

CHAPTER 14

Neglect

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Neglect, the most prevalent form of child maltreatment, is often chronic in nature, pervasive in impact and, unfortunately, common both globally and in the United States. Of the more than 6 million children reported to child welfare agencies in the United States, over 75% of identified victims were classified as neglected (U.S. Department of Health and Human Services, 2016). Yet despite its predominance among the forms of maltreatment experienced by children, we know the least about neglect (Stoltenborgh, Bakermans-Kranenburg, & van IJzendoorn, 2013; Zuravin, 1999). In this chapter, we discuss the importance of neglect in early life and describe methodological challenges that have hampered our knowledge of this form of maltreatment. We also discuss our knowledge of the causes and consequences of neglect, the potential for prevention and intervention, and promising next steps in the study of neglect.

Across mammalian species, a caregiver (often the mother) is responsible for caring for and protecting offspring. Physical proximity to one's caregiver is necessary for survival; human infants are completely dependent on their caregivers for their safety and sustenance. Not only do caregivers physically protect their offspring, but they are also the primary gatekeepers for

the infant's experience with the world. In fact, the attachment relationship serves as the primary experience-dependent feature of the child's early life (Bowlby, 1982); the caregiver is responsible for providing stimulation to the infant in every domain (e.g., physical, cognitive, emotional) necessary for the infant to learn about the world. Indeed, there is no period in human development during which needs are higher than they are in infancy.

From a neural perspective, "synaptogenesis," the process by which neurons connect to one another, occurs rapidly during the first years of life (Lexmond & Reeves, 2009). This period of rapid change provides both opportunities and vulnerabilities for the developing brain. Environmental input in early life sets the stage for neural connections throughout the lifespan; conversely, a lack of appropriate environmental stimulation reduces the number of neural connections, likely resulting in less effective learning and development. Specifically, a low level of appropriate environmental input can alter neurogenesis, cell migration, and synaptogenesis, and ultimately affect the neural functions that drive learning and behavior (De Bellis et al., 1999). It is clear, therefore, that neglect in infancy has profound effects (see Berens & Nelson, Chapter 3, this volume).

Much of what we know about neglect (often termed “maternal deprivation” in nonhuman animal research) and its impact comes from studies of rodents and nonhuman primates (Brett, Humphreys, Fleming, Kraemer, & Drury, 2015). In the earliest work on this topic, researchers found that laboratory rodents placed in an enriched environment performed better in terms of spatial processing and memory than did rodents in a standard and a comparatively deprived laboratory environment (Hebb, 1947). This demonstration was followed by a great deal of experimental research in which the environments of the animals were carefully controlled. Virtually all of these studies indicated that placing animals in “enriched” environments results in positive changes in the brain and in behavior (van Praag, Kempermann, & Gage, 2000), whereas removing infant animals from their mothers has negative consequences (Marco et al., 2015). In this context, therefore, it is not surprising that studies examining children who have been adopted from orphanages and placed into enriched environments (i.e., with families) have documented dramatic cognitive, linguistic, and emotional growth (Nelson, Fox, & Zeanah, 2014). Importantly, however, cross-species comparisons cannot provide the level of detail needed to understand naturally occurring variation in environmental input experienced by human infants and young children.

In fact, studies of children who experienced *severe* psychosocial deprivation in early life represent the majority of research on the effects of neglect in humans. Typically, these studies focus on children who experienced species-atypical caregiving environments, often due to institutional (i.e., orphanage) care. Institutional care is often characterized by high child-to-caregiver ratios, rotating staff, and highly routinized schedules. Consequently, children have little opportunity to form attachment relationships with caregivers and lack individualized attention. The consequences of neglect in the form of institutional care are severe and diffuse, affecting children’s cognitive, socioemotional, linguistic, motor, and physical growth. For nearly all outcomes, greater time in institutional care is associated with poorer outcomes, indicating a potential dose–response effect of neglect. Nonetheless, work from the Bucharest Early Intervention Project (BEIP) suggests that recovery from adverse effects of institutionalization is possible, a finding consistent with

results of the English and Romanian Adoptees Study (Rutter, Sonuga-Barke, & Castle, 2010). Supporting a sensitive period hypothesis, placing institutionalized children into enriched environments at earlier ages is associated with the best outcomes (Nelson et al., 2014).

Although findings of orphanage-based studies are valuable, a significant limitation of these investigations is that orphanage rearing does not represent species-typical variation in children’s experiences. Though these studies clearly document that extreme neglect is harmful, they provide little information about how variation in environmental input in typical caregiving situations (i.e., family-based care) is associated with outcomes of interest. The experience of institutional rearing differs from the experience of children neglected in their families, for whom attention from primary caregivers may be infrequent but occasionally valuable or sufficient in certain domains but lacking in others. Thus, to advance our knowledge of neglect, we must include in our studies participants who experience naturalistic variations in neglect–enrichment. A second limitation of orphanage-based studies is that nearly all investigations in which children experienced institutional care in early life are studies of recovery from deprivation following a profound improvement in care (e.g., adoption or transfer to high-quality foster care). These studies provide insight into how and when to intervene in cases in which dramatic changes in care are possible. Yet, in most situations, children do not experience dramatic shifts in their caregiving environments; indeed, children typically remain with the same caregivers in generally the same environmental circumstances, for better or worse, throughout their development.

Types of child maltreatment often co-occur; neglected children have two to three times the risk of also experiencing sexual abuse in childhood (Dong, Anda, & Felitti, 2004). In fact, few children experience only one type of maltreatment (McGee, Wolfe, & Wilson, 1997); thus, it is difficult to identify prototypical reactions to neglect (but see Rutter, Sonuga-Barke, Beckett, et al., 2010, for proposed deprivation-specific psychological patterns). In the next section, we highlight the significant methodological challenges that arise from attempts to study neglect outside of institutionalized settings, including definitions of neglect, which informants can provide the most valid information on child experiences, and issues concerning measurement

of a construct that may be better represented on a continuum (or on several continua).

