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The Relationship Between Performance On Cognitive Screening Tests And Everyday Functioning In Older Adults With Mild Cognitive Impairment

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Citation
THE RELATIONSHIP BETWEEN PERFORMANCE ON COGNITIVE SCREENING TESTS AND EVERYDAY FUNCTIONING IN OLDER ADULTS WITH MILD COGNITIVE IMPAIRMENT

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A dissertation submitted in partial fulfilment of the requirements for the degree of

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School of Physiotherapy,
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Supervisors: Dr Helen French and Dr Tadhg Stapleton
DECLARATION

I declare that this thesis, which I submit to RCSI for examination in consideration of the award of a Master of Science in Neurology and Gerontology is my own personal effort. Where any of the content presented is the result of input or data from a related collaborative research programme this is duly acknowledged in the text such that it is possible to ascertain how much of the work is my own. I have not already obtained a degree in RCSI or elsewhere on the basis of this work. Furthermore, I took reasonable care to ensure that the work is original, and, to the best of my knowledge, does not breach copyright law, and has not been taken from other sources except where such work has been cited and acknowledged within the text.

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Date: 01/09/2016
SUMMARY

Introduction:

Occupational therapists (OTs) play an important role in evaluating the cognitive and functional abilities of older adults with mild cognitive impairment (MCI) in the acute hospital setting. Cognitive screening tools such as the Montreal Cognitive Assessment (MoCA) and the Addenbrooke’s Cognitive Examination (ACE-III) are regularly administered by acute hospital OTs to assist in predicting the functional capacities of individuals with MCI. However, findings from clinical practice show that performance on cognitive screening tools is not always consistent with functional task performance.

Aims and Objectives:

The aim of the research was to explore the relationship between cognitive test performance and instrumental activity of daily living (IADL) function in older adults with MCI in the acute hospital setting. The objectives of the study were to determine which cognitive screening tool (MoCA or ACE-III) was most strongly related to IADL function, to determine the relationship between individual cognitive subdomains of the MoCA/ACE-III and IADL function and to explore the influence of various cognitive and demographic variables on IADL function.
Methods:

Forty older adults with MCI were recruited from an acute hospital setting for this cross-sectional study. All participants completed cognitive screening tests (MoCA and ACE-III) and an objective measure of everyday functioning (Executive Function Performance Test, EFPT). Correlation and regression analyses were conducted to explore the relationship between cognitive test performance and functional capacity.

Results:

The mean (±SD) age of the participants was 79.9 (±8.1) years with 52.5% (n=21) being female. A low correlation was found between EFPT total scores and MoCA total scores (r= -0.22, p<0.19). A moderate correlation was found between EFPT total scores and ACE-III total scores (r= -0.41, p<0.01). The visuospatial domain of the ACE-III was significantly correlated with EFPT total score (r= -0.54, p< 0.01) and all four subscales of cooking oatmeal (r= -0.53, p<0.01), telephone usage (r= -0.61, p<0.01), medication management (r= -0.50, p<0.01) and bill payment (r= -0.52, p<0.01). In multivariable regression analysis, gender (beta=-0.39, p<0.02) and ACE-III total scores (beta=-0.55, p<0.01) were independently associated with EFPT scores.

Conclusion:

Results demonstrated low-moderate relationships between performance on the MoCA/ ACE-III cognitive screening tests and IADL function as measured by the
EFPT. It is evident that performance on cognitive screening tests alone does not provide the clinician with a definitive evaluation of the functional abilities of older adults with MCI in the acute hospital setting.

**Implications of Findings**

This research provides the clinician with a better understanding of the relationship between performance on cognitive screening tests and functional abilities in older adults with MCI in the acute hospital setting. It highlights the importance of examining cognitive subdomains of screening tests rather than just the overall score. It also supports the value of functional assessment for individuals with MCI. This study demonstrated that the ACE-III was more strongly related to IADL function than the MoCA and this indicates that the ACE-III should be used when assessing individuals with MCI.
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INTRODUCTION

Mild cognitive impairment (MCI) is a condition that results in subtle decline in cognitive abilities (Lin et al., 2012). The cognitive deficits in MCI are not confined to memory and may include impairments in multiple cognitive domains such as attention, executive function and visuospatial abilities (Albert et al., 2011). In addition to cognitive deterioration, individuals with this condition may also experience difficulties in completing instrumental activities of daily living (IADL) such as meal preparation, medication management and use of everyday technology (Aretouli and Brandt, 2010; Marshall et al., 2011; Reppermund et al., 2011; Vermeersch et al., 2015).

