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## Brain Damage Among Mentally Disordered Sex Offenders

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**ABSTRACT:** The incidence and nature of structural brain dysfunction was investigated in a pilot study sample of individuals currently assigned the Nebraska Penal Code designation of mentally disordered sexual offender. It was hypothesized that the sexual offenders would show a significantly higher incidence of dysfunction than a psychosocially normal group as evidenced by computed tomography scan measures, regional cerebral blood flow, and neuropsychological instruments. The hypothesis was tested by two different methods. One method used a 160 by 160 printout of density numbers generated by computer from computed tomography scans administered to the sexual offenders. The second method used mean blood flow data generated from a Harshaw TASC-5 Regional Cerebral Blood Flow analysis system. Additionally, the Luria-Nebraska Neuropsychological Test Battery was administered as a measure of the behavioral correlates of brain dysfunction. Preliminary analyses indicate that 50% of the sexual offenders tested showed brain dysfunction as demonstrated by decreased density measures, decreased blood flow, and performance deficits on the Luria Battery. The implications of these findings, if confirmed, are substantial on issues of criminal responsibility, sentencing, treatment, and rehabilitation of the sex offender. Case reports of the patients studied are presented.

**KEYWORDS:** psychiatry, criminal sex offenses, brain

Brain damage resulting from organic processes can lead to a variety of sexual aberrations depending on the area and extent of involved brain tissue. The Kluver-Bucy syndrome resulting from bilateral lesions of the temporal lobes produces striking and specific effects on sexual behavior. The syndrome consists of bizarre hypersexuality, thought by Oppenheimer [1] to be a release phenomenon in the Jacksonian sense, or, in other words, the syndrome results when normal inhibitory controls on certain behaviors are removed, similar to the uncontrolled patterned behavior of the psychomotor seizure. Usually, however, brain damage produces nonspecific behavioral changes with dissolution of appropriate social interaction into more primitive behaviors [2]. Specifically, loss of social controls occurs with sexual activity taking place in improper circumstances.

In a study of Huntington's chorea, Dewhurst et al [3] studied 102 patients and their families for 16 years. Abnormal sexual behavior was noted in 30 of 48 from whom sexual histories were obtained and included sexual jealousy, exhibitionism, homosexual aggression, sodomy, voyeurism, and promiscuity. Problems related to hypersexuality led to hospitalization in some patients. Wives of patients frequently reported that their husbands were de-

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manding increased amounts of sexual satisfaction especially at inappropriate times and places and, if rebuffed, the patients were sometimes abusive and violent.

Epilepsy, especially of the temporal lobes, has been associated with abnormal sexual behavior. The early literature proposed a link between temporal lobe epilepsy and a variety of mental disorders including uncontrolled violence and aggressive sexual behavior. Recent controlled studies have failed to confirm any specific associations [3-11]. Data from the studies do suggest that the severity of the seizure disorder and the side, extent, and localization of the seizure focus all contribute to the degree of social disability and mental disturbance, therefore implying sexual difficulties [3-5]. Impotence and hyposexuality have been reported to occur interictally, occasionally resolving after temporal lobectomy [6-8]. Hypersexuality has been reported in both the preictal and ictal periods [9,10]. Shukla et al [11] made a controlled study of 70 temporal lobe epileptics who were without "neurological deficits" or "mental subnormality," comparing them to 70 patients with generalized grand mal epilepsy who were also without "deficits." The only consistent abnormality they found among the temporal lobe epileptics was a high incidence of hyposexuality.

Lishman [12] has reported a study of the relationship of head injury to psychiatric disability. Of 144 patients with psychiatric disability, only 8 were found to have significant sexual disturbances. However, those 8 cases showed some interesting findings. The lesions most likely to result in abnormal sexual behavior affected the orbital and frontal lobes. In addition, more psychiatric disability was associated with wounds of the right frontal lobe than the left. Typically the observed sexual disturbances consisted of increased sexual appetite with disregard for the sexual partner, or sexually related criminality.