Methodological Issues

There are numerous reasons for the “neglect of neglect” in child maltreatment research (Stoltenborgh et al., 2013). These include the potential differences in the prestige of professions that identify abuse (e.g., pediatricians) versus neglect (e.g., social workers), the likelihood that traumas garner more attention than do chronic conditions, and, not independent of these explanations, that it is exceedingly difficult to measure the construct of neglect (Schumacher, Slep, & Heyman, 2001). Dubowitz, Pitts, and Black (2004) noted several issues in neglect research that require further attention, including whether neglect is binary or dimensional, how to combine or classify types of experiences that traditionally fall into the purview of neglect, and what measures should be used to assess neglect. The Child Abuse Prevention and Treatment Act of 2010 offers the following definition of neglect: “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” (pg. 6; CAPTA Reauthorization Act of 2010 [Public Law 111–320]). This binary definition indicates that neglect results in harm or risk of harm due to lack of caregiver actions. What constitutes “harm,” however, is dependent on one’s perspective; moreover, this harm may not be immediately visible, and it may go undetected for many years. Finally, it may be difficult to identify neglect because, unlike other forms of maltreatment (e.g., physical, sexual, emotional abuse), neglect involves the absence of an expected input rather than the presence of harmful input (Humphreys & Zeanah, 2015).

Many approaches to defining neglect have divided this construct into component parts in order to identify specific types of neglect. Zuravin and Taylor (1987) defined eight types of neglect in a classification system: (1) physical health care; (2) mental health care; (3) supervision; (4) substitute child care; (5) housing hazards; (6) household sanitation; (7) personal hygiene; and (8) nutrition. Any child may experience neglect in only one, in two, or in several of these domains. Even such coding systems, however, are not exhaustive given that they do

not include some forms of stimulation that are expected to be provided by caregivers. In particular, psychological neglect, which encompasses not only emotional support (e.g., praise, nurturance) but also cognitive stimulation (Erickson & Egeland, 2002), is critical for healthy development. Definitions of neglect that are based on not meeting an acceptable level of the required input (e.g., food, supervision), while challenging to define, are somewhat easier to use than are definitions that involve deciding whether a sufficient level of emotional care or cognitive stimulation has been met. Indeed, children’s environments that lack sufficient stimulation in social interactions have been considered to reflect “covert neglect” (Allen & Wasserman, 1985). Given the variety of forms that neglect may take, attempts have been made to delineate the structure of neglect experiences; indeed, in those studies in which the types of neglect are carefully parsed, moderate to large intercorrelations between domains are reported (e.g., Dubowitz et al., 2004).

Researchers have used several methods to study neglect, including reviewing records from child welfare agencies, observing families in a home or laboratory setting, and collecting self-reports of behaviors and/or experiences by parents and offspring. Each method has advantages and disadvantages with respect to time, expense, and validity.

One option for making determinations of neglect is to use decisions made by child welfare agencies. These have the benefit of being validated cases of neglect that meet an established standard. It is important to recognize, however, that child welfare agencies vary in their definitions of neglect based on jurisdiction, limiting the generalizability of study findings (Barnett, Manly, & Cicchetti, 1993); indeed, definitions of neglect differ by state and can include failure to provide children with education, medical care, shelter, clothing, and nutrition. Complicating this issue is the fact that some states classify children as experiencing neglect when a parent has failed to prevent abuse or harm (e.g., when an infant is shaken by another caregiver). Thus, operationalizing neglect for research purposes cannot be done consistently from broad legal definitions of this construct (Slack, Holl, McDaniel, Yoo, & Bolger, 2004) or from established practices within individual child welfare agencies. Furthermore, if neglect exists on a continuum, and only the most severe cases become substantiated cases of maltreatment

through child welfare systems (English, 1998), the majority of children experiencing less extreme but nonetheless harmful levels of neglect are missed. Thus, relying solely on validated reports from child welfare agencies will suffer from low specificity (Sedlak & Broadhurst, 1996). Despite these issues, validated cases of child welfare-determined neglect have been found to be moderately associated with self-report and observational measures, and, further supporting the dimensional and incremental nature of neglect, these self-report and observational measures predicted child behavior problems at a subsequent follow-up assessment after researchers controlled for the effects of child welfare involvement (Dubowitz et al., 2004).

It is also possible in operationalizing neglect to ask parents about their behavior and/or the experiences of their child. We should note, however, that social desirability biases may affect the validity of interviews or self-report measures with parents given the sensitive nature of the topic. An alternative approach to assessing neglect in specific infant and caregiver relationships involves conducting structured interactions. Interaction patterns observed in the laboratory may reflect long-standing relationship patterns that occur in everyday life. For example, caregivers may ignore their children during “free-play” sessions or walk out of the room without notice. Children’s behavior in laboratory observations may also offer insight into their routines and expectations of their caregivers. Infant mental health theorists have posited that children who have experienced neglect learn that their caregivers do not respond to efforts to make a social connection (Powell, Cooper, Hoffman, & Marvin, 2009). Neglectful parents are unlikely to support the child’s comfort seeking by welcoming the child’s bids for proximity and affection. Over time, children learn that they need to try to manage difficult or complex emotions on their own. Observations consistent with these behaviors would indicate a cause for clinical concern, but would be insufficient to conclude that neglect has occurred.

In-home observations of mothers with and without a documented history of neglect revealed significant differences in play, affect, and verbal instruction during caregiver–child interactions (Bousha & Twentyman, 1984). The “serve and return” model of parent–child interactions (see Briggs et al., 2014) provides a framework to understand impaired interactions in families that are characterized by neglect, given

that neglectful parents are less likely to respond to their child’s attempts to engage them or to initiate interactions with their child (Crittenden, 1981, 1985). Although neglect broadly signifies reduced time spent in parent–child interactions, when interactions do occur, all behaviors are not affected equally. Specifically, in seminal work, Burgess and Conger (1978) found reduced rates of positive parent–child interactions in families with a history of neglect compared to rates in nonmaltreating families, but twice the rate of negative interactions. Neglected children also receive fewer indirect imperatives than children who are not neglected (Christopoulos, Bonvillian, & Crittenden, 1988). In another study, during dyadic play, mothers who had been charged with neglect engaged in less frequent praise and criticized their children more than did control mothers (Aragona & Eyberg, 1981). Although comparing group averages on constructs such as praise may be enlightening, this approach is limited in its ability to determine how much praise is needed so that a child does not experience the negative effects of emotional neglect.

