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THE NEUROPSYCHOLOGICAL DETERMINANTS OF SEXUAL CRIMES

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SUMMARY

When the mechanisms that lead to sexual crimes are examined, the biological basis of human sexuality should be taken into consideration. So far, however, the neuropsychological mechanisms of sexual perversion are not fully understood, nor has the neuropsychological profile of a sexual abuser been determined. Structural and functional brain anomalies are thought to play a crucial role in sexual offenders; the literature points to the importance of the brain mechanisms responsible for stimulation, direction and control of the sex drive. Empirical data shows that brain damage occurs in nearly 50% of perpetrators. The aim of this article is to identify the brain mechanisms of sexual drive disorders, modelled on sexual dysfunctions in frontal syndrome, the Klüver-Bucy Syndrome and temporal lobe epilepsy. We have also collected and systematised the existing neuropsychological and neuroimaging research on sexual abusers. First, we demonstrate the relation between sexual deviations and nervous system disorders on the general level (lower IQ in paedophiles and sexual sadists, comorbidity of paraphilias and other mental disorders). Secondly, we introduce three hypotheses of specific, and particularly localised, neuropsychological dysfunctions in sexual offenders. The Frontal-Dysexecutive Theory points to behavioural disinhibition and other cognitive aspects of behaviour control as the main causal factors. The Striato-Thalamo-Frontal Theory, claims that there is a shared pathological brain mechanism in sexual deviance and obsessive-compulsive disorders. The Temporal-Limbic Theory suggests that hyperactivation of sexual arousal and impaired erotic discrimination are the causal factors in sexual abusers.

Key words: sexual deviations, criminal behaviour, brain damage, executive functions, temporal-limbic system, OCD

INTRODUCTION

The literature provides many conceptions of the genesis and the mechanisms of sexual offences. Three distinctive theoretical models emerge from a meta-analysis:

- subjective models, concentrating on the offender and his individual psychological features that presumably facilitate the formation of a sexual deviation (sex drive regulation disorders);
- social models, emphasising the role of the society and culture in the genesis of sexual crimes;
- integrated models, pointing to multiple factors and their interactions (Beisert 2008).

Neuropsychological explanations of sexual deviations form the oldest subjective understanding of the problem, but they should also be considered important in the integrated models. On the other hand, though the hypothesis of the role of central nervous system disorders in sexual offenders has been present in the literature for more than 80 years, the empirical data behind it is uncommonly sparse. Moreover, research into the neuropsychological basis of the perpetration of sex offences is in a very early stage.

To date, research in the field has aimed at listing anomalies in the structure, biochemistry and functions of the brains of perpetrators. The results of the first three groups of studies, on IQ, lateralisation, and co-morbid psychological disorders, led to a general conclusion: sexual deviations may be linked with nervous system impairments. Subsequently, this general conclusion has stimulated further research, in order to investigate specific, more precisely localised brain dysfunctions that might be responsible for the impulse to commit sexual crimes. The largely unspoken idea behind all this is to establish the neuropsychological profile of a sexual offender.

GENERAL CONDITION OF THE NERVOUS SYSTEM IN SEXUAL OFFENDERS

The first studies aiming at assessing the condition of the nervous system in perpetrators tested intelligence quotient. This type of research started after 1930, and most frequently indicated that mean intelligence quotient in sexual offenders was low average. In their meta-analysis of research on IQ in perpetrators, Blanchard, Cantor, and Robichaud (2006) demonstrated that the IQs of those abusing children under 13 was significantly lower than of those abusing older minors. A comparison of groups of paedophiles, hebophiles and men with undisturbed sexual preferences, by Cantor and co-workers (2004), also revealed significant differences in mean IQs. With 454 criminals in the sample group, the means were 89.5, 93.7 and 97.8 respectively. Moreover, research indicated that the perpetrator's IQ was negatively correlated with the strength of sexual response, as measured on a plethysmograph, to presentations of child nudity. This means that persons with lower IQ were more aroused in response to deviant stimuli.

These findings have to be taken cautiously, however. Claiming that lower IQ predisposes to, or causes sexual deviations would be an overstatement, since both lower IQ and paraphilias may result from the same, specific brain injury. Blanchard and co-workers (2006) say that anomalous sexual interests can stem from cerebral trauma that both disrupts normal psychosexual development and lowers IQ test results. Considering the specific character of the pathology, it may be expressed only in some aspects of cognitive functioning, at the same time having an impact on the general IQ. Only neuropsychological examination of sexual offenders will allow us to answer the questions about this, possibly specific, brain pathology.

