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Neuropsychological profile of pedophilic child sexual offenders compared with an IQ-matched non-offender sample – Results of a pilot study

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ABSTRACT

Child sexual offenders have been found to have a lower average IQ than the general population. Several studies indicate that they also exhibit executive dysfunction, but the specificity of this dysfunction is unclear; the inconclusive results have been attributed to methodological problems and the heterogeneity of the population. Our study aimed to describe the neuropsychological profiles of convicted child sexual offenders with pedophilia (n = 15). To control for IQ-related effects on neuropsychological performance, we compared the sample with an IQ-matched control group (n = 15). Test scores in both groups were significantly lower than the norms, but we did not find significant differences between the two study groups. The findings of our pilot study indicate that the neuropsychological deficits of pedophilic sexual offenders are unspecific rather than the result of a pedophilia-specific brain dysfunction.

1. Introduction

1.1. Pedophilia and sexual offending

Pedophilia is considered to be a relevant factor on the pathway to child sexual offending. The point prevalence of pedophilia is estimated to range from 0.3% to 3.8% (Ahlers et al., 2011; Alanko, Salo, Mokros, & Santtila, 2013). According to ICD-10 (WHO, 1992), pedophilia is characterized by a sexual preference for children (boys or girls or both), usually of prepubertal or early pubertal age. The DSM-5 (APA, 2013), however, no longer classifies pedophilia as a mental disorder but instead defines pedophilic disorder, in which either the sexual urges must cause marked distress or interpersonal difficulty in the individual or the individual must have acted on these sexual urges. Depending on the sample characteristics and diagnostic criteria, between 30% and 70% of all convicted child sexual offenders are diagnosed with pedophilia (Kingston, Firestone, Moulden, & Bradford, 2007; Maletzky & Steinhauser, 2002; Seto & Lalumière, 2001; Wilson, Abracen, Looman, Picheca, & Ferguson, 2011).

1.2. Etiology

Hitherto, hypotheses on the etiology of pedophilia have been multifactorial and complex. They comprise findings of genetic influences (Alanko et al., 2013; Gaffney, Lurie, & Berlin, 1984); psychological theories of pedophilia as a disorder of impulse control (Cohen et al., 2002; Kafka, 1995), a result of classical and operant conditioning (e.g., learning mechanisms after a history of sexual abuse in childhood, Freund & Kuban, 1994; Freund, Watson, & Dickey, 1990), or an attachment disorder (Beech & Mitchell, 2005); and models of disturbed neurodevelopment (Cantor et al., 2004; Joyal, Beaulieu-Plante, & de Chantérac, 2014).

Neurobiological research based on case studies and structural and functional brain imaging has aimed to identify specific brain regions that relate to either inhibition dysfunction or disturbed processing of sexual arousal. Results indicate a potential role of the frontal or temporal lobe or a combination of the two, with frontal lobe pathology being responsible for offending and temporal lobe pathology accounting for sexual preoccupation with children (for a review, see Tenbergen et al., 2015). Nevertheless, according to a recent review the existing data do not allow any clear conclusions to be drawn on the etiology of pedophilia (Mohnke et al., 2014). Furthermore, different neurological factors might play different roles in offender subtypes (Cantor, Blanchard, Robichaud, & Christensen, 2005; Joyal et al., 2014).