Occupational therapists (OTs) play an important role in assessing individuals with MCI in terms of functional abilities and evaluating the impact of cognitive impairment on daily living tasks (Gold, 2012). OTs working in the acute care setting are routinely asked to make judgements regarding the ability of patients with MCI to complete various IADL tasks in order to facilitate their safe discharge from hospital. Functional assessments and psychometric tests are utilised by OTs to determine individuals’ abilities to complete various activities of daily living (ADLs) and to make judgements about their capacity to live independently (Marcotte and Grant, 2009; Vermeersch et al., 2015).

Cognitive screening tools such as the Montreal Cognitive Assessment (MoCA) and the Addenbrooke’s Cognitive Examination (ACE-III) are regularly administered by acute hospital OTs to assist in predicting the functional capacities of this client
group. However anecdotal findings from clinical practice show that performance on cognitive screening tools is not always consistent with functional task performance.

The relationship between cognitive and functional domains has been investigated in a number of studies involving MCI and dementia populations (Baum et al., 1995; De Paula and Malloy-Diniz, 2013; Farias et al., 2003; Perry and Hodges, 2000) which have predominately yielded modest results, with cognitive test performance generally accounting for moderate amounts of variance in functional abilities. The majority of this research has been undertaken in community-dwelling and residential-care settings with no evidence pertaining to hospitalised older adults existing. Previous research investigating the relationship between cognition and function has used a wide variety of neuropsychological tests however there is a paucity of research involving the MoCA and ACE-III tools which are common to OT practice in the acute setting. Furthermore, the majority of previous research studies used informant-based or self-report functional assessments which may be prone to bias.

The current study aims to extend the work of previous research pertaining to the relationship between cognitive and functional domains in MCI. To address the limitations of previous studies, the current study will employ a performance-based measure of functional status (Executive Function Performance Test, EFPT) that is weighted towards cognitively-orientated IADLs. Cognitive screening tools that are routinely administered in OT practice within the acute care setting will be used to assess participants’ cognitive status.
CHAPTER 1 LITERATURE REVIEW

1.1 Mild Cognitive Impairment

1.1.1 Definition and Overview

Mild cognitive impairment (MCI) has been defined as a transitional state between the cognitive changes of normal ageing and the more serious decline of early dementia (Petersen, 2004; Peterson, 2011; Winblad et al., 2004). Approximately 22% of older adults aged 71 years and above have diagnosed MCI with an increasing prevalence evident with advancing age (Brookmeyer et al., 2011). MCI contains several subtypes that assume differences in clinical presentation and progression (Yen-Chi et al., 2011). Clinical subtypes include amnestic-MCI single domain, amnestic-MCI multiple domains, non-amnestic-MCI single domain, and non-amnestic MCI multiple domains (Faucounau et al., 2010). Individuals with MCI exhibit cognitive and functional impairments similar to those that characterise Alzheimer’s disease (AD), although of a milder and usually more focal nature (Okonkwo et al., 2008). MCI populations are at high risk of progressing to dementia and losing functional independence (Reppermund et al., 2011). For those with MCI, the progression to AD or other dementias continues in roughly 20-30% of individuals within three years with a greater transition rate in those with amnestic-MCI single domain or amnestic-MCI multiple domains subtypes (Valcour et al., 2000).
1.1.2 Diagnostic Criteria

The diagnostic criteria for MCI have been controversial, particularly regarding whether functional deficits should be considered a core feature of the condition (Giovannetti et al., 2008). A number of studies have concluded that subtle difficulties on complex daily tasks are common in MCI (Farias et al., 2003; Peterson, 2004; Winblad et al., 2004). Clear diagnostic criteria for MCI has recently been established by the International Working Group on MCI (Winblad et al., 2004) and includes the following: a) presence of subjective cognitive complaints by either the participant or informant b) presence of cognitive impairment in one domain or more based on a threshold equivalent to 1.5 standard deviations or more below published normative data, c) normal or minimally impaired in functional abilities and d) no dementia according to the Diagnostic and Statistical Manual of Mental Disorders (DSM) criteria.