Regestein and Reich [13] have reported four cases of pedophilia that emerged after brain insults had produced cognitive impairment. All of these individuals had previously led normal lives without psychiatric disability and had shown no sexual deviation until after the events that resulted in the cognitive disability. In one case, pedophilia, personality change, and declining job performance developed after the removal of a meningioma through a right frontal craniotomy. Psychological testing tended to confirm the existence of a right frontal lobe deficit. Two cases illustrated development of pedophilia, sexual behavior changes, and alterations in personality after multiple cardiac resuscitations and presumed episodes of cerebral hypoxia. The fourth individual who had demonstrable cognitive deficits developed pedophilic behavior only when he was treated or self-medicated with a central nervous system depressant.

The previously mentioned literature suggests a relationship between abnormal sexual behavior and a variety of lesions of the brain, particularly of the frontal and temporal lobes. We have undertaken a case study of individuals whose sexual behavior has led to their legal designation as mentally disordered sex offenders. Nebraska statutes define a mentally disordered sex offender as "any person who has a mental disorder and who, because of the mental disorder, has been determined to be disposed to repeated commission of sexual offenses which are likely to cause substantial injury to the health of others." Mental disorder is determined by the opinion of a panel of two psychiatrists or a psychiatrist and a clinical psychologist. The study was designed to apply several recently developed techniques to an unselected group of mentally disordered sex offenders to assess the association between several indices of brain damage and inappropriate sexual behavior. We hypothesized that among individuals incarcerated under the provisions of a mentally disordered sex offender law [14] a high incidence of demonstrable cerebral disorder, both functional and structural, ought to exist. This preliminary study did not consist of a large enough group of subjects for careful statistical analysis.

## Method

We report the results of six case studies using several measures that have shown the ability to disclose even subtle evidence of brain abnormalities. These measures included the Luria-

Nebraska Neuropsychological Battery, computed tomography mean cerebral hemispheric "slice" density analysis, and regional cerebral blood flow.

The Luria-Nebraska Neuropsychological Battery [15] is a recently developed test of neuropsychological functioning, based on the work of Luria, which is both comprehensive in the range of abilities it assesses and apparently effective in its ability to demonstrate differences between the performance of normal individuals and patients with organic brain disorders [15-17], even when these patients have severe psychiatric disturbances [18]. Test results have also been shown to correlate with the ventricular brain ratio, a quantitative value for ventricular enlargement and, therefore, cerebral atrophy [19]. The test has also been used to predict which chronic schizophrenics will show evidence of brain damage, as demonstrated by lateral ventricular enlargement [20].

The battery consists of 269 items organized into 14 categories including acousticomotor (rhythm) functions, cutaneous and kinesthetic functions, visual functions, receptive speech, expressive speech, reading, writing, arithmetical skills, memory processes, intellectual processes, left-hemisphere index, and right-hemisphere index. In addition, the battery includes a localization scale that allows identification of that region of the brain containing a lesion producing dysfunction [21]. Each subject was given the test and his results were compared with normative standards.

Regional cerebral blood flow assessment has been of interest to a number of investigators studying neurologic and psychiatric disorders who have hoped that such assessment might reflect neuronal activity in separate regions of the brain, as well as cerebrovascular abnormalities. Indeed, abnormalities in regional cerebral blood flow have been discovered in alcoholics and chronic schizophrenics as well as victims of cerebrovascular accidents [21]. By using a Harshaw TASC-5 with a 16-detector array (8 detectors over each hemisphere), washout of  $^{133}\text{Xe}$  radionuclide from the brain was monitored. A technique developed by Obrist et al [22] and modified by Harshaw Inc. was used to compute mean hemispheric blood flow through gray and white matter. Only the gray matter value is considered in this study.

For the final evaluation of this study each patient received a computed tomographic scan on an EMI CT-1010 scanner. The computed tomographic (CT) scanning process involves projection of X-rays through the cranium at a number of different angles, measuring the transmitted X-rays, and calculating through a reconstruction algorithm the amount of X-ray beam attenuation resulting from each unit volume of tissue the beam traversed. The conventional CT image is produced by assigning a gray scale to the attenuation values and projecting a composite image on a cathode tube, which can be photographed. We have developed a technique for statistically analyzing the attenuation values described above for each hemispheric portion of a CT "slice," computing a hemispheric mean attenuation value (which corresponds to tissue density), and comparing these means for various populations. Usually three contiguous CT "slices" are studied, the lowest being at the top of the lateral ventricles and continuing upward. We have been able to identify significant differences between the left and right hemispheres of normal individuals as well as between the values of normal persons and two abnormal groups, chronic schizophrenics and chronic alcoholics [23,24].

