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Towards a Neurological Basis for Sexual Deviance and Offenses

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Introduction

The purpose of this document review was to gain an understanding of the neurobiological and cognitive causes and possible indicators of a predisposition to commit sexual offenses and suffer from deviant paraphilic conditions. As sexual offenses and particularly sexual offenses against children (child sex offenses – CSO) are particularly damaging and destructive for society, it is useful to understand the neurological function and any markers or behavioral traits common to sex offenders so that they can be given effective treatment before they might offend and can be integrated into polite society. Further, understanding the likelihood of recidivism is incredibly useful for sentencing those who have committed offenses as well as managing them once they have been released.

Much of the testing done is of the behavioral and neuropsychological type (Joyal, et al, 2014) such as the Stroop task (Stroop, 1935), Trail-Making B task (Army Individual Test Battery, 1944), the Logical Memory test (Weschler, 1987) and the Controlled Oral Word Association test (Benton & Hamsher, 1989). These are tests of executive functions (Stroop or TM-B) or non-executive learning and memory functions (LM or COWAT).

Separately, studies have been done on neurochemical actions in the brain and their relations to paraphilias. In particular, monoamines (norepinephrine, dopamine, and serotonin) show causal and inhibitory relations to sexual arousal and behaviours (Kafka, 1997). This work could lead to treatments similar to those for anxiety or depression as the monoamines play similar roles in those disorders.

Finally, it is possible to detect arousal, including problematic arousal when exposing test subjects to a variety of stimuli through certain physical response tests. The traditional one used in CSO cases was penile tumescence testing (O'Donohue & Letourneau, 1992) though this has its problems. An obvious one is that it cannot be used on female subjects. More recently, it is possible to use fMRI to study patterns of arousal (Ponseti et al. 2006).

Differentiating Types of Offenders

The very first thing that is made clear from meta-analyses and attempts to create integrated theories of sexual offending (Ward & Hudson, 1998; Ward & Beech, 2005; Joyal, et al. 2014; Dillien et al., 2020) is that it is imperative to differentiate between types of sex offenders. Sex offenders against children can be broken down into two groups, those who are offending opportunistically and those who are explicitly sexually attracted to children (Walton & Duff, 2016). These are distinctly different from offenders against adults/peers who have more in common with non-sexual offenders than with those committing CSO.

We can divide these offenders into asocial and antisocial categories. The asocial offenders would be those with a demonstrated attraction to children while the antisocial include opportunistic CSO and peer/adult rapists. These are more likely to see confounding factors such as substance abuse and alcohol (Langevin & Curnoe, 2008).

Test Results

The results of the cognitive tests amalgamated by Joyal et al (2014) showed a highly significant overall effect size when comparing all sex offenders to the general population (d = 0.592, SD = 0.024, 95% CI [0.292, 0.893] z score = 3.86; p < .0001) but the effect sizes were highly heterogeneous (Q = 43.58, df = 13; p < .0001). When accounting for the age of victims, they were able to increase the homogeneity of the results (Q_{within} = 22.8, df = 12, p = .03) but some further refinement is probably necessary such as with vs without physical contact, pedophilic vs non-pedophilic child molesters, and intra vs extra familial victims.

When compared to non-sex offenders, sex offenders performed lower when considering all the neuropsychological tasks together (d = 0.257, SD = 0.004, 95% CI: [0.128, 0.387], z = 3.89, p < .001). In this instance the effect size was statistically homogenous (Q = 7.95, df = 16, p > .05) but this was much more correlated to sex offenders against adults (Q = 0.64, p = .98; d = 0.2, SD = 0.011, 95% CI: [-0.007, 0.410], z = 1.89, p > .05) than sex offenders against children (d = 0.29, SD = 0.084, 95% CI: [0.127, 0.458] z = 3.46, p = .001).

Breaking this down into individual tests (Joyal et al., 2014), the Stroop, trail-making B, COWAT, and Wisconsin Card Sorting Task (Berg, 1948). Versus the overall population, the results of all tests were heterogeneous in all except the trail-making B (trail-making B: Q = 8.53, df = 8, p > .05; COWAT: Q = 97.42, df = 5, p < .001; WCST: Q = 15.3, df = 8, p = .05; Stroop: Q = 65.33, df = 6, p < .001). And sex offenders obtained significantly poorer results on all tasks than controls. Finally, comparing performance with non-sex offenders, only trail-making B was non-homogenous (Q = 5.66, df = 2, p = .05).

Looking at the neurochemical aspect of sex offending, in animal studies, serotonin (5-hydroxytryptamine, 5-HT) has a suppressive effect on sexual arousal while dopamine and norepinephrine increase arousal and decrease post-ejaculatory latency (PEL) in rats. Further dopamine combined with testosterone restored sexual behaviors in castrated rats where testosterone alone did not (Kafka, 1997). A reduction in central 5-HT neurotransmission is associated with the release of suppressed behaviors including impulsive behaviors and aggression. More testing would be needed in humans to show if these effects were related to human sexual performance and particularly to the suppression or expression of paraphilias.

