The Early Attachment Experiences are the Roots of Psychopathy

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Abstract

This review proposes the 'attachment and the deficient hemispheric integration hypothesis' as explanation for psychopathy. The hypothesis states that since secure attachment to the parents is essential for the proper development of both the hemispheres in children, psychopaths with histories of neglect and abuse are unable to develop efficient interaction of both the hemispheres, important for emotional processing and regulation. Various studies have shown that without an efficient interaction between the two hemispheres psychopaths fail to perform adequately on tasks that require both language abilities and non-verbal emotional processing. The hypothesis also explains why psychopaths will perform inefficiently in conditions that selectively prime the left hemisphere resources as these people would have learnt to rely more on the language based mode of this hemisphere. The childhood of psychopaths is marked by insecure attachment with their parents where the parents fail to respond to the needs of the pre-verbal infant thus leading to improper development of the right hemisphere abilities, one of which is decoding and showing appropriate non-verbal emotional signals resembling a pattern shown by the parents. The hypothesis is useful in explaining different findings on laterality in psychopathy as well as answering the nature-nurture debate of the disorder. Research carried out under the proposed framework can be helpful in understanding the nature of the disorder which will be ultimately useful in the prevention of its full blown manifestation.

Keywords: attachment; psychopathy; hemispheric integration

Attachment refers to the inbuilt ability of humans to form strong bonds of affection to significant others in their lives in infancy, adulthood as well as childhood. Attachment system plays a significant role in maintaining proximity between the infant and its caregivers so as to ward of danger and threat and thus increase the chance of survival (Ainsorth & Bowlby, 1991). Later on in an infant's life the attachment system serves to help children feel a sense of security and thus fosters exploration of the environment on the part of the child. Attachment serves to establish a close relation between the caregivers and the child and helps the immature brain of the child to use the mature functions of the parents' brain to organize his or her own mental processes

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(Hofer, 1994). The emotional nature of the close and secure attachment style between the parents and the child makes the parents sensitive to the signals of the child which in turn serves to amplify the child's positive emotional states and modulate negative ones (Sroufe, 1996).

Ainsworth et al. (1978) classified the infant attachment to their parents in three different categories namely:

Secure attachment style: Parents who are emotionally available and responsive to the infants needs have children who are securely attached to them. Such infants will show signs of missing the parents during periods of separation but will quickly initiate physical contact on the return of the parent. Such a child/infant will use the functions of the parents' brain to organize his or her own mental processes. Infants who share a secure attachment relation with their caregivers will also explore novel environment using the parent as a secure base. Such secure attachment will also serve to modify the negative states of the infant as well as amplify the positive ones. Later the child will independently be able to manage his or her own emotional states in an adaptive manner which is a key to successful adjustment later in life.

Avoidant attachment style: Avoidantly attached infants will fail to show signs of missing the parents during periods of separation and will also avoid the parent on reunion, showing no signs of seeking physical proximity. Parents who are emotionally unavailable to their infants' needs have children who show such an attachment style. Such a child when grows up will avoid dependence on others (Main, 1995). As a result, social competence in such children is severely compromised.

Resistant or Ambivalent style of attachment: Some parents are inconsistently available and also tend to intrude their own states of mind onto their children. Such parents have children who are not easily soothed by the return of the parents after the separation period. Such a child is always preoccupied by his or her own distress as they are always uncertain whether their own needs will be satisfied by their parents. On growing up, these children will have perceptions and expectations about the world that are filled with ambivalence.

Disorganized/disoriented style of attachment: This fourth style of attachment was proposed by Main & Solomon (1995). Such an infant behaves in a disorganized manner on the return of the parents after the period of separation. He or she will be seen as turning around in circles, approaching and then avoiding the parents and show stillness. Parents of such children will show frightening and disoriented behavior

towards their children. The parent is the source of fear for the children. Such an attachment style can be an outcome of parents who are emotionally, physically or sexually abusive (Kaufman & Zigler, 1987; Lyons-Ruth, Bronfman & Parsons, 1999). Children with such an attachment style show the most difficulty later in life in all spheres of adjustment (Carlson, 1998).

