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## **Short and Long Term Effects on Infants and Toddlers in Full Time Daycare Centers**

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**ABSTRACT:** Full-time daycare for infants and toddlers is stressful. This negative state is induced by perception of maternal rejection and abandonment, lack of an ongoing empathic dyadic relationship with the mother, and having to interact with multiple caregivers. The lack of empathic care the children are experiencing creates a growth-inhibiting environment that produces immature, physiologically undifferentiated orbital affect regulatory systems and parcellation of corticolimbic circuitries. Daycare stress is activating each child's hypothalamic-pituitary-adrenal (HPA) axis on a daily basis causing a persistent overproduction of corticotropin-release factor (CRF) and an ongoing release of abnormally high levels of stress hormones such as cortisol and the catecholamines, hormones that may disrupt the neurobiological maturation of the developing brain and destroy brain cells. These stress-induced impairments are implicated in an enduring vulnerability to various later-forming psychiatric disorders such as depression, chronic anxiety, attachment disorders, dissociative disorders, learning disorders, and attention deficit-hyperactivity (ADHD). The empathic dyadic attachment and secure attachment needed for the experience-dependent maturation of the regulatory system in the orbital prefrontal cortex may not be possible in a full-time daycare setting. The infants and toddlers in daycare often develop insecure-avoidant attachment or non-attachment disorders.

### THE PROBLEM

Since 1965, there has been a steady increase in both the number of mothers with infants in the work force and in the percentage who use daycare centers. In 1965, approximately 21 percent of mothers with infants and toddlers were in the work force (Shore, 1997). By 1995, 58 percent of mothers with children under 2 years old were working (1996 Green Book as cited in Hofferth, 1996). In 1965, only about 3 percent of infants and toddlers were in daycare. By 1993, 23 percent were using daycare centers (Scarr, 1998). The other 77 percent used various forms of in-home or out-of-home day care such as fathers, siblings, friends, neighbors, or relatives (Hofferth, 1996).

From 1962 to 1995, approximately the same period of time that witnessed the rapid increase in daycare, the suicide rate for children and teens tripled (Elias, 1999). At least a half million children are taking anti-depressants, although some experts believe the number is considerably higher (Elias). The American Academy of Child and Adolescent Psychiatry, (according to Elias), states that 5%, or approximately 3.4 million, children and teens are seriously depressed. We believe, based on our research, that these chilling statistics are, in part, the direct result of the growing number of infants and toddlers who do not have an ongoing empathic dyadic relationship with their mothers during their first two years of life.

Full-time day care during the first 2 years of life separates the mother and her child at a time when their empathic dyadic relationship is extremely critical. This is when the child's "affective experiences, especially those embedded in the relationship with the primary caregiver, elicit patterns of psychobiological alterations that influence . . . the critical period growth and organization of the developing neocortex" (Schore, 1996). The output of the mother's emotion-regulating right cortex is used by the child as a

template for the imprinting and hard wiring of circuits in his or her own right cortex.

Biochemical events, brought on by consistent ongoing empathic dyadic attachment bonds, are vitally important for the child's healthy neurobiological development (Trad, 1986). "It is the emotional availability of the caretaker in intimacy which seems to be the most central growth-promoting feature of the early rearing years" (Emde, 1988). The interaction between the primary caregiver and the offspring is among the most important early life influences (Ladd, Huot, Thrivikraman, Nemeroff, Meaney, and Plotsky, 2000).

Since infants and toddlers in full-time daycare centers are constantly experiencing stress, the situation appears to be detrimental to their neurobiological development and emotional well being. The unregulated interactive stress and altered levels of stress hormones are causing an "extensive apoptotic parcellation of corticolimbic circuits" (Shore, 1996, 1997). If this is true, it is a serious and far reaching problem that needs to be rectified. Future generations are in jeopardy since the damage, by its nature, is inter-generational (Shore, 1996).

## POSITION STATEMENT

Both a secure attachment and a loving "empathic dyadic attachment" between an infant/toddler and the primary caregiver are necessary for the healthy development of the child's brain and their future emotional health. Since we do not believe these attachments are possible when a child is attending a daycare center full time, all infants and toddlers in daycare centers are, it would appear, being damaged to some extent.

Ladd, Huot, Thrivikraman, Nemeroff, Meaney and Plotsky (2000) state that:

Burgeoning evidence indicates that there are critical developmental windows during which central nervous system neurocircuitry may be quite susceptible to environmental influences. We are compelled to acknowledge the importance of caregiver-child bonds during these periods, which, through multiple mechanisms, sculpt the nervous system.

"During the first and second years of life, the infant's affective experiences, especially those embedded in the relationship with the primary caregiver . . . are imprinted into the orbital frontal cortex-the hierarchical apex of the limbic system" (Shore, 1996, 1997). The experiences and beliefs established during this critical period determine the child's view of himself, of others, and his world. To a large degree, one's temperament, behavior, life-long psychological health, and the ability to relate affectionately to and have empathy for others, are determined during this period (Shore, 1996).

Without empathy, the ability to emotionally comprehend the impact of one's behavior on others is impaired. Persons lacking empathy may intellectually regret their actions but do not have emotional remorse. They have no compunction about hurting others (Perry, 1999).

Full-time care at a daycare center may be detrimental to the emotional and neurobiological health of many, if not all, infants and toddlers, adversely affecting their brains' neurobiological development and structure, their hormonal levels, and their ability to form affectionate empathetic relations with others for the rest of their lives. The severity of the harm may be amplified by prior life experiences such as having a rejecting mother, being unwanted while in utero, or experiencing a difficult birth. Environmental factors such as family poverty, witnessing or experiencing violence or living in a stressful home situation due to marital conflict will also influence the extent of the damage. The harm may be mitigated, to some degree, by subsequent life experiences or appropriate therapy, but the harm from maternal rejection, according to Perry (1994), is almost impossible to eliminate.

Fear, according to Perry, Runyan, and Sturges (1998), is a major impediment to a healthy attachment. Full-time daycare appears to be adversely affecting both maternal attachment and attachment to the caregivers at the daycare center, leaving the child with no secure attachment or empathetic dyadic attachment with anyone. This neglect can lead to mild interpersonal discomfort to profound social and emotional problems later in life (Perry, 1999).

The quality of the daycare center appears not to be the determining factor as to whether or not an infant or toddler will be damaged. Most of the children in high-quality daycare centers are experiencing similar abnormal cortisol circadian rhythms to children in lower quality centers according to Dettling, Gunnar, and Donzella (1999).

The ongoing abnormally high afternoon cortisol levels noted by Dettling et al. (1999) in 82% of the 3-year-olds are indicative of the unrelenting stress being experienced day after day. Daycare centers are apparently unable to meet the various biologically

programmed developmental and emotional needs of infants and toddlers. The fact that 82% of the 3-year-olds displayed the high afternoon cortisol levels also negates any consideration of a genetic predisposition in some for overreaction to the situation.

Although infants and toddlers in daycare centers are subject to a unique set of circumstances, much of the research we will cite may be applicable to some extent to infants and toddlers being cared for on a full-time basis by siblings, relatives, neighbors, friends, or foster parents rather than their biological mother or father. For the purpose of this position paper, full-time day care is defined as day care that exceeds 20 hours per week.

An infant is a child less than 12 months old, and a toddler a child less than 24 months old. When we refer to a child, we mean an infant or a toddler. Some research papers we are using refer to these two age groups collectively as "infants."\*

A caregiver is generally someone other than the biological mother. A primary caregiver is the mother. We recognize the important contributions the father often makes to the healthy development of an infant and toddler, but we believe that the mother is in a unique position in infant development. If the child was wanted at the time of conception, a loving empathic dyadic relationship has already developed prior to birth. The mother and child are already attuned to each other at birth and the attunement is usually deepened during nursing and other mother/child interactions.

We are aware that our position on full-time day care centers may not be applicable to infants and toddlers from severely abusive homes. Day care may well be their best hope for minimizing damages until such time as other appropriate and more beneficial remedial action can be taken. It should be noted, however, that research by Crittenden (1983) shows mandatory daycare for infants and toddlers in abusive home situations resulted in a further breakdown in mother-infant relations. Both the mothers and the infants reacted to the daycare placement with a combination of direct and indirect anger and the children consequently had to be removed and placed in foster care earlier than those children left in the home.

## LITERATURE REVIEW AND OBSERVATIONS

Our beliefs and conclusions are based on a search of the literature using ClinPsyc, PsycFIRST, and Medline. Key words used were attachment, day care, infant daycare, infant and toddler daycare, non-maternal care, and working women. The search was expanded into other areas using references from this initial search. Our beliefs and conclusions are also based on information obtained during the Masters Degree program, presenters at various APPPAH (Association for Pre- and Perinatal Psychology and Health) Conferences and other psychology-oriented workshops, personal conversations with leaders in the field of prenatal and perinatal psychology, and our own training, experiences, and observations as therapists. In order to gain first-hand knowledge of day care problems, I\* spent eight days at a daycare center interacting with their infants and toddlers, observing how the infants and toddlers were treated and how the children, their parents, and the caregivers responded to various situations.

### Contrasting Positions

There has been considerable controversy as to whether full-time attendance at a daycare center by infants and toddlers is beneficial or damaging. Studies by Etaugh (1980) and Hoffman (1974) point to positive effects for many children. Cotterall (1986) reports increased maternal sensitivity. Two Swedish longitudinal studies (Andersson, 1989, 1992) praise the benefits of full-time daycare, noting higher school grades and higher scores on socio-emotional ratings than similarly aged home-raised children. In contrast, studies by Barglow, Vaughn, and Molitor (1987), Belsky and Rovine (1988), Belsky (1999), and Chase-Landsdale and Owen (1987), point out deleterious affects. Vandell and Corasaniti (1990) found that infants who had attended poor quality daycare centers were reported by teachers as having poorer peer relations and work habits, exhibiting emotionally unhealthy traits, and having difficulty with discipline. A study by the National Institute of Child Health and Human Development [NICHD] Early Child Care Research Network (1997) shows no significant effects of day care on either attachment security or avoidance of the mother using Ainsworth's Strange Situation assessment (described in Ainsworth, Blehar, Waters, and Wall, 1979) at 15 months, whereas the NICHD (1999) reported decreased maternal sensitivity and lower positive mother engagement. All research by NICHD may, however, be flawed since the families were recruited for the study (Belsky, 1999). Belsky points out that Chase-Landsdale and Owen did not uncover the negative effects of early child care until the study examined family relations, not child care. Overall, according to McGurk, Caplan, Hennessey, and Moss (1993), there has been a paucity of good longitudinal studies that evaluate the long-term outcomes of early childhood nonmaternal care.

