The ecological validity of executive tests in a severely brain injured sample

Rodger Lll. Wooda,*, Christina Liossi b

a Department of Psychology, University of Wales Swansea, Singleton Park, Swansea SA2 8PP, UK
b Department of Psychology, University of Southampton, UK

Accepted 14 June 2005

Abstract

It is unclear how well performance on recently developed, specialized executive tests, reflects problems that patients and their relatives complain of in real life. The ecological validity of four specialised tests of executive function: the Hayling and Brixton Tests, and the Zoo Map and Key Search sub-tests from the Behavioural Assessment of Dysexecutive Syndrome (BADS) battery, was assessed against the Dysexecutive Questionnaire from the BADS in a sample of 59 severely brain injured individuals. Results indicated that only the Hayling C was significantly negatively correlated ($r = -0.26, P < .05$) with the informant version of the Dysexecutive Questionnaire. An index of insight was not correlated with any of the executive tests. It is concluded that these tests have limited ecological validity when used to assess patients following severe head trauma.

Executive function has been described as a “meta” cognitive activity, one involving cognitive processes that control and integrate other cognitive activities (Temple, 1997). Anatomically, executive function has been linked with functions of the prefrontal cortex (Mesulam, 2002) that deal with novelty, planning and implementing strategies, monitoring performance, using feedback to adjust future responding, vigilance, and inhibiting task-irrelevant information (Rabbit, 1997). Tests that have traditionally been used in neuropsychological assessment have been inconsistent in their ability to identify executive dysfunction (Baddley, 2002; Eslinger & Damasio, 1985; Shallice & Burgess, 1991). Recently, efforts have been made to develop more specialized tests of executive ability (Burgess & Shallice, 1997; Shallice & Burgess, 1991; Wilson, Alderman, Burgess, Emslie, & Evans, 1996), representing a departure from tests that have discriminative validity for diagnostic purposes, to ecological validity that allows test results to predict social and functional abilities relevant to real world settings. Chayton and Schmitter-Edgecombe (2003) propose two concepts upon which ecologically valid tests rely, verisimilitude and veridicality. Verisimilitude reflects the degree to which a test resembles the cognitive demands of real life tasks. The related concept of veridicality refers to the degree to which performance on a neuropsychological test is empirically related to measures of everyday functioning.

Tests such as the Multiple Errands Test [MET] (Shallice & Burgess, 1991) and Behavioural Assessment of Dysexecutive Syndrome [BADS] (Wilson et al., 1996) are founded on the principle of verisimilitude. The MET is described...
by Burgess (2003) as a test with, “the most obvious ecological validity in current use”, one that is “highly sensitive both to brain damage in general and to specific executive problems” (pp. 315–316). However, the test is also time consuming and not conducive to most clinicians’ idea of a routine clinical examination, principally because it is not an office-based test and has to be conducted in a community setting, subject to the vagaries of weather, public reaction and occasional professional embarrassment. Recent refinements are attempting to address this limitation (Alderman, Burgess, Knight, & Henman, 2003; Knight, Alderman, & Burgess, 2002). The BADS, which is office based, is composed of six tests that have similar task requirements to real-life activities. Each test has different ecological face validity and different relationship to informant ratings on real life executive behaviours, measured by the Dysexecutive Questionnaire [DEX]. The DEX is a supplementary measure to the BADS, considered to be a sensitive and ecologically valid measure of dysexecutive symptoms among patients with different types of neurological disorders (Burgess, Alderman, Evans, Emslie, & Wilson, 1998; Wilson, Evans, Emslie, Alderman, & Burgess, 1998). The Hayling and Brixton tests (Burgess & Shallice, 1997) seem to adhere to the principle of veridicality because both involve procedures that are sensitive to executive functions assumed to be frequently impaired after frontal injury. The Hayling test measures initiation speed and response suppression, while the Brixton test measures rule detection. These cognitive functions are clearly important to a range of social and functional activities.

The standardization of these tests was conducted on a variety of neurological patients. The BADS was evaluated on 78 brain injured patients by Wilson et al. (1998), 59% of whom had suffered closed head injury, the remainder comprising encephalitis, dementia or stroke. In the initial validation study, ecological validity was measured using the DEX. Significant, but only moderate, negative correlations (ranging from −.31 for Key Search to −.46 for Zoo Map) were established between each of the six individual tests and significant others’ ratings of executive problems. However, subsequent investigations of the relationships between these tests and independent DEX ratings have produced mixed results. Norris and Tate (2000) found that only one of the BADS subtests (Zoo Map) correlated with independent ratings on the DEX, but this was not in the expected direction. They found that the combined scores of three BADS subtests discriminated between the brain injured and control group, but this accounted for only 16.2% of the variance in role functioning (general cognitive functioning across different domains).

