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CLINICAL PSYCHOLOGY & NEUROPSYCHOLOGY | RESEARCH ARTICLE

Exploring the effectiveness of a screening measure to identify subtle cognitive and functional problems in a sample of acquired brain injury patients admitted to a neurological hospital in the UK: A feasibility study

S. Simpson[1*], A. Kaehne[2], J. Martlew[1] and C. Kelly[2]

Abstract: Patients considered asymptomatic after acquired brain injury (ABI) may be exhibiting undetected cognitive deficits which can lead to problems with everyday tasks. Current screening tools focus on cognitive deficits and not functional impact. This cross-sectional feasibility study aimed to explore the use of a bedside screening tool: Cognitive Functional Performance Measure (CFPM). Drawing on occupational therapy theory and principles, the CFPM offers the multi-disciplinary team a unique tool to trigger referral to occupational therapy. A sample of patients with ABI (n = 34) were recruited and their CFPM scores were compared with scores on the Montreal Cognitive Assessment (MoCA) and the Kettle Test. Spearman's rank and Chi-square were used to analyse the data. A moderate correlation was found between the MoCA and CFPM. There was no significant association between the type of ABI and performance on the CFPM. The unique design of the CFPM offers an alternative to existing screening tools, placing emphasis on the identification of cognitive impairment and functional deficits with the ultimate goal to develop a tool that is ecologically valid. Further studies exploring the feasibility and validity of the CFPM is recommended.

ABOUT THE AUTHOR

Suzanne Simpson qualified as an occupational therapist in 2004 from Salford University having completed a Psychology degree at the University of Central Lancashire prior to this. She has worked predominantly in neurosciences for the past eleven years in a variety of settings. Over the years she has developed a specialist interest in neuropsychological deficits following Acquired Brain Injury and the impact they can have on occupational performance and engagement. Suzanne completed a Masters in Research at Edge Hill University funded by the Walton Centre in 2018. Suzanne is currently working on a project exploring the impact of including occupational therapy in a nurse led neurovascular clinic.

PUBLIC INTEREST STATEMENT

An Acquired Brain Injury (ABI) refers to damage to the brain caused by events after birth and can result in physical, cognitive, emotional, or behavioural problems leading to changes in the ability to carry out everyday activities such as work. Brain injury does not always manifest itself in physical problems, the problems can be subtle and difficult to detect. In a hospital ward environment, health professionals can sometimes miss these problems based on general observation of the patient. This feasibility study aimed to explore the clinical use of a uniquely designed screening tool. The Cognitive Functional Performance Measure combines the assessment of individual skills such as memory or attention with a real-life task that requires the application of a variety of cognitive skills. Further studies are needed to establish the validity and reliability of the tool.

Subjects: Cognitive Psychology; Allied Health; Rehabilitation Medicine; Occupational Therapy; Stroke; NeurologicalRehabilitation; Trauma

Keywords: brain injury; occupational therapy; cognitive impairment; functional deficits; assessment; screening tools

1. Background

An acquired brain injury (ABI) is an injury to the brain caused by events after birth (Headway, 2013). Causes can include stroke, tumour, infection or trauma due to a fall or car accident. Stroke and traumatic brain injury (TBI) make up the largest proportion of ABI in the UK (Turner-Stokes, 2003). Over one million people in the UK live with the long-term effects of ABI at an estimated minimum cost of £4.1 billion (Anon, 2015). There were 348,934 admissions to hospital with ABI in the UK in 2013–14 and the number of ABI admissions has increased by 10% since 2005–6 (Headway, 2013). The majority of strokes are neurologically mild to moderate in nature (Wolf, Baum & Connor, 2009; Wolf, Barbee, & White, 2011). The incidence rates for mild TBI per 100,000 population worldwide are between 100 and 300; these mild injuries account for between 70% and 90% of all TBIs (Holm, Cassidy, Carrol, & Borg, 2005).

