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Special Issue Article

The Future of Developmental Psychopathology: Honoring the Contributions of Dante Cicchetti

Beyond form: The value of systems conceptualizations of function in increasing precision and novelty in the study of developmental psychopathology

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Abstract

Developmental psychopathology has successfully advanced an understanding of risk and protective factors in multivariate models. However, many areas have relied on top-down approaches that define psychological constructs based largely or solely on their physical form. In this paper, we first describe how top-down approaches have significantly hindered progress by generating generic risk and protective models that yield little more than the conclusion that axiomatically positive and negative factors respectively beget an interchangeable array of positive and negative child sequelae. To advance precision and novelty as central priorities, we describe behavioral systems frameworks rooted in evolutionary theory that infuse both form (i.e., what it looks like) and function (what it is designed to do) into psychological constructs. We further address how this paradigm has generated new growing points for developmental models of interparental relationships and parenting. In the final section, we provide recommendations for expanding this approach to other areas of developmental psychopathology. Throughout the paper, we document how the focus on functional patterns of behavior in well-defined developmental contexts advance precision and novelty in understanding children's response processes to threats, opportunities, and challenges in associations between their developmental histories and their psychological sequelae.

Keywords: Child coping strategies; developmental psychopathology; evolutionary-developmental theory; behavioral systems; social relationship qualities

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Prior to the emergence of developmental psychopathology as a scientific discipline (Cicchetti, 1984), much of the research on psychopathology was guided by traditional medical or disease models. In these models, disorders were commonly conceptualized as discrete syndromes that resulted from the unidirectional operation of a single or delimited, set of additive risk factors (Cummings et al., 2000; Sroufe, 1997). Over the past 40 years, research and theory guided by the tenets of developmental psychopathology has been remarkably successful in overcoming many of the limitations of the medical models. Significant advances in knowledge are evident in the delineation of risk and resilience factors in multifactorial models and the identification of moderators to account for heterogeneity in developmental sequelae (e.g., Cicchetti, 2016). Tangible signs of progress are also reflected in characterizations of the transactional interplay between the changing child in dynamic ecological contexts and mediational cascades underpinning typical and atypical developmental trajectories using multi-level approaches (e.g., Cicchetti, 2013). However, maintaining the health and vitality of developmental psychopathology requires continuous monitoring of emerging barriers to future progress and formulating sustainable approaches to address those limitations.

Accordingly, the goal of this article is to examine why continuing an ongoing generation of developmental psychopathology research is reaching a point of diminished returns. In the first section of the paper, we will describe the properties of the common top-down approach used to frame questions in developmental psychopathology. We will further illustrate how characterizing psychological constructs based largely or solely on their physical form in this approach is increasingly hindering advances in developmental psychopathology. In advocating for the value of shifting paradigms to overcome these pitfalls, the second section outlines the primary conceptual characteristics of an alternative approach rooted in evolutionary theory. By way of selective illustration, we further address how this paradigm can be usefully applied to generate new growing points in two areas of developmental psychopathology (i.e., developmental models of interparental relationships and parenting). In the final section, we conclude by providing some overarching recommendations for expanding the use this approach to other areas of work.

The principles and pitfalls of the top-down approach in developmental psychopathology

In a classic paper published in *Development and Psychopathology* over 25 years ago, John Richters (1997) highlighted many of the

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problems and potential solutions to advancing the developmental sciences. Although developmental psychopathology has made progress in overcoming many of the barriers outlined in the paper, our contention is that we have failed to implement precision and novelty as two standards for evaluating the value of theory and research in advanced sciences. According to Richters (1997), precision is defined as the "the degree of accuracy with which a theory can make point predictions of phenomena within a very narrow range of specificity (p. 208)." Novelty, in turn, is reflected in "a theory's ability to anticipate and predict facts and observations that would be unlikely absent the theory (p. 208)." We argue that this barrier is the result of the use of top-down strategies for formulating theory, conceptualizing research questions, and interpreting findings. Top-down approaches define the composition and boundaries of concepts based exclusively or primarily on their form or morphology (Stump et al., 2009). For example, anger is commonly defined in psychological models based on physical attributes reflected in facial expressions, postures, and gestures. However, the construct itself is conceptually hollow because there is no inherent meaning or function infused in its definition. Rather meaning is integrated post hoc in the form of evaluative judgments of the degree to which the construct is moral, virtuous, desirable, and appropriate or immoral, undesirable, impairing, and inappropriate. These judgements, in turn, are tacitly based on colloquial wisdom, cultural beliefs, and lived experiences of the researchers who are, in large part, from relatively privileged backgrounds and regions of the world (Henrich et al., 2010).

Once the form and culturally laden value of the concept is defined, the next step is to contextualize it within a multivariate framework of concepts. If the concept is regarded as appropriate or virtuous within the narrow and tacit bounds of the lived experiences of the scientists, then the priority is to myopically examine it as a correlate, antecedent, or consequence in a larger nomological network of virtuous, positive, and supportive characteristics. Conversely, if the target concept is undesirable or impairing, then the procedure is to follow up by examining how it relates to a wide array of other inherently negative (or "insufficient" levels of positive) factors. Although there may be some intangible dissatisfaction with this process, it is commonly masked through the inclusion of pseudo-sophisticated terms to describe the relations among inherently negative or positive factors. Instead of repeatedly referring to them as negative or positive factors, our field uses terms like deficits, risk factors, perturbations, compensatory factors, buffers, resources, provisions, and so forth. To advance beyond the simplicity of relating factors together with inherently similar valences, supplementary complexity is often added by expanding the scope and size of the models. Mediational cascades or transactions between individuals and their supportive and adverse environments have been a core part of the effort to capture the intricacies of development. In a complementary fashion, the considerable variability in the outcomes of children who share similar developmental experiences is often addressed in work identifying moderators that amplify or interrupt the developmental pathways. In these multivariate landscapes, additional terms are invoked to describe the nature of the interplay between children's functioning and their developmental contexts, including risk and promotive mechanisms, equifinality, multifinality, protective, potentiating, and vulnerability factors, and explanatory processes (Cummings & Davies, 2010).

However, when deconstructed into its conceptual nuts and bolts, this generation of research still suffers from many of the same drawbacks as its simpler conceptual and methodological predecessors. Hypotheses and interpretations of results generated by the top-down approach to test mediational or transaction models struggle to generate conclusions that move beyond the uninformative observation that inherently positive and negative factors respectively predict more intrinsically positive and negative sequelae. The top-down approach to testing for moderators relies on a generic list of: (1) intrinsically positive characteristics (e.g., social support, warm relationships, positive temperamental attributes, neighborhood cohesion) to identify protective factors; and (2) inherently negative factors (e.g., interpersonal discord, parent psychopathology, negative temperament traits, community disorganization) to delineate potentiating factors. Therefore, we still fall into the same conceptual trap as the more simplistic models of the past. When we find that the interplay among factors in our multivariate models conforms with the generic classification of positive (e.g., appropriate, moral, virtuous) and negative (e.g., inappropriate, immoral, impairing) factors derived largely from common knowledge, then we confirm the conventional, contextualist belief that everything relates to everything else in some weak, yet ill-defined way. In cases where analyses produce findings that contradict how positive and negative factors should behave together, a prevailing method of reconciling the discrepancy is to issue a directionless call for more research while chalking it up to measurement limitations, analytic issues, or vague differences in sample characteristics. In the end, the use of elaborate linguistic terms, complex methodological designs, and sophisticated analyses does not achieve the pinpoint precision or novelty that "would be otherwise explainable only as a damn strange coincidence (Richters, 1997, p. 208)."

