

Pedophilia and brain function

Po Liu¹

¹Department of Psychology, University of British Columbia

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Abstract

Pedophilia is defined as a sexual deviation in which an adult is sexually attracted to a prepubescent child. With relatively high prevalence rates and growing public concern over this issue, there has been a need to empirically investigate the neuropsychological basis of pedophilic behaviour. This literature review examines the resulting research, starting with research identifying the differences displayed in pedophilic individuals in IQ scores as compared to the general population. The developmental onset of pedophilia may also be linked to abnormal brain morphology: neurological structures in both the frontal/dysexecutive hypothesis and the temporal/limbic hypothesis have been proposed to be associated with pedophilia. Morphological differences between pedophilic individuals and non-pedophilic individuals have been further substantiated by the link between left-handedness and a diagnosis of pedophilia. Developmental reports of childhood head injury further support this claim, as pedophiles are more likely to have experienced head trauma at an early age. Finally, modern brain imaging studies have enabled researchers to discover that those individuals diagnosed with pedophilia display altered brain activity when presented with sexual stimuli in comparison with those not diagnosed. It must be emphasized that all of the findings may contain an innate bias due to the social denigration that is attached to research conducted on known pedophiles.

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Pedophilia is considered a psychiatric disorder, which is characterized by statistically abnormal sexual urges and behaviours in adults directed towards prepubescent children (American Psychiatric Association, 1994). Typically, this sexual desire for prepubescent children surpasses the individual's sexual desire for physically mature adults and exists predominately in men (Freund, 1981). The media has heightened the public's awareness of

deviant sexual behaviour, as evidenced by the popular reality television program *To Catch a Predator*, perpetuating a growing societal-level concern. The sexual exploitation of children has been documented in various cultures around the world (Bauserman, 1997; Ford & Beach, 1951), which has motivated the creation of international sex offender legislation (Newman et al., 2011). In the USA, the prevalence of child molestation is at an

estimated 100,000 to 200,000 cases every year (Gorey & Leslie, 1997), underscoring the need to understand the underpinnings of this disorder, including the neurobiological aspects of this condition. This review will examine scientific evidence supporting hypotheses in the literature that brain function differs between pedophiles and non-pedophiles.

Early Work – IQ

It has been hypothesized that brain dysfunction contributes to sexual criminology since the 19th century (Krafft-Ebing, 1886/1965). Early studies into cognitive functioning assessed the general intelligence or Intelligence Quotient (IQ) of sexual offenders (Frank, 1931), and these assessment techniques were subsequently adopted into the common battery of tests administered to pedophiles by many researchers in the field. Subsequent research found that child sexual offenders score lower in intelligence than age- and socioeconomically-matched individuals (Langevin et al., 1985). Furthermore, when compared to convicted offenders of non-sexual crimes, child sexual offenders continue to score lower on measures of intelligence (Hambridge, 1994). In further support of this pattern of lowered intelligence test scoring, research suggests that child sex offenders have lower intelligence test scores than sex offenders who target adults (Blanchard et al., 1999). Results from a large meta-analysis done by Cantor et al. (2005) indicated that there is a specific relation between IQ and the age of the child victims targeted by sex offenders: the average IQs of males who molested children age 13 or younger were lower than the IQs of men who molested children between age 13 and 17. Based on the extensive research done in this area to date,

it seems that the average IQ scores of pedophilic individuals are lower in comparison to various control groups, and that their intelligence scores decrease along with the age of their victims. Using other neurological assessments, Schiffer and Volaufen (2011) found that child molesters showed executive dysfunction concerning response inhibition. Such research provides convincing evidence that child sex offenders may have decreased cognitive neuropsychological functioning.

