The Unabomber: The Deprived Amygdala & the Serial Killer

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The Unabomber

"The many rejections, humiliations and other painful influences that I underwent have conditioned me to be afraid of people. This fear of rejection–based on bitter experiences at home and at school–has ruined my life, except for the few years that I spend alone in the woods, largely out of contact with people." Ted Kacynski.

Over the course of 17 years, Ted Kaczynski severely injured, maimed, or killed 27 people in 16 different bombings (Douglas, 1996; Graysmith, 1998). He had been living as a hermit and a recluse in a tiny plywood cabin in Montana, when he was arrested by FBI agents, on April 24, 1995. Described as "pathologically shy" Kaczynski was born on May 22, 1942, to Polish immigrants who eschewed learning, but who were otherwise, according to Kaczynski, emotionally cold, distant, and "rejecting" and who he "couldn't come to..." because they used him as a "defenseless butt." "The rejection I experienced even affected me physically," he complained in one letter to his mother.

According to his family, baby Ted has initially been the all American "bouncing... bundle of joy." However, around 9 months of age, he became severely ill with a dangerous case of the hives, was hospitalized and isolated, and even his parents were forbidden to make contact, to touch, hold, or hug him. This was "hospital policy" his mother was informed and sick children were to have "no visitors." There he remained, for over a month, and not once was she allowed to to touch, hold or comfort her son. According to his mother, after an initial protest phase, in which he cried incessantly and would stretch out his arms and plead and cry for her, he becoming increasingly listless, withdrawn, disinterested in and unresponsive to human contact, and "developed an institutionalized look." Thus he rapidly passed through all three stages associated with a condition Spitz referred to as "hospitalism."

For example, according to Spitz (1945, 1946) children between the ages of 6 months to 2 years, even if briefly isolated, would, within minutes, begin crying and screaming for their mothers. This was followed by a stage of despair in which they would cease to cry, lose interest in the environment and withdraw. In the final stage the children ceased to show interest in others and no longer responded to affection. Instead they became passive and unresponsive, sitting or lying quite still with a frozen expression, staring for hours at nothing (see also Bowlby, 1982). If the separation continued there was further deterioration, with children becoming ill or dying. Moreover, Spitz (1945, 1946) found that some children would quickly pass through all three phases, sometimes within a few days, and that those who experienced long-term separations often became permanently emotionally and even sexually abnormal.

However, Ted was not merely isolated, he was placed in full body restraints, and was pinned to his hospital bed with splints, spread eagle and completely naked. Hospital personnel felt that full restraint was necessary so as to prevent him touching his sores, or rubbing off the ointments and dislodging the compresses. As noted above, the amygdala becomes excessively active not only when stressed, but when stressed by physical restraint.

After Ted returned from the hospital all aspects of social and emotional functioning became bizarre. He ceased to respond to affection or social stimulation and became pathologically shy, severely withdrawn, and unable to relate. According to his mother, he was "no longer that happy, bouncing, joyous baby, but a little rage doll that didn't look at me... that was slumped over–completely limp... like a bundle of clothes."

Ted never recovered, and instead remained "always apart, aloof, alone." At age three when he was placed in nursery school, his teacher explained to his mother that "he will not play with other children." As he grew older, his remain isolated and alone, and if visitors arrived at his home, he would withdraw to his bedroom and lock the door. Throughout his undergraduate and graduate college days, Ted continued to avoid others, failing or refusing to acknowledge greetings even from those sharing his dorm at the University of Michigan. He would sweep past them, and quickly close the door to his room.

Although socially retarded, Ted was described as brilliant and a mathematical genius. After graduating from Harvard with a BS, he went on to the University of Michigan and published several papers in prestigious math journals. In 1976, his doctoral thesis on "Boundary Functions" won the annual Sumner Meyers Prize for best doctoral thesis. However, Ted was offered a professorship at Berkeley even before he obtained his Ph.D (Douglas, 1996).