Effect of Early Attachment on the Growing Infant

It has been shown that the infant's right hemisphere is involved in attachment and the mother's or the caregiver's right hemisphere is involved in comforting functions for the infants (Siegel, 1999). Moreover the ventral stream (Ungerleider & Haxby, 1994) of the right hemisphere is specialized to analyze low frequencies of visual perception and auditory tones (Ornstein, 1997). This is useful as the low frequencies of visual perception helps convey information regarding the general outlines of faces and the low frequencies of auditory tones help convey information about the emotional intonation of language of the caregivers. This in turn is useful for the infant as it helps the infant to orient to the caregiver's face and the tone of the voice.

The infant makes use of the non-verbal right hemisphere to develop close bonds with the caregivers and this thus develops the right hemisphere functions further. The infant gradually learns to regulate his/her vital functions that are crucial for supporting survival and enabling the organism to cope with stress actively as well as passively with the help of the right hemisphere (Schore, 2001). This support is provided by the closest attachment figure in the environment who models such regulatory processes for the infant by modulating her/his own emotional responses and also by soothing the infant during times of distress. The infant slowly imbibes such adaptive regulatory strategies. Thus the preverbal infant relies on the functions of the right hemisphere to explore the environment and therefore the attachment relation which the child shares with the attachment figures has an immense impact on the growing child.

Secure attachment not only has advantageous effects on the psychological well being of the growing child but also affects the underlying neurobiology. It helps to achieve efficient hemispheric integration. This is essential since the left hemisphere is most efficient in decoding and producing speech and hence is responsible for the language functions. The right hemisphere on the other hand, is responsible for decoding and producing the non-verbal signals that always go hand in hand with the language part

(Siegel, 1999). Thus the interhemispheric transfer of the representations of the left and right hemispheres are important for an individual to function effectively in a social setting and this is achieved by the hemispheric integration. The first maturing right hemisphere and its functions are followed by the development of the functions of the left hemisphere as language is picked up by the young infant.

Early attachment relationships also activate the orbitofrontal cortex (Schore, 1996) as it has cells just like the amygdala that are responsive to eye contact and facial expressions. The orbitofrontal cortex is responsible for very important functions like, evaluating the emotional valence of a stimulus along with structures like the amygdala and the anterior cingulate. Evaluation of the valence of the stimulus has effects on the action tendencies of the organism toward it and hence a positively evaluated stimulus will elicit approach behaviors. The orbitofrontal cortex is ideally situated at the interface of the lower regions of the brain that take input from the body and the higher regions that are involved in integrating information and making complex plans which makes it an ideal candidate for influencing various functions related to social cognition (Siegel, 1999). The structure also plays a very important role in response flexibility which is achieved by taking changing and novel situations into account and emitting appropriate responses (Freedman et al., 1998).

Disorder of Psychopathy

Psychopathy is termed as a disorder of empathy (Soderstrom, 2003). According to Blair (2001), psychopathy in both childhood and adulthood, is based on high scores on clinically based rating scales. The psychopathy-screening device (PSD) for assessing children and for adults, the revised psychopathy checklist (PCL) is generally used. Factor analyses based on both the PSD and PCL reveal two independent factors: (1) an emotion dysfunction factor defined largely by emotional shallowness and lack of guilt and (2) an antisocial behavior factor defined largely by the commission of a wide variety of offence types. Socioeconomic status and IQ are correlated with scores on the antisocial factor, but neither is associated with scores on the emotion dysfunction factor. This happens as scores on the emotion dysfunction factor seem to be determined, to some extent, by different influences than scores on the antisocial behavior. Scores on the antisocial behavior factor also decline with age but scores on the emotion dysfunction factor remain constant with age.

Etiological Mechanisms

Genetic Basis

Psychopathy is a disorder marked by both reactive and instrumental aggression. It is important to distinguish between reactive and instrumental aggression (Blair, Mitchell & Blair, 2005). Reactive aggression is initiated without any specific goal and usually occurs in response to a threatening or frustrating event that induces anger (Barratt et al., 1999). Instrumental aggression is initiated for the purpose of attaining a specific goal. The basic threat circuitry is responsible for reactive aggression which is elicited when escape from threat is not possible and is regulated by the executive system (Blair, Mitchell & Blair, 2005). Genetic factors can have an impact on either the basic threat circuitry through amygdala (Drevets, 2003) and/or the executive system by affecting the serotonergic functioning (Swann, 2003). Experimental manipulations that decrease serotonin receptor activation have been shown to increase reactive aggression (Bell, Abrams & Nutt, 2001). Widom (1992) observes that prior exposure to child abuse also increases the probability of reactive aggression.