Behavioral systems models in evolutionary theory

The limitations of the top-down approach to characterizing phenomena begs the question of how we can shift the paradigm to a new generation of research that prioritizes precision and novelty. From our perspective, systems conceptualizations offer one promising solution to the existing barriers by defining psychological processes based not only on what they look like (i.e., form) but also on what they are designed to do (i.e., function). Evolutionary-developmental theory has the potential to usher in a new generation of developmental psychopathology research by highlighting the value of integrating both form and function into characterizing interpersonal dynamics and psychological processes. Evolutionary models share the assumption that our brains and bodies were shaped by natural selection. Accordingly, psychological processes are phylogenetic vestiges of adaptive solutions to problems that promoted the survival and reproduction capacities of our ancestors. From this perspective, the top-down approach of focusing on psychological responses in the context of proximal stimuli can be misleading because the architecture, organization, and function of any emotional-behavioral system developed over the evolutionary course of our species. Thus, examining the operation of emotional-behavioral systems in relation to proximal cues and ontogenetic history is insufficient without consideration of its interplay with phylogeny. Our model relies heavily on the conceptualization of behavioral systems for achieving an understanding of the evolved psychobiological structures and implicit algorithms that direct the behavioral strategies of humans in meeting developmental challenges (e.g., Mikulincer & Shaver, 2006). In accordance with this approach, much of human behavior is posited to be organized by a limited set

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Table 1. Descriptions of the adaptive functions, observed goals, and common strategies of some of the salient control systems in childhood

Control system	*Proximate function or external goal*	*Common behavioral strategies*	*Broad ultimate function*
Attachment	Maximize sensitivity and protection of caregiver	Distress; bids for comfort and support; proximity-seeking; clinging behavior; monitor whereabouts of caregiver	Protection from harm
Social Defense	Defuse or avoid threats and aggression by conspecifics	Fear; vigilance; freezing; flight; fight; cut off behavior (e.g., covering eyes); camouflaging behaviors (e.g., inhibiting verbal and overt emotional expressions); heightened perceptual-cognitive sensitivity to environmental cues of danger; demobilization (e.g., dysphoria, fatigue, inferiority, helplessness), social de-escalation (e.g., gaze avoidance, coy behavior)	Protection from harm
Exploratory	Familiarization with physical world	Approach novel objects and settings; systematic observation and manipulation of object world	Access to basic survival materials
Affiliation	Acquire social skills and standing	Social interest and approach; joint attention; initiation and maintenance of interpersonal ties (e.g., sharing, gifting play)	Access to basic survival materials; formation of alliances
Caregiving	Proximity to the dependent	Monitoring of dependent, sensitivity to dependent distress signals, and responsiveness to dependent needs	Protection of dependents
Dominance	Increase access to material resources and mates, eliminate adversaries	Anger; aggression; attention seeking; direct gaze	Acquisition of basic survival materials
Sexual	Sexual arousal and intercourse	Unncommitted sex with multiple partners; pair bonding with restricted partners; monogamous, intimate sexual bonding; mate guarding and sexual jealousy; courtship behavior	Reproductive success

of primitive, species-typical, and goal-directed behavioral systems (Bowlby, 1969).

Each behavioral or control system is characterized by patterns of affective, psychological, and physiological processes that organize behaviors toward specific goals. During childhood and adolescence, seven systems are particularly relevant, including: (a) attachment; (b) affiliation; (c) exploration; (d) social defense (or, more broadly, fear/wariness); (e) dominance; (f) caregiving; and (g) sexual systems (e.g., Bretherton, & Ainsworth, 1974; Gilbert, 1993; Hilburn-Cobb, 2004; Leedom, 2014). Each of these control systems can be distinguished based on adaptive functions, goals, and action tendencies or strategies (Hilburn-Cobb, 2004). The *broad ultimate function* is defined as the broad advantage the system or module conferred in promoting survival over evolutionary time. As shown in Table 1, adaptive functions can vary from survival (e.g., protection from harm, acquisition of basic materials for survival) to reproduction. The *proximate function or external goal* of each control system in Table 1 refers to the original specific function of the system in regulating the present relationship between the organism and the environment in ways that ultimately contributed the survival and continuation of the species. Finally, *behavioral strategies* are defined by patterns of behavior, affect, and information processing that function flexibly to achieve the behavioral goal. Organisms are constantly regulating broad fitness goals (i.e., protection from harm, acquisition of resources, reproduction) in the context of emerging threats and opportunities in the environment by directing their limited energy and biological resources toward specific control systems and external goals. Decisions to allocate resources to a specific control system and its proximate function (e.g., maximizing caregiver accessibility or defusing conspecific threat) are products of automatic, evolved algorithms that calculate the fitness gain involved in prioritizing one system over the others based on the actively surveilling the environment for threatening and rewarding stimuli (Leedom, 2014).

Assessing how different control systems are operating requires much greater precision and depth in the conceptualization and measurement than top-down approaches. For example, procedures for capturing individual differences in attachment consist of developing contexts where the attachment system and its external goal of maximizing caregiver protection during distressing periods is the primary organizer of children's behavior. From a behavioral systems perspective, the series of caregiver separations and reunions interspersed with the introduction of a stranger in the Strange Situation is precisely designed to activate the attachment system by drawing on two forms of normative anxiety (i.e., separation and stranger anxiety). In turn, individual differences in the strategies that children use to achieve the external goal are, in some approaches, based on an evaluation of both form and function. For example, variations between children in their use behaviors to maximize caregiver accessibility can be functionally differentiated into strategies involving direct communicative bids for support, coercion, caregiving, and minimizing overt expressions of negative affect to prevent loss of caregiver access (Crittenden, 2013). Because children can flexibly use different behaviors (e.g., refusal caregiver affection, whining, aggression, tantrums) in the service of the same function (e.g., coercive attachment), just examining the form or morphology of the behaviors cannot accurately capture the behavioral strategies (Crittenden, 1992; 2013).

