Developmental Review 51 (2019) 109–122

Contents lists available at ScienceDirect

Developmental Review

journal homepage: www.elsevier.com/locate/dr

The neglect–enrichment continuum: Characterizing variation in early caregiving environments

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ARTICLE INFO

Keywords:
Neglect
Deprivation
Parenting
Caregiving
Development

ABSTRACT

The nature and consequences of threat in the caregiving environment have been widely studied and discussed. The construct of psychosocial neglect, however, has received less attention. In this paper, we advance a novel framework for examining the nature and consequences of neglect, which we posit can be represented as variations along a continuum from severe psychosocial neglect to environmental enrichment. Recognizing that caregiving is multi-dimensional, we conceptualize enriching input from caregivers as falling along two dimensions. Specifically, we propose that caregivers vary in their provision of *emotional* and *cognitive* input, and that the effects of this input on child development are moderated by caregiver sensitivity. Further, we present preliminary data indicating that emotional and cognitive input are separable. Conceptualizing the caregiving environment along these two dimensions advances the field in terms of (1) characterizing variation in early life experience; (2) understanding predictors of child developmental outcomes; and (3) identifying optimal targets for interventions to improve the well-being of children.

Introduction

What do young children need to flourish, beyond instrumental care (e.g., food, water, shelter), and what are the consequences when these needs are unmet? Although researchers and the scientific media often cite "high-quality caregiving" as essential for healthy development, it is not clear precisely how we should define and best measure this construct. Global assessments of caregiving fail to account for its multi-dimensional nature; moreover, they equate distinct aspects of caregiver input that are likely to have unique antecedents and consequences (we discuss other writings on domains of caregiving below [Bernard, Meade, & Dozier, 2014; Grusec & Davidov, 2010; Leerkes, Weaver, & O'Brien, 2012]). These limitations have hindered both our understanding of the predictors of children's developmental outcomes and our ability to identify optimal targets for caregiving intervention.

In the context of childhood adversity, researchers have recognized the need to move beyond global assessments of caregiving to distinguish between the presence of threatening caregiving (e.g., abuse) and the deprivation of caregiver input (e.g., neglect; Belsky, Schlomer, & Ellis, 2012; Humphreys & Zeanah, 2015; Sheridan & McLaughlin, 2014). Indeed, the nature and consequences of threat in the caregiving environment have been widely studied and discussed (Gershoff, 2013; Mclaughlin & Lambert, 2017; Moffitt, 2013; Osofsky, 1995). The construct of neglect, however, has received less attention. In fact, experts in childhood maltreatment indicated that the field is characterized by a "neglect of neglect" (Stoltenborgh, Bakermans-Kranenburg, & Van Ijzendoorn, 2013). To date,

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https://doi.org/10.1016/j.dr.2019.01.001
Received 13 May 2018; Received in revised form 12 December 2018

most of our knowledge of the effects of neglect on child development has come from studies of children reared in the species-atypical setting of orphanages. One challenge for the study of neglect in the context of family-based care is defining and assessing the *absence* of something; perhaps not surprisingly, there is no agreed-upon definition of neglect (see Humphreys, King, & Gotlib, 2018).

Neglect can be characterized by the type of input that the child is lacking. *Physical* neglect, or the deprivation of the basic requirements for human survival, often accompanies *psychosocial* neglect; however, children may be deprived of adequate psychosocial stimulation despite instrumental care needs being met. The study of psychosocial neglect is an especially pressing area for future research. Unlike physical neglect, in which there is a failure to meet a clear threshold of care (e.g., the child does not go hungry), the necessary amount and quality of psychosocial enrichment for healthy development is less clear. Further, there is evidence that experiences of neglect in physical and psychosocial domains are independently associated with child outcomes (Doom et al., 2014). In contrast to physical neglect, psychosocial neglect may be especially insidious because it has less obvious physical consequences and, therefore, may go undetected. Indeed, this form of neglect has been described as "covert" (Allen & Wasserman, 1985), and statistics concerning the prevalence of neglect reported to child protective services are likely significant underestimates of its true burden.

The goal of this paper is to advance a framework for examining the nature and consequences of psychosocial neglect, which we posit can be represented as variations along a continuum from severely neglectful to highly enriched environments. Recognizing that caregiving is multi-dimensional, we conceptualize enriching input from caregivers as falling along two dimensions. Specifically, we propose that caregivers vary in their ability to provide *emotional* and *cognitive* input, and that caregiver sensitivity moderates the effects of variation along these two dimensions. We argue that conceptualizing the caregiving environment along these dimensions provides an important lens for (1) characterizing variation in early life experience; (2) understanding predictors of child developmental outcomes; and (3) identifying optimal targets for caregiving intervention to improve the well-being of children.

Orphanage-Rearing

Orphanage (i.e., institutional) rearing is not a species-typical experience. Although children in institutions generally receive adequate instrumental care, their environments may be characterized by severe psychosocial deprivation in the form of isolation, regimentation, and high child-to-caregiver ratios (i.e., the lack of individualized emotional and cognitive input) (Zeanah, Smyke, & Settles, 2006). In the landmark Bucharest Early Intervention Project (BEIP), researchers conducted a randomized controlled trial of foster care as an alternative to institutional care, allowing causal conclusions to be drawn about the effects of family placement on the outcomes of institutionalized children (Nelson, Fox, & Zeanah, 2014; Zeanah et al., 2003). Specifically, institutionalized young children from all six institutions in Bucharest, Romania were randomly assigned to either high-quality foster care (i.e., foster families who received training and clinician support) or care as usual (often remaining in institutional care for a prolonged period). The importance of individualized psychosocial input for young offspring input was not always obvious. Indeed, at the time that the BEIP was initiated, it was an open question in Romania whether the state or the family was better equipped to care for children (Nelson et al., 2014).

The BEIP provided causal evidence regarding the role of caregiving environments in child outcomes, yielding insights concerning the positive impact of family-based care on both socioemotional and cognitive functioning. For example, compared to children who remained in institutions, children who were randomized to foster care had more secure attachments with their caregivers (Smyke, Zeanah, Fox, Nelson, & Guthrie, 2010), lower levels of psychopathology (Humphreys et al., 2015; Zeanah et al., 2009), and better cognitive functioning at preschool age, childhood, and early adolescence (Almas, Degnan, Nelson, Zeanah, & Fox, 2016; Fox, Almas, Degnan, Nelson, & Zeanah, 2011; Nelson et al., 2007). Further, by early adolescence, children in the foster care group were more likely than were children in the care-as-usual condition to exhibit a broad pattern of adaptive functioning, assessed with a composite of family and peer relations, risk-taking behavior and substance use, mental and physical health, and academic performance (Humphreys, Miron et al., 2018). The BEIP provided evidence that simply meeting the instrumental care needs of children is not sufficient for healthy development—adaptive functioning is significantly influenced by exposure to psychosocial enrichment.