Once at Berkeley, he continued to live the life of a recluse, avoiding human contact, refusing to look at his students, and often ignoring even their questions while he lectured facing the blackboard. He also became increasingly sexually confused and even sought a sex change operation. Nevertheless, he also craved social stimulation which he expressed through his voluminous writings, but when he personally interacted with others, including family or members of the opposite sex, he would react in a bullying, sadistic, and angry fashion often becoming profoundly enraged.

According to his brother, Ted Kaczynski "through the years has shown sudden and unpredictable mood swings, a preoccupation with disease, extreme phobias, compulsive thinking and an inability to let go of minutia. One senses a psyche that feels itself terribly isolated and threatened by the world, tormented by its own complexity, unable to hold things in their proper perspective or to find comfort, security, or rest in itself."

Indeed, Ted himself admitted that his entire life he has felt "always under stress."

As noted, not all humans or animals react the same to stress, abuse, or insufficient social stimulation, as there are individual, gender, and other predisposing factors which differentially contribute to the outcome. In the case of Mr. Ted Kaczynski, it is noteworthy that he complained that his mother had always been emotionally cold and distant. In addition, his father committed suicide, and his brother David, also briefly lived as a recluse, in a hole in the ground, twenty miles from the nearest road. When it rained, or got too cold, David would pull a tarp over the hole to keep out the weather. In this regard, it could be argued that Ted Kaczinsky was already at risk and was predisposed to suffer catastrophic consequences from the brief period in which he was completely isolated around 9 months of age. Nevertheless, in this regard,

Mr. Kaczynksi also developed and forever displayed the characteristic symptoms associated with septal and amygdala abnormalities secondary to insufficient maternal and social-emotional stimulation during infancy (Joseph, 1999b).

Although Mr. Kaczynksi developed sexual problems, there is no evidence of sexual abuse in his early history. Of course neglect and isolation coupled with physical restraint, like sexual abuse, is exceedingly stressful, and may induce, to varying degree similar sexual and social-emotional problems due to the damaging effects on the limbic system.

Of course, it would be expected those who are neglected, deprived of sufficient mothering, and who are also sexually abused, would be even more severely and profoundly affected than Mr. Kaczyksi.

The Amygdala, Septal Nuclei & Social Emotional Deprivation

The amygdala and septal nuclei are crucially involved in all aspects of social emotional functioning and development. Moreover, as these structures mature, they not only give rise to social emotional behaviors, but require social emotional stimulation in order to develop normally. If that stimulation is not provided, these structures begin to develop abnormally, and social emotional functioning also becomes abnormal.

Beginning around 8 weeks, and as the medial amygdala begins to mature (Langworthy, 1937; Yakovlev & Lecours, 1967), the infant becomes exceedingly socially oriented, and will coo, goo, phonate, and babble in response to smiling faces, and will selectively search out and focus on the eyes of their caretaker (Sroufe, 1996). These emerging social behaviors can be directly attributed to the amygdala as well as the overlying (partly contiguous) temporal lobe. Both structures contains neurons which selectively respond to smiles, to the eyes , and which differentiate between male and female faces and the emotions they convey (Hasselmo, Rolls, & Baylis, 1989; Morris, Frith, Perett, Rowland, Young, Calder, & Colan, 1996 ; Rolls, 1984).

For example, the left amygdala can determine the direction in which someone else is looking, whereas the right amygdala becomes activated when making eye to eye contact (Kawashima et al., 1999). Moreover, the normal human amygdala typically responds to frightened faces by altering its activity and in fact increasing its activity as the facial expression changes from a smile to fear (Morris et al., 1996). In response to facial and eye-to-eye contact, the amygdala can trigger, via the corpus striatum (basal ganglia) and brainstem, eye-to-eye contact and a variety of facial expressions including the smile or the face of fear (e.g., Chen & Forster, 1973; Offen , Davidoff, Troost, & Richey, 1976; Sethi & Rao, 1976).

