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ORIGINAL PAPER

Executive dysfunction and domestic violence

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Abstract
Primary objective: To replicate previous studies which have reported a high prevalence of traumatic brain injury (TBI) in partner-abusive men and to extend research in this area by determining the prevalence of executive dysfunctions, which have been linked with both TBI and violent behaviour.
Research design: Thirty-eight men with criminal convictions for violence and who were receiving treatment for abusing their partners were assessed.
Methods and procedures: Subjects with a self-reported history of TBI ($n = 22$) were compared to the non-TBI group ($n = 16$) on various psychological measures.
Main outcomes and results: The two groups were not significantly different on the variables of age, pre-morbid IQ, self-esteem and alcohol use. The TBI group scored more poorly than the non-TBI group on a measure of current IQ and two of the three measures of executive functioning.
Conclusion: The presence of executive dysfunction has implications for the design of successful intervention programmes with this sub-group of batterers.

Keywords: *Traumatic brain injury, domestic violence, executive dysfunction*

Introduction

Numerous studies, in both animals and humans, have supported an association between abnormalities in brain function and aggressive and violent behaviour [1–3]. Both structural and pharmacological abnormalities have been investigated. In addition to the generalized deterioration seen in dementia, focal lesions in the frontal and temporal regions have been found to be the major structural events linked to an increase in violent behaviour [2]. Pharmacological studies have focused primarily on the influence of serotonin and have concluded that, while there is a link between serotonergic dysfunction and aggression, the strength of this relationship varies widely across individuals [3]. In addition to brain injury increasing the probability of violence, it also appears to increase the likelihood of aggression and violence occurring at lower levels of arousal [4].

The candidate region of the brain most frequently cited in studies of violence is the frontal lobes. In particular, damage to the pre-frontal regions of the brain and the resulting impairment in executive functions is considered to be associated with increased aggressive and anti-social behaviour [4, 5]. It has been suggested that impairment in executive functions may facilitate aggression and violent behaviour, particularly in situations that are stressful, precarious, frustrating or provocative [6].

One of the most common causes of brain dysfunction in adult males is traumatic brain injury (TBI) and the areas of the brain most susceptible to damage in this type of injury are the frontal and temporal lobes [7]. Impairment in executive function is a common sequelae of TBI [7]. Studies investigating the psychosocial sequelae of TBI as reported by relatives generally conclude that many behaviours consistent with executive dysfunction frequently appear following TBI [8].

Domestic violence is a specific violent behaviour which is recognized as a serious social, health and

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economic problem that has historically plagued all levels of society [9]. As with violence generally, research into domestic violence has predominately focused on cultural, social and psychological factors [10–12] and few studies have examined the role of neuropsychological factors in spouse abuse [13, 14]. Only two studies have specifically investigated the incidence of TBI in convicted male spouse abusers. In the first study, 62% of 31 subjects self-reported a history of TBI [15], while in the second study the self-reported prevalence rate was 53% for 53 subjects [16]. Research addressing the alternative issue, whether males with TBI are more likely to be abusive in intimate relationships, has been inconclusive due to methodological difficulties such as the use of unrepresentative TBI samples, brief follow-up periods between injury and assessment of domestic violence and the use of TBI samples that are demographically dissimilar to partner-abusive populations [2].

The aim of the present study was to investigate the prevalence of TBI in a group of partner-abusive men who also have criminal convictions for violence. The specific focus of the study was to determine if a history of TBI was associated with impairment in those cognitive abilities, namely executive functions, which have been linked to violent behaviour.

Method

Subjects

The sample for this study was drawn from the Hamilton Abuse Intervention Programme. This agency provides domestic violence education programmes for men, many directed by the courts, who have used aggressive or violent behaviour in their relationships. The 26-week programme focuses on the abuse of power and control in intimate relationships and alternative ways of behaving. During the 13-week period of subject recruitment, 176 men attended the treatment programme. Criterion for inclusion in the study was at least one criminal conviction for violence.

A total of 46 men volunteered to participate. One candidate was subsequently unavailable due to imprisonment for failing to comply with the court direction to complete the programme in its entirety. A further three volunteers did not fulfil the inclusion criterion in that they did not have criminal convictions for violence. Of the remaining 42 men, the results from four were discarded due to one having a history of serious psychiatric disorder and three due to lack of co-operation during the assessment process. The final sample, therefore, consisted of 38 men.

Table I. Demographic characteristics of the sample ($n = 38$).