Precision and novelty in conceptualizing and operationalizing child functioning within control systems can, in turn, advance the developmental psychopathology aims of characterizing the nature, antecedents, and sequelae of children's atypical and atypical functioning over time. Understanding the function of behavioral strategies in achieving the external goal of a control system provides a guide for more precisely identifying the experiential and developmental precursors of their patterns of psychological functioning. In returning to the attachment example, a defended or avoidant strategy of minimizing overt expressions of distress

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may permit some accessibility to an attachment figure who has a history of responding to child distress with rejection and emotional distancing (Crittenden, 2013; Fraley, 2019). When function is infused into the characterization of children's responses to fitness relevant goals, it can also offer greater precision and novelty in formulating predictions about the subsequent course of children's psychological adjustment. Evolutionary theory assumes that any behavioral pattern has developmental tradeoffs in both adaptive and maladaptive functions for fitness (i.e., survival and reproduction). As an illustration of greater precision, children with defended or avoidant attachment patterns are likely to intensify their prioritization of self-protection over social connection and, in turn, specifically increase their vulnerability to antagonism, callousness, and cynicism (Ein-Dor et al., 2010). However, this attachment pattern is also posited to garner fitness advantages in harsh environments by specifically accelerating the aging process and expediting reproduction (Belsky et al., 2010; Simpson & Jaeger, 2022). Rooted in evolutionary theory, the hidden talents model has further highlighted the novel prediction that response patterns that are designated as broadly "risky," "pathogenic," or "suboptimal" in the top-down approach may also confer proficiencies that are advantageous across a wide array of contexts (Ellis et al., 2022).

Interparental conflict in developmental contexts: the utility of the social defense system

Problems stemming from the top-down approach are ubiquitous in the interparental conflict literature. For example, emotional security theory proposes that the stressfulness of witnessing hostile interparental conflict increases children's risk for developing psychopathology by undermining their goal of emotional insecurity in contexts of interparental conflict. When this latent goal is undermined, children are posited to exhibit three measurable classes of response processes in contexts of interparental discord, including: (a) emotional reactivity, characterized by children's elevated, prolonged distress; (b) regulation of exposure to the conflict through involvement or avoidance; and (c) negative internal representations, reflected in children's pessimistic working models of the harmful consequences parental conflicts have for the welfare of themselves and their families (Cummings & Davies, 2010; Davies & Cummings, 1994). Several longitudinal studies employing multiple methods or informants have documented emotional insecurity as a mediator in the association between hostile interparental conflict and children's psychological problems (e.g., Buehler et al., 2007; Cummings et al.,2012; Davies et al., 2020).

Over the past two decades, researchers have expanded the tests of the emotional security theory across all steps of the hypothesized mediational model. As the central risk factor in the original theory, hostile interparental conflict has been replaced in tests with a wide array of other family and community factors including disengaged and dysphoric interparental conflict, parenting difficulties, parent psychopathology, maltreatment, diminished constructive and productive interparental conflict, and even political violence. In a comparable fashion, the definition of emotional security as a relational construct nested in the interparental relationship has been bloated well beyond its original conceptual boundaries (Davies & Cummings, 1994). For example, the highly variable definitions of emotional insecurity have been expanded to include the degree to which broadly negative (i.e., angry, scared, sad) responses outweigh positive responses (e.g., Goeke-Morey et al., 2003), positive parent-child relationship qualities (e.g., "belief that one is loved and cared for;" Crockenberg & Langrock, 2001, p. 139), a metaphorical "bridge between the child and the world (p. .134)" (Cummings et al., 2006), and even a set of personality traits consisting of emotion dysregulation, dependency, negative social expectancies, and generalized anxiety disorder symptoms (Mann & Gilliom, 2004; Su et al., 2011). Likewise, the laundry list of child sequelae of emotional insecurity continues to grow to the point of muddying dispersion. For example, analyses of emotional security as a predictor of child functioning have focused on numerous emotional (e.g., internalizing symptoms, anxiety, depression), behavioral (e.g., externalizing symptoms, conduct problems, hostility), and social (e.g., poor peer relations, social skill impairments) difficulties, academic problems, eating disorders, substance, use, self-esteem, internet addiction, parent-child communication quality, and subsequent spousal conflict in adulthood.

So, what is the value of this research? From the top-down perspective, replacing one factor with another factor of similar valence in the mediational tests of emotional security can be regarded as novel because it includes a construct in the model that had not been examined in prior research. This approach might be interpreted as important in collectively advancing an understanding of the range of multifinality in the sequalae of children exposed to interparental conflict. However, this lens has also hindered scientific progress in numerous ways. Because top-down approaches do not integrate function a priori in form-based definitions of the constructs, the meaning of any factor in the original emotional security theory is only determined post hoc based on the daily experiences of scientists in largely privileged cultures. As a result, these procedures yield the same old, ill-defined taxonomies that tacitly classify constructs into desirable-undesirable, appropriate-inappropriate, or healthy-pathogenic categories. In this paradigm, there is little remarkable or unique in the meaning or function of hostile interparental conflict, children's emotional security, and their psychological problems in the original theory beyond the broad notion that they are undesirable or impairing. Thus, the predictor, mediator, and outcome are interchangeable with a long formulaic laundry list of risk factors, risk mechanisms, or sequelae. In the end, the resulting unbridled expansion of predictors, mediators, and outcomes in tests of emotional security theory has collectively generated little more than the conclusion that inherently negative socialization factors predict child responses and functioning that are also inherently undesirable. Thus, paradoxically, the results of the work over the past decades fall far short of achieving the scientific priorities of novelty and precision outlined by Richters (1997).

To overcome these limitations, the reformulation of emotional security theory (EST-R; Davies & Martin, 2013; 2014) proposes that children's behavior in the context of interparental conflict is organized by the social defense system. According to EST-R, the high costs of intragroup conflict and exclusion throughout human history (e.g., caloric expenditure, risk of debilitating injury or death, group exile) put selective pressure on the development of the social defense system; a behavioral system designed to efficiently identify cues of interpersonal danger (e.g., yelling, dominant posturing) and respond by minimizing the threats (Davies & Sturge-Apple, 2007). Interparental conflict is theorized to increase the salience of the adaptive goal of protection against harm because it contains cues (e.g., anger, hostility) that increase the likelihood of family aggression and commonly signifies deeper interpersonal struggles between adult caregivers who hold disproportionate power in organizing the climate, stability, and resources in the

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Table 2. A synopsis of the hypothesized behavioral function, form, and family antecedents of each of the four SDS patterns of child reactivity to interparental conflict in EST-R

