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Validity of the Comprehensive Assessment of Prospective Memory (CAPM) for Use With Adults With Traumatic Brain Injury

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Objective: To expand upon the existing psychometric properties of the Comprehensive Assessment of Prospective Memory (CAPM) for use with adults with traumatic brain injury by examining concurrent and criterion validity. **Method:** Participants were 45 adults with a traumatic brain injury. Participants and their relatives completed Section A of the CAPM and a measure of psychosocial integration. Participants were also administered two neuropsychological tests of prospective memory, the Cambridge Prospective Memory Test (CAM-PROMPT) and the Memory Intentions Screening Test (MIST). Concurrent validity was measured by comparing scores on the CAPM with scores on the CAM-PROMPT and MIST. Criterion validity was examined by correlating CAPM scores with level of psychosocial integration. **Results:** Participant self-reports on the CAPM were not significantly correlated with the CAM-PROMPT or MIST, but were significantly correlated with level of psychosocial integration. Relative reports on the CAPM were correlated significantly with total score on the MIST and CAM-PROMPT and level of psychological integration. **Conclusions:** The findings indicate that the concurrent validity of the self-report version of CAPM is low suggesting that self-reports alone do not provide an objective measure for assessing prospective memory function. The relative report version however, demonstrated reasonable concurrent and criterion validity, suggesting that the relative report version of the Section A of the CAPM is a useful means of evaluating frequency of prospective memory failure in adults with traumatic brain injury.

Keywords: neuropsychological assessment, psychosocial integration, self-report, test validity

Memory impairment in individuals with traumatic brain injury (TBI) has been found to be long-term, debilitating, and a major obstacle for rehabilitation (Williamson, Scott, & Adams, 1996). Predominantly, the focus in the literature has been on retrospective memory, which involves recalling events from the past or previously learnt information (Weiten, 1998); for example, when a person is

required to remember text or recognise faces. In contrast, prospective memory (PM) involves remembering to perform an action in the future (Kvavilashvili & Ellis, 1996). Only a few studies have examined PM problems after TBI, despite the fact that deficits in PM may have serious repercussions for everyday functioning (Maylor, Darby, Logie, Della Sala, & Smith, 2002).

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Prospective memory is necessary for day-to-day activities such as remembering to buy milk, pay bills, attend appointments, and take medication. Mateer, Sohlberg, and Crinean (1987) found that individuals with and without brain injury perceived that their PM failed more often than their retrospective memory. For individuals with TBI, frequent memory failures can be frustrating, embarrassing, and sometimes even life threatening and may cause reliance on a carer for prompting, resulting in loss of independence (Fleming, Shum, Strong, & Lightbody, 2005). Returning to work and maintaining interpersonal relationships can also be a concern for individuals with PM impairments, with frequent PM failure being perceived as a lack of reliability (Winograd, 1998). Therefore, PM is a prerequisite for the successful performance of future and intended actions as well as being closely related to everyday functioning and independent living. Given that TBI frequently results in damage to the frontal and temporal lobes, areas that are related to initiation and execution of planned intentions and cue-recognition and interruption of ongoing activity, it is not surprising that PM deficits occur following TBI (Shum, Valentine, & Cutmore, 1999). To better understand deficits underlying this type of memory impairment, health professionals require standardised measures of PM; however, there are only a small number in existence. Additionally, very few studies have compared different PM assessment tools that are available and examined their various psychometric properties.

Types of Prospective Memory

Einstein and McDaniel (1990) proposed that there are two types of PM. The first type is time-based PM and involves remembering to perform an action at a specific time or after a certain amount of time has elapsed (e.g., recording a television show at 3.00 p.m.). Event-based PM is the second type and it involves remembering to perform an action in response to a specific cue (e.g., giving a friend a message that is cued by seeing that person). Both types of PM usually involve performing an action while engaging in another activity or activities. However, evidence suggests that the cues available in event-based PM tasks make these tasks easier than time-based tasks (Einstein & McDaniel, 1990). Kvavilashvili and Ellis (1996) later proposed a third type of PM; activity-based, which involves performing an action at a particular stage during or after a task (e.g., switching off the oven after

cooking). Activity-based PM tasks are considered easier to remember than time or event-based because they do not require the interruption of ongoing activity, but are similar in nature to event-based PM in that they involve an external cue (Shum et al., 1999).