Violato and Russell (1994), summarizing their meta-analysis of published research on the effects of nonmaternal care on child development, noted that many studies were subject to criticism for the use of small bias samples, the focus on high quality university based daycare centers, and cross-sectional comparisons rather than longitudinal studies. These studies were of little value, according

to Violato and Russell, and therefore not used in their research. After reviewing 88 "valid" studies on the effects of nonmaternal care on child development, they stated that any conclusions regarding lasting long-term effects of nonmaternal care could only be tentative at best. Nevertheless, their research is noteworthy in that it revealed a 4% increase in negative outcome for nonmaternal care in the cognitive domain, 11% in the social domain, 16% in the behavior domain, and 19% in the maternal attachment domain. Violato and Russell made no attempt to differentiate their findings on the basis of type or quality of the nonmaternal care or on the ages of the children being evaluated.

### Basis for Position

The HPA axis manages the body's response to distress. Nemeroff (1998) points out "When a threat to physical or psychological wellbeing is detected, the hypothalamus amplifies production of corticotropin releasing factor (CRF) which induces the pituitary to secrete the adrenocorticotropic hormone (ACTH). ACTH then instructs the adrenal gland atop each kidney to release cortisol. Together, all the changes prepare the body to fight or flee and causes it to shut down other activities that would distract from self preservation" (Nemeroff, 1998). By measuring the level of cortisol, the activity of the hypothalamus-pituitary adrenocortical (HPA) axis in response to stress can be determined (Dettling et al., 1999).

Since research by Dettling et al. (1999) and Tout, de Haan, Campbell, and Gunner (1998) shows that most young children in full-time daycare have abnormally high afternoon cortisol levels, there can be little doubt that full-time daycare is stressful. The loss of one's mother represents a loss of psychological control, a proven potent activator of the HPA axis (Levine and Ursin, 1991). While stress brought on by a brief separation from a mother is dealt with by the tone of the vagal system (Porges, 1997), exposure for an extended period of time to what the child perceives as a stressful situation activates the HPA and spinal sympathetic-adrenal system—that is, the sympathetic nervous system (SNS).

A cortisol circadian rhythm does not start to form until the infant's second or third month of life, according to research by Mantagos, Moustogiannis, and Vagenakis (1998). Healthy non-stressed children over the age of 9 months, like adults, have salivary cortisol levels that are significantly higher in the morning than at midday or evening (Kiess, Meidert, Dressendörfer, Schriever, König, Schwarz, and Strasburger, 1995).

Using the level of cortisol in relation to a normal cortisol circadian rhythm to ascertain the activity of the HPA axis, and thereby determine whether 39- through 106-month-old children attending full time childcare were experiencing stress, Dettling et al. (1999) found an increase in cortisol levels from mid-morning to mid-afternoon, rather than the normal decline, in 82% of the 3 year-olds attending a full time childcare center, 63% of the 4-year-olds, and 50% of the 5-year-olds.

The cortisol levels for various age groups at "home" and in "childcare" that Dettling et al. found are shown in Figures 1a and 1b. The 7- and 8-year olds afternoon levels of cortisol declined as shown in Figure 1a, despite their being in "childcare," to approximately the same level as the at "home" children shown in Figure 1b. The 5- and 6-year olds morning and afternoon levels remained steady and the 3- and 4-year olds afternoon cortisol levels significantly increased over their morning levels.

The results of similar tests of cortisol circadian rhythms for infants and toddlers in daycare have not yet been published although available according to Megan Gunnar (personal conversation) of the Developmental Psychobiological Laboratory, Institute of Child Development at the University of Minnesota, Minneapolis, MN.

The high afternoon cortisol levels shown in Dettling et al.'s research clearly indicates the 3-year-olds were experiencing stress in the day care situation. This stress, we believe, is being brought about by a sense of loss of control associated with the repeated day-long loss of their primary caregiver, their mother. "As long as individuals . . . perceive themselves to be in control, the HPA axis is not activated and the [stress] steroids stay low" (Henry, 1992). From the children's perspective, their mothers were not responding to their distress calls and were abandoning them.

Research with 12-week-old infant squirrel monkeys may explain why Dettling et al.'s (1999) 3- and 4-year-olds are showing the dramatic afternoon cortisol increases. Levine, Wiener, and Cole (1993) found that visual, but not vocal, separation of infant squirrel monkeys from their mothers for periods of up to 6 hours "produced levels of cortisol never observed in adult squirrel monkeys." The plasma cortisol levels during undisturbed (base) conditions and following separation at 1, 3, and 6 hours are shown in Figure 2. The cortisol levels after 6 hours of separation were the same as that found in infants separated for 24 hours (Levine et al.). The primary response an infant uses to lower his or her arousal levels during disturbing and stressful situations is to maintain contact or proximity with the mother (Levine et al.). During an involuntary separation, reunion is no longer possible and thus his or her primary coping responses are not available. The infant monkeys were experiencing a loss of control. This is reflected, according to Levine et al., by

persistent elevations of plasma cortisol levels. The progressive cortical increase associated with longer periods of separation, Levine et al. suggest, may be due to the infant monkey's inability to clear the cortisol from their circulation and/or the immaturity of their stress reducing feedback system. In neurobiologically healthy adults, high levels of cortisol suppresses the release of corticotropin release factor (CRF) from the hypothalamus and adrenocorticotrophic hormone (ACTH) from the pituitary, eventually leading to a drop in circulating cortisol (Levine et al.).

#### Figure 1

Mean and  $\hat{\pm}$ SEM of the cortical change (log 10 of mid-afternoon minus log 10 of mid-morning levels in  $\hat{\mu}$ g/dl) for 3- and 4-year olds, 5- and 6-year olds, and 7- and 8-year-olds. "Numbers above 0 reflect increases over the day, those below 0 reflect decreases over the day. Figure 1a shows data from 'home' sampling, figure 1b from 'childcare' sampling."

#### Figure 2

Plasma cortisol levels of 12-week-old Squirrel monkeys during undisturbed (base) conditions and following physical and visual, but not olfactory and auditory, separation of 1, 3, and 6 hours (Mean  $\hat{\pm}$  SEM, n = 5).

Research by Lane and Donzella (1999), shown in Figure 3, differs slightly from Dettling et al.'s (1999) research in that Lane and Donzella's research showed the 4:00 PM levels of cortisol in at-home 3-year-olds were about the same as their 10:00 AM morning levels. We suggest the difference may be due to Lane and Donzella's research subjects having already had their normal unstressed cortisol circadian rhythms, a rhythm established during infancy, permanently altered by full time daycare attendance.

#### Figure 3

Comparison of the coping patterns in response to a challenge when there is a threat to control of a situation versus when there is a perceived loss of control and a feeling of helplessness. With a threat to control, the sympathetic-adrenal medullary system's defenses are activated. With a perceived loss of control, the hypothalamic-pituitary-adrenal axis is activated and the oxytocin-gonadotrophic species preservative system shuts down.

The fact that 18% of the 3-year-olds in Dettling et al.'s research did not show an afternoon increase in cortisol levels does not indicate that these children were not finding the experience stressful. Researchers, depending on increases in cortisol levels to indicate whether children are experiencing stress, need to be aware that some children may not display an increase. According to Mason, Giller, Kosten, and Harkness (1988); De Boer, De Beun, Slagen, and Van der Gugten (1990); Henry (1992), if a stress, or prior stress, or combination of stresses, was severe enough to have caused a person to develop post traumatic stress disorder (PTSD), there would probably be no cortisol increase.

Donzella, one of the coauthors of the Dettling et al. research paper, told me (personal conversation, 1999) that they do not know what is causing the resulting elevated afternoon cortisol levels. They were entertaining the thought that the stress may be due to the children having to interact with other children before they were emotionally ready. This theory was tested on a very small stable group in a private home daycare situation (Donzella, personal conversation, 2000). They found, however, the same elevated afternoon cortisol levels found in children attending daycare centers. Another theory was that the higher levels were being caused by a lack of sufficient afternoon naptime. Research by Lane and Donzella (1999) showed, however, that napping is associated with an increase, not a decrease, in cortisol. Lane and Donzella conclude, "Perhaps for toddlers who have more difficulty with focused/sustained attention, the challenges of the day may be enough to sustain higher cortisol levels."

We suggest that the high afternoon cortisol levels are not the result of any "effort" or challenge. According to Henry (1991),

"Extensive new animal data show that the effort involved with maintaining control over the environment is associated with arousal and increased catecholamines, whereas increases in the pituitary adrenocortical axis resulting in a cortisol release are associated with the perception that despite every effort, control is being or may be lost." Research by Lovallo, Pincomb, Brackett, and Wilson (1990) as well as Lundberg and Frankenhaeuser (1980) showed that tasks involving effort without distress primarily activated the norepinephrine system, not the hypothalamus-pituitary-adrenal (HPA) axis. According to Henry (1992), "The pituitary adrenocortical axis is preferentially activated as subjects become immobile-passive when loss of control is experienced and the conservation-withdrawal mode of stress response takes over."

A comparison of coping patterns due to a perceived stimulus is shown in Figure 3. In a challenging situation, when a perception of control is maintained, the sympathetic-adrenal medullary systems defense response is activated. When a loss of control is perceived and helplessness may occur, the situation is distressful, there is an activation of the HPA axis, and the oxytocin-gonadotrophic species preservation system shuts down (Henry, 1992).