Research has shown that cognitive impairment often affects the functional outcome more than physical disability (Bugarski, Semnic, Gegaur, & Kozic, 2015). There is growing evidence that patients deemed to have mild ABI go on to have difficulties returning to their previous level of function due to cognitive impairment (Jokinen et al., 2015). Patients with mild ABI are less likely to return to work or do not return to the same level of responsibility or working hours (Van Velzen, Van Bennekom, Edelaar, Sluiter, & Frings-Dresen, 2009; Benedictus, Spikman, & Van Der Naalt, 2010; Fride et al., 2015). ABI can have a significant negative impact on family carers and wider society (Olai, Borgquist, & Svärdsudd, 2015; Centre for Mental Health, 2016; Persson et al., 2015). The concern is many of these patients are perceived to be asymptomatic (Planton et al., 2012). Early intervention for mild ABI patients with cognitive difficulties could result in more positive return to work outcomes (Radford et al., 2013). This highlights the need for more accurate ways of screening for cognitive impairment prior to discharge from hospital in order that patients receive appropriate intervention.

Clinicians struggle to identify subtle cognitive deficits and their functional impact in the acute stage following brain injury (Blackburn, Bafadhel, Randall, & Harkness, 2013). The time given to assess patients is limited with the pressure to discharge patients as soon as they are physically well to ensure available bed capacity. Referrals to occupational therapy are usually made based on physical and cognitive ability established using observations and Glasgow Coma Score (GCS), and an awareness of the patient's social circumstances. The GCS was not designed as a referral tool and does not guarantee the absence of subtle impairments; a patient functioning on a ward may not be able to function once home (Larner, 2008). The development of a comprehensive bedside assessment to identify subtle deficits has been recommended (Wong et al., 2012).

The Montreal Cognitive Assessment (MoCA) (Nasreddine et al., 2005) has been suggested as a screening tool by the National Institute of Neurological Disorders and Stroke–Canadian Stroke Network Vascular Cognitive Impairment Harmonization Standards and by the UK NHS improvements for stroke documents (Blackburn et al., 2013). A recent systematic review explored cognitive screening in subacute stroke examining the convergent, criterion and predictive validity of multi-domain instruments used within four weeks post infarct or haemorrhagic stroke (Van Heugten, Walton & Hentschel, 2015). A total of 51 studies investigating 16 cognitive screening instruments including the MoCA were reviewed. The MoCA was found to significantly predict long-term cognitive impairment and was seen as the best choice at present, but the results for functional outcome were mixed. None of the instruments fulfilled all the validity criteria especially measurement of thinking speed. The heterogeneity of the study methods did not enable a meta-analysis (Van Heugten et al., 2015).

The MoCA's relationship with functional outcome was further explored in one cross-sectional study using patients with mild stroke in the acute setting for which a MoCA cut off of 26 did not identify those who might experience problems in daily functioning after mild stroke (Van Der Wijst, Wright, & Steultjens, 2014). The study compared MoCA scores to scores on The Assessment of Motor and Process Skills (AMPS)—a standardised performance analysis used by trained occupational therapists to establish detailed information about the patient's ability to perform specific daily activity tasks (AMPS UK and Ireland, 2015). They found that age and education had an impact on MoCA scores and a low score did not always correlate with functional impairment. Assessors were blinded to patient's performance on each assessment reducing risk of interviewer bias and the representativeness of the study is reduced by exclusion criteria (Van Der Wjist et al., 2014).

The MoCA has been criticised for having poor correspondence with a neuropsychological test battery, remaining less sensitive to executive dysfunction (Ferguson & Lincoln, 2012). Executive function is used to encompass a variety of complex cognitive processes and sub-processes (Elliott, 2003). Executive function should be an essential component of post-stroke and TBI assessment Schiehser et al., 2011; Poulin, Korner-Bitensky, & Dawson, 2013), but there is a paucity of measures to reliably identify executive dysfunction after stroke (Conti, Sterr, Brucki, & Conforto, 2015). Quality of life studies suggest in order to inform rehabilitation there is a need for structured screening of cognitive impairments, emotional problems, and personal factors (Passier, Rinkel, Lindeman, Post, & Visser-Meily, 2012; Adamit et al., 2015). The purpose of a cognitive screening tool is to detect potential impairments in asymptomatic but potentially at-risk individuals, they should be simple and acceptable to patients and staff (Wald, 2008). They need to be quickly administrable to accommodate the busy acute setting (Blackburn et al., 2013). They are generally designed to be highly sensitive in order to prevent potential impairments being missed (Lees et al., 2014).