SDS pattern characteristics	Secure	Mobilizing	Dominant	Demobilizing
Function	Only efficiently respond to signs of clear, direct threat	Stay ready to actively managing threat and cultivate social support	Directly defeat threat through coerciveness	Lay low to reduce salience as a target of hostility
Form	• Minimal/mild distress	• Demonstrative distress	• Vigilance to threat	• Restrained fear
	• Empathetic concern	• Appeasing behavior	• Suppression of fear &	• Camouflaging
	• Confidence	• Active involvement & avoidance	distress	• Freezing,
	• Autonomy		• Anger& hostility	• Submissiveness
		• Solicitation of comfort, sympathy, & attention	• Coerciveness	• Subtle disengagement
				• Dysphoria
Family Precursors	*Harmonious*: minimal interparental hostility, family cohesion & parent responsivity; parent emotion socialization	*Enmeshed*: Hostile interparental conflict, coparental discord, conditional parental responsiveness & psychological control family triangulation	*Disengaged*: moderate interparental hostility, vulnerable parent behavior, parental inconsistent discipline, parental indifference	*Chaotic or Detouring*: interparental aggression, parent intolerance of affect expression, frightening parent behavior, parental alliance against child, parent emotion volatility
Developmental Precursors	• Low fearfulness	• High approach	• High approach	• Low approach
	• Soothability	• High negative affect	• High frustration	• Low frustration
	• Planning	• Low positive affect	• Low effortful control	• Low positive affect
	• Working memory	• High activity		• Low activity
	• High effortful control	• Low effortful control		• High effortful control
Developmental Sequelae	• Cooperation	• Anxiety, depression	• Externalizing problems	• Anxiety, depression
	• Social problem-solving	• Externalizing problems	• Callousness	• Social withdrawal
	• Gullibility, naivety	• ADHD	• Extraversion	• Courteous
			• Self-confidence	• Conscientious
		• Social interest		

Note. SDS = social defense system.

family. Although both the social defense and attachment systems share the overarching goal of protection from harm, the frightened and frightening behavior by caregivers during stressful interparental interactions is unlikely to trigger the external goal of the attachment system because the attachment figures are the sources of threat. Rather, EST-R proposes that the frightening and frightened behaviors by caregivers during stressful interactions selectively increase the prioritization of the external goal of defusing the threat in the social defense system. Although Table 2 illustrates that children can enact a several behavioral strategies to defuse threat, the defining behavioral output of the social defense system is elevated vigilance and fear.

Take home message #1: not all types of inherently negative risk factors are the same

Relative to the top-down approach, the EST-R framing of emotional security within the social defense system provides greater precision and novelty. At the level of the predictor, the primacy of angry and aggressive cues as organizers of the social defense system yields the hypothesis that histories of exposure to hostility between parents should be a relatively a more powerful predictor of children's subsequent emotional insecurity in the interparental relationship than other forms of interparental conflict (Davies & Martin, 2013; 2014). Because diminished adult happiness, support, problem-solving, cooperation are far less reliable cues of danger for children in the absence of hostility and anger EST-R hypothesizes that cooperative or "constructive" interparental conflict carries minimal weight in sensitizing the social defense system and children's concerns about emotional security. Conversely, top-down approaches have proposed that low levels of constructive interparental conflict have similar meaning to hostile interparental conflict as "undesirable" generic risk factors in predicting children's emotional insecurity (e.g., Cummings & Schatz, 2012; Goeke-Morey et al., 2003; McCoy et al., 2009). Results from four separate samples using a variety of methods, informants, and designs have supported the added novelty and precision in the EST-R hypotheses (Davies et al., 2012b; 2016a). More specifically, the findings from this work indicated emotional insecurity in the interparental relationship mediated the association between hostile interparental conflict and children's psychological problems over and above the negligible role of uncooperative interparental conflict as a predictor of emotional security pathways. Thus, behavioral systems theory and research on the social defense system adds a new layer of precision and novelty in supporting the notion that not all types of inherently negative forms of interparental conflict are the same in their roles as predictors of children's responses.

Take home message #2: not all types of "negative" child responses are the same

In comparison to the top-down expansion of emotional insecurity to include a variety of positive and negative emotions, parent-child

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relationship qualities, and personality traits (e.g., Cummings et al., 2006; Goeke-Morey et al., 2003; Mann & Gilliom, 2004; Su et al., 2011), the conceptualization of fear and vigilance as defining components of emotional insecurity in the social defense system also translates to the hypothesis that fear is a central source of emotional insecurity and, as a result, a predominant mediator of the association between interparental conflict and child psychopathology (Davies & Martin, 2013; Davies et al., 2016b). Consistent with EST-R, autoregressive structural equation model analyses indicated that children's fearful reactivity was the only consistent mediator in the associations among their exposure to interparental aggression and their internalizing and externalizing symptoms one year later. These pathways were robust with the inclusion of the negligible roles of children's angry and sad forms of reactivity to conflict and trait (i.e., temperament) indices of emotionality as mediators (Davies et al., 2012a). Prior tendencies to expand the assessment of emotional security well beyond its conceptual boundaries may be rooted in the implicit assumption that larger constructs offer greater explanatory strength in models of developmental psychopathology (Davies et al., 2012b). Yet, paradoxically, our findings illustrate that the top-down propensity to aggregate negative or undesirable (e.g., sad and angry reactivity, temperamental affect attributes) into increasingly amorphous, adulterated, and unwieldy constructs obscures the power to identify distinctive developmental pathways. Accordingly, gains in precision and novelty derived from a functional account in the behavioral systems framework underscores that not all inherently negative child responses necessarily mediate children's vulnerability to interparental conflict.

Take home message #3: not all child emotional insecurity is the same

Consistent with tenet that there are multiple strategies to achieve the external goals of each behavioral system, EST-R posits that there are four primary patterns of defending against threat based on their distinct functional utility in regulating children's exposure to family conflict (Davies & Martin, 2013; 2014). As shown in Table 2, each strategy is organized around a constellation of behaviors that defuse the threat of interparental conflict in distinctive ways. For example, the dominant reactivity pattern serves to neutralize social danger by directly defeating threat (i.e., function) through behaviors (i.e., form) that reflect high vigilance to threat and the minimization of vulnerable forms of distress and, in turn, effectively permit angry, domineering, and coercive efforts. In contrast, the demobilizing pattern is designed to defuse threat by laying low (i.e., function) through the expression of camouflaging behaviors that may include restrained fear, submissiveness, reticence, subtle disengagement, and freezing behavior (i.e., form).

