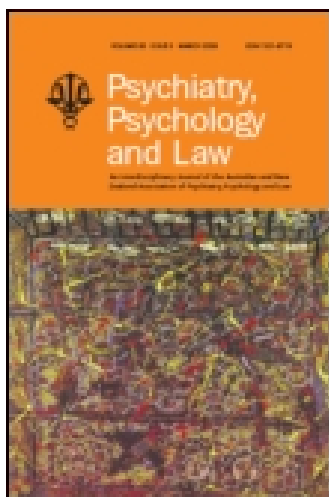


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Neurocognitive Functioning and Subtypes of Child Molesters: Poorer Working Memory Differentiates Incestuous from Non-Incestuous Offenders

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Neurocognitive Functioning and Subtypes of Child Molesters: Poorer Working Memory Differentiates Incestuous from Non-Incestuous Offenders

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Studies of neurocognitive functioning suggest that child molesters can be differentiated into offender types based on frontal neurocognitive (executive) functioning. The aim of this study was to examine performance on cognitive tests that assess processing speed, cognitive flexibility, executive control and working memory in two samples of child molesters (incestuous and non-incestuous) compared with an age- and education-matched control group of non-offenders. These groups were matched for clinical, sociodemographic and criminological characteristics. Our results suggest that cognitive measures of executive functioning (i.e., processing speed, cognitive flexibility and executive control) differentiate child molesters from non-offender participants, and that working memory performance in incestuous child molesters differentiates this group from non-incestuous offenders and control participants. These findings suggest specific components of impaired cognitive performance in incestuous child molesters relative to extra-familial offenders and non-offender control participants. Poorer working memory in incestuous child molesters may help differentiate this group from other child molester types.

Key words: child molesters; executive dysfunction; forensic psychology; incestuous offenders; neuropsychology; offenders profiling; working memory.

Recent studies of neurocognitive functioning in child molesters find dysfunction in cognitive performance associated with executive functions (particularly cognitive flexibility, executive control and processing speed) in sex offenders relative to control groups of non-sexual offenders and healthy controls (Eastvold, Suchy, & Strassberg, 2011; Kruger & Schiffer, 2011; Schiffer & Vonlaufen, 2011; Suchy, Whittaker, Strassberg, & Eastvold, 2009). These studies suggest that the differentiation of child molesters into subtypes is possible; paedophilic child molesters have slower information-processing speed,

whereas non-paedophilic (i.e., criminally opportunistic) child molesters have poorer performance on cognitive flexibility and verbal memory tasks (Eastvold *et al.*, 2011; Kruger & Schiffer, 2011; Schiffer & Vonlaufen, 2011; Suchy *et al.*, 2009). Homo- and heterosexual paedophiles do not differ in their executive functioning impairments (Kruger & Schiffer, 2011).

These investigations highlight the need for research examining other possible child molester subtypes (Eastvold *et al.*, 2011; Kruger & Schiffer, 2011; Schiffer & Vonlaufen, 2011; Suchy *et al.*, 2009). One of

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the less studied child molester populations is incestuous offenders. Although these offenders have been studied using different psychological measures (personality, psychopathology, childhood abuse history and sexual functioning; Firestone, Dixon, Nunes, & Bradford, 2005; Marshall, Laws, & Barbaree, 1990), few studies have used neuropsychological tests for characterizing this group of sex offenders (Langevin, Wortzman, Dickey, Wright, & Handy, 1988). In this study (Langevin *et al.*, 1988), 3 in 10 incestuous offenders were found to show impaired performance in the Halstead-Reitan battery, suggesting that neuropsychological study of these sex offenders may be useful clinically.

The aim of the current study was to compare the neurocognitive measures of executive functioning in incestuous and non-incestuous child molesters to a control group of non-offenders. Our investigation improves previous psychological investigations in this field by including different child molesters groups (Firestone *et al.*, 2005; Langevin *et al.*, 1988) and a control group of non-offenders from the general population (Eastvold *et al.*, 2011; Firestone *et al.*, 2005; Marshall *et al.*, 1990).