Assessments of Prospective Memory

There have been many types of measures developed to assess memory in general, including standardised neuropsychological tests and self-rated questionnaires, but fewer designed to test PM in particular. The Cambridge Prospective Memory Test (CAM-PROMPT, Wilson et al., 2005) is a standardised neuropsychological test that solely measures PM. It relates to Einstein and McDaniel's (1990) model in that it comprises four time-based and four event-based PM tasks performed while performing a filler activity, using both verbal and written instructions. In a study by Groot, Wilson, Evans and Watson (2002) comparing 36 participants with TBI and 28 controls, performance on an earlier edition of the CAM-PROMPT was found to be significantly poorer for the TBI group. Groot et al. (2002) found that the CAM-PROMPT correlated significantly with measures of memory, attention and executive functioning. A later edition of the CAM-PROMPT has since been published and is considered a highly valid tool for measuring PM in the TBI population.

The Memory for Intentions Screening Test (MIST) is another standardised neuropsychological test that measures PM (Raskin & Buckheit, 2000). It is comprised of PM tasks that require a 2-minute or 10-minute delay with two different tasks to perform during the delay (Raskin & Buckheit, 2000). Responses for each question are either verbal or action (Raskin & Buckheit, 2000). Although the MIST is currently unpublished, prior research supports its internal consistency (Cronbach's $\alpha = 0.87$; Raskin, 2004) and construct validity (0.80) compared with the Rivermead Behavioural Memory Test (Carey, Woods, Rippeth, Heaton & Grant, 2006; Raskin, 2004).

Self-rated questionnaires have been another popular method for obtaining information related to memory performance in everyday life after TBI. These questionnaires generally assess memory by asking the respondents to rate their abilities using questions regarding their frequency of forgetting or remembering, how their memory has changed, and the type of strategies they use to enhance their memory (Herrmann, 1983). Questionnaires can be valuable in gaining an

understanding of a person's everyday memory performance, in contrast to performance on clinical tasks in laboratory-based studies (Mateer et al., 1987). The Subjective Memory Questionnaire (Bennett-Levy & Powell, 1980), the Cognitive Failures Questionnaire (Broadbent, Cooper, Fitzgerald, & Parkes, 1982), the Everyday Memory Questionnaire (Sunderland, Harris & Gleave, 1984), the Memory Functioning Questionnaire (Gilewski & Zelinski, 1988) and the Prospective and Retrospective Memory Questionnaire (Smith, Della Sala, Logie, & Maylor, 2000) are among a few of the self-rating scales which contain items relating to PM. However, few questionnaires are designed specifically to address PM following TBI. One exception is the Prospective Memory Questionnaire (PMQ) which was the first questionnaire developed solely to assess PM (Hannon, Adams, Harrington, Fries-Dias, & Gipson, 1995). Hannon et al. (1995) found the PMQ to be a highly reliable tool for assessing PM; however, found mixed results for validity. In this study, the TBI group reported poorer performance than the control group on time-based PM tasks completed after a short interval but not after a long time interval, suggesting low discriminating ability between groups.

Comprehensive Assessment of Prospective Memory

An alternative PM questionnaire, the Comprehensive Assessment of Prospective Memory (CAPM), was developed by Waugh (1999) and later used by Roche, Fleming and Shum (2002) for individuals with TBI. It contains three sections: the first section measures the frequency of PM failure, the second determines the perceived importance of such failures, and the third gauges the perceived reasons for prospective remembering and forgetting. For the purpose of this study, the focus will be on Section A, which measures the frequency of memory lapses. The CAPM is completed by the person with TBI and/or a relative and they are required to rate the frequency of PM failure on a five point scale. For example, one of the questions asks 'How often have you forgotten to buy an item at the grocery store?'