1.2 Cognitive Assessment in MCI

OT theory and research support the principle that cognition is essential to the performance of everyday tasks (Toglia and Kirk, 2000). Cognition refers to the information-processing functions carried out by the brain which include the skills of attention, memory, executive function, comprehension and formation of speech, calculation ability, visual perception and praxis skills (American Occupational Therapy Association, 2013). MCI causes a decline in cognitive abilities including memory, executive functioning, abstract thinking and social cognition (Yanhong et al., 2013). The consequences of cognitive impairment can significantly impact the way in which an individual functions in everyday life (Joliffe et al., 2015).
Controversy exists as to how MCI can be best assessed as there is insufficient evidence to recommend specific cognitive tests and cut-off scores (Winblad et al., 2004). OTs commonly use cognitive tests to assist in making decisions about a person’s ability to perform day-to-day tasks (Vermeersch et al., 2015). Cognitive abilities are assessed under the assumption that they are the underlying foundation skills necessary for successful daily task performance (Joliffe et al., 2015). Therapists often make predictions about an individual’s functional ability based on performance on cognitive screening assessments (Katz et al., 2002). Previous research provides a strong foundation of evidence to suggest that cognitive status shares a strong association with functional status (Brown et al., 2013). However, anecdotal findings from OT clinical practice demonstrate that performance on cognitive screening tests is not always consistent with performance of everyday functional tasks amongst individuals with cognitive impairment. The ability of cognitive tests to predict everyday functional abilities is a strong research interest and clinical necessity (Yantz et al., 2010).

The process of selecting the most appropriate cognitive assessments to use with individuals with MCI is an important consideration (Joliffe et al., 2015). Cognitive screening tools such as the MoCA and the ACE-III are regularly administered by acute hospital OTs to assist in predicting the functional capacities of individuals with MCI. However, few studies have investigated the association between cognitive skills and functional performance using the MoCA and ACE-III. Assessment of cognitive abilities is common practice in the acute hospital context (Joliffe et al., 2015) however there is a significant lack of research examining the link with
cognitive and functional domains amongst individuals with MCI within this clinical setting.

1.3 Functional Assessment in MCI

There is significant research to show that individuals with MCI experience difficulties in their ability to complete IADL tasks (Belchior et al., 2015). Giovannetti et al. (2008) evaluated the degree and pattern of functional deficits in MCI via direct observation of everyday task performance. Individuals with MCI (n=25), mild AD (n=25) and healthy controls (n=18) completed the Naturalistic Action Test (NAT). The NAT involves three everyday tasks of increasing complexity including preparation of toast and coffee, gift-wrapping a present and packing a child’s lunchbox and schoolbag. Results showed that individuals with MCI demonstrated subtle deficits due to the inefficient and imprecise execution of task steps. The authors suggested that the functional deficits in MCI differ in both degree and type from the functional deficits in dementia i.e. individuals with MCI have more difficulty performing steps of tasks accurately (commission errors) however individuals with AD show errors in commission but also in omission. This is in agreement with findings from research by Ciro et al. (2015) which suggested that IADL deficits in MCI were related to adequacy and quality of task performance rather than safety and independence.

A systematic review by Jekel et al. (2015) summarised research results regarding the performance of individuals with MCI in specific IADL tasks compared with individuals who are cognitively normal and/or individuals with dementia. This
systematic review included 37 studies. Results showed that IADLs with higher neuropsychological demand, such as financial capacity, shopping, keeping appointments, driving and everyday technology use were most severely affected in MCI. There was no consensus regarding which IADL domains are typically impaired in MCI, however activities that require higher cognitive processes appear to be affected.

Burton et al. (2009) found that adults with multiple-domain MCI demonstrated poorer IADL function than older adults with no cognitive impairment on the Everyday Problems Test and the Scale of Independent Behaviour-Revised test. They also stated that IADL deficits in MCI may be too subtle to be detected by certain functional assessment measures. Similarly, Gold (2012) and Aretouli and Brandt (2010) suggested that multi-domain MCI was associated with greater functional impairment than single-domain MCI.

Griffith et al. (2003) examined everyday functioning in MCI using a standardised measure of financial capacity. Findings revealed that specific domains of occupational performance were more impaired than others e.g. cheque book management versus transactions. They also found that MCI and control participants differed only on the more complex financial tasks. Interestingly, MCI participants did not differ from controls in their financial knowledge however they were not always capable of applying this knowledge to the task. Furthermore, Rodakowski et al. (2014) found that two functional tasks of shopping and cheque book balancing, measured by the observation-based Performance Assessment of Self-Care Skills, demonstrated increased effort for individuals with MCI.
Functional assessment can assist in judging the clinical significance of impairment in certain neuropsychological tests or domains amongst individuals with MCI (Reppermund et al., 2011). Several options exist for assessing IADL in MCI including informant-report, self-report or performance-based measures. Different methods of assessing functional abilities provide varying estimates of IADL independence and each approach has it’s advantages and disadvantages (Burton et al., 2009).

