

# Anxiety in Adolescence: The Integration of Attachment and Neurobiological Research into Clinical Practice

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**Abstract** Attachment theory illuminates aspects of adolescent development and points to critical treatment directions for adolescents. Recent neurobiological research illustrates the importance of integrating physiological understanding into clinical work. The application of attachment theory and neurobiology to treatment is illustrated best through the case example of one adolescent with panic disorder treated in an outpatient setting.

**Keywords** Attachment · Psychotherapy · Adolescent development · Panic disorder

## Attachment in Adolescent Development: The Integration of Attachment and Neurobiological Research into Practice

According to attachment theory, the presence of a principal attachment figure as a source of emotional security significantly affects human development (Allen and Hauser 1996; Freeman and Brown 2001). Depending on an individual's developmental phase, the role of this attachment figure varies.

During infancy, the caregiver's role is to provide a secure base from which the child can explore her surroundings. The caregiver's response to this need will affect the child's attachment behaviors. Securely-attached infants seek caregivers to help them regulate distress, while insecurely-attached infants avoid caregivers or become hyper-vigilant to the caregivers' needs. These insecurely-attached

children communicate distress as anger or fear, while securely-attached children openly express distress with the expectation that caregivers will provide safe haven and comfort (Ainsworth 1979; Keiley and Seery 2001). A caregiver's availability, warmth and consistency to the child's needs shape the attachment behaviors of the child.

Caregiver inconsistency can result in an insecure-ambivalent attachment while caregiver unavailability or rejection can result in a child's insecure-avoidant attachment (Keiley and Seery 2001). When a caregiver's behavior is chronically inconsistent or rejecting or when the caregiver simply does not meet the child's need for security and emotional support, the child is nearly always in a state of uncertainty about the physical or emotional availability of the parent. As a result, the child may form internal models of attachment characterized by feelings of hostility. The child is likely to believe that their needs will not be met by others (Allen et al. 1990). Conversely, a consistently warm and responsive caregiver fosters the development of secure attachment (Keiley and Seery 2001), allowing the child to explore her environment knowing that safety needs will be met and emotional support will be provided. These attachment behaviors develop into patterns and coping styles that provide physiological and behavioral regulation (Reite and Boccia 1994). These schemas, referred to as the attachment system, are typically stable throughout an individual's life.

## Adolescent Attachment

Adolescence is a developmental stage characterized by intense individual transformation (Allen and Land 1999). Adolescents experience this transformation differently depending on the cultural context. For example, in a review

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of studies examining the adolescent and parent relationship in Japan and the United States, Rothbaum et al. (2000) identified values and behaviors more characteristic of Japanese adolescents than American adolescents. Japanese teenagers typically are more invested in maintaining relationships with parents and less engaged in the individuation process than Americans. American adolescents typically spend more time with peers, are engaged in greater transference of allegiance from parents to peers, and experience greater conflict in their relationships with parents (Rothbaum et al. 2000).

Western cultures place great emphasis on individuation. Western adolescents strive to develop a sense of self-determination and to develop the skills that enable them to function independently from family (Freeman and Brown 2001; Kenny 1994; Kuperminc et al. 1996; Pavlidis and McCauley 2001). Western societies place significant emphasis on the completion of this individuation in adolescence. In many Western cultures, adolescence is a time to transition from living with one's family of origin to living with one's peers or partners by young adulthood. This individuation therefore is a central feature of Western adolescent development (Kuperminc et al. 1996; Moore 1987), and appears as a prominent dynamic in many American teenagers.

Adolescents demonstrate secure attachment behavior through establishing autonomy while maintaining connections with their caregivers (Allen and Hauser 1996; Grotevant and Cooper 1985). This concept, termed "autonomous relatedness," describes the dynamic created when adolescents seek to differentiate themselves from others by asserting independence and self-determination. These behaviors are particularly evident during conflicts expressing differences of opinions between parents and teens. At the same time, the adolescent continues to nurture the parental relationship. Through displays of interest and validation of the other's thoughts and feelings (Allen and Hauser 1996) the adolescent preserves the supportive parent-child relationship. In secure attachment relationships between adolescents and their parents, adolescents successfully balance both autonomy and relatedness, maintaining independence and utilizing caregiver support when needed (Allen and Hauser 1996; Grotevant and Cooper 1985).

