Demonstrating disability following traumatic brain injury should include objective measures of social abilities: Towards a social IQ test.

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Introduction

The Problem

Common long-term symptoms for people with traumatic brain injuries (TBI):

- Problems with appropriate social behaviour
- Social judgment deficits

These problems have long-term, devastating consequences for patients' lives [2,4,7,11-15].

However, ***many assessments of people with TBI never measure social competencies objectively or quantitatively***.

Neuropsychologists can use several methods for assessment:

- performance measures – objective tests requiring patients to demonstrate competence
- informant reports – questionnaires or qualitative reports by caregivers about patients' competence
- self-report by questionnaire or qualitatively
- clinicians' qualitative judgments based on interviews

Cognition is usually assessed using performance measures

Social/emotional assessment usually uses informant reports, self-reports, and clinical judgment.

Clinicians (and courts) naturally prefer objective performance measures, so…

… ***patients' cognition is usually assessed in more detail than their social competencies, missing a key area of disability in TBI.***

The Solution

Objective social/emotional measures are needed to improve clinical care of TBI patients who suffer social/emotional deficits.

We developed three objective performance measures and one informant report measure of social/emotional competencies that

- could differentiate TBI patients from matched controls.
- related to variation in social skill.

Methods: Participants

16 people (15 ♂, 1 ♀) with moderate to severe TBI.

16 controls (14 ♂, 2 ♀), samples balanced on age, education, substance use history*, anxiety, or depression.

Anatomy: based on CT scans in patients' charts

8 had frontal lobe injury

4 had widespread contusions or hematomas including frontal lobes

3 had no available scan

1 had no visible cerebral damage on CT (comatose at time of scan)

Table 1. Patient and control characteristics

Demographics	*Patients*	*Controls*	*MANOVA*
Age	39.9 (12.2)	35.5 (12.0)	n.s.
Education	12.2 (1.67)	12.9 (2.67)	n.s.
Neuropsychological Test	*Patients*	*Controls*	*MANOVA*
WTAR (reading)	48.0 (21.5)	64.4 (19.0)	F(1, 30) = 4.75, p < .05*
Digit Span	54.1 (32.7)	50.5 (24.4)	n.s.
Digit Symbol Coding	33.2 (27.5)	49.1 (25.4)	F(1, 30) = 1.87, p ≈ .1
Phonemic Fluency (F-A-S)	22.2 (27.6)	53.5 (25.3)	F(1, 29) = 12.3, p < .005**
Semantic Fluency	39.9 (31.0)	66.8 (27.5)	F(1, 28) = 6.15, p < .05*
Trails A	46.6 (30.5)	63.3 (20.4)	n.s.
Trails B	35.8 (39.3)	55.6 (24.4)	F(1, 29) = 3.00, p ≈ .09

Table 2. Details of patients' traumatic brain injuries

	Years since injury	LOC (days)	GCS (on admission)	PTA (days)
Mean *(SD)*	6.2 (*8.8*)	33.5 (*40.8*)	6.2 (*2.8*)	50.3 (*37.9*)

(LOC= duration of loss of consciousness; GCS= Glasgow Coma Score [18; PTA= duration of post-traumatic amnesia [10]).

* We excluded people with alcohol use exceeding consumption of >10 standard drinks >2 days per week for >1 year Numerous sources suggest that alcohol and drug misuse is disproportionate among people with TBI [6,9], with estimated rates of 18-66% for alcohol misuse, and 36-44% for misuse of other substances [3,15] compared with estimated population rates of 8.6% for alcohol and at most 8.9% for other substances in Australia [1].

References & acknowledgments on reverse side of poster reprints.

Methods: Measures

Performance Measures of Social Competency

Awareness of Social Context:

Intention: 1) When she said "I haven't seen you in ages" what purpose was she trying to accomplish? [open-ended]

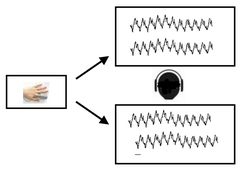
Emotion: 2) What emotion did the woman express when she said "I haven't seen you in ages"? [open-ended, 1 word]

Attitude: 3) How positive or negative was the woman towards the man? [-1 (negative), 0 (neutral), +1 (positive)]

- Participants watched 2 sets of 10 paired video clips of two actors interacting.
- 2 sets of clips separated with intervening tasks in between.
- Pairs: in one pair, a woman said to a man "I haven't seen you in ages." In one clip she was happy to see him, while in the other, she expressed awkwardness about the chance meeting.
- Participants then answered questions about each clip.

Figure 1. The Awareness of Social Context task presented 20 video clips of interpersonal interactions.

Interoceptive Awareness – Heartbeat Detection:

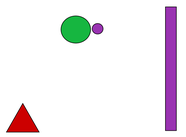


Listens to heart beat in real time

Listens to heart beat w-700ms delay

Figure 2. The heartbeat detection task presented 14 trials, with equal numbers of synchronous and asynchronous trials randomly intermixed.

Perspective-taking:



-Short animations of social interactions between ▲ and ●
- P's told to interpret actions of ▲ as themselves, and actions of ● as a stranger they had just met.
- Asked a multiple choice question: "What happened in the movie?"
- E.g. ▲ (the participant) bouncing a ball off a wall, and ● (the stranger) stealing the ball & taunting ▲ with it.
- Multiple-choice responses were: "1) The other person stole your ball. 2) The other person pitched a ball to you."

Figure 3. In the Perspective-Taking task, participants watched 24 7-second animations portraying social interactions between abstract geometric shapes.

