children can (eventually) independently and autonomously operate for themselves.

Development of Coping During Infancy: Implicit Appraisals, Intentional Action Regulation, and Co-regulatory Coping Systems

Once homeostatic functioning and the initial phases of attachment relationships are established during the first months after birth, three important developments shape age-graded changes in coping over the course of the rest of the first year: (1) the emergence of implicit appraisals used to interpret the meaning of stressful transactions; (2) the practice of sensorimotor intentionality and intrinsic motivation that support goal-directed coping; and (3) a shift of the interpersonal coping system from one operated largely via external coping to one based on true co-regulation.

Implicit Appraisals of Stressful Transactions

During the first months after birth, infants' stress reactivity and regulation begin to be guided by implicit appraisals that serve to detect and interpret the meaning of challenging and threatening interactions. Although it may seem surprising that infants as young as 8–10 weeks of age start to form generalized expectations, it turns out that the kinds of transactions that cumulate in coping appraisals may be prioritized for attention and integration. These transactions, by definition, are stressful, and typically involve the infants' own actions and the actions of other people. Such hot interpersonal action-event contingencies (compared to cool event-event contingencies) capture attention because of their adaptive value in guiding stress reactivity and regulation during demanding transactions.

Research in the areas of attachment and perceived control, which have studied these implicit appraisals as internal working models (Sherman et al., 2015) and as generalized expectations of contingency (Frankenhuis et al., 2013), have found evidence that they seem to be operating in infants' interactions with people and objects within the first few months after birth (Tarabulsy et al., 1996). Because they are constructed from a history of experiences with sensitive and responsive caregivers, these implicit appraisals are typically benign, and so can provide a rudimentary psychological buffer between potentially stressful encounters and energetically expensive neurophysiological reactions. A positive bias, in addition to counteracting the generally negative bias of cautious neurophysiological systems that subserve stress reactivity (Thayer and Lane, 2009), also supports prolonged and constructive interactions with demands and obstacles, which allows infants to learn about contextual affordances while further strengthening their regulatory coping muscles (Sherman et al., 2015).

At the same time, such appraisals remain well integrated with actual experience, since they are constructed from continuous real-time updating of ongoing interactions. The consolidation of generalized appraisals that are both realistic and optimistic allows infants to remain open to demands and challenges, while interacting with them in ways that minimize distress and optimize effectiveness. Such appraisals begin to create a space for more autonomous and agentic coping and may provide a foundation for future development of the kinds of more complex self-system processes that have been implicated in explicit coping appraisals at later ages.

Development of Intentional Action Regulation and Goal-Directed Coping

The second transformation in coping systems during this time involves the increasing centrality of intrinsic motivation and sensorimotor intentionality (e.g., Morgan et al., 1990), both of which prepare action systems for focused engagement, exploration, persistence, and authentic expression, and so pave the way for more robust goal-directed coping actions. When homeostatic functions have been established, and caregivers prevent or intervene when situations threat to overwhelm infants' coping capacities, a zone of proximal development is created within which intrinsic motivational systems can take center stage.

As described in functionalist theories of emotion (e.g., Barrett and Campos, 1991), these intrinsic (or primordial) action systems comprise the default coping system, and guide infants' responses based on their appreciations of specific contextual demands. Three "intrinsic coping" modes have been identified: (1) freeze/flight in response to novelty or threat and characterized by the emotion of fear; (2) fight/protect in response to goal blockage or resource loss and characterized by anger emotions; and (3) aversion/repulsion in response to unpalatable experiences and characterized by the emotion of disgust. These intrinsic emotional systems serve multiple functions (Barrett and Campos, 1991). They ready the organism to "cope," by taking action to modify stressful interactions, such as turning one's head to escape a stranger's gaze, struggling to get out of a blanket, or spitting out a bitter tasting liquid. These responses also alert others to infants' distress and their goals in the specific situation, thus readying caregivers to take actions on their behalf.

