

Misdiagnosis of post-traumatic stress disorder following severe traumatic brain injury

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Background The incidence of post-traumatic stress disorder (PTSD) after traumatic brain injury is unclear. One issue involves the validity of diagnosis using self-report questionnaires.

Aims To compare PTSD 'caseness' arising from questionnaire self-report and structured interview.

Method Participants ($n=34$) with traumatic brain injury were recruited. Screening measures and self-report questionnaires were administered, followed by the structured interview.

Results Using questionnaires, 59% fulfilled criteria for PTSD on the Post-traumatic Diagnostic Scale and 44% on the Impact of Events Scale, whereas using structured interview (Clinician-Administered PTSD Scale) only 3% were 'cases'. This discrepancy may arise from confusions between effects of PTSD and traumatic brain injury.

Conclusions After traumatic brain injury, PTSD self-report measures might be used for screening but not diagnosis.

Declaration of Interest None.

There is growing acceptance that post-traumatic stress disorder (PTSD) can occur after traumatic brain injury (McMillan *et al*, 2003), but the reported incidence varies widely (0–56%), making service planning difficult. Such variability may arise because of methodological difficulties (Bryant, 2001), but in addition, the effects of traumatic brain injury might lead to inaccurate reporting or interpretation of responses. For example, people with traumatic brain injury can focus on the memory gap resulting from coma and post-traumatic amnesia without great distress and this might be inappropriately labelled as 'intrusive'; they may avoid tasks and situations because of incapacity rather than fear; and often their lives have been significantly altered by traumatic brain injury (McMillan, 2001). Personality change, including impulsiveness, reduced insight, rigid thinking, reduced motivation, and impaired learning and concentration resulting from traumatic brain injury, may also cause some complaints to be mislabelled as PTSD symptoms. McMillan (2001) reported a severe case of traumatic brain injury that appeared to have PTSD on the basis of the Post-traumatic Diagnostic Scale (PDS), but clearly did not at clinical interview. The present study examines McMillan's finding in a group of severe cases of traumatic brain injury.

METHOD

Permission was obtained from the local research ethics committee.

Participants

A total of 34 participants were recruited from community out-patient and rehabilitation services, and voluntary organisations. A power calculation based on proportions of people with severe traumatic brain injury reaching PTSD 'caseness' on the Impact of Events Scale (IES) and

Clinician-Administered PTSD Scale (CAPS) (Turnbull *et al*, 2001) indicated $n=30$, needed for 80% power, with α set at 0.05 and β at 0.2. Participants were >17 years, with a severe traumatic brain injury (post-traumatic amnesia >1 day) at least 3 months before interview. Exclusion criteria were scores <27 on the Mini-Mental State Examination (Folstein *et al*, 1975), severe dysphasia or dyslexia, or current treatment for psychosis.

Measures

PTSD

- (i) IES, a 15-item self-report questionnaire, providing ratings of avoidance and intrusion (Horowitz *et al*, 1979). Total IES scores >25 determined 'caseness' (Cornell *et al*, 1999).
- (ii) PDS, a 49-item self-report questionnaire based on the 17 DSM-IV (American Psychiatric Association, 1994) symptoms, with ratings of duration, onset and impact on social and occupational functioning (Foa *et al*, 1997). PTSD 'caseness' is defined here as fulfilment of criteria B–F. For all definitions, criterion A need not be met in a population with severe traumatic brain injury given the co-occurrence of loss of consciousness and post-traumatic amnesia.
- (iii) CAPS, a structured clinical interview assessing the 17 DSM-IV symptoms, their duration and impact. A symptom is 'present' when the frequency is >0 and intensity >1 (Blake *et al*, 1995). Two definitions of caseness were used to consider difficulties that might arise if CAPS is administered by an unsupervised and inexperienced clinician:
 - (a) CAPS–without judgement requires DSM-IV criteria B–F to be fulfilled.
 - (b) CAPS–with clinical judgement *in addition* requires the clinician to adjudge that the symptoms are related to the trauma.

Other

- (i) The Hospital Anxiety and Depression Scale (HADS) has two sub-scales (anxiety and depression); scores >7 were rated abnormal (Zigmond & Snaith, 1983).
- (ii) The Rivermead Post Concussion Symptoms Questionnaire (RPQ) is a 14-item self-report questionnaire (King *et al*, 1995).