Informant report questionnaire measure: The Global Interpersonal Skills Test (GIST)

- A 69-item questionnaire that caregivers, family, or friends can fill out about the patient.
- The GIST is internally consistent (α = .97), and has good inter-rater reliability (intraclass correlations .60 - .83)
- The GIST also has good convergent validity: fondness for person and social skill as measured by GIST scores ($r(40) = .66$, $p < .0001$), self-rated social anxiety and self-rated GIST ($r(36) = -.40$, $p < .05$) [8]

Figure 4. Sample items from the GIST.

		very much like this		neither one nor the other		very much like this		
9	Discloses/ reveals too much personal information	-3	-2	-1	0	1	2	3	Discloses appropriately
55	Unempathic/ Unsympathetic	-3	-2	-1	0	1	2	3	Empathic/ Sympathetic

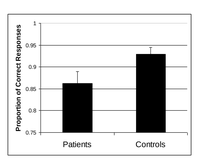
Standard cognitive measures from neuropsychological testing

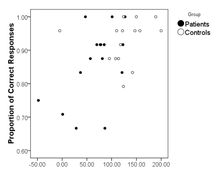
- Digit Span, WTAR, Digit Symbol Coding, Phonemic Fluency (F-A-S), Semantic Fluency, Trails A&B

Results

Perspective-Taking Task: Although the difference between TBI patients and controls did not reach our .05 cutoff, there was a trend with TBI patients having lower scores than controls $F(1,30) = 3.48$, $p = .073$.

Scores on perspective-taking did correlate significantly with other-rated social skill on the GIST.



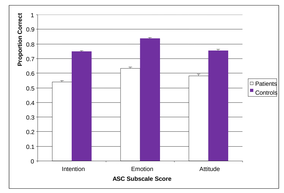


$p(31) = .460$, $p < .0001$

Figure 5. Differences between TBI's & controls on perspective-taking, and scores as related to other-rated social skill.

Results

Differences between TBI Patients & Controls on the Awareness of Social Context task



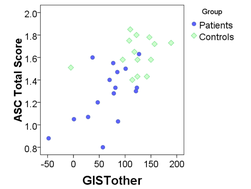


Figure 6. Patients with TBI were significantly worse than controls on each subscale, and total score correlated with social skill as rated by friend or family member. MANOVA, Intention $F(3,31) = 14.78$, $p < .005$; Emotion $F(3,31) = 18.86$, $p < .0001$; Attitude $F(3,31) = 13.20$, $p < .005$.
For patients, correlation betw ASC & GIST: $\rho(31) = .624$, $p < .0001$. For controls, correlation was $\rho(30) = .58$, $p < .002$.

Differences between TBI Patients & Controls on the Heartbeat Detection task

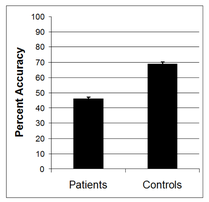


Figure 7. Patients with TBI were significantly less accurate at detecting their own heartbeat than were controls: MANOVA $F(1,28) = 9.69$, $p < .005$
(N = 14 for TBI patients, due to hardware failure during 2 patients' testing sessions.)

Patient	*Heartbeat Detection Task (% Accuracy)*	*Self-Reported Emotional Changes*
01	9	More labile
02	29	More emotional blunting
03	36	More emotional blunting
04	36	More labile
05	43	More labile
06	43	More labile
07	50	More labile
08	50	More labile
09	50	More labile
10	57	More labile
11	57	More labile
12	57	More labile
13	57	No changes reported
14	71	No changes reported*

Table 3. Self-reported post-injury emotional changes for each participant with TBI, rank-ordered by % accuracy score on the heartbeat detection task .
* Sad, but normal mood for marital break-up.

Differences in other-rated social skill for TBI patients and controls – GIST scale

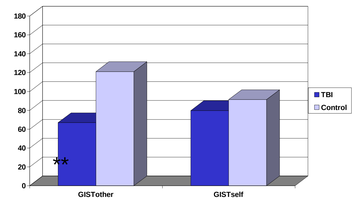


Figure 7. Friends and family rated the social skills of patients with TBI significantly lower than did friends and family of control participants: **MANOVA $F(1,28) = 22.2$, $p < 0.0001$. Self-ratings, as predicted, were not different.

Social measures better predict the presence of TBI than do cognitive tests

Cognitive composite score: summed percentiles for Digit Symbol Coding (total correct; measure of processing speed), FAS (total words; measure of executive functioning), and Trails B (total time; measure of complex attention) ; selected *a priori* for sensitivity to TBI [5, 17]

Social composite score: summed proportion correct scores for the Awareness of Social Context, Interoceptive Awareness (measure of emotional self-awareness), and Perspective-Taking tasks.

Predictor	β	SEβ	Expβ	Wald	*p* value
Cognitive Composite	.006	.009	1.01	0.532	≈ 0.5
Social Composite	9.59	3.9	14567	6.03	< 0.015
Constant	-21.9				

Table 4. Logistic regression examining the predictive value of the Cognitive and Social composite variables for presence of TBI. Because of missing data there were13 TBI patients and 15 controls in the analysis.

Discussion

- **Cognitive assessment alone may not be sufficient to produce a comprehensive portrait of the strengths and weaknesses of people with TBI.**
- Performance-based & informant-report measures of social competency seem effective in detecting problems suffered by those with TBI.
- 3 new measures of social /emotional competencies were better predictors of the presence of TBI than were 3 standard neuropsychological measures of cognition.
- **To prevent people genuinely disabled by TBI from being denied benefits they need because their disability has not been adequately assessed,**

current assessment practice should be updated to include objective, quantitative measures of social competencies.

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