The majority of studies that examine child maltreatment group victims together despite varying histories of abuse and neglect. As we noted earlier, many times these experiences co-occur in children; nevertheless, different experiences are likely to have differential impacts. Recently, two research groups have attempted to create a framework for understanding different forms of early experiences that may affect child development and long-term functioning (Humphreys & Zeanah, 2015; McLaughlin & Sheridan, 2016; Sheridan & McLaughlin, 2014). Specifically, one can imagine two potentially orthogonal dimensions: one consisting of a dimensional approach to assessing neglect, deprivation, or the absence of expected environmental (ranging from highly deprived to highly enriched and nurturing environments), and the other on another axis on which levels of harmful or threatening input are situated (ranging from low-threat environments to extremely abusive environments). Using this approach, researchers may be better able to examine children’s patterns of experiences, as well as the consequences of variation along each dimension.

Making binary determinations, which is often the case in determining whether child welfare agencies become involved, in custody decisions, and in recommending prevention or intervention initiation, can be difficult if neglect is conceptualized as occurring along a

continuum (or along several continua representing various types of neglect). In Figure 14.1 we outline three (of several possible) hypothetical models of the association between the degree of environmental input early in life and subsequent healthy development. A threshold model is based on existing work using grouped approaches (e.g., children with and without validated reports of neglect or with and without a history of psychosocial deprivation due to orphanage care). A second, linear model is based on a smaller subset of studies that attempt to assess environmental input on a continuum (e.g., studies that use a Likert-scale to sum items of retrospectively reported neglect) and that use a linear model to examine the impact of neglect on development. Third, although no models have specifically postulated a “diminishing returns” association between environmental input and neglect, it is conceivable that the resulting gains for the child diminish with further environmental input. Defining where to draw the line to determine whether neglect has occurred is necessarily arbitrary for any model other than a threshold model. Of course, this difficulty is not unlike those that occur in determining other cutoffs, such as what absolute number constitutes “low birthweight” or how many symptoms are needed to meet criteria for a psychiatric disorder.

Cultural and contextual factors influence our definition and understanding of behaviors that may reflect neglect (National Research Council, 2013). For example, the acceptability of a child’s housing situation is clearly culturally dependent; whereas a lack of electricity or running water may be normative in some communities, this may be considered hazardous in others. Changing social norms about whether children should be allowed to play unattended outside of the house (Pimentel, 2012) are seen by some as an overcorrection of perceived dangers; moreover, there are large generational shifts in the time children spend outdoors. In the United States, there is no national law regarding the age at which a minor can be left at home unattended. In this context, city ordinances or state-level recommendations can provide (albeit inconsistent) guidance, and the legality of leaving children alone at home varies based on often arbitrary determinations.

In terms of measurement, the construct of neglect poses significant challenges. Each measurement technique suffers from significant limitations, highlighting the importance of using multimodal assessment approaches. Furthermore, assessing the frequency, severity, chronicity, duration, and type of neglect may provide meaningful metrics for determining when, why, and how neglect is most harmful.

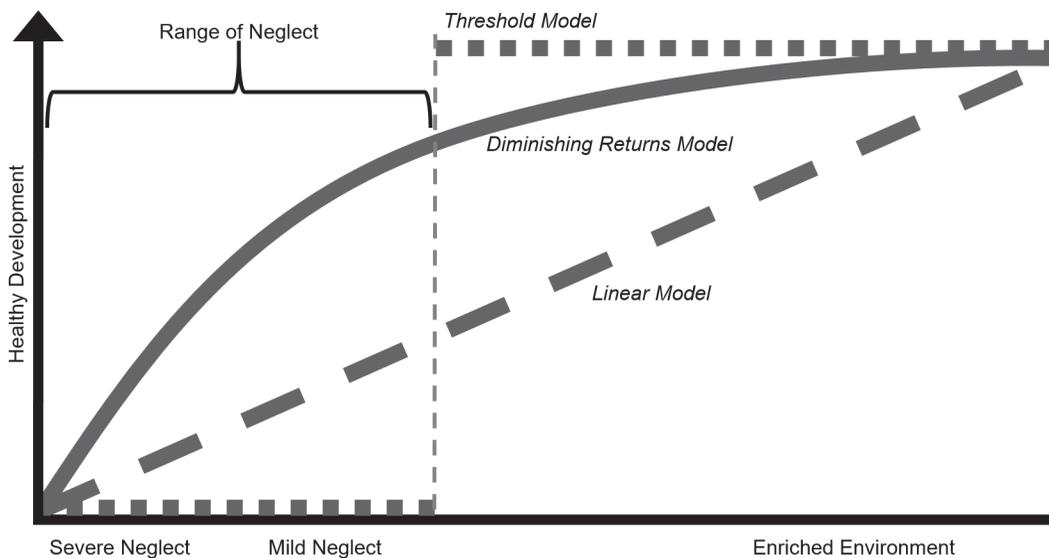


FIGURE 14.1. Proposed association between environmental stimulation and healthy development (Humphreys, 2016).

These determinations are critical for informing future research efforts, as well as prevention and intervention programs for this prevalent form of childhood adversity.

Etiology of Neglect

Gaining a valid and comprehensive understanding of the etiology of neglect, as well as its consequences, requires that researchers use consistent definitions across studies (Slack et al., 2004); however, as noted earlier, we have not yet established a widely adopted definition of neglect. Consequently, documented risk factors may not be associated with all aspects of neglect (e.g., emotional neglect vs. cognitive neglect). The etiology of neglect is typically considered in terms of either *broader contextual risks* (e.g., poverty) or *specific caregiver characteristics* (e.g., substance use; low knowledge about child needs). Before considering in detail these two lines of research examining contributors to child neglect, however, it is important to recognize that in these models, children are often conceptualized as passive recipients. In contrast to this approach, significant research on child development has highlighted the transactional nature of parent–child interactions, in which infants and children play an active role in eliciting responses from a caregiver (Kiff, Lengua, & Zalewski, 2011). Considered in this context, it is possible that child dispositional factors contribute to the likelihood that the child will experience neglect, a formulation that has not yet been meaningfully explored in etiological models of neglect (for an exception, see Belsky's 1993 developmental–ecological theory).