For purposes of comparison, we present data for the patients alongside group mean values for normal individuals and chronic schizophrenics determined and reported in previous studies (Table 1). Case reports and results of individual assessments are also presented.

### Case 1

The patient was a 36-year-old married white factory worker who was committed as a mentally disordered sexual offender following an incident in which he entered a women's restroom in a public park, seized a woman about the neck, displayed a knife, and threatened to kill the woman if she did not commit fellatio on him. This assault was followed six to eight weeks later by an abortive attack on a woman that ended when she was cut by his knife. He had had no previous criminal record.

TABLE 1—Summary of test results.<sup>a</sup>

Test	Normal Group Mean Values ± 1 SD	Schizophrenic Group Mean Values ± 1 SD					
		Case 1	Case 2	Case 3	Case 4	Case 5	Case 6
Historical summary	...	36-year-old rapist	21-year-old rapist	30-year-old pedophilic	24-year-old pedophilic with known head injury	21-year-old rapist, extensive criminal history	33-year-old pedophilic long history inappropriate sexual behavior negative
Results LNNB	...	negative	negative	positive	positive	positive	
Mean cerebral gray matter blood flow							
Left	88.4 ± 16.5	87.7	86.4	77.5	79.1	82.4	74.2
Right	88.1 ± 14.8	84.8	87.9	79.2	72.1	89.9	85.4
Mean cerebral hemispheric density							
Left, Level A	40.0 ± 3.1	38.0	40.5	38.7	35.7	36.7	38.3
Left, Level B	42.5 ± 3.0	42.1	44.4	43.0	39.8	37.9	38.5
Left, Level C	45.6 ± 3.3	44.1	49.3	45.5	42.7	39.9	41.6
Right, Level A	38.3 ± 3.8	38.0	39.3	38.4	36.6	34.8	37.3
Right, Level B	41.3 ± 2.9	41.9	43.6	42.4	39.7	38.3	38.1
Right, Level C	43.9 ± 3.5	44.5	47.8	44.8	43.4	39.3	41.5

<sup>a</sup>SD = standard deviation and LNNB = Luria-Nebraska Neuropsychological Battery.

The patient was the fifth of six children and grew up under some stress. His father, a farmer who encountered financial difficulty, committed suicide when the patient was ten. The nature of his father's death was unknown to the patient until much later. His mother took a job to help support the family and left the care of the children to their maternal grandmother. An average student, the patient graduated from high school and worked at a variety of jobs including work on the family farm before becoming the proprietor of a small retail store in 1975, continuing to work on the farm parttime. The store failed financially after a short time. He then held blue-collar jobs until his arrest.

The patient denied any sexual experience, including masturbation, prior to his marriage at age 23 to a 19-year-old woman. His wife described their relationship as having been generally good. The patient reported that he and his wife had had intercourse three or four times per week until his business failed. Since then, frequency of intercourse had dropped to two or three occasions per month. The patient noted a lack of satisfaction in his sexual relationship with his wife and attributed part of the problem to the "interference" of the couple's six-year-old son.

The patient began to perceive himself as a failure following his bankruptcy. This was compounded when, after the death in 1978 of his older brother, who had managed the family farm, he was completely excluded from any financial role in the farm because of fears of his incompetence. His sense of inadequacy began to interfere with his personal relationships. About one year before his arrest he began to masturbate while reading stories of sexual crimes in a "detective" magazine. This activity became the patient's favored sexual outlet. The incident that led to his arrest was inspired by one of those stories.

The pattern of test results gave the following information. The Luria-Nebraska Neuropsychological Battery revealed intellectual functioning to be in the average range. Although some of the scale scores were more elevated than the rest, none were elevated sufficiently to raise suspicion of organic brain damage. Regional cerebral blood flow values were not noticeably different from previously established control values. The CT density analysis showed variance from control values in only one of six regions studied, the left hemisphere mean for the lowest level.