Adolescent strivings for autonomy may appear opposite to infants' displays of neediness; however, adolescents' attachment needs are functionally similar to those of infants (Allen and Hauser 1996; Allen and Land 1999). Adolescents often appear to be engaged in a flight away from primary attachment figures in an attempt to establish autonomy, but they desperately need caregiver support. They are most successful at establishing autonomy when still able to utilize the secure base relationship with

caregivers (Allen and Hauser 1996; Allen and Land 1999; Bowlby 1980). The conceptual difference between infant attachment needs and those of adolescents is the shift from the infant's physical secure-base attachment relationship to the adolescent's cognitive and emotional secure base (Allen and Hauser 1996).

### Attachment and Neurobiology

Attachment theory assumes a biological basis for human behavior. It presumes an ethological-evolutionary perspective and considers relationships necessary for survival and security (Ainsworth 1979; Bowlby 1958, 1980, 1988; Cassidy and Mohr 2001). In addition to shaping behavior, attachment likely serves in the process of brain development and organization, preparing individuals for social existence (Fonagy and Target 2005). Attachment also plays a role in establishing/maintaining physiological regulation (Reite and Boccia 1994). In fact, Reite and Capitanio (1985) define attachment as "a neurobiologically based and mediated behavioral system, one of whose major functions is to promote the development and regulation (or modulation) of psychobiological synchrony between organisms" (p. 224).

Since Bowlby (1958) introduced us to attachment theory, researchers have sought to understand attachment origins and implications (Ainsworth 1979; Allen and Land 1999; Fonagy and Target 2007; Main and Solomon 1986). While a great deal is known about the social and psychological aspects of attachment, neurobiological research has only recently begun to contribute to our understanding of attachment (Insel 2000).

Caregiving behaviors are both environmentally driven and genetically influenced with key neurobiological components underlying specific features of maternal behaviors (Hofer 2003; Leckman et al. 2004). For example, infant signals can activate certain neurotransmitters, such as oxytocin and dopamine, influencing maternal parenting behaviors (Swain et al. 2007). Research suggests that artificial stimulants can influence these behaviors by affecting these neurotransmitters (Swain et al. 2007). For example, in one study, Light et al. (2004) found that when responding to infant contact and a stressor, mothers exposed to cocaine during pregnancy demonstrated significant differences in peripheral oxytocin responses than did their matched controls. This group also demonstrated greater hostility, depressed mood and less mastery over life events. In another study, children exposed to cocaine, opiates, or other substances in utero, demonstrated lower levels of attachment security (Seifer et al. 2004).

Most studies of the relationship between neurobiological processes and attachment examine animals. Studies looking at behavioral and physiological responses of animals to

separation from their mothers serve as important models of human separation (Reite and Boccia 1994; Swain et al. 2007). Most of these studies consider biological responses to the disruption of maternal-infant bonds and explore the consequences of long-term separations and caregiver disturbances (Putnam 2005).

Studies of non-human primates are particularly useful for understanding the dynamics of human separation and attachment. Non-human primates, such as monkeys, experience developmental stages that mirror our own and encounter comparable challenges (Putnam 2005). Non-human primates develop peer attachment relationships and create complex social structures within their environments. In addition, they, similar to humans, demonstrate considerable variability in responses to separation and loss (Putnam 2005; Reite and Boccia 1994).

Non-human primates also offer researchers insight into the interaction effects of the central nervous system, social behavior, and social attachment (Keverne 2005; Reite and Boccia 1994). The commonalities between the central nervous systems of human and non-human primates create a rich opportunity for understanding the neurobiological components of attachment. In addition, research looking at social behavior and social attachment of non-human primates leads scientists to believe that the neurobiological basis of social attachment in non-human primates is likely homologous with that of humans (Reite and Boccia 1994).