The other focal point of research was right-handedness and left-handedness in sex offenders. Many studies indicate that paedophiles are more often not right-handed (Cantor et al., 2004, 2005; Blanchard et al., 2007; Bogaert, 2001, cited by Blanchard et al., 2006). Cantor et al. (2004) demonstrated that the feature occurred three times more often in paedophiles than in the normal population. In some cases, this may be the so-called "pathological left-handedness" that results from early, mostly prenatal or perinatal, brain damage (Ramadhani et al., 2006). Summing up, a higher left-handedness index is considered to be a proof of the significance of the neurological component in the aetiology of paedophilia.

Research into the history of cerebral trauma in sexual offenders also confirms the hypothesis of the role of neurological factors in the genesis of paraphilias. Langevin and Curnoe (2008) conducted a study into this problem on a sample of 1180 sexual offenders. Their conclusion was that 49.3% of the perpetrators had experienced head injuries with unconsciousness. A frequent result of such injury is, in turn, sexually inappropriate behaviour, that is, attempting to touch others without their consent or being exhibitionistic. This pertains to 6-33% of the patients of neurological clinics (Simpson et al., 1999; Luiselli et al., 2000, cited by Langevin & Curnoe 2008). Observations of the influence of traumatic brain injuries and nervous system diseases on the sexual functioning of neurological patients led to a conjecture that in sexual abusers paraphilias are triggered by neurological injuries and diseases.

It is especially early injuries that may be of significance in the genesis of sexual deviations. Blanchard and co-workers (2002, 2003) reported that injuries before age six, but not after age six, were correlated with a higher incidence of paedophilia. Later brain injuries, in turn, were linked to drug abuse and promiscuity, but not paedophilia. Moreover, early injuries were also related to attention deficit hyperactivity disorder (ADHD), lower IQ, and left-handedness. At the same time, however, the authors consider the possibility that there is no causal relation between cerebral trauma and paedophilia, and there is a third factor, known as neurodevelopmental perturbation. Blanchard argues that it could, following this line of reasoning, be responsible both for higher susceptibility to injuries, e.g. balance disturbances resulting in more frequent falls, and proneness to sexual deviations. Kolarsky, Freund and Machek (1967) likewise emphasised the connection between early (preadolescent) neurodevelopmental perturbations and paedophilia,

noticing particularly frequent cases of early onset epilepsy in a group of paedophiles. Early brain damage is an interruption in the progression of brain structure maturation and, as such, may have a snowball effect on many crucial brain functions (cognitive, emotional and psychosocial) in later periods of development (Smidts, 2004). For instance, early frontal lobe injuries facilitate the development of an antisocial personality. This is because the trauma prevents interiorisation of the rules of social conduct (both prohibitions and orders) and the development of normal, empathetic reactions.

Interesting explorative research has also been conducted on comorbid conditions, other than sexual preferences and personality disorders, in sexual offenders. For the past 20 years numerous studies have indicated that there is a relation between attention-deficit-hyperactivity-disorder (ADHD) in children and the occurrence of criminal behaviour in later developmental periods (Pastwa-Wojciechowska, 2008). Raymond, Coleman, Ohlerking, Christenson, and Miner (1999) assessed mental health in a sample of 45 paedophiles. Their conclusion was that 42 of them met criteria for other psychiatric disorders. Anxiety disorders and mood disorders (mainly depression) were diagnosed most frequently. Moreover, Schiffer et al. (2007) and Tost et al. (2004) point to comorbidity of paedophilia and obsessive-compulsive disorders (OCD), while Langevin and Curnoe (2008) reported that paedophilia is associated with attention deficit hyperactivity disorder (ADHD) as well as with specific learning disabilities (SLD) in childhood (e.g. dyslexia). These childhood conditions pertain to 29% of paedophiles. The authors of the cited study suggest a shared neuronal mechanism of paedophilia and comorbid disorders: that is, a congenital or very early predisposition of the nervous system to develop paedophilia and other mental disorders.

SPECIFIC NERVOUS SYSTEM DYSFUNCTIONS IN SEXUAL OFFENDERS

The results of the first three groups of research (on IQ, lateralisation, and comorbid psychological disorders) were interpreted as indicators of nervous system impairments in sexual offenders. Yet, they did not allow to precisely localise and characterise the damages. Three theories were posed on localisation of cerebral trauma leading to paraphilias:

1. damage in the frontal lobes area (Frontal – Dysexecutive Theory);
2. temporo-limbic anomalies (Temporal – Limbic Theory);
3. striato-thalamo-frontal processing loop dysfunction (Striato – Thalamo-Frontal Theory).