As with other forms of maltreatment, there appears to be an intergenerational cycle of neglect (Zeanah & Zeanah, 1989). Mothers who neglect their own children often have histories of being maltreated as children themselves (Petersen, Joseph, & Feit, 2014). Similarly, children who were neglected are at high risk for becoming parents who maltreat their own offspring (Heyman & Slep, 2002). Thus, neglect is one of many conditions that may be “passed down” generationally, through social modeling, epigenetics, or shared environmental contributors.

Among contextual or environmental factors, the most robust predictor of neglect is poverty (Slack et al., 2011). In fact, the Third National Incidence Study of Child Abuse and Neglect

(Sedlak & Broadhurst, 1996) reported over a 40-fold increase in risk for neglect in families with annual incomes below \$15,000 compared to families with annual incomes of \$30,000 or more. Similarly, a study of neglect within the state of Missouri found that zip codes with the highest poverty rates had almost 20 times the incidence of neglect compared to zip codes with the lowest poverty rates (Drake & Pandey, 1996). Although poverty is a risk factor for abuse (Bong Joo & Goerge, 1999), it is associated more strongly with neglect than with other forms of child maltreatment (Drake & Pandey, 1996; Sedlak & Broadhurst, 1996). Moreover, while poverty predicts subsequent neglect, it does not necessarily play a simple causal role: Children in middle- and high-income families also experience neglect, and the majority of low-income children are not neglected. Indeed, the fact that neglect occurs in a minority of families who live in poverty highlights the importance of factors in addition to income (Slack et al., 2004).

Contextual features related to poverty have also been linked to neglect. In a longitudinal study examining predictors of self-reported physical abuse or neglect, Chaffin, Kelleher, and Hollenberg (1996) used data from an epidemiological sample of over 7,000 parents (i.e., the National Institute for Mental Health's Epidemiologic Catchment Area survey). Neglect was longitudinally predicted by several demographic factors that may be confounded with poverty. Specifically, risk for neglect was higher in families with younger mothers, unmarried primary caregivers, and membership in ethnic/racial minority groups (Chaffin et al., 1996). It is important to note that the association between these demographic factors and neglect is likely driven by multiple mechanisms, including high levels of parenting stress and being exposed to societal bias and discrimination. In addition to low household income, the number of members in the household predicted neglect longitudinally. Potential features that did not predict child neglect included the sex of the child, level of parental education, and surprisingly, social support. The nonsignificant findings for the relation of social support and parental education with neglect are inconsistent with results of other studies. Researchers have found social isolation in the form of few social connections and/or little social support to be a strong predictor of child neglect (Gaudin, Polansky, Kilpatrick, & Shilton, 1993). Mothers identified in neglect

cases report low levels of social and tangible support (Williamson, Borduin, & Howe, 1991). In addition, Coohy (1998) found that parents of inadequately supervised children had fewer years of formal education than did parents who gave adequate supervision to their children. Other predictors of neglect include transience, frequent moves, and shorter times in one residence (Creighton, 1985), and may differentiate risk for neglect and abuse (Zuravin, 1999). Finally, time spent watching television has been found to be a strong predictor of neglect, with high daily television viewing (i.e., more than 4 hours per day) associated with a fourfold increased risk for child welfare involvement due to neglect (Slack et al., 2004).

Parent-specific factors have been of interest in identifying the etiology of neglect, especially given the role parents play as gatekeepers for the child's experience. A social information-processing theory of child neglect proposes that parents who neglect their children may have difficulty (1) determining that the child has a need; (2) interpreting the meaning of the need; (3) selecting an appropriate response to the need; or (4) implementing that response (Crittenden, 1993). It is important to bear in mind, however, that many parents who are not neglectful are also likely to struggle with these stages of information processing. Similarly, a recent model of child neglect proposes that deficits in *parental empathy*, or the ability to share and understand the child's mental states, play a crucial role (De Paul & Guibert, 2008). Indeed, neglectful parents have been found to be characterized by relatively low levels of empathy (Shahar, 2001); again, however, it is not clear that the association between low empathy and neglect is causal. As with the information-processing model, deficits in empathy may occur at different stages in the process of caregiving. For example, whereas some neglecting parents may not have emotional responses to children's signals of need (i.e., they do not share the child's state), other parents may neglect their child despite an emotional response to the child's signal because they fail to reason effectively about what the child needs. A model that conceptualizes neglect as a failure of parental empathy has been advanced by researchers conducting neuroimaging studies of parents. Indeed, an interesting body of work has examined parents' neural responses to children's photos, videos, and audio recordings (Musser, Kaiser-Laurent, & Ablow, 2012; Swain, Lorberbaum, Kose, & Strathearn, 2007;

Wan et al., 2014), and may help to identify individual differences in parental response to children, to their own child versus other children, or to specific emotional states.

Features of parents in addition to empathy have also been linked to increased risk for neglect. Compared to parents who were not neglectful, parents of neglected children have been found to be less adequately prepared for caretaking and to have less knowledge about child development (Burke, Chandy, Dannerbeck, & Watt, 1998), to have lower acceptance and approval of children, and lowered expectations for those children (Coohy, 1998). Parents may also have internal working models of the child that are defined by expectations that children's primary role is to serve the parents' needs. If so, monitoring and acting on the child's behalf may not be a role for which they are psychologically prepared. Caregiving environments are often compromised by parental psychopathology; thus, early theories focused on characterological problems in neglecting parents (Polansky, 1985). Depression in primary caregivers, typically mothers, has been linked consistently to risk for neglect (Coohy, 1998; Kotch, Browne, Dufort, Winsor, & Catellier, 1999; Polansky, Chalmers, Bittenwieser, & Williams, 1983). Lower levels of parental self-efficacy that are associated with depression may be relevant to inappropriate caregiving in these parents (Slack et al., 2011). One study found that parental depression had different relations to abuse and neglect (Zuravin, 1989); whereas there was a *linear* association between increasing levels of depression and greater levels of neglect, the association between parental depression and abuse was *curvilinear*, with low levels of child abuse in families in which there was severe parental depression. Another study found that parental depression was a stronger predictor of abuse than neglect, and that both abuse and neglect were significantly predicted by substance use disorders in the parents (Chaffin et al., 1996). Therefore, it is not surprising that 40–60% of children with out-of-home services for child maltreatment have parents who abuse substances (Wulczyn, Ernst, & Fisher, 2011). Certainly, parents who are high or intoxicated are not capable of meeting the physical or emotional needs of their infants or children.