Research examining the parent–child separation experience in non-human primates suggests that this incident is a powerful disruptor of many physiological and behavioral systems (Reite and Boccia 1994; Swain et al. 2007). Suomi (1996) looked at mother-reared and peer-reared rhesus monkeys. In this study, the experimental group consisted of infant monkeys removed from their biological mother's at birth and placed in a nursery with other infant monkeys their age. These monkeys lived in this "peer group" for the first 6 months of their lives. The control group consisted of infant monkeys raised by their biological mothers. Researchers periodically put both groups through short-term separation and reunion episodes. After the initial 6 months, researchers placed all infants from both groups together in a common social group with one older male and one older female with whom they lived until adulthood. However, these monkeys were periodically challenged to subsequent separation experiences (Suomi 1996).

This study found significant differences between the two groups in terms of blood chemistry, activity profiles, and adrenocortical neurochemical and behavioral responses to the brief separation experiences. Following the 6 month separation when all infants were placed together, most group differences diminished. However, following subsequent separations, the peer-reared monkeys displayed extreme behavioral disruptions and physical arousal as

measured by differences in plasma cortisol and adrenocorticotrophic hormone (ACTH) levels and levels of nor-epinephrine and serotonin metabolites (Suomi 1996). Interestingly, the female peer-reared monkeys were more likely to demonstrate inadequate mothering techniques with their own children. Similarly, many group members excluded the male peer-reared monkeys from their social groups (Suomi 1996). The parent–child separation and rearing environments influenced the attachment behaviors and neurological responses to separation in infant monkeys. Findings such as these suggest that early parent–child attachment disruptions affect the neurobiology of human infants.

The human infant generally experiences early attachment disruptions as stressful or threatening to his sense of security. In fact, research on non-human primate behavior consistently links stress, threatening situations and hormones of the hypothalamic–pituitary–adrenal (HPA) axis to the formation of attachments (Carter 1998; Hennessy 1997). Literature suggests that the secretion of hormones of the HPA axis, cortisol, corticosterone, and ACTH, are associated with separation from attachment figures (Hennessy 1997; Levine et al. 1997; Mendoza and Mason 1997; Reite and Boccia 1994). This data lends credence to the hypothesis that physiological responses reflect the disruption of attachment processes (Hennessy 1997).

Mendoza and Mason (1997) demonstrated this disruption in a study of mother and infant squirrel monkeys. When separated, both mother and infant squirrel monkeys exhibited elevated plasma cortisol levels even when the separated individual remained in the home cage with other familiar companions. Reite and Boccia (1994) presented similar findings, describing other physiological and immunological responses, cardiac changes, and sleep disruptions associated with social separation in primates.

#### Neurobiology and Psychopathology

Many adolescents referred for treatment are insecurely attached. When faced with stressful situations, these individuals are likely to develop symptoms of neuroses or depression (Bowlby 1977). Further linking insecure attachment to psychopathology, studies identify higher levels of psychopathology in children with parents diagnosed with affective disorders when compared to children whose parents do not have such disorders (Radke-Yarrow et al. 1985). Radke-Yarrow et al. (1985) found that children raised by mothers diagnosed with depression or bipolar disorder were more likely to be insecurely attached.

While there appears to be a link between insecure attachment and psychopathology, our understanding of the neurobiology of adolescent psychopathology is still limited (Kaufman and Charney 2003). Some studies use

neuroimaging to look at brain structure irregularities and have found evidence of abnormalities in the frontal cortex of depressed adolescents (Nolan et al. 2002; Steingard et al. 2002; Zalsman et al. 2006). Steingard et al. (2002) found that total brain volumes in depressed subjects were significantly smaller when compared with the non-depressed subjects. Nolan et al. (2002) looked at adolescents with Major Depressive Disorder, near illness onset, prior to exposure to psychotropic medications. They reported larger left-sided prefrontal cortex volumes in adolescents with non-familial Major Depressive Disorder. The findings of Nolan and colleagues were contrary to similar studies with adult subjects that reported a reduction in prefrontal gray matter in subjects with unipolar depression (Drevets et al. 1997). Such findings suggest that adolescent pathology has a neurobiological base, but one which is still poorly understood.