## THE DAYCARE EXPERIENCE: THE CHILD'S PERSPECTIVE

In order to appreciate why we believe infants or toddlers are experiencing stress associated with a perceived loss of control when attending full-time daycare centers, one needs to look at a typical day from the child's perspective. The infant or toddler, after awakening, is dressed and fed breakfast by the mother, father, or some other family member. If there are other children in the family, their needs must also be attended to. The time the child spends in any sort of affectionate dyadic interaction with the mother is, in all probability, minimal. After arriving at the center, the child is, preferably but not always, turned over to his or her assigned caregiver, and placed with a group of similarly aged children. Each caregiver, under what is considered ideal conditions, is responsible for three children. As low as this ratio is, conditions arise where other caregivers besides the assigned caregiver interact with the child. Different caregivers will read the child's cues for need fulfillment differently and respond differently both emotionally and visually. The child, in turn, may read different caregivers facial expressions differently. The child may be further confused and scared by new children arriving from time to time and by others leaving. The group is not stable, and the child, we suggest, is not certain as to what is going to happen next, or why. The infants and toddlers, in all probability, perceive daycare as being chaotic.

At the end of the daycare day, approximately 9 or 10 hours later, someone (probably a parent) will pick the child up. At home, the child will be fed, along with any other family members, perhaps played with to some extent by the mother, bathed, and put to bed. A father or other sibling may assist the mother in these activities. Once again, as in the morning, the child experiences only limited, if any, empathic dyadic relations with the mother.

We believe that a child is very aware, when turned over to a caregiver at a daycare center, that the primary source of safety and nurturing is no longer present. Most of the children in the daycare center I visited were clearly distressed when initially brought to the center. The staff confirmed that the reactions I witnessed were typical and would often continue daily for several weeks. Those few not distressed appeared to already be in some sort of stupor or withdrawn state. The children's initial distress reactions usually ceased after a few weeks when they appeared to give up trying to get their needs met and, instead, became compliant.

Bowlby (1982a, pp. 27-29) describes how infants, in institutional settings, become acutely distressed when separated from their mothers. They will use every means at their disposal to get the mother to return. They progress through three different phases he describes as "protest" followed by "despair" then "detachment." The detachment phase appears to be a period of recovery because the child starts to interact once again with the environment. The child will appear cheerful and unafraid of anyone and shows delight with his toys. He becomes increasingly self centered, concerned with self preservation, and moving toward "detaching" from others. In time, he will stop trying to attach to anyone, according to Bowlby. Everything appears normal to an observer until the infant, upon returning to his or her mother, either ignores or snubs her.

Verrier (1991), like Bowlby (1982a, pp. 27-29), points out that children who have been abandoned when still infants or toddlers are often people pleasers, and are seeking approval. "As children, they were very cooperative, polite, charming, and generally good." These are the same behavioral characteristics that many researchers have used to claim that full-time daycare centers are beneficial. The child, by behaving these ways, may believe he or she is decreasing the possibility of another rejection.

Fein, Gariboldi and Boni (1993) found that the stress level in infants and toddlers was highest upon their entry into daycare. The adjustment was only marginal after three months. Their opinions, it should be noted, were based on behavioral observations. After six months, the infants and toddlers exhibited more positive affect and positive peer interaction but less contact with adults. These reactions are similar to the phases Bowlby (1982a, pp 27-29) describes, with the possible exception of the "despair" stage. We believe this stage is also present in infants and toddlers at a daycare center, but is not as apparent since the infants and toddlers are

surrounded by toys and other children.

Infants younger than 7 months do not have the same biological and emotional reactions as older infants since they do not yet have the capacity to internalize the interactive experiences (Zulueta 1993). At around 7 months, infants start rejecting caregivers who do not correspond to their internal working model according to Zulueta. A key feature of the older infants working model, according to Bowlby (1973, p. 236), is the infant's knowledge of who the attachment figures are, where they are, and how they will respond. When an older infant's primary caregiver (mother) leaves, and the center's appointed caregiver does not respond in the same way as the mother, the older infant will feel threatened and reacts accordingly. Having to interact with multiple caregivers at the center compounds the problem.

One has to wonder, considering Zulueta's (1993) research, why Andersson (1992) found, in his longitudinal study of Swedish schoolchildren, that the younger the child, the greater the benefits of being placed in daycare. If placed in day care when younger than 7 months, what sort of working model in regard to caregivers did the Swedish children form? We suggest that the children had "detached" in accordance to Bowlby's (1982a, pp 27-29) research and "appear cheerful and unafraid of anyone and shows delight with his toys." Andersson's research, like many others, may be flawed by mistakenly judging the effects of full-time daycare as positive based on a misinterpretation of their visual observations. Seemingly beneficial adaptations in the short run may, under stressful environmental conditions, actually be maladaptive over the life span of the individual (Ladd, Huot, Thrivikraman, Nemeroff, Meaney, and Plotsky, 2000).

Crying, part of Bowlby's (1982a, pp 27-29) protest phase, is a developmental response to a threat a child is unable to avoid (Perry, Pollard, Blakley, Baker, and Vigilante, 1995). The children are attempting to communicate, by biologically programmed means, that they are under threat and need to be removed to safety according to Perry et al. Crying also releases, to some extent, stress-related hormones such as adrenalin and is an inborn stress management as well as a healing mechanism (Solter, 1995). Since the centers' caretakers are unable to appropriately respond to the infants and toddlers protests, the children sense a loss of control over the events that are affecting their lives and are frightened as shown by their increase in cortisol. The need for a child to feel in control is vital to preventing the activation of the HPA axis and the resultant release of cortisol.

Nancy Verrier (personal communication, International APPPAH Congress, December 4, 1999), author of *The Primal Wound*, believes that placing infants and toddlers in full-time daycare centers is ". . . the crime of the century against humanity" and "They are in terror all the time they are there." When I asked her if, in her opinion, the time the child spent with the mother in the morning and evening was sufficient to make up for the time the mother and child were separated, she responded "No, the terror is forever. An infant has no sense of time."

Barglow, Vaughn, and Molitor (1987) suggest that infants placed in daycare believe their mothers are rejecting them. We suggest that an infant or toddler placed in a full-time daycare center, believes, like the adopted child (Verrier, 1991), that it is his fault, that he is the cause of the rejection, and that he is unwanted for some reason or it wouldn't be happening. If one looked inside the psyche of the infants and toddlers at daycare centers, one would probably find the same beliefs, fear, pain, and rage found inside the adopted children that Verrier has so eloquently written about. These beliefs and emotions will become part of their internal working model.

The infants and toddlers sent to daycare centers, like adopted children, are being sensitized to rejection and loss of control and may well react strongly to it when they approach maturity (Perry et al., 1995). The road rage, airplane rage, police rage, workplace rage, school rage, and other violent acts that are becoming so prevalent today may well be the residual rage from the person's abandonment and rejection when a child.

Any sense of being unwanted at the time of conception, while in utero, and at birth or shortly thereafter, will strengthen and heighten any sense the infant or toddler may have of rejection by the mother by placement for long periods of time every day in a daycare center. Any sense of being unwanted by being placed in a daycare center will strengthen and heighten any sense of rejection later in life. Similar traumas build on and reinforce each other (Perry et al., 1995). The more frequent a certain pattern of neural activity occurs, the more indelible it becomes. An experience creates a processing template through which new experiences are filtered. Eventually, even thinking or dreaming about the event or similar events will provoke the response according to Perry et al. Everyday Stressors that normally would not create any response, elicit exaggerated reactions (Perry et al.). The child may become hyperreactive and overly sensitive. The child is in a persistent fear state. The fear state may become a trait and continue on into the child's adult daily life (Perry et al.).

The child's belief that it is his fault, that he is the cause of rejection, and that he is unwanted or it wouldn't be happening will become part of the child's internal working model (Lieberman and Zeanah, 1995). He or she will tend to view the world, his or her

relationship to it, and the people in it on the basis of this internal working model for the rest of his or her life-or until, somehow, the beliefs are changed. A child's internal working model, including his notion as to whether he is acceptable or unacceptable, wanted or unwanted, worthy or unworthy, is based on the behavior of the caregiver or caregivers (Bowlby, 1973, pp. 236-237).

## THE ACUTE RESPONSE TO A THREAT

A trauma, according to Perry et al. (1995), need not be severe if the conditions causing it are repeated often enough or continue over a period of time. Repeated mild traumatic events are, due to sensitization, just as harmful as a severe traumatic event. Also, what constitutes a traumatic event is often dependant on the age of the person. Separation from a primary caretaker, according to Perry et al. (1995) is traumatic to an infant, yet only minimally threatening to an adolescent. When threatened, according to Perry et al. (1995), a human will engage the specific adaptive emotional and physical responses shown in Table I.

The responses are generally determined by the person's sex, age, and physical abilities and are designed to assure the survival of the species gene pool. Adult males (Perry et al. 1995), go from a rest state, to vigilance, to a freeze state, and ultimately to a fight or flight state. They seek, as they move through each state of the continuum, survival and a resolution to the threat. An older male child, in response to an acute severe threat or ongoing similar repeated minor threats, will tend to follow the hyperarousal continuum from a rest state to vigilance (crying), to resistance (freeze), to defiance (posturing), and finally to aggression. A female child tends to go from rest to avoidance (crying), to compliance (freeze), to dissociation (numbing), to, rarely, fainting (mini-psychosis). Which part of the triune brain is used by the infant or toddler to respond to a stressful event in the present as well as later in life, is determined in part by developmental experiences (Perry et al., 1995).

Infants and toddlers are not well equipped to fight or flee. The more immobile, helpless, and powerless the child feels, the more likely the dissociative response. If an initial response of crying does not negate the threat, they tend to move along the dissociative continuum to immobile or compliant behavior (freezing or surrender) and, if needed for self preservation, to dissociation (Perry et al., 1995). An important facet of dissociation includes surrender (Perry et al., 1995). In the face of threat, it may be self protective for young children to become numb, nonhysterical, compliant, obedient and not combative rather than become hyperaroused and combative or to flee (Perry et al., 1995).