Most people do not attack others to obtain money (a goal) which is desired by everybody, as they have been prevented by moral socialization from engaging in such behaviors to obtain a goal. Therefore Blair, Mitchell & Blair (2005) hypothesize that to give an account of the instrumental aggression observed in psychopathic individuals an explanation that accounts for why socialization is not achieved in this particular population is required.

Attachment

Blair, Mitchell & Blair (2005) hypothesize that attachment problems faced by children with their primary caregivers are unlikely to lead to psychopathy. According to them it is endogenous emotional disturbance of the child that seems to interfere with the attachment process. Secure attachment style is also said to have a modulatory role on reactive aggression. Moral socialization that checks an individual from engaging in instrumental aggression is not facilitated by harsh parenting style that frequently involves punishing the child (Baumrind, 1983). But again for Blair, Mitchell & Blair (2005) the inherent pathology associated with psychopathy interferes with proper socialization.

Farrington (2002) showed that harsh parental style of discipline can affect the affective and antisocial components of psychopathy. This happens as children's behavior depends on rewards and punishment provided by the parents. Thus children become antisocial if parents provide a model of antisocial behavior and respond in an inconsistent manner to the child's need. Child abuse is also shown to predict psychopathic tendencies (Weiler & Widom, 1996). Various explanations have been proposed by Widom (1994) to explain the link between child abuse and the psychopathic tendencies. The link may be present as abuse may cause brain injury or give way to dissociative coping styles on the part of the children, desensitization towards pain or changes in social information processing or isolation from prosocial peers on the part of the children that may predispose them towards violence.

Parental conflict and family disruption predicted the antisocial but not the affective component of psychopathy (Farrington, 2002). Several explanations have been advanced for the link between family disruption and psychopathy. The first explanation states that this happens as the loss of a parent can have damaging effects on the attachment between the lost parent and the child (trauma theory). Life course theories state that multiple stressors like parental conflict and loss, reduced economic circumstances, changes in parental figures and maladaptive child rearing methods have an adverse effect on the growing child. Selection theories focus on the issue that disrupted families produce such children because of preexisting differences on various risk factors (Farrington, 2006).

Large family size may also cause overcrowding in the household and because of this parental attention on each child declines (West & Farrington, 1973). Farrington et al. (2001) have also shown that antisocial behavior runs in families as there might be exposure to risk factors for the different generations more so for disrupted families living in deprived neighborhoods, there is also a tendency for antisocial females to choose antisocial partners and family members may influence each other for antisocial activities. The other factors having an adverse influence on children were absence of biological fathers (Morash & Rucker, 1989), teenage pregnancy (Smith et al., 2000), an anxious or depressed mother (Farrington, 2000), substance use by the parents (Loeber et al., 1998) and smoking by the mother during pregnancy (Rasanen et al., 1999).

Attachment Problems and their Effects on Various Cognitive Processes in Psychopathy

Psychopaths have shown to suffer from a problematic style of attachment with their caregivers (Kernberg, 1996). This is in contrast to Blair, Mitchell & Blair's (2005) hypothesis that the emotional problems of psychopaths interfere with the attachment process. But it is quite possible that the disorganized form of attachment interferes with the psychological as well as the neurobiological substrates which act as risk factors predisposing the growing child towards the debilitating disorder. It has been highlighted that disorganized type of attachment interferes with the efficient interhemispheric integration and correspondingly such deficits have been shown in psychopaths (Raine et al., 2003).

Raine and colleagues (2003) have shown abnormal changes in the callosal white matter volume in psychopaths with an increase in callosal length and decrease in callosal thickness. According to them such abnormalities reflect atypical neurodevelopmental processes that involve an arrest of early axonal pruning or increased white matter. These abnormalities may be responsible for abnormal transfer of information across the hemispheres leading to affective deficits as shown by psychopaths. Glaser (2000) in her paper discusses the negative impact of childhood experiences that includes abuse, neglect and unhealthy forms of attachment on the corpus callosum. This implies that the unhealthy form of attachment can have a detrimental affect on the corpus callosum which acts as a risk factor for psychopathy.