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1.3. Neuropsychology

Neuropsychological studies, which are closely linked with studies on pedophilia-specific brain pathology, have focused on identifying profiles of (dys-)function in pedophilia. Early studies found no significant differences in IQ or neuropsychology between juvenile child sexual offenders and controls (Tarter, Hegedus, Alterman, & Katz-Garris, 1983) and no neuropsychological differences between adult sexual and non-sexual violent offenders after accounting for age and education (Abracen, O'carroll, & Ladha, 1991). A comparison of a forensic inpatient offender group with a non–sex-offender group also found no significant neuropsychological differences (Gillespie & McKenzie, 2000). The results of a meta-analysis showed that child sexual offenders seem to have a significantly lower IQ than people who have offended against adults; furthermore, the lower the IQ of the offender sample, the younger the victim's age (Cantor et al., 2005). In a sample of sex offenders, Joyal, Black, and Dassylva (2007) found significant executive dysfunctions, especially in verbal fluency, verbal processing, memory, response inhibition, and sustained attention, but no impairments in set shifting, cognitive flexibility, or viso-spatial integration. Suchy et al. compared executive functions of child sexual offenders with and without pedophilia and demography-matched controls and found weaknesses in executive functioning in both offender groups (Suchy, Whittaker, Strassberg, & Eastvold, 2009). A further comparison of executive abilities of pedophilic and non-pedophilic child sexual offenders and non-sexual offenders found no differences in overall executive functioning between the groups but did find distinctive profiles concerning specific domains: (1) child sexual offenders displayed weaker executive function than non-sexual offenders, (2) child sexual offenders performed better on abstract reasoning and worse on inhibition, and (3) pedophilic sexual offenders performed better on planning and overall accuracy than non-pedophilic offenders (Eastvold, Suchy, & Strassberg, 2011). Other studies confirmed the finding of specific deficits in inhibition and information processing in pedophilic offenders (Schiffer & Vonlaufen, 2011; Suchy, Eastvold, Strassberg, & Franchow, 2014). Some studies, however, provided contradictory results: in one study, pedophilic offenders scored lower than controls in verbal fluency but showed normal findings in impulsivity and attention (Cohen et al., 2002). Another study in pedophilic sex offenders also found an overall impairment in nearly all tests, e.g. lower scores on the intelligence scale and weaker performance in information processing, although some of these findings were partly explained by confounding factors, such as education or age (Kruger & Schiffer, 2011).

Several reviews have discussed the methodological weaknesses of past studies: they criticized the lack of control for incarceration status and sexual preference, the use of test batteries that were older or too broad, the failure to consider confounding factors (e.g., demographic characteristics, IQ), and the absence of a comparison with the general population (Joyal et al., 2014; Tenbergen et al., 2015). In their review, Joyal et al. suggested three moderating factors to distinguish subgroups of participants and measures: age of victim, type of neuropsychological assessment, and type of comparison group (Joyal et al., 2014).

A recent study with a comprehensive design compared executive functioning of offending and non-offending pedophiles, non-pedophilic child sexual offenders, and healthy controls (Massau et al., 2017). The study found that both offender groups showed worse response inhibition but that only non-pedophilic offenders also showed disturbances in strategy use; the pedophilic offender group showed the best performance in set shifting. The authors concluded that executive functions relate to offense status rather than pedophilic preference.

2. Current study

In contrast to the more or less inconclusive data on executive function, the finding of a lower IQ in sexual offender groups is relatively stable (Cantor et al., 2005). Therefore, in this study we compared the neuropsychological profiles of a pedophilic offender group with those of a non-offender sample with the same IQ. The aims of the study were (1) to assess response inhibition, attention, and problem solving in convicted pedophilic child sexual offenders, and (2) to compare the results with an IQ-matched sample of non-offending psychiatric patients and the norms for the tests. Our hypotheses were that (1) the subgroup of offenders would show signs of executive dysfunction in the measured domains and (2) the impairments would be significantly greater than those of the control group of non-offenders with the same IQ. The results might contribute to a better understanding of the role of certain neuropsychological functions (impulsivity, inhibition, and cognitive flexibility) in a comprehensive model of child sexual offending, which would have implications for accurate risk assessment procedures and offender treatment.

3. Methods

3.1. Participants

We recruited 15 male forensic inpatients (FIP) from 2 forensic inpatient mental health services, Guenzburg and Kaufbeuren, in Bavaria, Germany. Screening for participants was conducted by the heads of the services via telephone interviews. FIP were included in the study if they had been convicted of a child sexual offense and had sufficient language skills (according to information provided by the care team). For the control group (CG), we recruited 15 men living in 3 assisted living facilities for mentally disordered individuals associated with general mental health care institutions in the same districts of Bavaria. We assessed potential participants in the CG with the IQ test (see “Assessments” below) before recruiting them into the study to ensure that the IQ in the CG matched that in the FIP group (tolerance: ± 5 IQ points). All participants gave informed consent. The study was approved by the ethics committee of Ulm University (No. 411/15).

3.2. Assessments

3.2.1. Sociodemographic and clinical data

Sociodemographic data and diagnoses according to ICD-10 (including the diagnosis of pedophilia) were collected by reviewing the medical records. To confirm the diagnosis, we also assessed sexual deviance with the Multiphasic Sex Inventory (Deegener, 1996). We measured IQ with the computer version of Raven's Standard Progressive Matrices (SPM, Horn, 2009); education-specific norms are available for SPM (standard population: N = 1700; age 12–30 years), and retest reliability (after 60 days) shows a high stability of the total score (r = 0.83).

