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Paraphilic Sexual Offenders Do Not Differ From Control Subjects With Respect to Dopamine- and Serotonin-Related Genetic Polymorphisms

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ABSTRACT

Introduction: Rape and pedophilic child molestation are the most commonly convicted sexual offenses in Poland. Recent studies have suggested a possible genetic contribution toward pathologic sexual interests and behaviors.

Aim: To analyze and compare functional polymorphisms of genes associated with the activity of the serotonin and dopamine systems in a group of paraphilic sexual offenders and control subjects.

Methods: The study sample (n = 97) consisted of two groups: paraphilic sexual offenders (65 pedophilic child molesters and 32 rapists) and controls (n = 76). Genetic polymorphisms previously associated with behavioral control, addictive behaviors, and sexual functions were chosen for analyses. Specifically, functional polymorphisms in dopamine receptors genes (*DRD1, DRD2, DRD4*), catechol-O-methyltransferase gene (*COMT*), dopamine transporter gene (*DAT*), serotonin transporter gene (*SLC6A4*), serotonin type 2A receptor gene (*5HTR2A*), tryptophan hydroxylase 2 gene (*TPH2*), monoamine oxidase A gene (*MAOA*), and brain-derived neurotrophic factor gene (*BDNF*) were analyzed.

Main Outcome Measures: An association between a history of sexual offense and the distribution of genotypes and alleles in the analyzed polymorphisms.

Results: Our results found no association between a history of sexual offense and the distribution of genotypes or alleles in the analyzed polymorphisms.

Conclusion: Although these results are limited by the small sample and are exploratory, they highlight a novel approach to sample selection in a population that is difficult to access and study. Future research should include larger samples and other relevant polymorphisms to advance this field of study.

Key Words: Sexual Offense; Pedophilia; Genetic Polymorphism; Serotonin; Dopamine

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INTRODUCTION

In Poland more than 46,000 people became victims of a sexual crime from 2007 to 2011, of which more than 75% were children younger than 15 years (http://www.policja.pl). Rape and pedophilic child molestation are the most commonly convicted sexual offenses in Poland.[1] The true prevalence of these sexual offenses is difficult to establish because of under-reporting and lack of careful documentation. Despite prevalence rates, which are likely to be highly underestimated, the problem of sexual criminality, especially pedophilic childhood molestation, raises widespread discussions concerning human nature and desires and the scope of provided interventions. Sexually violent behaviors are especially problematic because they manifest severe deficits of

impulse control over sexual interests. In addition to traumatizing individual children, these behaviors harm society by undermining a sense of security in communities. Therefore, research explaining their background and nature is particularly important and demanded.

The etiology of sexual crimes is considered multifactorial. Recent studies have suggested a possible genetic contribution toward pathologic sexual interests and behaviors. Gaffney et al[2] observed that pedophilia is found more frequently in families of pedophiles than in families of non-pedophilic paraphiliacs. Alanko et al[3] reported that genetic influences might play a role in shaping the sexual interest of adult men toward adolescents and younger children. In that large population-based study, the amount of variance attributable to non-additive genetic influences was estimated at 14.6%. Importantly, twin correlations were higher for monozygotic than for dizygotic twins. Also, sexually coercive behaviors by men were shown to be influenced by genetic factors.[4] In a recent large epidemiologic study, Langstrom et al[5] observed a strong familial aggregation of sexual crimes suggesting that genetic factors might play a significant role in the liability to sexual offending (child molestation and adult rape). Also, Labelle et al[6] described genograms of five families with an unusual high occurrence of paraphilias (mainly pedophilia). Sex-steroid–related genetic influences on sexuality and paraphilia also have been suggested in previous studies.[7] In general, genetic factors have been shown to play a noticeable role in a wide range of sexual expressions, not only those considered harmful or pathologic.