Table 1

### The Acute Response to a Threat

We believe Perry et al.'s (1995) "dissociation" state is the same as Bowlby's (1982a, pp. 27-29) "despair" state. "Dissociation is simply disengaging from external stimuli to attending to an internal world" (Perry et al., 1995). There are various degrees of dissociation. Soldiers in combat often partially dissociate, becoming numb to a wound while remaining hypervigilant. The primary dissociative response pattern includes distraction, numbing, compliance, avoidance, daydreaming, and restricted affect (Perry et al., 1995; Perry and Pollard, 1998). We suggest that the "dissociation" continuum includes a "detachment" from and avoidance of specific sources of conflict and anxiety such as untrustworthy or unwanted caregiver(s).

Repeated exposure to a stressful situation results in an altered, more sensitive system. Because of the use-dependant development of the brain and sensitization, repeated or prolonged exposure to even a mild trauma can cause one to respond with alarm (using the limbic system), or even with terror (using the brain stem), instead of responding with calm using the neocortex (Perry et al., 1995). Current models of dissociative disorders (DD) suggest that, once a child has entered into a dissociative state, that a child, (and later the adult), tends to repeatedly enter into this state in the face of perceived stress and trauma. This process becomes a conditioned defensive reaction to lesser stresses (Putnam, 1991). Perry et al. (1995) agree, stating that if dissociation was resorted to earlier in one's life, it is far more apt to be resorted to again in stressful situations (Perry et al., 1995). Putnam (1991) states that the signs, symptoms, and behaviors of pathologically dissociating children and adults include behavioral activities such as explosive anger, aggression, risk-taking, and self destructive behavior. Secondary effects of chronic dissociation include depression and hypervigilance.

When a child is in a state of alarm due to a current trauma, or reacting to past traumas, she is less capable of concentrating, more anxious, and pays more attention to nonverbal cues since she is operating out of her lower brain centers, not her neocortex (Lipton, 2000). "This has implications for understanding the way a child who has been traumatized is processing, learning, and reacting in

any given situation" (Perry et al., 1995). Also, according to Putnam (1991a) "state-dependent learning and retrieval phenomena of dissociation means that the child is not able to retrieve and use information that was learned in nondissociated states."

The increasingly violent nature of our society may be due to the large increase in the nonmaternal care of our young children and the resulting sense of rejection. The predominant response pattern to a stressful situation often shifts from the dissociative continuum to the hyperarousal continuum when a child, particularly a boy, gets older. A full-blown fight or flight response thus becomes viable during any even remotely similar stressful situation (Perry and Pollard, 1998). Perry (1997) rightfully points out that the majority of individuals who are emotionally neglected in childhood do not become violent individuals. They "carry their scars in other ways, usually in a profound emptiness, or in emotionally destructive relationships, moving through life disconnected from others and robbed of some of their humanity."

We are aware that full-time day care at a daycare center will affect different individuals differently. Whether or not the child was wanted at the time of conception, discovery, implantation or while in utero, the nature of the birth experience, the mother/child interaction following birth, and the parents' emotional, educational, and financial status, all have a bearing on the type and severity of the long-term consequences of full-time daycare. Certain events may even interact in what is known as "biosocial interaction." Research by Raine, Brennan, and Mednick (1994) suggests that "those who suffered both birth complications and early child rejection were most likely to become violent offenders in adulthood. Only 4.5% of the subjects had both risk factors, yet this small group accounted for 18% of all violent crimes. The effect was specific to violence . . ." Neither a complicated birth nor maternal rejection were specifically, by themselves, precursors to violent behavior. Maternal rejection was defined by Raine et al. as a lack of maternal warmth, child neglect, and separation from the parents.

Levine (1997) has another way of explaining what may be happening to children in daycare centers. According to Levine, most mammals—including humans—go into a "freeze state" when they grasp that they have little to no control over what is happening to them and that escape is impossible. When infants and toddlers realize that their primary caregiver—usually the mother—is abandoning them at the daycare center, they "freeze". Freezing, according to Levine, is both a survival technique and a way to avoid pain. A zebra in the wild, moments before the cheetah brings it to the ground, will go into a freeze state. Fight/flight is no longer an option, and the zebra no longer has any control over the situation. This biologically programmed defense may help the zebra survive, since the cheetah will sometimes leave to get the rest of his or her family or group. Since the Sympathetic Nervous System (SNS) has been activated, the energy and hormones (such as cortisol and adrenalin necessary for flight/fight) are present, according to Levine, and are available for fleeing should the opportunity present itself.

The zebra's response and symptoms appear to closely resemble the symptoms found in the dissociated state referred to by Perry et al. (1995). This is not surprising, since the neurobiology and phenomenology of dissociation appears to match the neurobiology of the "defeat" response seen in animals (Perry et al.). Levine's defeat response of the zebra may be similarly activated in infants and toddlers when their mothers are no longer available and they sense having lost control of the situation since their mother is not responding to their distress cries. They, like the zebra, are, we suggest, terrified.

Since the stress is a daily occurrence and ongoing, the children are, potentially, protecting themselves from feeling overwhelmed by detaching or dissociating (Perry et al., 1995) or even going into shock (Emerson, 1999). Shock is a condition brought about by being in a highly stressful situation in which a person believes that he or she has little or no control over what is taking place (Emerson). Potentially shocking events, according to Emerson, include being repeatedly rejected and/or not having one's emotional needs met (Emerson, 1999).

A shocking event is an occurrence that affects a person both psychologically and physiologically whereas a traumatic event affects a person only psychologically (Emerson, 1999). Since daycare is affecting the infants and toddlers physiologically (Dettling et al. 1999; Tout, de Haan, Cambell and Gunner 1998), and since they clearly have no control over what is happening and are feeling overwhelmed, the possibility that at least some of the children are going into shock needs to be considered.

Shock has two primary forms, according to Emerson (1999), sympathetic and parasympathetic. Once established, they will persist to some degree, without intervention, for the balance of a person's life. In sympathetic shock, the person tends to remain in the fight/flight mode with an aroused sympathetic nervous system (SNS). The person in parasympathetic shock tends to withdraw and become docile.

The persistence of either a PNS hypoarousal state, or an SNS hyperarousal state, if it occurs, is due to "parcellation" of the limbic system (Schore, 1996). Whether or not the limbic system parcellates is determined by the type of relationship the child has with his or her caregiver(s) in the first two years of life (Schore, 1996). Parcellation will not occur if a healthy empathic dyadic relationship exists on an ongoing basis between the infant or toddler and his or her "caregiver" (Schore, 1996, 1997). Schore, it should be noted,

appears to be using "caretaker" and "mother" interchangeably-apparently he was not considering the daycare center situation.

According to Schore (1996), withdrawn mothers produce withdrawn children in whom the PNS has become dominant and the SNS inactive due to parcellation of the limbic system. The prominence of the parasympathetic state is augmented, according to Main and Weston (1982), by having a mother who "manifests a general aversion to physical contact and pushes the child away." Intrusive mothers produce the opposite effect, leading to a hyperaroused SNS and irritable, aggressive and anti-social children and adults.

Since an infant or toddler in daycare is unable to fight or flee, but instead must surrender and detach or dissociate (Perry et al., 1995), these children, if their limbic system parcellates, will parcellate into the parasympathetic hypoarousal state (Schore, 1996). Since the parcellation is the result of selective pruning of the sympathetic innervation and expansion of the parasympathetic innervation, the limbic systems autonomic balance will be subsequently biased toward a state of perpetual PNS hypoarousal.

Parcellation of the limbic system is very damaging in that it limits shifting between states of sympathetic and parasympathetic arousalshifting that is critical for the reestablishment of a balance of the ANS after an emotional stress (Schore, 1996). Individuals with hypoarousal parcellation exhibit low heart rates and low heart rate variability.

Raine (1996) found that low heart rate symptoms associated with hypoarousal in normal unselected 15-year-old schoolboys indicated possible criminal behavior by the age of 24. Measures of arousal correctly classified 74.7% of all subjects as criminal/non-criminal. The violent group had the lowest heart rate of all, with the nonviolent offenders in between the violent and the control group. Whether or not a person with a low arousal becomes violent depends on a number of other factors, according to Raine. Some may find alternate ways of obtaining excitement such as "joining the army, becoming a police officer, a politician, or a successful academic."

The low heart rate may not be due solely to the limbic system having parcellated to a parasympathetic hypoarousal bias. Rather, it may be due to dissociation. We, as mammals, have a polyvagal triune brain system (MacLean, 1990). The polyvagal theory of emotion proposes a hierarchical response strategy with the most recently developed employed first and the most primitive last. Each of these systems is available, as needed, and which system is used is determined in part by developmental experiences (Perry et al., 1995). The oldest, the dorsal vagal complex (DVC), used by reptiles, is associated with immobilization behaviors and may reduce cardiac output to protect metabolic resources when fight or flight is not an option (Forges, 1997). The vagal tone increases dramatically when a person dissociates, decreasing blood pressure and heart rate despite increases in circulating epinephrine (Perry et al., 1995). Epinephrine is a product of the catecholamine system and is associated with flight-anxiety (Henry and Wang, 1998).

## ATTACHMENT DISORDERS

A secure attachment is created between a mother and her child when the mother permits access to her whenever needed by the child. This access engenders an expectation that during times of stress she will remain consistently available and responsive to the child's signals (Lieberman and Zeanah, 1995; Schore, 1996).

An insecure attachment is created when the mother is inaccessible or unavailable for reunion when needed and reacts to the infants expressions of emotions and stress inappropriately and/or by rejection (Schore, 1996). Children with an insecure attachment "anticipate that the attachment figure will be at best erratically available and will not provide a consistent feeling of being protected from external danger or internal need." They do not trust their mothers to meet their needs. They look away, turn away, and usually avoid interaction (Lieberman and Zeanah, 1996).

Since the mother of an infant or toddler in daycare is not consistently available, it is not surprising to see a deterioration of their attachment. And since the mother-child attachment is based on trust, their attachment is further compromised by the child's belief that the mother is rejecting him or her (Barglow, Vaughn, and Molitor (1987). In the daycare situation, maternal rejection is a daily occurrence.