The Hayling and Brixton tests were standardised on 91 patients with circumscribed neoplastic and haemorrhagic lesions and did not include a head trauma sample. A recent study that used the Brixton test on patients with localized lesions suggests that it may be more sensitive to left hemisphere damage. Reverberi, Lavaroni, Gigli, Skrap, and Tim (2005) administered the Brixton tests to a group of 40 patients with focal frontal lesions of mixed aetiology and 43 control subjects. They found that patients with left lateral frontal lesions were significantly impaired on the test but right lateral lesion patients made the same number of errors as controls (although they made three times more ‘capture errors’, a sign of impaired monitoring processes). The authors concluded that Brixton performance may dissociate between inductive reasoning, monitoring, and working memory, mediated by the left lateral frontal cortex, and processes for monitoring and checking in the right lateral cortex. A similar left hemisphere bias can be made about the Hayling test. When used in association with functional imaging techniques to identify cortical areas responsible for verbal initiation and suppression in normal subjects, left frontal activation was predominant (Collette et al., 2001; Nathaniel-James, Fletcher, & Frith, 1997). However, the use of the Hayling and Brixton tests with head trauma patients has produced less clear results. Bajo and Nathaniel-James (2001) assessed 48 persons with moderate to severe traumatic brain injury using the Hayling and Brixton tests. Independent DEX ratings were correlated with Hayling and Brixton performance. Hayling part 1 (initiation) correlated with all three DEX factors (response suppression, intentionality, and executive memory) although only weakly (.21–.28). Performance on the Brixton Test correlated significantly with the executive memory factor (.40). Hayling part 2 (response suppression) did not correlate with scores on any of the three factors.

It appears therefore that whilst these tests of executive function may be useful in cases of circumscribed cerebral lesions, their clinical utility in the assessment of executive abnormalities in patients who have suffered head trauma, remains uncertain, even though such injuries primarily affect frontal structures. This was confirmed by Wood and Rutterford (2004) who reported discordance between performance on such tests and everyday functional abilities in a patient with serious frontal injury as a result of a road traffic accident. One explanation for this discrepancy may be that highly intelligent patients (as was the case of MN reported by Wood & Rutterford) cope more effectively with the executive demands of consulting room executive tests, even though they lack the mental flexibility to cope with comparable (but simultaneous) cognitive demands in real life. Duncan (1995) has suggested that many tests of executive ability measure primarily a non-specific intellectual function, reminiscent of general intelligence ‘g’. This theoretical proposition has received empirical support from studies on healthy individuals (Obonsawin et al., 2002) and
head injured patients (Duncan, Johnson, Swales, & Freer, 1997; Stokes & Bajo, 2003). When using the BADS tests, Stokes and Bajo found that only the Zoo Map and Key Search tests correlated with any factors on the DEX before IQ was partialled out but neither Hayling nor Brixton tests showed any correlations. After WAIS III scores were partialled out, all BADS correlations disappeared, suggesting that BADS subtests measure primarily a non-specific intellectual function. However, at the same time, a number of Hayling and Brixton measures became significantly correlated with DEX measures, implying a greater specificity in the measurement of executive function for these tests. The authors concluded that the Hayling and Brixton measures were better predictors of everyday executive function than BADS measures, once IQ has been partialled out.

The purpose of the present study was to examine a sample of seriously injured head trauma patients with CT scan abnormalities, to determine how well performance on specialized executive tests corresponds with executive problems that patients and their relatives complain of in real life. More specifically, the aim of the present investigation was to evaluate the ecological validity of four easily administered and widely used paper and pencil tests of executive function, i.e., the Hayling test of response initiation and suppression, Brixton test of rule attainment, Key Search and Zoo Map tests, both of which involve planning ability. Performance on each test was compared with scores on the DEX-I (independent rater) and information obtained during clinical interview. Based on previous studies it was hypothesized that there would be a negative correlation between DEX ratings and scores on specialized measures of executive function.