To the best of our knowledge, there has been only one study focusing on polymorphisms related to sexual interests, *but not sexual offenses,* toward children. Alanko et al[8] analyzed single-nucleotide polymorphisms in hormonal genes (androgen, estrogen, prolactin, corticotrophin, and oxytocin), serotonin receptor genes (*HTR1A, HTR1B, HTR2A, HTR2C, HTR3A, HTR3B*), and dopamine receptor genes (*DRD1, DRD2,* and *DRD3*). They observed some significant associations between analyzed polymorphisms and sexual interest toward children in bivariate analyses, but no associations remained significant after controlling for multiple testing. However, this study was based on *self-reported* sexual interest and behaviors toward children. Of 1,672 men in that study, only 13 declared an interest in children and only one reported a history of sexual behavior with children.

In general, the data on the role of genetic factors in the general risk of crime are inconsistent. For example, contrary to hypotheses that carriers of alleles associated with lower dopamine (DA) activity would be at higher risk of committing a crime, DeLisi et al[9] showed that youth with genetic polymorphisms associated with a lower activity of D2 and D4 receptors exhibited a significantly later onset of criminal behaviors. The conclusions from a recent systematic review have confirmed that there is no clear evidence that neurobiological alterations solely can explain criminal behavior.[10]

There are several theories concerning the etiology of paraphilic sexual offending,[11] including one that involves the serotonin (5-hydroxytryptamine [5-HT]) and DA neurotransmitter systems. To date, the potential significance of DA and 5-HT activity in the etiology of sexual offense is based mainly on theoretical inference or animal models. However, some small research studies have indicated that 5-HT and DA neurotransmission could be associated with the risk of sexual offense.[12–17]

The assumption that 5-HT and DA activity is be involved in the risk of sexual offense comes from observations that they are related to sexual activity and behavioral control.[18] In numerous studies, polymorphisms associated with decreased 5-HT and DA activity have been correlated with higher levels of impulsive behaviors (aggression, suicide attempts, and substance abuse).[19] It has been speculated that pedophilia might resemble one possible phenotypical manifestation of the genetically driven "reward deficiency syndrome"[20] (associated with dopaminergic system activity and frequently suggested to underlie substance use and addiction susceptibility). Importantly, a significant association between substance use and the risk of sexual offense is well known and established.[1] Also, recent evidence has documented that paraphilic disorders can emerge as relatively uncommon iatrogenic consequences in individuals with Parkinson disease who have symptoms of severe DA deficits.[21]

Considering the dearth of candidate gene studies in the field of paraphilia and sexual offenses,[11] the aim of this study was to analyze and compare functional polymorphisms of genes associated with the activity of the 5-HT and DA systems in a group of paraphilic sexual offenders and control subjects. The 5-HT- and DA-related polymorphisms were chosen for investigation because the activity of these two neurotransmitter systems has been suggested as major neurobiological mechanisms of paraphilia, that is, impulse control deficits and reward deficiency and addictive behaviors and sexual interests and behaviors. We conducted the study in paraphilic sexual offenders (who were not only diagnosed with a paraphilic disorder but who also committed a serious crime while being unable to inhibit their sexual desires) because we were interested in the neuromechanisms through which individuals with paraphilia lose control of their behaviors and surpass the limits of law and social norms.

Therefore, for this study, genetic polymorphisms previously associated with behavioral control, addictive behaviors, and sexual functions were chosen. Specifically, the dopamine type 1 receptor gene (*DRD1*) has been associated with reward deficiency, substance abuse risk,[21] and age at first sexual intercourse[22]; the dopamine type 2 receptor gene (*DRD2*) has been related to novelty seeking, behavioral control, and sexual dysfunction in male schizophrenia[23]; the dopamine type 4 receptor gene (*DRD4*) has been associated with impulsivity,[24] age at sexual initiation,[25] and desire, arousal, and sexual function[26]; the serotonin type 2A receptor gene (*5HTR2A*) has been associated with behavioral impulsivity[27] and human "loving style"[28]; the dopamine transporter gene (*DAT*) has been related to behavioral control[24] and