A feature of the CAPM that distinguishes it from other PM questionnaires is the nature of its two subscales that relate to the type of activity of daily living being remembered. Waugh (1999) performed a principal components analysis of Section A and found that there were two components which related to 'common' and 'uncommon'

PM lapses. The common PM lapses occurred mostly during instrumental activities of daily living (IADL), that is, household management activities (e.g., managing finances, shopping and meal preparation). The uncommon PM lapses were related to basic activities of daily living (BADL), that is, daily self-care tasks (e.g., dressing, eating, personal grooming and hygiene). Two items that were not included in either components were 'leaving the stove on', 'walking into a room and forgetting why you were there' and were thus classified as additional components. More PM lapses were reported in the IADL component than in the BADL component (Waugh, 1999). Reliability (Cronbach's alpha) for the IADL and BADL components was found to be 0.92 and 0.79 respectively (Waugh, 1999).

A study by Chau, Lee, Fleming, Roche and Shum (2007) examined normative data on the CAPM to determine differences in reported frequency of PM failure related to age, sex and education. No significant differences were found between sex and education levels for the IADL, BADL and total CAPM scores. These findings are consistent with other studies that have examined both sex and education levels and PM performance. However, significant differences in PM failures were found when examining age, with the younger age group reporting more frequent PM failures than the older age group, which may have reflected the lower degree of importance placed on remembering to perform the various PM tasks by the younger group (Chau et al., 2007).

Roche et al. (2002) used the CAPM to investigate the frequency of PM failure in 33 adults with TBI and 29 non-injured controls. This study also compared the self-ratings of the participant with that of the relative. No significant differences were found between the self-ratings of the TBI and the control groups. However, significant differences were reported between the relative ratings of the two groups, with PM failure reported more frequently for the TBI group. This provides some initial evidence to support the validity of the relative's version of the CAPM, but further investigations of the validity of the CAPM is needed.

The CAPM, in particular Section A, which rates the frequency of PM failure, has potential as a PM assessment tool for use with adults with TBI. Additionally, the CAPM may be useful in rehabilitation as it may provide a clearer understanding of the frequency of PM failure following TBI, therefore assisting the clinician in planning interventions specific to the client. However, further research is required to continue to establish the validity of this assessment for use with TBI populations.

The current study aimed to expand upon the existing psychometric properties of the CAPM for use with adults with TBI by examining both its concurrent and criterion validity. Concurrent validity looks at how well one variable or variable set relates to another that has previously been validated (Gravetter & Wallnau, 2000); in this case the CAM-PROMPT and the MIST. It was hypothesised that there would be a significant correlation between CAPM scores and CAM-PROMPT and MIST scores. Criterion validity measures how well one variable or variable set predicts the outcome of another variable based on the information obtained (Gravetter & Wallnau, 2000). As previously mentioned, PM failure is perceived as having a direct impact on everyday function in terms of occupational activities, interpersonal relationships and independent living. Therefore, the current study aimed to establish the criterion validity of the CAPM by comparing it to an external but related variable, in this case the level of psychosocial integration of the individuals with TBI, including occupational activities, interpersonal relationships and independent living skills. It was hypothesised that there would be a significant correlation between CAPM scores and level of psychosocial integration.

Method

Design

A cross-sectional correlational model was employed to test the validity of the CAPM in adults with TBI living in the community. Concurrent validity for Section A of the CAPM was measured by correlating results from the CAPM with standardised neuropsychological tests of PM. Criterion validity was measured by correlating the CAPM with the level of psychosocial integration.