### Attachment, Anxiety, and Neurobiology

For ethical purposes, most neurobiological research investigating social processes utilizes animal models (Heim and Nemeroff 2001). However, a substantial body of literature considers biochemical and physiological responses to stress and trauma in humans (Baker et al. 1999; Cicchetti and Rogosch 2001; King et al. 2001; Putnam and Trickett 1997; Yehuda 2002). Such data contributes crucial information to our understanding of social processes like attachment.

Studies consistently link the development of insecure attachment behaviors with many stressors measured in neurobiology studies (Cassidy and Mohr 2001; Hesse and Main 2000; Radke-Yarrow et al. 1985). However, research asserts that, in order to develop successfully, humans need opportunities to deal with stressful situations. Resolving experiences of fear or trauma, they argue, are essential for the development of necessary brain structures to cope adaptively with anxiety and develop organized responses to stressful situations (Siegel 2002). At the same time, a history of unresolved trauma places children at risk for maladaptive coping and psychopathology later in life (Cassidy and Mohr 2001).

High stress and anxiety times activate the attachment system. Substantial evidence suggests that early adverse life experiences link to physiological and behavioral changes indicative of fear and anxiety, predisposing individuals to increased vulnerability for depression and anxiety (Heim and Nemeroff 2001). Because of a low sense of control and predictability, insecurely attached individuals will be at risk for chronic anxiety (Pacchierotti et al. 2002).

Secure attachment relationships serve to help humans develop security, self-esteem, and social competence. The

lack of this secure relationship, and in turn the deficiency of these qualities, can lead to anxiety and depression (Bowlby 1980). While secure individuals are generally equipped to acknowledge and cope effectively with negative or stressful situations, insecure individuals are often unable to regulate their emotions effectively and become anxious or despondent (Cooper et al. 1998).

Attachment researchers identify differential cerebral circuits involved in attachment and the mediation of fear: the amygdala, cingulate and septal nuclei (Cummins and Ninan 2002; Pacchierotti et al. 2002). Notably, the physiological development of these cerebral circuits corresponds with the emergence of wariness and fear (Pacchierotti et al. 2002). Ballenger (1998) notes that anxiety responses can develop prior to an individual's ability to be cognitively aware of the experience. Well before the declarative memory develops, early traumatic experiences leave their traces in the amygdala as emotional memories, eliciting fearful responses (Ballenger 1998). When this occurs, children develop fearful and anxious responses, but lack cognitive awareness as to the cause. This may explain why insecure individuals may respond emotionally to stressful situation without knowledge of the reasons (Cooper et al. 1998).

Research is increasingly looking at the effects of stress on human infants. Focusing primarily on HPA activation in response to stress, studies examining the effects of stressful experience on brain development have resulted in an increased understanding of the neurobiology of brain development and the neuroplasticity of the brain. Further, stress causing HPA activation during early development is recognized as a factor in the development of depression pathways in the brain (Beatson and Taryan 2003; O'Keane 2000).

HPA activation in response to stress differs in infants with varying attachment classifications (Spangler and Schieche 1998). Spangler and Schieche (1998) observed 106 infants during the "Strange Situation" procedure. The Strange Situation is a sequence of separation and reunion events implemented in a laboratory setting designed to assess toddler attachment. In this study, caregivers also completed a measure assessing temperament and researchers measured children's circadian rhythms and cortisol levels at various times throughout the day (Spangler and Schieche 1998). The study found that insecure-ambivalently attached subjects had heightened adrenocortical responses and that the securely attached infants did not (Spangler and Schieche 1998). These responses are likely attributable to insecure infants' lack of organized response system to stress and the secure infant's ability to use her caregiver as a secure base during stressful situations. The secure infant's ability to use her caregiver allows her to develop the ability to regulate emotional distress independently (Beatson and Taryan 2003; Spangler and Schieche 1998).