## Case 2

The patient was a 21-year-old white laborer who was committed as a mentally disordered sex offender following an incident that occurred in the apartment building where he was employed as a maintenance man. While wandering through the building, "looking for light bulbs to replace," he noticed a woman who was in the doorway of her apartment. He forced his way into her apartment, planning to rob her. He grabbed her from behind, claspings his hand over her mouth when she began to scream. He became sexually excited, dragged her into her bedroom, and raped her. He left after searching the apartment for her purse and was arrested when he later returned to his own apartment.

The patient was the second of two children whose parents became divorced when he was two years old. He remained with his father and a succession of stepmothers until age 16. The patient described a chaotic developmental period during which he claimed to have undergone physical and psychological abuse at the hands of his father. He reported having attempted suicide on several occasions. His first attempt was at age 8 when he ingested floor wax. He has since drunk bleach, slashed his wrists, hung himself, and taken fourteen 100-mg Thorazine® tablets. The patient had been a frequent user of ethanol and marijuana.

The patient completed the eleventh grade and later obtained a General Education Development certificate. At age 16 he ran away to California where he spent some time in foster homes and institutions. He then traveled to Washington State, where he stayed for 14 months after being found guilty of trespassing and assaulting an officer. After being released to attend a community college, he assaulted a roommate who had accused him of damaging some

of his belongings. He was then told to leave the campus, which he did. He worked at a variety of jobs for a few months until he heard of high-paying jobs in Omaha. Although he never found the jobs he sought, he began work as an apartment maintenance man. Dissatisfied, he was looking for money to return to California when the incident leading to his arrest occurred.

His first sexual experience took place when he was 15 and involved seduction by a 21-year-old who became pregnant and miscarried. Although he has had other girlfriends, none of his relationships has lasted beyond a couple of weeks. He described difficulty in developing relationships with females and was fearful of approaching them, though he stated that they would often approach him.

The test results were as follows. The Luria-Nebraska Battery revealed superior performance intellectually and indicated no performance deficits in any of the item scales. Regional cerebral blood flow and CT density analysis profiles showed little difference from previously established control values.

### Case 3

A 30-year-old white common laborer was found to be a mentally disordered sex offender following an episode in which he took the three-year-old daughter of a woman with whom he was living into a bedroom and unsuccessfully attempted intercourse. He had previously been arrested for the sexual assault of a two-year-old nephew, but charges had been dropped for lack of evidence.

The patient is the third oldest of eleven children born to parents of poor socioeconomic standing. His mother recalled nothing unusual about the patient's prenatal or postnatal development though her recollection might be questioned. The patient himself described a tumultuous childhood filled with parental abuse and neglect. The children were removed from the home by local authorities on two occasions for neglect. On the second, the patient's father was implicated in an incestuous relationship with the patient's sister who was 21 at the time. By the patient's account, all five of the sister's children had been conceived in these incestuous relations.

The patient completed only the first grade in school and had remained functionally illiterate. He spent much of his late childhood and adolescence as a member of a violent gang. His involvement with street drugs had been extensive and he reported heavy use of alcohol, amphetamines, barbiturates, and marijuana.

The patient gave a history of sexual activity with from 15 to 20 females ranging in age from 3½ to 16 as well as 20 to 25 child and adult males. He had never formally married but had cohabited with two females on two separate occasions. He continued to prefer sexual encounters with young boys and girls. During evaluation, he appeared unable to understand his inability to complete intromission with the young girl he had been convicted of assaulting. His sexual knowledge was noted to be limited. He stated that the differences between men and women were confined to "boys gotta peter, and no tits." He felt that he had been unable to have sex with many girls not because of physical limitations but because of their being "the wrong girls and not really wanting sex." He remained unable to understand his inability to have intercourse with a three-year-old and her distress resulting from the assault.

The Luria-Nebraska Battery revealed borderline intellectual performance overall. He showed impairment in all areas except tasks involving simple tactile sensation. His greatest deficits involved language functions, especially those related to mathematics. He also showed a severe deficit in perception of musical and rhythmic information. He showed fine motor impairment, visual perceptual impairment, and memory deficits, particularly verbal memory. Localization scales indicated a diffuse pattern of deficits with some localization to the left and right frontal lobes. Regional cerebral blood flow was much lower than that usually observed in normal individuals, with blood flow slightly more decreased on the left. Density

analysis of the patient's CT scan demonstrated only one of six hemispheric mean values to be notably less than normal values.