EST-R leverages the functional emphasis on how the four behavioral patterns achieve the external goal to formulate more precise and novel hypotheses on how and why children's response profiles to conflict have distinct developmental repercussions. The taxonomy in EST-R proposes that the function underpinning the person-based patterns of reactivity engenders a distinctive portfolio of specific sequelae that contain both developmental liabilities and advantages. For example, children displaying dominant reactivity are proposed to defeat threats of family conflict by minimizing their vulnerable experiences and downplaying the significance of close relationships. Therefore, the proposed long-term cost of adopting this response pattern is heightened risk for developing externalizing symptoms and callousness (Davies & Martin, 2013; 2014). However, in highlighting the novelty of EST-R, repeated experiences of successfully vanquishing threat are also proposed to increase benign functioning in the form of extraversion, agency, and confidence. In contrast, defusing interparental threats through the demobilizing strategy of laying low is posited to increase children's risk for internalizing symptoms and poor social competence by heightening their sensitivity to punishment and reducing their approach motivations. At the same time, EST-R proffers that demobilizing patterns confer developmental advantages in the form of better inhibitory control and cooperation. Although more research is needed to identify the unique risks and potential advantages of adopting the EST-R patterns of children's reactivity to conflict, the emerging research has generated support for its more precise and novel predictions (Davies & Martin, 2013; Davies et al., 2016b). Notably, the functional emphasis on EST-R can be contrasted with the reliance on top-down tests of the old emotional security theory. More specifically, predominant use of variable-based procedures for assessing insecurity by aggregating dimensions of child reactivity into a linear composite of negativity has yet to achieve much more than a long list of negative or "inappropriate" psychological outcomes of children who experience high levels of insecurity. As a result, it does not readily solve the puzzle of why children who exhibit greater insecurity differ substantially from each other in their experiences with for specific types of psychopathology and benign or beneficial sequelae.

The functional approach in the EST-R taxonomy also has the potential to increase pinpoint accuracy in identifying developmental antecedents of each pattern of reactivity. In the domain of children's early emerging attributes, EST-R posits that individual differences in temperamental traits calibrate the social defense system toward the enactment of specific reactivity patterns to conflict (see Table 2). For example, whereas demobilizing patterns are proposed to develop from constitutional dispositions to experience diminished reward responsivity and heightened sensitivity to punishment (Davies & Martin, 2013; Korte et al., 2005; Sih & Bell, 2008), the brash underlying strategy of dominant reactivity is theorized to be rooted in children's temperamental impulsivity and fearless approach tendencies. Consistent with these hypotheses, research has shown that diminished temperamental activity, positive affect, and approach during preschool predicted increases in children's demobilizing reactivity to interparental conflict one year later. In addition, increases in children's dominant reactivity to interparental conflict over the one-year period were predicted by their greater temperamental approach and impulsivity dispositions in preschool (Davies et al., 2016c).

In further contrast to the top-down approach of procuring long lists of inherently negative socialization antecedents of broad "negative" insecurity composites, EST-R further proposes that each reactivity pattern may develop from children's previous histories of exposure to relatively distinct family dynamics (see Table 2). For example, because the mobilizing pattern is theorized to reflect high emotional stakes and entanglement in the interparental relationship, a derivative hypothesis is that children with mobilizing tendencies are relatively more likely to experience enmeshment and diffuse boundaries between family systems. Enmeshment may specifically be reflected in hostile interparental conflict, coparental discord, triangulated family relationships, and parental psychological control (e.g., conditional parent sensitivity). Conversely, because the "lay-low" function underlying demobilizing reactivity is theorized to be a last resort strategy for defusing

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threat, EST-R proposes that it develops in oppressive family contexts that contain high levels of threat and little or no access to family support (Davies & Martin, 2013; Gilbert, 1993). Although empirical tests of these more precise and novel hypotheses are still in the early stages, the initial empirical findings are promising. For example, latent profile analyses have shown that children in the enmeshed family profile experienced subsequent increases in mobilizing reactivity to interparental conflict. Conversely, children in the oppressive, detouring family profile (i.e., parental alliance against the child) exhibited increases in demobilizing reactivity to interparental conflict over time (Davies et al., 2023)

Parenting in developmental contexts: the utility of the caregiving system

Although research on parenting has a rich history of characterizing caregiving using pattern-based approaches (Barber et al., 2005), top-down procedures for conceptualizing and operationalizing parenting practices continue to focus on categorizing parenting into 'positive' and 'negative' bins. Parsing child-rearing practices into 'negative' and 'positive' classifications is commonly based on factor analyses of self-report assessments of parenting that do not clearly define the context or function of child-rearing behaviors. The result is a lack of precision or specificity in identifying the developmental sequelae of parenting behaviors. Thus, we have still not successfully addressed the barriers identified 20 years ago by Collins (2005): "Perhaps most important for future research, the present framework is a timely reminder of the importance of moving beyond global associations toward divergent predictions, thus avoiding the frequent, but only somewhat informative, conclusion that good things go together and bad things go together (p. 140)." Behavioral systems models can address this limitation by more precisely identifying parental socialization goals and the behavioral strategies for achieving those goals within in specific child-rearing contexts (Grusec & Davidov, 2010; Kuczynski, 1984). Through a functional lens, behavioral systems models of caregiving may offer greater clarity on distinctive pathways between caregiving patterns and child psychological adjustment.

As the central behavioral system governing parenting practices, the caregiving system is designed to maximize survival and reproductive success of offspring (Bowlby, 1969; Davies et al., 2016b; George & Solomon, 2008). The behavioral goal of the caregiving system is to alleviate distress and fulfill the developmental needs of dependents. As with other behavioral systems, individuals can access a suite of specific behaviors or strategies for achieving this overarching goal. The first signs of the caregiving system as an organizer of behavior consist of young children's empathetic and sympathetic responses to the distress of others and, over time, pretend play around parenting roles and responsibilities and care of siblings. However, given the multi-faceted complexity of attending to dependent needs, the caregiving system continues to develop well into adulthood through a process of increasing differentiation and integration of multiple caregiving goals. Thus, although early accounts of the caregiving system focused largely on its association with the child attachment system and the shared goal of protection from harm, there is increasing acknowledgement that the caregiving system has multiple functions. For example, the domain model of parenting distinguishes between modules within the caregiving system based on their: (1) distinct evolutionary challenges; (2) behavioral goals; (3) caregiving strategies for achieving the behavioral goal; (4) developmental salience and timing; and (5) distinctive developmental pathways and outcomes of the offspring (Grusec & Davidov, 2010). The resulting five modules include protection, reciprocity, control, guided learning, and group participation. Thus, the domain model of parenting is impressive in its broad scope of addressing multiple parenting goals and functional action tendencies.

Yet, unlike the top-down approach to aggregating multiple caregiving practices and contexts into positive and negative parenting dimensions, the domain model of parenting does not sacrifice depth and precision in achieving breadth. For example, the evolutionary challenge of dependent exposure to biological and social dangers put selective pressure on the development of a caregiving module designed to protect young vulnerable offspring through action tendencies focused on sensitivity and responsiveness to depdendent distress signals. Greater parental responsiveness to distress, in turn, is hypothesized to specifically engender child confidence in protection (e.g., secure attachment) and ultimately reduced egoistic distress and greater empathy and prosocial behavior. By contrast, the behavioral goal of the caregiving reciprocity module is to increase dependent access to basic survival materials by promoting alliances in parent-child dyads and social groups. Caregiver compliance with sensible child requests achieve this goal by increasing children's proclivities to reciprocate cooperation, attunement, and synchrony (i.e., child affiliation system). The distinctive developmental consequences of this module for offspring include greater positive affect, self-confidence, and social skills (Grusec & Davidov, 2010).