The majority of studies investigating IADL function in MCI have used self-report or informant-report instruments to assess occupational performance. Informant and self-report assessments show monetary and temporal efficiency in assessing a wide range of activities in a short time period (Gold, 2012). However they can have potential limitations including the risk of reporter bias. Furthermore reporters may not always be able to distinguish different causes of disability and subsequently under or overestimate an individual’s functional abilities (Reppermaud, 2011). Performance-based measures typically involve observing an individual enact an IADL such as meal preparation or medication management. Performance-based assessments have been criticised for removing the individual’s chosen routines and environmental cues that typically facilitate IADL performance (Gold, 2012). However, there is much evidence to show that they may be more valid as there is direct observation of how an individual performs a task with precise definition of IADL deficits (Ciro et al., 2015). They also have the advantage of objectively scoring individuals on their ability to perform everyday activities rather than relying on subjective self-rating or second-party judgement (Reppermund et al., 2011).
A systematic review of 37 studies by Jekel et al. (2015) recommended use of IADL assessment tools specifically designed and validated for patients with MCI. The authors recommend that use of performance-based assessments should be intensified as they allow a valid and reliable assessment of subtle IADL deficits in MCI. Furthermore, a study by Goldberg et al. (2010) demonstrated that performance-based measures of everyday function are sensitive tools in the evaluation of individuals with MCI. Many performance-based functional assessments have been developed in recent years including the EFPT which is a standardised performance-based assessment of functional abilities to complete functional tasks of cooking, telephone usage, medication management and bill payment.

1.4 The Relationship between Cognition and Function

1.4.1 Global Cognitive Screening Tests and Functional Status

The relationship between cognitive and functional domains has been investigated in a number of studies (Baum et al., 1995; De Paula and Malloy-Diniz, 2013; Farias et al., 2003; Perry and Hodges, 2000) which have predominately yielded modest results with neuropsychological performance generally accounting for moderate amounts of variance in function. Previous research demonstrates mixed results regarding the nature of the relationship between cognitive and functional domains in MCI. Although cognition is a strong predictor of everyday functioning, there is still no consensus on the relationship between cognition and ADLs (Vermeersch et al., 2013).
Vermeersch et al. (2015) completed an exploratory study to investigate the relationship between functional decline and cognitive decline in 45 persons with MCI, 48 persons with AD and 50 cognitively healthy controls. Cognitive function was measured using the Mini Mental State Examination (MMSE) and the Cambridge Cognition Examination (CAMCOG). Functional ability was evaluated using three IADL tasks from the Advanced Activities of Daily Living Tool, namely use of everyday technology, driving a vehicle and performing complex economic activities. For the sample as a whole, moderate to strong negative correlations (ranging from $r=-0.276$ to $-0.613$) were found between the cognitive measures and all of the IADL domains. However, within each subgroup, only two significant correlations were found. For the MCI group, no significant correlations were found between cognitive decline and functional decline. This may be due to a loss of statistical power given reduced range and variation of cognitive and functional scores within the difference population groups.

Joliffe et al. (2015) examined if clients’ performances on the Rowland Universal Dementia Assessment Scale (RUDAS) were associated with their functional performance as measured by the Functional Independence Measure (FIM) (n=30). They found that the six RUDAS scale items were significantly associated with FIM total score ($r^2=0.230$, p<0.05), FIM cognition subscale ($r^2=0.35$, p<0.05) and FIM physical subscale ($r^2=0.24$; p<0.05). They concluded that the RUDAS cognitive screen is associated with the functional abilities of older adults with dementia.

Reppermund et al. (2011) examined the differences in IADL between individuals with MCI and cognitively normal elderly people and also examined the relationships
of IADL with cognitive functions. Seven hundred and sixty-two community-dwelling older adults were assessed with a comprehensive neuropsychological test battery and MMSE and the informant-completed Bayer-Activities of Daily Living Scale. Small but statistically significant negative correlations were found between IADL scores and each of the five cognitive domains of memory (r=-0.12, p<0.01), attention/processing speed (r=-0.16, p<0.01), visuospatial (r=-0.09, p<0.01), language (r=-0.14, p<0.01) and executive functions (r=-0.11, p<0.01). Furthermore, results showed that people with MCI have more difficulties in IADL, especially those that require a high demand on cognitive capacities.