Neglect as a continuum

Although neglect has been described as species atypical (McLaughlin, Sheridan, & Nelson, 2017), this characterization may be limited to neglect in the form of orphanage-rearing. In family-based care, experiences of deprivation are alarmingly common. In the U.S., neglect accounts for approximately 75% of all cases of maltreatment identified by child protective services, or approximately 500,000 children annually (U.S. Department of Health & Human Services, 2018). Among children with validated cases of neglect, the severity and form of their experiences vary due to differences in chronicity and intensity. Further, many children whose experiences would not be formally classified as neglect experience less severe forms of psychosocial deprivation. For example, some infants and young children may be left alone watching television for hours at a time. Although this experience would not be grounds for the involvement of child protective services, child exposure to television is associated with fewer linguistic interactions with caregivers (Christakis et al., 2009) and, when prolonged, may be a common form of cognitive neglect.

Recognizing that variations in neglect occur along a continuum from severe deprivation to enrichment stands in contrast to studies of children in institutional care and of youth involved in child protective services, in which differences in early environmental input are typically treated as binary (i.e., neglected vs. not neglected). By failing to assess the continuous nature of psychosocial input, the "extreme-groups" approach taken in these studies is unlikely to capture the predictive relation between less dramatic but potentially significant improvements in the environment and changes in child development. In addition to the well-known

cumulative risk approach (Evans, Li, & Whipple, 2013), which considers the frequency or chronicity of exposure, researchers are beginning to conceptualize adversity based on both type and severity of exposure (e.g., McLaughlin, 2016; Zeanah & Sonuga-Barke, 2016). In the case of psychosocial deprivation, because severely neglected children are broadly deprived of *both* emotional and cognitive input from caregivers, investigators have been unable to determine whether both psychosocial elements are critical for achieving healthy development, or whether specific child competencies depend selectively on cognitive or emotional input.

Dimensions of the neglect–enrichment continuum

We propose here that children require both emotional and cognitive input from their caregivers for healthy development. Whereas emotional input is defined by the *affective information the caregiver provides to the child*, cognitive input is defined by the *stimulation the caregiver provides to the child.* Caregivers may provide emotional and cognitive input both when their children are emotionally aroused and when their children are affectively neutral; further, these inputs may manifest during reciprocal interaction or be passively received. Caregiver behaviors communicating affective information may include facial expression, physical touch, laughter, crying, and tone of voice. Behaviors providing stimulation include child-directed speech, visual stimulation, reading, and teaching. We posit here that emotional and cognitive input occur along a continuum ranging from deprivation to enrichment.

We theorize that the effects of the quantity of caregiver input for both emotional and cognitive dimensions are moderated by its quality. Specifically, the degree to which emotional or cognitive input involves caregiver *sensitivity* influences its impact on child outcomes; thus, more input is not always better. Our definition of sensitivity aligns with Ainsworth and colleague's conceptualization of the caregiver's ability to *notice the child's cues, accurately interpret the meaning of these cues, and implement an appropriate response to these cues* (Ainsworth, Blehar, Waters, & Wall, 1978). Thus, the defining characteristic of sensitivity is that it is child-centered: sensitive behaviors are those that are attuned to the child's signals rather than based on the adult's desires. Although researchers have studied extensively the positive influence of caregiver sensitivity on child functioning (Belsky, Pasco Fearon, & Bell, 2007; Jaekel, Pluess, Belsky, & Wolke, 2015; Kok et al., 2013; Wolff & van IJzendoorn, 1997), scientists have rarely considered the dimension (i.e., emotional or cognitive) in which sensitivity occurs. Certainly, when neglect is severe and pervasive, any increase in the quantity of non-threatening caregiver input is desirable. We posit, however, that children experience the most improved developmental outcomes when emotional and/or cognitive input is delivered with sensitivity.

In Fig. 1, we present a three-dimensional model of the relations among emotional input, cognitive input, and caregiver sensitivity, with hypothetical continuous data. We hypothesize that caregiver sensitivity is typically consistent; nevertheless, some caregivers may express different levels of sensitivity along emotional and cognitive dimensions, perhaps due to specific experiences of caregiving in their families of origin (Powell, Cooper, Hoffman, & Marvin, 2013). Given that factors such as socioeconomic status, parental stress, and parental psychopathology are likely to affect both emotional and cognitive input as well as sensitivity (Hart & Risley, 2003; Lovejoy, Graczyk, O'Hare, & Neuman, 2000; Pereira et al., 2012), we have simulated moderate correlations among these variables.

Pervasive and severe neglect involves low levels of both emotional and cognitive input. This is the experience of children in most institutions, where child-to-caregiver ratios are too high to support the provision of sufficient amounts of input tailored to the individual child. This may also be the experience of children of caregivers with severe or chronic substance use or other forms of severe mental illness, which, if untreated, can render the caregiver psychosocially absent (Chaffin, Kelleher, & Hollenberg, 1996). Conversely, environmental enrichment involves high levels of both emotional and cognitive input, delivered with high sensitivity. This is the experience of children with consistently available caregivers who flexibly tune their emotional responses to their child's unfolding signals and provide developmentally appropriate and child-centered cognitive stimulation.

In addition to these two archetypical examples, there are other possible combinations of emotional input, cognitive input and sensitivity. Not only may some children experience higher levels of one type of input and lower levels of the other, but *children may experience high levels of emotional and/or cognitive input in the absence of caregiver sensitivity*. In Table 1, we describe the presence of emotional and cognitive input at low and high levels of sensitivity, and provide illustrations of each. Examples of emotional and

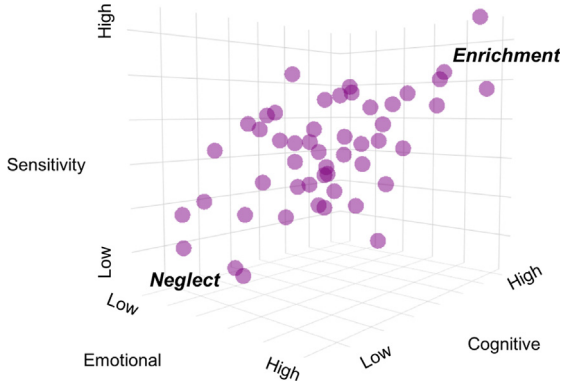

Fig. 1. Hypothetical data for the relations among sensitivity, emotional input, and cognitive input.

Table 1
Definitions and example markers of emotional and cognitive input at low and high levels of sensitivity.