Adherents of the Frontal – Dysexecutive Theory believe that the main factor triggering sexual anomalies is behavioural disinhibition, resulting from a malfunction in the frontal lobes, in particular the orbitofrontal cortex. Given that behavioural inhibition is not only crucial for the control of sexual drive, but also for the control of aggression, this factor probably does not differentiate between sex offenders and perpetrators of other crimes. However, it may still be significant in sexual deviations.

In addition to this disinhibition problem, there are other important cognitive processes that may be critical for committing crimes and are associated with the frontal lobes. The literature lists such frontally localised behaviour regulation components as:

- self-awareness;
- use of internal speech to reflect on behaviour;
- criticism, taking feedback about inappropriate behaviour personally;
- behaviour correction;
- the ability to learn and interiorise the rules governing interpersonal relationships;
- empathic responses to negative reactions to one's behaviour;
- the capacity to anticipate consequences, to plan efficiently and make decisions-(e.g. taking into account the consequences of one's behaviour, being aware of alternatives);
- the capability for abstract reasoning and reasoning in terms of moral values (Herzyk & Krukow, 2009a, Damasio 2003).

However, it is the orbitofrontal cortex that seems to be the area most involved in inner mechanisms of self-control. Impairment of social intelligence, infringements of personal principles, and lack of justified embarrassment have been found to be consequences of lesions in the orbitofrontal area (Ledwoch, Grochmal-Bach & Tomaszewska, 2008).

All the above-mentioned components of efficient behaviour regulation depend on executive functions. These can be defined as „a set of psychological processes involved in conscious control of thoughts, and actions, or processes responsible for thoughtful, goal-oriented behaviour” (Putko, 2008 p. 33). Executive functions are also defined as the ability to devise new patterns of behaving and thinking in response to changing situations (Pačhalska 2003). Although no full agreement as to exactly what processes form this group of abilities has been reached, usually the following basic components are listed:

- inhibition control (or behavioural inhibition);
- attention efficiency (despite distractors);
- cognitive flexibility (adaptability to changing conditions);
- working memory;
- abstract thinking (Zelazo & Muller, 2002).

Sometimes, the executive functions are defined as more complex cognitive functions (e.g. Norman & Shallice, 1986; Kaczmarek, 2009), though consisting of the features mentioned above.

Observations of the consequences of brain damages have shown that executive functions are located in the frontal cortex, with various aspects in slightly different parts of the frontal lobes. Damage to the ventral, medial, and dorso-lateral areas results in different symptoms in the psychomotor drive, initiative, emotionality, impulse inhibition, and the efficiency of the so-called reward system, forming variations of the frontal lobe syndrome (Herzyk & Krukow, 2009b; Kaczmarek, 2009). Different areas of the frontal cortex may therefore have a slightly

varying part in the formation of sexual deviation. Thus various types of sexual molesters, e.g. impulsive-disorganised, manipulative-organised, may correspond to distinct localisations of frontal dysfunctions.

It is believed that the characteristics of frontal syndrome are more common in the population of offenders than in the normal population. A large-scale study of persons detained in prisons in Poland, by Kaczmarek's team (Ledwoch & Krukow 2009), confirmed that deficits in executive functions were significantly correlated with antisocial acts (various crimes).

When we are speaking about frontal syndrome, however, it is also important to note that, according to microgenetic theory, the subject (that is, the person with frontal lobe dysfunction) is the whole of subjectivity, which includes the body, space and external objects.

The direction of actualization – or becoming – is from the instinctual core of the subject into the body and objects in space. The trajectory from core to object – which comprises one epoch of subjectivity – actualises the being of the state (Pačalska 2008). The completion of one cycle of becoming-into-being gives existence to the state. The object appears as the outer portion of the state, but its existence requires the entire transition. An object is the exteriorized portion of the subject. It is a subjective event. It differs from a physical or noumenal entity out-