Methods

Participants

The total sample comprised 60 men (age range 25–70 years; mean age 46.85, *SD* = 9.41) divided into intra- and extra-familial sex offender groups, and in a non-offenders control group from the general population. All were volunteers who participated anonymously for this study, and all spoke Spanish as their native language.

The sex offender sample comprised 32 currently incarcerated male adult prisoners, all convicted of hands-on “contact” sexual offences against children. All were currently held in closed Spanish prisons. In this study, a contact offence was defined as any fondling of the genitals or breasts over or under clothing, as well as skin-to-skin contact (hand-to-

genital, genital-to-genital, mouth-to-genital, genital-to-anus acts; Becerra-García, García-León, Muela-Martínez, & Egan, 2013; Bourke & Hernández, 2009). These participants were categorized by victim type into two groups: incestuous (intra-familial) and non-incestuous (extra-familial) groups. The incestuous group comprised 21 participants who had committed contact sexual offences against family members (i.e., a biological child, stepchild, nephew, niece, grandchild or sibling) when the victim was aged 16 years or younger. The non-incestuous group comprised 11 participants (all convicted of contact sexual offences against non-family members who were aged 16 years or younger). Finally, the non-offenders control group comprised 28 non-convicted men from the general population who were invited to participate in this study.

Exclusion criteria

We excluded participants with diagnosed psychiatric pathologies (i.e. neurological disorders, psychosis, bipolar, disorder, drug dependency requiring treatment history, etc.) that might affect the results in neurocognitive measures (Periáñez *et al.*, 2007). Thus four participants were excluded: two due to a history of traumatic brain injury, one with a diagnosed psychosis, and one diagnosed with learning disability. Additional exclusion criteria for the control group included having been convicted or incarcerated for committing an offence.

Measures

All participants were tested with the following brief neurocognitive measures of executive functioning:

- (1) The Trail Making Test (TMT; Reitan, 1992). The TMT comprises two parts (A and B). Part A consists of encircled numbers from 1 to 25 spread irregularly across a sheet of paper. Part B requires the participant to connect

numbers (1–13) and letters (A–L) in an alternating sequence. The objective is to connect the numbers (or numbers and letters) in correct sequence as quickly as possible. The TMT assesses two different constructs: processing speed (part A) and cognitive flexibility (part B). Because both parts are timed, executive control can be confounded by processing speed. To avoid this possibility, a ratio (B–A), which reflects executive control without the processing speed component, was calculated (Periáñez *et al.*, 2007).

- (2) The Digit Span task of the Wechsler Adult Intelligence Scale-Third Edition (WAIS-III; Wechsler, 2001). The Digit Span test was used for assess short-term (or transient) and executive working memory (Perry *et al.*, 2001). The Digit Span task comprises two parts; Digit Span forward (DF) and Digit Span backward (DB). The DF task required the participant to repeat a series of numbers read aloud by the examiner at the rate of one digit per second; the DB task required the participant to repeat the presented series of numbers in reverse order.

Procedure

Participants were administered the TMT-A, TMT-B, DF and DB tasks in a single session. TMT-A and TMT-B were scored as the total time (in seconds) to complete. For the DF and DB tasks, the number of correctly

recalled number sequences were recorded. Written informed consent was obtained for all persons who participated in the study. Kolmogorov–Smirnov’s test established that all measures were normally distributed, whilst Levene’s test was used to assess the equality of variances (homoscedasticity). Non-offenders and child molesters were compared on the five cognitive measures. All analyses were carried out using Statistical Package for the Social Sciences (SPSS) Statistics 17.0. All statistical tests were two-tailed, with significance levels set at 0.05.

Results

Sociodemographic characteristics

The mean age of incestuous participants was 47.33 years ($SD = 7.92$), 49.09 years ($SD = 13.38$) for non-incestuous sex offender participants, and 45.61 years ($SD = 8.77$) for the control group. In relation to educational level, the mean years of study for incestuous sex offenders, non-incestuous sex offenders and non-offenders participants were 8.57 years ($SD = 1.20$), 9.72 years ($SD = 3.22$) and 10.10 years ($SD = 3.38$), respectively. These groups did not differ by age ($F_{(2, 59)} = 0.57$; $p = 0.56$) or educationally ($F_{(2, 59)} = 1.87$; $p = 0.16$).