Psychopaths show abnormal processing of affective linguistic stimuli (Williamson et al., 1991). In comparison to normal individuals psychopathic individuals were slow to decide whether a given letter string formed an emotional as compared to a neutral word. This could be an outcome associated with the disorganized attachment style. A securely attached child shows mutually regulated hemisphere to hemisphere co-ordination with the parent and contrastingly the child with a disorganized style will show lack of right hemisphere communication with the parents with the result that the left hemisphere comes to serve as a dominant mediator of communication (Siegel, 1999). Such an attachment history might predispose the growing child towards interpreting all forms of communication within the linguistic domain, a factor which in itself might increase the risk for psychopathic symptoms. Psychopaths are thus shown to perform inefficiently in conditions that selectively prime the left hemisphere resources

as these people have learnt to rely more on the language based mode of this hemisphere in their daily interactions that might became incapable of supporting efficient performance under difficult task conditions where the left hemisphere resources are primed. This is popularly known as the left hemisphere activation (LHA) hypothesis (Kosson, 1996; 1998).

Consistent with the above predictions Kiehl et al. (1999) showed that when processing negative emotional material, psychopaths, compared with non-psychopaths, would rely less on connotative-emotional processes based in the right hemisphere and more on denotative-linguistic processes based in the left hemisphere implying that psychopathy is associated with weakly or unusually lateralized cerebral hemispheres (Day and Wong, 1996). It has been shown that weak lateralization exists for emotional stimuli in the right hemisphere and not for language functions in the left hemisphere.

Hiatt and colleagues (2002) suggest that abnormalities in asymmetries are evident in psychopaths on complex tasks as this increase the demand for interhemispheric processing. According to them even the less lateralized emotion processing also reflects poor hemispheric integration and a greater distribution of functions that are usually lateralized in the right hemisphere. Hiatt & Newman (2007) documented that trials in which the psychopaths used their right hands showed evidence of slowed interhemispheric transfer. A finding which is not consistent with the LHA as the psychopaths' deficits were specific to interhemispheric transfer rather than their overall performance.

Optimal socio-emotional environments of the growing child helps the brain to achieve proper connectivity between the amygdala, orbitofrontal cortex and the other parts of the limbic system supporting proper development of emotional processing and regulation (Schore, 2001). These structures have also been found to be functioning inefficiently in psychopathy and thus these people show deficiencies in various functions supported by the amygdala, orbitofrontal cortex and the other parts of the limbic system and their connectivity that supports emotion regulation, emotion recognition, aggression (Loeber, 1998).

Based on the review of literature on psychopathy, it can be suggested that disorganized forms of attachments and its detrimental influence on the growing child's psychological and neurobiological development might predispose him/her towards developing psychopathy, (the 'attachment and the deficient hemispheric integration hypothesis'). The proposed hypothesis is a potentially testable one and offers the scope

to understand the influences of early problematic attachment on the development of psychopathy. One of the main tenets of the hypothesis is that the early disorganized forms of attachment has a negative influence on the adaptive psychological functioning and the neurobiological substrates. The most negative influence could be on the corpus callosum and the functions that it supports leading to faulty hemispheric integration and its outcome for deficits in emotional processing and regulation.

Conclusion

The paper proposes the attachment and the deficient hemispheric integration hypothesis' suggesting that the problematic behaviors shown by the people affected by the disorder could be associated with the erratic attachment style that they might have shared with their parents, as children. Such a style is most likely to be the disorganized form. This erratic style of attachment not only negatively affects psychosocial adjustment but also has a negative influence on the neurobiological systems (amygdala, the orbitofrontal cortex, other parts of the limbic system and the corpus callosum) that are responsible for functions like emotional processing and social adjustment. This hypothesis has the potential to explain the already proposed LHA hypothesis and the weak lateralization observed for emotional processing in the right hemisphere.

Secure attachment helps the pre-verbal child to adapt to the surroundings and helps in the development of the right hemisphere functions which in turn helps the child to achieve regulation of various biological functions and effective social communication. The development of the non-verbal communication that is supported by the right hemisphere is important as the infant has undeveloped language abilities. The later developing left hemisphere also contributes towards the child's adaptive functioning due to the strengthening of the connectivity between the two hemispheres which itself is supported by the secure environment that the caregivers provide. The proper integration of both the hemisphere is important in daily functioning. The disorganized form of attachment that the children share with their parents is thus ultimately responsible in disposing them towards developing the psychopathic symptoms in both the affective as well as the interpersonal domain.

The hypothesis proposed is yet to be worked upon but provides an explanation that can coherently explain various dysfunctions observed in psychopathy. The paper provides an overview of a limited functioning domain but is nevertheless important as a

beginning. The hypothesis is also helpful in providing insight on the nature-nurture controversy for the development of psychopathy.