3.2.2. Neuropsychology

The neuropsychological assessment included the subtests Go/NoGo, Alertness, and Divided Attention from the Test of Attentional Performance (TAP, Zimmermann & Fimm, 2009) and the German version of the Tower of London test (TL-D, Tucha & Lange, 2004).

The TAP subtest Go/NoGo measures the ability to respond appropriately under time pressure while controlling an inappropriate behavioral impulse. For this purpose, an upright (“+”) and a horizontal cross (“x”) are presented in a random sequence on a screen. When a horizontal cross appears, participants have to react as quickly as possible by pressing a key, but they should not react when an upright cross appears. We recorded and analyzed the median reaction times (Rt-median), incorrect reactions (errors), and missed reactions (omissions, i.e., when the key should have been pressed but was not).

The TAP subtest Alertness assesses the short-term focus of attention on an expected event (i.e., phasic arousal). For this purpose, the reaction time is examined under two conditions: one is a simple reaction time measurement in which a cross (the critical stimulus) appears on

the screen at random intervals and the participant should respond as quickly as possible by pressing a key, and the other is a complex reaction time measurement in which the critical stimulus is preceded by a warning tone. We evaluated phasic alertness, i.e., the difference between the median reaction times with and without a warning tone in relation to the median of the total reaction time [$(Rt_{without} - Rt_{with})/Rt_{total}$].

The TAP subtest Divided Attention measures the ability to keep track of multiple things at the same time. Therefore, participants work on a visual and an auditory task in parallel. In the visual task, when four crosses form a particular pattern in a square field of 4 × 4 points participants press a key as fast as possible. In the auditory task, participants press a key when, instead of an alternating high- and low-pitched sound, a high- or low-pitched sound is played twice in a row. We analyzed wrong reactions (errors) and missed reactions (omissions).

The TAP provides age-, gender-, and education-specific norms (Go/NoGo: n = 439, age 19–90 years; Alertness: n = 604, age 19–89 years; Divided Attention: n = 808, age 19–90 years). Retest reliabilities after a mean of 25 days vary considerably, depending on the variable (Go/NoGo: Rt-median: r = 0.56; errors: r = 0.73, omissions: r = −0.09; Alertness: Phasic alertness: r = 0.81; Divided Attention: errors: r = 0.64, omissions: r = 0.44).

The TL-D detects disorders of problem solving. In this task, a wooden plate with three vertical bars is placed on the table in front of the participant. The bars are of different lengths and have space for one, two, or three balls. The aim of the task is to move the balls from an initial arrangement to a target arrangement in as few moves as possible. We analyzed the total number of solved problems. The test provides age- and education-specific norms (n = 1.263, age 18–80 years), and the retest reliability after 21 days is r = 0.85.

3.3. Statistical analyses

For descriptive variables, we determined means and standard deviations for metric data and absolute and relative frequencies for categorical data. We analyzed group differences between the FIP and CG for categorical variables with the Chi-square test or with Fisher's exact-test (if more than 20% of the cells contain frequencies less than 5) and for metric variables with a *t*-test for independent samples or Mann-Whitney *U* test (if the assumption of a normal distribution is not given.).

Group differences in the various executive function tests were analyzed with a *t*-test for independent samples or a Mann-Whitney *U* test. To check whether the executive capacities of the examined participants were above or below the mean value of the standard sample, we performed one-sample *t*-tests (test score: *T* = 50). Statistical analyses were performed with SPSS for Windows (IBM SPSS Statistics 23).

4. Results

4.1. Sample characteristics

All individuals in the FIP group were convicted of child sexual offending and detained under Section 63 (n = 14, 93.3%) or Section 64 (n = 1, 6.7%) of the German Criminal Code. The mean duration of detention was 107.47 months (SD = 88.78), and the mean rate of prior convictions was 5.2 (SD = 5.99). Prior offenses included adult sexual offending (n = 4, 26.6%) and violent offending (n = 4, 26.6%). The individuals in the CG (n = 15, 100%) had no history of offending. The two groups did not significantly differ in age, education, vocational training, marital status, IQ, or, besides the diagnosis of pedophilia, other psychiatric diagnoses according to ICD-10 (see Table 1).