Criminological characteristics of child molesters

Table 1 shows the criminological characteristics of each group of child molesters studied.

Table 1. Criminological characteristics of incestuous and non-incestuous sex offenders.

	IG ($n = 21$)	NIG ($n = 11$)
Age of victims ($M \pm SD$)	12.10 \pm 2.79	12.18 \pm 3.09
Pre-pubertal victims (<12 years)	33.3% ($n = 7$)	27.3% ($n = 3$)
Victims aged between 12 and 16 years	66.7% ($n = 14$)	72.7% ($n = 8$)
Number of victims ($M \pm SD$)	1.43 \pm 0.97	3.00 \pm 5.65
Number of previous sex offences ($M \pm SD$)	0.05 \pm 0.21	0.27 \pm 0.64
Number of previous non-sex offences ($M \pm SD$)	0.33 \pm 0.57	0.18 \pm 0.40

Notes: IG, incest group; NIG, non-incest group; M , mean; SD , standard deviation.

The analyses of these variables showed that child molester groups did not differ by age of victim ($t_{(30)} = -0.08$; $p = 0.93$) or proportion of individuals with pre-pubertal victims ($\chi^2 = 0.12$; $p = 0.72$). Likewise, in relation with number of victims, number of previous non-sexual offences and number of previous sex offences, the two groups did not differ (t -tests and p -values respectively: $t_{(30)} = 1.25$; $p = 0.22$; $t_{(30)} = -0.77$; $p = 0.44$, and $t_{(30)} = 1.12$; $p = 0.28$).

Neurocognitive functioning

As the sample was matched in age and educational level, and child molesters also were matched in criminological characteristics, we used one-way analysis of variance (ANOVA) with a between-subjects factor as independent variable (Group) for the performance on the five neurocognitive measures obtained. Table 2 presents a summary of the means (and standard deviations) and comparisons of DF, DB and TMT (direct and derived scores) between non-incestuous sex offenders, incestuous sex offenders and control group. All post-hoc tests were corrected using Bonferroni’s method.

The one-way ANOVA showed significant differences between groups in all measures of executive functioning used (see Table 2). For the TMT, the incestuous and non-incestuous child molesters groups had significantly

higher scores for part A, part B and the ratio of B–A than the non-offenders group ($p < 0.01$ for all differences). There were no significant differences between the two child molester groups for any TMT index of cognitive function.

As can be seen in Table 2, while the two sex offender groups did not differ on DF, the incestuous child molesters had significantly lower scores than control participants ($p < 0.001$; after Bonferroni correction). Lastly, post-hoc tests found that incestuous child molesters group had significantly lower scores than non-incestuous offenders and control groups for DB ($p < 0.001$ for difference between incestuous group and control group, and $p = 0.02$ for difference between the incestuous and non-incestuous groups); however non-incestuous sex offenders did not differ on DB scores compared to the control group.

Discussion

This study suggests that cognitive measures of executive functioning differentiates child molesters from non-offender participants, and also can differentiate between incestuous and non-incestuous child molesters. The finding that both child molester groups performed worse than non-offender participants in all TMT tasks is consistent with the results of previous studies (Eastvold *et al.*, 2011;

Table 2. Comparisons of executive functioning (TMT, DF and DB) among incestuous sex offenders, non-incestuous sex offenders and control group.