References

Ainsorth, M. D. S., Blehar, M. C., Waters, E., & Wall, S. (1978). *Pattern of attachment: A psychological study of the Strange Situation.* Hillsdale, NJ: Erlbaum.

Ainsorth, M. D. S., & Bowlby, J. (1991). An ethological approach to personality development. *American Psychologist*, *46*, 333-341.

Barratt, E. S., Stanford, M. S., Dowdy, L., Liebman, M. J., & Kent, T. A. (1999). Impulsive and premeditated aggression: a factor analysis of self-reported acts. *Psychiatry Research*, *86*, 163-173.

Baumrind, D. (1983). Rejoinder to Lewis's interpretation of parental firm control effects: are authoritative families really harmonious? *Psychological Bulletin*, *94*, 132-142.

Bell, C., Abrams, J., & Nutt, D. (2001). Tryptophan depletion and its implications for psychiatry. *British Journal of Psychiatry*, *178*, 399-405.

Blair, R. J. R. (2001). Neurocognitive models of aggression, the antisocial personality disorders, and psychopathy. *Advances in Neuropsychiatry*, *71*, 727-731.

Blair, R. J. R., Mitchell, D., & Blair, K. (2005). What is Psychopathy? In, *The Psychopath: Emotion and the Brain* (pp. 1-17). Malden MA: Blackwell.

Carlson, E. A. (1998). A prospective longitudinal study of attachment disorganization/disorientation. *Child Development*, *69*, 1107–1128.

Day, R., & Wong, S. (1996). Anomalous perceptual asymmetries for negative emotional stimuli in the psychopath. *Journal of Abnormal Psychology*, *105*, 648-652.

Drevets, W. C. (2003). Neuroimaging abnormalities in the amygdala in mood disorders. *Annals of the New York Academy of Sciences, 985*, 420-444.

Farrington, D. P. (2000). Psychosocial predictors of adult antisocial personality and adult convictions. *Behavioral Sciences and the Law*, *18*, 605-622.

Farrington, D. P., Jolliffe, D., Loeber, R., Stouthamer-Loeber, M., & Kalb, L. M. (2001). The concentration of offenders in families and family criminality in the prediction of boys' delinquency. *Journal of Adolescence*, *24*, 579-596.

Farrington, D. P. (2002). Key results from the first 40 years of the Cambridge Study in Delinquent Development. In T. P. Thornberry & M. D. Krohn (Eds.), *Taking stock of delinquency* (pp. 137-183). New York: Kluwer/Plenum Press.

Farrington, D. P. (2006). Family background and psychopathy. In C. J. Patrick (Ed.), *Handbook of Psychopathy* (pp. 229-250). New York: The Guilford Press.

Freedman, M., Black, S., Ebert, P., & Binns, M. (1998). Orbitofrontal function, object alternation and perseveration. *Cerebral Cortex, 8*, 18-27.

Glaser, D. (2000). Child abuse and neglect and the brain - A review. *Journal of Child Psychology and Psychiatry, 41*, 97-116.

Hiatt, K. D., Lorenz, R. A., & Newman, J. P. (2002). Assessment of emotion and language processing in psychopathic offenders: Results from a dichotic listening task. *Personality and Individual Differences, 32*, 1255-1268.

Hiatt, K. D., & Newman, J. P. (2007). Behavioral evidence of prolonged interhemispheric transfet time among psychopathic offenders. *Neuropsychology, 21*, 313-318.

Hofer, M. A. (1994). Hidden regulators in attachment, separation, and loss. *Monographs of the Society for Research in Child Development, 59*, 192-207.

Kaufman, J., & Zigler, E. (1987). Do abused children become abusive parents? *American Journal of Orthopsychiatry, 57*, 186-192.

Kernberg, O. (1996). A psychoanalytic theory of personality disorders. In J. F. Clarkin & M. F. Lenzenweger (Eds.), *Major theories of personality disorder* (pp. 106-140). New York: Guilford Press.

Kiehl, K. A., Hare, R. D., McDonald, J. J., & Brink, J. (1999). Semantic and affective processing in psychopaths: An event-related potential study. *Psychophysiology, 36*, 765–774.

Kosson, D. S. (1996). Psychopathy and dual-task performance under focusing conditions. *Journal of Abnormal Psychology, 105*, 391-400.