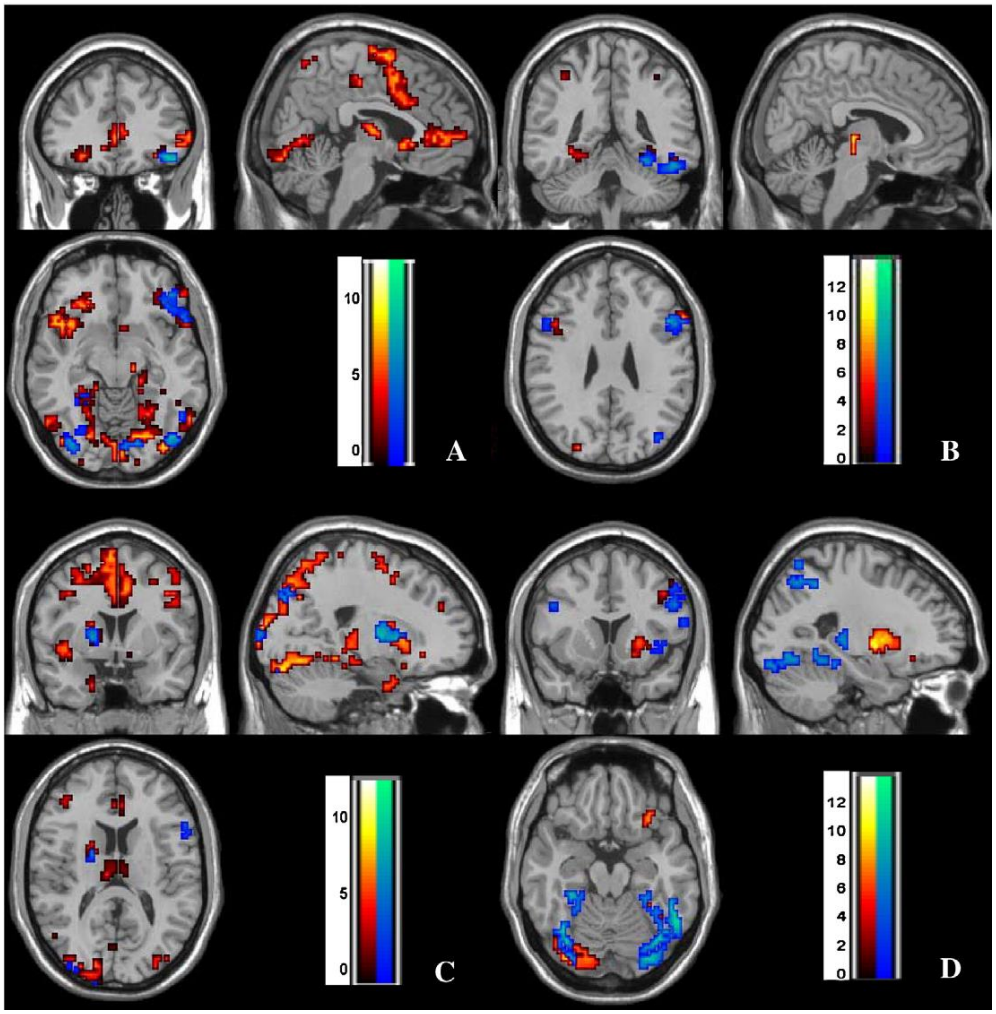


Fig. 1. Regional maps of activation in heterosexual controls and paedophiles for the Sexual Block–Neutral Block contrast in various conditions. (A) Red=Activation map of heterosexual controls in the women's condition, Blue=Correlation map of activation and the corresponding sexual arousal ratings; statistical threshold FDR pb0.05 (corrected for multiple comparisons) for a minimum of 5 adjacent voxels (MNI coordinates −5×35×−10 mm). (B) Red=Activation map of heterosexual paedophiles in the girls' condition, Blue=Correlation map of activation and the corresponding sexual arousal ratings; statistical threshold FDR pb0.05 (corrected for multiple comparisons) for a minimum of 5 adjacent voxels (MNI coordinates: −6×−43×28 mm) (C) Regional maps of activation in heterosexual controls (red) and paedophiles (blue) for the Sexual Block–Neutral Block contrast in the women's condition; statistical threshold FDR pb0.05 (corrected for multiple comparisons) for a minimum of 5 adjacent voxels (MNI coordinates: −21×4×14 mm). (D) Regional maps of activation in heterosexual controls (red) and paedophiles (blue) for the Sexual Block–Neutral Block contrast in the girls' condition; statistical threshold FDR pb0.05 (corrected for multiple comparisons) for a minimum of 5 adjacent voxels (MNI coordinates: 24×13×−18 mm). (Shiffer, Gizewski et al. 2008)

Finally, we can look at brain scans of heterosexual controls vs heterosexual pedophiles (Shiffer, Gizewski, et al., 2008) in Fig 1 below. We can distinctly see similarities in the arousal patterns of the controls when exposed to the nude women stimulus and the arousal patterns of the paedophiles when exposed to the nude girls stimulus. The converse is also true as the lack of arousal when exposed to the opposite stimulus with the opposite subjects (see Fig 2).