Participants

Forty-five participants and their relatives were recruited from past inpatients and current outpatients at a brain injury rehabilitation unit at a major metropolitan hospital in Australia. Persons included in the study were required to be aged between 18 and 60 years and with a diagnosis of moderate or severe TBI. Participants were excluded from the study following consultation with their treating occupational therapist if they (1) had not fully emerged from coma, (2) had low levels of arousal, (3) demonstrated severe persistent amnesia or confusion, (4) had a diagnosis of a premorbid psychiatric or neurological disorder,

(5) were discharged to a residential care facility, (6) were unable to communicate competently in English, or (7) displayed severe behavioural and/or visual deficits which precluded them from participation in the study.

Measures

Four measures were used in the current study: the CAPM, which is the PM questionnaire under investigation, two neuropsychological tests of PM, which have established reliability and validity and therefore are considered the 'gold standard' for establishing concurrent validity, and one measure of psychosocial integration for establishing criterion validity.

Section A of the Comprehensive Assessment of Prospective Memory (CAPM). This self-report questionnaire assesses the frequency of PM lapses (Waugh, 1999). The CAPM is completed by the person with TBI and/or a relative and they are required to answer questions on a five point scale where 1 = *Never*, 2 = *Rarely*, 3 = *Occasionally*, 4 = *Often*, and 5 = *Very often*. There is also a 'not-applicable' option if the item does not apply to the participant. All participants however, are encouraged to complete as many items as possible. Higher scores on the CAPM are indicative of more frequent PM failure. Section A of the CAPM consists of 39 items which can be split into the BADL component (10 items) and the IADL component (23 items) with two additional items that are not included in either component. Mean responses for the BADL and IADL components and total scores were calculated by adding the item responses together and then dividing by the total number of items. Not applicable responses were excluded from the mean scores.

Cambridge Prospective Memory Test (CAM-PROMPT). The CAM-PROMPT is a neuropsychological test developed to measure PM performance (Wilson et al., 2005). It generates scores on time-based and event-based subscales, each scoring a maximum of 18, as well as a total score out of 36, with higher scores reflecting better PM performance. The four time-based tasks are: (a) reminding the tester after 15 min not to forget their keys, (b) requesting a newspaper after 20 min, (c) after working for 20 min on the first filler task, switching to a second filler task after a further 5 min, and (d) opening or closing the booklet of the filler task 3 min after the instruction is given. The four event-based tasks are (a) reminding the tester about five hidden objects after the tester says the testing is over, (b) putting a briefcase under the desk after an alarm rings

which is set to ring 5 min after the beginning of the session, (c) changing pens after having completed seven filler assignments, and (d) giving an envelope with 'message' written on it to the tester when the tester says that there are 10 min left. Participants are also allowed to spontaneously use strategies, such as note taking, to help them remember.

Memory for Intentions Screening Test (MIST). The MIST is comprised of eight PM tasks, which are counterbalanced on delay interval (2- vs. 15-min), cue type (event-based vs. time-based), and response (action vs. verbal) (Raskin & Buckheit, 2000). The tasks are scored on a 3-point scale ranging from 0 to 2, where 0 equals no response or an incorrect response, 1 equals either a correct response but incorrect time or an incorrect response at a correct time, and 2 equals a completely correct response. Following completion of these eight tasks, a 3-choice recognition trial is administered, with scoring ranging from 0 to 8. The range of overall scores on the MIST is 0 to 48, with higher scores reflecting better PM performance.

Sydney Psychosocial Reintegration Scale (SPRS). The SPRS is a self-report questionnaire designed to measure the level of psychosocial integration following TBI compared to the person's premorbid level of functioning (Tate, Hodgkinson, Veerabangsa, & Maggioletto, 1999). The SPRS consists of both a self-report and a relative version, both of which were included in this study. The SPRS addresses three broad domains of functioning: Occupational Activities, Interpersonal Relationships and Independent Living Skills. It comprises 12 statements with four items addressing each domain. The total score for the SPRS ranges from 0 to 72, with scores for each of the three domains ranging from 0 to 24. Higher scores indicate better degrees of psychosocial functioning. Tate et al. (1999) compared the psychometric properties of the Sydney Psychosocial Reintegration Scale (SPRS) against the Sickness Impact Profile and found it to be a valid tool for assessing the types of psychosocial encounters after TBI. In addition to this, Tate et al. (1999) found the SPRS to have a high interrater reliability (0.95).