#### Case 4

A 24-year-old white unmarried man was found to be a mentally disordered sex offender after an incident in which he induced a six-year-old girl to perform fellatio. He had met the young girl while bicycling around the neighborhood. She later came unbidden to his apartment, just as he was leaving the shower. He answered the door in his bathrobe and asked her to wait in the living room while he dressed. She walked into the bedroom as he was dressing, and he reported being seized by an impulse to ejaculate in her mouth. Afterward, feeling ashamed, he reported asking her forgiveness, but he made no attempt to prevent her from reporting the incident.

The patient was the youngest of two children and according to his parents had developed normally. His behavior changed following a severe head injury resulting from an auto accident when the patient was 15. Following the injury the patient remained unconscious for two months. As he recovered, early deficits included impaired speech production, impaired recent memory, loss of visual acuity in the left eye, and epileptic seizures. More persistent deficits after further recovery included "scanning" speech (especially notable with stress), impairment of motor coordination, absence of central vision in the left eye, and impulsiveness (a quality noted by the patient and his parents).

Following a period of recovery, he returned to high school, which he completed as an average student. He was unable to participate in any team sports because of his difficulties with coordination. He did not obtain a driver's license until two years after his peers had done so. He worked on the family farm until age 22 and then held factory jobs although his poor coordination affected his performance.

Six years prior to the incident that led to his arrest (when the patient was 17), he had been evaluated under court order following an episode of child molestation. He had forced a 10-year-old boy whom he had encountered in a store restroom to perform fellatio on him. At the time both the parents of the child and of the patient were within the store. Evaluation at that time revealed that since his injury, the patient had had difficulty with impulsivity and temper outbursts. He related poorly to members of the opposite sex. He would approach girls bluntly asking if they "wanted to give me a piece." On occasion he had nearly forced himself upon girls.

At the time of this evaluation he described himself as shy around girls. Although he did experience sexual desire, he had great difficulty in establishing any satisfying personal relationships.

The Luria-Nebraska Battery revealed severe impairment in items related to motor coordination and the perception of rhythmic and auditory patterns. Moderate impairment was noted in the areas of visual perception, expressive speech, memory, intellectual function, visual-motor coordination, abstract reasoning, and judgement. Localization scales placed major deficits in the right parieto-occipital, right frontal, left sensorimotor, and right temporal regions in decreasing order of severity. Overall the right hemisphere fared worse than the left. Regional cerebral blood flow studies demonstrated decreased blood flow to both cerebral hemispheres with the right hemisphere flow more depressed than the left when compared with normal values. Five of six hemispheric mean density measures were less than normal values, and these also were less than values for chronic schizophrenics previously shown to be abnormally low.

#### Case 5

A 21-year-old single white laborer was convicted of first-degree sexual assault for the second time before evaluation. He attributed the event that led to his arrest to a male voice that told him to go on a "spree." He had only heard these voices after he had been off drugs.

His parents had been divorced when he was five. At the time his mother had been drinking a great deal and had several boyfriends. The patient continued to live with his father until age nine. The patient was returned to his mother at that age because of his frequent involvement with the law. He stated that he was beaten frequently by his father and blamed his criminal activity on the beatings. In his ninth year, he was involved in 15 to 20 burglaries. At age 12 he derailed a train by pulling a switch as the train passed over it. Between the ages of 13 and 14 he was involved in purse snatching. By 15 he had become involved in heavy burglary. From age 14 he had been a heavy user of street drugs including marijuana, "speed," "downers," "acid," cocaine, mescaline, and, occasionally, heroin. His favorite was lysergic acid diethylamide (LSD).

The patient completed the eighth grade, repeating the second grade in special education. His primary occupation since age 14 and before incarceration had been drug selling, which allowed him to support his own habit and net \$2000 per week. His only legal employment was at a beef-packing plant after parole from his first sexual assault sentence.

The patient had never been married but at the time of his arrest he had been living with a girlfriend who was pregnant. Both he and the girlfriend expressed a desire to marry should he be released. He had little insight into the harmful effects of rape on a woman, expressed no remorse, and offered that if opportunity was present he would commit sexual assault and take any or all varieties of street drugs.