Early responses to anxiety can become maladaptive, developing into anxiety disorders. An example of this is panic disorder (PD). PD is characterized by the presence of recurrent panic attacks, persistent concern about having another panic attack and significant behavioral changes such as avoiding places and situations or engaging in self-medication as a result (American Psychiatric Association 2000). PD involves sudden and intense episodes of anxiety, somatic symptoms and a desire to flee (Cummins and Ninan 2002).

Pacchierotti et al. (2002) note that some authors consider PD to be rooted in attachment disruptions. This belief is consistent with the observation that patients with PD, similar to insecurely attached individuals, demonstrate a heightened sensitivity to perceived, threatened, or actual separations (Pacchierotti et al. 2002). In addition, several studies link early disruption of attachment, including separation anxiety, to the later development of PD (Cummins and Ninan 2002; Pacchierotti et al. 2002; Pine et al. 1998).

### Clinical Implications

Attachment theory illuminates aspects of adolescent development and points to critical treatment directions. One of the most fundamental contributions of attachment theory to clinical work is the framework it provides for understanding the developmental history and internal working models of clients (Daniel 2006). Whatever the goals of treatment, attachment-oriented therapists focus on altering clients' existing internal working models (Daniel 2006).

In treatment, attachment-oriented therapists focus on creating conditions through which clients can explore current and past attachment experiences (Sable 1992). In terms of adolescent treatment, it is important for therapists to recognize that the autonomy-relatedness struggle often creates internal dissonance for the adolescent. This presents an additional challenge to the therapist striving to create an environment conducive to the development of a secure base.

Attachment-oriented treatment focuses on helping clients to understand their various states of affect arousal and assists them in recognizing their unhealthy relational patterns and self-regulation strategies. This is particularly pertinent for clients diagnosed with PD. These clients generally lack awareness of their physiological responses and typically underutilize successful de-escalation skills. Rather, they become overwhelmed with fear and besieged with the desire to flee.

Recent neurobiological research illustrates the importance of integrating a physiological understanding with treatment planning. The goal is to develop an understanding

of the potential physiological as well as behavioral responses. Within the framework of adolescent attachment, creating a secure base will decrease the stress associated with separation, ultimately altering the biological response mechanisms. This is essential in that physiological responses reinforce feelings of depression, anxiety, and panic, perpetuating maladaptive responses. In addition, it is important for therapists to recognize when there may be a need for pharmacological interventions. While pharmacological treatment is beyond the focus of this article, it seems clear that life events can drastically alter the neurobiology of many clients and psychotherapy may begin to heal this. A case example here will illustrate more clearly application of the above principles to practice.

### Case Example

Janine was a Caucasian 13-year-old girl who presented for treatment describing numerous symptoms of panic. Her father, with whom she primarily lived, called to schedule the initial appointment, stating that his daughter seemed to be having a difficult time socially at the start of the seventh grade year. In the initial session with Janine, she described episodes of panic with agoraphobia. She stated that she tended to become panicked at school and preferred to stay at home. She endorsed panic symptoms of palpitations, sweating, shaking, feeling dizzy, fearing loss of control, and hot flushes. She described these symptoms beginning during her sixth grade year of school when she became alienated from most of her female friends.

Janine stated that, during her sixth grade year, she inadvertently angered one of the most popular girls in her school, leading to that girl's disparagement of her and subsequent loss of other friendships. Janine described making a comment about the popular girl's clothing one day and showing up next week at school to an entirely changed social circle. Janine described herself previous to this incident as social but shy. She noted that she rarely initiated friendships with others, relying on more gregarious peers to seek her out. She stated that she was grateful to anyone who befriended her and that she expected to give more in her relationships than receive.