When infants detect the possibility of interacting with interesting people or objects, their intrinsic motivations propel them to pursue these attractive affordances, to explore them, and to express their genuine reactions. Such propensities are sometimes described as fundamental psychological needs (e.g., Connell and Wellborn, 1991; Deci and Ryan, 1985), directed at innate desires for (1) effectance or competence (i.e., experiences of effectiveness in producing desired or preventing undesired effects), (2) relatedness or belonging (i.e., experiences of connection and union with other people), and (3) autonomy (i.e., experiences of authentic expression of genuine preferences and goals). By the same token, transactions in which these needs are thwarted (e.g., via non-contingency, rejection, or coercion) would represent intrinsically stressful experiences.

As infants are encouraged to follow these intrinsic motivations during their interactions with social and physical contexts, sensorimotor action schema and underlying intentionality are strengthened (Delafield-Butt and Gangopadhyay, 2013). These developments systematically convert preferences to purposes, and so are utilized to guide actions and communications aimed at

reaching goals and dealing with challenges and problems. The exertion and persistence fueled by infants' goals and guided by their developing schema for effective actions pave the way for instances of goal-directed coping. Together, these processes underlie a shift in the coping system from early reliance on neurophysiological control to increasing supervision by implicit appraisals, intentions, and action schema. By the end of the first year, rudimentary precursors of all the major families of coping are available. For example, early precursors of problem-solving coping include infants' use of alternative actions to reach the same outcome; precursors of help-seeking coping can be seen in infants' use of social referencing and their appeals to caregivers for instrumental aid; and early forms of accommodative coping are apparent when infants abandon an unreachable goal in order to pursue another more attractive alternative.

Emergence of a Co-regulatory Coping System

From "coping" based almost entirely on the actions of external agents (i.e., caregivers), a true co-regulatory system emerges by the end of the first year, in which the infant becomes as increasingly active partner (Gianino and Tronick, 1988). Infants participate actively in each step of the coping process. They accurately detect emotional and goal-directed problems in ongoing interactions, and explicitly communicate differentiated signals to caregivers that provide clear information diagnostic of their authentic states and preferences. In ambiguous situations, they defer to caregivers' interpretations of safety and danger via social referencing. Infants' implicit appraisals filter the meaning of potentially stressful transactions and prepare appropriate actions, which can be amplified via effort exertion or modulated via the application of alternative means to reach goals. Infants are the arbiters of whether distress has been relieved or problems solved, and they communicate to caregivers their opinions about whether transactions are resolved or coping should continue. As a result, infants' newly constructed appreciations and goal-directed actions increasingly participate in "coping packages" that are co-created and co-scripted by caregiver and infant, designed to deal with specific problems, and tested and stored for use in future stressful encounters (Holodynski and Friedlmeier, 2006). Together, these capacities (and their feedback in continuing to program developing stress neurophysiology in terms of higher tipping points and faster recovery times) may contribute to improved biobehavioral "stress resistance" and "stress resilience" by the end of the first year of life (Fleshner et al., 2011).

Development of Coping During Toddlerhood: Explicit Appraisals, Emotional Action Regulation, and Cooperative Coping Systems

Three important developments take place during the second year (Kopp, 2011; Kopp and Neufeld, 2003) that may underlie age-graded shifts in coping: (1) the emergence of representational capacities transforms implicit appraisals to explicit belief systems that may buffer experiences of potentially stressful transactions: (2) the development of emotional and self awareness and understanding converts "emotional action regulation" to coping efforts supervised by an increasingly agentic self; and (3) the capacity for shared intentionality transmutes the co-regulatory coping system into an increasingly cooperative "triadic" system that allows toddler and caregiver to confront the problems faced by the child as a united front.