Similarly, a systematic review by Royall et al. (2007) identified and compared 68 papers that had reported regression analyses of cognitive measures with functional outcomes. In total, 156 individual regression models comprising 812 unique associations between a cognitive measure and a functional outcome were identified. On average it was found that cognition explained 21% of variance in functional outcomes. Overall, the association between cognitive measures and functional outcomes was modest at best.

1.4.2 Individual Cognitive Subdomains and Functional Status

Previous research has shown that certain cognitive domains such as verbal learning, memory and executive function may be more strongly related to functional status than others (Farias et al., 2003; Okonkwo et al., 2006). Goldberg et al. (2010) found a strong and significant relationship between cognitive domains of processing speed, episodic memory and semantic processing and performance-based functional
assessment score. Reppermund et al. (2011) found associations between deficits in IADL measures and executive function with strong links between memory and psychomotor speed. Lorch and Earland (2015) stated that the primary concerns facing these individuals with MCI are deficits with attention, memory and aspects of executive functioning, as they related to and impact occupational participation and functioning.

Royall et al. (2007) found that executive and general cognitive measures explained significantly more variance in functional outcomes than memory, attention or verbal measures, with simple cognitive screening tests such as the MMSE more strongly associated with functional outcomes than formal neuropsychiatric measures. The authors concluded that executive and general cognitive measures explained significantly more variance in functional outcomes.

In addition, Aretouli and Brandt (2010) investigated the contribution of three domains of executive function to everyday functioning in individuals with MCI (n=124) and cognitively normal elderly participants (n=68). Three domains of executive function included working memory, judgement and planning/problem-solving. Results showed that functional abilities are compromised in all MCI subtypes. Contrary to expectations, only one executive function component, working memory contributed significantly to functional status after controlling for demographic, health-related and other cognitive factors.

Marshall et al. (2011) investigated the relationship between executive function and IADL in a large cohort of cognitively normal controls (n=228), mild cognitive
impairment (n=387) and mild AD participants (n=178). Results demonstrated a significant relationship between executive function deficits and IADL impairment across all subject groups. The relationship was evident even after accounting for degree of memory deficit across the continuum of cognitive impairment and dementia. Furthermore, Bell-McGinty et al. (2002) reported that executive function accounted for 54% of the variability in a performance-based measure of IADL in a sample of older adults.

Schmitter-Edgecombe et al. (2009) evaluated multiple memory processes and explored their contributions to functional deficits in individuals with amnestic and non-amnestic subtypes of MCI. Findings demonstrated that impairments in memory beyond the traditionally assessed content memory were present in individuals with amnestic and non-amnestic MCI. Furthermore, the results showed that these non-content memory processes, which have been linked with executive functioning, play a role in supporting IADL performance. Although there have been a number of studies exploring the relationship between cognitive test performance and IADL function, there has been no research using MoCA or ACE-III. Most IADL instruments were report-based and included a variety of rather simple activities that did not require a high degree of cognitive processing.

1.5 Conclusion

MCI can result in deficits of cognitive and functional abilities. Psychometric tests and functional assessments are regularly used with MCI patients in the acute hospital setting to assist in making decisions regarding their capacity to live independently
and complete various ADLs. However findings from clinical practice and the literature show mixed results regarding the relationship between cognitive test performance and functional status in MCI.

Previous research in this area has many limitations including use of informant or self-report functional measures; use of wide variety of neuropsychological batteries which makes comparison between studies difficult; and lack of research within the acute hospital setting. The current study aims to extend the work of previous research pertaining to the relationship between cognitive and functional domains in MCI. To address the limitations of previous studies, the current study will employ a performance-based measure of functional status (EFPT) which is weighted towards cognitively-demanding IADLs. Cognitive screening tools that are routinely administered in OT practice within the acute care setting will be used to assess participants’ cognitive status.
CHAPTER 2 METHODOLOGY

2.1 Aim and Objectives

The aim of this research was to explore the relationship between cognitive test performance and IADL function in older adults with MCI in the acute hospital setting.

The objectives were:

1. To determine which global cognitive screening tool (MoCA or ACE-III) is most strongly related to IADL function in older adults with MCI.