Top-down and systems frameworks are also substantially different when it comes to operationalizing parenting in child-rearing contexts. Top-down conceptualizations generally do not prioritize the consideration of the proximal environment and cues in evaluating and assessing parenting practices (Sturge-Apple et al., 2022). As such, the meaning of parenting along broad, amorphous dimensions of sensitivity-insensitivity or positivity-negativity is largely interchangeable across contexts. Because the focus is on the form rather than the function of behavior, assessments of parental negativity or responsiveness can be captured by disengagement, anger, and rejection in virtually any child-rearing context (e.g., play, learning, distress, discipline) and are hypothesized to yield the same long laundry list of respectively negative and positive and dimensions of child functioning. Likewise, because context does not assume conceptual significance in top-down models, the process of selecting informants (e.g., parents, observers) or methods (e.g., surveys, observations) for assessing parenting is primarily a methodological matter. More specifically, it is primarily important in advancing the rigor of the methodological approach (e.g., use of multiple methods), but is not perceived in top-down approaches as substantially affecting the fidelity between the conceptual meaning of the parenting construct and its operationalization.

In contrast, systems approaches require careful consideration of the caregiving contexts because different cues in the environment increase the salience of specific caregiving modules and their distinctive strategies and developmental outcomes. For example, in the framework of the domain model of parenting, individual differences in parental responsivity in the protection module are specifically assessed by parental abilities to accurately identify and tailor responses to children's distress in interaction contexts where the caregiver is not source of child apprehension (e.g., Strange Situation). Conversely, caregiver responsiveness in the reciprocity model consists of the parents cooperating and complying with children's efforts to take the lead in unstructured play contexts.

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Table 3. Observational assessments of three caregiving domains across developmental stages

Caregiving domain	Developmental stage	Observational task	Coding system (sample of subscales)
Control	Early childhood-middle childhood	*Discipline discussion* Parents and children participated in an observational assessment in which parents were tasked with discussing an issue of discipline with their child for six minutes. Parents were permitted to choose any topic they wanted and were asked to discuss the issue a way they normally would at home.	Caregiving Around Discipline System (CADS; Jones-Gordils et al., 2021) • Structuring/Motivation • Discipline scaffolding • Hostility • Democratic • Reasoning
Protection	Middle childhood -adolescence	*Support task* Adolescents wrote down three issues outside of the parent-child relationship that caused them to be upset, stressed, or worried. Mothers and their teens were brought into the room and seated facing one another. Adolescents were asked to share the topic as well as how they feel about it and why. The participants were then asked to discuss this topic.	Caregiving Assessment Scale (CAS; Martin et al., 2017a) • Empathy/Concern • Save Haven • Secure Base • Perspective Taking • Responsivity
Guided Learning	Early childhood	*Grocery task* Parents and children were presented with a three-dimensional grocery store board game and given a shopping list and a small shopping cart. They were then presented with a list of five rules that they needed to follow when grocery shopping.	Grocery Task Coding System (GTCS; Suor et al., 2019; Swerbenski et al., 2023) • Engagement/Maintaining • Planning/Organization • Intrusiveness • Scaffolding • Affect

Thus, in systems frameworks, the proximal socialization context increases the primacy of specific modules as organizers of parenting behaviors and, as a result, is critical to understanding the form and function of parenting in different caregiving modules. In addition, because some experimenter control over the context is critical in precisely characterizing parenting in relation to specific behavioral goals, the top-down procedures of using any number of methods (usually surveys) for assessing "glop" indices of parenting in interchangeable ways is generally not an option in systems frameworks. Rather, observational assessments are often the method of choice for both methodological and conceptual reasons. At a methodological level, carefully crafted observational procedures tend to minimize positive reactivity and response biases relative to self-report measures of parenting (Sturge-Apple et al., 2015). At a more important conceptual level, observations can yield more precise assessments of parenting strategies used to achieve the behavioral goals in specific modules through greater control over the cues presented in proximal parent-child interactional context. Moreover, because parental ways of approaching behaviors are, to a large extent, implicit and automatic, observations are likely to provide a more accurate assessment of the form and function of parenting in the caregiving system than other approaches (e.g., surveys, structured interviews) that require more explicit, deliberate, and conscious recall. Thus, a systems approach to parenting emphasizes the importance of: (a) both function and form of caregiving behaviors, (b) domain-specific methodological approaches, and (c) analysis of domain specialization in children's developmental outcomes.

Our broad conceptual distinctions between systems and top-down approaches may still seem abstract at this point. To further illustrate the value of systems frameworks of caregiving, our lab has developed multiple assessments for more precisely capturing caregiving and their developmental implications at a domain-specific level, including the control (Jones-Gordils, et al., 2021; Li et al., 2022), protection (Jacques et al., 2021), and guided learning (Suor et al., 2019; Swerbenski et al., 2023) domains. As Table 3 shows, the Discipline Discussion Task is designed to activate the control domain in early and middle childhood with the ultimate function of promoting children's internalization of societal and cultural standards of conduct. In turn, parenting practices in the control domain should be the most proximally related children's moral functioning and behavioral regulation. The discipline discussion task requires parents to identify a control-related concern with their child and use explicit and deliberative reasoning to problem solve with their child with the goal of their internalization of family and cultural values and respect for authority. Jones-Gordils et al. (2021) demonstrated that parental structuring of the discussion, scaffolding of children's understanding of the discipline concern, and identification of problem-solving solutions along with expressions of praise and commitment were associated with children's behavioral control within the school setting.

Although the protection domain emerges as a salient caregiving subsystem in infancy and early toddlerhood, it remains a prominent caregiving module throughout childhood and adolescence. During this developmental period, protection consists of providing both safe haven support in alleviating youth distress and secure base provisions for promoting youth confidence and autonomous exploration in the face of challenges (Martin et al., 2017b). To assess these protection dimensions, we used the Support Task in which adolescents discussed a topic or issue outside the parent-child relationship that is source of worry or distress. The observational system for assessing protection focused on how behaviors served specific secure base (e.g., instilling confidence and encouraging adolescents to think and explore the difficult topics autonomously) and safe haven (e.g., expressions of

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empathetic concern, soothing behaviors) functions. In highlighting the value of distinguishing between different dimensions of protection, diminished maternal secure base provisions, but not maternal safe haven support, was uniquely associated with adolescent psychological problems through youth difficulties in secure exploration.