Age (years)	Mean	34
	SD	8
	Range	18–54
Marital status	Married/cohabiting	18 (47%)
	Separated/divorced	13 (34%)
	Never married	7 (18%)
Education (years)	Mean	11
	SD	2
	Range	8–14
Occupational status	Full-time employment	19 (50%)
	Part-time employment	3 (8%)
	Unemployment benefit	8 (21%)
	Sickness benefit	6 (16%)
	Student	2 (5%)
Ethnicity	New Zealand Maori	22 (58%)
	New Zealand European	13 (34%)
	Other	3 (8%)
Socioeconomic status*	1	0
	2	2 (11%)
	3	0
	4	0
	5	1 (5%)
	6	3 (16%)
	7	8 (42%)
	8	3 (16%)
	9	2 (11%)

*$n = 19$.

Demographic information is presented in Table I. For the 19 subjects that were in full-time employment, socioeconomic status was determined according to the New Zealand Socioeconomic Index of Occupational Status [17]. This index provides graded indices that rank occupational skills from 1 (representing legislators, administrators and managers) to 9 (representing labourers and related elementary service workers).

Measures

Medical history interview. A medical history questionnaire was designed as the basis for a semi-structured interview. The purpose of the interview was to gather information on the prevalence and severity of TBI. To reduce the possibility that social desirability effects would influence the subjects' reporting of TBI, the questionnaire was comprehensive in content and included items on birth complications, medical illnesses and current medication, occupational exposure to chemicals, treatment for alcohol and substance use, psychiatric history, physical abuse during childhood and accidents and injuries (particularly head injuries resulting in loss of consciousness). This questionnaire was based on those described by previous researchers [18–22]. Reports of TBI resulting in a loss of consciousness were classified as mild, moderate or severe, based on reported coma duration [7].

Psychometric tests. A battery of tests was used to assess general cognitive functioning and, in particular, dysexecutive syndrome. Pre-morbid intelligence was assessed through the administration of the National Adult Reading Test [23]. For those five (13%) subjects who scored in the range indicative of pre-existing reading disorders, pre-morbid IQ was calculated using the Barona Index [21]. Current level of general intellectual functioning was assessed by administration of a two-sub-test (Vocabulary and Block Design) short form of the Wechsler Adult Intelligence Scale-Revised (WAIS-R) [21]. Executive functioning was assessed by administration of the Behavioural Assessment of the Dysexecutive Syndrome (BADS) [21, 24] and the Hayling and Brixton tests [25]. The BADS was normed on a group of 216 healthy people and has a reported inter-rater reliability of 0.88. Concurrent validity data for the BADS has been established by comparing the performance of healthy controls to a group of 78 neurological patients and by the relationship between BADS scores and objective ratings of everyday executive problems amongst neurological patients. The Hayling and Brixton tests were normed on 121 healthy volunteers. Test–re-test reliability for the Hayling was 0.76 and 0.71 for the Brixton. The discriminate validity of the tests was established by their ability to distinguish between healthy volunteers and three neurological lesion groups. Finally, symptom validity was assessed by administration of the Rey Fifteen Item Memory Test [21].

Self-report questionnaires. The Rosenberg Self-Esteem Scale [26] was used to assess perceived self-esteem and symptoms of depression. The Short Michigan Alcoholism Screening Test [27] was used to screen for alcoholism.

Procedure

Ethical approval for the research was obtained from the Research Committee, Department of Psychology, University of Waikato. Research procedures were also reviewed by the Hamilton Abuse Intervention Programme and approval was granted.

Initial contact with the participants was made by a representative of the programme during regular group time, who explained the general purpose of the research and criteria for inclusion. All group members were provided with an information pack that included an outline of the purpose of the study, their entitlements as participants and the procedures involved. The research was described as an investigation of men currently attending the programme with criminal convictions for violence and aspects of their medical histories, of which tests examining general knowledge and problem-solving abilities were a part. Participants were not told that the focus of the medical history interview was on TBI. Men interested in participating were asked to read and sign a consent form and were given a demographic questionnaire to complete. As compensation for participating in the research, credit for programme attendance was awarded to court-mandated men and session fees waived for men attending groups on a self-referral basis.

Testing was completed in almost all cases, in a single session of ~2-hours. For four subjects, a second session was needed to complete the assessment. After completion of the medical interview, the tests were administered in identical order, with standardized administration and scoring protocols followed. The tests were administered in the following order: National Adult Reading Test, short form WAIS-R, BADS, Hayling and Brixton tests, Rey Fifteen Item Memory Test, Rosenberg Self-Esteem Scale and Short Michigan Alcoholism Screening Test.