Procedure

This study was part of a larger randomised control trial on PM in TBI and the data used were collected at pre-intervention assessments. Ethical clearance was obtained from the relevant hospital and university ethics committees before commencing the study. Participants and relatives gave

written informed consent to participate in the study. Information on demographic and diagnostic variables was retrieved from the participants' medical file. Participants attended a university clinic and participated in a pre-intervention assessment session during which the four assessments and the Wechsler Abbreviated Scale of Intelligence (WASI) were conducted. Order of administration was: SPRS, CAPM Section A, CAM-PROMPT, WASI, and MIST. Assessments took place within a quiet room and assistance and rest breaks were given as necessary. Relatives were either given or mailed the relative versions of the CAPM and SPRS and asked to complete and return the questionnaires. Relatives were followed up by phone if they had not returned their questionnaire by mail.

Data Analysis

All data were analysed using SPSS (version 12.0). Data were screened for missing values and accuracy of data input. Descriptive data including means, standard deviations, minimum and maximum scores were calculated for continuous participant data and results from the four assessments. Nominal participant data was described using frequencies and percentages. One participant scored unusually low on the MIST (total score = 0) indicating very poor PM performance, and was therefore subsequently excluded as an outlier for analyses including MIST data. Concurrent validity of the CAPM was examined by correlating component and total CAPM scores (self-report and relative report) with scores on the CAM-PROMPT and the MIST. Criterion validity of the CAPM was examined by correlating component and total CAPM (self-report and relative report) with subscale and total SPRS scores on both the self-report and relative report versions. Spearman's rho was selected to measure correlations, due to the ordinal nature of the scoring on the CAPM, MIST and SPRS.

Results

The 37 male and 8 female participants were aged between 19 and 50 years ($M = 30.02$, $SD = 11.46$). The majority of participants were of Caucasian background (85%), other backgrounds including Asian (7.5%), Aboriginal or Torres Strait Islander (2.5%), Pacific Islander (2.5%) and African (2.5%). Participants were diagnosed with moderately severe to very severe TBI, with a mean length of post-traumatic amnesia of 48 days. The mean Glasgow Coma Score at the scene of injury was less than 8. Further diagnostic details of the

TABLE 1
Diagnostic Details of Participants With TBI

Variable	Mean	SD	Min	Max
WASI IQ score	103.27	11.73	69	132
Length PTA (days)	47.89	35.41	2	152
Lowest GCS	7.08	3.89	3	15
Time since injury (days)	550.2	1136.5	102	7633
LOS (days)	81.08	78.38	2	344

Note: WASI IQ Score = Wechsler Abbreviated Scale of Intelligence
PTA = Post Traumatic Amnesia
Lowest GCS = Lowest Glasgow Coma Score on a range of 3–15
LOS = Length of stay in hospital

participants are displayed in Table 1. The most frequent mechanism of injury was through motor vehicle accidents (37.5%). Other mechanisms of injury included motorbike accidents (15.0%), pedestrian accidents (15.0%), fall from a building/structure (10.0%), bicycle accidents (10.0%), assault (7.5%), and sporting injuries (5.0%). The most common site of injury was a combination of both frontal and temporal lobe lesions (30.0%), followed by temporal (20%), frontal (22.5%) and other damage (27.5%).

A summary of results on the four measures is presented in Table 2. The mean total score for self-reports on the CAPM ($M = 1.67$) indicates that participants perceived that they had low rates of PM failure. However, the relatives' total mean scores on the CAPM were higher than that of the participants' ($M = 2.05$) still indicating that they perceived the participants as having reasonably infrequent PM failure following a TBI. Mean total scores for the SPRS self-report ($M = 47.51$) and relative report ($M = 47.55$) are comparable. Mean total score ($M = 24.16$) for the CAM-PROMPT corresponded with a low level of PM performance. Mean total scores for the MIST ($M = 32.91$) were also low, indicating deficits in PM function.

