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NATIONAL SCIENTIFIC COUNCIL ON THE DEVELOPING CHILD

# The Science of Neglect: The Persistent Absence of Responsive Care Disrupts the Developing Brain

WORKING PAPER 12



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The National Scientific Council on the Developing Child is a multidisciplinary, multi-university collaboration designed to bring the science of early childhood and early brain development to bear on public decision-making. Established in 2003, the Council is committed to an evidence-based approach to building broad-based public will that transcends political partisanship and recognizes the complementary responsibilities of family, community, workplace, and government to promote the well-being of all young children. For more information, go to [www.developingchild.net](http://www.developingchild.net).

The authors gratefully acknowledge the significant contributions to drafting this paper by Johanna Bick, Postdoctoral Research Fellow, Yale Child Study Center, Yale School of Medicine.

Please note: The content of this paper is the sole responsibility of the authors and does not necessarily represent the opinions of the funders or partners.

Suggested citation: National Scientific Council on the Developing Child. (2012). *The Science of Neglect: The Persistent Absence of Responsive Care Disrupts the Developing Brain: Working Paper 12*. <http://www.developingchild.harvard.edu>

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# The Issue

THE BUILDING BLOCKS OF THRIVING COMMUNITIES AND WELL-FUNCTIONING SOCIETIES REST ON the health and development of their people. Beginning immediately after birth, a strong foundation for human well-being requires responsive environments and supportive relationships to build sturdy brain circuits, facilitate emerging capabilities, and strengthen the roots of physical and mental health.<sup>1,2,3</sup> Through mutually rewarding, “serve and return” interactions with the adults who care for them (see sidebar below), young children are both initiators and respondents in this ongoing process. These reciprocal and dynamic interactions are essential for healthy development and literally shape the architecture of the developing brain.<sup>4,5</sup>

Because responsive relationships are developmentally expected and biologically essential, their *absence* signals a serious threat to child well-being, particularly during the earliest years, and this absence activates the body’s stress response systems. When decreased responsiveness persists, the lost opportunities associated with diminished interaction can be compounded by the adverse impacts of excessive stress activation, the physiological effects of which can have lifelong

consequences. This multidimensional assault on the developing brain underscores why significant deprivation is so harmful in the earliest years of life and why effective interventions are likely to pay significant dividends in better long-term outcomes in learning, health, and parenting of the next generation.<sup>6</sup>

Extensive biological and developmental research over the past 30 years has generated substantial evidence that young children

## Serve and Return Interaction Between Children and Caregivers

The architecture of the brain is composed of highly integrated sets of neural circuits (i.e., connections among brain cells) that are “wired” under the continuous and mutual influences of both genetics and the environment of experiences, relationships,



and physical conditions in which children live. Experiences “authorize” genetic instructions to be carried out and shape the formation of the circuits as they are being constructed. This developmental progression depends on appropriate sensory input and stable, responsive relationships to build healthy brain architecture.

Abundant scientific evidence demonstrates that a major ingredient in this process is the “serve and return” relationship between children and their parents or other caregivers in the family or community. Young children naturally reach out for interaction through babbling, facial expressions, gestures, and words, and adults respond with the same kind of vocalizing and gesturing back at them. This “serve and return” behavior continues back and forth like a game of tennis or volleyball. If the responses are unreliable, inappropriate, or simply absent,

the developing architecture of the brain may be disrupted, and later learning, behavior, and health may be impaired.

A breakdown in these reciprocal, serve and return interactions between adult caregivers and young children can be the result of a multitude of predisposing factors. These may include significant stresses associated with high levels of economic hardship, social isolation, and/or chronic disease, as well as a wide range of adult mental health impairments, including depression, anxiety, post-traumatic stress disorder, serious personality disorders, or substance abuse involving alcohol or illicit drugs. Caregivers who are at highest risk for providing inadequate care often experience several of these problems simultaneously. Neglectful acts or patterns occur in every culture, at all income levels, and within all racial, ethnic, and religious groups.

ILLUSTRATION BY BETSY HAYES

who experience severe neglect—defined broadly as the ongoing disruption or significant absence of caregiver responsiveness—bear the burdens of a range of adverse consequences. Indeed, deprivation or neglect can cause more harm to a young child’s development than overt physical abuse, including subsequent cognitive delays, impairments in executive functioning, and disruptions of the body’s stress response.<sup>9,10,11</sup>

## Defining Neglect

Understanding the biological effects of inadequate responsiveness to the needs of young children has important implications for policy decisions—but it is important to also acknowledge that the term “neglect” carries special significance because of its association with the child welfare system and its implications for case documentation and adjudication. The federal Child Abuse Prevention and Treatment Act (CAPTA), as amended by the Keeping Children and Families Safe Act, defines child abuse and neglect as “at a minimum, any recent act or failure to act on the part of a parent or caretaker, which results in death, serious physical or emotional harm, sexual abuse or exploitation, or an act or failure to act which presents an imminent risk of serious harm.”<sup>7,8</sup>

This latter dimension—“failure to act which presents an imminent risk of serious harm”—lies at the core of most legal definitions of neglect, but it fails to sufficiently acknowledge the less immediately visible but highly threatening, long-term consequences of excessive deprivation that can lead to lifelong problems in learning, behavior, and health. Indeed, science tells us that many young children who are identified by the child welfare system as meeting the criteria for reportable neglect may not exhibit evidence of physical harm, yet they may have already sustained disruptions of their developing brain circuitry (or other developing organs and metabolic systems) that could have serious lifelong consequences.

To researchers, neglect—also sometimes referred to as deprivation—refers to the absence of sufficient attention, responsiveness, and protection that are appropriate to the age and needs of a child. The potential seriousness of such a circumstance is acknowledged broadly, yet its specific parameters can vary widely by type, duration, and cultural differences in child-rearing beliefs and practices. This paper is intended to help policymakers and practitioners distinguish among various forms of neglect—and potential responses to them—by focusing not on state or federal definitions but on biological responses to the diverse characteristics of unresponsive care that can undermine healthy development. While understanding that the terms “neglect” and “serious neglect” indicate important distinctions to policymakers through definitions that have been codified in various legislative or administrative decisions, in this paper they are employed to reflect the descriptive terminology used by neuroscientists and developmental scholars.

When chronic deprivation leads to persistent activation of stress response systems in a young child, it can actually disrupt and weaken developing brain architecture. Over time, the wear and tear of this excessive stress response and the chemicals it releases can lead to academic struggles, difficulties in social adjustment, mental health problems, and even chronic physical disease.

The early roots of this science are reflected in pioneering behavioral studies of children living in institutions,<sup>12</sup> as well as in family settings with compromised caregiving capacities.<sup>10,13</sup> More recently, this knowledge base has been deepened by extensive developmental and neurobiological evidence from studies of young children who experienced extreme deprivation in state-run institutions in Romania, China, and other contexts outside North America.<sup>14,15,16,17,18</sup> Regardless of the differences in settings (i.e., home versus institution) or causes of neglect, however, understanding the fundamental connection between early deprivation and subsequent impairment lies in the realization that healthy development can be threatened not only by bad things that may happen to children (e.g., as a result of physical or sexual abuse), but also by the *absence* of sufficient amounts of essential experiences that are required for their positive well-being.

Despite these compelling findings, child neglect receives far less public attention than physical abuse and sexual exploitation<sup>19,20,21</sup> and a lower proportion of mental health services is dedicated to children who have been neglected in comparison to the availability of treatment programs for victims of physical trauma.<sup>22</sup> Yet neglect is by far the most prevalent form of child maltreatment. In 2010, more than half a million documented cases that met state or federal definitions of neglect were reported in the United States, which accounted for 78% of all maltreatment cases nationwide. This rate far exceeded all other forms of child maltreatment (some of which included both overt abuse and neglect), including physical abuse (17.6%), sexual abuse (9.2%), and psychological abuse (8.1%).<sup>23</sup>

Explicit criteria for determining the threshold for government intervention in cases of suspected neglect are within the purview of each state’s child welfare system, and the definitions vary considerably across jurisdictions. Within this context, most circumstances that are

selected for investigation fall within one of the following categories: (1) physical or supervisory neglect (i.e., failure to provide adequate food, shelter, hygiene, and/or appropriate oversight to ensure a child's safety); (2) psychological neglect (i.e., failure to attend to a child's emotional and/or social needs); (3) medical neglect (i.e., failure to secure adequate treatment for an identified health problem); and (4) educational neglect (i.e., failure to meet a child's formal learning needs). Notwithstanding their distinctive characteristics, these four forms of neglect have often been found to co-occur.<sup>24,25,26</sup> And while these distinctions are time-tested and valid, they do not help with the challenge of judging relative severity or determining when to intervene. Here the science of development and neurobiology of stress can help.

The aim of this working paper is to synthesize a wealth of evidence from neuroscience, molecular biology, epigenetics, and a range of behavioral and social sciences to promote greater public understanding of this widespread threat to child well-being. Using science as our guide, we have delineated four types of diminished responsiveness and their consequences in order to provide a useful framework for developing more effective strategies

to protect vulnerable children from this complex challenge.