Data analysis

Descriptive statistics were obtained for demographic and clinical variables. Analysis was undertaken using both one-tailed and two-tailed *t*-tests for independent groups. An α-level of 0.05 was used to determine statistical significance. In those instances where $p < 0.05$, the exact α-level is reported.

Clinical interpretation of obtained scores was undertaken using the cut-off scores or outcome categories provided by the normative data for each measure. Performance on the BADS is classified on a 7-point scale ranging from 1 (impaired) to 7 (very superior). For the purposes of this study, these descriptive categories were collapsed, with the categories of impaired and borderline classified as 'impaired', low average, average and high average as 'average' and superior and very superior as 'superior'. Similarly, performance on both the Hayling and Brixton tests is classified on a 10-point scale ranging from 1 (impaired) to 10 (very superior). For the purposes of this study these descriptive categories were collapsed, with the categories of impaired, abnormal and poor classified as 'impaired', low average, moderate average, average and high average as 'average' and good, superior and very superior as 'superior'.

Results

Results for the total sample

Prevalence of TBI. The prevalence of TBI resulting in a loss of consciousness was the most frequent medical incident reported by the current population. A total of 22 (58%) reported at least one TBI resulting in a loss of consciousness. For 17 (77%)

of these, medical attention was sought or received. Based on reported length of unconsciousness, the severity of the TBI was seven (32%) mild, four (18%) moderate and the remaining 11 (50%) were severe TBI.

Psychosocial functioning. Results from the Rosenberg Self-Esteem Scale indicated that 12 (32%) of the 38 subjects were reporting symptoms of low self-esteem. On the Short Michigan Alcoholism Screening Test, 27 (71%) of the sample reported alcohol use patterns consistent with a clinical diagnosis of alcoholism. The patterns reported by a further three (8%) were suggestive of alcoholism. Therefore, only eight (21%) reported no indication of alcohol dependence.

Comparison of TBI and non-TBI groups

Matching variables. There were no significant differences between the two groups on the matching variables of age ($t(36) = -0.45, p > 0.05$), pre-morbid IQ ($t(36) = 1.29, p > 0.05$), Rosenberg Self-Esteem Scale scores ($t(36) = -1.97, p > 0.05$) and Short Michigan Alcoholism Screening Test scores ($t(36) = -1.58, p > 0.05$) (Table II).

Cognitive functioning. The results from the test of malingering indicated that the subjects' responses to the cognitive tests could be assumed to be valid (i.e. all subjects scored above the recommended cut-off scores). One-tailed *t*-tests were used to compare performance on the four measures of cognitive functioning. The two groups were significantly different on the measure of IQ ($t(36) = 1.95$, $p = 0.03$), with the TBI group having a lower average IQ (Table II). While there was no statistically significant difference between the two groups on the BADS ($t(36) = 0.77, p > 0.05$), the TBI group performed more poorly on both the Hayling ($t(36) = 2.84, p = 0.004$) and the Brixton ($t(36) = -1.97, p = 0.03$) tests (Table II).

Prevalence of executive impairment within the TBI group

The performance of the TBI group on the three measures of executive functioning showed that four (18%) were impaired on the BADS and six (27%) were impaired on the Hayling test and the Brixton test (Table III). Examination of individual cases showed that of the four subjects impaired on the BADS, one was impaired on the Hayling test and none were impaired on the Brixton test. Of the six subjects impaired on the Hayling test, three were also impaired on the Brixton test. No subject was impaired on all three tests.

Discussion

The purpose of this study was to provide a replication and extension of two previous studies which have reported a high level of TBI in partner-abusive men and to determine the prevalence of

Table II. Means, standard deviations and *t*-statistics for the TBI ($n = 22$) and non-TBI ($n = 16$) groups on the matching and cognitive variables.

	TBI		non-TBI		
Variable	*M*	SD	*M*	SD	*t*
Matching variables					
Age (years)	34.05	8.58	32.88	7.09	−0.45
Pre-morbid IQ	95.95	9.11	99.75	8.82	1.29
Rosenberg self-esteem scale	2.45	1.44	1.63	1.03	−1.97
Short Michigan alcoholism screening test	11.55	10.25	6.88	6.80	−1.58
Cognitive variables					
Full scale IQ	96.09	10.13	102.56	10.09	1.95*
BADS total	16.09	3.49	16.94	3.13	0.77
Hayling test total	15.64	3.37	18.31	1.96	2.84*
Brixton test total	20.55	7.02	16.38	5.54	−1.97*

*$p < 0.05$; BADS = Behavioural Assessment of the Dysexecutive Syndrome.