Spearman's rho correlation coefficients were calculated between self-report scores on the CAPM and scores on the three other measures. As seen in Table 3, self-report CAPM scores did not significantly correlate with scores on the CAM-PROMPT or the MIST. Self-report CAPM total scores and BADL scores showed a moderate negative correlation with self-reported level of psychosocial integration on all subscales of the SPRS and total SPRS scores indicating that more frequent PM failure was related to lower levels of integration. Self-report scores on the IADL component of the CAPM were significantly negatively correlated with self-report SPRS total and rela-

tionship scores. Self-report CAPM scores were also found to significantly negatively correlate with relatives' ratings on the SPRS work subscale, indicating that higher levels of self-reported PM failure were related to lower levels of productivity, as reported by a relative.

Table 4 displays Spearman's rho correlations between relative report CAPM scores and the three other measures. Relative report total CAPM scores and IADL scores showed a moderate negative correlation with total CAM-PROMPT scores, indicating that higher levels of PM failure for IADL, as reported by relatives, are associated with poor performance on standardised PM assessment. Furthermore, relative report CAPM total scores and IADL scores were also moderately negatively correlated with the MIST. Relative report CAPM scores did not significantly correlate with SPRS self-report scores. Relative reports on the CAPM did however show a moderate negative correlation with SPRS relative report scores for all subscales and the total SPRS score.

Discussion

The purpose of the study was to expand upon the existing psychometric properties of the CAPM for use with adults with TBI by examining both its concurrent and criterion validity. Concurrent validity was measured by comparing scores on the CAPM with scores on the CAM-PROMPT and MIST. Criterion validity was determined by comparing the level of community integration of individuals with TBI, as measured by the SPRS. It was hypothesised that there would be significant correlations between scores on the CAPM, CAM-PROMPT, and the MIST and the level of community integration, as measured by the SPRS.

Results showed that there were no significant correlations between self-report scores on the

TABLE 2
Participant Scores on the CAPM, SPRS, CAM-PROMPT and MIST

	Mean	SD	Min	Max
CAPM Self-Report total	1.67	0.50	0.88	3.21
BADL	1.37	0.48	1	3
IADL	1.93	0.69	0.66	3.52
CAPM Relative-Report total	2.05	0.84	0.60	4.05
BADL	1.71	0.70	0.90	3.30
IADL	2.37	1.03	0.80	5
CAM-PROMPT total	24.16	7.35	8	36
Time	10.64	4.48	1	18
Event	13.51	3.80	3	18
MIST total	32.91	10.10	9	48
Time	4.24	2.04	0	8
Event	6.73	2.02	1	8
SPRS Self-Report total	47.51	10.74	25	70
Occupational activities	10.96	4.66	4	22
Interpersonal relationships	18.27	4.78	7	24
Living skills	19.02	3.82	8	24
SPRS Relative Report total	47.55	13.07	3	71
Occupational activities	11.78	4.80	2	22
Interpersonal relationships	18.46	4.02	7	24
Living skills	19.02	4.43	9	24

CAPM and the CAM-PROMPT and MIST, indicating that level of self-reported PM failure is not related to performance on neuropsychological assessments. While these findings concur with previous discussions on the ecological validity of neuropsychological assessments for measuring PM impairments following TBI (Burgess,

Alderman, Evans, & Emslie, 1998; Cicerone & DeLuca, 1990), it is not clear that this is due to a lack of ecological validity. It has previously been argued that the circumstances of a person performing a neuropsychological assessment under strict examination conditions might be so different from situations in the real world that there is little

TABLE 3
Spearman's Rho Correlations Between Self-Report CAPM and CAM-PROMPT, MIST and SPRS Scores