**Occasional Inattention.** There is considerable variation in the circumstances and contexts in which parents and other caregivers do or do not respond in a timely fashion to the everyday needs and overtures of young children. If diminished attention occurs on an intermittent basis in an otherwise loving and responsive environment, there is no need for concern. Indeed, some developmental scientists suggest that variations in adult responsiveness present growth-promoting challenges that may help young children recognize the distinction between "self" and "other," which is a necessary prerequisite for moving toward greater independence and increasing capacity for self-care and problem-solving.<sup>27</sup>

**Chronic Under-Stimulation.** If caregivers exhibit an ongoing, diminished level of child-focused attention that fails to support a young child's need for cognitive, language, social, and emotional engagement, intervention can be helpful. Common examples of such under-stimulation include few daily interactions that provide opportunities for young children to engage in active conversation with adult caregivers or

## Science Helps to Differentiate Four Types of Unresponsive Care

	OCCASIONAL INATTENTION	CHRONIC UNDER-STIMULATION	SEVERE NEGLECT IN A FAMILY CONTEXT	SEVERE NEGLECT IN AN INSTITUTIONAL SETTING
Features	Intermittent, diminished attention in an otherwise responsive environment	Ongoing, diminished level of child-focused responsiveness and developmental enrichment	Significant, ongoing absence of serve and return interaction, often associated with failure to provide for basic needs	"Warehouse-like" conditions with many children, few caregivers, and no individualized adult-child relationships that are reliably responsive
Effects	Can be growth-promoting under caring conditions	Often leads to developmental delays and may be caused by a variety of factors	Wide range of adverse impacts, from significant developmental impairments to immediate threat to health or survival	Basic survival needs may be met, but lack of individualized adult responsiveness can lead to severe impairments in cognitive, physical, and psychosocial development
Action	No intervention needed	Interventions that address the needs of caregivers combined with access to high-quality early care and education for children can be effective	Intervention to assure caregiver responsiveness and address the developmental needs of the child required as soon as possible	Intervention and removal to a stable, caring, and socially responsive environment required as soon as possible

frequent periods in which infants or toddlers are left in front of a television for hours at a time. In some cases, this lack of serve and return engagement is the result of limited understanding of the developmental needs of young children. In other circumstances, it may be caused by a range of risk factors such as caregiver depression, social or geographic isolation, the stresses of poverty or discrimination, or a distracting family illness. Understanding the precipitating factors and employing appropriate strategies to address identified needs (e.g., from simple

## **The significant absence of basic, serve and return interaction can produce serious physiological disruptions that lead to lifelong problems in learning, behavior, and health.**

parenting education to the provision of enriched learning experiences through high-quality child care or early education programs) can produce strong returns on relatively simple, voluntary interventions.

**Severe Neglect in a Family Context.** The ongoing disruption or significant absence of the kind of basic, serve and return interaction necessary for healthy child development can produce serious physiological disruptions that lead to lifelong problems in learning, behavior, and health. This magnitude of neglect may also be associated with the failure to provide for a child's basic nutritional, medical, and educational needs. Children who experience this level of deprivation typically have no stable, adult source of reliable care and protection, and therefore meet the criteria for public intervention under the jurisdiction of the child welfare system. In the most severe cases (e.g., a baby or toddler who is typically left alone and ignored for many hours at a time), a child's very survival is threatened and immediate intervention is mandatory.

### **Severe Neglect in an Institutional Setting.**

Of equal concern, yet presenting a very different context, institutions that "warehouse" large numbers of infants and young children serve as extraordinary examples of extreme deprivation. Such conditions typically include staff with little

or no training in the care of children, highly regimented "assembly-line" caregiving with minimal one-on-one interaction, youngsters who are ignored and unstimulated for virtually all of their awake hours, and no adult-child relationships that are reliably responsive to a child's individual needs. Young children who live in such settings experience little more than transient serve and return interactions. Frequent staff rotations mean that infants are cared for by many different people, making it extremely difficult to develop meaningful relationships with any single caregiver. In such circumstances, although basic needs for food, warmth, shelter, and medical care may be met (thereby avoiding most legal definitions of neglect), the setting itself may still be a precipitant of severe psychosocial deprivation for the youngest inhabitants. While most of the research relating to profound neglect in such settings has been focused on extreme situations, such as those in Eastern Europe and other locations around the world, a wide range of quality of care in institutional settings exists within the United States as well. Indeed, there is growing evidence that some residential care facilities for infants and toddlers in the United States are harmful to development and, therefore, are not an acceptable alternative to high-quality foster care or adoptive parents.<sup>28</sup>

IN SOME CONTEXTS, THE DETERMINATION OF whether a child is being neglected falls within the relatively low-stakes realm of individual judgment. In other contexts, it falls within the exceedingly high-stakes jurisdiction of child welfare agencies and courts of law, where highly consequential decisions are made about custodial responsibility, parental rights, criminal culpability, and the best interests of the child. The four types of deprivation described above are intended to provide an organizing framework for assessing current policy and program options for young children who are deemed to be experiencing a level of inadequate caregiving that warrants public attention and identifying those whose situations do not. In the final analysis, the magnitude of the decision-making challenge requires a balanced blend of scientific knowledge, cultural values, and shared public responsibility.

# What Science Tells Us About the Impact of Neglect on the Development of Young Children

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THE CLEAREST FINDINGS ON THE EFFECTS OF deprivation on development come from studies of children who have experienced severe neglect while being raised in institutions. Research on these children has provided an opportunity for investigators to examine the distinctive consequences of extreme psychosocial deprivation apart from the impacts of other forms of maltreatment. Additional knowledge comes from studies involving institutionalized children whose life circumstances have been transformed through foster care placements or permanent adoption. Although neurobiological information on children who experience significant neglect in home settings is less available, research currently in progress is likely to generate new insights in the near future.

**There is extensive evidence that severe neglect in institutional settings is associated with abnormalities in the structure and functioning of the developing brain.** Children who experience extreme levels of social neglect early in life show diminished electrical activity in the brain, as measured through electroencephalography (EEG).<sup>15,18</sup> These EEG disturbances are similar to those observed in non-neglected children who have difficulties with attention and learning.<sup>29</sup> Institutionally reared children also show differences in the neural reactions that occur as an individual is processing information, such as looking at faces to identify different emotions.<sup>16,17</sup> These findings indicate impairments in the way the brain interprets such input and are consistent with behavioral observations that neglected children struggle to correctly recognize different emotions in others.<sup>11,30</sup> Children who experience severe neglect in institutional settings also exhibit decreased brain metabolism and poorer connections among different areas of the brain that are important for integrating complex information, including cognitive, social, and emotional competencies.<sup>14,31</sup>

Significant neglect or deprivation in the early childhood years influences the development of a variety of brain regions that are important for thinking, learning, focusing attention,

controlling emotions, and managing stress. One particularly sensitive area is the prefrontal cortex (PFC), which serves as the brain's "air traffic control system" by supporting the development of a wide range of executive functions, such as planning, monitoring, working memory, problem-solving, and behavioral self-regulation.<sup>32</sup> In neuroimaging studies, adults and adolescents who report histories of severe neglect during childhood show smaller PFC volumes when compared with non-neglected individuals.<sup>33,34</sup> Serious deprivation is also associated with abnormal activity in areas of the brain involved in emotion and stress regulation (i.e., the amygdala and hippocampus)<sup>33,34,35,36,37,38</sup> as well as attention and self-control (e.g., the anterior cingulate cortex).<sup>39</sup> Collectively, these findings indicate that significant deprivation disrupts the way in which children's brains develop and process information, thereby increasing the risk for attentional, emotional, cognitive, and behavioral disorders later in life.

**Chronic neglect can alter the development of biological stress response systems in a way that compromises children's ability to cope with adversity.** Extensive research indicates that the two primary stress response systems in humans—the sympathetic-adrenal-medullary (SAM) system, which produces adrenaline and affects heart and respiration rates, and the hypothalamic-pituitary-adrenal (HPA) axis, which elevates cortisol, a key stress hormone—are both disrupted by significant deprivation. For example, years after adoption, children who experienced extreme neglect in institutional settings show abnormal patterns of adrenaline activity in their heart rhythms, which can indicate increased biological "wear and tear" that leads to greater risk for anxiety, depression, and cardiovascular problems later in life.<sup>40</sup>

Cortisol regulation, an important marker of stress response activation in the HPA axis, is altered in children who experience severe neglect either in families or in institutional settings. The normal rhythms of cortisol secretion observed among typically developing children begin with a sharp increase in the morning to get the body