Hence, around 2-months of age, as the amygdala and its facial-detecting neurons begin to develop, the infant increasingly stares into the eyes of others, and begins to

recognize and will orient toward familiar faces (e.g. Sroufe, 1996). By 6-months it can discriminate between male and female faces, and by 9 months can easily discriminate between different facial expressions (e.g. Caron, Caron & Myers, 1985; Carpenter, 1974; Spitz & Wolf, 1946)–functions associated with the amygdala.

Moreover, these facial-detecting-neurons are richly interconnected with yet other amygdala-temporal lobe neurons concerned with auditory perception and social emotional functioning, including those which can trigger a smiling, laughing, and even a crying and sobbing response (Chen & Forster, 1973; Offen et al., 1976; Sethi & Rao, 1976). Hence, emotiona and face-to-face and eye-to-eye activation of the amygdala can also trigger smiling and social behavior.

Thus the early maturation of certain specialized amygdala-temporal lobe neurons which are selectively sensitive to human faces is an exceedingly adaptive development as it promotes social emotional face-to-face, vocal interaction, and the formation of emotional attachments.

However, if the infant is raised in an environment where the mother or primary caretaker fails to provide sufficient face-to-face stimulation, these neurons will fail to develop normally thus profoundly affecting all aspects of social affective behavior. Consider, for example, some of the classic signs of autism. The autistic child refuses to make eye-to-eye contact–and limbic system abnormalities have been associated with deprivation induced-autistic behavior in primates (Heath, 1972). This is not to imply that insufficient mothering is the cause of human autism, (though in some cases that may be true), but rather that insufficient mothering can damage the limbic system and produce autistic behaviors (see below).

Amygdala Social-Emotional Maturation

As the amygdala matures over the course of the first 8 months of development, the infant becomes increasingly social, may gaze into the eyes and smile at anyone, and will vocalize and seek to make contact even with complete strangers (Bronson, 1974; Charlesworth and Kruetzer, 1973; Schaffer, 1966; Spitz & Wolf, 1946; Waters, Matas, & Stroufe, 1975). Likewise, i nfants less than 6-months of age will readily accept mother substitutes.

However, by 8–12 months, as the amygdala, cingulate and other forebrain nuclei reach advanced stages of maturation (Benes, 1994; Joseph, 1992, 1999b; Yakovlev & Lecours, 1967), infants increasingly become upset at the prospect of maternal separation (Ainsworth et al., 1978; Bowlby 1969, 1982; Schaffer, 1966; Spitz, 1946). They also begin to experience and vocalize fear and separation anxiety (Bronson, 1972; Emde, Gaensbauer, & Harmon, 1976; Sroufe & Waters, 1976). Fear, of course, is associated with the amygdala (Davis et al., 1997; Gloor, 1992; Halgren, 1992; Rosen & Schulkin, 1998) , whereas activation of the anterior cingulate can produce infantile behavior, anx-

iety, and a separation cry (Devinksy, Morrell, & Vogt,1995; Jurgens, 1990; MacLean, 1990).

By nine months, 70% of children may respond aversively if a stranger approaches, whereas by 10 months they might cry out (Bronson 1974; Schaffer, 1966; Waters et al., 1975). By 1 year 90% of children may respond aversively to strangers (Schaffer, 1966). Instead, they increasingly bond to their mothers and are more likely to restrict their smiling and socializing to familiar faces and specific members of their family (Sroufe, 1996).

In this regard, the immature amygdala initially promotes indiscriminate socializing as it in fact requires this stimulation in order to develop normally,. Later, the maturing amygdala, in conjunction with the cingulate, septal nuclei and other forebrain structures, acts to promote the formation of specific and intense attachments. This is accomplished at first through expressions of joy and eye-to-eye facial contact which reinforces maternal behavior, and later via the generation of fear and separation anxiety which promotes close maternal contact and the formation of specific and enduring attachments (Joseph, 1992a, 1999b). In this regard the slow and differential rate of amygdala, cingulate, and septal maturation (see below) is exceedingly adaptive, such that emotions which restrict social tendencies appear only after the infant has received considerable social and emotional stimulation, and has already formed a generalized attachment to the primary caretaker. Again, however, if these neurons are not provided sufficient social, emotional and face-to-face stimulation during early development, they may lose the capacity to respond to these social signals such that all aspects of social, emotional, and even sexual behavior become exceedingly abnormal.