1. Method

1.1. Participants

A series of 165 consecutive referrals for medico-legal neuropsychological examination and/or rehabilitation advice between 2002 and 2004 were reviewed. Fifty-nine patients were selected for this study on the basis of abnormal CT scan reports indicating structural brain damage associated with head trauma. Nine (15.3%) had evidence of left frontal injury, 12 (20.3%) right frontal, 20 (33.9%) bi-lateral and 18 (30.5%) posterior injury. It is acknowledged that in addition to these focal areas of damage, all patients would have suffered a degree of diffuse axonal injury. Fifteen patients had objective neurological signs of brain injury (hemiparesis and/or problems of taste/smell). All patients met criteria for serious head injury, determined by low Glasgow Coma Score on admission to hospital (Teasdale & Jennett, 1974) \(x = 7.37\); S.D. = 3.6) and long posttraumatic amnesia \(x = 21.4\) days; S.D. = 34.09). The majority of the participants were male (41, 69.5%). Their ages ranged from 17 to 64 years \(x = 33.86\) years; S.D. = 12.72). Ninety-nine cases were excluded on the basis of no CT scan or CT scan without evidence of structural damage. Other exclusion criteria included previous history of (a) head injury, neurological or psychiatric disorder, (b) alcohol or drug abuse, (c) speech, motor or perceptual deficit likely to interfere with neuropsychological assessment. Seven patients were excluded because of speech, motor or perceptual deficits.

All patients were classified as “dysexecutive” based on the criteria used during clinical interview (Baddeley & Della Sala, 1997). In cases where insight was diminished, close relatives provided information. All cases (or their relative) spontaneously reported problems of multitasking, comprising various degrees of difficulty with planning, organizing and initiating activities. Similarly, all cases reported problems focusing and sustaining attention in the face of distracting stimuli. Drive and motivational problems were reported by 38 (64.41%) cases, time management by 29 (49.15%), while aggression, against a background of labile mood and temperament, was reported by 19 (32.20%). The executive problems had persisted at least 2 years postinjury and continued to undermine capacity to return to work or function independently on a day-to-day basis.

1.2. Measures

All patients took part in a neuropsychological examination and semi-structured interview with a clinical neuropsychologist (R.L.W.). A close relative was interviewed separately but was also present during the interview. The aim of the interview was to identify executive deficits in everyday life. Designation of a patient as “dysexecutive” was based on fulfilling one or more of the criteria described in Baddeley and Della Sala (1997). In the majority of cases, supporting information of executive dysfunction was also available from rehabilitation reports, educational records, and (in a few cases) occupational health records from the individual’s place of work. As recommended by Burgess and Alderman
Table 1
Intelligence and executive function (scaled scores) by primary location of injury

<table>
<thead>
<tr>
<th>Location of injury</th>
<th>NART-R</th>
<th>Hayling A</th>
<th>Hayling B</th>
<th>Hayling C</th>
<th>Brixton</th>
<th>Zoo Map</th>
<th>Key Search</th>
<th>DEX-S</th>
<th>DEX-I</th>
<th>WAIS-III FSIQ</th>
<th>WAIS-III VIQ</th>
<th>WAIS-III PIQ</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bifrontal (N=20)</td>
<td>91.2 (17.12)</td>
<td>4.6 (1.27)</td>
<td>5 (1.34)</td>
<td>5.35 (2.9)</td>
<td>5.6 (2.21)</td>
<td>2.4 (1.23)</td>
<td>2.37 (1.36)</td>
<td>36.35 (13.33)</td>
<td>49.45 (7.87)</td>
<td>86.75 (11.21)</td>
<td>86.45 (10.93)</td>
<td>87.05 (13.57)</td>
</tr>
<tr>
<td>Left frontal (N=9)</td>
<td>95.77 (25.66)</td>
<td>4.22 (1.85)</td>
<td>5.66 (0.7)</td>
<td>5.44 (2.3)</td>
<td>5.88 (1.76)</td>
<td>2.66 (1.41)</td>
<td>3 (1.41)</td>
<td>37.77 (12.4)</td>
<td>52.44 (12.72)</td>
<td>91.31 (14.24)</td>
<td>88.75 (12.64)</td>
<td>93.87 (17.27)</td>
</tr>
<tr>
<td>Right frontal (N=12)</td>
<td>95.25 (13.9)</td>
<td>5.16 (0.83)</td>
<td>5.58 (0.99)</td>
<td>5.42 (2.68)</td>
<td>6.5 (0.9)</td>
<td>2.83 (1.11)</td>
<td>3.11 (1.05)</td>
<td>38.83 (13.54)</td>
<td>53.9 (9.17)</td>
<td>90.54 (11.5)</td>
<td>92.5 (12.73)</td>
<td>88.58 (10.98)</td>
</tr>
<tr>
<td>Posterior (N=18)</td>
<td>98.28 (10.66)</td>
<td>4.6 (1.14)</td>
<td>5.33 (1.14)</td>
<td>5.5 (2.09)</td>
<td>6.33 (1.91)</td>
<td>2.55 (1.29)</td>
<td>2.6 (1.12)</td>
<td>36.94 (13.05)</td>
<td>46.64 (11.41)</td>
<td>87.61 (8.23)</td>
<td>87.05 (9.79)</td>
<td>88.16 (9.2)</td>
</tr>
<tr>
<td>All injury categories</td>
<td>94.88 (16.29)</td>
<td>4.66 (1.27)</td>
<td>5.32 (1.14)</td>
<td>5.42 (2.48)</td>
<td>6.05 (1.84)</td>
<td>2.58 (1.23)</td>
<td>2.69 (1.24)</td>
<td>37.25 (12.85)</td>
<td>49.95 (10.19)</td>
<td>88.43 (10.76)</td>
<td>88.21 (11.17)</td>
<td>88.66 (12.3)</td>
</tr>
</tbody>
</table>