Dimension	Low Sensitivity	High Sensitivity
Emotional	Undifferentiated expressions of affect or affection that are adult-centered and inappropriate to the child's state *smiling/laughter when the child expresses negativity, excitement when the child cues calmness, persistent touch when the child signals disengagement or autonomy*	Contingent expressions of affect, affection, or empathy that are child-centered and attuned to the child's signals *mutual positive affect, acknowledging the child's distress, touch when the child's signals engagement, tuning arousal level to the child's state*
Cognitive	Linguistic stimulation and play interactions that are adult-centered and unconnected or inappropriate to the child's cues and/or developmental level *rapid/constant speech without turn-taking, insisting the child attempt a challenging task or play with a toy despite child cues for disinterest, taking over the child's activities instead of allowing the child to lead*	Linguistic stimulation and play interactions that are synchronous with the child's signals and appropriate to the child's developmental level *narrating the child's experience and allowing the child a "turn" to vocalize, following the child's lead when exploring the environment, scaffolding the child's efforts during challenging tasks*

Note. Definition. *Illustrative examples*.

cognitive input at low and high levels of sensitivity will be familiar to scientists and practitioners who have conducted observational assessments of caregiver–child interactions. One class of emotional input involves expressions of positive affect (often referred to as "warmth"; e.g., smiles, laughter, and affectionate touch). While positive emotional input is an important element of the caregiver–child relationship and predicts more positive child outcomes (Eisenberg et al., 2005; Wright, Hill, Sharp, & Pickles, 2018), warm behaviors are not always sensitive. For example, laughter in response to child distress or persistent affectionate touch in response to a child's bid for disengagement are not child-centered. Indeed, Lohaus, Keller, Ball, Elben, and Voelker (2001) found that observational ratings of caregivers' warm responses to positive infant signals were associated with ratings of caregiver sensitivity, and that, in contrast, maternal smiling and "baby talk" during infant distress were unrelated to sensitivity. Similarly, Feldman, Singer, and Zagoory (2010) found that whereas affectionate touch when mothers and infants are gazing at each other was associated with greater infant vagal tone during play, asynchronous touch (touching the infant despite gaze aversion) was related to both lower infant vagal tone during play and greater infant cortisol reactivity to a subsequent stressor.

A fundamental marker of cognitive input is talk. Although the resource of speech (signed or spoken) is somewhat bounded by caregiver education, vocabulary, and time, unlike other sources of cognitive enrichment (e.g., toys, books, and museums) it is principally free and accessible. Nonetheless, there is a well-known gap related to socioeconomic status in the amount of speech to which children are exposed (Hart & Risley, 2003), and even among low-income families there is substantial variability in how much caregivers talk to their children (Weisleder & Fernald, 2013). The focus on increasing the *quantity* of speech that caregivers provide, a goal of programs such as Bloomberg Philanthropy's Providence Talks (https://mayorschallenge.bloomberg.org/ideas/providence-talks/), may not necessarily address the importance of the *quality* of this speech. Although child-directed speech, as opposed to overheard speech, appears specifically to be important for children's language development (Weisleder & Fernald, 2013), it is not clear that more speech, even when child-directed, is always better. For example, the *fluency and connectedness* of mothers' speech during interactions with their two-year-old children explained substantially more of the variance in children's expressive vocabulary one year later than did the *amount* of mothers' speech during the interactions (Hirsh-Pasek et al., 2015). Insensitive speech is speech that is inappropriate to the child's developmental level (e.g., pacing that is too fast or slow), that is directed to the child but unconnected to the child's signals for engagement or current interests, or that is intrusive (i.e., constant and does not allow the child a "turn"). We hypothesize that as child-directed speech is increasingly insensitive, its association with positive language outcomes is diminished.

Domain-specific approaches to caregiving

Our proposed multi-dimensional approach to characterizing variation in caregiving environments complements previous work in which researchers have provided taxonomies of caregiving by differentiating the contexts in which parent–child interactions occur. Grusec and Davidov (2010) applied socialization theory to parent–child relationships to develop a domain-specific approach in which interactions within the five domains of *protection, reciprocity, control, guided learning,* and *group participation* mediate distinct socialization processes in children. These researchers theorized that child socialization processes require domain-specific parental behaviors. Whereas in the domain of *protection* parents must soothe children's distress, in the domain of *guided learning* parents must match their teaching to children's developmental stage. We contend that characterizing the dimensions of emotional and cognitive caregiver input provides a broader perspective: emotional and cognitive input operate across multiple domains of parent–child interaction. Whereas *protection* and *guided learning* are domains in which we expect the amount and quality of emotional and cognitive input, respectively, to be most critical, other domains may require both types of input. For example, interacting as equal-status partners in the domain of *reciprocity* involves both emotional and cognitive mutuality.

Previous research (Bernard, Meade, & Dozier, 2014; Davidov & Grusec, 2006; Leerkes, Blankson, & O'Brien, 2009; Leerkes et al., 2012) has differentiated types of caregiving based on the context of the child's emotional state (i.e., distress versus child non-distress). Different characteristics of caregivers may influence their capacity to provide input that is sufficient in quality and amount during distress versus non-distress situations (Leerkes, 2011b); further, deprivation or enrichment in each of these situations may lead to specific child outcomes. Indeed, whereas caregiver responses during distress have been associated with children's regulation of

negative affect (Davidov & Grusec, 2006) and attachment security (Leerkes, 2011a), caregiver responses during non-distress have been associated with regulation of positive affect and peer acceptance (Davidov & Grusec, 2006). Once again, we posit that our proposed multi-dimensional approach complements this research by broadly defining variation in the amount and quality of emotional and cognitive input, which are dimensions that researchers may assess across child emotional states.

Although parents are likely to respond with emotional input in the context of child distress, they may also respond with cognitive input. Indeed, parent-initiated distraction through cognitive stimulation is one method parents use to regulate their children's negative affect (Spinrad, Stifter, Donelan-McCall, & Turner, 2004). Further, when children are not distressed, responses involve both emotional and cognitive input. Leerkes et al. (2012) defined "sensitivity to non-distress" as the quality of caregiver responses to infant cues that are emotionally neutral or positive. Davidov and Grusec (2006) identified caregiver *warmth*, or "manifestations of fondness and enjoyment in the child" (p. 44), as the behavior of interest during non-distress, whereas Bernard et al. (2014) focused on *synchrony* during non-distress or "following the child's lead in interactions… in ways that maintain the child's perspective and goals" (p. 6). Warmth is one type of emotional input, whereas synchrony can involve either emotional or cognitive input. Therefore, caregiving behavior during child non-distress may shift fluidly between different forms of input.

Distinct caregiving processes

We theorize that the two dimensions of the neglect–enrichment continuum involve largely distinct caregiving processes. Specifically, we posit that whereas the ability to provide *emotional* input depends on caregivers' own emotion regulation and empathic concern toward their children, the ability to provide *cognitive* input depends on caregivers' ability to engage in perspective-taking concerning their children's thoughts, knowledge, and interests. Although these processes may influence each other and, thereby, produce cross-dimension effects, we hypothesize that each explains a larger amount of within-dimension variance in both the amount and the sensitivity of input.