Kosson, D. S. (1998). Divided visual attention in psychopathic and non-psychopathic offenders. *Personality and Individual Differences, 24*, 373-391.

Loeber, R., Farrington, D. P., Stouthamer-Loeber, M., & van Kammen, W. B. (1998). *Antisocial behavior and mental health problems*. Mahwah, NJ: Erlbaum.

Lyons-Ruth, K., Bronfman, E., & Parsons, E. (1999). Maternal frightened, frightening, or atypical behavior and disorganized infant attachment patterns. *Monographs of the Society for Research in Child Development, 64*, 67-96.

Main, M. (1995). Recent studies in attachment. In S. Goldberg, R. Muir & J. Kerr (Eds), *Attachment theory: Social, developmental, and clinical perspectives* (pp. 467-474). Hillsdale, NJ: The Analytic Press.

Main, M., & Solomon, J. (1990). Procedures for identifying infants as disorganized/disoriented during the Ainsworth Strange Situation. In M. T. Greenberg, D. Cicchetti, & E. M. Cummings (Eds.), *Attachment in preschool years: Theory, research, and intervention* (pp. 121-160). Chicago: University of Chicago Press.

Morash, M., & Rucker, L. (1989). An exploratory study of the mother's age at child bearing to her children's delinquency in four data sets. *Crime and Delinquency, 35*, 45-93.

Ornstein, R. (1997). *The right mind: making sense of the hemispheres.* New York: Harcourt Brace.

Raine, A., Lencz, T., Taylor, K., Hellige, J. B., Bihrle, S., Lacasse, L., Lee M, Ishikawa, S., & Colletti P. (2003). Corpus callosum abnormalities in psychopathic antisocial individuals. *Archives of General Psychiatry, 11*, 1134-1142.

Rasanen, P., Hakko, H., Isohanni, M., Hodgins, S., Jarvelin, M., & Tilhonen, J. (1999). Maternal smoking during preganancy and risk of criminal behavior among adult male offspring in the Northern Finland 1966 birth cohort. *American Journal of Psychiatry, 156*, 857-862.

Schore, A. N. (2001). Effects of a secure attachment relationship on right brain development, affect regulation, and infant mental health. *Infant Mental Health Journal, 22*, 7-66.

Schore, A. N. (1996). The experience dependent maturation of a regulatory system in the orbital prefrontal cortex and the origin of developmental psychopathology. *Development and Psychopathology, 8*, 59-87.

Siegel, D. J. (1999). *The Developing Mind: How relationships and Brain Interact to Shape Who We Are*. New York: The Guilford Press.

Smith, C. A., Krohn, M. D., Lizotte, A. J., McCluskey, C. P., Stouthamer-Loeber, M., & Weiher, A. (2000). The effect of early delinquency and substance use on precocious transitions to adulthood among adolescents males. In G. L. Fox & M. L. Benson (Eds.), *Families, crime and criminal justice* (pp. 233-253). Amsterdam: JAI Press.

Soderstrom, H. (2003). Psychopathy as a disorder of empathy. *European Child Adolescence Psychiatry*, *12*, 249-252.

Sroufe, L. A. (1996). *Emotional development: The organization of emotional life in the early years.* New York: Cambridge University Press.

Swann, A. C. (2003). Neuroreceptor mechanisms of aggression and its treatment. *Journal of Clinical Psychiatry, 64* (Supplement 4), 26-35.

Ungerleider, L. G., & Haxby, J. V. (1994). What and where in the human brain. *Current Biology*, *4*, 157-165.

Weiler, B. L., & Widom, C. S. (1996). Psychopathy and violent behavior in abused and neglected young adults. *Criminal Behavior and Mental Health, 6,* 253-271.

West, D. J., & Farrington, D. P. (1973). *Who becomes delinquent*? London: Heinemann.

Widom, C. S. (1992). *The Cycle of Violence*. Washington, DC: US Department of Justice, Office of Justice Programs, National Institute of Justice.

Widom, C. S. (1994). Childhood victimization and adolescent problem behaviors. In R. D. Ketterlinus & M. E. Lamb (Eds.), *Adolescent problem behaviors* (pp. 127-164). Hilsdale, NJ: Erlbaum.

Williamson, S., Harpur, T. J. & Hare, R. D. (1991). Abnormal processing of affective words by psychopaths. *Psychophysiology*, *28,* 260-273.

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