- (iii) The Glasgow Outcome Scale–Extended (GOS–E) is a clinician-rated scale of social and functional disability after traumatic brain injury (Wilson *et al*, 1998).
- (iv) Post-traumatic amnesia duration estimates severity of traumatic brain injury and was carried out retrospectively (McMillan *et al*, 1996).
- (v) The Mini-Mental State Examination was used to assess ability to consent to participate (Folstein *et al*, 1975).
- (vi) The Speed of Comprehension Test (SCT) assesses speed and accuracy of information processing (Baddeley *et al*, 1992).
- (vii) The National Adult Reading Test (Nelson & Willison, 1991) estimates premorbid intellectual ability.

Procedure

Demographic and injury information were obtained at interview. Screening measures and self-report questionnaires were administered, and then the clinician-rated GOS–E and the structured interview (CAPS).

RESULTS

Demographic and descriptive measures

Thirty male and four female participants were recruited from community services. The average age at interview was 40 years (s.d.=11, range 20–60 years) and years of education 12 (s.d.=2, range 10–20). Average premorbid intelligence quotient (IQ) (National Adult Reading Test (NART)) was 100 (s.d.=14, range 69–121) and time since injury 6 years (s.d.=7, range 0.6–34). Average duration of post-traumatic amnesia was 11 weeks (s.d.=13 weeks, range 26 h to 52 weeks). Cause of injury was road traffic accident (16), fall (11), assault (6) or sports accident (1). Compensation claims or legal proceedings were ongoing in 12 cases. GOS–E scores ranged from lower-severe to upper-moderate disability, with 53% in the lower-moderate category. RPQ scores ranged from 3 to 60 (mean=30, s.d.=14). Average SCT scaled scores were <25th percentile (Baddeley *et al*, 1992), (mean=6, s.d.=2.7, range 1–12).

Diagnostic measures (Table I)

More ‘cases’ were found on the PDS (McNemar’s $\chi^2=12.07$, $P<0.01$) and IES

Table I Assessment measure scores, interpretation and caseness criteria

Measure	Range	Mean	s.d.	Interpretation of mean score	PTSD caseness (%)	PTSD caseness criteria
HADS–anxiety	0–18	9	5	Mild		
HADS–depression	0–16	8	4	Mild		
PDS–number of symptoms	2–17	9.74	4.22	–	20 (59)	¹
PDS–symptom severity score	2–45	21.18	11.11	Moderate–severe		
IES–total score	0–59	24.35	16.77	Mild	15 (44)	²
IES–intrusion score	0–29	10.71	8.31	–		
IES–avoidance score	0–36	13.65	9.72	–		
CAPS–total (frequency plus intensity)	13–59	29.35	11.95	–	6 (18)	³
CAPS–frequency	7–30	16.21	6.42	–		
CAPS–intensity	6–29	13.09	5.82	–	1 (3)	⁴

CAPS, Clinician-Administered Post-traumatic Stress Disorder Scale; HADS, The Hospital Anxiety and Depression Scale; IES, Impact of Events Scale; PDS, Post-traumatic Diagnostic Scale; PTSD, Post-traumatic Stress Disorder.

1. Criteria B–F fulfilled.

2. Cut-off > 25 on total IES score.

3. Criteria B–F are fulfilled (minimum score of 1 for frequency and 2 for intensity) (B, 1 symptom; C, 3 symptoms; D, 2 symptoms; E, duration > 1 month; F, symptoms have social and occupational impact).

4. PTSD diagnosed if criteria B–F are fulfilled (as defined above) and if clinical judgement indicates that symptoms are trauma related and responses are reliable.

(McNemar’s $\chi^2=4.27$, $P<0.05$) than on CAPS–without clinical judgement. Only one participant (3%) was diagnosed with PTSD using CAPS–with clinical judgement. Of 20 ‘cases’ identified by questionnaires, 19 were false positives, as were 5 out of 6 ‘cases’ identified using CAPS–without clinical judgement. No false negatives were found. Either questionnaire identified more false positive ‘cases’ than CAPS–without clinical judgement (McNemar’s $\chi^2=4.32$, $P<0.05$).