Janine described her home life as "fine," describing a quiet family life with her businessman father. She stated that her parents divorced when she was one year old and that they maintained a cordial but cool relationship. She lived mostly with her father, but spent school holidays with her mother who lived with a steady boyfriend about 30 miles away. Janine stated that her relationship with her father was close, explaining that she often shared her stories about her day with him and that he was a good and attentive listener. She detailed a conflictual relationship

with her mother, with whom she felt she could share little without judgment.

Janine described a family history marked by several important separations. She described that she had lived with her father for the 4 years immediately following her parents' divorce, but then spent the rest of her childhood between the two homes: 2 years here, 4 years there, 3 years back here. She described that both of her parents wanted time with her and changed their minds several times about which home was best for her. When she lived with her father, her mother was largely unavailable to her and visa versa. When she lived with her mother, her father often travelled for business, spending months abroad for work. Janine reported that these moves were difficult for her, but that she tended not to question her parents' decisions.

Janine stated that she was interested in coming to outpatient therapy because she was embarrassed by her panic symptoms and found them hard to hide. She was particularly worried about her peers' noticing her distress. Janine stated that she had always been an anxious person and that her father was, as well. She stated that she was used to her anxiety, but found her panic hard to manage among an environment of peers.

I assessed Janine as having an insecure attachment style, one which was likely impacted both from early caregiver relationships and from important separations throughout her childhood. Suomi's (1996) findings suggest that early parent-child attachment disruptions may affect children's neurobiology. I hypothesized that early, extended separations in Janine's life post-divorce may have hampered her successful neurological development, leading to significant neurochemical and physiological arousal manifesting in panic symptoms. These symptoms activated primarily in response to relational disruptions with peers at school where she had no sense of safe haven or secure base.

I aimed then to use interventions which would decrease neurochemical and physiological arousal in Janine. I decided to implement behavioral interventions which decrease anxiety symptoms short-term, interventions such as guided visualizations and diaphragmatic breathing. Such interventions could decrease short-term arousal, while I would make efforts to build a therapeutic relationship long-term which might contribute to "earned secure" attachment. Siegel (2002) suggests that resolving experiences of fear is essential for the successful development of brain structures to cope with anxiety and organize responses to stress. Therapy then would aim to create a space where Janine could work through experiences of fear and create organized responses to stressful events.

Weekly individual therapy with Janine began with a thoughtful effort to build a strong therapeutic relationship. This therapist believed that a strong therapeutic

relationship might serve effectively as a secure base from which exploration was possible. Focusing on careful attentiveness and empathic, attuned responses, this therapist attempted to listen to Janine's distress. Slowly, she began to trust that I would listen without judging or abandoning her.

Every week, I invited Janine to speak about whatever issues were troubling her most. She often spoke about school and conflicts with peers. Occasionally, she was tearful but more often she was anxious and her breathing quickened. Through this process, I was able to see her distress and her limited ability to self-regulate affect states. When I noticed she was anxious in session, I often asked her if she could identify her own feelings. She generally couldn't and this was good information for me in designing interventions. I decided that treatment would focus on affect identification with the eventual goal of self-management of affect states. These goals would be accomplished through the medium of a warm, empathic therapeutic relationship.

During our second month working together, Janine started to explore conflict in her relationships with her parents. She frequently spoke in session about conflicts with her father in his house or unhappiness with some response her mother had made to her. This focus on family relationships initially increased her panic symptoms and she questioned the function of therapy. Hearing her concerns, I attempted to provide a safe space where her anxiety over relational conflict could be held. I explained to her that sometimes unearthing conflicts produced greater anxiety and that eventually her anxiety would lower. I continued to model for her identifying one's own affect states as well as concrete skills for managing these. Specifically, I taught Janine guided visualizations and diaphragmatic breathing to use when her anxiety was particularly high. We also reviewed behavioral measures for reducing panic symptoms. With these tools, she seemed to improve her management of anxiety symptoms and explore in earnest her relationships.