Belsky (1988) determined, after reviewing two longitudinal studies, that infants exposed to more than 20 or more hours per week of child care displayed significantly more avoidance of mother on reunion and were more likely to be classified as insecurely attached than children with less than 20 hours per week of care. This is not surprising since fear, according to Perry, Runyan, and Sturges (1998), is a major impediment to a healthy attachment.

In a recent study (NICHD, 1999), the length of the daily separation appears to be the important determinant of infant-mother interaction. NICHD (1999) found that the breakdown they observed in mother/ child interaction was the result of the long hours of

separation, not the type or quality of care. The results were the same whether the care was given in a daycare center, a home center, or by a relative in the home. NICHD states that, "Child care effects on mother-child interaction (for the behavior of mothers and children alike) were on the same order of magnitude as . . . (child difficult temperament and maternal depressive symptoms). . . ." NICHD also reported that children who attended daycare for fewer hours were more positively engaged with their mothers.

This disruption of a secure attachment early in life has long-term effects. According to van der Kolt and Fisler (1994), a "lack of secure attachments may produce the most devastating effects because consistent external support appears to be a necessary condition in learning how to regulate internal affective states and how to modulate behavioral responses to external Stressors." Schore (1996), as we will be pointing out later, explains how this happens.

Having multiple caregivers, in addition to the mother, has its problems. An infant or toddler, as well as being securely or insecurely attached, may be non-attached (Lieberman and Zeanah, 1995). This type of attachment disorder was apparently not considered by Barglow et al. (1987), Belsky (1988, 1999), Belsky and Rovine (1988 and 1990) and others. Infants and toddlers with a "disorder of nonattachment" do not demonstrate a preference for any adult caregiver, according to Lieberman and Zeanah (1995). They do not consistently turn to a specific person for help when hurt, or in any other situation that would ordinarily elicit attachment behavior.

The predominant effect of a disorder of nonattachment may range from emotional withdrawal to indiscriminate sociability. In the example given by Lieberman and Zeanah (1995) for indiscriminate sociability, the disorder was brought on during infancy by having an emotionally unstable biological mother and repeated caregiver changes. The child seldom cried, was easily consoled, and had a wonderful temperament. She would bring her toys to anyone. Her social skills, to a casual observer, were exemplary.

Lieberman and Zeanah's (1995) description parallels my observations at the daycare center I visited. In the daycare center situation, one caregiver for every three children is considered ideal. Having to take care of three infants or toddlers, as most mothers know, can be extremely demanding and time consuming. Whatever caregiver was free at any given moment was expected to meet a child's needs. Each age group also had its own set of caregivers. Every infant or toddler thus had multiple caregivers.

According to Lieberman and Zeanah (1995), when a child is confronted by caregivers that appear and disappear for no clear reasons, the avoidance of any attachment is predictable. Avoiding attachment, while minimizing pain and anxiety, becomes part of the child's internal working model (Lieberman and Zeanah). During the first half hour of my first day visiting a daycare center, three of the eight infants offered me, a total stranger, their toys. After about 45 minutes and a short period of intense eye contact, an older infant crawled into my left arm, and after again gazing intently into my eyes, went to sleep. He spent considerable time with me the rest of that day and the following day. Other infants from time to time did the same thing. In the toddler and 2-year-old groups, the children showed similar indiscriminate sociability, offering me their toys and wanting me, a total stranger, to play with them. The "social skills" identified by researchers Fein et al. (1993) and Andersson (1992) such as social confidence, openness, and independence that children develop in daycare may well be indicative of Lieberman's "disorder of nonattachment." Like insecure-avoidant attached children, their experiences have led them into deactivation of the attachment system (Henry and Wang, 1998). Attachment problems may not be apparent since they primarily show up at times of stress when the usual social support is unavailable (Henry and Wang).

Having multiple caregivers at daycare centers, in addition to the mother, creates another set of problems. Bower (1989), talks at length about the formation of hypotheses and the general conclusions infants come to. Lieberman and Zeanah (1995) call these conclusions "internal working models." A child's attachment system, according to Lieberman and Zeanah (1995), "operates in interaction with a maternal caregiving system that provides the child with the conditions necessary for survival and development." Through moment-to-moment, day-to-day, transactions "the child learns to know, anticipate, and predict how the world works and how his or her actions affect it. This knowledge about the world and the child's place in it is stored in the form of various working models . . ." These working models "are emotional or cognitive structures that comprise attention, perception, memory, affect, fantasy, and behavior, and . . . they increasingly come to shape the child's view and guide his or her responses to people and events." The same working model will continue to guide the person as an adolescent or an adult. The adult will continue, we believe, to avoid any "attachment" except for security or safety reasons.

We believe that a multiple caregiver system, no matter how good the caregivers are individually, will not permit the development of a stable, emotionally healthy, working model. Each caregiver reacts differently and responds differently to the child's needs and wants. The infant or toddler will sometimes, but not always, be able to get his or her needs met. Without a clear, healthy working model, a child does not know how to interact with his or her world and get his needs met. This inability to make sense of his outer world, of not knowing how to get his needs met, creates stress, pain, rage, and fear and may be one of the causes of depression, suicide, and drug abuse. The biological mother, due to the breakdown of mother-child interaction, is of little help in establishing a healthy working model. Under these conditions, we suggest the mother may actually be a hindrance.

## AINSWORTH'S STRANGE SITUATION INAPPROPRIATENESS

"Attachment" is the dimension of the infant-caregiver relationship involving protection and security regulation (Bowlby, 1982). The fact that a child turns to its mother, or to any other caregiver, in time of stress does not necessarily mean that an empathic dyadic attachment also exists.

Numerous research studies of infants and toddlers in daycare have used Ainsworth's Strange Situation to determine whether the children are securely or insecurely attached. They then used these findings to determine whether full-time day care was beneficial, benign, or harmful. The researchers assumed that as long as a child was "securely" attached to a caretaker, the child was not being neurobiologically or emotionally harmed by being in daycare, an assumption we believe to be invalid. While a secure attachment between a child and his or her mother, as determined by the Strange Situation, may be a significant factor in a child's development, we do not believe this is true for a secure attachment between a child and a caregiver at a daycare center. There are, we suggest, other factors besides a secure attachment to a caregiver that are critical for the healthy development and emotional well being of a child.

Perry (1999) points out that since "attachment" of some type is important for survival, neglected children may seek any "attachment" available. Observers often notice neglected children are "loving" and hug virtual strangers. These "affectionate" behaviors are, Perry believes, actually safety-seeking behaviors. Ultimately they contribute to the child's confusion about the nature of intimacy and are not consistent with normal social interactions (Perry).

In a longitudinal study of high-risk children, Egeland and Heister (1995) looked specifically at the social and emotional long-term consequences of secure vs. insecure attachment, as determined by the Strange Situation, when infants attended daycare as opposed to when they stayed home. When the infants in their research became 42-month-olds, they discovered that within each attachment group differences between daycare and home-reared groups occurred only within the securely attached groups and favored the home-reared children. Within the insecurely attached group, none of the comparisons between the daycare and home-reared groups was significant. Early daycare for securely attached children had a significant detrimental effect on adaptation at 42 months (Egeland and Heister).

By kindergarten (Egeland and Heister, 1995), the home-reared securely attached children were functioning more competently than the securely attached daycare children. The securely attached daycare children were more aggressive and disruptive. The opposite effect was found within the insecurely attached groups, with the daycare children being less socially withdrawn than the home-reared insecurely attached children (Egeland and Heister, 1995).

We suggest that this finding may mean that the daycare children, reacting to their rejection and neglect, only "appear" to be sociable as predicted by Bowlby (1982), Lieberman and Zeanah (1995) and Perry (1999). The home reared children, although insecure, may not have "detached" or "dissociated", since detaching or dissociating is a function of the level of the stress being experienced.

Summarizing the first grade results, Egeland and Heister (1995) found that "attachment was related to outcomes . . . only for the home-reared children. Attachment did not predict outcomes in the first grade for daycare children. The home reared children who were securely attached were most competent on the Child Behavior Checklist-Teacher (CBC-T) form in the first grade. The daycare children, regardless of the attachment classification and the home-reared insecure children all had similar high behavior problem scores."

## SECURE ATTACHMENTS VS. EMPATHIC DYADIC ATTACHMENTS

In an empathic dyadic attachment, the type of relationship Schore (1996, 1997) states is necessary for proper neurobiological maturation of the orbital frontal cortex, the mother and child enter into a symbiotic state (Hofer, 1990) where the mother's and infant's individual homeostatic systems are linked together in a superordinate organization. This allows for mutual regulation of vital endocrine, autonomic, and central nervous systems of both mother and infant by elements of their interaction with each other. A monadic relationship, that is a relationship where only person is feeling empathy, will not suffice, according to Schore (1997). Each person must have empathy for the other.

Harlow (1962) removed infant Rhesus monkeys from their mothers and raised them under various conditions. Some were offered only a wire-surrogate mother, others a cloth-surrogate mother, and still others, both. Strong monadic "attachments" were formed with the cloth-surrogate mothers, attachments that appeared to satisfy all of the infant monkey's needs for security and a safe base for exploration. When frightened, the infant monkeys would run to their cloth-surrogate mothers just as an infant or toddler runs to his

or her mother when a secure attachment exists between them. The infant monkeys, within minutes or even seconds after attaching to the cloth-surrogate mother, would relax and start visually exploring a frightening stimulus (Harlow, 1960).

Harlow (1962) did not realize for some time that his research primates had serious emotional and behavioral problems. His first 47 infant monkeys were raised in wire cages with verbal but no physical contact with other infant monkeys. As these monkeys matured, they generally showed typical autistic behavior, and some would go into violent frenzies of rage (Harlow). When an attempt was made to mate them, they fought with each other, with the females sometimes attacking males they perceived as weak. They had no control over their emotions and were unable to form any relationships.

Harlow's (1962) cloth-surrogate mother raised monkeys that were allowed to form normal infant-infant affectional patterns, while not autistic or violent, demonstrated infantile sexual behavior and generally avoided each other when mating was attempted. When the females, who never knew a real mother, became mothers, they were ". . . helpless, hopeless, heartless mothers devoid, or almost devoid, of any maternal feeling" according to Harlow. The mothers appeared to have no empathy for their own children. Attempts to reverse the effects of the monkeys early maternal deprivation were only partially successful in that many monkeys were able to function normally under basal conditions but were unable to cope with psychosocial Stressors (Suomi, Delizio, and Harlow 1976).