NART-R: National Adult Reading Test-Revised; DEX-S: Dysexecutive Questionnaire-Self; DEX-I: Dysexecutive Questionnaire-Other; WAIS-III FSIQ: Full Scale IQ; WAIS-III VIQ: Verbal IQ; WAIS-III PIQ: Performance IQ.
In line with current recommendations regarding the assessment of possible biased responding (Greve, Bianchini, Mathias, Houston, & Crouch, 2003), all individual scores of patients were checked against the Mittenberg index (i.e., Vocabulary–Digit Span difference of 5 or greater) (Mittenberg, Theroux-Fichera, Zielinski, & Heilbronner, 1995).

1.4. Statistical analysis

Based on the BADS manual correlation of .46 between DEX-I and Zoo Map, a power analysis indicated that for a two-tailed test and a power coefficient of .94, 59 participants would be required. Correlations using Pearson product moment correlation coefficient $r$ were used to investigate the relationship between different measures of executive function as well as between measures of executive function and general intelligence. Similarly, correlations were used to explore the relationship between levels of insight (this was operationalised as the difference between DEX-S and DEX-I scores) and executive measures. A multivariate analysis of covariance (MANCOVA) was performed to determine whether performance of different executive tests is associated with different primary location of injury. All analyses were two tailed, with $\alpha$ level set at .05.

2. Results

2.1. Detection of malingering

Based on the criteria outlined above, only five patients had a Vocabulary–Digit span difference score greater than 5. However, criteria for diagnosing malingered neurocognitive dysfunction (Slick, Sherman, & Iverson, 1999) were not met in any of the cases, therefore, the data were included for analysis.

2.2. Statistical analysis

Table 1 presents the sample’s performance on the executive tests and WAIS-III by primary location of injury and as a whole. A multivariate analysis of covariance was performed on eight dependent variables: Hayling A, B, C, Brixton, Zoo Map, Key Search, DEX-S and DEX-I. Adjustment was made for two covariates: age and full scale IQ. Independent variable was primary location of injury (bifrontal, left frontal, right frontal, posterior). There was no significant difference among the groups of patients by location of injury on the combined dependent variables $F(24, 96.31) = 0.73$; Wilk’s $\lambda = 0.61$; $\eta_p^2 = 0.15$; $P = .81)$. However, it needs to be noted that this comparison is underpowered (observed power = 0.54).

Impaired performance on the Hayling and Brixton tests was determined by using a scale score of 2 (abnormal), as recommended in the manual (Burgess & Shallice, 1997). When looking at the sample’s performance, irrespective of the predominant area of brain injury, surprisingly few cases from any of the injury categories were recorded as impaired: Hayling A = 3, B = 2, C = 13 and Brixton = 4. A similar classification of patients, based on the Zoo Map and Key Search tests, was not possible because the manual (Wilson et al., 1996) only provides an overall profile score for the whole battery on a percentile basis.