Both groups had a mean IQ score significantly below that of the general population (one-sample *t*-test FIP: $t(14) = -8.944$; $p < .001$; one sample *t*-test CG: $t(14) = -10.987$; $p < .001$).

Table 1
Sample characteristics of a group of forensic inpatients convicted of a child sexual offense (FIP, n = 15) and a control group (CG, n = 15).

	FIP	CG	FIP versus CG
	M (*SD*)	*M* (*SD*)	
Age (years)	50.5 (11.4)	48.1 (11.0)	$t(28) = -0.601$, p = .553
IQ	78.9 (9.1)	77.1 (8.1)	$t(28) = -0.593$, p = .558
	n (%)	n (%)	
Education			
No graduation	10 (67%)	4 (27%)	Fisher's exact test = 5.893, p = .150
School to end of Grade 9	5 (33%)	9 (60%)	
School to end of Grade 10	0 (0%)	1 (7%)	
School to pre-university level	0 (0%)	1 (7%)	
Vocational training			
Completed	10 (67%)	7 (47%)	$Chi^2(1) = 1.222$, p = .269
None	5 (33%)	8 (53%)	
Marital status			
Single	9 (60%)	11 (73%)	Fisher's exact test = 2.131, p = .833
Married	1 (7%)	0 (0%)	
Divorced	4 (27%)	4 (27%)	
Widowed	1 (7%)	0 (0%)	
Comorbidity (FIP)/ Diagnosis (CG)			
Schizophrenia	1 (7%)	5 (33%)	Fisher's exact test = 7.972, p = .137
Affective disorders	0 (0%)	2 (13%)	
Organic personality disorder	4 (27%)	1 (7%)	
Alcohol use disorder	1 (7%)	2 (13%)	
Mental retardation	4 (27%)	1 (7%)	
No comorbidity/ diagnosis	5 (33%)	4 (27%)	

4.2. Executive function

As can be seen in Table 2, we found no significant differences in the neuropsychological profiles of the two groups. In all four tests, the FIP achieved similar results to the CG. Both groups had lower scores than the norms (for a description, see the Methods section) in the following tests: Go/NoGo errors and omissions, Alertness/phasic alertness, and Divided Attention errors and omissions. In both groups, the median response time in the Go/NoGo test and the total number of problems solved in the Tower of London test did not differ from the standard population. The FIP showed a higher rate of errors in the Go/NoGo test, indicating speed-accuracy trade-offs, i.e., the participants reacted just as fast as the standard population, but their high speed resulted in more mistakes.

5. Discussion

On the background of existing data on the neuropsychology of pedophilic sexual offenders, our study aimed to assess specific neuropsychological functions in a child sexual offender sample with diagnosed pedophilia. Because previous research indicated that this population may have impairments in executive functioning, in this pilot study we measured response inhibition, attention, and problem-solving skills and compared the results with those of an IQ-matched non-offender group. We were especially interested in controlling for IQ because it is a stable finding that sex offenders score lower on measures of intelligence (Cantor et al., 2005). With this design, we intended to avoid some of the methodological weaknesses of previous studies. To our knowledge, this approach has not been used before.

Descriptive analysis found no significant group differences in sociodemographic data or in the frequency or type of mental disorders (except for the diagnosis of pedophilia). Therefore, the two study

Table 2
Results of executive functioning tests in a group of forensic inpatients convicted of a child sexual offense (FIP, n = 15) and a control group (CG, n = 15).