If emotional and cognitive input involve distinct caregiving processes and there are individual differences in these processes, some children will experience emotionally enriched but relatively cognitively deprived environments, whereas other children will experience cognitive enrichment but deprivation of emotional input. For example, caregivers with histories of trauma may struggle to provide emotional input when their children are distressed but succeed in delivering cognitive input during non-distress interactions. Further, caregivers who prioritize school readiness may provide appropriate input in emotional contexts but intrusive cognitive input in language and numeracy learning activities. Knowledge about the developmental needs and capacities of young children may also affect the amount and quality of input. For example, caregivers who underestimate children's capacity to learn from language may be less likely to engage in child-directed speech (Rowe, 2008). Similarly, caregivers who overestimate a child's self-regulatory ability may be less likely to provide soothing emotional input (e.g., sensitive touch). Assessing individual differences in parents' knowledge of child development (e.g., Knowledge of Infant Development Inventory; MacPhee, 1981) and in their expectations concerning children's needs and capacities may elucidate how parents diverge, and the implication of intra- and inter-individual differences in the amount and quality of the input they provide.

We propose that adaptive emotion regulation among caregivers supports the provision of appropriate emotional input by increasing the emotional availability of caregivers and their ability to tune the arousal and valence of emotional input to the child's state. From a functionalist perspective on emotion (Levenson, 1999; Porges, 2007), when caregivers are emotionally dysregulated, particularly in response to their own children's cues, their caregiving behaviors may become disorganized, resulting in the absence of emotional input (i.e., detachment/withdrawal) and/or the presence of *insensitive* emotional input (i.e., intrusions; Del Vecchio, Walter, & O'Leary, 2009). Pregnant women who responded more negatively to videos of crying infants demonstrated reduced sensitivity postnatally to their own infants' distress (Leerkes, 2011b). In a different study, expectant mothers with insecure attachment styles reported more aversive responses to videos of crying infants than did expectant mothers with secure attachments; further, among mothers with insecure attachments, greater physiological reactivity to these videos predicted lower scores on a composite measure of the amount and quality of maternal emotional responses to their 9-month-old infants' distress (Ablow, Marks, Shirley Feldman, & Huffman, 2013). Importantly, psychiatric disorders that are characterized by pervasive emotion dysregulation, such as depression, have been associated with reduced empathic understanding of children (Coyne, Low, Miller, Seifer, & Dickstein, 2007). Further, the tendency of mothers with higher levels of depressive symptoms to be self-focused in describing their children has been associated with reduced affection and enthusiasm in caregiving interactions (Humphreys, King, Choi, & Gotlib, 2018).

We propose that caregivers' ability to engage in perspective-taking concerning their children's thoughts, knowledge, and interests facilitates the provision of appropriate cognitive input by promoting child-directed speech, conversational turn-taking, and synchronous play. This type of perspective-taking or "mind-mindedness" (Meins, 1997) is often assessed by identifying the extent to which caregivers make specific comments about their children's mental states during interactions (Meins, Fernyhough, Fradley, & Tuckey, 2001), attribute meaning to their infants' vocalizations (Meins, 1998), and generate mentalistic descriptions of their preschool-age children (Meins, Fernyhough, Russell, & Clark-Carter, 1998). We posit that, by viewing the child as more than "an entity with needs that must be satisfied" (Meins et al., 2003, p. 1194), mind-minded caregivers interact with their children as co-thinkers who benefit from and respond to cognitive stimulation. Although researchers have not yet examined relations between mind-mindedness and broader measures of cognitive input, mind-mindedness has been associated prospectively with children's cognitive development, particularly with the development of theory of mind, which is mediated in part by the positive association between mind-mindedness and children's receptive vocabulary (Meins, Fernyhough, Arnott, & Leekam, 2013). Recently, mind-mindedness at one year of age was found to be associated with subsequent cognitive school readiness in kindergarten, and was mediated by children's expressive vocabulary at age two years and effortful control at ages three and four years (Bernier, Mcmahon, & Perrier, 2017).

Caregiving as a transactional process

The association between the caregiving environment and child functioning may not be unidirectional. A large body of research indicates that an adverse caregiving environment is associated with problems in child behavior, and evidence from randomized interventions reviewed above indicates these associations cannot be explained solely by the heritability of problematic behavior or by individual differences in how difficult children are to parent. Nonetheless, children's temperaments, or their dispositional tendencies to be reactive, emotional, and self-regulatory (Shiner et al., 2012), may influence both the care they receive and the care they require for healthy development. Temperament is moderately stable early in life, and is shaped by both biological and environmental factors (Shiner et al., 2012).

The association between caregiving behavior and child temperament may be bidirectional (Kiff, Lengua, & Zalewski, 2011). Specifically, children's behaviors may elicit certain responses from their caregivers, which in turn may increase children's tendencies to behave in certain ways. In the context of neglect, this dynamic may create a vicious cycle of deprivation. Children of neglectful parents may exhibit delays in development due to insufficient input, which may then hinder their ability to elicit the care that they need. For example, Lawler, Koss, and Gunnar (2017) found that young children who received poorer care prior to adoption also received less responsive care from their adoptive parents; similarly, children who evidenced more growth stunting, indicating neglectful pre-adoptive care, had adoptive parents who were less successful at structuring their environments and setting appropriate limits. These researchers, however, identified a unidirectional association between the quality of post-adoptive caregiving and later regulation difficulties. Indeed, not all pathways between parent and child behavior appear to be bidirectional (Klein et al., 2016).

Individual differences in children's temperament may also be associated with sensitivity to both positive and negative experiences. The theories of "biological sensitivity to context" and "differential susceptibility" (Ellis, Boyce, Belsky, Bakermans-Kranenburg, & van Ijzendoorn, 2011) posit that children with greater neurobiological susceptibility (i.e., heightened reactivity of the nervous system) are more likely to evidence prolonged developmental change in response to environmental input. From this perspective, those children who are most likely to suffer the negative consequences of emotional or cognitive neglect are also those most likely to benefit from increases in the quality and quantity of input. Given that separate neurobiological systems may support receptivity to emotional versus cognitive input (Avants et al., 2015; Rao et al., 2010), it is possible that some children are especially sensitive to one dimension of caregiver input but not the other. This postulation, if supported, would have important implications for tailoring interventions to individual families. The first step in investigating differential vulnerabilities to the early environment is nuanced measurement of caregiver input.