Development of Representational Capacities

The emergence of representational capacities, which starts already by the end of the first year, allows young children to construct mental models of hot social and physical experiences (Sherman et al., 2015; Thompson, 2015) that, under stress, can begin to guide reactivity and regulation. On the one hand, these appraisals pull emotional and motivational experiences up to the surface where they can be expressed in words. If caregivers are perceptive and sensitive, they can coach children on both the meaning and verbalization of their internal (typically invisible) experiences, and children's emotions and goals can become objects of mutual attention and discussion (Thompson, 2015). Accurate appraisals allow toddlers to "use their words" to identify their desires, to sustain attention and maintain goals that are more durable over longer periods of time, and to plan successively more complex action strategies before carrying them out (e.g., Keen, 2011; Rat-Fischer et al., 2012).

On the other hand, explicit appraisals also serve a social function. They enable information about emotional and motivational states to become increasingly available to both caregivers and toddlers for use in joint coping efforts. This opens an important avenue for toddlers to explore their arousal, distress, goals, concerns, and problems, as well as potential causes and cures. These mental models allow both toddler and caregiver to engage directly with the child's coping experiences (Calkins and Hill, 2007; Thompson, 2015). If these appraisals remain well-integrated with actual experience, they provide "actionable information" for the action readiness and regulation efforts of the developing coping system: helping to detect challenges and threats, diagnose the source of problems, and suggest alternative responses to engage, remedy, or avoid them (Holodynski and Friedlmeier, 2006).

Like the implicit appraisals constructed at earlier ages, these explicit representations are based on actual experiences in the safe and protected context created by a secure attachment relationship, and so should maintain the dual qualities of optimism and realism that can foster constructive engagement during challenging and demanding interactions (Sherman et al., 2015). Such representations expand the reach of coping experiences, since they can be used retroactively to interpret the meaning of previous stressful transactions, as well as proactively to anticipate and plan for future encounters. Appraisals also enlarge the psychological buffer between ongoing potentially stressful transactions and toddler's neurophysiological stress reactivity, by adding the explicit messages

provided by caregivers and repeated by the self, which now have the potential to help down-regulate and comfort children when they are distressed.

Emergence of the Reflective Self

The development of emotional and self-awareness during the second year (Brownell and Kopp, 2007) shifts the center of gravity of the coping system. Up until that time, young children's intrinsic motivational and goal-directed action systems have largely been operating via "emotional action regulation" (Kopp, 1989, 2011). Following this shift, however, actions are supervised by an increasingly autonomous and mastery-oriented self (Kopp and Neufeld, 2003; Thompson, 2006). Dawning self-awareness and self-consciousness are sometimes considered the beginning of the development of the self, but it is likely that the self-relevant information of which the emerging self becomes aware during toddlerhood incorporates both implicit understandings and explicit appraisals that have been under construction as internal working models since infancy. This transition results in more durable intentions but also in new sources of conflict, such as the experience of stressful self-conscious negative emotions or goal conflicts that are both intrapersonal and interpersonal.

The use of words allows children to decouple the expression from the experience of distressing emotions or motivations, and so creates a growing space between impulse and action. This marks an important shift in the development of flexible action and emotion regulation under stressful conditions (aka coping; Kopp, 2009). During the second year, coping transactions create well-practiced and coherent emotion-focused and problem-focused coping packages, consisting of integrated sequences of appraisals, goal-directed emotions, flexible action tendencies, and strategies for repair and comfort, as well as the capacity to talk about them (although not always in the heat of the moment).

Perhaps surprisingly, the establishment of an increasingly agentic self also lays the groundwork for the development of the extrinsic motivation system. As a complement to intrinsic motivation, this system allows children to take action (or refrain from action) even when no spontaneous desire to do so is present (Kochanska et al., 2001; Kopp, 2009). Although extrinsic motivation initially relies on requests, demands, and expectations from others, it also is enabled by previously established close and trusting relationships, which create a "mutually responsive orientation" in which toddlers become reciprocally concerned about the emotions and problems of their caregivers (Kochanska, 1997). This relational quality promotes young children's willingness to cooperate with the caregiver in dealing with conflicts and problems. When children are asked to comply with external requests or rules, these demands can create stress for toddlers, but if demands are reasonable and support is provided, they can also be opportunities for young children to exercise and strengthen the regulatory muscles they will utilize in future coping transactions.