2.3. The relationship between tests of executive function, DEX and WAIS-III

Table 2 presents the correlations between the different measures of executive function, DEX and WAIS-III. Only the Hayling C score was significantly negatively correlated to the independent DEX rating (DEX-I). The correlation
Table 2
Correlations between measures of executive function and WAIS-III

<table>
<thead>
<tr>
<th></th>
<th>Hayling A</th>
<th>Hayling B</th>
<th>Hayling C</th>
<th>Brixton</th>
<th>Zoo Map</th>
<th>Key Search</th>
<th>WAIS-FSIQ</th>
<th>WAIS-VIQ</th>
<th>WAIS-PIQ</th>
<th>DEX-S</th>
<th>DEX-I</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hayling B</td>
<td></td>
<td>.39**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hayling C</td>
<td>.06</td>
<td></td>
<td>.49**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Brixton</td>
<td>.15</td>
<td>.43**</td>
<td>.24</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Zoo Map</td>
<td>.13</td>
<td>.15</td>
<td>.36*</td>
<td>.09</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Key Search</td>
<td>.1</td>
<td>.24</td>
<td>.22</td>
<td>.14</td>
<td>.63**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>WAIS-FSIQ</td>
<td>.42**</td>
<td>.25</td>
<td>.303**</td>
<td>.25</td>
<td>.37**</td>
<td>.32**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>WAIS-VIQ</td>
<td>.35**</td>
<td>.25</td>
<td>.35**</td>
<td>.29**</td>
<td>.33**</td>
<td>.28</td>
<td>.91**</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>WAIS-PIQ</td>
<td>.41**</td>
<td>.21</td>
<td>.22</td>
<td>.18</td>
<td>.35**</td>
<td>.302*</td>
<td>.92**</td>
<td>.68**</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DEX-S</td>
<td>-.19</td>
<td>.03</td>
<td>-.17</td>
<td>-.16</td>
<td>-.17</td>
<td>-.08</td>
<td>-.45**</td>
<td>-.4**</td>
<td>-.43**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DEX-I</td>
<td>-.22</td>
<td>-.1</td>
<td>-.26*</td>
<td>-.25</td>
<td>-.11</td>
<td>.001</td>
<td>-.23</td>
<td>-.23</td>
<td>-.196</td>
<td>.68*</td>
<td></td>
</tr>
</tbody>
</table>

DEX-S: Dysexecutive Questionnaire-Self; DEX-I: Dysexecutive Questionnaire-Other; WAIS-III FSIQ: Full Scale IQ; WAIS-III VIQ: Verbal IQ; WAIS-III PIQ: Performance IQ.

* Correlation is significant at the .05 level (two-tailed).
** Correlation is significant at the .01 level (two-tailed).

was low ($r = -.26$, $P < .05$). All tests of executive function, except Hayling B and the Brixton test, were significantly positively correlated with WAIS-III Full Scale IQ.

Chayton and Schmitter-Edgecombe (2003) suggest that premorbid intellectual ability may influence the relationships between test scores and everyday cognitive skills, therefore they stress the importance of controlling for IQ when relating neuropsychological tests to measures of everyday functioning. In this study, partial correlations were calculated between the different executive measures controlling for premorbid IQ as estimated by the NART 2. The only significant correlation (i.e., between Hayling C and DEX-I) disappeared.

Similarly, when partial correlations were calculated between the different executive measures, whilst controlling for current WAIS-III Full Scale IQ (following Stokes & Bajo, 2003), the significant correlation disappeared.

Burgess and colleagues (Burgess et al., 1998) suggest that the DEX-I measures five principal symptom clusters: three cognitive (inhibition, intentionality, executive memory) and two smaller factors related to emotional experience (positive affect, negative affect). In this study, factor scores for the patients were derived for each of the three cognitive factors and the correlations between these factors and the patients’ performance on the executive tests were examined. None of the executive measures were significantly correlated with the scores on any of the factors (in all cases $P > .05$).

2.4. Insight and executive function

Burgess et al. (1998) have further suggested that the difference between the DEX-S and the DEX-I scores, where the items are direct parallels, may form an index of “insight”. An S–I discrepancy score was calculated by totaling the difference between patient and significant-other ratings (the participant scores were subtracted from the significant-other scores) on each of the 20 questions to create a composite S–I discrepancy score. Positive scores indicate underestimation of deficits by the patients. In the present study this index of insight was not correlated significantly with any of the executive measures (in all cases $P > .05$).