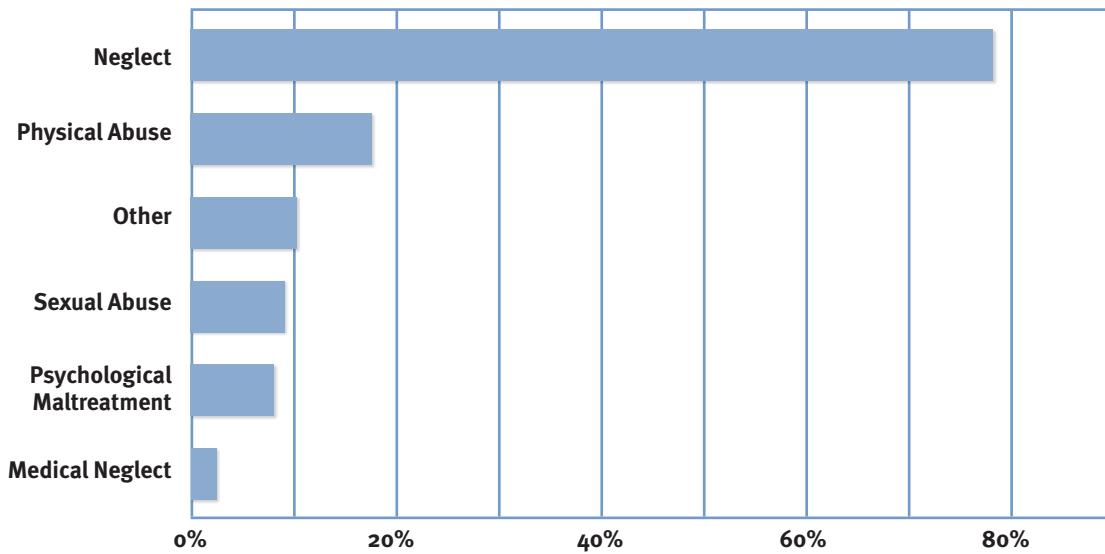
going for the day, followed by a steady decline in levels that bottom out in late afternoon or evening as the body prepares for sleep. In contrast, children who experience significant neglect, whether in institutional or family settings, show lower levels of cortisol in the morning and an atypically flat pattern of secretion across the day.<sup>9,41,42</sup> Although these abnormal cortisol responses appear to normalize when children are placed in nurturing home environments, there is evidence that the brain architecture that developed at the time of these atypical patterns may be structurally weakened, which could have enduring, adverse effects throughout life.<sup>43</sup>

**Children who have experienced serious deprivation are at risk for abnormal physical development and impairment of the immune system.** Severe neglect is associated with significantly delayed growth in head circumference (which is directly related to brain growth) during infancy and into the toddler years.<sup>44</sup>

More extreme conditions of deprivation, such as those experienced in institutional settings that “warehouse” young children, are associated with even more pervasive growth problems, including smaller body size, as well as impairments in gross motor skills and coordination.<sup>45,46,47</sup> Profound deprivation has also been found to compromise physical health, as children who are raised in institutional settings have more infections and are at greater risk of premature death than children who live in supportive homes.<sup>19</sup> One possible explanation for these findings is that chronically disrupted cortisol levels suppress immunologic reactivity and physical growth, thereby leading to a greater risk for infection and chronic, stress-related disease throughout life.<sup>48</sup>

**Severe neglect in both family and institutional settings are associated with greater risk for emotional, behavioral, and interpersonal relationship difficulties later in life.** Children reared in families who experience chronic neglect

## Neglect is the Most Prevalent Form of Child Maltreatment



Each state defines the types of child abuse and neglect in its own statute and policy, guided by federal standards, and establishes the level of evidence needed to substantiate a report of maltreatment. The data above, from the National Child Abuse and Neglect Data System (NCANDS), reflects the total number of victims (defined as a child for whom the state determined at least one report of maltreatment was found to be substantiated or indicated) as reported by all 50 states, the District of Columbia, and Puerto Rico, between Oct. 1, 2009, and Sept. 30, 2010. “Other” includes abandonment, threats of harm, and drug addiction.

Source: U.S. Department of Health and Human Services (2010b)<sup>23</sup>

show higher rates of insecure or disorganized attachment behaviors with their primary caregivers, and these relationship difficulties extend to interactions with others as they grow older.<sup>49,50,51,52,53,54</sup> Preschoolers with histories of severe neglect in a family setting are more likely to become overly dependent on their teachers for support and nurturance, when compared with non-neglected children.<sup>10</sup> Youngsters who have experienced chronic under-stimulation or serious neglect in family settings engage in fewer social interactions with their peers during preschool when compared with children who experienced other forms of maltreatment.<sup>55,56,57</sup> This deficiency in social skills and peer relationships often persists throughout the school-age years<sup>13,56,58,59,60</sup> and can extend into adolescence.<sup>61</sup>

Children who have been severely neglected also have higher rates of emotional and behavioral problems in comparison to non-neglected children, even when compared to those who have been physically or sexually abused.<sup>49</sup> Infants and toddlers exposed to severe neglect within a family context, or to the profound deprivation of an institutional setting, show increased negative emotions, poorer impulse control, and reduced enthusiasm, confidence, and assertiveness when completing problem-solving tasks.<sup>10,49,62,63</sup> Severe neglect in institutional settings also has been linked to difficulties in children's emerging ability to discriminate emotions.<sup>11,30,64</sup> As they grow older, children reared in neglectful conditions in family settings are at increased risk for a variety of emotional difficulties, such as low self-esteem, poor self-confidence, and diminished assertiveness.<sup>10</sup> Significant neglect is also associated with an increased risk for personality disorders, anxiety, and depression when compared with other forms of maltreatment.<sup>65,66,67,68</sup>

Beyond the short-term consequences of neglect, there is also evidence that these emotional difficulties can persist. Adults who report childhood neglect and emotional abuse experience greater anxiety, depression, and post-traumatic stress symptoms when compared with adults without such histories.<sup>69,70</sup> Although the majority of adults who experienced neglect as children do not engage in delinquent, criminal, or violent behavior,<sup>71</sup> the odds are significantly greater that they will be arrested for violent crimes and have

diagnoses of antisocial personality disorder compared with adults who were not maltreated as children.<sup>72,73</sup>

**Children who have experienced severe neglect are more likely to have cognitive problems, academic delays, deficits in executive function skills, and difficulties with attention regulation.** Extreme deprivation in institutional settings has been associated with particularly severe cognitive impairments<sup>74,75,76</sup> and academic delays,<sup>77</sup> with documented effects persisting into adolescence.<sup>78</sup> Infants who experience significant neglect in family environments demonstrate poorer performance on later measures of cognition and language development than young children who have experienced other forms of maltreatment.<sup>52,79,80,81</sup> Throughout the elementary school years, children who were

### Chronic neglect can alter the development of biological stress response systems in a way that compromises children's ability to cope with adversity.

previously neglected in family settings show more academic problems and special education referrals than non-neglected children.<sup>13,56,82,83,84</sup> While research on the long-term effects of deprivation into adulthood is more limited, adults with histories of childhood neglect (and/or abuse) exhibit lower IQ scores, are less likely to graduate from high school, and have poorer reading skills when compared with adults who were not neglected as children.<sup>85</sup>

Severe neglect can have particularly devastating effects on the development of executive function skills, which are critical to the ability to operate effectively and independently throughout life. Consistent with observed alterations in patterns of brain activity, children who have experienced serious levels of deprivation—whether in homes, foster care, or institutions—tend to struggle with the demands of regulating attention.<sup>86</sup> They are more frequently rated as inattentive and hyperactive by both their parents and teachers,<sup>87</sup> as well as described as unfocused and inattentive during the school years,<sup>13</sup> with longer or more severe

deprivation associated with higher levels of dysfunction.<sup>87</sup> Children who experienced serious deprivation in the first few years of life display greater problems in executive function skills during middle childhood, with particular difficulties in visual memory;<sup>88</sup> continuing problems in attention and learning;<sup>89</sup> and atypical neural activity related to attention and executive functioning that persists throughout the school years.<sup>26,75,90</sup>

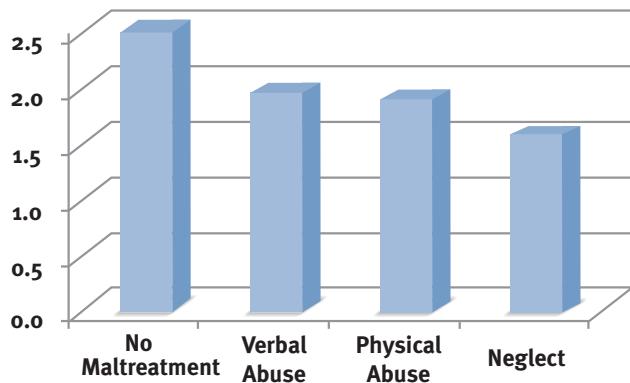
**The impact of severe neglect can be manifested in different ways across different periods of development.** At younger ages, maltreated children show impairments in their ability to discriminate different emotions, yet these difficulties are not observed at older ages.<sup>11,35,91</sup> Conversely, antisocial behavior may be more salient among adults or older adolescents with early childhood histories of neglect.<sup>72,73</sup> Given the fact that interpersonal relationships and life challenges (e.g., dealing with peers, becoming involved in romantic relationships, entering parenthood, achieving

financial stability) change across the lifespan, it is essential that the adverse consequences of significant deprivation are addressed in a developmentally appropriate manner.