2. Cognitive functional performance measure

Traditional neuropsychological tests have demonstrated validity and reliability for assessing cognitive deficits, but were never designed to measure functional deficits (Robertson & Schmitter-Edgecombe, 2017). There is currently a lack of efficient functional cognitive screening assessments which are ecologically valid and designed to be used by the MDT. A measure of this type has the potential to provide a more realistic measurement of functional ability following ABI. Administration by the MDT of such a pre-screening tool in the acute setting, could ensure patients with potentially life changing deficits are referred for further assessment and rehabilitation.

This feasibility study aimed to explore the use of a new measure known as the Cognitive Functional Performance Measure (CFPM) which draws on the core theories and principles of occupational therapy in its design. Feasibility studies allow the researcher to explore the practicality of a proposed study and to identify potential changes in order to improve the design of the main study (Arain, Campbell, Cooper, & Lancaster, 2010). They enable the exploration of an area that has little known knowledge and enable the researcher to identify possible effects and associations that may be worth focusing on in a subsequent larger study (Thabane et al., 2010). This study aimed to establish the potential for implementation, the practicality of using the CFPM in practice and to test the effectiveness of the CFPM using limited-efficacy testing (Bowen et al., 2009). Implementation and practicality are not the focus of this reporting but are referred to in the discussion. Clinicians responsible for administering the CFPM completed usability questionnaires following the completion of the recruitment period. In order to explore the potential efficacy of the CFPM concurrent criterion validity testing was used and will be reported in this paper.

Occupational therapists understanding of cognition is influenced by health science, neuropsychology and the theory of occupational performance (Maskill & Tempest, 2017). Occupational therapists employ a combination of functional activity focused assessments and impairment focused assessments as a means of robustly assessing patient's cognition (Maskill & Tempest, 2017). In an acute setting, occupational therapists may use a combination of personal care tasks and kitchen activities, combined with cognitive screens or standardised assessment batteries to assess patients in order to establish whether a patient is safe for discharge (Smith-Gabai & Holm, 2017; Robertson and Schmitter-Edgecombe 2017; Sansonetti and Hoffman 2013 Robertson & Schmitter-Edgecombe, 2017; Sansonetti & Hoffmann, 2013). This enables them to make inferences about wider functional ability, rehabilitation needs and informs the decision to discharge home (Koh et al., 2009; Korner-Bitensky, Barrett-Bernstein, Bibas, & Poulin, 2011; Pilegaard, PilegaardI, Birn, Kristensen, & Morgan, 2014).

The CFPM uniquely combines neuropsychological subtests taken from traditional screening assessments with a real-life functional task of shopping and money handling. The choice of cognitive subtests was influenced by existing cognitive screening measures used within the occupational therapy department. The CFPM contains 5 subtests with a maximum total score of 30. The neuropsychological subtests were chosen based on their perceived functional relevance by members of the acute occupational therapy service and include orientation, immediate and delayed recall of a name and address, verbal fluency and the clock drawing test. The shopping task requires the patient to identify coins from a coloured photo and calculate the amount, using this money they are asked to identify two items they would purchase from a list of items when presented with a scenario, they are then asked to calculate the change. A score is given depending on the ability to follow the instruction and the patient's reasoning for their choices. As a collective, they are believed to test a variety of skills including verbal understanding, memory, executive function and visuospatial constructive skills. These subtests can provide useful information about the individual's ability to engage in functional activities.

The CFPM is suitable for completion at the bedside and takes approximately 10 minutes to administer and score. The CFPM aims to offer the MDT a simple pre-screening assessment that identifies the need for further functional assessment by an occupational therapist.

3. Methods

3.1. Study setting
A specialist neurological hospital based in the North West of the UK, providing elective and non-elective neurosurgery.

3.2. Study design
Cross-sectional feasibility study. Concurrent criterion validity testing was used to explore the efficacy of the CFPM. Concurrent validity is established by comparing a new measure with an existing measure that is considered to be the gold standard (Gomm, 2008). The CFPM was designed by utilising two approaches to assessing cognitive impairment. There are currently no screening measures available that adopt this format therefore the CFPM had to be compared to two separate measures. The MoCA represented a traditional widely used neuropsychological screening measure and the Kettle Test represented the functional test.