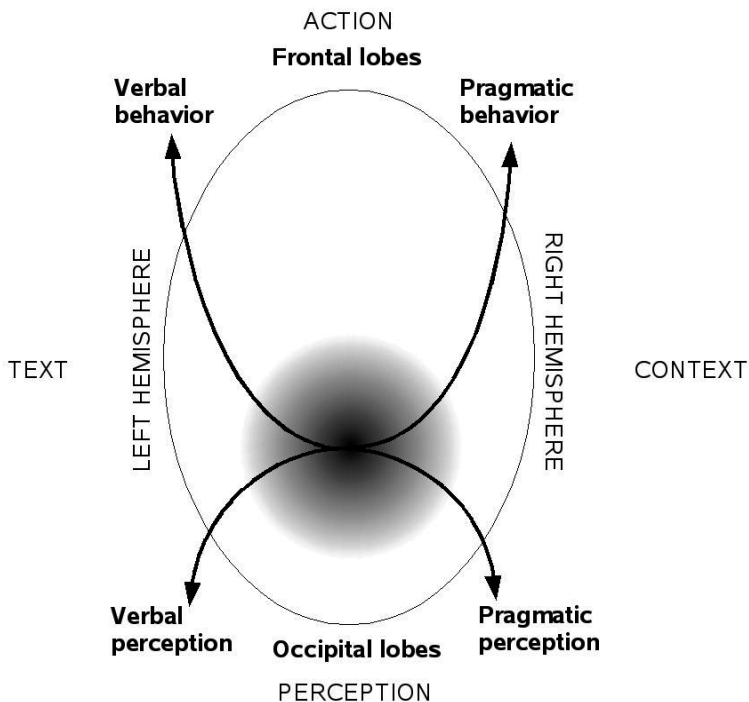


Fig. 1. Microgenetic model of perception-action cycle on the basis of language's text and context (Pačalska & MacQueen 2008)

side the subjective field, which similarly exists over the duration – temporal extensibility – of its own actualisation, in which an important role is played by the frontal lobes (see Paçhalska 2007; Paçhalska & MacQueen 2008).

It should be also noted that there has been little research exploring the efficiency of executive functions in sexual offenders (Stone & Thompson 2001). There are two especially noteworthy works, which demonstrated a statistically significant decrease in executive functions test results in perpetrators of sexual crimes. The first is a work by Yeudall, Fedora and Fromm (1987) indicating deficits in top-down attention intensity and selectivity, and limited cognitive flexibility. Secondly, then, a work by Stone and Thompson (2001) revealed also reduced inhibition ability. Other researchers, on the other hand, have failed to obtain differences between sexual offenders and control groups in the scope of executive functions, although they have used similar neuropsychological tests (e.g. Dolan, Millington & Park, 2002; Cohen et al, 2002; Knox-Jones, 1994; Rubenstein, 1992, Westergren, 2002, cited by Blanchard, Cantor & Robichaud, 2006). Failure to confirm the frontal - dysexecutive hypothesis in these studies may, however, result from the inappropriate sampling strategy, that is, using an overly broad inclusion criterion that resulted in the inclusion of non-deviant offenders, that is, those who commit criminal acts out of nonsexual motivation (such as economic incentives for persons convicted of trafficking in child pornography). Executive function deficits are most common in sexual deviants and are either nonexistent or less expressed in sexual offenders committing sexual crimes for other than sexual reasons. e.g. economic (as in the case of the pornography trade). The Frontal – Dysexecutive Theory may still be relevant and requires further research.

The Striato-Thalamo-Frontal Theory is a variant of Frontal – Dysexecutive Theory. It is the latest attempt at explaining the basis of deviant sexual behaviour. Its proponents (e.g. Schiffer et al., 2007; Tost et al., 2004) suggest that sexual deviations should be seen as one of the possible expressions of the obsessive-compulsive disorder (OCD) spectrum. Their assumption is that both deviations and obsessive-compulsive disorders share the same pathological neuroanatomical and neurochemical basis, that is, irregularities in the striato-thalamo-frontal loop.

This loop, also called the reward system, plays an important role in the regulation of motor functions, motivational processes, and gratifying (appetitive) behaviours. Disruptions in its functioning may result in losing the rewarding value of many daily activities. This results in “reward deficiency.” To supply oneself with the missing stimulation, the person either seeks new sources of positive experiences or repeats known pleasurable activities many times. This provides a good explanation of compulsive masturbation or contacts with atypical sexual objects in some persons.

Structural damages or dysfunction of neurotransmission (serotonergic and dopaminergic transmission balance) in the striato-thalamo-frontal loop may also result in the malfunction of the inhibition processes, presence of intrusive thoughts and actions, and other impulse control disorders such as kleptomania, trichotillomania and Tourette’s syndrome (Jeníke et al., 1996, Pujol et al., 2004; Szeszko et al, 2005; Schiffer et al. 2007).