Inherent to discussions of the etiology of neglect is determining responsibility for maltreatment. For cases in which a child is physically or sexually abused, the perpetrator of that abuse

is clearly to blame. For neglect, however, it is less clear who is responsible for providing care and stimulation for the child, particularly when the neglect may be occurring without a parent's knowledge (e.g., at day care; with a nonresident parent). Given parental gender and other biases in assigning blame, there are benefits to focusing on neglect as an experience that the child does or does not have, rather than as the failure of a specific caregiver to provide the child with the appropriate necessities.

Consequences of Neglect on Child Functioning

Attentive, nurturing, and stimulating caregiving is optimal for fostering healthy brain development. Although brain networks develop at different rates and reach maturity at different times, development of the brain occurs in a sequential, bottom-up process; thus, disruptions during the earliest years of life have foundational consequences for later maturational processes and growth. Neglect during the critical early years of life disrupts the experience-dependent environmental cues that are required for healthy neurodevelopment (De Bellis, 2001).

A great deal of our knowledge about the adverse effects of maternal deprivation comes from research with nonhuman animals. Indeed, animal research examining maternal deprivation, in which animals are separated from their mothers and kin for a period of time in infancy, has documented a number of negative neurobiological consequences including hyperactivity/impulsivity, problems in executive function, atypical hypothalamic–pituitary–adrenal (HPA) axis activity, and decreased cellular plasticity of the brain (Brett et al., 2015). Nonhuman animal research allows for the direct manipulation of early environmental experiences, allowing investigators to draw causal conclusions. In humans, however, the most direct insight we have into the role of the environment on child outcomes comes from randomized controlled trials of early interventions, including a nurse home visiting program (Olds et al., 2007) and the BEIP (Nelson et al., 2014). This type of research typically demonstrates treatment effects that are broad-based, such that improving children's environments and reducing the time spent in neglect leads to positive outcomes across domains, including language, cognition, socioemotional functioning, and psychopathology (Nelson et al., 2014). Across the lifespan,

those who experienced neglect in early life have increased rates of psychiatric disorder, including attention-deficit/hyperactivity disorder, conduct disorder, disinhibited social engagement disorder, major depressive disorder, and reactive attachment disorder (Humphreys et al., 2015; Widom, DuMont, & Czaja, 2007; Zeanah et al., 2009; Zeanah & Gleason, 2015). Difficulties in emotion and stress regulation, as well as poorer social functioning, may play an important explanatory role from neglect to psychopathology (Cicchetti & Toth, 1995; Humphreys et al., 2018; McLaughlin et al., 2015)

Given that the socioemotional difficulties identified in neglected children are mediated by changes in the brain, we focus in the following section on the links between neglect and neurobiology. Most of this research has been conducted with older children and adolescents. There are several explanations for the dearth of studies conducted in infancy and early childhood. As noted earlier, neglect may not be immediately visible; neglected children may not be identified until later in life, when they are adopted from institutions or are identified in the school-age years by mandated reporters (e.g., teachers). In addition, collection of neurobiological measures in infancy is more challenging than in older children and adolescents, and only recently have researchers begun to use magnetic resonance imaging (MRI) in infants to examine the effects of variation in the caregiving environment on brain function and structure (e.g., Graham et al., 2015). Currently, it is unclear whether the deviations that researchers have observed in older children and adolescents are evident in infancy or only manifest later.

As we described earlier, neglect is multidimensional in nature, including physical, cognitive, or socioemotional deprivation. Each of these aspects of neglect may affect developing neurobiology. Physical neglect (e.g., inadequate provision of nutrition and hygiene) can have clear and direct effects on overall physical growth and risk for disease, such as failure to thrive (Block, 2005). Cognitive and emotional neglect likely have distinct consequences (Farah et al., 2008), but in combination may produce broadly deleterious effects on endocrinology, neural structure, and brain function. Specifically, deprivation of cognitive stimulation, including the lack of rich and varied exposure to language, may cause widespread deficits in brain development; the absence of sensitive and responsive caregiving may have specific effects

on developing stress response systems. The impact of multiple aspects of neglect on different domains of neurobiology may explain the broad ameliorative effects of interventions aimed at dramatically improving the caregiving environment. Below, we highlight the association between neglect and endocrine function, brain function, and brain structure. This is not an exhaustive list of neurobiological domains known to be affected by neglect, as a growing body of work has also examined whether epigenetic factors are affected by neglect (Drury et al., 2012; Humphreys et al., 2016; Non et al., 2016).

Endocrine Function

The body's response to stress involves the release and regulation of stress hormones in a process that maintains biological balance in the face of a changing environment (McEwen & Wingfield, 2003). Specifically, the HPA axis governs the release and regulation of glucocorticoids, including cortisol, through a cascade of interactions involving the hypothalamus, adrenal gland, amygdala, and hippocampus. In typically developing children, HPA axis functioning is sensitive to input from caregivers. For example, research indicates that the withdrawal of the mother during the Still-Face Paradigm, a parent–infant interaction stressor, is associated with increases in infant cortisol output (Provenzi, Giusti, & Montiroso, 2016). Studies of the impact of early neglect on the HPA axis suggest that chronic deprivation of appropriate input from caregivers ultimately results in hyporesponsivity of the HPA axis, as evidenced by blunted patterns of cortisol secretion, both in response to acute stress and diurnally (Bernard, Hostinar, & Dozier, 2015; McLaughlin et al., 2015).