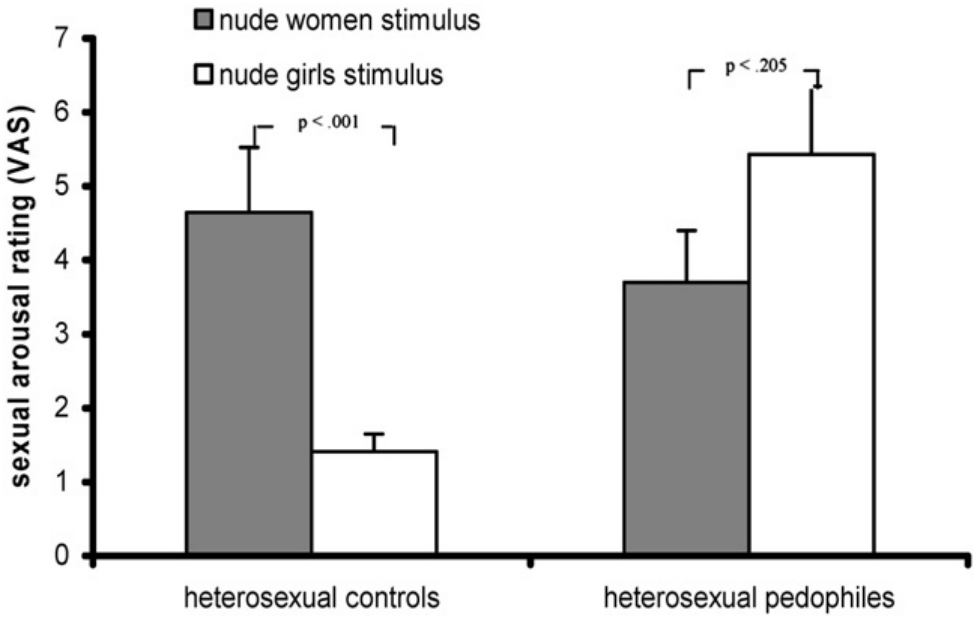


Fig. 2. Subjective ratings of visual stimuli by heterosexual controls (N=12) and heterosexual paedophiles (N=8). Each subject rated seven slides of nude boys and men using a 10 cm visual analogue scale. Data are presented as M±SEM. *(Shiffer, Gizewski, et al. 2008)*

The traditional method of assessing or comparing arousal response in males was the penile tumescence assessment method using either a loop of wire or an air displacement chamber to measure erectile response. This is problematic for a number of reasons: it is not suitable for use on females, differences in response due to age, impairment due to substance abuse, and physical differences (O'Donohue & Letourneau, 1992). An fMRI is a more reliable method.

What the Tests Tell Us

The neuropsychological tests (Stroop, trail-making b, COWAT, etc) allow a quick assessment and classification of offenders. These can be coupled with environmental factors (Rahman & Symeonides, 2007; Skorska & Bogaert, 2019) to predict paraphilic interests. Much of the work around these sorts of tests suffer from the fact that the test subjects are generally incarcerated is a confounding factor. Further, much of the current work fails to separate CSO from sex offences against peers/adults and there are definitely differences between the two sorts of offenders, even sub-groups within each category. But as a method of understanding the functioning of the offenders' brains, it is very useful and non-invasive.

Tests involving chemical changes in the brain are almost exclusively done on animal test subjects (Kafka, 1997; Lorrain, et al., 1999). This is useful in doing tests and getting at the inner brain structures but it does not always carry over to human subjects and the nature of the testing cannot be done on those subjects. Some work has been done particularly in relation to serotonin in paraphilics but it is usually incidental to other disorders such as anxiety or depression. More work needs to be done to expand our understanding of chemical effects.

Physiological brain responses are the gold standard for understanding and predicting problematic paraphilias. We can very easily map responses in an fMRI that have considerable predictive power (Shiffer, Gizewski, et al., 2008; Shiffer, Krueger, et al. 2008) and allow the use of any sort of stimuli we would care to think of. But the equipment is expensive and unwieldy so it is the last resort when we cannot use neuropsychological tests instead.

Conclusion

We can see that there is a wide spectrum of sex offenders that exhibit different behavioral profiles. There are also commonalities in all types of sex offenders but these are less useful as they also overlap with non-sex offenders or individuals with non-criminal but atypical sexual interests depending on if we are looking at the axis of criminality such as poor impulse control and poor control of interference. Some work has been done with chemical neurotransmitters in the brain but much more is needed. FMRI is replacing the older methods of measuring penile tumescence in order to characterize arousal but it suffers from all of the disadvantages fMRIs suffer from.

Much more work is needed in understanding the brains of all sorts of sex offenders. This would allow the prediction and treatment of problematic behaviors before they have a negative impact on society. Given that the attraction system has any number of universals (Fisher, et al. 2002), we should be able to treat sex offenders and integrate them into society instead of marginalizing them as we do now. But earlier warnings of potential problems are needed before they end up too far gone. No one is irredeemable or worthless but there is little place in modern society for most sex offenders.

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