Amygdala Destruction and Amygdala Deprivation

Because limbic nuclei and subdivisions within these nuclei mature at different rates and differentially contribute to the experience and expression of emotion, they are also differently affected depending on if or when they are deprived of normal experience. For example, humans and non-human primates who are neglected and deprived of sufficient social and emotional contact during the first six months of postnatal development exhibit symptoms which are basically identical to those following bilateral amygdala destruction.

For example, monkeys deprived for the first three months of development become severely self abusive, withdrawn, and bizarre, and will withdraw and scream if touched or approached (Harlow & Harlow, 1965a,b). Those deprived for 6 months become severely autistic, and any desire for social contact is completely extinguished (Harlow & Harlow, 1965a,b). Similarly, human infants placed in foundling homes soon after birth and who are reared under deprived conditions for 6-months or more, become extremely bizarre, autistic, withdrawn, mute, self-stimulating and self-abusive, and

will withdraw or respond with "blood curdling screams" if approached (Goldfarb, 1943, 1945, 1946; Koluchova,1976; Spitz 1945, 1946).

Likewise, if the amygdala is destroyed, emotional functioning becomes exceedingly abnormal, and social behavior is essentially abolished. Among humans (Lilly et al., 1983; Marlowe et al., 1975; Ramamurthi, 1988 ; Scott, Young, Calder, Hellawell, Aggleton, & Johnson, 1997; Terzian & Ore, 1955) and non-human primates and mammals (Kling, 1972; Kling & Brothers 1992; Kluver & Bucy, 1939), bilateral injuries or destruction of the amygdala significantly disturbs the ability to determine, discern, or identify the motivational and emotional significance of externally or internally occurring events, to accurately perceive social-emotional nuances conveyed by others through gesture, voice, or facial expression, or to select what behavior is appropriate given a specific social context. Animals or humans with bilateral amygdaloid destruction become pathologically shy, respond in an emotionally blunted manner, and seem unable to discern the social, emotional or motivational characteristics of what they see, feel, hear, and experience.

Even with mild injuries they may be unable to determine if others are behaving in a friendly or unfriendly fashion are are unable to feel liked or experience affection. Like those who are not necessarily neglected but who receive insufficient mothering and social stimulation, with mild amygdala injuries the individual may become shy and feel awkward and uncomfortable when around others.

Since the human amygdala (and the forebrain) remains relatively immature for the first two months of postnatal development (Yakovlev & Lecours, 1967), likewise, emotional and social neglect experienced and limited to this early age, is not as destructive as compared to those neglected later in life (Langmeier & Matejcek, 1975). Likewise, amygdala injury during the first several months does not appear to be as disruptive as damage experienced later–a function of neuroplasticity and the ability of other brain tissues to acquire displayed functions and associated (and still intact) neural pathways (see below).

However, when the amygdala is injured later in life, the resulting social-emotional agnosia will even abolishes any emotional feeling for loved ones (Lilly et al., 1983; Marlowe et al., 1975) including, in one case, the patient's mother with whom he had been exceedingly close (Terzian & Ore, 1955). As described by Terzian and Ore (1955) the patient became extremely socially unresponsive, preferred to sit in isolation, well away from others, and demonstrated extreme and indiscriminate orality.

Among primates who have undergone bilateral amygdala removal, a dense social-emotional blindness becomes readily apparent. In several studies it was found that once these amygdalectomized primates were released to their social group, they were unable to comprehend emotional or social nuances and had little or no interest in social activity and persistently attempted to avoid contact with others (Kling, 1972; Kling & Brothers 1992; Jonason & Enloe, 1972). If approached they would withdraw. If followed they would flee. Among adults with bilateral amygdala lesions, total isolation was preferred.

Even maternal behavior is severely affected. According to Kling (1972), amygdalectomized mothers would bite off fingers or toes, break arms or legs, and behaved as if their "infant were a strange object to be mouthed, bitten and tossed around as though it were a rubber ball".