Harlow's (1962) monkeys were showing signs of the impaired corticolimbic brain system described by Schore (1996). Critical neurobiological development of the corticolimbic brain system takes place during the first two years after birth. A proper development results when the infant and mother establish and maintain an empathic dyadic relationship. Proper neurobiological development is extremely important for one's emotional health and the ability to form empathic attachments. Experiences during this critical time period have either beneficial or detrimental long-term structural and behavioral consequences.

We believe there is a similarity between the early years of life of Harlow's (1962) monkeys and the infants and toddlers in an all-day daycare center. Both were or are being denied an intimate ongoing contact with their biological mothers, the ongoing empathic dyadic relationship Schore (1996,1997) believes to be absolutely necessary for the development of the infant and toddlers orbital prefrontal cortex. This frontolimbic system generates stress-regulating coping strategies and serves as the hierarchical apex of the limbic system and ANS (Schore, 1997). A faulty neurobiological maturation of this system leads to an "enduring vulnerability to and the pathophysiology of various later forming psychiatric disorders."

Infant and toddler daycare centers may well be producing adults who, like Harlow's (1962) monkeys, are capable of forming only a limited empathic dyadic attachment with other adults and their own children. The problem becomes transgenerational since the necessary empathic attachment (relationship) between the mother and child does not exist (Schore, 1996). As Bowlby (1982) so clearly stated, "The disruption of the infant's attachment system, whether caused by neglect, abuse, or other factors, is likely to be recapitulated when the child becomes an adult."

## THE MOTHER'S ROLE IN THE DEVELOPMENT OF THE CHILD BRAIN

The mother plays a vital role in the development and neurobiological maturation of the child's brain. Her presence and interaction with her infant or toddler during a major part of the child's day is indispensable (Schore, 1996). Schore states "during the first and second years of life, the infant's affective experiences, especially those imbedded in the relationship with the primary caregiver, elicit patterns of psychobiological alterations that influence the activity of subcortically produced trophic bioamines, peptides, and steroids that regulate the critical period growth and organization of the developing neocortex". Thus, during the first two years of the infant's life, the relationship between the primary caregiver and the infant determines the growth and development of the child's neocortex.

According to Schore (1996, 1997), self-organization of the developing brain occurs in the context of a relationship with another self, another brain. From the time of birth through toddlerhood, the mother's presence is needed to perform the essential role in regulating her infant's psychobiological states. "Synchronized gaze transactions induce changes in the infant's bodily states by maternal regulation of the child's autonomic nervous system and this interactive mechanism represents a mutual entrainment of the mother's and infant's brains, including a coupling of subcortical areas responsible for the somatic components of emotion" (Schore, 1996).

Schore (1996) suggests that there is a critical period, near the end of the first year, for the maturation of the orbitofrontal cortex. In an empathic dyadic relationship, the mother is not only modulating the child's affective state, she is regulating his or her production of the neurohormones that influence the activation of gene-action systems that program the structural growth of brain regions essential to the future socioemotional development of the child. The empathic dyadic communication between the mother and infant

generates intense positive affective states, creating a growth-promoting environment for the prefrontal cortex (Schore, 1996).

The orbitofrontal areas are critically involved in the attachment process and empathic feelings for others. According to Schore (1996), ". . . the orbitofrontal region is uniquely involved in social and emotional behavior and in the self-regulation of body and emotional states." Empathic face-to-face transactions between the infant and the primary caregiver directly influence the circuit wiring of this system. Optimal affect-regulating experiences with the primary caregiver are imprinted into the circuits of the infant's frontolimbic system. These circuits are instrumental to attachment functions, producing orbitofrontal organizations that neurobiologically express different patterns of secure attachment. Lack of the prerequisite empathic dyadic mother-child relationship (Schore, 1996 and 1997) "result in structurally defective systems that, under stress, inefficiently regulate subcortical mechanisms that . . . mediate emotions."

There is a behavioral similarity worth noting between infants or toddlers with early prefrontal cortex lesions and children whose prefrontal cortexes failed to properly mature. Anderson, Becara, Damasio, Tranel and Damasio (1999) found that individuals with prefrontal cortex lesions before they were 16 months old had ". . . severely impaired social behavior despite normal basic cognitive abilities, and showed insensitivity to future consequences of decisions, defective autonomous responses to punishment contingencies and failure to respond to behavioral interventions." Unlike adult-onset lesions, individuals with early prefrontal cortex lesions had defective social and moral reasoning, suggesting that the acquisition of complex social conventions and moral rules had been impaired.

Recent research in animals (Arnsten, 1999) found that exposure to even relatively mild psychological stress produces a functional lesion of the prefrontal cortex by causing the release of high levels of the catecholamines dopamine and norepinephrine in the prefrontal cortex. These changes, according to Arnsten, are most evident in animals and humans when the subjects feel they have no control over the stress. High levels of these neurochemicals impair the working memory function of the prefrontal cortex. These working memories effectively guide behavior, freeing us from responding only to our immediate environment, inhibit inappropriate responses or distractions, and allow us to plan and organize (Arnsten). "Animals or humans with lesions to the prefrontal cortex exhibit poor attention regulation, disorganized and impulsive behavior, and hyperactivity" (Arnsten). These same catecholamines are known to cause cognitive deficits (Arnsten). If the child's stress state becomes a stress trait, as proposed by Perry et al., (1995) these high levels of catecholamines will continue to adversely effect one's cognitive ability for the rest of the child's life.

The infant's and toddler's experiences with the mother shape the neurobiological maturation of structural connections within the cortical and subcortical limbic areas that mediate socioaffective functions. The right cortex is specifically impacted by early social experiences. The child, according to Schore (1996), uses the output of the mother's emotion-regulating right cortex as a template for the imprinting or hard wiring of his own right cortex. That template will mediate his own expanding affective capacities—a capacity that will stay with him for the rest of his life.

According to Schore (1996), the second year of life is also very important in affect regulation. The mother of the 13- to 17-month old toddler expresses a prohibition on the average of every nine minutes (Schore). The mother now becomes the socializing agent in the mother-infant dyad. She must persuade her child to inhibit activities such as unrestricted exploration, bladder and bowel functions, etc.—activities he enjoys. She does this, according to Schore, by using the negative emotion shame and its associated stress. The mother's presence is necessary at this point, according to Schore, to help the child reexperience a positive affect, thereby teaching the child that negativity can be endured and conquered. This is only possible if the primary caretaker and the child have the needed empathic dyadic attachment. The mother is, when this condition is present, structuring the operation of the ANS. She is hard wiring the full use of the hyperarousal (sympathetic) and hypoarousal (parasympathetic) states.

Since the final maturation of the orbitofrontal cortex takes place in the last half of the second year of life (Schore, 1996) the entire first two years of a child's life are of paramount importance. Deprivation of an empathic dyadic attachment during this time, according to Schore, creates a growth-inhibiting environment that produces immature, physiologically undifferentiated orbitofrontal affect-regulating systems, thereby setting the stage for all psychiatric and empathy disorders.

Schore (1996) repeatedly mentions the need for an empathic dyadic relationship with the mother without mentioning the father. There may be a valid reason for this since the mother and child, at the time of birth, have already had an empathic dyadic relationship for 9 months. After birth, if the child feels loved and wanted, the bond between the mother and child will deepen during their ongoing interactions. We suggest the father, if he too wanted the infant and assisted the mother in meeting the child's needs with such activities as feeding, bathing, holding, soothing and playing with him or her on a regular basis, will also have the requisite empathic dyadic relationship.

## THE EMPATHIC DYADIC ATTACHMENT

Obviously, there can be no empathic dyadic attachment if the child is experiencing "non-attachment" or any other attachment disorder with the caregiver. Even having a secure attachment, as determined by Ainsworth's Strange Situation assessment, does not assure the existence of the critically important empathic dyadic attachment Schore (1996, 1997) believes is required for a healthy neurobiological maturation of the corticolimbic systems. An empathic dyadic attachment involves a specific type of interpersonal interchange that can only take place during specific circumstances (Schore, 1996, 1997).

We do not believe that an empathic dyadic attachment is possible as long as the child is reacting to the daycare situation with the ongoing elevated cortisol levels reported by Dettling et al. (1999) and Tout et al. (1998). These children are clearly experiencing their day care situations as stressful and frightening. If they were not, we believe their circadian cortisol rhythms would be approximately equivalent to that of maternally cared for "home" children.

An infant or toddler's loving and appreciative empathic dyadic attachment with his or her primary caregiver, starting with nursing and physical contact, causes the release of the neuropeptide oxytocin in the child as well as in the mother (Uvn s-Moberg, 1998). This release continues into adulthood whenever there is an empathic dyadic relationship. I suggest that the release of oxytocin is an important component of an empathic dyadic relationship. Oxytocin has been shown to facilitate bonding and attachment between not only parents and their infants, but between adults as well (Witt, Winslow and Insel, 1992). In the case of the infants and toddlers in daycare, sensing a loss of control, their HPA axis, seeking self preservation, is being activated, and their oxytocin-gonadotrophic species preservation systems shut down (Henry and Wang, 1998).

Porges (1998) states "Oxytocin may be part of a complex response profile related to the perception of the environment as safe." Oxytocin promotes states that are resistant to stress (Carter and Altemus, 1997; Uvn s-Moberg, 1997). Oxytocin increases the output of the vagal nerve and thereby the cardiac vagal tone, inducing a shift from sympathetic to parasympathetic autonomic dominance, a shift that would inhibit cortisol output (Uvn s-Moberg, 1998). Since the afternoon cortisol levels of infants and toddlers in daycare are elevated, it would appear that the caregivers at these daycare centers are not fostering oxytocin's release.