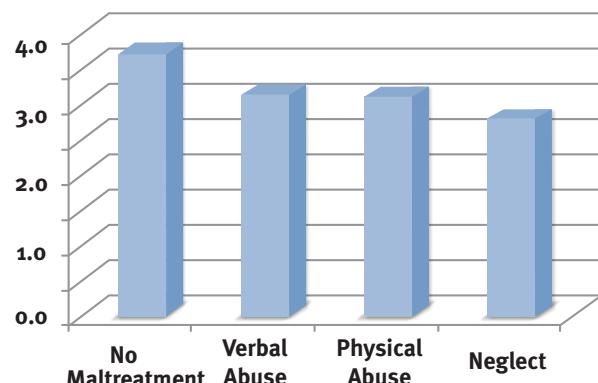
**The negative consequences of severe neglect can be reduced or reversed through appropriate and timely interventions.** The capacity for recovery in children who are removed from neglectful conditions and placed in nurturing environments in a timely fashion has been well-documented.<sup>92,93,94,95,96</sup> However, improvement often requires more than simply the cessation of neglectful caregiving. Rather, systematic, empirically supported, and often long-term (six to nine months or longer) interventions are needed to promote effective healing. Successful treatments of this nature have been shown to reduce behavioral difficulties and attachment problems in previously neglected young children who have been placed in foster homes<sup>92,93,95</sup> as well as to promote secure attachments in young children who continue to live with their families while being

## Neglect Can Be a Greater Threat to Development than Abuse

Creativity



Confidence and Assertiveness



At age 3 ½, children who had experienced different types of maltreatment in the first year of life and a group that had not experienced any maltreatment were compared in a “barrier box” situation designed to evaluate children’s responses to frustrating situations. In the scenario, toys were placed inside a box that could not be opened by a young child. Researchers observed the children’s efforts to solve the challenge and rated them on a 3- or 7-point scale and then adjusted scores for time spent on task (median scores for each group are shown above). Results showed that neglected children had the greatest difficulty and lacked the creativity, confidence, and assertiveness to cope with the challenges they faced.

Source: Egeland, et al. (1983)<sup>10</sup>

monitored by child welfare agencies because of previous allegations of neglect.<sup>97</sup> On a biological level, systematic interventions targeting the social-emotional needs of young children living in foster care settings (the majority of whom were victims of neglect rather than physical abuse) have shown evidence of improved stress-regulatory capabilities with patterns of cortisol production that are indistinguishable from those of non-neglected, healthy children.<sup>26,93,94,96,98,99</sup> With appropriate intervention, previously institutionalized children have also demonstrated improvements in brain activity as measured by EEG.<sup>100,101</sup>

**Children's recovery rates are influenced by the severity, duration, and timing of the deprivation as well as by the timing and type of the intervention that is provided.** Children who experience more severe neglect, especially during the early childhood years, are more likely to withdraw when stressed and show more anxiety and difficulties regulating their mood than children whose experiences of deprivation are less severe.<sup>60</sup> Longer periods of deprivation have also been associated with greater deficits in attention and cognitive control,<sup>102</sup> academic achievement,<sup>78,103</sup> brain activity,<sup>104</sup> and dysregulation of the HPA axis.<sup>105</sup> Previously institutionalized children who experienced the most extreme levels of deprivation often continue to struggle with problems in

attention and behavioral regulation even after intervention has been provided.<sup>106,107,108,109,110</sup>

The timing of intervention is a critically important predictor of outcomes. If appropriate intervention occurs very early—in various studies the benchmark age for removal from extreme deprivation has been identified as 6, 12, or 24 months—substantially improved functioning in cognition, attention, memory, and executive functioning can be achieved.<sup>74,88,101,111</sup> For example, young children who were removed from Romanian institutions and placed in high-quality foster

### If appropriate intervention occurs very early, substantially improved functioning in cognition, attention, and memory can be achieved.

care homes prior to 24 months of age (in comparison to those who were removed after age two years), showed remarkable gains (after an initial period of adjustment) in a range of cognitive abilities<sup>74</sup> and neuropsychological functioning, especially in the area of visual memory.<sup>88</sup> Generally speaking, it appears that the more profound and pervasive the deprivation, the earlier the child needs to be removed in order to facilitate the greatest recovery.

## Addressing Common Misconceptions

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**Contrary to popular belief, severe neglect appears to be at least as great a threat to health and development as physical abuse—possibly even greater.** When compared with children who have been victimized by overt physical maltreatment, young children who experienced prolonged periods of neglect exhibit more severe cognitive impairments, language deficits, academic problems, withdrawn behavior, and problems with peer interaction.<sup>52,60</sup> This suggests that sustained disruption of serve and return interactions in early relationships may be more damaging to the developing architecture of the brain than physical trauma.<sup>52,66</sup>

**Contrary to popular belief, the mere removal of a young child from an environment of severe neglect is not a guarantee of positive outcomes.** Children who experience significant deprivation typically need therapeutic, supportive care to facilitate their recovery. In the absence of appropriate intervention services, neglected children remain at increased risk for a host of problems (as described above) that have been found to continue through adolescence and into the adult years.<sup>71,72,78,85</sup> Evidence-based intervention programs designed to help caregivers respond to the distinctive needs of neglected children are currently available (see sidebar on page 12).<sup>94,97</sup> The imperative of appropriate and timely referrals cannot be ignored.

# The Science-Policy Gap

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**Public concern about the problem of child maltreatment is focused disproportionately on the dangers of physical and sexual abuse, while significant neglect receives less attention.** Given the fact that child neglect is the most common reason for engaging protective services, it is particularly striking that there is still no broad-based agreement on clear and objective criteria for defining this form of maltreatment and for authorizing state intervention. Moreover, despite important scientific advances in elucidating the wide range of adverse developmental and neurobiological impacts of early deprivation, there has been relatively little change in the way in which services are provided for this proportionally large and highly vulnerable population within the child welfare system.

**Despite considerable advances in scientific knowledge about the short- and long-term consequences**

**of significant deprivation and the importance of prompt intervention, most child welfare agencies have relatively limited capacity to address the developmental needs of young children who have experienced reportable neglect.** The disruptions in neural pathways and stress response systems brought on by significant neglect can be lessened by the provision of skilled, supportive caregiving.<sup>98,100,104,112,113</sup> Growing evidence for this assertion underscores the imperative for increased investment in the development and implementation of effective, scalable, evidence-informed programs in community-based settings for children who are experiencing significant deprivation. Recognizing the potentially greater returns on prevention compared with rehabilitation, there is a particularly compelling need for more effective outreach to families facing considerable adversity that puts their young children at risk for significant neglect and its consequences.

## Implications for Policy and Programs

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SCIENCE TELLS US THAT REPEATED AND persistent periods of prolonged unresponsiveness from primary caregivers will lead to excessive activation of a young child's psychological and physiological stress response systems. This, in turn, can lead to toxic stress and its consequences—a lifetime of impairments in learning, behavior, and both physical and mental health. Conversely, extensive research points toward the healing power of nurturing, responsive, and reliable relationships for young children who have experienced severe neglect, with or without associated trauma.

Notwithstanding the dangers of significant deprivation, common sense tells us that young children do not need constant attention every minute of every day—and most are able to tolerate reasonable delays in responsiveness from the adults who care for them without any evidence of harm. Indeed, extensive research demonstrates that manageable levels of normative stress provide opportunities for young children to develop their own capacities to cope with adversity, particularly when adults provide the supportive “scaffolding” necessary to help build

those adaptive skills over time. It is also important to recognize that normative child-rearing beliefs and practices vary considerably across and within cultures with respect to what might be considered a desirable or ideal amount of “serve and return” interaction between young children and adults.

Given the dangers of both over- and under-identification of “inadequate” caregiving, the time has come to leverage advances in science to inform a fundamental re-examination of our approaches to the identification, prevention, reduction, and mitigation of neglect and its consequences, particularly in the early years of life. The principal question facing policymakers and practitioners is clear: How can the decisions we make ensure that all young children receive the benefits of the caring and responsive relationships they need to develop in a healthy way?

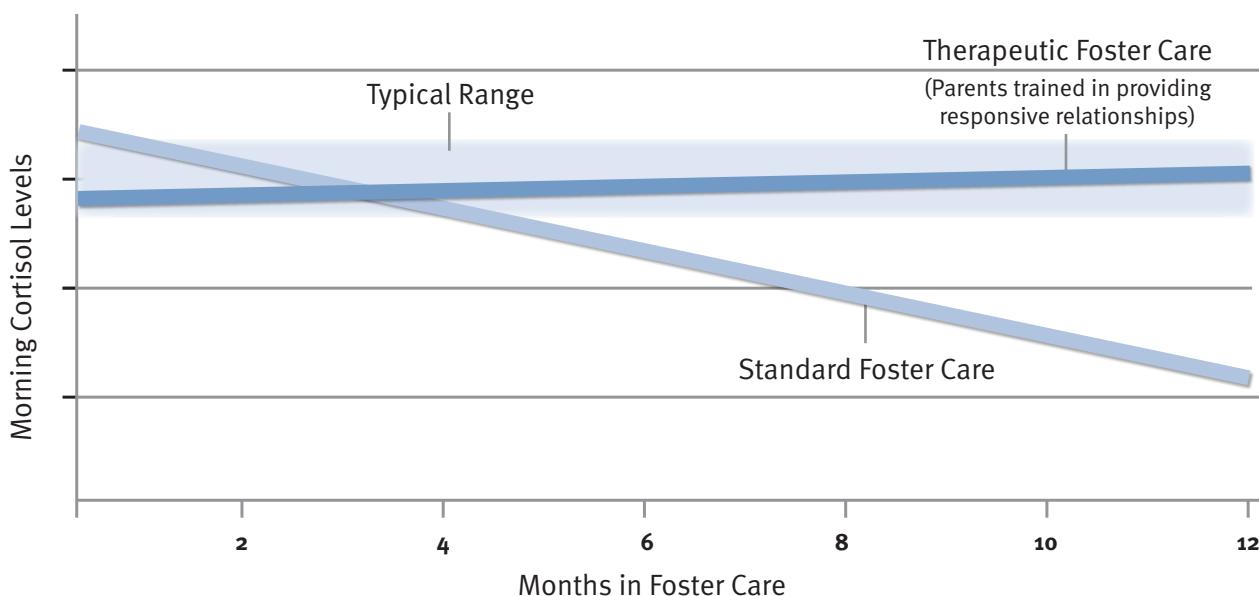
**There is a compelling need to re-assess the allocation of resources to and within the child welfare system, and to invest more in the development and implementation of evidence-based programs specifically designed to address the distinctive**