3.3. Ethics
The study was approved by the NHS Research Ethics Committee, REC reference 16/NW/0182.

3.4. Participants
Convenience sample of patients with a diagnosis of TBI or haemorrhagic stroke. See Table 1 for details of the inclusion and exclusion criteria. All patients had a GCS of 15 at the time of enrolment. Patients with TBI and a GCS of 15 were categorised as having a mild TBI if they had been recorded as having a GCS between 13 and 15 on admission. Mild haemorrhagic stroke patients were defined using The World Federation of Neurological Surgeons Grading System for Subarachnoid Haemorrhage or WFNS scale which indicates that patients with a Grade 1 subarachnoid haemorrhage are classed as being GCS 15 and without motor deficits (Rosen & MacDonald, 2005).

Table 1. Inclusion and exclusion criteria

Inclusion Criteria	Exclusion Criteria
Aged between 18–90 years old	A diagnosis of brain tumour
Diagnosis of ABI to include traumatic brain injury and haemorrhagic stroke	A diagnosis of brain infection to include brain abscess and encephalitis
A reported GCS of 15	A diagnosis of hydrocephalus
Independently mobile on the ward	A pre-existing diagnosis of dementia or already known to a memory clinic
Reported to be able to attend to their own personal care to include washing/dressing/toileting without assistance from nursing staff	English not first language

3.5. Procedure

Patients were recruited from May 2016 to the end of February 2017. The majority of patients were identified during normal review by the Trauma Therapy Co-ordinator or Specialist Vascular Nurse depending on diagnosis. If participants met the inclusion criteria the clinicians proceeded with the consent process and administration of the CFPM. Patients were provided with written and verbal information about the research and given a minimum of two hours to consider the information prior to a decision being determined. The CFPM was completed at the bedside, participants were given access to a table in order to complete the written sections of the test. Participants were asked about their hearing and sight prior to assessment to ensure any prescribed hearing aids or glasses were used.

The MoCA and Kettle Test were administered by the occupational therapy team in the department kitchen within 24 hours of completion of the CFPM as far as was feasibly possible and were blinded to the participant's score on the CFPM in order to minimise observer bias. Participants found to have impairment on the CFPM or comparison measures were offered further occupational therapy intervention. Patients found to have "no impairment" were discharged from occupational therapy.

4. Assessments

4.1. Cognitive functional performance measure (CFPM)

The CFPM contains 4 traditional neuropsychological subtests covering a variety of cognitive domains (orientation, memory, verbal fluency and the clock drawing test). The final subtest is a shopping and money handling task and aims to assess functional ability. It has a maximum total score of 30 and takes approximately 10 minutes to administer and score. The trauma therapy co-ordinator and specialist vascular nurses underwent training to ensure standardised administration and interpretation of the CFPM. They were provided with written instructions to help guide this process.

4.2. Montreal cognitive assessment (MoCA) (Nasreddine et al., 2005)

The MoCA uses verbal and written questions covering multiple cognitive domains (orientation, attention, memory, language, visuospatial skills, executive function, verbal fluency and abstract thought) with a total score of 30. The MoCA is the only screen to adjust for education awarding an extra point for <12 years of education. The MoCA comes in alternative languages and has alternative versions for repeated testing. The MoCA is freely available to download and use by appropriately qualified clinicians.

The MoCA was administered by an occupational therapist and required little to no additional training as it was a familiar measure to the occupational therapy department. A cut off of <26 was used as recommended by the literature for the identification of any cognitive impairment (Burton & Tyson, 2015; Wong et al., 2013 Lees et al., 2014).

4.3. The Kettle test (Hartman-Maeir, Harel, & Katz, 2009)

The Kettle Test (Hartman-Maeir, Harel & Katz 2009) instructs the patient to prepare 2 hot drinks, performance is scored based on the level of prompting required, and scoring ranges from 0 to 52 with a higher score indicating functional impairment. Kitchen assessments are regularly carried out in the occupational therapy department and The Kettle Test complemented these practices utilising existing resources. It takes approximately 5–20 minutes to administer, is free to use and the creators provide a user manual free of charge. The descriptive component was not included in this study as the qualitative information generated would not be comparable to the quantitative data collected from the other measures. Permission was gained from the creators not to use this component without invalidating the test. The Kettle Test was administered by an occupational therapist alongside the MoCA following completion of the CFPM.