Even if oxytocin were released at home or while at daycare, it appears that it may have little effect. Neonatal stress in rats transiently altered the development of hippocampal oxytocin receptors according to Noonan, Caldwell, Li, Walker, Pedersen, and Mason (1994), and there is no reason that I am aware of to believe the same thing would not happen in infants and toddlers. "While the specific function of oxytocin receptors in the hippocampus is currently unknown" according to Noonan et al., "mild stress to the infant and a disruption of the infant-mother contact transiently alters the normal development of this system." The training or dedication of a daycare center's caregivers is thus immaterial. Even if the mother triggered the release of oxytocin in the infant or toddler during the evening or on weekends, it may not reduce the stress level since the receptors for oxytocin in the hippocampus are either severely limited or non-existent (Noonan et al., 1994).

The SNS and the PNS are reciprocally innervated, and their responses are normally coordinated (Porges, 1992, 1995; Schore, 1996). The body, when coping with a stressful event, may respond by activation of the SNS preparing it to fight or flight. The body, however, also has a need to conserve energy, permitting the body to function in a manner that will foster restoration and growth. During periods of ongoing stress the SNS is literally telling the body's systems to do one thing while the PNS is demanding that those same systems do the exact opposite. When this happens, the two systems are said to be in "conflict" and are competitive (Porges, 1995; Tiller, McCraty, and Atkinson, 1996). The heart rate variability (HRV) shown in figure 4 illustrates this conflict. This condition is often referred to as an "incoherent" or "chaotic" state.

Figure 4

Chaotic incoherent heart rate variability (HRV) pattern when feeling anxiety or fear.

When feeling love and sincere appreciation, the system is in a state of homeostasis, and the two branches of the ANS are more in balance and coherent. Various body rhythms including the HRV, pulse transit time, and respiration become orderly and synchronized with each other as shown in Figure 5. The system is said to be "entrained" (Tiller, McCraty, and Atkinson, 1996).

When mutually entrained, we suggest the mother and child are in what Hofer (1990) refers to as a symbiotic state where the adult's

and infant's individual homeostatic systems are linked together in a superordinate organization, allowing for mutual regulation of vital endocrine, autonomic, and central nervous systems. Mutual entrainment between the infant and mother can only take place when each person's systems are entrained and they are in close proximity to each other according to McCraty, (personal communication, 1999); Tiller, McCraty, and Akinson, (1996); Russel and Schwartz, (1994). The mother thus regulates her child's HRV and thereby her child's ANS and energy state. As long as the child in daycare is experiencing stress sufficient to activate the HPA axis thereby creating a SNS response, the HRV will be chaotic, and the child will be unable to internally entrain or mutually entrain with a caregiver. We suggest that under these conditions, the empathic dyadic relationships Schore believes to be critically necessary for a healthy maturation of the corticolimbic systems, including the orbital frontal cortex, are impossible. The emotional state of the child is just as important as that of the caregiver for an empathic dyadic attachment. The need for the child to feel love for the caregiver is just as important as the need for the caregiver to feel love for the child.

## Figure 5

Balanced and coherent heart rate variability (HRV) pattern when feeling appreciation-heartfelt love.

## POSSIBLE CONSEQUENCES OF FULL-TIME DAY CARE STRESS

It has been shown that most young daycare children have abnormally high levels of cortisol (Dettling et al., 1999). This generally happens in the presence of abnormally high levels of CRF and the catecholamines. It is well known that high levels of these neurobiochemicals have a deleterious affect on the neurobiological development and structure of the brain and may permanently alter the normal level of these and other neurobiochemicals.

The full extent and long term consequences of damage to the developing brain resulting from abnormal levels of neurochemicals is a lengthy and technical subject by itself and beyond the scope of this paper. Four of the possible long-term consequences are worth mentioning, as they may already be observable in our society. The first concerns an apparent large increase in recent years in the number of children and adults suffering from depression. The second, an increase in the number of children with ADHD. The third is an increase in children with learning disabilities. The fourth is what appears to be a trend toward self-preservation, not species-preservation behavior.

The mother, by having an ongoing empathic dyadic attachment with the child, is able to modulate the infant's and toddler's stress (Schore, 1996). Deprivation of this modulation is known to trigger an exaggerated release of corticosteroids (cortisol) upon exposure to novel experiences and will continue releasing it for longer periods of time (Schore, 1996 and 1997). Elevated levels of these stress hormones during infancy and toddlerhood inhibits dendrite branching, reduces brain nucleic acid synthesis, and permanently decreases brain corticosteroid receptors. These receptors are needed and used to reduce the activity of the Hypothalamic-Pituitary-Adrenocortical (HPA) axis after a stressful event has passed. This exaggerated release of corticosteroids and their persistent release often continue into adulthood (Schore, 1996). The "state" of exaggerated cortisol release has become the "trait" of persistent release in accordance with research by Perry et al. (1995).

Persistent overactivity of the HPA axis, particularly overproduction of the corticotropin-release factor (CRF) causing the release of corticosteroids, contributes to depression (Nemeroff, 1998). Nemeroff and his colleagues at Emory University of Medicine propose that early abuse or neglect not only activates the stress response, it produces persistently increased activity in CRF-containing neurons, known to be overactive in depressed people. If the hyperactivity persists into adulthood-as Schore (1996) and Perry et al., (1995) suggest it will the supersensitized cells would vigorously react to even mild Stressors (Nemeroff). If a person was genetically or for some other reason predisposed to depression, the increased HPA activity could then produce both the neuroendocrine and behavioral responses characteristic of depression (Nemeroff).

While the findings obtained by experimenting with rats are not always applicable to humans, research by Nemeroff (1998) and his colleagues is noteworthy. The type of maternal deprivation they created for their research is similar to that experienced by infants and toddlers in full time daycare centers (Nemeroff, 1998). They removed rats from their mothers for brief periods on 10 of their first 21 days of life before allowing them to grow up (after weaning) in a normal rat colony. "As adults, these maternally deprived rats showed clear signs of changes in CRF-containing neurons, all in the direction observed in depressed patients. Levels of corticosterone (the rats cortisol) also rose and stayed high."

Nemeroff and his associates also found an increase in CRF-receptor density in certain brain regions of their maternally deprived rats (Nemeroff, 1998). Permanently elevated receptors would tend to magnify the action of CRF, thereby forever enhancing the depression-inducing effects of CRF and stress. Nemeroff's coworker, Paul Plotsky, has found that Paxil, one of the selective serotonin reuptake inhibitors used to treat depression, returns CRF levels to normal, compensating for any gain in receptor sensitivity or number of receptors, and thereby normalizes behavior (Nemeroff).

Heim, Owens, Plotsky, and Nemeroff (1997) and Arborelius, Owens, Plotsky, and Nemeroff (1999) report that CRF has been proven to be the major regulator of the mammalian stress response. It is the neurobiological substrate mediating the effects of early life stress on subsequent psychopathology. They propose that early life events "render the individual vulnerable to the effects of stress later in life, resulting in an increased risk for developing psychopathology via long-lived alterations in CRF-containing neural circuits."

CRF, a 41 amino acid-containing peptide, apparently mediates not only the endocrine but also the autonomic and behavioral responses to stress. According to Arborelius, Owen, Plotsky and Nemeroff (1999), stress (in particular early-life stress such as childhood abuse and neglect) is associated with a higher prevalence rate of affective and anxiety disorders in adulthood. Their evidence suggests that CRF is hypersecreted from hypothalamic as well as from extrahypothalamic neurons in depression, resulting in hyperactivity of the HPA axis and elevations of cerebrospinal fluid (CSF) concentrations of CRF. "This increase in CRF neural activity is also believed to mediate certain behavioral symptoms of depression involving sleep and appetite disturbances, reduced libido, and psychomotor changes." Arborelius et al. believes that hyperactivity of CRF neuronal systems is a state marker for depression because HPA axis hyperactivity normalizes following successful anti-depressant treatment.

ADHD is characterized by developmentally inappropriate levels of attention, impulsivity, and hyperactivity. Neuropsychological findings are suggesting that a failure to inhibit motor responses may be the primary deficit in ADHD (van der Meere and Sergeant, 1988). Benson (1991) suggests that these findings point to faulty neurobiological maturation of the prefrontal lobe. Functional brain electrical activity mapping of 17 boys without ADHD showed a transient reduction in steady-state visually evoked potential (SSVEP) latency at right prefrontal sites in response to appropriate priming stimulus (Silberstein, Farrow, Levy, Pipingas, Hay, and Jarman, 1998). Boys with ADHD showed no change or an increase in prefrontal SSVEP latency. Silberstein et al. concluded that their research suggests "increased speed of prefrontal neural processing in children without ADHD following a priming stimulus, and a deficit in such processes in children with ADHD."

High levels of cortisol over an extended period of time reduces the size of the hippocampus according to the research referred to in a review article by Bremner (1999). The hippocampus both mediates the stress response and is effected by it. Individuals with PTSD associated with child abuse show a 12% atrophy of the left hippocampus according to Bremner. New learning and memory are also affected since these functions are mediated by the hippocampus. Exposure to the stress of an unfamiliar environment results in deficits in working memory indicative of hippocampal dysfunction (Bremner). If the stress state of the infants and toddlers in daycare is sufficient to cause atrophy of the hippocampus or if their stress state becomes a stress trait as suggested by Perry et al. (1995) and Schore (1996) the infants and toddlers now in daycare may well have a life long learning disorder.

As pointed out earlier, recent research in animals (Arnsten, 1999) has found that exposure to even relatively mild psychological stress produces a functional lesion of the prefrontal cortex by causing the release of high levels of the catecholamines dopamine and norepinephrine, thereby impairing the working memory function of the prefrontal cortex. These working memories effectively guide behavior, freeing us from responding only to our immediate environment, inhibiting inappropriate responses or distractions, and allowing us to plan and organize (Arnsten). "Animals or humans with lesions to the prefrontal cortex exhibit poor attention regulation, disorganized and impulsive behavior, and hyperactivity," according to Arnsten.