Sociocultural context

Although our proposed approach to characterizing neglect and enrichment in caregiving environments focuses on parent–child interactions, it is important to note that these interactions are influenced by the situation in which they take place. In his ecological model of human development, Bronfenbrenner (1979) proposed that development occurs through reciprocal interactions between children and their environments. In this model, parent–child interactions are a "proximal process" taking place in the child's immediate environment or "microsystem," which is nested within increasingly broader meso- and macrosystems. Incorporating this perspective, Markus and Hamedani (2019) described the role of the "sociocultural context" in human psychology, which may be determined by one's nation, neighborhood, race, ethnicity, religion, gender, socioeconomic status, and generation. The "culture cycle" is defined by the dynamic and interacting ideas, institutions, and interactions that influence individual psychology (Markus & Kitayama, 2010). Using this framework, cultural ideas about children (e.g., infants are too young to benefit from linguistic stimulation), national policies concerning families (e.g., maternity and paternity leave), and interactions concerning gender roles (e.g., messaging that women are the primary caregivers), likely interact to influence patterns of caregiving, including both the amount and quality of emotional and cognitive input.

Unfortunately, most psychological research has focused on what Henrich, Heine, and Norenzayan (2010) termed Western, Educated, Industrialized, Rich, and Democratic (WEIRD) societies, limiting our understanding of how the sociocultural context influences the caregiving environment. In fact, Henrich and colleagues contend that WEIRD samples represent outliers in terms of global humanity. An important criticism of existing psychological research on caregiving is that its guiding theories (e.g., attachment theory; Bowlby, 1969) were developed by Western scientists and have catalyzed research from a Western perspective. A prominent difference between many North American/Western European families and families in other societies concerns the prioritization of the relationship between the child and a primary caregiver, usually the mother (van Ijzendoorn, Sagi, & Lambermon, 1992). Globally, most children are cared for by multiple people (e.g., grandparents, siblings, other community members), a style of caregiving termed *alloparenting*. Keller (2016) contends that although all children need to form a sense of safety and trust in their relationships, the attachment bond need not be limited to one or two adults, but rather, may be "embodied in a relational network" (p. 61). Given the limitations of current methods for assessing attachment in cultures characterized by alloparenting, this formulation has yet to be tested formally.

We believe that our proposed approach to characterizing variation in caregiving environments may be appropriate for applications across sociocultural contexts, with the recognition that measurement techniques must be adapted. Like Keller (2016), we suggest that although all children require sufficient emotional and cognitive input from their caregivers for healthy development, this input need not come primarily from one's mother or father. In societies in which children receive input from many different caregivers, measurements must be distributed across this network. A better understanding of how caregiving functions in non-industrialized and/or in non-Western societies may illuminate within-culture variation and encourage research in under-investigated

areas, such as fathers' behaviors and the stimulation provided by siblings. We note that privileging the mother–child relationship over others may not yield the highest-quality environment or the best outcomes for children, especially in the presence of other risk factors (Baydar et al., 2014).

While diversity in children's experiences does not necessarily translate into "better" or "poorer" environments, there are some clear cases in which variation in human experience can be harmful. For children who are experiencing severe deprivation, in which basic needs (e.g., sufficient food and water, clothing to warm and protect the body) are not met, caregivers must prioritize survival over behaviors that promote thriving. For example, if a child is struggling to gain sufficient calories, sensitive cognitive input is not the first priority of caregivers. Children in poverty are particularly vulnerable to experiencing deficits in input, given that they are more likely to experience stress and trauma, to live in neighborhoods with poorer quality air and water, and to have reduced access to resources of all types (e.g., support services, books, toys, high-quality child care; Duncan, Magnuson, & Votruba-Drzal, 2017; Evans, 2004). Indeed, the line between family poverty and neglect can be blurred, with potentially devastating consequences for socio-economically disenfranchised groups (e.g., family separation due to a working parent's inability to afford proper supervision for a young child). Adverse experiences associated with poverty are posited to create a developmental cascade that impairs children's future adaptive functioning (Jensen, Berens, & Nelson, 2017). While caregiving behavior that is sufficient in quantity and quality, both at home and in child-care settings, is likely to be protective for in children poverty (Votruba-Drzal, Coley, & Chase-lansdale, 2004), many aspects of the child's experiences may be outside of the control of the caregiver. Living in a low-resource, polluted, or dangerous neighborhood may challenge caregivers' abilities to provide appropriate input and may exacerbate child difficulties associated with the experience of neglect.

Evidence for the utility of the proposed approach

Thus far, we have proposed that, by recognizing that psychosocial neglect occurs along a continuum and that caregiving experiences vary in the amount and quality of both emotional and cognitive input, we may be better able to characterize children's early environments. We believe that this measurement framework has important implications for understanding child development and will inform prevention and intervention efforts that are tailored to the strengths and weaknesses of different caregiving environments. Certainly, however, these formulations require careful and systematic empirical study in order to be supported or falsified.

Rather than use a composite approach to the assessment of caregiving (i.e., summing or averaging ratings of several caregiving components), separately assessing emotional and cognitive inputs may elucidate the unique contributions of each dimension to child developmental outcomes. Further, we suggest that future investigations should examine caregiver sensitivity as a moderator of these forms of input in order to clarify the extent to which the amount versus the quality of input explains child competencies. Researchers may already have metrics of emotional input (e.g., warmth; responsiveness to distress) and cognitive input (e.g., scaffolding; linguistic stimulation) in their past and ongoing studies. Indeed, in order to test the utility of this approach, we have applied this framework to our own data. To investigate whether emotional and cognitive input are separable dimensions of caregiving, we examined (1) the extent to which measures of these dimensions are correlated; and (2) whether different caregiver processes, operationalized as affective and cognitive components of maternal empathy, are differentially associated with these dimensions. Below we provide details of our sample, measurement, and preliminary results.

Participants

Mothers and their 6-month-old infants were recruited from communities in the San Francisco Bay Area to participate in the Brain and Behavior Infant Experiences (BABIES) project (see Humphreys, King, Choi, et al., 2018). To date, we have assessed and processed assessments of both emotional and cognitive input from 64 mothers (mean age [SD] = 34.24 [4.96] years) and their infants (mean age [SD] = 6.16 [0.39] months). Fifteen percent of these mothers endorsed Hispanic/Latina ethnicity; 63% reported their race as White/Caucasian, 24% as Asian, 12% as "Other", 1% as Native Hawaiian or Pacific Islander, and 0% as Black or African American. Annual household income ranged from $5001 to > $150,000, with 27% of families classified as "low income" based on an income-to-needs ratio < 1 (annual family income/Santa Clara county low-income threshold for the number of people in the home; www.huduser.gov/portal/datasets/il/il2017/2017summary.odn).