While these observations provide useful evidence, there is an alternate interpretation of the apparent relationship between intelligence and child molesting: less intelligent pedophiles may be more likely to be apprehended, and low socioeconomic status due to relatively low intelligence may render these offenders unable to afford the most effective legal representation. Perhaps the less intelligent pedophiles are more likely to be convicted due to the influence of these other variables. Unfortunately, researchers only have access to known (accused or convicted) child molesters. Because of legal implications and moral condemnation, pedophiles have little or no incentive to reveal their sexual attraction to children for the purposes of research studies. Not surprisingly, even those individuals who have documented sexual histories suggesting symptoms of the disorder will often outright deny sexual interest in children (Brown, Gray, & Snowden, 2009). In addition, since sexual offences against children committed by women are estimated to constitute only 0.4% - 4% of all convicted sexual offenders (Maletzky, 1993), research studies tend to focus on male subjects and the results may not be applicable to females for this reason. Thus, the pool of possible research participants may be limited to male sexual

child offenders who have been caught, accused, or convicted. This is a clear limitation to the research conducted in the area.

Hypothesis on the Development of Pedophilia

There are two main hypotheses concerning the development of pedophilia and sexual offending: the frontal/dysexecutive hypothesis and the temporal/limbic hypothesis (Blanchard et al., 2006). The frontal/dysexecutive hypothesis predicts that neurological deviations occur in the prefrontal cortex (which may be responsible for planning, decision making, and conforming to social norms), producing an inability to inhibit sexual urges (Yang & Raine, 2009). The temporal/limbic hypothesis suggests that pedophilia may be related to abnormalities within structures in the temporal lobe, which has been associated with hypersexuality. Hypersexuality is the tendency to seek out sexual activity with both appropriate and inappropriate partners or objects at appropriate or inappropriate times. This pattern of behaviour is one of many of the behavioural manifestations of Kluver-Bucy syndrome in which individuals have damaged or ineffective temporal lobes (Baird et al., 2002). Kluver-Bucy syndrome is a behavioural disorder caused by bilateral temporal lobe malfunction, and the disease is characterized by both cognitive and sexual disturbances including visual agnosia (the inability to associate meaning with visual stimuli), oral tendencies (examining objects or surroundings with the mouth), reduced sexual inhibition, and increased sex drive (Ozawa et al., 1997). Damage to the temporal lobe is also responsible for speech and language deficits, which may explain why pedophiles have difficulty relating to

adults and therefore become attracted to children (Marshall et al., 2000).

Head Preference and Head Injuries

Another line of research investigating hand preference (handedness) has provided evidence relating brain dysfunction to pedophilia. Bogaert (2001) demonstrated that pedophiles have a higher incidence of left-handedness and these results remained significant after IQ and age were controlled for (Cantor et al., 2001). While it may be the case that pedophiles with lower IQ are more likely to be caught by the law, this argument does not hold true in the case of left-handed pedophiles. Therefore, the correlation between left-handedness and pedophilia indicates a unique characteristic of the disorder and handedness may suggest neurological differences as well. It has been well documented that disrupted perinatal neurodevelopment increases the likelihood of becoming left-handed (Coren & Halpern, 1991). For example, individuals who have experienced insults to neurodevelopment such as birth stress (Williams, Buss, & Eskenazi, 1992), ultrasound (Kieler et al., 2001), neurotoxins (Biro & Stukovsky, 1995), and prematurity (Marlow, Roberts, & Cooke, 1989) have higher rates of left-handedness than controls. Therefore, disruptions in perinatal development of the brain may be related to the diagnosis of pedophilia.

Because of the possible differences in the neurological development of pedophiles compared to controls, researchers have studied whether childhood injuries to the head have associations with pedophilic tendencies. Indeed, an association seems to exist. For example, Blanchard et al. (2002) found that accidents in childhood leading to unconsciousness were associated with pedophilia, lower IQ, and lower levels of education. Later studies provided further

evidence that pedophiles reported more head injuries before the age of 13 than non-pedophilic controls (Blanchard et al., 2003). One possible interpretation of these results is that brain damage after birth increases the probability that a male will develop pedophilia, falling in line with the observation that pedophilic populations have a higher incidence of left-handedness.