5. Statistical analysis

This cross-sectional feasibility study aimed to test the criterion validity, specifically the concurrent validity of the CFPM using concurrent criterion testing. Statistical analyses were generated using SPSS for Windows Version 24.0. Scores from the CFPM, MoCA and Kettle Test formed ordinal level data and required the use of non-parametric tests which focus on the rank order and do not assume that the data is normally distributed. Spearman's rank has been reported, this test looks at whether variables change in line with each other. Calculations are based on deviations and it is said to be much more sensitive to error and discrepancies in data (Field, 2014). A difference with a p-value of less than 0.05 was regarded as statistically significant (two-tailed test). An r value close to +1 indicates a positive correlation as one score goes up so does the other. An r value close to −1 indicates that as one goes up the other goes down. An r value close to 0 suggests no relationship, a strong correlation is indicated by a result of ±0.7 or above (Coolican, 1994).

The chi-square test for independence is used to discover if there is a relationship between two categorical variables (Coolican, 1994). This looked for any potential associations between type of brain injury; stroke or TBI and performance on the CFPM, MoCA and Kettle Test.

6. Results

A total of 42 participants were recruited to the study. The study was subject to a total of 8 drop-outs, scores from the remaining 34 participants, 12 females and 22 males were used in the final analysis. Information relating to level of education was missing for one participant. The age of patients ranged from 20 to 84 years old. Participants were split into two groups based on type of injury, 35.3% (n = 12) of patients had a diagnosis of TBI and 64.7% (n = 22) a diagnosis of haemorrhagic stroke. Patients classified as having a TBI had suffered a subdural haematoma (n = 10) or a traumatic subarachnoid haemorrhage (SAH) (n = 2). Out of the 22 patients classified as having a haemorrhagic stroke the majority (n = 20) had a diagnosis of SAH and the remaining patients (n = 2) had a diagnosis of intracerebral haemorrhage. Table 2 provides details of the demographics of the study.

Table 3 provides details of the spread of scores relating to the CFPM, MoCA and Kettle Test. When considering the CFPM 11.8% (n = 4) of the participants scored 30/30, in comparison 58.8% of the sample (n = 20) scored above the cut off of 26 on the MoCA.

The CFPM was compared in its entirety with the MoCA and Kettle Test, but also in its two parts to its corresponding comparison assessment. CFPM A refers to the traditional neuropsychological subtests which equates to a total score of 24 and CFPM B refers to the functional based task which has a total score of 6. There was a significant moderate positive correlation between the CFPM and MoCA (r = .583, N = 34, p < .001, two-tailed). Figure 1 is a scatter plot depicting this correlation. There was no significant correlation between the CFPM and Kettle Test (r = −.307, N = 34, p = .078, two-tailed). There was a significant moderate positive correlation between the CFPM A and MoCA (r = .515, N = 34, p < .001, two-tailed), but only

Table 2. Demographics

Variable	Levels	Number of patients	% of Patients
Gender	Male Female	22 12	64.7 35.3
Age	20–29 30–39 40–49 50–59 60–69 70–79 80+	3 3 6 12 3 4 3	8.9 8.9 16.7 35.2 8.9 11.8 8.9
Age of leaving Education	<16 16–18 >18	11 18 4	33.3 54.5 12.1
Diagnosis	TBI: SDH TSAH Stroke: SAH ICH	12 10 2 22 20 2	35.3 (83.3) (16.7) 64.7 (90.9) (9.1)