Procedure

The BABIES project was approved by the Stanford University Institutional Review Board. Mothers provided informed written consent for themselves and their infants. Mothers were recruited through online advertisements and flyers posted in the community; specifically, mothers completed an online interest form after which they were contacted by a study staff member to complete a telephone screening. Potentially eligible dyads were invited to the laboratory for assessments for which mothers completed a self-report measure of empathy, participated in the repeated Still-Face Paradigm, and took home an audio recording device for assessment of the linguistic environment (described below). Inclusion criteria were that mothers were fluent in English, had an infant between the ages of 5–8 months, and had no immediate plans to leave the geographical region. Exclusion criteria were bipolar disorder or psychosis, dyslexia or reading/visual processing problems, severe complications during infant delivery, premature birth (i.e., prior to 36 gestational weeks), infant injury/head trauma, and severe medical conditions.

Measures

Repeated Still-Face Paradigm

We conducted observational assessments of maternal behavior during the laboratory-based repeated Still-Face Paradigm (SFP-R; Haley & Stansbury, 2003; Tronick, Als, Adamson, Wise, & Brazelton, 1978). The SFP-R is a parent–child interaction stressor that reliably elicits infant distress (Mesman, van IJzendoorn, & Bakermans-Kranenburg, 2009), and is therefore likely to evoke emotional input from caregivers in response to infant emotion. Specifically, the SFP-R consists of five two-minute face-to-face interaction episodes between mother and child: (1) a baseline normal play episode; (2) the still-face episode in which mothers become unresponsive and maintain a neutral expression without touching their child; (3) a reunion episode in which mothers resume normal interaction; (4) a second still-face episode; and (5) a final reunion episode. The SFP-R was recorded, with separate cameras recording mother and infant. Recordings were then time-locked in Datavyu Team (2014).

Sensitivity

Using the infant adaptation of the Parent–Child Interaction Rating Scales (Bosquet Enlow, Carter, Hails, King, & Cabrera, 2014; Sosinsky, Marakovitz, & Carter, 2004; https://osf.io/gwpcj/), one of two trained coders rated maternal *sensitivity* during each 30-second interval of the play and reunion episodes of the SFP-R with possible scores ranging from 1 (*not at all characteristic*) to 7 (*very characteristic*), increasing in half-point increments (Humphreys, King, Choi, et al., 2018). *Sensitivity* was defined as the extent to which the mother evidenced awareness of her infant's cues (e.g., needs, moods, interests) and responded to these cues contingently and appropriately. We computed the mean rating of sensitivity across all 12 30-second intervals. To ensure reliability, a subset of the videos (19%) were randomly selected to be rated by both coders. Reliability at the level of mean ratings for sensitivity was good (ICC = 0.84).

Emotional input

To operationalize emotional input, we conducted assessments of maternal touch during the SFP-R. Specifically, using the Datavyu software (Datavyu Team, 2014), coders determined whether the mother was touching (1) or not touching (0) the infant during each second of the play and reunion episodes of the SFP-R. We then computed the mean proportion of time mothers spent touching their infants across these episodes of the SFP-R.

Cognitive input

To operationalize cognitive input, we conducted assessments of infants' exposure to linguistic stimulation in their everyday lives. Specifically, we provided mother–infant dyads with a LENA audio recording device and specialized clothing with instructions that the infant wear the device from waking to bedtime during a typical day. We then uploaded the recordings to the LENA Pro analysis software (Xu, Yapanel, & Gray, 2009), which provides daily estimates of the number of adult words. To be included in the current analyses, we required families to have completed at least 8 h of recording on or before the infant's 8-month birthday. On average, families recorded for 15.34 h (SD = 1.40) and recordings took place 1.81 weeks (SD = 1.65) following the laboratory visit. To account for variation in recording length, we computed the hourly rate of overheard adult words by dividing the daily estimate of the total number of adult words by the duration of the recording. Given that the LENA records linguistic stimulation from any adult, we asked a subset of mothers (55%) what proportion of the recording day they spent with their infants. On average, mothers reported spending 83% (SD = 19%) of the day with their infants.

Caregiver processes

Mothers completed the Interpersonal Reactivity Index ([IRI] Davis, 1983), a self-report questionnaire assessing dispositional empathy. Empathy is a multi-faceted social process comprising distinct components (Zaki & Oschner, 2016) that may be differentially related to forms of caregiver input. Specifically, empathy has been dissociated into an *affective* or *experience sharing* component and a *cognitive* or *mentalizing* component (Zaki & Williams, 2013). The IRI assesses four components of empathy corresponding to four seven-item subscales: perspective taking, assessing the tendency to adopt the perspective of others (e.g., *I sometimes find it difficult to see things from the "other guy's" point of view* [reverse scored]); fantasy, assessing the tendency to adopt the feelings and actions of fictional characters (e.g., *I daydream and fantasize, with some regularity, about things that might happen to me*), empathic concern, assessing feelings of sympathy and concern for others (e.g., *I often have tender, concerned feelings for people less fortunate than me*), and personal distress, assessing feelings of anxiety and discomfort in difficult interpersonal situations (e.g., *I sometimes feel helpless when I am in the middle of a very emotional situation*). Mothers rated their agreement with each of the 28 statements on a scale from 0 (*Does not describe me very well*) to 4 (*Describes me very well*). Internal consistency was acceptable for each of the four subscales (Cronbach's α = 0.73–0.79). Four mothers did not complete the IRI.

Data analysis

We conducted analyses in R (R Core Team, 2018). We used Pearson's bivariate correlations to assess the extent to which emotional and cognitive input were positively correlated (i.e., share variance in characterizing the environment), as well as the associations of these forms of input with each of the four subscales of the IRI. We computed 95% confidence intervals to characterize the statistical effects.

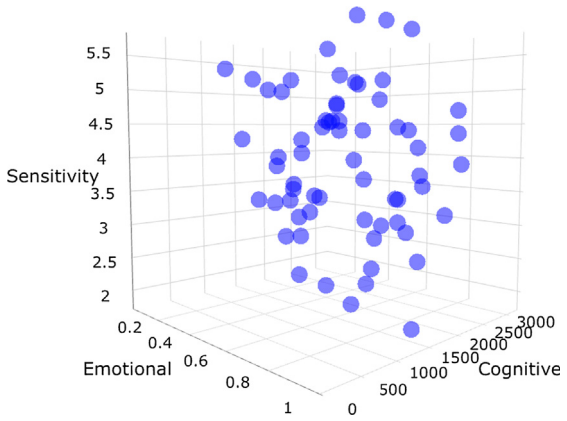

Fig. 2. Relations among emotional input, cognitive input and sensitivity in our data. *Note*. Input from N = 64 families of six-month-old infants. Sensitivity was rated from observation of maternal awareness and appropriate responsiveness to infant cues during the repeated Still-Face Procedure (SFP-R). Emotional input was assessed from observation of the proportion of time mothers spent touching their infants during the SFP-R. Cognitive input was assessed using the LENA recorder and analysis software to measure the hourly rate of adult words in the infant's environment in a typical day.