The concept of the obsessive-compulsive aetiology of some paraphilias seems to be an adequate explanation of the symptoms presented by some persons with sexual anomalies. In a certain group of deviants it is possible to observe obsessive dependence on the sexual object, pervasive sexual fantasies and automatism of actions, manifested in an inability to abstain from the urgent sexual impulses in contact with the object. These symptoms indicate a significantly reduced ability to control impulses and resemble the symptoms of the obsessive-compulsive disorder, which, according to International Statistical Classification of Diseases ICD-10 (WHO, 2008), is characterised by recurring, intrusive thoughts, experienced as unpleasant, or actions, and the inability to abstain from them. Like persons suffering from OCD spectrum disorders, this group of sexual deviants construes their thoughts and behaviour as persistent and inconsistent with the ego, and tries to oppose them.

Several studies lend support to the hypothesis of disorders in the striato-thalamo-frontal loop and the connection between paraphilias and OCD. Schiffer and colleagues (2007) performed neuroimaging studies that demonstrated a correlation between lesions of these structures and paedophilia (a smaller volume of grey matter in the ventral striatum, orbitofrontal cortex and cerebellum in paedophilia). According to the authors, this confirms the hypothesis that some forms of deviant erotic preferences may have the same neuronal correlate as OCD. To date, however, there have been no other studies confirming this hypothesis.

Finally, the Temporal-Limbic Theory assumes that sexual deviance is due to a dysfunction in the deep structures of the temporal lobe associated with the limbic system. The limbic system is a complex network of cortical and subcortical structures, regulating the instinctive and emotional functions. The reward system that determines whether behaviour (including deviant) is satisfying or not is also located there. The hypothalamus and other structures attached to temporal areas are assumed to be responsible for sexual anomalies. This happens because the hypothalamus generates a sexual reaction in response to perceived, external stimuli (thus it decides whether the stimuli become sexual for the person and, as such, if they are to be included in the experience of pleasure). So far, however, research on this hypothesis has given ambiguous results.

The results of several studies suggest that there is a relation between the efficiency of the functioning of the temporal-limbic structures and sexual perversions. The leading study is by McLean (1973, cited by Langevin, 1990). In experiments involving the stimulation of different areas of the brain in monkeys, he demonstrated that the structures responsible for sexual arousal and aggression are one millimetre apart. The proximity of these systems may explain the relation of sexual behaviour and aggression frequently observed in sex offenders.

Earlier experiments on animals led to similar conclusions. Klüver and Bucy (1939, 1997) in their experiments on rhesus monkeys noticed that removal of the temporal lobes (including amygdala) resulted in intensification of sexual arousal and heterosexual, homosexual, and autoerotic behaviour. Their sexual conduct towards other animals (oral, manual and genital activities) became chaotic and

violent to the extent that separation of the animals was necessary. In solitude, masturbation in various forms, including health-threatening behaviour (such as biting their own genitals or hitting their cage with them), became the dominant activity. What is also important, a loss of normal preference for females of their own species was observed. Animals directed their sexual behaviour to males of their own species and members of other species, with no preference for sex. Moreover, the rhesuses also made explicit attempts to copulate with objects and lost their ability to distinguish edible objects from inedible. The normal reactions of anxiety and aversion in situations that previously caused them (e.g. seeing snakes, faeces) disappeared. According to the authors, such behaviour has neither been observed in monkeys without lesions of temporal lobes, nor with lesions in other areas of the brain.