Shared Intentionality

A third transformation in the coping system during toddlerhood is ushered in by the development of the capacity for shared intentionality (Tomasello, 2007; Tomasello and Carpenter, 2007). Sometimes called "we" intentionality, this refers to collaborative interactions in which partners share common psychological states with each other (such as goals or emotions) and are also aware that they are sharing these states. Shared intentionality creates common ground that allows dyads or groups to collaborate, cooperate, and communicate in ways that are qualitatively different from the self-focused instrumental versions of these actions. For example, in addition to infants' use of pointing as an instrumental strategy of "indirect coping" (e.g., to get a caregiver to retrieve an object or take them in a specific direction), by 9 to 12 months of age, infants also point with no apparent instrumental aim– just to share a joint experience with the caregiver or to provide helpful information (e.g., about the location of an object the adult seems to be searching for). These capacities suggest both a set of social-cognitive skills (e.g., gaze following, intention reading, and sensitivity to the attentional state of the recipient) and also a motivation for synchrony or sharing interest and attention (Tomasello and Carpenter, 2007).

For the coping system, it suggests that toddler and caregiver can now work together to jointly solve the emotional and motivational problems that trigger stress. This may instigate a shift from co-regulation in which infant and caregiver mutually shape each other's distress, actions, comforting, and relief, to coping interactions that are truly cooperative (Tomasello, 2007). This coping system can now be considered "triadic" in that toddler and parent work together as a cooperative unit to deal with the third member of the transaction—namely, the stressor. Rather than focusing on each other, the target of their joint problem solving becomes the emotional or goal-directed issues that require their attention and action. Such a cooperative system supplements the infant's previous roles in coping, when the baby operated as a reporter of the difficulties she is experiencing, a recipient of the caregivers' coping activities, and a judge of whether efforts are sufficient to solve the problem. Now the toddler is working in unison with the caregiver, based on a common understanding of the problem, as an active co-agent of coping efforts (Tomasello and Carpenter, 2007). Based on a history of caring and attuned coping provided by the caregiver, the child's coping system operates as part of a mutually responsive orientation, meaning that just as the neurophysiological stress reactivity system of the newborn soon became open to external regulation from the caregiver, the new autonomous coping system of the toddler remains receptive to participation from trusted others. This enables the child to continue to receive supportive inputs from the social context, whether in the form of instruction, tools, help, or advice (Kochanska, 2005).

Development of Coping During Early Childhood: Inferential Appraisals, Voluntary Action Regulation, and Individual Coping Systems

During early childhood, coping is transformed from an *inter*personal to an *intra*personal process, based on three crucial developmental milestones: (1) improvements in representational capacities allow children to appraise problems using increasingly complex and inferential mental models; (2) advances in attentional and working memory capacities contribute to the emergence of voluntary regulation of coping actions; and (3) the development of a "moral compass" allows external expectations, moral rules, and concern for others to be incorporated into growing coping systems. The emergence of intentional action regulation during early childhood ushers in one of the most important transformations of the coping system. For some theorists, who define coping as comprising only conscious and volitional efforts, the development of voluntary action regulation marks the beginning of coping proper.

Emergence of Inferential Appraisals

Much of what is happening during stressful transactions is invisible. Taxing interactions, in which valued goals are threatened or children are pressured to conform to adult demands, generate emotions and action tendencies below the surface. During early childhood, advances in representational capacities allow children to construct increasingly complex mental models, and so enrich coping appraisals by incorporating emotional states and inferential concepts, like desires and misunderstandings. The development of these capacities has been studied by researchers examining emotional understanding (Thompson, 2015) and cognitive and affective theory of mind (Wellman et al., 2011). Research in these areas documents the normative progression of children's appraisals about their own and others internal states (desires, beliefs, and knowledge) and their connections to reality (Wellman, 2002; Wellman et al., 2011). Prior to about the age of 3, these understandings are fused. Children assume that whatever they want, feel, and know is identical to what everyone else wants, feels, and knows, and to reality. Over time, preschoolers come to realize that, even in exactly the same situation, people can differ in their desires, beliefs, and knowledge; and any of these can diverge from reality. These increasingly differentiated appreciations allow children to better understand that invisible internal states (i.e., desires, emotions, knowledge) are operating, and that in other people these states cannot be perceived directly but must be inferred from action.