**needs of children who are experiencing significant neglect.** Given the limited public attention focused on problems that result from deprivation, it is not surprising that so few financial and programmatic resources are directed toward addressing this costly societal problem. That said, the immediate circumstances and long-term prospects of neglected children could be enhanced significantly by several critical actions. These include (1) dissemination of new scientific findings to child welfare professionals; (2) collaboration between child development researchers and service providers to develop more effective prevention and intervention strategies; (3) coordination across policy and service sectors to identify vulnerable children and families as early as possible; and (4) cooperation among policymakers, family court judges, and practitioners to improve access to non-stigmatizing, community-based services. Greater societal benefits would also be realized if we moved beyond

a narrow focus on children whose parents are struggling with significant social and economic hardship and directed more attention to the threat of neglect in families across the socio-economic spectrum, such as in circumstances where parents are overwhelmed by chronic psychological or medical conditions. To this end, the types of deprivation described in this paper help to identify potentially neglecting environments that are less likely to be brought to the attention of child welfare professionals.

**The long-term, neurobiological and developmental consequences of the most serious conditions of deprivation underscore the need for prevention programs as early as possible.** Powerful and robust findings from developmental science suggest that the sooner neglected children receive appropriate intervention, the less likely they are to demonstrate long-term, adverse effects. It is therefore critical that key personnel

## Supportive Relationships Restore Disrupted Stress Response



Children in the child welfare system, many suffering from serious neglect, can see dramatic improvements in stress response with the provision of supportive relationships. Without such relationships, children in this study who received standard foster care showed suppressed levels of the stress hormone cortisol, which worsened the longer they were in foster care. Foster parents trained to provide responsive relationships through the Multidimensional Treatment Foster Care for Preschoolers intervention (see sidebar on page 12) were able to restore foster children's stress hormones to typical levels, as measured in a control group of children from the same community who were not in foster care.

Source: Fisher, et al. (2007)<sup>96</sup>

# Promising Intervention Models

*Three promising intervention models (among others) for children who have experienced significant neglect and other forms of maltreatment have demonstrated effectiveness on a variety of measures.*

## Attachment and Biobehavioral Catch-Up (ABC) Intervention

This short-term intervention, developed by Mary Dozier at the Infant Caregiver Lab at the University of Delaware, is designed to improve attachment regulation and bio-behavioral regulation in children who have experienced abuse and neglect.

### TARGET POPULATION

Infants and toddlers placed in foster care, relative care, or living with their birth parents.

### PROGRAM GOALS AND INTERVENTION STRATEGIES

Strengthen parents' or caregivers' sensitivity and responsiveness to an infant's cues and help them provide an environment in which they are able to foster a young child's regulatory abilities.

### EVIDENCE FOR EFFECTIVENESS

Young children who received the ABC intervention developed more secure attachments to their caregivers more frequently,<sup>92</sup> showed more normative patterns of cortisol production (indicative of improved stress regulation),<sup>93,98</sup> and demonstrated better behavioral regulation<sup>93</sup> than children who received a control intervention.

## Child-Parent Psychotherapy (CPP)

This treatment model, developed by Alicia Lieberman and Patricia Van Horn at the University of California San Francisco (UCSF) Child Trauma Research Program, is designed to improve social-emotional, behavioral, and cognitive functioning in children exposed to interpersonal violence and other traumatic events.

### TARGET POPULATION

Children aged 0-5 who experience mental health, attachment, and/or behavioral problems as a result of traumatic events.

### PROGRAM GOALS AND INTERVENTION STRATEGIES

Repair the rupture of trust in the parent-child relationship following trauma by enhancing the parent's capacity to protect the child and helping the child to regain a sense of safety in the relationship with the parent. Treatment also focuses on contextual factors that may affect the parent-child relationship, such as cultural norms and socioeconomic and immigration-related stressors.

### EVIDENCE FOR EFFECTIVENESS

CPP is listed as an evidence-based treatment in the SAMHSA National Register of Evidence-Based Practices and Programs, with five randomized studies documenting CPP efficacy. After CPP treatment, relative to control groups, anxiously attached toddlers of recent immigrant Latina mothers showed improvements in attachment and their mothers showed increased responsiveness;<sup>114</sup> children who witnessed domestic violence showed greater reductions in behavior problems and traumatic stress symptoms;<sup>115,116,117</sup> the rate of secure attachment in maltreated infants improved significantly;<sup>118</sup> maltreated preschoolers showed better self-esteem and attitude towards the mother;<sup>119</sup> and toddlers of depressed mothers showed more secure attachment and improved cognitive functioning.<sup>120,121,122</sup>

## Multidimensional Treatment Foster Care for Preschoolers

This early intervention service model, developed by Phil Fisher at the Oregon Social Learning Center, is designed to promote healthy self-regulation, positive relationships with caregivers and peers, and enhanced school readiness in vulnerable young children.

### TARGET POPULATION

Three- to six-year-old children in foster care, many of whom have histories of neglect.

### PROGRAM GOALS AND INTERVENTION STRATEGIES

Help caregivers provide and maintain a positive, responsive, and consistent environment for young children through the use of concrete encouragement to reinforce positive behaviors and effective limit-setting to reduce problematic behaviors. Children also receive additional support through behavioral therapy in a preschool setting and participate in a weekly playgroup that promotes positive socialization.

### EVIDENCE FOR EFFECTIVENESS

Preschoolers in the MTFC-P program showed improvements in attachment-related behaviors,<sup>95</sup> fewer behavior problems, and improved cortisol rhythms,<sup>96,99</sup> when compared with children who received a control intervention.

in the medical, child welfare, mental health, and legal systems are educated about this new science and organized to work collaboratively to assure the earliest possible identification of families that require preventive assistance as well as children who need therapeutic intervention. State responses to the federal Title IV-E waiver guidelines issued in 2012, focusing on child well-being and trauma-informed practice, offer a promising opportunity to address this need. Moreover, because child neglect often co-occurs with other family problems (particularly parental mental health disorders, such as depression and addictions to alcohol and drugs), effective intervention will require specialized services to address a variety of adult medical, economic, and social needs. Programs that serve adults facing serious challenges such as these—even those that don't specifically focus on children—can have a significant impact on child outcomes by building caregiver capacities and family resources that

prevent deprivation from occurring in the first place.

**Measuring the economic benefits of interventions that improve life outcomes for young children who experience significant neglect or chronic understimulation would provide important data to justify and guide enhanced resource allocation.** Much of the public discourse about economic returns on investment in the early childhood years is focused on the benefits of early care and education programs that generate long-term savings by reducing the societal costs of special education and incarceration, while increasing economic productivity. A rich and growing evidence base on the adverse impacts of serious deprivation on lifelong learning, behavior, and both physical and mental health suggests that the economic benefits of greater attention to this under-addressed problem in the early years could be substantial and thus justify targeted investments in both prevention and early intervention.

## References

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1. Field, T. (1994). The effects of mother's physical and emotional unavailability on emotion regulation. *Monographs of the Society for Research in Child Development*, 59(2-3), 208-227.
2. Hofer, M. A. (1994). Hidden regulators in attachment, separation, and loss: The development of emotion regulation: Biological and behavioral considerations. *Monographs of the Society for Research in Child Development*, 59(2-3), 192-207.
3. Shonkoff, J. & Phillips, D. (Eds.). (2000). *From Neurons to Neighborhoods: The Science of Early Childhood Development*. Committee on Integrating the Science of Early Childhood Development, National Research Council and Institute of Medicine. Washington, DC: National Academy Press.
4. National Scientific Council on the Developing Child. (2004). *Young Children Develop in an Environment of Relationships: Working Paper 1*. <http://www.developingchild.harvard.edu>
5. National Scientific Council on the Developing Child. (2007). *The Timing and Quality of Early Experiences Combine to Shape Brain Architecture: Working Paper 5*. <http://www.developingchild.harvard.edu>
6. Center on the Developing Child at Harvard University. (2010). *The Foundations of Lifelong Health Are Built in Early Childhood*. <http://www.developingchild.harvard.edu>
7. U.S. Department of Health and Human Services, Administration for Children and Families, & Child Welfare Information Gateway. (2008). *What is child abuse and neglect?* <http://www.childwelfare.gov/pubs/factsheets/whatisca.pdf>
8. CAPTA Reauthorization Act of 2010 (P. L. 111-320). (2010). <http://www.gpo.gov/fdsys/pkg/BILLS-111s3817enr.pdf>
9. Bruce, J., Fisher, P. A., Pears, K. C., & Levine, S. (2009). Morning cortisol levels in preschool-aged foster children: Differential effects of maltreatment type. *Developmental Psychobiology*, 51(1), 14-23.
10. Egeland, B., Sroufe, A., & Erickson, M. (1983). The developmental consequence of different patterns of maltreatment. *Child Abuse & Neglect*, 7(4), 459-469.
11. Pollak, S. D., Cicchetti, D., Hornung, K., & Reed, A. (2000). Recognizing emotion in faces: Developmental effects of child abuse and neglect. *Developmental Psychology*, 36(5), 679-688.
12. Provence, S. & Lipton, R. (1962). *Infants in Institutions*. New York: International Universities Press.
13. Erickson, M., & Egeland, B. (1996). Child neglect. In J. Briere, L. Berliner, J. A. Bulkley, C. Jenny, T. Reid, (Eds.), *The APSAC handbook on child maltreatment* (pp. 4-20). Thousand Oaks, CA: Sage Publications, Inc.
14. Eluvathingal, T. J., Chugani, H. T., Behen, M. E., Juhasz, C., Muzik, O., Maqbool, M., ... & Makki, M. (2006). Abnormal brain connectivity in children after early severe socioemotional deprivation: A diffusion tensor imaging study. *Pediatrics*, 117(6), 2093-2100.
15. Marshall, P. J., Fox, N. A. & the BEIP Core Group. (2004). A comparison of the electroencephalogram between institutionalized and community children in Romania. *Journal of Cognitive Neuroscience*, 16(8), 1327-1338.
16. Parker, S. W., Nelson, C. A., & the BEIP Core Group. (2005a). An event-related potential study of the impact