Brain Imaging Studies

More recent studies using modern imaging techniques such as positron emission tomography (PET) and functional magnetic resonance imaging (fMRI) allow for the depiction of neural activity within individuals. These technologies are useful in identifying specific areas of the brain and their differential responses to identical stimuli. For example, studies in this area may be able to identify differing patterns of activity in pedophiles compared to non-pedophiles.

Using fMRI, Walter et al. (2007) found abnormal brain activity in the hypothalamus, periaqueductal gray, and dorsolateral prefrontal cortex (DLPFC) in response to adult visual-erotic stimulation in heterosexual pedophiles. Walter et al. (2007) suggested that because these regions are involved in the emotional components of sexual arousal (Ferretti et al., 2005), dysfunction within these areas may be involved in the lack of sexual interest towards adults. Through case study investigations and brain anatomy studies, morphological changes in the prefrontal cortex, ventral striatum (reward center), and regions of the temporal lobes have also been found (Mendez et al., 2000; Burns & Swerdlow, 2003; Schiffer et al., 2007). These studies provide support for the temporal/limbic hypothesis. Furthermore, Schiffer et al. (2008) found that when

presented with erotic stimuli featuring children, structures corresponding to areas of the brain involved in sexual arousal and behaviour (the thalamus, globus pallidus, and striatum) were significantly more highly activated in pedophiles compared to controls.

While only a few studies are summarized here, the differential brain activation patterns described in the aforementioned studies lend strong support for the suggestion that pedophiles show differences in brain function in response to erotic and sexual stimuli compared to controls.

Conclusion

The cross-cultural and widespread prevalence of pedophilia have necessitated academic efforts to understand the neurobiological underpinnings of brain structure, function, and development in relation to altered sexual tendencies. While traditional methods in the form of IQ tests, retrospective head injury studies, and hand preference statistics have suggested neurological differences in pedophilic individuals, modern studies using advanced imaging technologies have provided a glimpse into the complexity of this psychiatric disorder, which may be influenced by the interplay of multiple neurological structures. The studies discussed in this paper have pointed to the reduced neurocognitive abilities and abnormalities in brain function among pedophiles; however, more research is needed to gain a complete understanding of the mechanisms underlying pedophilia.

Declaration of Conflicting Interests

The author declared they have no conflicts of interests with respect to their authorship or the publication of this article.