SDH: Subdural Haematoma, TSAH: Traumatic SAH, ICH: Intracerebral Haemorrhage

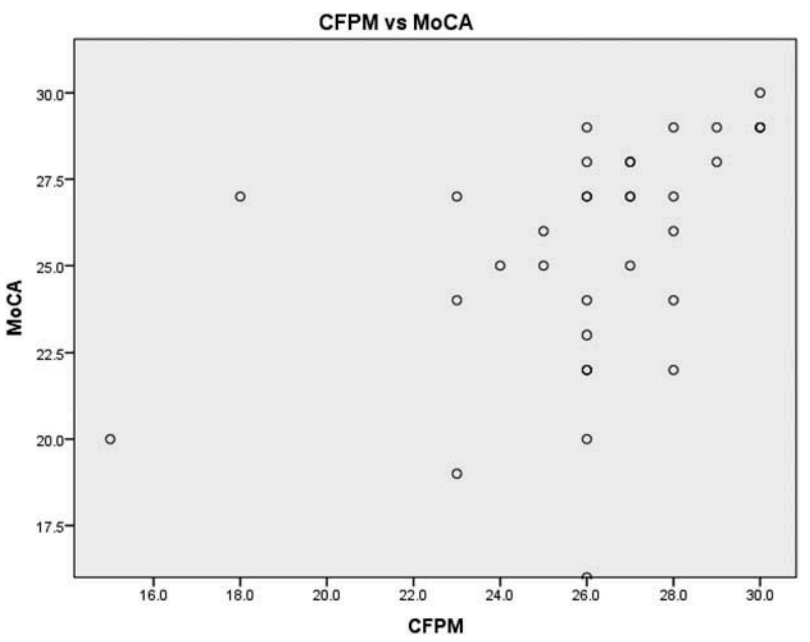
Table 3. Descriptive analysis of the data

Descriptive Statistics

	n	Minimum	Maximum	Mean	Std. Deviation
CFPM	34	15.0	30.0	26.147	3.1347
CFPM A	34	13.0	24.0	21.206	2.5320
CFPM B	34	2.0	6.0	4.824	1.2424
MoCA	34	16.0	30.0	25.529	3.3866
Kettle	34	.0	10.0	2.765	2.1750
Valid N (listwise)	33				

MoCA = Maximum score 30. Kettle Test = Scored out of 52 the higher the score the greater the impairment.

Figure 1. Correlational relationship between the CFPM and MoCA.



a significant weak negative correlation between the CFPM B and Kettle Test ($r = -.345$, $N = 34$, $p < .05$, two-tailed).

There was no significant association between the type of brain injury TBI or stroke, and performance on the CFPM as a whole (χ^2 (9) = 9.187, $p = .420$), the type of brain injury and performance on the CFPM A (χ^2 (7) = 7.493, $p = .379$) and the type of brain injury and performance on the CFPM B (χ^2 (4) = 8.350. $p = .080$). Similarly, there was no significant association between the type of brain injury and performance on the MoCA (χ^2 (11) = 9.865, $p = .543$) or Kettle Test (χ^2 (7) = 9.500, $p = .219$). This indicates that no measure was able to detect a difference between type of injury and performance.

7. Discussion

The CFPM combines two approaches to assessing cognitive impairment, it uniquely incorporates traditional neuropsychological subtests with a functional based task, drawing upon core occupational therapy theories and principles. There are currently no screening measures available that utilise this format therefore the CFPM had to be compared with two separate measures. The MoCA represented a traditional widely used neuropsychological screening measure and the Kettle Test represented the functional based task.

The results suggest the CFPM has a moderate relationship with the MoCA and only a weak relationship with the Kettle Test. The moderate relationship between the MoCA and CFPM was anticipated given that the CFPM uses subtests taken from the MoCA. When considering the CFPM in its two parts neuropsychological subtests (CFPM A) and the functional based task (CFPM B) the results suggest a moderate relationship between the CFPM A and the MoCA and a weak to no relationship between the CFPM B and the Kettle Test.

The CFPM is a unique assessment tool combining two approaches to assessment therefore comparison with other measures is challenging as no equivalent exists. The Kettle Test was chosen chiefly for its ability to fit into existing practice in the occupational therapy department and placed the least amount of time demand on the occupational therapists administering the comparison measures. The choice of this measure is recognised as a limitation of the study. In the original Kettle Test study patients under the age of 60 were excluded (Hartman-Maeir, Harel and Katz, 2009), the mean age of patients in this study was 53 with 12 patients under the age of 50, suggesting the two patient groups were different and potentially not comparable.

A small number of patients (11.8%) gained a maximum score of 30 on the CFPM and would not trigger referral to occupational therapy for further assessment. In comparison over half of the patients (58.8%) would be considered to have normal cognitive function based on a score above the cut off of 26 on the MoCA. More than half the patients in this study would not be seen by an occupational therapist if referral was dependent on impairment being identified by the MoCA. Given that some studies as highlighted earlier have found that the MoCA is unable to determine functional ability it would be right therefore to predict some of these patients would miss out on potentially vital intervention.