Such understandings allow children's mental models of the stress and coping process to penetrate below the plane of action to consider the inner workings directly involved in processes that generate emotions (like distress, frustration, or determination) and guide corrective action. Over this period, young children's emotional vocabulary becomes increasingly differentiated, creating ever more robust connections between their interoceptive somatic experiences, their representations of those states, and their communications to others (Holodynski and Friedlmeier, 2006; Thompson, 2015). Through conversations with attuned caregivers during episodes of emotion- and problem-focused coping, young children expand their understandings of the workings of their own emotions, desires, and goals (and those of others) in hot situations. They learn that these invisible internal states can signal potentially stressful transactions triggered by obstacles, challenges, problems, and setbacks; and so can also be used to formulate more insightful analyses of these issues, and to suggest more effective strategies for constructively managing emotions and goals during coping efforts. Especially important in this regard are discussions with caregivers that incorporate multiple perspectives and explore causal interpretations (Calkins and Hill, 2007). As with the implicit and explicit coping appraisals described previously, these more nuanced understandings maintain a benevolent default interpretation of one's own actions and those of others, by assuming that intentions are benign (and not hostile), actions are motivated by legitimate needs and concerns (and not designed to hurt others), and that any harmful actions are accidental (and not intentional). These assumptions create an even thicker psychological buffer between potentially stressful experiences and stress reactivity (both neurophysiological and emotional), allowing young children to remain composed and cooperative in increasingly demanding situations. Because this default is extended to other people, these appraisals also create a *social* buffer zone within which children can work on episodes of interpersonal coping.

Voluntary Attention Regulation

A second crucial milestone in early childhood is reached when children develop the capacity to deliberately regulate their own behavior (Kochanska et al., 2001; Kopp, 2011). The emergence of intentional action regulation depends on the development of attentional and working memory capacities. Researchers distinguish three key attentional networks, referred to as alerting, orienting, and executive attention, that differ in their underlying neurophysiology, as well as in their functions and developmental course (Posner et al., 2014; Rothbart et al., 2011). All are active even in infancy, but their predominance shifts as children develop. From birth, alerting attention systems bring infants from a resting to an alert state that allows them to focus on and become open to receiving external stimulation. Sometimes considered part of homeostatic functions, these networks are exercised as infants shift from resting to alert states when they interact with people and interesting objects.

During infancy the orienting network is dominant and coordinates the functioning of the other two. This system serves to direct attention to high-priority events, and so is essential to coping because it shifts the individual's focus to interactions of adaptive significance. Compared to the alerting network, it also allows more flexibility and discrimination in attending and shifting attention to internal and external events. At about 3–4 months of age, when infants begin to gain control over this network, orienting serves as some of the earliest forms of emotion regulation and coping, as infants disengage from distressing interactions and focus their

attention on more soothing ones. Parents take advantage of this network (and exercise its functioning) when they use attractive objects or social interactions to distract children from their distress. Older infants deploy this network themselves when they shift their attention from a distressing event to the caregiver, or when they exercise caution when approaching novel or interesting objects or people.