No significant differences were found between PTSD ‘cases’ and ‘non-cases’ on questionnaire measures (PDS or IES) or CAPS–without clinical judgement, for age at interview (PDS or IES, $U=105.5$, $P<0.78$; CAPS, $U=58.5$, $P<0.25$), age at injury ($U=101.5$, $P<0.67$; $U=52.0$, $P<0.15$), time since injury ($U=112$, $P<0.63$; $U=68$, $P<0.47$), years of education ($U=105$, $P<0.63$; $U=83.5$, $P<0.98$), duration of post-traumatic amnesia ($U=100.5$, $P<0.64$; $U=55$, $P<0.19$), or premorbid IQ ($U=104.5$, $P<0.76$; $U=80$, $P<0.88$). No significant differences were found between those pursuing litigation and those not, in terms of PDS symptom severity score ($U=123$, $P<0.76$), IES total score ($U=99.5$, $P<0.24$), or CAPS total score ($U=117.5$, $P<0.60$).

RPQ scores significantly correlated with CAPS total score ($r=0.67$, $P<0.01$)

and PDS symptom severity score ($r=0.32$, $P<0.07$). Scores on the HADS depression sub-scale significantly correlated with IES total score ($r=0.34$, $P<0.05$), PDS severity score ($r=0.68$, $P<0.01$) and CAPS total score ($r=0.73$, $P<0.01$). Scores on the HADS anxiety sub-scale significantly correlated with PDS severity score ($r=0.43$, $P<0.01$) and CAPS total score ($r=0.49$, $P<0.01$) but not with IES total score ($r=0.31$, $P<0.08$). Questionnaire scores did not significantly correlate with total scores on the SCT (PDS $r=0.14$, $P<0.4$; IES $r=0.15$, $P<0.39$) or the error number on the SCT (PDS $r=0.28$, $P<0.40$; IES $r=0.07$, $P<0.83$).

DISCUSSION

People with severe traumatic brain injury met PTSD criteria for ‘caseness’ more often using self-report questionnaires than structured interview. Significantly more (false positive) ‘cases’ were identified using questionnaires, even compared with interview without clinical judgement guiding the relevance of responses to trauma. ‘Cases’ were not identified at interview that were not also identified by questionnaire, supporting the use of questionnaires as screening tools, perhaps tentatively given that only one participant was diagnosed with PTSD at

interview with clinical judgement. This incidence of 3% is lower than reported (17–27%) in studies on severe traumatic brain injury (Bryant *et al*, 2000; Hibbard *et al*, 1998). Participants often self-rated symptoms as present on questionnaires, but denied symptom presence at interview, or reported other reasons for symptom presentation, as found previously (McMillan, 2001). The overlap between traumatic brain injury and PTSD symptoms may lead to some errors in questionnaire responding (despite written instructions) that become clear at interview. Slowed speed of information processing and errors in comprehending written material were observed, but were not associated with higher questionnaire scores; nor was premorbid intellect, severity of brain injury nor ongoing litigation. Other changes in personality and cognition that can result from traumatic brain injury were not considered (e.g. impulsivity, reduced insight, rigid thinking, memory impairment) but might influence symptom reporting (Williams *et al*, 2002). PDS and CAPS scores correlated with anxiety and depression scores on the HADS, perhaps again because of symptom overlap. However, as this effect was found for questionnaires and interview, it does not explain the discrepancy in ‘caseness’ frequency arising between these measures. There was anecdotal evidence that participants reported symptoms not related to psychological trauma. For example, curiosity (without associated distress) about the memory gap after traumatic brain injury being inappropriately labelled as ‘intrusive’ and psychological and social impacts of traumatic brain injury being considered in response to prompts about ‘avoidance’ and ‘hyperarousal’ symptoms. Clinical judgement allowed consideration of differential diagnosis, context and confounding factors, and not simply symptom number and frequency. This is obviously relevant in the clinical situation, independently of whether criteria for ‘caseness’ are reached.

The current study is limited because the sample was not consecutive, although demographics were in line with a recent prospective traumatic brain injury cohort (Thornhill *et al*, 2000). Future research should include interview methodology in studies on PTSD after severe traumatic brain injury, and further investigate differential diagnoses and confounding factors in order to standardise assessment with this population. Although self-report measures

CLINICAL IMPLICATIONS

- Structured interview is necessary for diagnosis of PTSD after severe traumatic brain injury.
- Questionnaire self-report can be useful to screen for PTSD symptoms after traumatic brain injury.
- The true incidence of PTSD after severe brain injury has yet to be determined.

LIMITATIONS

- Findings may not extend to minor brain injury.
- Understanding of how people with traumatic brain injury make errors on questionnaires may be improved by qualitative data.
- Although similar demographically to cohort studies, the sample was not recruited consecutively.

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can be used for screening, they can mislead if used for diagnosis of PTSD after traumatic brain injury.

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