In the absence of the regulatory support of sensitive caregivers, hyporesponsivity of the HPA axis may have short-term benefits but long-term costs. Indeed, blunted cortisol output has been associated with internalizing (Colich, Kircanski, Foland-Ross, & Gotlib, 2015) and externalizing problems (Bernard, Zwerling, & Dozier, 2015) in children and adolescents. There is evidence, however, that when implemented early, interventions can result in recovery of the HPA axis. For example, in research from the BEIP, McLaughlin and colleagues (2015) found that children who were transferred from institutions to family-based care before age 24 months showed patterns of cortisol re-

activity that resembled those of a never-institutionalized comparison group. Similarly, child welfare-referred (neglected and/or abused) children who received the 10-week Attachment and Biobehavioral Catch-Up (ABC) intervention in the first 2 years of life showed more typical (less blunted) patterns of diurnal cortisol production 3 years later than did control maltreated children (Bernard, Hostinar, et al., 2015).

Brain Function

Paralleling research documenting atypical endocrine responses to stress in neglected children, investigators have demonstrated that deprivation of caregiving results in anomalous functioning of brain circuitry implicated in responses to stress and fear. Specifically, there is evidence that neglect leads to accelerated development of frontoamygdala circuitry. Although, in childhood, this circuitry appears to be characterized by positive coupling of the amygdala and the medial prefrontal cortex (mPFC) in response to fear, recent research suggests that there is a normative shift to negative coupling during adolescence, indicating greater top-down regulatory control (Gee, Gabard-Durnam, et al., 2013). Neglected children, however, may arrive early at a mature profile. In fact, Gee and colleagues (2013) found that both children and adolescents who were previously institutionalized exhibited negative coupling of the amygdala and mPFC in response to fear, a pattern that may originate from greater amygdala reactivity in early life (Gee, Humphreys, et al., 2013). Based on this and other research, Callaghan and Tottenham (2016) have advanced the “stress acceleration hypothesis,” positing that accelerated development of amygdala–mPFC circuitry truncates a period in which children acquire critical regulatory skills from their caregivers. Thus, while accelerated development may be adaptive in deprived contexts, this trajectory likely has negative long-term consequences.

Other researchers have documented anomalies in brain function related to maladaptive social behavior and emotional processing in neglected children. In particular, investigators have focused on how neglected children process faces. Given that the preference for the mother's face and the ability to recognize different emotional faces develops in infancy, children who are deprived of visual input from caregivers in early life may experience enduring problems in

attention to faces, with cascading consequences for social interactions. For example, Tottenham and colleagues (2011) found that heightened reactivity of the amygdala in response to fearful faces in children exposed to early neglect in orphanages partially explained decreased eye contact to emotional faces in this group. Studies using electroencephalography (EEG) to examine brain activity have found that institutionalized infants and young children show cortical hypoarousal when processing faces of both caregivers and strangers (Moulson, Westerlund, Fox, Zeanah, & Nelson, 2009; Parker & Nelson 2005), and furthermore, that a broad pattern of cortical hypoactivation in previously institutionalized children predicted indiscriminately friendly behavior at age 36 months (Tarullo, Garvin, & Gunnar, 2011). Researchers have also implicated the amygdala in this type of developmentally inappropriate social behavior. For example, Olsavsky and colleagues (2013) found reduced amygdalar discrimination of maternal versus stranger images in previously institutionalized children ages 6–15 years, which was associated with socially disinhibited behavior.

While most research on anomalous brain function in neglected children has focused on responses to stress and socioemotional processing, there is also evidence that neglected children show disruptions in responses to reward. In fact, altered reward learning has been most frequently found in neglected versus abused children (McLaughlin & Sheridan, 2016). Two recent functional magnetic resonance imaging (fMRI) studies have documented anomalous functioning of the ventral striatum in children exposed to neglect, which may underlie increased rates of depression in this group. In a cross-sectional study of the effects of institutionalization, Goff and colleagues (2013) found that compared to their typically developing counterparts, previously institutionalized youth showed reduced responsiveness of the nucleus accumbens (NAcc) when viewing faces, an effect driven by the fact that only youth in the comparison group showed higher NAcc activation in adolescence compared to childhood. Although institutionalization is an extreme and species-atypical experience, emotional neglect in family-reared environments similarly affected the ventral striatum (Hanson, Hariri, & Williamson, 2015). Supporting the interpretation that neglect disrupts normative development of reward circuitry, greater levels of emotional neglect were associated with attenu-

ated increases in responsiveness of the ventral striatum to reward from earlier to later adolescence. Furthermore, disrupted development of ventral striatum reactivity partially explained increased depressive symptoms in emotionally neglected children, mediating approximately 20% of this association. Given estimates that 18% of children experience emotional neglect (Stoltenborgh et al., 2013) and the fact that risk for depression increases in adolescence, there is a need for further research examining anomalous reward circuitry as a mechanism linking deprivation of emotional input in early life to the onset of psychopathology.

Brain Structure

Gray-Matter Morphology

As described earlier, the amygdala and hippocampus serve central roles in the HPA-axis response to and regulation of environmental threats; consequently, these structures have been the focus of studies examining the impact of neglect on the developing brain. In particular, the hippocampus, which is central to learning and memory, has the highest density of glucocorticoid receptors in the brain and is one of the most vulnerable regions to stress (McEwen, Eiland, Hunter, & Miller, 2012). Although glucocorticoids can enhance hippocampal function, chronic exposure to atypical levels of glucocorticoids is deleterious, resulting in changes in dendritic branching, neurogenesis, and apoptosis (McEwen, 2000). In the broader literature on stress and trauma, researchers suggest that the effects of early adversity on hippocampal volume may not be detectable until adolescence (Tottenham & Sheridan, 2009). Therefore, the timing of both stress exposure and brain measurements influence research findings. Furthermore, growth of the hippocampus is nonlinear (Gogtay et al., 2006); thus, prospective studies beginning in early life are needed to clarify interpretation of cross-sectional findings.