The development of the executive attention network starts later, and proceeds more slowly, but begins to take over the coordination of the other two networks starting at the end of the second year. This network plays functional roles in the deployment of attention and in the processing and deliberate regulation of emotion, cognition, and action. One of the areas of the brain that subserves executive attention, the anterior cingulate cortex (ACC), is of special interest to coping researchers because it seems to be a hub for the cognitive, emotional, attentional, and motivational processes that are active during stressful transactions (Calkins and Hill, 2007; Compas, 2006); and their integration should allow more adaptive (i.e., flexible and informed) action regulation. The executive attention network undergoes a period of rapid growth in connectivity during the preschool period, when performance on task requiring executive function improves rapidly.

Attentional processes are central to coping at every age. They are involved in all phases of dealing with stressful transactions, starting with threat detection and stress reactivity. They support problem-focused coping by allowing children to deliberately focus on chosen intentions and strategies and to disregard others. They support emotion-focused coping by allowing children to engage and disengage attention during distraction, to prevent rumination, and by focusing attention on the present (instead of worrying about what just happened or what might happen in the future) and on positive states and experiences (facilitating, for example, positive reappraisal).

Voluntary Action Regulation

Advances in executive attention, representational capacities, and language contribute to the emergence of the capacity to intentionally regulate one's own actions, via processes of executive function (EF; Diamond, 2013; Zelazo, 2015). This development again shifts the coping system's center of gravity to an increasingly more agentic and autonomous self, as young children are able to appraise and deal with problems and stressors using their own interpretations and actions as a first line of defense. A great deal of research has examined the normative progression and neurocognitive skills that underlie the development of EF across early childhood (and beyond) (e.g., Best and Miller, 2010; Peterson and Welsh, 2014). Key EF skills are those essential to resolving goal conflicts—specifically, conflicts created when guides prescribe alternative mutually exclusive courses of action, for example, conflict between a bottom up urge and a top down intention, or between a personal desire and a request from the caregiver. Prior to this time, these conflicts were handled relatively automatically, by allowing the pre-potent or habitual response to dictate behavior.

However, as children's representational and language skills develop, they are able to represent and hold conflicting goals in working memory, to negotiate the conflict between them internally, and to use their skills to allow the non-dominant guide to prevail. For example, young children can use inhibitory control to shift their attention away from the pre-potent or habitual goal, thus strengthening the non-dominant response, and show cognitive flexibility in shifting guides for action regulation from one set of rules to another. Slowly, cognitively represented goals, like requests for compliance from caregivers, can successfully compete with the action tendencies urged by powerful motivational and emotional systems.

In the study of EF, researchers distinguish between hot and cool executive functions (Peterson and Welsh, 2014; Zelazo and Carlson, 2012). Hot EF refers to the exercise of these regulatory skills in situations where stakes are high—where goals, motivations, and emotions are activated, for example in classic delay of gratification tasks where rewards (i.e., marshmallows) are consummatory. The neurocognitive processes and specific skills utilized differ in situations that are hot versus cool, with hot EF tasks seemingly more difficult, and the developmental progression of hot EF lagging behind that of cool EF (Peterson and Welsh, 2014). It seems that processes of coping would require both hot and cool EF skills. By definition, coping takes place when stakes are high, that is under conditions of challenge and threat, so hot EF would be essential in allowing young children to constructively regulate the action tendencies urged by stress reactivity systems. At the same time, cool EF skills would also be essential, to optimize problem-focused coping strategies.

Most interesting would be how both of these kinds of EF can be integrated and coordinated to lift action regulation during coping off relatively automatic attention-motivation-emotion systems guided by local conditions and implicit rules derived from previous experience. This would enable cognitive representations from coping appraisals to inject some space between previous experience and current action, which would facilitate action regulation that is increasingly intentional and deliberate. This accomplishment allows coping to become less reactive and more flexible. It provides a channel for children's own goals and intentions to participate in coping episodes, as well as channels for the participation of others. Current research on both hot and cool EF suggests that these systems are strengthened through the repeated practice of effortful regulation on the ground, and in the case of hot EF, practice under stressful conditions.