The results from the studies performed were as follows. Although no marked elevations of any scales of the Luria-Nebraska Battery were noted, more variation between the scales was observed than is seen in normal individuals, suggesting the possibility of brain damage. The greatest elevations were in rhythmic perception and writing. The localization scale showed the greatest deficit to be in the right temporal lobe. Regional cerebral blood flow studies revealed no notable differences between the patient's left and right values and those of normal individuals; however, there was a large left-right difference between the patient's own flow values, which is not the normal case. All six of the patient's mean hemispheric CT density measures were notably less than normal values as well as values for chronic schizophrenics.

### Case 6

A 33-year-old white radio program director was committed as a mentally disordered sex offender following sexual assault on a child. His 11-year-old stepdaughter reported that he had awakened her, removed her underpants, licked her groin, rubbed her vulva and breasts, exposed his penis, and asked her to masturbate him, which she did.

The patient was born the oldest of five children. His father was reportedly an alcoholic who would frequently beat the patient's mother. The patient's mother was a heavy drinker as well and would frequently beat her children. The patient harbored much resentment toward his parents, particularly his mother who frequently told him he was a "bad person." He completed high school with a "B" average and followed this with one or two semesters in a Protestant seminary. Following that and continuing until his arrest he had worked for a variety of small radio stations as an announcer and program director.

The patient gave a long history of inappropriate sexual behavior. His first sexual experience took place when he was 11 and involved fondling his sisters (ages 8 and 3). When his mother learned of this she beat the patient severely. At age 13, he and a friend became sexually involved with two young girls they had met in a movie theater. From that time onward he would sit behind attractive young girls in movie theaters in order to attempt fondling their breasts. Again at 13, he was accused of molesting an 8-year-old girl and was again severely beaten by his mother. At 14, when his father disappeared, he was placed in a children's home, where he had sexual relations with a girl resident. When he was 18 and in the military he went to a movie theater, sat behind a 13-year-old girl, and reached forward to fondle her breasts. This episode led to his early discharge, as the girl's father was the base commanding

officer. He met and fondled his first wife in a theater. They continued sexual relations for two years before they married.

He subsequently had married two more times. All three of his marriages had been marked by poor communication and his frequent infidelities. He had felt considerable guilt regarding his promiscuity. Prior to the incident which led to arrest he had grown close to the child involved. She apparently had been fond of him as he was the most stable father figure she had had. He had been in the habit of allowing her to sit on his lap, which aroused him. This arousal did not strike him as wrong in any way.

This behavior stood in contrast to the patient's strong affiliation with a fundamentalist church. He could see no problem with his behavior in light of his religion and became frustrated when others pointed to possible inconsistencies.

The evaluation revealed the following. No significant abnormalities were made apparent by the Luria-Nebraska Battery. His right hemispheric cerebral blood flow was not notably different from normal values. Mean left hemispheric values for the patient were depressed. Five of six mean hemispheric CT density measurements gave less than normal values. Four of these five were lower than average values for chronic schizophrenics.

## Discussion

These case studies demonstrate that at least some sexual offenders classified legally as mentally disordered can be shown by several types of measurements to have abnormal brain structure and function. Two of the six patients were definitely abnormal with respect to all of the three measures employed. Two more were abnormal with respect to two of the three test measures. The remaining two individuals showed essentially no evidence of cerebral abnormality with the measures employed in this study. Interestingly, the two individuals [Cases 1 and 2] in whom our test measures revealed no apparent abnormality appeared to have fewer unusual features to their clinical histories than did those individuals in whom abnormalities were discovered.

Those individuals who did have abnormal test results [Cases 3, 4, 5, and 6] tended to be engaged in more primitive forms of sexual behavior. Three of the four cases involved child molestation. All four individuals tended to lack impulse control with regard to their sexual behavior. Damage in three of the four individuals (as measured by the Luria-Nebraska Neuropsychological Battery) was predominantly localized to the frontal and temporal lobes.

The results of these case studies tend to support the idea that certain forms of sexual deviation result from dysfunction in the inhibitory systems controlling sexual behavior. As noted earlier, frontal and temporal lobe deficits tend to result in disinhibitory syndromes. Unfortunately, our sample size is not sufficiently large to allow meaningful statistical analysis. Also our case definition criteria may be too broad. However, these case-report data are suggestive and encourage further study of the incidence of cerebral disorder in the sex offender population.

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