Perhaps not surprisingly given these challenges, findings related to hippocampal morphology following early neglect have been mixed. Several studies have found no effects of neglect on hippocampal volume in childhood and adolescence (Hanson, Nacewicz, et al., 2015; Mehta et al., 2009; Tottenham et al., 2010). In a recent study, however, Hodel and colleagues (2015) found that adolescents exposed to early institutionalization had significantly smaller

left hippocampal volumes than did their non-exposed counterparts. Highlighting the consequences of prolonged exposure to neglect, only children institutionalized past 12 months of age had significantly smaller right hippocampal volumes. Furthermore, across all previously institutionalized children, later age of adoption was associated with reduced right and left volumes. Unlike studies of institutionalization, Rao and colleagues (2010) used a dimensional approach to assess the effects of variations in environmental stimulation (i.e., cognitive input) and parental nurturance (i.e., emotional input) in early life. In a cohort of predominantly low-income children, Rao and colleagues found that parental nurturance, but not environmental stimulation, *inversely* predicted left hippocampal volume at the mean age of 14 years. Moreover, there was evidence of a sensitive period for parental care, such that nurturance at age 4, but not at age 8, was associated with hippocampal volume. The authors suggest that the lack of appropriate caregiver responses to distress is uniquely impactful for brain regions that govern responses to environmental stress, and that given the age of the participants, the association between lower parental nurturance and larger hippocampal volumes may indicate a developmental delay of normative decreases in volume during adolescence. Generally, however, it is *reduced* hippocampal volume that has been associated with risk for mental health problems in adolescence (e.g., Chen, Hamilton, & Gotlib, 2010; Hanson, Nacewicz, et al., 2015).

Synthesizing research on the neurobiological effects of child maltreatment, Teicher and Samson (2016) noted divergent findings of the impact of different forms of adversity on amygdala volume. Based on the extant literature, the authors suggest that whereas early neglect leads to increased amygdala volume, multiple forms of maltreatment across development ultimately serve to decrease amygdala volume. Indeed, in a pilot study of adolescents, Mehta and colleagues (2009) did not find differences in hippocampal volume between Romanian children adopted from orphanages and a comparison group, but they *did* find that previously institutionalized children had significantly larger amygdala volumes. Similarly, Tottenham and colleagues (2010) also found that remaining in an institution after 15 months of age was associated with increased amygdala volume. These results are consistent with the *stress acceleration hypothesis* (Callaghan & Tottenham, 2016),

which proposes that early neglect is associated with early development of amygdalar circuitry. Importantly, several studies have linked greater amygdala volume with increased risk for mental health problems that are characterized by emotion dysregulation (Buss et al., 2012; Lange & Irle, 2004; Tottenham et al., 2010). Nonetheless, other researchers have documented reduced amygdala volume in later-adopted previously institutionalized children (Hodel et al., 2015)

White-Matter Connectivity

In addition to evidence that neglect results in anomalous functional connectivity of the brain, a small number of studies have documented deficits in white-matter microstructure among children and adolescents exposed to neglect. In typically developing individuals, white-matter integrity (i.e., fractional anisotropy [FA]) increases throughout the brain across childhood and adolescence (Lebel, Walker, Leemans, Phillips, & Beaulieu, 2008). Thus, reduced white-matter integrity may indicate a developmental insult that has resulted in more diffuse connectivity, lower axonal density, or reduced myelination of axons. Evidence for the specific tracts that are affected by neglect is preliminary and mixed. Some research points to broad effects of deprivation on white-matter development, with deficits in the integrity of numerous tracts. For example, in research from the BEIP, Bick and colleagues (2015) found that at approximately age 8 years, previously institutionalized children showed alterations in white-matter integrity in the body of the corpus callosum, as well as in tracts involved in limbic circuitry, frontostriatal circuitry, and sensory processing.

Other research indicates specific effects of neglect on tracts implicated in cognitive function and emotional processing, although the extent to which different dimensions of neglect (cognitive and emotional) explain these findings is not clear. For example, Hanson and colleagues (2013) found support for the hypothesis that neglect disrupts white-matter organization in the prefrontal cortex (PFC), resulting in cognitive deficits. Specifically, in this study, previously institutionalized youth (mean age 14 years) showed reduced FA in the PFC and in tracts connecting the PFC to the temporal lobe. Furthermore, among neglected youth, FA in several of these tracts was associated with reduced neurocognitive performance. The uncinate fasciculus, which connects the temporal and frontal corti-

ces, may also be specifically affected by early neglect given that it is implicated in emotion regulation, memory, and learning (Olson, Von Der Heide, Alm, & Vyas, 2015). In fact, reduced FA was found in the uncinate fasciculus in a small study of internationally adopted children at the mean age of 10 years (Eluvathingal et al., 2006), a finding that has been replicated in more recent work (Kumar et al., 2014).

An important issue in interpreting research on the neurobiological consequences of neglect concerns whether findings reflect the unique consequences of experiencing neglect in early life. Because different forms of maltreatment likely have specific neurobiological consequences (Humphreys & Zeanah, 2015; Sheridan & McLaughlin, 2014), we have focused on research of institutionalized children, who suffer severe psychosocial deprivation but are unlikely to experience abuse. Nonetheless, given that most of this research was conducted later in development, it is possible the neurobiological deviations observed in children who experienced neglect in early life are in part due to later correlated stressors. It will be important for future research to measure experiences of both deprivation and threat across development to determine the extent to which each of these dimensions and their cumulative impact contributes to neurobiological deviations.

Prevention and Treatment of Neglect

The prevention and treatment of neglect occur both formally and informally. Friends, neighbors, and family members often step in to provide additional care for children observed to be vulnerable to neglect. This is not always possible, however, and child welfare agencies are frequently asked to evaluate potential cases of child maltreatment. Although over 6 million children are reported to child welfare agencies each year (U.S. Department of Health and Human Services, 2016), the majority of these families do not receive intervention. Alarmingly, among families with validated cases of child maltreatment, there is evidence that over one-third of victims do not receive postinvestigation services following the initial validation (Waldfoegel, 2009). Families who are involved in child protective services are obvious targets for interventions aimed to reduce neglect, whether by placing children into families that are less likely to be neglectful or by changing aspects of their current home environment. Inherent

in making such decisions is determining what value should be prioritized (i.e., the child's right to an adequate environment vs. parents' right to retain custody of their offspring; keeping families intact). Often social welfare agencies and judges must make determinations of how long to wait for birth parents who have previously neglected their children to provide an adequate environment, understanding that there are accumulating negative consequences for children in a neglectful environment. In any case, given the diminishing plasticity of the developing brain as children age, it is critical that children be provided enriched, or at least adequate, environments as early as possible.