Table III. Prevalence of impairment on three measures of executive functioning for the TBI group ($n = 22$).

Measure	Impaired*	Average	Superior**
Behavioural assessment of the dysexecutive syndrome	4 (18%)	18 (82%)	0
Hayling test	6 (27%)	15 (68%)	1 (5%)
Brixton test	6 (27%)	15 (68%)	1 (5%)

*<10th %tile **> 90th %tile.

specific cognitive deficits, namely executive dysfunctions, which have been linked with both TBI and violent behaviour. The finding from the present study of a 58% prevalence rate for TBI is consistent with the rates of 53 and 62% reported by Rosenbaum and colleagues [15, 16], but higher than the 46 and 40% rates reported by other researchers [13, 14]. Overall, the prevalence rate found here provides further evidence that the prevalence of TBI, in particular severe TBI, is considerably higher in partner-abusive men than in the general population.

The high level of affective disorder (32%) is also consistent with previous reports of a greater prevalence of emotional distress in partner-abusive populations [13]. Similarly, the high level of alcohol abuse reported for the current sample (71%) supports the findings from previous research with these populations [14]. The presence of affective disorder and a history of substance abuse are potential confounds when undertaking a neuropsychological assessment.

In the current study, the role of these confounds was controlled for by matching the TBI and non-TBI groups on these two variables. The two groups were also matched on age and an estimate of premorbid IQ. In this way, it was hoped to isolate the effects of the TBI on the subjects' performance on the cognitive measures.

The two groups were significantly different on a measure of current IQ, with the TBI group obtaining a lower average score. However, an examination of the IQ scores for the TBI group showed that the majority still obtained scores within the average range, with 86% scoring within 1 SD (i.e. greater than 85) and no subject obtaining an IQ of less than 80. Therefore, the group differences on average IQ are unlikely to explain the group differences on the measures of executive functioning and previous research has not found a strong relationship between impairment of executive functioning and general intellectual status [7].

The TBI group performed more poorly on two of the three measures of executive functioning. An examination of the prevalence of impaired scores within the TBI group showed that the prevalence of impairment was 18–27% across the three measures. Of note was the finding that an individual impaired on one of the executive measures was not necessarily impaired on the other two measures and that no individual was impaired on all three measures.

Given the diverse nature of executive functions and the more specific or focused nature of the various measures of executive dysfunction it is not unexpected that some subjects would perform at different levels across the three measures. Indeed, measures of executive functioning have been noted to have low inter-correlations [28, 29] and this is probably due to the multi-faceted nature of the cognitive abilities subsumed under the construct of executive functioning.

Despite the small number of subjects, the sample reported on here can be considered representative as it included almost all of the men attending the programme who had criminal convictions for violence and their demographic characteristics are similar to those reported for other populations of partner-abusive men [9, 13, 16]. The major limitation of the current study is the use of self-report for determining the presence and severity of TBI. However, this is the methodology that has been used by all the other major studies in this area [13–16]. While it may be ideal to have confirmed the history of TBI through a medical record review, the nature of this population's offending means that they are reluctant to engage in research if there is any chance that this will result in others (e.g. medical records staff) becoming aware of their criminal activities. The necessity to develop a greater understanding of variables which impact on the effectiveness of treatment programmes for partner-abusive men needs to be balanced against the necessity to have confirmed information on relevant medical variables. In this study, an attempt was made to enhance the validity of self-reports of TBI by having the questions concerning prior TBI embedded within the context of a general medical history questionnaire.

Family violence has considerable personal and social implications for a substantial number of people [10]. However, a neuropsychological approach to the study of violence is not incompatible with functional and volitional models of domestic violence, as such an approach reflects the association between individual and inter-personal factors within the broader socio-cultural context. As with other influencing variables, an awareness of the potential contribution of neuropsychological factors is not justification for violence occurring. Further, recidivism rates suggest that there may be sub-groups within the heterogeneous batterer population for whom current intervention strategies are not effective [9]. Consideration of neuropsychological aetiologies may lead to a better understanding of some aspects of domestic violence and contribute to the development of more effective and efficient intervention strategies for a sub-group of batterers whose aggression may be related to executive dysfunction.

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