Results

On average, mothers were rated as moderately sensitive (mean [SD] = 3.99 [0.95]), mothers engaged in touch for 72% (SD = 21%) of the interaction, and infants heard 1237.91 adult words per hour (SD = 612.64). There was, however, wide variation in all three of these dimensions of caregiving. Sensitivity ranged from 1.84 (very low/low) to 5.71 (moderately high/high), touch ranged from 5% to 98% of the interaction, and adult words ranged from 81.93 to 3155.33 per hour.

Maternal touch during the SFP-R and linguistic stimulation were not correlated ($r(61) = -0.10$, 95% CI [−0.34, 0.15], $p = .414$), suggesting that emotional and cognitive input are dissociable. Further, sensitivity was not associated with maternal touch ($r(62) = 0.01$, 95% CI [−0.24, 0.25], $p = .954$) nor linguistic stimulation ($r(62) = -0.16$, 95% CI [−0.39, 0.09], $p = .197$), suggesting that these forms of input are delivered with varying levels of quality. In Fig. 2, we present the three-dimensional associations among observed sensitivity, emotional input, and cognitive input. From our real-world data, it is evident that sensitivity and emotional and cognitive input constellate differently within individual children's environments. We have posted an interactive version of this plot and the data online (https://plot.ly/~lucysking/5/).

Whereas the fantasy and empathic concern subscales of the IRI were not correlated with either maternal touch during the SFP-R nor linguistic stimulation ($rs < |0.20|$), maternal personal distress and maternal perspective taking were uniquely associated with maternal touch and linguistic stimulation, respectively. As presented in Fig. 3, mothers who reported greater personal distress during interpersonally challenging situations touched their infants less during the SFP-R ($r(58) = -0.42$, 95% CI [−0.61, −0.19],

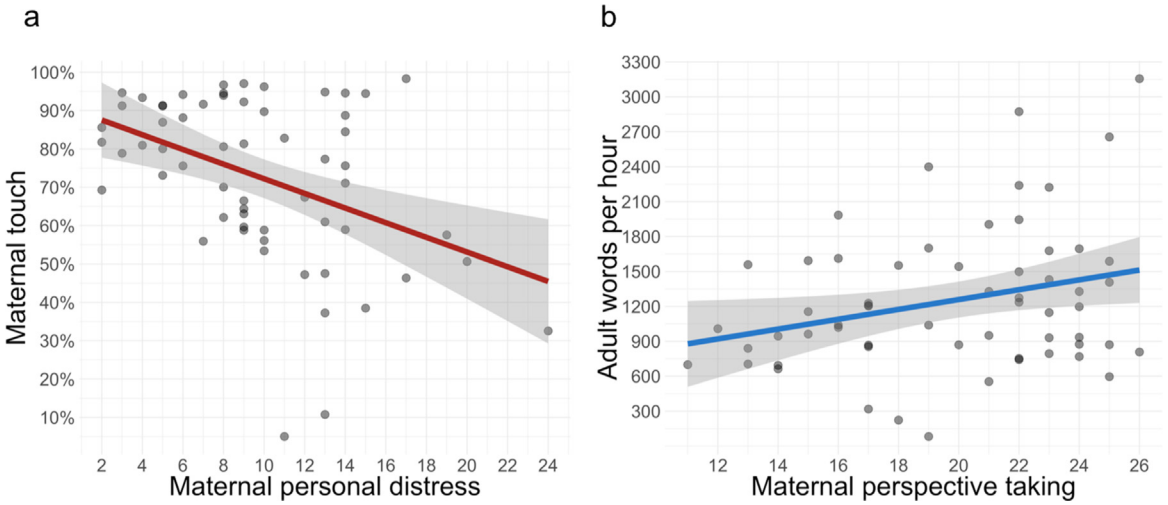

Fig. 3. Associations between different components of maternal empathy and emotional and cognitive input. *Note*. Maternal empathy was measured using the Interpersonal Reactivity Index (IRI) and total scores were calculated for the personal distress and perspective taking subscales. a: Personal distress was uniquely negatively associated with maternal touch ($r = -0.42$). b: Perspective taking was uniquely positively associated with linguistic stimulation ($r = 0.28$).

$p < .001$) whereas mothers who reported greater perspective taking had infants who were exposed to a greater number of adult words per hour ($r(58) = 0.28$, 95% CI [0.03, 0.51], $p = .030$).

When holding perspective taking constant in a linear regression model, personal distress remained negatively associated with maternal touch (B = −0.02, SE = 0.01, $t(57) = -3.56$, 95% CI [−0.03, −0.01], $p < .001$) whereas perspective taking was unassociated with maternal touch ($p = .379$). When holding personal distress constant in a linear regression model, perspective taking remained positively associated with linguistic stimulation (B = 41.80, SE = 19.14, $t(57) = 2.18$, 95% CI [3.48, 80.12], $p = .033$) whereas personal distress was unassociated with linguistic stimulation ($p = .473$).

Conclusions and future directions

Our preliminary data support our proposed model for characterizing variation in caregiving along a continuum of neglect to enrichment. Specifically, emotional and cognitive input, operationalized as maternal touch during a mother–infant interaction stressor and infant exposure to linguistic stimulation, are not colinear. Further, the amount of input along these dimensions is not correlated with observations of mothers' capacities to notice their infants' cues and respond to them appropriately and contingently. Finally, affective and cognitive components of maternal empathy (i.e., personal distress and perspective taking) are associated with emotional and cognitive input, respectively. Supporting our theory that adaptive emotion regulation facilitates the provision of emotional input whereas perspective taking concerning children's thoughts, knowledge, and interests supports the provision of cognitive input, mothers who reported dysregulation during interpersonally challenging situations provided less emotional input to their infants during a stressor whereas mothers who reported greater ability to take the perspective of another had infants who received more cognitive input in their everyday lives. Of course, this analysis was not comprehensive. Important limitations include the cross-sectional design, which precludes the interpretation that components of maternal empathy are antecedents of the input mothers provided to their infants; further, we do not know whether our findings generalize to samples in other communities that may differ from this sample in distributions of race, ethnicity, income, and cultural background. Although our findings must be replicated in a larger sample, they suggest that distinguishing different dimensions of enriching caregiver input may inform our understanding of how to intervene and with whom. There are many avenues for future research using the proposed framework.