This implies that coping transactions could be an important venue for the exercise of hot and cool EF, as long as regulatory systems are not overwhelmed, that is, as long as demands are challenging and support is available (Kopp, 2009). Especially important in this regard are processes of reflection, or the iterative re-processing of information (Zelazo, 2015). Reflection facilitates the construction of increasingly more complex, context-attuned representations of goal and action hierarchies. Reflection is fostered by verbal discussion, for example, conversations in which caregivers engage with their young children about the nature and meaning of

stressful transactions. As these appraisals become sturdier and more powerful, they can hold their own against stress reactivity systems, allowing more effective intentional action regulation, that is, more autonomous coping.

Development of a "Moral Compass"

A third major milestone during early childhood is the emergence of a moral compass, as depicted in research on the development of conscience (Kochanska, 2005; Thompson, 2006). This development, which is part of the general shift from heteronomous to autonomous regulation, provides a way to integrate the means and goals of the self with those of others using an increasingly internalized set of moral principles and values (Eisenberg et al., 2009; Kochanska et al., 2001). By imposing demands for mature behavior governed by moral principles, caregivers create "problems" for their young children (Kopp, 2011), and the integration of these principles into episodes of emotion-focused and problem-focused coping, along with their accompanying discussions, allow children to strengthen their increasingly autonomous self-regulatory "muscles."

The internalization of pro-social strategies, concern for others, and moral rules for use in regulating action are combined with continued development of the capacity to search for effective means to reach desired goals, or problem-solving. Although it has its origins in infancy, intentional problem-solving as a cognitive and social process comes into its own during early childhood (Keen, 2011). If handled sensitively, "stressful" transactions can become laboratories for developing problem-solving skills—allowing young children, with the help of adults and peers, to identify and generate new strategies, imagine their effects, select from different options, try them out, and learn about their effectiveness (Berg and Strough, 2010). In fact, it is likely that the development of all constructive families of coping emerge from an interpersonal scaffolding—not only of pro-social ways of coping (like accommodation and negotiation), but also ones that are not so obviously social, like strategizing and self-soothing, which may emerge from joint problem-solving and the coaching of emotion regulation.

By the end of early childhood, the coping system has been transformed from an interpersonal one in which coping is carried out *between* caregiver and child to one that is largely *intra*personal, carried out by the child him- or herself (Holodynski and Friedlmeier, 2006). Information about stressful encounters (i.e., problems and emotional distress) that was previously communicated to the caregiver must now be directed to the developing self for consideration and action. Decisions and preparations for action that were previously taken in cooperation with the caregiver, are now initially negotiated internally, just as reappraisals and next actions steps are also formulated by the child. It is important to note that the interpersonal system is not replaced by a more independent coping system; instead it is supplemented. Young children still have access to the cooperation of caregivers, through the deployment of coping strategies such as help-, comfort-, and proximity-seeking. Throughout this period, support provided by caregivers is crucial, but caregivers must find ways both to stand back and to scaffold young children's test-drives of their increasingly self-regulated coping systems.

Conclusion

Research on the development of coping during infancy and early childhood has much to learn from work in closely related areas that depicts the age-graded progression of neurobiological, psychological, and social subsystems that underlie stress reactivity and action regulation during challenging and stressful encounters. This work demonstrates that coping systems undergo multiple qualitative shifts starting at birth and continuing to the end of early childhood (and beyond). At the same time that development decisively shapes how individuals cope, coping transactions, in which infants and young children strive to organize their biopsychosocial resources in order to engage constructively with everyday demands and problems, reciprocally shape the development of all the subsystems involved in coping. Caregivers play a crucial role in these processes at every age. Through their attuned participation in coping episodes, they create conditions essential to the construction of adaptive stress reactivity and regulatory systems, and so play a vital role in the healthy development of coping.

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Dr. Ellen Skinner. Portland State University. https://www.pdx.edu/psy/ellen-skinner-phd-professor-of-human-development-psychology-chair-department-of-psychology.
Dr. Melanie J. Zimmer-Gembeck research lab https://sdrsinfo.wordpress.com/.