References

- American Psychiatric Association. (1994). *The Diagnostic and Statistical Manual of Mental Disorders, fourth edition (DSM-IV)*. Washington DC: APA Press.
- Baird, A. D., Wilson, S. J., Bladin, P. F., Saling, M. M., & Reutens, D.C. (2002). Hypersexuality after temporal lobe resection. *Epilepsy & Behaviour*, 3(2), 173–181.
- Bauserman, R. (1997). Man-boy sexual relationships in a cross-cultural perspective. In J. Geraci (Ed.), *Dares to speak: Historical and contemporary perspectives on boy-love* (pp. 120-137). Norfolk, England: Gay Men's Press.
- Biro, V. & Stukovsky, R. (1995). Handedness as manifested in school children from a region polluted by neurotoxins. *Studia Psychologica*, 37, 81-87.
- Blanchard, R. (1989). The concept of autogynephilia and the typology of male gender dysphoria. *Journal of Nervous and Mental Disease*, 177, 616-623.
- Blanchard, R., Cantor, J.M., & Robichaud, L. K. (2006). Biological factors in the development of sexual deviance and aggression in males. In H.E. Barbaree & W.L. Marshall (Eds.), *The juvenile sex offender* (pp. 77-104). New York: The Guilford Press.
- Blanchard, R., Christensen, B. K., Strong, S. M., Cantor, J. M., Kuban, M. E., Klassen, P., Dickey, R., & Blak, T. (2002). Retrospective self-reports of childhood accidents causing unconsciousness in phallometrically diagnosed pedophiles. *Archives of Sexual Behaviour*, 31, 511-526.
- Blanchard, R., Kuban, M. E., Klassen, P., Dickey, R., Christensen, B. K., Cantor, J. M., & Blak, T. (2003). Self-reported head injuries before and after the age of 13 in pedophilic and non pedophilic men referred for clinical assessment. *Archives of Sexual Behaviour*, 32, 573-581.
- Blanchard, R., Watson, M. S., Choy, A., Dickey, R., Klassen, P., Kuban, M., & Ferren, D. J. (1999). Pedophiles: Mental retardation, maternal age, and sexual orientation. *Archives of Sexual Behaviour*, 28, 111-127.
- Bogaert, A. F. (2001). Handedness, criminality, and sexual offending. *Neuropsychologia*, 39, 465-469.
- Brown, A. S., Gray, N. S., Snowden, R. J. (2009). Implicit measurement of sexual associations in child sex abusers: role of victim type and denial. *Sexual Abuse: A Journal of Research and Treatment*, 21(2), 166-180.
- Burns, J. M., Swerdlow, R. H. (2003). Right orbitofrontal tumor with pedophilia symptom and constructional apraxia sign. *Archival Neurology*, 60(3), 437-440.
- Carlson, N. R. (2010). *Foundations of Behavioural Neuroscience*. (8th ed.). New York: Princeton Hall.
- Cantor, J. M., Blanchard, R., Robichaud, L. K., & Christensen, B. K. (2005). Quantitative reanalysis of aggregate data on IQ in sexual offenders. *Psychological Bulletin*.
- Cantor, J. M., Christensen, B. K., Klassen, P. E., Dickey, R., & Blanchard, R. (2001, July). Neuropsychological functioning in pedophiles. In R. Blanchard (Chair), *Diagnosis, prognosis, and etiology of pedophilia*. Symposium conducted at the meeting of the International Academy of Sex Research, Bromont, Quebec.
- Coren, S., & Halpern, D. (1991). Left-handedness: A marker for decreased survival fitness. *Psychological Bulletin*, 109, 90-106.
- Ferretti, A., Caulo, M., Del Gratta, C., Di Matteo R., Merla, A., Montorsi, F., Pizzella, V, Pompa, P., Rigatti, P., Rossini, P. M., Salonia, A., Tartaro, A., & Romani, G. L. (2005). Dynamics of male sexual arousal: distinct components of brain activation revealed by fMRI. *Neuroimage*, 26(4), 1086-1096.
- Ford, C. S. & Beach, F. A. (1951). *Patterns of sexual behaviour*. New York: Harper & Row.
- Frank, B. (1931). Mental level as factor in crime. *Journal of Juvenile Research*, 15, 192-197.
- Freund, K., & Watson, R. J. (1981). Assessment of pedophilia. In M. Cook & K. Howells (Eds.), *Adult sexual interest in children* (pp. 139-179). London: Academic Press.
- Gorey, K.M. & Leslie, D. R. (1997). The prevalence of child sexual abuse: Integrative review adjustment for potential response and measurement biases. *Child Abuse & Neglect*, 21 (4), 391–398.
- Kieler, H, Cnattingius, S., Haglund, B., Palmgren, J., & Axelsson, O. (2001). Sinistrality – a side-effect of prenatal sonography: A comparative study of young men. *Epidemiology*, 12, 618-623.
- Krafft-Ebing, R. von. (1965). *Psychopathia sexualis: A medico-forensic study* (H. E. Wedeck, Trans.). New York: Putnam. (Original work published 1886)
- Hambridge, J. A. (1994). Pedophiles' ratings of adult and child photographs using a semantic differential. *Journal of Forensic Sciences*, 39, 456-461.