Given that individual differences in caregiving processes may interact with the nature of the caregiver–child interaction to explain both the amount and quality of input, it may be important to assess caregiving behaviors in different contexts in future research. Methodological advances have been made that allow these constructs to be assessed reliably outside of the laboratory (e.g., the LENA device and analysis software to assess linguistic stimulation in the child's daily life [Ford, Baer, Xu, Yapanel, & Gray, 2008; Xu et al., 2009]). These advances are important for increasing generalizability to the home environment and reducing the "performance" effect that is of concern in video-recorded in-laboratory interactions when it is apparent that researchers are monitoring the session. Yet, laboratory tasks offer opportunities for the focused assessment of specific types of environmental input. For example, the observation-based Still-Face Paradigm (Tronick et al., 1978), a parent–child interaction stressor, allows the assessment of emotional input in response to infant distress whereas observations of "free-play" interactions provide assessments of cognitive input. It is important, however, for researchers to consider that these laboratory tasks may be measuring caregiver *ability* to provide sensitive emotional or cognitive input, rather than the mean or variability of these experiences for children in their daily lives.

Future investigations should also focus on the long-term consequences of the different dimensions of the neglect–enrichment continuum. Although research in this area is scarce, there is nevertheless support for a double dissociation of emotional and cognitive dimensions: specifically, early emotional input was associated with memory functioning and hippocampal volume in adolescence, whereas cognitive input was associated with language development and cortical thickness (Avants et al., 2015; Farah et al., 2008; Rao et al., 2010). We hypothesize that, compared to cognitive input, variation in the amount and the quality of emotional input is a stronger predictor of emotional development, including the development of emotion regulation capacities and empathy. We hypothesize further that, compared to emotional input, the amount and quality of cognitive input is a stronger predictor of cognitive development, including the acquisition of language and executive function. We should also note here, however, that these forms of input likely interact to influence children's outcomes. For example, whereas emotional input may be most important for the functioning of children's stress response systems (e.g., the hypothalamic-pituitaryadrenal axis and amygdala-prefrontal circuitry; Gunnar, Hostinar, Sanchez, Tottenham, & Sullivan, 2016), cognitive input may indirectly influence this functioning in later childhood through its effects on inhibitory control and cognitive flexibility, skills involved in emotion regulation. In turn, dysregulation of stress response systems due to insufficient or insensitive emotional input may attenuate the positive effects of cognitive input by interfering with children's capacity to process this input (Blair et al., 2011).

Extending this framework to other relevant outcomes of child functioning across development is an exciting direction for future research. By measuring variation in emotional and cognitive input rather than simply the presence or absence of neglect, researchers can identify the appropriate model for the predictive relation between levels of caregiver input and healthy child development (see Fig. 4; Humphreys, King, & Gotlib, 2018). A *threshold* model is consistent with previous research on child neglect that uses an extreme-groups approach, and with the concept of the "good enough parent" (Winnicott, 2002), in which improvements in caregiving beyond a specified level are not expected to have measurable effects. A *linear* model is based on a smaller number of studies assessing neglect continuously and using a "cumulative risk" approach (e.g., Evans et al., 2013). There may, however, be nonlinear relations between variation in cognitive and/or emotional input and child development. Specifically, a *diminishing returns* model indicates that the positive effects of gains in enrichment are attenuated with further increases in the amount of input. Such a model would be consistent with the notion that adding two hours of highly sensitive emotional and cognitive input would be more meaningful for a child who is frequently alone than for a child whose typical environment could be characterized as moderately enriched.

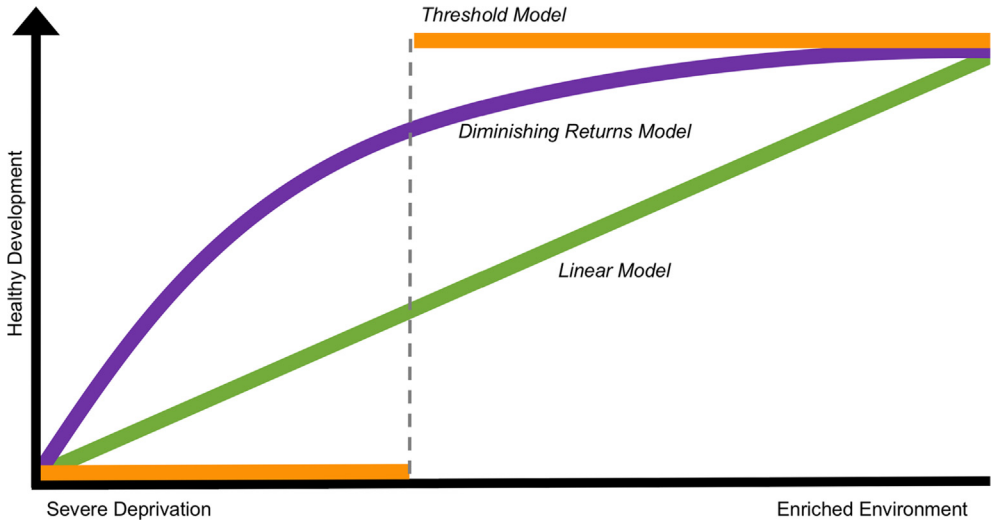

Fig. 4. Hypothetical models for variation along the neglect–enrichment continuum.

Finally, given the possibility that distinct caregiving characteristics, skills, knowledge, or values are related to each dimension, this line of research is promising for identifying targets for prevention and intervention with parents (including those expecting a child). In order to address risk factors and build skills that would benefit their children, it may be useful to assess these characteristics, skills, knowledge, and values to identify their strengths and areas for targeted intervention. As one example, the motivations and goals of parents in their caregiving relationship (e.g., *I want my child to be smart and successful* or *I want my child to feel the love that I didn't experience*) may be useful for identifying the domains in which interventionists may find common ground and/or the domains that would benefit from additional attention.

Limitations of existing approaches to assessing the early caregiving environment have hindered both our understanding of children's developmental outcomes and our ability to identify optimal targets for caregiving intervention. We propose that the study of the consequences of early caregiving experiences for child development can be meaningfully advanced by considering variation in both emotional and cognitive input along a continuum of psychosocial neglect to environmental enrichment. We believe that identifying predictors of these distinct dimensions of caregiver input, encouraging the sensitive delivery of each form of input, and tracing the consequences of variation in both emotional and cognitive input are important and exciting new directions for research aimed at improving the well-being of children and families.

Acknowledgements

The authors thank Drs. Charles Zeanah and Katherine Guyon-Harris for their helpful comments, Vivian Vu and Marissa Roth for their assistance in data collection, Samia Islam for her assistance in video coding, and the families who participated in the research described in this paper.

Funding

This research was supported by the National Institute for Child Health and Human Development (R21-HD090493) and the National Institute for Mental Health (R21-MH111978 and R37-MH101495) (IHG), the National Science Foundation graduate research fellowship (LSK), the Brain and Behavior Research Foundation (Young Investigator Award 23582), the Klingenstein Third Generation Foundation Fellowship, and the Jacobs Foundation Early Career Research Fellowship (KLH).

Appendix A. Supplementary material

Supplementary data to this article can be found online at https://doi.org/10.1016/j.dr.2019.01.001.

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