The second type of data supporting the hypothesis of temporal-limbic dysfunction in the aetiology of paraphilias comes from neurology. Following temporal lobe injuries, some people demonstrate behaviour similar to that reported by Klüver and Bucy in rhesus monkeys, and therefore are diagnosed with Klüver-Bucy Syndrome. The clinical picture is dominated by general disinhibition with euphoria, loss of fear, and hypersexuality (Herzyk, 2005). Similar changes occur in the course of dementia that affects the temporal lobes (Neylan, 1997; Bilikiewicz, Parnowski, Liberski & Bratosiewicz, 2002; Herzyk, 2005) and in patients with temporal lobe epilepsy. As far as sexual functioning concerned, the most common effect of this type of epilepsy is a drop in libido and impotence. Still, some people exhibit an increase in libido and bizarre sexual behaviour. Such a case was described for the first time in 1954, by Mitchell, Falconer and Hill (1954, cited by Langevin, 1990). In this case, fetishism developed later in life in a man who had not previously manifested sexual dysfunctions. What is also important, it was bizarre in nature, because the object of choice that sexually aroused the man was a safety pin. Further research into the effects of temporal lobe epilepsy has revealed abnormalities in the intensity of sexual drive and object selection in more patients. Moreover, disintegration of sexual object leading to fetishistic preferences, changes of sexual object without its disintegration, and emergence of paedophilic preferences were observed. In a study by Hill, Pond, Mitchell and Falconer (1957, 2004) nearly half of their patients were hyper-sexual and had perverse preferences. In some patients, the abnormalities disappeared after the epileptic lesion was removed, or when drug treatment was administered. In a few, however, sexual symptoms aggravated after the implementation of pharmacotherapy. This illustrates the complexity of the temporal mechanisms that regulate human sexuality.

Sexological studies by Kolarsky and colleagues (1967) seem to confirm the hypothesis of the relation between dysfunctions in temporal areas and disorders of sexual preference. The clinical group consisted of 87 patients with different locations of the epileptogenic focal lesion. Some were also tested on a plethysmograph for erotic preference. Paraphilias were found in 20% of patients with temporal epilepsy, but there were no such problems when epilepsy was located in other areas of the brain.

Neuroimaging studies have also been used to confirm the Temporal-Limbic Theory of sexual deviations. Of particular note is a recent work by Cantor et al. (2008), who used MRIs to reveal significant negative associations between paedophilia and the volume of white matter in temporal and parietal lobes bilaterally. In previous works on paedophilia, the volume of the temporal lobes was smaller in paedophiles than in perpetrators of other crimes, but the results did not reach statistical significance (Langevin, Wortzman, Dickey & Wright, 1988; Wright, Nobrega, Langevin & Wortzman, 1990). As far as sexual sadism is concerned, in three studies on sexual offenders whose victims were adult women, more abnormalities were found in the right temporal lobe in sexually sadistic perpetrators than in non-sadistic perpetrators (Hucker et al., 1988; Langevin et al., 1985; Langevin et al., 1988).

These observations suggest that the structures of the temporal area are responsible for the attribution of meaning to stimuli and the generation of appropriate attitudes towards them. Perhaps in sexual deviants it is precisely these parts of the brain that are not functioning properly. As a consequence, proper differentiation of erotic stimuli is impossible, and so is feeling anxiety when breaching social and legal norms. This would mean that damage in temporal areas, like damage in frontal areas, may be responsible for the deficit in response inhibition, increased libido and defective sexual differentiation leading to sexual interest in people regardless of their age, gender or degree of relatedness. These three factors – the excessive generation of sexual impulses, the fear deficit and the faulty erotic discrimination – most likely connected with the temporal regions may be the causes of sexual crimes.

CONCLUSIONS

To sum up: research to date has failed to produce a neuropsychological profile for sexual deviants. Reports by the leading researchers of the neuropsychological determinants of sexual crimes, R. Langevin and S. Curnoe (2008), do not specify what neuropsychological impairment occurs in this type of perpetrators. Though the study was conducted on a sample of 1180 criminals, the results are limited to assessment of the impairment index, without attempts to describe the specificity of the damage or its localisation. Despite researchers' attempts to confirm the frontal-dysexecutive theory, so far only incomplete and inconsistent results have been achieved. The striato-thalamo-frontal hypothesis still has preliminary status. The temporal-limbic theory seems to have a better theoretical background, but so far exact neuropsychological data confirming the theory are lacking. Among the disadvantages of the existing studies are the narrow range of studied variables and the small size of heterogeneous sample groups (usually of approximately 20 to 30 perpetrators of various sexual crimes). However, the research results quoted above suggest that brain impairment and neuropsychological deficits may play a crucial role in the formation of deviations of sexual drive regulation. Moreover, a meta-analysis of the existing studies leads to the presump-

tion that neuropsychological deficits differentiate types of sex deviation. Therefore the neurological and neuropsychological perspective is worth further exploration. Conclusions in this area would be important both for forensic sexology and in planning appropriate treatment. In particular, if the obsessive-compulsive hypothesis is confirmed, the current standards for the treatment of sex abusers will need to be revised, which means the inclusion of drugs balancing dopaminergic and serotonergic neurotransmission.

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