3. Discussion

This study aimed to assess the ecological validity of four widely used measures of executive function, the Hayling, Brixton, Zoo Map and Key Search tests. In line with previous studies (Eslinger & Damasio, 1985; Shallice & Burgess, 1991; Wood & Rutterford, 2004), many patients with CT scan evidence of frontal lesions, displayed a marked contrast between (normal) performance on consulting room executive tests and (impaired) performance on executive tasks in everyday situations, as reported by patients and their relatives. Correlations between Hayling and Brixton tests and the Dysexecutive Questionnaire were low, suggesting that the ecological validity of these tests is limited. This finding is similar to the Bajo and Nathaniel-James (2001) and Stokes and Bajo (2003) studies. Similarly, the Zoo Map and Key Search scores did not correlate significantly with the Dysexecutive Questionnaire. This is in contrast to the initial validation study of Wilson et al. (1996) but similar to the findings of Norris and Tate (2000). The data appear to support
the argument put forward by Chayton and Schmitter-Edgecombe (2003) that the ecological validity of executive tests varies across different neurological populations and/or level of severity. Further research will need to explore whether type of clinical population and level of severity can moderate the relationship between tests and everyday functioning.

The significant correlations recorded between some tests of executive function (i.e., Hayling A and C, Zoo Map, Key Search) and WAIS-III, confirms that general intellectual ability contributes substantially to performance on certain executive tests, providing support for Duncan’s hypothesis (Duncan, 1995). Future investigations are needed to determine the shared variance between the executive tests used in this study and the relationship of this variance to general intellectual ability.

In this study, there was no correlation between the DEX index of insight and any of the executive function measures. This is consistent with the findings of Bogod, Mateer, and MacDonald (2003), but is contrasted against the data produced by Burgess et al. (1998). The data also go some way to supporting Fleming, Strong, and Ashton (1996) who only found a marginally significant correlation between the DEX index of insight and the Self-awareness of Deficits Interview. The variation in results can probably be attributed to the elusive nature of insight as a psychological concept, one which has a long history of divergent and inconsistent definitions and measurements (Amador & David, 1998). Prigatano (1991) has suggested that lack of insight in severely brain-injured patients should be conceived as a multidimensional construct with a number of overlapping dimensions. It is therefore somewhat inevitable that measures attempting to relate insight with cognitive performance will yield variable results.

The lack of significant correlations cannot simply be explained by the relatively small sample size because the present study was designed to have sufficient power to detect correlations at least equal to the ones reported in the published literature. However, it could be argued that a limitation of the study involved using the DEX as an ecological comparator for executive tests. Many previous studies have used the DEX in this capacity but further work on the questionnaire’s psychometric properties is clearly needed before it can be used as a ‘gold standard’ ecological comparator for office-based tests.

In contrast to studies that found a relationship between test performance and site of lesion (Collette et al., 2001; Reverberi et al., 2005), this study did not find differences in test performance associated with location of injury. This could be explained by the small sample size and by the diffuse nature of closed head injuries sustained predominantly in motor vehicle accidents.

The assessment of executive dysfunction remains elusive, possibly because executive function represents a cluster of components that have not been successfully related to each other and have no obvious hierarchy (Rabbit, 1997). Consequently, the identification of subcomponents of executive function and the development of tests to assess them is difficult. Moreover, existing tests can involve several executive and non-executive processes (known to be linked to brain areas outside the frontal lobes). From a heuristic point of view this hinders the identification of the underlying cognitive deficit. It may ultimately be impossible to develop a pure test of executive function because, by definition, executive function involves the simultaneous management of a variety of different cognitive functions. Furthermore, problem-solving in everyday situations is a multifaceted concept involving not only cognitive processes but also social and emotional processes, such as understanding the situation from another’s perspective and responding appropriately to environmental feedback. Consequently, there are likely to be multiple cognitive/emotional pathways involved in the development of posttraumatic executive difficulties in everyday life, therefore, it is necessary to develop more sophisticated paradigms to examine how different contributory factors underpin apparently similar performance deficits (Channon, 2004).

The implications of this study are particularly significant for clinical neuropsychologists who attempt to make long-term psychosocial predictions or give advice regarding the need for specialist rehabilitation interventions based on a patient’s performance on these executive tests. The results strongly indicate that even patients who experience executive problems in real life and have CT scan evidence of severe frontal brain injury may do well on certain executive function tests in a consulting room setting.

References