Janine explained at this point in treatment that she felt particularly anxious around her parents, but for entirely different reasons. She explained that she felt she had to edit narratives told to her father in order to reduce his anxiety. This left her holding her own distress alone. From her mother, she felt little interest but significant judgment. Janine explored how, in both relationships, she tended to adapt herself to her perception of her parents' needs. With encouragement and questioning from this therapist, she began to recognize how such relational patterns played out with her peer groups as well. I frequently asked her questions designed to display interest without judgment. I often said, "can you tell me more about that?" or "what was that like for you?" My questions and my responses to her

narratives were intended to reflect a therapeutic stance of attentive, empathic other.

In the final months of year-long course of treatment, Janine began to form new patterns in peer relationships. She began to demand more of her friends and ask that they listen to her. She formed new friendships when the old ones couldn't adapt to her changing self-concept. While relapse into old patterns of relating was common in the final month of treatment, Janine continued to display hopeful signs of changed relational expectations.

## Discussion

The case of Janine illustrates several important elements of the attachment literature. In this case, we see relatedness with no autonomy. Janine, an early adolescent and an anxious one, has not yet begun to question her parents or their decisions. She tends to avoid conflict and subjugate herself to others' wishes. We can assume that she learned to do so in her relationships with her primary caregivers, her parents.

Janine also appears to be insecurely attached to both parents. While she shares some information with her father, she edits out that information which might appear challenging to him in order to preserve the relationship. Such editing is emblematic of what D.W. Winnicott termed the "false self," the construction of the self which develops when a child receives inadequate mirroring from the caregiver. In such cases, the child lets go of the "true self," the self she experiences herself most closely to be, and adopts a self and traits which the caregiver most wants to see (Winnicott 1965).

We see little evidence of normative individuation in Janine, an early adolescent who believes she must subjugate the self in order to maintain relatedness with parents or peers.

While in secure attachment relationships adolescents balance both autonomy and relatedness by maintaining independence and utilizing caregiver attentiveness, we see in Janine evidence of only of relatedness with no autonomy.

We hypothesize that, in the case of Janine, parent-child separations and rearing environments influenced her attachment behaviors and neurological responses to separation. Janine's repeated and lengthy separations from both parents appear to have impacted her developing brain, supporting the emergence of anxious pathology. We see Janine's hyperarousal to conflict and separation with peers and the emergence of her panic symptoms in response. Neurobiological research suggests that physiological responses reflect the disruption of attachment processes. We see evidence for this in Janine.

We also see evidence for her insecure attachment in her inability to share fully with both parents, in her careful editing of what to share with them and what they can tolerate. We see evidence particularly of anxious attachment in Janine. Her tendency to crave closeness, paired with her anxiety at her parents' unavailability, is a hallmark of anxious attachment. This attachment style puts her at particular risk for chronic anxiety because insecurely attached individuals maintain a low sense of control and predictability over their relationships. They perceive themselves as being constantly subject to the whims of others and without the ability to get their emotional needs met assertively.

Insecurely-attached children tend to develop fearful and anxious responses to relational stimuli, but lack cognitive awareness as to the cause. This may explain why insecurely-attached individuals respond emotionally to stressful situations without knowledge of the reasons. Janine's panicked responses to her peers' disparagement is one such relational stressor. Given Janine's attachment history, she has little tolerance for separations from peers. Such separations induce overwhelming panic in her, panic which she cannot understand or control.

The case of Janine clearly illustrates the application of attachment and neurobiological research to an understanding of adolescent anxiety and development. Understanding such research may provide clinicians with deeper insight into the relational dynamics of our complex populations. Clinical social workers are wise to maintain awareness of the complex interplay of attachment and neurobiological factors in our clients. We ought to be aware of that neurobiological research which provides insight into our clients' affect states. When we can accurately see our clients' complex behaviors as driven by attachment needs as well as neurobiological impulses, we can begin to design interventions which speak to the heart of clients' problems. In the case of Janine, an understanding of adolescent developmental tasks, adolescent attachment needs and neurobiological research drove treatment planning. As clinical social workers, we may find that our most successful treatment plans result from similar integrations of theory and research into practice.

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