- of institutional rearing on face recognitions. *Development and Psychopathology*, 17(3), 621-639.
17. Parker, S. W., Nelson, C. A. & the BEIP Core Group. (2005b). The impact of early institutional rearing on the ability to discriminate facial expressions of emotion: An event-related potential study. *Child Development*, 76(1), 54-72.
  18. Tarullo, A., Garvin, M. C., & Gunnar, M. (2011). Atypical EEG power correlates with indiscriminately friendly behavior in internationally adopted children. *Developmental Psychology*, 47(2), 417-431.
  19. De Bellis, M. D. (2005). The psychobiology of neglect. *Child Maltreatment*, 10(2), 150-172.
  20. Minty, B., & Pattinson, G. (1994). The nature of child neglect. *British Journal of Social Work*, 24(6), 733-747.
  21. Wolock, I., & Horowitz, B. (1984). Child maltreatment as a social problem: The neglect of neglect. *American Journal of Orthopsychiatry*, 54(4), 530-543.
  22. Erickson, M. F., & Egeland, B. (2002). Child neglect. In J. E. B. Myers, L. Berliner, J. Briere, C. T. Hendrix, C. Jenny, & T. A. Reid (Eds.), *The APSAC handbook on child maltreatment* (2nd ed., pp. 3-20). Thousand Oaks, CA: Sage Publications, Inc.
  23. U.S. Department of Health and Human Services, Administration for Children and Families, Administration on Children, Youth and Families, & Children's Bureau. (2011). *Child Maltreatment 2010*. <http://archive.acf.hhs.gov/programs/cb/pubs/cm10/cm10.pdf>
  24. Kaufman, J., Jones, B., Stieglitz, E., Vitulano, L. & Mannarino, A. (1994). The use of multiple informants to assess children's maltreatment experiences. *Journal of Family Violence*, 9(3), 227-248.
  25. Levy, H. B., Markovic, J., Chaudry, U., Ahart, S., & Torres, H. (1995). Re-abuse rates in a sample of children followed for 5 years after discharge from a child abuse inpatient assessment program. *Child Abuse & Neglect*, 19(11), 1363-1377.
  26. Pears, K. C., Kim, H. K., & Fisher, P. A. (2008). Psychosocial and cognitive functioning of children with specific profiles of maltreatment. *Child Abuse & Neglect*, 32(10), 958-971.
  27. Tronick, E. Z., & Gianino, A. (1986). Interactive mismatch and repair: Challenges to the coping infant. *Zero To Three*, 6(3), 1-6.
  28. Jones-Harden, B. (2002). Congregate care for infants and toddlers: Shedding new light on an old question. *Infant Mental Health Journal*, 23(5), 476-495.
  29. Barry, R. J., Clarke, A. R., & Johnstone, S. J. (2003). A review of electrophysiology in attention-deficit/hyperactivity disorder: I. Qualitative and quantitative electroencephalography. *Clinical Neurophysiology*, 114(2), 171-183.
  30. Wismer-Fries, A. B., & Pollak, S. D. (2004). Emotion understanding in post institutionalized Eastern European children. *Developmental Psychopathology*, 16(2), 355-369.
  31. Sheridan, M. S., Fox, N. A., Zeanah, C. H., McLaughlin, K., and Nelson, C. A. (2012). Variation in neural development as a result of exposure to institutionalization early in childhood. *Proceedings of the National Academy of Sciences of the United States of America*, 109(32), 12927-12932.
  32. Center on the Developing Child at Harvard University. (2011). *Building the Brain's "Air Traffic Control" System: How Early Experiences Shape the Development of Executive Function: Working Paper 11*. <http://www.developingchild.harvard.edu>
  33. Edmiston, E., Wang, F., Mazure, C., Guiney, J., Sinha, R., Mayes, L., & Blumberg, H. (2011). Corticostratial-limbic gray matter morphology in adolescents with self-reported exposure to childhood maltreatment. *Archives of Pediatric and Adolescent Medicine*, 165(12), 1069-1077.
  34. Frodl, T., Reinhold, E., Koutsouleris, N., Reiser, M., & Meisenzahl, E. M. (2010). Interaction of childhood stress with hippocampus and prefrontal cortex volume reduction in major depression. *Journal of Psychiatric Research*, 44(13), 799-807.
  35. Maheu, F. S., Dozier, M., Guyer, A. E., Mandell, D., Peloso, E., Poeth, K., ... & Ernst, M. (2010). A preliminary study of medial temporal lobe function in youths with a history of caregiver deprivation and emotional neglect. *Cognitive Affective and Behavioral Neuroscience*, 10(1), 34-49.
  36. Mehta, M. A., Golembio, N. I., Nosarti, C., Colvert, E., Mota, A., Williams, S. C. R., ... & Sonuga-Barke, E. J. S. (2009). Amygdala, hippocampal and corpus callosum size following severe early institutional deprivation: the English and Romanian adoptees study pilot. *Journal of Child Psychology and Psychiatry*, 50(8), 943-951.
  37. Tottenham, N., Hare, T. A., Quinn, B. T., McCarry, T. W., Nurse, M., Gilhooly, T., & ... Casey, B. J. (2010). Prolonged institutional rearing is associated with atypically large amygdala volume and emotion regulation difficulties. *Developmental Science*, 13(1), 46-61.
  38. Tottenham, N., Hare, T., Millner, A., Gilhooly, T., Zevin, J. D., & Casey, B.J. (2011). Elevated amygdala response to faces following early deprivation. *Developmental Science*, 14(2), 190-204.
  39. Mueller, S., Maheu, F., Dozier, M., Peloso, E., Mandell, D., Leibenluft, E., ... & Ernst, M. (2010). Early-life stress is associated with impairment in cognitive control in adolescence: an fMRI study. *Neuropsychologia*, 48(10), 3037-3044.
  40. Gunnar, M. R., Frenn, K., Wewerka, S. S., & Van Ryzin, M. J. (2009). Moderate versus severe early life stress: Associations with stress reactivity and regulation in 10-12-year-old children. *Psychoneuroendocrinology*, 34(1), 62-75.
  41. Dozier, M., Manni, M., Gordon, M. K., Peloso, E., Gunnar, M. R., Stovall-McClough, K., ... & Levine, S. (2006). Foster children's diurnal production of cortisol: An exploratory study. *Child Maltreatment*, 11(2), 189-197.
  42. Carlson, M., & Earls, F. (1997). Psychological and neuroendocrinological sequelae of early social deprivation in institutionalized children in Romania. In C. Carter, I. Lederhendler, & B. Kirkpatrick (Eds.), *The Integrative Neurobiology of Affiliation* (pp. 419-428). New York: New York Academy of Sciences.
  43. Brunson, K. L., Grigoriadis, D. E., Lorang, M. T., & Baram, T. Z. (2002) Corticotropin-releasing hormone (CRH) downregulates the function of its receptor (CRF1) and induces CRF1 expression in hippocampal and cortical regions of the immature rat brain. *Experimental Neurology*, 176(1), 75-86.
  44. Strathearn, L., Gray, P. H., O'Callaghan, F., & Wood, D. O. (2001). Childhood neglect and cognitive development in extremely low birth weight infants: A prospective study. *Pediatrics*, 108(1), 142-151.
  45. Johnson, D. E., & Gunnar, M. R. (2011), IV. Growth failure in institutionalized children. *Monographs of the Society for Research in Child Development*, 76(4), 92-126.
  46. Macovei, O. (1986). *The Medical and Social Problems of the Handicapped in Children's Institutions in Iasi Bucharest, Romania*. Bucharest, Romania: Institutul de Igiena si Sanatate Publica.