	Self-report CAPM scores		
	BADL	IADL	Total
CAM-PROMPT total	0.14	-0.10	-0.03
Time	0.10	-0.10	-0.03
Event	0.16	-0.12	-0.02
MIST Total	0.21	-0.23	-0.14
Time	0.19	-0.22	-0.12
Event	0.22	-0.24	-0.14
SPRS Self-Report total	-0.53**	-0.39**	-0.52**
Occupational activities	-0.50**	-0.27	-0.41**
Interpersonal relationships	-0.40**	-0.37*	-0.43**
Living skills	-0.40**	-0.27	-0.37*
SPRS Relative Report total	-0.16	0.06	-0.02
Occupational activities	-0.44**	-0.34*	-0.43**
Interpersonal relationships	-0.04	-0.32	-0.23
Living skills	-0.17	0.04	-0.03

Note: ** $p < .01$. * $p < .05$

TABLE 4

Spearman's rho Correlations Between Relative-Report CAPM and CAM-PROMPT, MIST and SPRS Scores

	Relative report CAPM scores		
	BADL	IADL	Total
CAM-PROMPT total	-0.10	-0.38*	-0.33*
Time	-0.04	-0.16	-0.14
Event	-0.08	-0.31	-0.28
MIST total	-0.28	-0.46**	-0.41*
Time	-0.17	-0.38*	-0.36*
Event	-0.23	-0.38*	-0.45**
SPRS Self-Report total	-0.20	-0.10	-0.12
Occupational activities	-0.21	-0.11	-0.12
Interpersonal relationships	-0.14	-0.15	-0.14
Living skills	0.02	0.16	0.15
SPRS Relative Report total	-0.60**	-0.48**	-0.52**
Occupational activities	-0.50**	-0.53**	-0.53**
Interpersonal relationships	-0.56**	-0.36**	-0.43**
Living skills	-0.52**	-0.42**	-0.48**

Note: ** $p < .01$, * $p < .05$

correspondence between the cognitive resources tapped in the examination condition, and those tapped in the real world ones (Burgess et al., 1998; Fleming, Doig, & Katz, 2000). If real life situations place higher demands on executive function and the ability to perform multiple tasks than what is required on a standardised assessment, it could be expected that participants would show unimpaired performance on tests but report impaired performance in everyday life. In fact, the opposite scenario was found: Participants reported very few PM failures on the CAPM but demonstrated impairments on neuropsychological testing. Findings from this study showed that the self-report version of the CAPM has poor concurrent validity using neuropsychological assessments as a reference point. Therefore, this demonstrates the importance of not relying solely on self-report measures, but the need to use standardised tests to detect PM impairment following TBI.

Relative reports on the IADL component of the CAPM were found to correlate with total CAM-PROMPT scores and scores on the MIST, indicating that frequent PM failures, as reported by the relative, are related to poor performance on standardised assessments of PM functioning. These findings suggest that the relative version of the CAPM has some concurrent validity when compared with performance on neuropsychological assessments. Goldstein and Polkey (1992) found that relative report scores correlated with objective memory test scores, such as the

Rivermead Behavioural Memory Test. However, it is interesting to note that total CAPM score and IADL score correlate significantly with the neuropsychological measures but not the BADL score, suggesting that the BADL score has less concurrent validity and that less common IADL activities are more sensitive to PM impairment.

Since participants with TBI perceive that their PM failure is less frequent than reported by relatives, and relatives' scores correlate with test performance, then lack of insight may be responsible. Relative reports have been found to be more valid than self-reports of patients with TBI because of impaired self-awareness (Andrews, Hordern, & Kaye, 1998; Sunderland et al., 1984), which refers to the inability to adequately recognise impairments or disabilities that have resulted from the injury. Previous research has suggested that impaired self-awareness may compromise the validity of TBI participants' self-report measures of PM, with TBI participants tending to report levels of PM failure reflective of their premorbid status (Roche et al., 2002). It has, therefore been suggested that relative reports may provide a more objective measure of PM function in participants with a TBI (Fleming et al., 2005). Nonetheless, self-report measures can still be valuable tools for gaining an understanding of a person's everyday memory performance, in contrast to laboratory-based studies (Mateer et al., 1987). Furthermore, the comparison between relative report and self-ratings may provide an

important means for measuring self-awareness of PM that may assist in goal-setting and rehabilitation planning. The findings of the current study support the use of the relative version of the CAPM as a more objective and valid measure of frequency of PM failure.