	FIP	CG	FIP vs. CG	FIP vs. standard population	CG vs. standard population
	M (*SD*)	*M* (*SD*)			
Go/NoGo					
Reaction time median (ms)	408.87 (50.98)	462.40 (107.31)	Z = −1.307, p = .191		
Reaction time median (T values)	51.00 (7.84)	45.87 (12.73)	t(24) = −1.317, p = .201	t(13) = 0.477, p = .641	t(14) = −1.258, p = .229
Errors	3.87 (3.94)	3.27 (3.15)	Z = −0.397, p = .691		
Errors (T values)	42.50 (9.44)	43.07 (9.99)	t(27) = 0.157, p = .877	t(13) = −2.974, p = .011	t(14) = −2.688, p = .018
Omissions	0.60 (1.35)	1.47 (2.85)	Z = −0.892, p = .373		
Omissions (T values)	38.14 (4.24)	35.80 (6.01)	t(27) = −1.204, p = .239	t(13) = −10.463, p < .001	t(14) = −9.144, p < .001
Alertness					
Phasic alertness	0.01 (0.08)	−0.05 (0.15)	Z = −1.016, p = .310		
Phasic alertness (T values)	45.00 (6.69)	42.27 (9.61)	t(27) = −0.883, p = .385	t(13) = −2.796, p = .015	t(14) = −3.117, p = .008
Divided Attention					
Errors	13.27 (16.35)	8.53 (14.09)	Z = −1.001, p = .317		
Errors (T value)	34.92 (8.37)	37.53 (9.76)	t(26) = 0.753, p = .458	t(12) = −6.494, p < .001	t(14) = −4.947, p < .001
Omissions	5.27 (3.49)	8.40 (9.23)	Z = −0.418, p = .676		
Omissions (T value)	37.57 (9.47)	37.27 (15.89)	t(23) = −0.063, p = .950	t(13) = −4.911, p < .001	t(14) = −3.104, p = .008
Tower of London					
Solved problems	15.14 (2.28)	13.93 (2.49)	Z = −1.278, p = .201		
Solved problems (T values)	50.00 (11.24)	43.68 (11.43)	t(27) = −1.500, p = .145	t(13) = 0.000, p = 1.000	t(13) = 2.142, p = .050

groups were considered to be homogenous regarding a number of common confounding factors, e.g. age and education.

Our findings confirmed our first hypothesis that the FIP group would show deficits in all applied tests, i.e. in inhibition, attention, and problem-solving skills. This is in line with prior studies that described impaired executive functioning in child sexual offenders. In particular, diminished response inhibition ability is one of the most common findings in child sexual offenders (Eastvold et al., 2011; Massau et al., 2017; Schiffer & Vonlaufen, 2011). In addition to the overall weaker performance in the Go/NoGo test, the results of the FIP group in our study indicated problems of speed accuracy, i.e., the participants reacted just as fast as the standard population, but their high speed resulted in more mistakes.

The finding that the FIP group did not significantly differ from the CG in any of the tests was surprising and in contrast to our second hypothesis. Although this finding has to be interpreted with caution, one possible interpretation is that the observed impairments in executive functioning in pedophilic sex offenders indicate an unspecific brain dysfunction rather than a distinctive neuropsychological profile of pedophilia. If so, it would be of utmost importance to carefully consider the characteristics of the controls in future research.

Our results indicate that future studies may have to evaluate the role of executive functions in sexual offending. Studies on child sexual offenders focus on those who have been convicted, which could lead to a bias insofar as weaker executive functioning might increase the risk of being caught rather than the risk of offending. One of the most recent studies attempted to overcome this problem by including pedophilic men with and without a history of offending (Massau et al., 2017). Nevertheless, the issue of unreported and undetected criminal behavior remains unsolved.

To clarify the inconclusive results of past studies, future research might also consider the type of offense and the modus operandi of the offenders because different neuropsychological profiles might be related not only to different types of offenders (Cantor et al., 2005) but also to different ways of offending. For example, grooming behavior involves much more planning than an impulsive offense. Furthermore, situational external factors, such as access to children, could be taken into consideration as well.

This pilot study has several limitations. First, the sample size was small. Second, we assessed a selected population of offenders: the majority were detained under Section 63 of the German Criminal Code, which implies diminished criminal responsibility because of severe mental illness. More than half of the participants in both groups had a diagnosis of an organic brain syndrome (including mental retardation); these conditions may have a “ceiling-effect,” in that the more severe neuropsychological dysfunction of the participants masks potential specific effects of pedophilia. Third, we did not compare the two groups with a pedophilic non-offender group because of the expected difficulties in finding a sample of pedophilic individuals outside detention or correctional settings.

In conclusion, further research on larger samples is needed to improve the understanding of the neuropsychological mechanisms of child sexual offending. When selecting the study sample, the diagnosis and prior offending of the study group seem to be as important as the diligent selection and characterization of the control group. In addition to neuropsychological findings, it might be useful to consider the role of external factors, such as the subtype of child sexual offending and the modus operandi (homosexual vs. heterosexual, incest vs. other victim).

Conflicts of interest

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