Stress during infancy that is severe enough to create an insecure attachment has a dissociative effect by disrupting right hemisphere emotional functioning and species preservation behavior (Henry and Wang 1998). A permanent bias toward self preservation may then become an adult trait. In mammals, the development of insecure as opposed to secure attachment during infancy biases the individual's response to challenges toward a self-preservation behavior pattern and undermines the ability of the adult to form attachments necessary for species preservation behavior. This applies, according to Sperling and Berman (1994), to both mother-infant bonding and to adult-adult empathic affectionate attachments. The consequences are some of the types of behavior Harlow (1962) observed in his maternally deprived monkeys.

The shift from species preservation to self preservation is brought about by hormonal changes resulting from ongoing stress (Henry and Wang, 1998). According to Henry and Wang:

As status and control are increasingly challenged, there is a falling off of species preservative activity (gonadotrophins, oxytocin)

and an increase of norepinephrine with the drive to meet the challenge with action, i.e. 'self preservative' activity. With uncertainty that all is under control, anxiety grows and the epinephrine and then the cortisol rise. As fatigue and exhaustion are approached, there is an increasing helpless loss of control. This is associated with arousal of the HPA axis and increased cortisol.

The stress need not be severe. This decrease in gonadotrophin hormones such as testosterone and the attachment hormones such as oxytocin-hormones needed for species preservation-and an increase in noradrenaline (fight), epinephrine (flight-anxiety), and CRH-  
ACTH-corticosterone (helplessness-depression)-hormones needed for self preservation-are shown in Figure 6.

The shift from species preservation to self preservation brought about by stress due to nonmaternal day care may already be apparent. The number of young adults who are not getting married and yet are having children has increased dramatically since the 1970s. An increasing majority of these mothers are rejoining the work force, sometimes out of perceived financial necessity, and are turning the raising of their children over to someone else. This is not, we suggest, species preservation behavior. An emotionally and physically healthy mother will want to be with her infant and will feel a physical longing to smell, cuddle, rock, and gaze at her infant (Perry, 1999).

#### Figure 6

"A theoretical schema relating cardiovascular performance to chronic states of arousal. As status and control are increasingly challenged, there is a falling off of 'species preservation' activity (gonadotrophins, oxytocin) and an increase of norepinephrine with the drive to meet the challenge with action, i.e. 'self preservation' activity. With uncertainty that all is under control, anxiety grows and epinephrine and then cortisol rise."

#### THE NEED FOR RESEARCH

"Unlike broken bones, irreversible maldevelopment of brain areas mediating empathy resulting from emotional neglect in infancy and childhood is not readily observable" (Perry et al, 1995). Medical research is needed to determine just what is happening to infants and toddlers in full-time daycare centers. An in-depth study of the hormonal production of the Hypothalamic-Pituitary-Adrenocortical (HPA) axis in infants and toddlers in full time daycare would, we believe, be a good place to start. We hope to complete a pilot study within the next few months. We will be testing the salivary cortisol, DHEA, ACTH, and immune system activity in approximately 18 infants and toddlers in daycare centers and approximately 10 other infants and toddlers who are at home with their mothers. These tests will facilitate a stress response evaluation since a graphic correlation between salivary free cortisol and DHEA levels will allow differentiation of normal, adapted, and maladapted stress response patterns. Abnormal patterns of cortisol to DHEA ratios have been shown to underlie several diseases and dysfunctions that include: psychosomatic diseases, chronic depression, chronic fatigue syndrome, stress-induced diseases such as osteoporosis and hypoglycemia, reduced immunity and chronic infections.

By including the ACTH value, which was not included in any prior studies mentioned in this paper, a researcher would be able to determine the effect of the full-time daycare stress response at the hypothalamic level. Insight into this area will help chart the hormonal influences of the HPA axis to brain and behavioral development.

A measurement of an infant's or toddler's HRV while attending daycare would also be very beneficial, as this test would indicate the status and variability of the ANS. Knowing the status and variability would hopefully enable a researcher to state whether or not the child's limbic system had parcellated and if so, in what direction, and whether the HRV is chaotic or entrained. A HRV analysis, possibly in conjunction with a cortisol level evaluation, may serve as an index of stress and stress vulnerability (Porges, 1992,1995).

Core body temperature and pulse rate might also be beneficial. Ainsworth's Strange Situation assessment and other visual observations are, we believe, of little value in determining whether infants and toddlers are being damaged in the areas under investigation.

Ultimately, we would like to undertake research to determine whether the child's limbic system is developing as it should, or whether the child has, to some extent, detached, dissociated, or gone into shock. Which non-invasive tests would best facilitate this assessment has yet to be determined.

## SUMMARY AND CONCLUSIONS

When we study the impact on infants and toddlers of full-time daycare, we need to ask what the child is experiencing emotionally and how these emotions may be affecting his neurobiological and personality development. We need to ask what the child is learning about himself and others. Is the child learning that he or she is lovable or is the child being taught to expect rejection? We need to ask to whom the child is turning, if anyone, for fulfillment of emotional as well as safety needs. We need to ask what conclusions the child is drawing about her world-is it a safe or threatening place to be? We need to look at the daycare child's internal working model as, once set, these models are very difficult to change. A child's perception of his or her world determines his or her belief system, and these beliefs determine the child's present and future behavior, abilities, and expectations.

Full-time day care is stressful, and the infant and toddlers HPA axis, ANS, and other stress related systems are being affected accordingly. Stress hormones such as cortisol and the catecholamines dopamine and norepinephrine disrupt the maturation of the developing brain, affect the number of receptors in various parts of the brain, and adversely affect behavior, emotions, and control of these emotions. Full-time daycare appears to be affecting, to varying degrees, a person's ability to form empathic dyadic attachments. Without empathy, a person has limited ability to relate to others. He does not emotionally comprehend the impact of his behavior. He is not aware of what it is like for others when he does or says something hurtful and he will feel no remorse.

Caretakers at day care centers appear to be unable to meet a child's emotional needs regardless of the quality of the daycare center or the caretaker's education and dedication. This is because the child is too distressed and the HRV too chaotic to allow development of an empathic dyadic attachment required for the proper neurobiological maturation of the prefrontal cortex and the limbic system. Stress also inhibits both the release and effect of oxytocin, a known stress-reducing and attachment-enhancing hormone.

The lack of an empathic dyad relationship between the mother and the infant or toddler attending daycare full time sets the stage for the infant or toddler to develop psychiatric and empathy disorders. An ongoing mother/child empathic dyad attachment during the first two years after birth is critical for the development of the child's prefrontal cortex and the orbitofrontal cortex, the system that controls emotions and affectionate relations. Without a healthy neurobiological maturation of these systems it may be difficult, if not impossible, to have an affectionate relationship with anyone else. Relationships are more apt, instead, to be based on self-preservation need fulfillment.

The relationship of the mother to the child is adversely affected in direct proportion to the number of hours of separation. Research indicates that the relationship between a mother and child is damaged by full time daycare and that mother/child interaction becomes approximately equivalent to that found between a depressed mother and her child.

The infants and toddlers in full-time daycare settings often develop either a "disorder of nonattachment" or an "insecure-avoidant attachment." The children may be learning that attaching to anyone is painful, non-rewarding, and something to be avoided because it may lead to yet another rejection. They may also be learning that adults are untrustworthy and to be avoided. They will live their lives based on these beliefs, which have become part of their internal working model. Group association with peers, in order to feel safe and wanted, may appear to be the only viable option when they become adolescents and young adults.

Full-time daycare appears to be creating an enduring vulnerability to later forming psychiatric disorders such as chronic stress, pathological dissociative states, depression and ADHD, as well as various other affective disorders. Whether or not a disorder develops is, in part, dependant on prior and subsequent events and/or a genetic predisposition.

The stressful state infants and toddlers are experiencing in daycare may become a stressful trait and the child becomes sensitized to similar stressful situations for the rest of his life. Similar situations, such as the rejection the infant or toddler felt by being placed in daycare, will, in all probability, generate the same emotions that were appropriate for the original trauma. These may include anxiety or rage. These emotions, unless defused by an appropriate form of therapy, may be vented on whoever is perceived to cause the person pain or distress.

The Strange Situation and other visual evaluations are probably of little value in assessing the critical long term effects of daycare. Medical tests may be the only way of determining whether the children are being damaged, and if so, the nature and severity of the damage.

## THE FUTURE OF DAYCARE CENTERS FOR INFANTS AND TODDLERS

There are no easy or simple solutions to keep infants and toddlers from being neurobiologically and emotionally damaged by full-

time nonmaternal daycare centers. Based on current research, the child needs to be with his or her mother on an ongoing basis, if she is emotionally healthy, in order to facilitate a healthy neurobiological maturation of the corticolimbic systems. We believe that the father, if he wanted and interacted with the child prior to birth and cared for the child on a regular basis after birth, would also be able to engage in the needed empathic dyadic attachment.

Since it appears that the number of hours away from the mother is one of the determining factors in to the mother/child relationship, a way needs to be found to reduce, if not eliminate, the number of hours the mother and infant/toddler are separated. One possible option may be what has been referred to as "reverse social security." Under this plan, mothers would be paid to stay at home at least half a day using funds that they would normally have collected when they retired at age 65. Their retirement age would then be raised accordingly.

Italy, we are told, is trying to resolve the dilemma created by multiple caregivers by having the caregivers advance with the children through each age change. This may help to some degree, but we do not believe it will solve the problem. Unpublished research by the University of Minnesota shows that children in small private home daycare situations with a consistent caregiver may still have elevated cortisol levels.

The United States has tax laws and regulations that are structured to punish families with one wage earner and reward the family when both parents work outside the home. These regulations encourage the disintegration of the family and often require mothers of young children to work. Our attitudes, policies, and laws need to be revised in order to allow and encourage mothers to spend more time at home with their children during the first two critical years.

\* Since the research papers we will be referencing and occasionally quoting refer to children as "1-year-olds" or "in their first year of life," etc., we will use their language. We are aware that a 1-year-old child has actually been alive in utero for approximately an additional 9 months. For simplicity and reading ease, when referring to a single person, we will sometimes use "he" or "she" rather than "he or she." He or she, when used, are interchangeable.

\* Here and hereafter when the pronoun I is used, it refers to the lead author Henry Brandtjen.

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