This study found a significant correlation between self-report total CAPM and BADL scores and level of community integration, indicating that more frequent PM failure was related to lower levels of psychosocial integration. This finding is not surprising considering that BADL are generally over-learned routine tasks that are habitual in nature and may be performed without executive control (Roche et al., 2002). It is expected that a person would be able to perform BADL tasks before having the capacity to reintegrate into the community.

Results showed that self-report scores on the IADL component of the CAPM significantly correlate with total SPRS and relationship scores. Commonly, IADL PM tasks are considered more complex and not as habitual as BADL tasks and place a higher demand on one's executive function (Roche et al., 2002). Since executive function is commonly affected following a frontal lobe lesion, it is not surprising that PM failure occurs in nonroutine (IADL) tasks and can affect a person's ability to maintain interpersonal relationships. Frequent PM failures in IADL tasks such as, forgetting to do the shopping, pay bills, attend appointments, or prepare meals (Roche et al., 2002) may place additional strain and impact upon a person's ability to maintain a personal relationship.

It was found that self-report CAPM scores significantly correlated with relatives' ratings on the work subscale of the SPRS indicating that higher levels of self-reported PM failure relate to a reduced level of productivity, as reported by the relative. Frequent PM failures have the potential to limit a person's independence, which may affect their ability to return to work or to start a new vocation (Fleming et al., 2005). Furthermore, a person with frequent PM failure may be deemed as being an unreliable person (Winograd, 1987), which can impact upon long-term performance in the workplace and job maintenance. Lack of awareness about potential deficits in PM following TBI may cause employers to perceive reduced long-term productivity as low motivation rather than a consequence of the injury itself.

In the current study, relative reports on the CAPM were significantly correlated with relative reports on the SPRS, indicating that frequent

PM failure relates to lower levels of psychosocial integration, as reported by the relative. This finding reflects the consistency in responses across both report measures.

This study has a few limitations based on methodology. First, the scope of the findings for this study is limited, due to the specific exclusion criteria whereby participants were excluded if they demonstrated persistent confusion, had cognitive deficits, and had a premorbid diagnosis of psychiatric or neurological deficits. Findings from this study may only be representative of a population of participants with PM failure functioning at a higher level in the community. Thus, it is difficult to make generalisations of the findings for people with severe impairments. Another limitation to this study could be that the correlations between the CAPM and SPRS could simply reflect the response style of respondents, but other correlations, for example of relative reports with neuropsychological test scores, would suggest otherwise.

Directions for future research include expanding upon the psychometric properties of Section B of the CAPM, which measures the perceived importance of PM memory failure. If health professionals were able to tap into the perceived importance of PM memory failure, this would enable them to collaborate with the client to generate a PM rehabilitation program that targets specific needs of the individual. Furthermore, research into the use of a combination of self-report and neuropsychological measures of PM may assist in determining a more comprehensive means of evaluating PM for adults with TBI for the purposes of intervention planning.

Conclusion

This study aimed to further establish the validity of the CAPM for use with adults with TBI. The findings from this study suggest that self-report ratings do not stand alone as an objective and valid measure for predicting PM impairments. Relative reports on the CAPM better relate to PM functioning and broader psychosocial integration in adults with TBI. It can be concluded that the relative report version of the CAPM showed reasonable concurrent and criterion validity and is a useful tool for assessing frequency of PM failure in adults with TBI. However, further research with a larger sample of participants and a population representing differing degrees of functioning is required to fur-

ther establish the validity of the self-report version of the CAPM for use for adults with TBI.

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