The behavior of mothers with bilateral amygdala destruction is in fact almost identical to the "maternal" behavior of mothers who had been raised in isolation. As described by Harlow and Harlow (1965, pp. 256–257, 259): "After the birth of her baby, the first of these unmothered mothers ignored the infant and sat relatively motionless at one side of the cage, staring fixedly into space hour after hour. As the infant matured desperate attempts to effect maternal contact were consistently repulsed... Other motherless monkeys were indifferent to their babies or brutalized them, biting off their fingers or toes, pounding them, and nearly killing them until caretakers intervened. Despite the consistent punishment, the babies persisted in their attempts to make maternal contact," which of course is due to the incredible need the infant and its limbic system has for social emotional stimulation.

Septal Destruction and Septal Deprivation

The amygdala maintains a mutually influential and counterbalancing relationship with the septal nuclei as both are richly interconnected via the stria terminalis axonal fiber bundle and both interact in regard to the hypothalamus and hippocampus. In general, the amygdala exerts inhibitory and excitatory influences on the septal nuclei, which in turn exerts inhibitory influences on the amygdala and both exert counterbalancing influences on the hypothalamus via the stria terminalis (see chapter 13).

For much of the first postnatal year, septal influences are relatively minimal as this nucleus matures and develops at a much later age than the amygdala (Brown, 1983; Joseph, 1992a, 1999b). In fact, the initial development of the septal nuclei is influenced if not triggered by the extended amygdala, the tuberculum olfactorium (Humphrey, 1967), and later, it is only upon the receipt of, and activation by amygdala afferent fibers that the septal nuclei begins to differentiate (Brown, 1983). Moreover, the myelination of the septal nuclei is "extraordinarily protracted" (Yakovlev & Lecours, 1967). Indeed the septal nuclei and septal pathways do not display a significant degree of myelination until around 4-months of age and takes well over 3 years to reach advanced stages of development (Yakovlev & Lecours, 1967).

These differential rates of septal vs amygdala maturation are exceedingly adaptive. For example, as the inhibiting septal nuclei develops, the indiscriminate contact seeking of the amygdala comes to be suppressed, inhibited, and sufficiently restricted so that a very narrow and intense attachment is fashioned in its place.

In addition, as the septal nucleus is associated with internal inhibition and oppositional feelings of negativity (Heath, 1976) including rage (Blanchard & Blanchard, 1968; Jonason & Enloe, 1972), the later maturation of this structure likely contribute

to the oppositional and defiant childish attitude that emerges around age two: the so called "terrible twos." These behaviors do not promote intimate social interactions and are probably produced secondary to septal influences on the amygdala and hypothalamus as these latter structures commonly trigger rage reactions (see chapter 13).

Destruction of or injury to the septal nucleus eliminates in part those counterbalancing inhibitory influences exerted on the amygdala and hypothalamus. However, septal injury secondary to deprivation and abuse experienced later in development can also induce septal seizure-like activity (Joseph, 1999b). If the septal nucleus is injured or develops seizure-like activity and if the the amygdala is released from septal inhibitory activity, and as the amygdala promotes indiscriminate socializing, there results an extreme desire for social and physical contact coupled with aggressive, explosively violent, and bizarre behavior (Jonason & Enloe, 1972; McClary, 1966; Meyer, Ruth, & Lavond, 1978). That is, since the amygdala as well as the septal nuclues mediates aggressive and social behavior, and since septal destruction of injury results in amygdala disinhibition, the disinhibited amygdala (coupled with septal stressed-induced abnormalities) promotes aggressive, emotionally bizarre behaviors

In addition, septally lesioned animals and humans also become explosively violent (Jonason & Enloe 1972, MacLean, 1990; McClary, 1966; Meyer et al., 1978). This behavior is similar to that of humans who suffered maternal deprivation late in development (Goldfarb, 1945,1946; Koluchova,1976; Spitz, 1946). That is, these deprived children will behave in a socially bizarre, bullying, sadistic, and explosively violent fashion.

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