Children who experience neglect may be less likely to be identified as victims compared to those children who experience other forms of maltreatment. Crittenden (1981, 1985) has found that neglected children often behave passively in interactions. Thus, these children may be missed in the clinical context because it is often the presence of behavioral problems that bring children into contact with mental health professionals. Still, waiting until behavioral problems rise to the level of affecting day care or preschool providers would lead to late identification of neglect. Thus, pediatricians may be most capable of identifying neglect when the impact is greatest, although the signs are not always obvious, and they are already screening for a great number of potential problems in short office visits. Furthermore, children who are neglected are the least likely to be taken to regular physician appointments, or to attend additional services if referred by another provider. Assessments and interventions that take place in the caregiver's home may increase the likelihood of treatment completion; indeed, promising work from the parenting-based ABC program has demonstrated notable improvements for children involved in the child welfare system (Bernard et al., 2012).

Prevention may be the best option for improving the outcomes of young children at risk for neglect. As in most infant mental health work, the caregiver is often the target for prevention. Candidate programs include the Nurturing Parenting Program (Bavolek, 2002), which provides a variety of levels of prevention and intervention, and generally focuses on group-level treatments with psychoeducation and activities oriented toward perspective taking, spending time with the child, and understanding how parents' own experiences may affect parenting behaviors. Reflective approaches in which parents

consider their own childhood experiences and make conscious decisions to change learned parenting patterns may help those who experienced maltreatment break the intergenerational cycle of neglect (Wahler, Cartor, Fleischman, & Lambert, 1993). Reflective interventions during pregnancy may be a particularly important time to “reset” expectations for parenthood, including to prepare new parents for caring for an infant.

Infants and young children place significant demands on caregivers, and many new parents may be inadequately prepared for these challenges. Home visiting programs, including the Nurse–Family Partnership, help first-time mothers through their transition to parenthood, beginning with home visits during pregnancy, and have provided evidence of prevention of child maltreatment (Donelan-McCall, Eckenrode, & Olds, 2009; see Zeanah & Korfmacher, Chapter 38, this volume). The Triple P (Positive Parenting Program), an evidenced-based intervention that draws from social learning theory and cognitive-behavioral therapy, includes facets that directly counter neglect (e.g., promoting a positive learning environment; ensuring a safe, engaging environment); this intervention has been found to prevent child maltreatment (Prinz, Sanders, Shapiro, Whitaker, & Lutzker, 2009). Broader-level interventions not directly tied to parenting behaviors may be a useful target, especially given the link between poverty and neglect. As such, interventions to address families’ poverty may inform efforts to prevent neglect (Slack et al., 2004); income infusion may decrease worry about material needs and reduce the amount of time parents spend working outside of the home, and, as a result, increase parental physical and psychological presence in interactions with their children.

Conclusions and Future Directions

The relative inattention to neglect, compared to other forms of child maltreatment, is particularly concerning given its broad and enduring impact, and the large number of children who experience some form of neglect in their lives. There are many challenges to studying neglect and measuring how interventions may reduce experiences of neglect. It is important to highlight here three considerations for future work on neglect. First, from a cultural perspective, infant interactions with caregivers have changed dramatically across our evolutionary history.

Both one-on-one care (e.g., with a “stay-at-home” parent or child care provider) and group-based care (e.g., day care with multiple children with one or more caregivers) are likely to differ significantly from the experiences of infants in hunter–gatherer societies. The number of caregiving adults per dependent child, closeness with kin and non-kin caregivers, and relative lack of privacy may have dramatic differences in the experience of young children. Today, the average household in the United States consists of three individuals. Typically, children sleep in their own rooms, apart from their parents or other siblings. Television and other forms of screen-based entertainment are prevalent and may interfere with dyadic interactions of infants and their caregivers. Thus, considering the context for child care environments, including who the caregiver is and his or her relation to the child, who else may be interacting with the child, and what the other aspects of the child’s environment may be fostering or suppressing interactions with the child are likely to be important for determining the range of infant and child experiences. Relatedly, the broader home, neighborhood, or community context of support and/or stress must be considered in developing and evaluating models of neglect.

The second consideration is timing, as children’s needs necessarily change across development. Given that infants and young children have the least physical independence and greatest brain plasticity, this is a period in which caregiving experiences are particularly important. From the perspective of the prevalence rates of maltreatment, including experiences of neglect, infants are at far greater risk for maltreatment than are children of any other age (U.S. Department of Health and Human Services, 2016). In the context of conducting research that informs practice and policy, focusing on the early life period is useful given that interventions targeting transition periods may be most effective in creating behavioral changes (i.e., programs targeting new parents during the pregnancy and postnatal period result in the best outcomes for children). Although there are only a few groups conducting MRI in infants, this method is promising in its ability to document both structural (Rifkin-Graboi et al., 2015) and functional brain patterns (Graham, Fisher, & Pfeifer, 2013) associated with different patterns of early experience, and may help to identify how neglect gets “under the skin” far earlier than do measures of behavior, language, or cognition. Although neglect at older ages clearly has adverse

effects, a focus on experience in the earliest years of life merits particular consideration.

Thus, the third consideration for future directions involves measurement of experiences in early life, including the postnatal period. With advances in technology, particularly in wearable devices that track our movements and activity level, we may be able to overcome a significant “blind spot” in our understanding of early experience. The use of ecologically valid measures of real-world interactions between caregivers and children are best suited to provide information that is unbiased by the laboratory environment or by potential Hawthorne effects of in-person observers at home visits. Similar naturalistic approaches to studying auditory stimulation have led to significant advances in understanding the importance of child-caregiver conversations in language development (e.g., Zimmerman et al., 2009). All-day recording devices of the home environment such as the LENA (Ford, Baer, Xu, Yapanel, & Gray, 2008), which is placed in children’s clothing, may better capture everyday interaction patterns. Indeed, investigators using the LENA have documented dramatic variance in at-home language exposure (Christakis et al., 2009). Finally, as Belsky (1993) noted, researchers must not rely only on easy-to-study families (e.g., middle class, willing to travel to the laboratory and disclose on parenting behaviors) to better understand the causes and consequences of neglect. If we are to increase both the generalizability of our findings and specificity of our understanding of neglect, it is critical that we recruit diverse families. Neglect is a multidimensional experience that, through a range of pathways, ultimately affects all of us.

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