Measures	IG ($n = 21$)	NIG ($n = 11$)	CG ($n = 28$)	ANOVA $F_{(2, 59)}$ (p value)
	M (SD)	M (SD)	M (SD)	
TMT-A	56.05 (25.36) ^a	61.18 (27.91) ^a	36.36 (16.10)	7.27 (= 0.002)
TMT-B	155.14 (70.24) ^a	145.09 (68.71) ^a	70.04 (26.66)	17.31 (< 0.001)
TMT B-A	99.09 (49.12) ^a	83.90 (52.91) ^a	33.67 (16.91)	18.92 (< 0.001)
DF	6.48 (1.56) ^a	8.00 (1.73)	9.39 (1.95)	16.02 (< 0.001)
DB	4.05 (1.49) ^{a, b}	5.82 (1.83)	6.46 (1.85)	11.87 (< 0.001)

Notes: CG, control group; IG, incest group; NIG, non-incest group; M , mean; SD , standard deviation; TMT-A, Trail Making Test part A (time in s); TMT-B, Trail Making Test part B (time in s); TMT B-A, Trail Making Test ratio B-A; DB, Digit Span backward; DF, Digit Span forward.
Post-hoc tests significant after Bonferroni correction: ^a vs. control group; ^b vs. non-incest group.

Kruger & Schiffer, 2011; Schiffer & Vonlaufen, 2011; Suchy *et al.*, 2009). These investigations (Eastvold *et al.*, 2011; Kruger & Schiffer, 2011; Schiffer & Vonlaufen, 2011; Suchy *et al.*, 2009) show that child molesters have significant executive functioning deficits, mainly in processing speed (i.e. TMT-A), cognitive flexibility and executive control (i.e. TMT-B and ratio B-A) when they are compared with a non-offending control group. Thus in this study, executive functions assessed by TMT reflect neuropsychological dysfunctions in sex offenders against children compared with non-offenders, but did not differentiate subtypes of child molesters.

Our findings show that the impaired executive functioning that may characterize incestuous child molesters is comprised of deficits in components of working memory. Compared with control groups and non-incestuous child molesters, incestuous sex offenders have a deficit in transient and executive functions of working memory (Perry *et al.*, 2001). The results show that non-incestuous persons performed normally in this test, whereas performance for incestuous molesters was impaired. These results suggest that incestuous sex offenders have difficulties in the temporary storage, retrieval and manipulation of information necessary for complex cognitive tasks (e.g. language comprehension, learning and reasoning) that guide behaviour in motivational and emotional states (Engle, Tuholski, Laughlin, & Conway, 1999; Perry *et al.*, 2001).

Previous studies have shown that incestuous offenders have a deficit in social functioning (Worling, 1995), and also have dysfunctions in mechanisms that regulate parent-child interactions, which may generate conflicts between family member roles and sexual needs (Seto, Lalumière, & Kuban, 1999). Recent studies show the importance of working memory for successful performance on tasks requiring changing demands (Jha & Kiyonaga, 2010), and in similar tasks involving social functioning (Amir & Bomyea, 2011; Castaneda *et al.*, 2011). Given the

importance of working memory in successfully resolving conflict tasks and adapting successfully to social situations, impaired working memory may be an important part of the cognitive process leading to the selection of a family member to victimize. There may be other dysfunctional elements in the executive functioning of incestuous child molesters relative to other kinds of sexual offender. Future studies should include more extensive evaluation of cognitive functioning related to the frontal lobes (i.e. evaluation of action planning, impulsivity and decision-making). It would also be useful to consider other subtypes of incestuous child molesters (i.e. cross-over child molesters with victims of diverse ages, or with different degrees of familial relationship).

Finally, this study is limited by its small sample size; these results must thus be seen as preliminary. New studies should be conducted with larger sample sizes of incestuous and non-incestuous child molesters to confirm these findings; it may be that executive control has a greater effect in a larger sample. A more tightly matched control sample of non-sexual, but incarcerated, offenders serving similar sentence lengths would also greatly enhance the ability to argue our that findings demonstrate a specific neuropsychological basis to incestuous offending. This study was modest due to the lack of time and resources for assessment and sampling, limiting the implications. Better access to the client group and more time for assessment would optimize the results of subsequent studies. Nevertheless, this study potentially shows that working memory is impaired in incestuous child molesters compared with non-incestuous offenders and control participants, whereas other measures of executive functioning remain equally affected in these offenders groups in relation to control group.

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