The CFPM aims to identify potential deficits particularly in executive functioning that could result in reduced independence in activities of daily living (ADLs) especially return to work. Occupational therapists are able to provide advice and guidance to optimise function, they do not focus solely on cognitive deficits providing education about other extremely common problems such as fatigue which can significantly impact on ADLs (Mollayeva et al., 2014; Egerton, Hokstad, Askim, Bernhardt, & Indredavik, 2015). As part of their intervention, occupational therapists will signpost patients and their family carers to support services such as local support groups or national charities who can support patients in the absence of specialist community services. However, it is unrealistic to expect occupational therapists to assess every patient in the absence of an identified cut off on the CFPM, reinforcing the need for further validation studies.

Keeping people with long-term conditions in work is recognised as a health outcome (Daniel, Wolfe, Busch, & McKevitt, 2009). The economic impact and societal cost of stroke are significant (Saka, McGuire, & Wolfe, 2009). A recent study reviewing current stroke-specific vocational rehabilitation service provision highlighted the current lack of specialist intervention available for patients with mild stroke (55) (Sinclair, Radford, Grant & Terry, 2014). Mild stroke survivors often failed to meet inclusion criteria for community and out-patient rehabilitation services with services tending to favour those with physical deficits. This further highlights the difficulties faced by those with mild, invisible difficulties and emphasises the need for further research into the identification of mild deficits and the development of appropriate interventions to support discharge and beyond.

8. Strengths and limitations

Carrying out research in a clinical setting can be challenging. This project relied on the Specialist Vascular Nurses and Trauma Therapy Team clinicians being trained in how to consent and use the CFPM, integrating the research protocol into their clinical practice, and the occupational therapy team seeing patients in addition to their clinical caseload with limited to no evening or weekend provision of services. As a result, a number of patients were discharged either prior to assessment with the CFPM or prior to completion of the comparison measures. However, despite the challenges, all the teams involved embraced the project reporting it had raised their understanding of appropriate assessment of patients and of the research process itself. The trauma and vascular teams reported increased knowledge of cognitive deficits and that the CFPM provided a unique assessment that was offering patients a more holistic assessment and helping to guide intervention. Both services have now adopted the CFPM to help inform referral to occupational therapy providing them with a focus for discussion, it is recognised that having the opportunity to discuss referrals face to face and in a timely way is unique to the trust where this study took place and not all hospitals have this luxury. This does, however, suggest further validation studies should be recommended as the CFPM demonstrates the potential to be clinically relevant and useful in optimising patient care.

The clinicians reported difficulty with the administration of the shopping task and highlighted that the question sometimes required further clarification. This suggests the study may have been subject to observer bias leading to reduced inter-rater reliability. Future studies would therefore need to explore the training supporting the implementation of the CFPM and examine inter-rater reliability following changes. Future studies with healthy non-neurologically impaired participants would be essential to provide normative data to help with the interpretation of scores. Inclusion of a measurement of thinking speed should be explored including normative time data, as this has been recommended as an essential requirement for assessment tools aiming to identify common cognitive deficits (Van Heugten et al., 2015).

9. Conclusion

Although further feasibility studies are required to develop and validate the CFPM, it raises an important issue regarding the continued need for an ecologically valid screening tool. The CFPM offers a unique approach to screening, placing emphasis on the identification of subtle cognitive and functional deficits following ABI. Clinicians continue to fail to detect subtle deficits using traditional methods such as observation or GCS, which are often used to trigger referral to occupational therapy. Further studies should aim to refine the measure and determine levels of sensitivity and specificity. The inclusion of non-neurologically impaired participants in future studies would provide essential normative data.

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Implications for Rehabilitation
Current screening tools predominately used with patients with brain injury focus on cognitive deficits and not functional impact.
The Cognitive Functional Performance Measure offers the multi-disciplinary team a unique tool to trigger referral to occupational therapy.
There is a need for more ecologically valid assessments as clinicians continue to fail to detect subtle deficits using traditional methods such as observation or GCS.

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