47. Miller, L. C., Kiernan, M. T., Mathers, M. I., & Klein-Gitelman, M. (1995). Developmental and nutritional status of internationally adopted children. *Archives of Pediatrics & Adolescent Medicine*, 149(1), 40-44.
48. McEwen, B. S., Biron, C. A., Brunson, K. W., Bulloch, K., Chambers, W.H., Dhabhar, F. S., ...& Weiss, J. M. (1997). Neural-endocrine-immune interactions: the role of adrenocorticoids as modulators of immune function in health and disease. *Brain Research Review*, 23(1-2), 79-133.
49. Bakermans-Kranenburg, M.J. Steele, H., Zeanah, C. H., Muhamedrahimov, R. J., Vorria, P., Dobrova-Krol, N. A., Steele, M., van IJzendoorn, M. H., Juffer, F., & Gunnar, M. R. (2011). III. Attachment and emotional development in institutional care: Characteristics and catch-up. *Monographs of the Society for Research in Child Development*, 76(4), 62-91.
50. Carlson, V., Cicchetti, D., Barnett, D., & Braunwald, K. (1989). Disorganized/disoriented attachment relationships in maltreated infants. *Developmental Psychology*, 25(4), 525-531.
51. Crittenden, P. M., & Ainsworth, M. D. S. (1989). Child maltreatment and attachment theory. In D. Cicchetti & V. Carlson (Eds.), *Child maltreatment: Theory and research on the causes and consequences of child abuse and neglect* (pp. 432-464). New York: Cambridge University Press.
52. Egeland, B., & Sroufe, L. (1981). Attachment and early maltreatment. *Child Development*, 52(1), 44-52.
53. Hesse, E., & Main, M. (2000). Disorganized infant, child, and adult attachment: Collapse in behavioral and attentional strategies. *Journal of the American Psychoanalytic Association*, 48(4), 1097-1127.
54. Lyons-Ruth, K., Connell, D. B., Grunebaum, H. U., & Botein, S. (1990). Infants at social risk: Maternal depression and family support services as mediators of infant development and security of attachment. *Child Development*, 61(1), 85-98.
55. Camras, L. A., & Rappaport, S. (1993). Conflict behaviors of maltreated and nonmaltreated children. *Child Abuse & Neglect*, 17(4), 455-464.
56. Erickson, M., Egeland, B., & Pianta, R. (1989). The effects of maltreatment on the development of young children. In D. Cicchetti & V. Carlson (Eds.), *Child maltreatment: Theory and research on the causes and consequences of child abuse and neglect* (pp. 647-684). New York: Cambridge University Press.
57. Hoffman-Plotkin, D., & Twentyman, C. T. (1984). A multimodal assessment of behavioral and cognitive deficits in abused and neglected preschoolers. *Child Development*, 55(3), 794-802.
58. Bolger, K. E., Patterson, C. J., & Kupersmidt, J. B. (1998). Peer relationships and self-esteem among children who have been maltreated. *Child Development*, 69(4), 1171-1197.
59. Kaufman, J., & Cicchetti, D. (1989). Effects of maltreatment on school-age children's socioemotional development: Assessments in a day-camp setting. *Developmental Psychology*, 25(4), 516-524.
60. Manly, J., Kim, J. E., Rogosch, F. A., & Cicchetti, D. (2001). Dimensions of child maltreatment and children's adjustment: Contributions of developmental timing and subtype. *Development and Psychopathology*, 13(4), 759-782.
61. Chapple, C. L., Tyler, K. A., & Bersani, B. E. (2005). Child neglect and adolescent violence: Examining the effects of self-control and peer rejection. *Violence and Victims*, 20, 39-54.
62. Crittenden, P. M., & DiLalla, D. L. (1988). Compulsive compliance: The development of an inhibitory coping strategy in infancy. *Journal of Abnormal Child Psychology*, 16(5), 585-599.
63. Koenig, A. L., Cicchetti, D., & Rogosch, F. A. (2000). Child compliance/noncompliance and maternal contributors to internalization in maltreating and non-maltreating dyads. *Child Development*, 71(4), 1018-1032.
64. Vorria, P., Papaligoura, Z., Sarafidou, J., Kopakaki, M., Dunn, J., van IJzendoorn, M.H., & Kontopoulou, A. (2006). The development of adopted children after institutional care: A follow-up study. *Journal of Child Psychology and Psychiatry*, 47(12), 1246-1253.
65. Johnson, J. J., Smailes, E. M., Cohen, P., Brown, J., & Bernstein, D. P. (2000). Associations between four types of childhood neglect and personality disorder symptoms during adolescence and early adulthood: Findings of a community-based longitudinal study. *Journal of Personality Disorders*, 14(2), 171-187.
66. Toth, S. L., Cicchetti, D., Macfie, J., & Emde, R. N. (1997). Representations of self and other in the narratives of neglected, physically abused, and sexually abused preschoolers. *Development and Psychopathology*, 9(4), 781-796.
67. Toth, S. L., Cicchetti, D., Macfie, J., Maughan, A., & Vanmeenen, K. (2000). Narrative representations of caregivers and self in maltreated preschoolers. *Attachment & Human Development*, 2, 271-305.
68. Waldfinger, R. J., Toth, S. L., & Gerber, A. (2001). Maltreatment and internal representations of relationships: Core relationship themes in the narratives of abused and neglected preschoolers. *Social Development*, 10, 41-58.
69. Ogawa, J. R., Sroufe, L., Weinfield, N. S., Carlson, E. A., & Egeland, B. (1997). Development and the fragmented self: Longitudinal study of dissociative symptomatology in a nonclinical sample. *Development and Psychopathology*, 9(4), 855-879.
70. Spertus, I., Yehuda, R., Wong, C., Halligan, S., & Seremetis, S. (2003). Childhood emotional abuse and neglect as predictors of psychological and physical symptoms in women presenting to a primary care practice. *Child Abuse and Neglect*, 27(11), 1247-1258.
71. Widom, C. S. (1989). The cycle of violence. *Science*, 244(4901), 160-166.
72. Luntz, B. K., & Widom, C. (1994). Antisocial personality disorder in abused and neglected children grown up. *The American Journal of Psychiatry*, 151(5), 670-674.
73. Maxfield, M. G., & Widom, C. S. (1996). The cycle of violence: Revisited six years later. *Archives of Pediatrics & Adolescent Medicine*, 150(4), 390-395.
74. Nelson, C., Zeanah, C. H., Fox, N. A., Marshall, P. J., Smyke, A. T., & Guthrie, D. (2007). Cognitive recovery in socially deprived young children: The Bucharest Early Intervention Project. *Science*, 318, 1937-1940.
75. Pears, K. & Fisher, P.A. (2005). Developmental, cognitive, and neuropsychological functioning in preschool-aged foster children: Associations with prior maltreatment and placement history. *Journal of Developmental & Behavioral Pediatrics*, 26(2), 112-122.
76. Smyke, A. T., Koga, S. E., Johnson, D. E., Fox, N. A., Marshall, P. J., Nelson, C. A., ... & Group, B. C. (2007). The caregiving context in institution-reared and family-reared infants and toddlers in Romania. *Journal of Child Psychology & Psychiatry*, 48(2), 210-218.
77. Loman, M., Wiik, K., Frenn, K., Pollak, S., & Gunnar, M. (2009). Postinstitutionalized children's development:

- Growth, cognitive, and language outcomes. *Journal of Development and Behavioral Pediatrics*, 30(5), 426–434.
78. Beckett, C., Maughan, B., Rutter, M., Castle, J., Colvert, E., Groothues, C., ... & Sonuga-Barke, E. (2007). Scholastic attainment following severe early institutional deprivation: A study of children adopted from Romania. *Journal of Abnormal Child Psychology*, 35(6), 1063–1073.
  79. Allen, R. E., & Oliver, J. M. (1982). The effects of child maltreatment on language development. *Child Abuse & Neglect*, 6(3), 299–305.
  80. Culp, R. E., Watkins, R. V., Lawrence, H., Letts, D., Kelly, D. J., & Rice, M. L. (1991). Maltreated children's language and speech development: abused, neglected, and abused and neglected. *First Language*, 11(33), 377–389.
  81. Gowan, J. (1993). *Effects of neglect on the early development of children: Final report*. Washington, D. C.: National Clearinghouse on Child Abuse and Neglect, Administration for Children & Families.
  82. Eckenrode, J., Laird, M., & Doris, J. (1993). School performance and disciplinary problems among abused and neglected children. *Developmental Psychology*, 29, 53–62.
  83. Egeland, B. (1991). A longitudinal study of high risk families: Issues and findings. In R. Starr & D. A. Wolfe (Eds.), *The effects of child abuse and neglect* (pp. 33–56). New York: Guilford Press.
  84. Wodarski, J. S., Kurtz, P. D., Gaudin, J. M., & Howing, P. T. (1990). Maltreatment and the school-aged child: Major academic, socioemotional, and adaptive outcomes. *Social Work*, 35(6), 506–513.
  85. Perez, C. M., & Widom, C. (1994). Childhood victimization and long-term intellectual and academic outcomes. *Child Abuse & Neglect*, 18(8), 617–633.
  86. Pears, K., Bruce, J., Fisher, P., & Kim, H. (2010). Indiscriminate friendliness in maltreated foster children. *Child Maltreatment*, 15, 64–75.
  87. Kreppner, J. M., O'Connor, T. G., Rutter, M., & English and Romanian Adoptees Study Team. (2001). Can inattention/overactivity be an institutional deprivation syndrome? *Journal of Abnormal Child Psychology*, 29(6), 513–528.
  88. Bos, K. J., Fox, N., Zeanah, C. H., & Nelson, C. (2009). Effects of early psychosocial deprivation on the development of memory and executive function. *Frontiers In Behavioral Neuroscience*, 3, 16.
  89. Pollak, S. D., Nelson, C. A., Schlaak, M. F., Roeber, B. J., Wewerka, S. S., Wiik, K. L., ... & Gunnar, M. R. (2010). Neurodevelopmental effects of early deprivation in post-institutionalized children. *Child Development*, 81, 224–236.
  90. McDermott, J., Westerlund, A., Zeanah, C. H., Nelson, C.A., & Fox, N.A. (2012). Early adversity and neural correlates of executive function: Implications for academic adjustment. *Developmental Cognitive Neuroscience*, 2, S55–66.
  91. Pine, D. S., Mogg, K., Bradley, B. P., Montgomery, L., Monk, C. S., McClure, E., ... & Kaufman, J. (2005). Attention bias to threat in maltreated children: Implications for vulnerability to stress-related psychopathology. *The American Journal Of Psychiatry*, 162(2), 291–296.
  92. Dozier, M., Lindhjem, O., Lewis, E., Bick, J., Bernard, K., & Peloso, E. (2009). Effects of a foster parent training program on young children's attachment behaviors: Preliminary evidence from a randomized clinical trial. *Child & Adolescent Social Work Journal*, 26(4), 321–332.
  93. Dozier, M., Peloso, E., Lindhjem, O., Gordon, M., Manni, M., Sepulveda, S., ... & Levine, S. (2006). Developing evidence-based interventions for foster children: An example of a randomized clinical trial with infants and toddlers. *Journal of Social Issues*, 62(4), 767–785.
  94. Fisher, P. A., Gunnar, M. R., Chamberlain, P., & Reid, J. B. (2000). Preventive intervention for maltreated preschool children: Impact on children's behavior, neuroendocrine activity, and foster parent functioning. *Journal of the American Academy of Child & Adolescent Psychiatry*, 39(11), 1356–1364.
  95. Fisher, P. A., & Kim, H. K. (2007). Intervention effects on foster preschoolers' attachment-related behaviors from a randomized trial. *Prevention Science*, 8(2), 161–170.
  96. Fisher, P. A., Stoolmiller, M., Gunnar, M. R., & Burraston, B. O. (2007). Effects of a therapeutic intervention for foster preschoolers on diurnal cortisol activity. *Psychoneuroendocrinology*, 32(8–10), 892–905.
  97. Bernard, K., Dozier, M., Bick, J., Lewis, E., Lindhjem, O., & Carlson, E. (2012). Enhancing attachment organization among maltreated children: Results of a randomized clinical trial. *Child Development*, 83(2), 623–636.
  98. Dozier, M., Peloso, E., Lewis, E., Laurenceau, J., & Levine, S. (2008). Effects of an attachment-based intervention of the cortisol production of infants and toddlers in foster care. *Development and Psychopathology*, 20(3), 845–859.
  99. Fisher, P. A., Gunnar, M., Dozier, M., Bruce, J., & Pears, K. C. (2006). Effects of a therapeutic intervention for foster children on behavior problems, caregiver attachment, and stress regulatory neural systems. *Annals of the New York Academy of Sciences*, 1094, 215–225.
  100. Moulson, M. C., Fox, N. A., Zeanah, C. H., & Nelson, C. A. (2009). Early adverse experiences and the neurobiology of facial emotion processing. *Developmental Psychology*, 45(1), 17–30.
  101. Vanderwert, R. E., Marshall, P. J., Nelson, C., Zeanah, C. H., & Fox, N. A. (2010). Timing of intervention affects brain electrical activity in children exposed to severe psychosocial neglect. *PLoS ONE*, 5(7), e11415.
  102. Colvert, E., Rutter, M., Kreppner, J., Beckett, C., Castle, J., Groothues, C., ... & Sonuga-Barke, E. S. (2008). Do theory of mind and executive function deficits underlie the adverse outcomes associated with profound early deprivation? Findings from the English and Romanian adoptees study. *Journal of Abnormal Child Psychology*, 36(7), 1057–1068.
  103. Van IJzendoorn, M.H. & Juffer, F. (2006). The Emanuel Miller Memorial Lecture 2006: Adoption as intervention. Meta-analytic evidence for massive catch-up and plasticity in physical, socio-emotional, and cognitive development. *Journal of Child Psychology and Psychiatry*, 47(12), 1228–1245.
  104. Marshall, P. J., Reeb, B. C., Fox, N. A., Nelson, C., & Zeanah, C. H. (2008). Effects of early intervention on EEG power and coherence in previously institutionalized children in Romania. *Development and Psychopathology*, 20(3), 861–880.
  105. Gunnar, M., Morison, S. J., Chisholm, K., & Schuder, M. (2001). Salivary cortisol levels in children adopted from Romanian orphanages. *Development and Psychopathology*, 13(3), 611–628.
  106. Hodges, J., & Tizard, B. (1989). IQ and behavioural adjustment of ex-institutional adolescents. *Journal of Child Psychology and Psychiatry*, 30, 53–75.
  107. Kreppner, J., Kumsta, R., Rutter, M., Beckett, C., Castle, J., Stevens, S. & Sonuga-Barke, E. J. (2010). IV. Developmental course of deprivation-specific

- psychological patterns: Early manifestations, persistence to age 15, and clinical features. *Monographs of the Society for Research in Child Development*, 75, 79–101.
108. Rutter, M. and the English and Romanian Adoptees (ERA) study team. (1998). Developmental catch-up, and deficit, following adoption after severe global early privation. *Journal of Child Psychology and Psychiatry*, 39(4), 465-476.
109. Verhulst, F. C., Althaus, M., & Versluis-den Bieman, H. J. (1990). Problem behavior in international adoptees: II. Age at placement. *Journal of the American Academy of Child and Adolescent Psychiatry*, 29(1), 104-111.
110. Verhulst, F. C., Althaus, M., & Versluis-den Bieman, H. J. (1992). Damaging backgrounds: Later adjustment of international adoptees. *Journal of the American Academy of Child and Adolescent Psychiatry*, 31(3), 518-524.
111. Rutter, M., Beckett, C., Castle, J., Colvert, E., Kreppner, J., Mehta, M., ... & Sonuga-Barke, E. (2007). Effects of profound early institutional deprivation: An overview of findings from a UK longitudinal study of Romanian adoptees. *European Journal of Developmental Psychology*, 4(3), 332-350.
112. Bruce, J., McDermott, J. M., Fisher, P. A., & Fox, N. A. (2009). Using behavioral and electrophysiological measures to assess the effects of a preventive intervention: A preliminary study with preschool-aged foster children. *Prevention Science*, 10(2), 129-140.
113. Fisher, P. A., & Stoolmiller, M. (2008). Intervention effects on foster parent stress: Associations with child cortisol levels. *Development and Psychopathology*, 20(3), 1003-1021.
114. Lieberman, A.F., Weston, D. R., & Pawl, J. H. (1991). Preventive intervention and outcome with anxiously attached dyads. *Child Development*, 62(1), 199-209.
115. Lieberman, A.F., Van Horn, P.J., & Ghosh Ippen, C. (2005). Toward evidence-based treatment: Child-Parent Psychotherapy with preschoolers exposed to marital violence. *Journal of the American Academy of Child and Adolescent Psychiatry*, 44(12), 1241-1248.
116. Lieberman, A.F., Ghosh Ippen, C., Van Horn, P.J. (2006). Child-Parent Psychotherapy: Six month follow-up of a randomized control trial. *Journal of the American Academy of Child and Adolescent Psychiatry*, 45(8), 913-918.
117. Ghosh Ippen, C., Harris, W.W., Van Horn, P., & Lieberman, A.F. (2011). Traumatic and stressful events in early childhood: Can treatment help those at highest risk? *Child Abuse and Neglect*, 35(7), 504-513.
118. Cicchetti, D., Rogosch, F.A., & Toth, S.L. (2006). Fostering secure attachment in infant in maltreating families through preventive interventions. *Development and Psychopathology*, 18(3), 623-649.
119. Toth S.L., Maughan A., Manly J.T., Spagnola M., Cicchetti D. (2002). The relative efficacy of two interventions in altering maltreated preschool children's representational models: Implications for attachment theory. *Developmental Psychopathology*, 14(4), 877-908.
120. Cicchetti D., Toth S.L., Rogosch F.A. (1999). The efficacy of toddler-parent psychotherapy to increase attachment security in offspring of depressed mothers. *Attachment and Human Development*, 1(1), 34-66.
121. Cicchetti, D., Rogosch, F.A., & Toth, S.L. (2000). The efficacy of Toddler-Parent Psychotherapy for fostering cognitive development in offspring. *Journal of Abnormal Child Psychology*, 28(2), 135-148.
122. Toth, S. L., Rogosch, F. A., & Cicchetti, D. (2006). The efficacy of Toddler-Parent Psychotherapy to reorganize attachment in the young offspring of mothers with major depressive disorder: A randomized preventive trial. *Journal of Consulting and Clinical Psychology*, 74(6), 1006-1016.

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