As a final example, we developed the Grocery Task and coding system (Suor et al., 2019) to assess individual differences in parenting approaches to achieving the external goal of assisting children in understanding of the physical world within the guided learning domain in early and middle childhood (Grusec & Davidov, 2010). Mothers were asked to help children in learning the rules of a grocery game that involved shopping for items in aisles of a toy grocery store. Consistent with the goals of the guided learning system, the coding system was designed to assess maternal scaffolding, planning, and organization strategies during the task. We specifically tested the hypothesis that parenting in the guided learning domain would distinctively predict children's executive functions (i.e., cognitive flexibility, working memory, and inhibitory control) over and above parenting in other domains that function to promote cooperative alliances (i.e., caregiving in the reciprocity domain in an unstructured play task) and child compliance with rules to promote group harmony (i.e., caregiving in the control domain in a discipline task). In support of the hypothesis, parenting in the guided learning domain was uniquely and significantly associated with children's executive functions after inclusion of the negligible effects of parenting in the reciprocity and control domains. Taken together, we believe there is clear utility for behavioral systems conceptualizations to inform the study of parenting and child development.

Future directions and implications for other areas of developmental psychopathology

A primary goal of this paper was to systematically document the value of adopting behavioral systems approach for addressing the limitations of top-down approaches in areas of interparental relationships and parenting processes. In this concluding section, we provide a synopsis of how behavioral systems models provide bases for growing points in several other areas in developmental psychopathology.

Conflict in parent-child, sibling, and peer contexts

According to EST-R, children's social defense system is a central organizer of their children's responses to threatening contexts that extend beyond the interparental subsystem to other familial (e.g., parent-child, sibling) and extrafamilial (e.g., peers, friendships) relationships. Threats arising from conflict and competition are prevalent in each of these relationships. For example, conflicts characterized by frequent aggression, bullying, and abuse are so rampant in sibling relationships that mental health professionals have referred to the problem as a "pandemic" or "hidden epidemic" (e.g., Krienert & Walsh, 2011; Lancer, 2020). Likewise, most children in the United States report being a victim of bullying by peers over 6 months spans and virtually all report experiences with peer hostility, relational aggression, and rejection (e.g., Glew et al., 2008). Threats in the form of caregiver anger and dissatisfaction with children are also ubiquitous in parent-child conflicts and commonly result in parental physical aggression toward children (e.g., Straus, 2001). Furthermore, research has shown that exposure to high levels of sibling, parent-child, and peer conflict are risk factors for the development of psychopathology (Bascoe et al., 2012; Spivak, 2016; Weaver Krug et al., 2019).

Despite the developmental significance of conflict and aggression in these relationships, theory and research have yet to systematically identify the distinct ways children respond to these threats and their mechanistic roles in understanding relations between children's developmental (e.g., temperament) and socialization (e.g., family relationship qualities) histories and their psychological adjustment. In fact, research has predominantly relied on 50-year-old concepts from social learning theory to offer post hoc, speculative accounts of children's response processes (e.g., vicarious learning, positive reinforcement) that might mediate links between parent-child, sibling, and peer conflicts and children's functioning (e.g., Buist et al., 2013; Spivak, 2016; Weaver Krug et al., 2019). Translating the EST-R taxonomy of SDS strategies may breathe new life into these areas of inquiry by providing a guide to precisely characterizing the nature, antecedents, and sequelae of children's ways of responding to conflict in these relationships. Consistent with the potential of EST-R, our pilot work has shown that children's enactment of secure, mobilizing, dominant, and demobilizing SDS strategies are common responses in threatening parent-child (i.e., disagreements) and peer (i.e., conflict, competition, rejection) contexts (Davies & Martin, 2013). In advancing beyond this proof-of-concept stage, a central direction for developmental psychopathology should consist of identifying the precursors and mental health consequences of the four SDS strategies.

Friendships and peer relationships

Although we have addressed the value of distinguishing between modules (e.g., caregiving system in parenting) and strategies for achieving goals (e.g., social defense system strategies for defusing threats of interpersonal conflicts) within behavioral systems, these approaches can also facilitate precision and novelty in developmental psychopathology by examining the relative salience and interplay of multiple behavioral systems. For example, during adolescence, friendships can achieve *affiliation system* functions of promoting the formation of cooperative partnerships and attachment system goals of regulating accessing protection, comfort, and support from supportive others (see Table 1 for details). Individual differences in the relative bias toward prioritizing the goal of one of these systems are posited to have important implications for children's psychological adjustment over time (Martin et al., 2017a). For example, a highly salient affiliation system in close friendships relative to other behavioral systems (e.g., attachment) is proposed to be a potent predictor of social competence by motivating youth to capitalize on opportunities for acquiring and refining social skills (Davies & Martin, 2013; Gilbert, 2015). By contrast, prioritizing the attachment system is posited to reduce youth emotional difficulties by orienting them toward accessing and expecting support from close friends in times of distress (Brumariu & Kerns, 2010).

Longitudinal results using narrative techniques for differentiating between affiliation and attachment provisions in adolescent internal representations of their best friendships provided support for these pinpoint predictions. Whereas more elaborated friendship affiliation themes selectively predicted subsequent increases in youth social competence, greater salience of attachment themes were selectively associated with decreases in youth internalizing symptoms over time (Martin et al, 2017a). The level of specificity afforded by the behavioral systems approach in

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developmental psychopathology can be contrasted with the generic top-down conceptualizations of friendship qualities as consisting of inherently positive features or "provisions" (e.g., companionship, closeness, reliable alliance) and negative dimensions (e.g., conflict) that are examined in isolation from each other or in linear, additive composites. Following a consistent theme, the approach yields little more than the unremarkable prediction that negative and positive friendship characteristics should be associated with antecedents, correlates, and sequelae that are respectively negative and positive by axiomatic cultural standards (Erdley & Day, 2017).

Developmental psychopathology cascades

Conceptual and empirical integrations of multiple behavioral systems also provide useful guides for characterizing the unfolding course of children's functioning. EST-R proposes that the enduring salience of attachment and social defense systems as organizers of children's behaviors reflects shifts of resources away from approach-oriented, behavioral systems (e.g., exploration, affiliation, caregiving) toward the prioritization of defense goals (i.e., defusing interpersonal threat, maximizing accessibility to attachment figures) (Davies & Sturge-Apple, 2007). As a result, attachment and social defense systems may lay the foundation for a wide range of psychological difficulties through specific, well-defined mechanisms that are not necessarily interchangeable as generic pathogenic processes. According to EST-R, greater insecurity in the interparental relationship indicative of the prolonged operation of the social defense system is proposed to increase children's risk for: (1) academic difficulties by undermining the operation of the exploratory system and its behavioral output of competency motivation, problem-solving skills, autonomous engagement in learning activities; (2) poor social competence and peer relationships by reducing the salience of the affiliation system and its behavioral manifestations of cooperation, mutuality, and reciprocal altruism; and (3) impairments in prosocial behavior and, ultimately, parenting skills by limiting the significance of the caregiving system and its behavioral products of sympathy, helping behavior, and perspective taking. Although research testing these pathways is in its early stages, findings are promising. For example, longitudinal work has shown that increases in children's insecurity in the interparental relationship were associated with subsequent decreases in their valuation of affiliation in best friendships. The diminished salience of affiliation, in turn, selectively predicted decreases in children's social competence but not their emotional functioning (Davies et al., 2018).