- Langevin, R., Hucker, S. J., Handy, L., Purins, J. E., Russon, A. E., & Hook, H. J. (1985). Erotic preference and aggression in pedophilia: A comparison of heterosexual, homosexual, and bisexual types. In R. Langevin (Ed.), *Erotic preference, gender identity, and aggression in men: New research studies*. (pp. 137-159). Hillsdale, NJ: Erlbaum.
- Maletzky, B. M. (1993). Factors associated with success and failure in the behavioural and cognitive treatment of sexual offenders. *Annual Sexual Research, 6*, 241-258.
- Marlow, M., Roberts, B. L., & Cooke, R. W. I. (1989). Laterality and prematurity. *Archives of Disease in Childhood, 64*, 1713-1716.
- Marshall, W.L., Seerran, G.S., & Cortoni, F.A. (2000). Childhood attachments, sexual abuse, and their relationship to adult coping in child molesters. *Sexual Abuse: A Journal of Research and Treatment, 12*, 17-26.
- Mendez, M. F., Chow, T., Ringman, J., Twitchell, G., & Hinkin, C. H. (2000). Pedophilia and temporal lobe disturbances. *Journal of Neuropsychiatry in Clinical Neuroscience, 12*, 71-76.
- Nahas, Z., Teneback, C.C., Kozel, A., Speer, A.M., DeBrux, C., Molloy, M., Stallings, L., Spicer, K.M., Arana, G., Bohning, D.E., Risch, C., George, M.S. (2001). Brain effects of TMS delivered over prefrontal cortex in depressed adults. *Journal Neuropsychiatry Clinical Neuroscience, 13*, 459-470.
- Newman, W. J., Hold, B. W., Rabun, J. S., Phillips, G., & Scott, C. L. (2011). Child sex tourism: Extending the borders of sexual offender legislation. *International Journal of Law and Psychiatry, 34*(2), 116-121.
- Ozawa, H., Sasaki, M., Sugai, K., Hashimoto, T., Matsuda, H., Takashima, S., Uno, A., & Okawa T. (1997). Single-Photo emission CT and MR findings in Kluver-Bucy Syndrome after Reye Syndrome. *American Journal of Neuroradiology, 18*(3), 540-542.
- Salloway, S., Malloy P., & Cummings J. L. (1997). The Neuropsychiatry of Limbic and Subcortical Disorders. *American Psychiatric Pub., p. 125*. ISBN 0880489421.
- Schiffer, B., Krueger, T. H., Paul, T., DeGreiff, A., Forsting, M., Leygraf, N., Schedlowski, M., & Gizewski, E. (2008). Brain response to visual sexual stimuli in homosexual pedophiles. *Journal of Psychiatry Neuroscience, 33*, 23-33.
- Schiffer, B., Paul, T., Gizewski, E., Forsting, M., Leygraf, N., Schedlowski, M., & Kruger, T.H.C. (2008). Functional brain correlates of heterosexual paedophilia. *NeuroImage, 41*(1), 80-91.
- Schiffer, B., Peschel, T., Paul, T., Gizewski, E., Forsting, M., Leygraf, N., Schedlowski, M., & Krueger, T. H. (2007). Structural brain abnormalities in the frontostriatal system and cerebellum in pedophilia. *Journal of Psychiatry Research, 41*(9), 753-762.
- Schiffer, B., & Volaufen, C. (2011). Executive Dysfunctions in Pedophilic and Nonpedophilic Child Molesters. *Journal of Sexual Medicine, 8*(7), 1975-1984. doi: 10.1111/j.1743-6109.2010.02140.x.
- Walter, M., Witzel, J., Wiebking, C., Gubka, U., Rote, M., Schiltz, K., Bermphol, F., Tempelmann, C., Bogerts, B., Heinze, H. H., & Northoff, G. (2007). Pedophilia is linked to reduced activation in hypothalamus and lateral prefrontal cortex during visual erotic stimulation. *Biological Psychiatry, 62*, 698-701.
- Williams, C., S., Buss, K. A., & Eskenazi, B. (1992). Infant resuscitation is associated with an increased risk of left-handedness. *American Journal of Epidemiology, 136*, 277-286.
- Yang Y. & Raine A. (2009). Prefrontal structural and functional brain imaging findings in antisocial, violent, and psychopathic individuals: a meta-analysis. *Psychiatry Res, 174*(2): 81-88. doi: 10.1016/j.psychres.2009.03.012.