Behavioral systems approaches to life history strategies

As another evolutionary framework informing developmental psychopathology, life history theory in psychology (LHT-P) proposes that variations in exposure to rearing conditions organize human life strategies that reflect differences in how individuals allocate biological and material resources toward key life functions (Figueredo et al., 2015; Nettle & Frankenhuis, 2020). According to LHT-P, threat, deprivation, and unpredictability in socialization contexts calibrate individuals toward a fast-life strategy in which resources are allocated toward accelerated maturation and reproduction over body maintenance and growth functions. In the context of sexual system outlined in Table 1, phenotypical manifestations of this strategy include earlier pubertal onset, precocious sexual activity, and more sexual partners (Ellis et al., 2012; Hartman et al., 2018). However, there are also theoretical and empirical bases for delineating how a larger suite of behaviors may serve the same underlying function of a fast-life strategy. For example, other facets of a fast-life strategy that may increase the likelihood of survival and reproduction in harsh environmental contexts include greater interpersonal exploitation, hostility, preference for immediate reward over long-term investment in larger payoffs, and impulsivity (Del Giudice, 2014; Figueredo et al., 2015).

Although expanding the delineation of fast-life history properties has yielded significant gains in knowledge, it has also resulted in considerable variability across studies in the operational definitions of fast-life strategies. To address this limitation, the behavioral systems model outlined in Table 1 may provide an organizing framework for achieving greater depth and consistency in characterizing fast-life strategies and precision in tracing the developmental progression of offspring functioning. For example, consistent with the Friendship and Peer Relationships section, the behavioral systems model may be useful in more systematically plotting how a fast-life strategy might reflect the prioritization of some systems and their external goals (e.g., sexual, dominant, and social defense systems) over others (e.g., attachment, exploration, affiliation). In accord with the interparental and parenting sections, future research may benefit from examining how individual differences in fast-life strategies within a behavioral system (e.g., dominant reactivity to family threats in the social defense system) may alter strategies for attaining external goals in other behavioral systems (e.g., fast reproductive profile in the sexual system, manipulative interpersonal style in the affiliation system). Finally, a new level of novelty might be achieved by testing whether the prolonged operation of one system (e.g., attachment or social defense system) might confer both developmental costs and benefits in other behavioral systems (e.g., exploratory system) (Ellis et al., 2022). For example, as a manifestation of the prolonged operation of attachment and social defense systems, children's antagonistic internal representations of their family relationships were associated with unique tradeoffs in exploratory system functioning characterized by poorer performance on explicit, higher-order cognitive tasks and better proficiency in detecting reward probabilities in an implicit learning task (Davies et al., 2022).

Conclusions

In closing, we believe that many developmental psychopathologists are experiencing identity crises. Although we are trained to study behavior, we are commonly distracted by other methods of assessment in our aim of advancing a multiple-levels-of-analysis understanding of developmental psychopathology. In discussing the implications of this trend for neuroscience, Niv (2021) concluded that "purely behavioral research is essential for understanding the brain . . . contrary to the opinion of prominent funding bodies and some scientific journals, who erroneously place neural data on a pedestal and consider behavior to be subsidiary (p. 601)." History has only repeated itself across other domains of study over the last several decades, as we continue to be lured away from the careful study of behavior by the latest technological advances. As a result, we are continually enamored with the ceaseless parade of "breakthrough" tools for assessing cardiovascular reactivity to stress (e.g., respiratory sinus arrythmia, pre-ejection period), urinary and salivary markers of stress hormones (e.g., cortisol) and catecholamines (e.g., norepinephrine),

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molecular genetics, epigenetics, immune and health biomarkers, sleep (e.g., actigraphy), and brain functioning (e.g., fMRI, EEG, fNIRS). Unfortunately, the revolving door of great excitement and fanfare ushered in by each new technological advance is generally followed by scientific bewilderment and disappointment when it becomes evident that the knowledge gained was not commensurate with the high expense, attention, and expectations afforded it.

Despite the disappointment, we do not adequately consider the causes of the failures because moving on to the next "cutting-edge" assessment of constructs that are peripheral to behavior is perceived as a necessary sacrifice for advancing scientific innovation in federal funding initiatives and top journal outlets. Paradoxically, we contend that a central cause of many of these failures or challenges is not with the latest breakthroughs in neurocognitive, neurobiological, psychophysiological, immunological, biomarker, or genetic assessments. Rather, it is a consequence of our myopic focus on the technology to the relative neglect of carefully studying behavior. Behavior is a central part of multiple-levels-of-analysis frameworks in developmental psychopathology. Yet, despite the optimistic designation of the first years of this century as the "Decade of Behavior" by American Psychological Association, the actual study of behavior has decreased markedly across numerous areas of psychology (e.g., Berkman & Lieberman, 2011; Doliński, 2018). If we do not devote more effort in precisely carving behavior at its natural joints, we will continue to face significant problems in understanding its interplay with ecological, family, neurobiological, and genetic factors. Therefore, efforts to advance developmental psychopathology will require much greater attention to conceptualizing and operationalizing behavior.

Vague lip service to the importance of "deep phenotyping" and methodologically rigorous assessments will not resolve this issue. At the most fundamental conceptual core, our reliance on top-down approaches will remain a serious obstacle to advancing central scientific priorities of novelty and precision in developmental psychopathology unless there is a paradigm shift (Richters, 1997). Identifying psychological constructs based on form or morphology rather than function has resulted in a proliferation of generic risk and protection models in developmental psychopathology. Guided by behavioral systems approaches rooted in evolutionary theory, our goal was to document how focusing on the function of patterns of behavior in well-defined developmental contexts can yield more precise and novel insights into the pathways between children's histories of developmental experiences and their psychological sequelae. Greater care in defining contexts for understanding the salience of strategies or modules within behavioral systems and the interplay between multiple systems will likely yield significant returns in precision in understanding the nature, precursors, and sequelae of children's response patterns to environmental threats, challenges, and opportunities. Gains in novelty are also evident in the focus on identifying both the developmental costs, conditional benefits, and broader proficiencies that are associated with the enactment of what may be considered risky or inappropriate response patterns in top-down models of developmental psychopathology. Although we chose to focus on evolutionary-developmental accounts in our illustration of the barriers and solutions to advancing developmental psychopathology, developmentalists also have several alternative options for shifting away from an overreliance on top-down models, including family systems and relational models that integrate both form and function (e.g., enmeshment, disengagement, detouring) in characterizing family and interpersonal processes (e.g., Bascoe et al., 2012; Coe et al., 2020; Davies et al., 2023; Thompson et al., 2022). We are hopeful that this growing suite of different conceptual and methodological tools facilitates a new generation of work in developmental psychopathology.

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