2. To examine the relationship between individual cognitive subdomains of the MoCA/ ACE-III tests and IADL function in older adults with MCI.

3. To examine the influence of various cognitive and demographic variables on IADL function in older adults with MCI.

2.2 Hypothesis

It was hypothesised that there would be a moderate negative correlation between cognitive test performance and IADL function in older adults with MCI in the acute hospital setting.
2.3 Study Design

This study employed a cross-sectional design to investigate the relationship between cognitive test performance and IADL function in older adults with MCI in the acute hospital setting. The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement guidelines were reviewed during development of the research design to ensure methodological validity (Von Elm et al., 2008).

2.4 Subjects

2.4.1 Sample Selection

Participants were recruited from the Care of the Older Person and General Medical inpatient services within the Mater Misericordiae University Hospital (MMUH). A clinical sample of convenience was used. Recruitment took place over a five-month period between October 2015 and February 2016.

2.4.2 Inclusion and Exclusion Criteria

Inclusion Criteria:

- Diagnosis of MCI according to published criteria by Peterson (2004) and Winblad et al. (2004) with a score of 18-25/30 on MoCA.
- Aged 65 years or older.
- Referred to OT.
- Medically stable.
- Willing and able to provide informed consent.
• Able to comprehend, read and write English.
• Living at home at baseline and participating in at least one IADL.
• Able to engage in functional assessment at time of recruitment with maximum physical support level of assistance of one.

Exclusion Criteria:

• Presence of delirium according to Diagnostic and Statistical Manual of Mental Disorders (DSM-5) criteria (American Psychiatric Association, 2013).
• Diagnosis of dementia according to DSM-5 criteria (American Psychiatric Association, 2013).
• Communicative or sensory impairment that could significantly interfere with ability to engage in assessments.
• Neurological disorder that could affect cognition e.g. cerebrovascular accident, traumatic brain injury, multiple sclerosis, Parkinson’s disease.
• Major psychiatric disorder affecting cognition.
• History of substance (drug or alcohol) abuse.
• Developmental disability.

2.4.3 Sample Size

The sample size calculation was derived from previously published data for studies that produced statistically significant results pertaining to the psychometric properties of the EFPT (Baum et al., 2008; Cederfeldt et al., 2011; Cederfeldt et al.,
The mean number of participants used in these studies was calculated at \( n=37.66 \). The current study had a sample size of \( n=40 \). In addition, Conroy (2009) recommended a sample size of 40 to detect a correlation of 0.55 or greater for a study powered at 95%.

### 2.5 Ethical Considerations

Ethical approval was sought from the MMUH and RCSI Research Ethics Committees (Appendix 1). Recruitment commenced following written approval from both ethics committees (Appendix 2 and Appendix 3). All data were collected in accordance with the Declaration of Helsinki (World Medical Association, 2013) and stored under the Data Protection Act (2003) and the Data Protection Guidelines on Research in the Health Sector Act (2007). To ensure confidentiality, each participant was given a unique code. This was then used as the only identifiable marker on all hard copy record sheets and electronic records. The primary researcher had access to a separate Excel file, which linked the codes to the participants. Electronic records were stored on a secure encrypted USB flash drive and a password-protected desktop computer in the MMUH. Paper records and the encrypted USB flash drive were stored in a locked filing cabinet in the OT department at the MMUH. Data will be stored securely for five years and thereafter destroyed in accordance with the ethics committee policy.
2.6 Procedure

2.6.1 Informed Consent

The selection criteria were applied to all patients referred to OT from the Care of the Older Person and General Medical inpatient services within the MMUH. Eligible participants were invited to participate in the study by a gatekeeper who was an OT colleague working in the Care of the Older Person or General Medical service. The gatekeeper provided eligible participants with a participant information leaflet (Appendix 4) outlining the purpose of the study. These potential participants were given a 24-hour period of time to allow comprehension of the information provided. Potential participants were then approached by the primary researcher who provided additional study details and answered specific questions as required. If participants agreed to take part in the study, they were asked to sign a participant consent form (Appendix 5). Once informed consent was gained, the primary researcher began data collection. Participants were made aware of their ethical right to withdraw from the study at any time without any consequences or influence on further treatment. A letter of notification was sent to each participant’s consultant (Appendix 6) to inform them of the patient’s decision to partake in the study.

2.6.2 Pilot Study

A pilot study was completed prior to the main study. Two participants were recruited and assessed by the primary researcher for the purpose of the pilot study. This allowed the primary researcher to estimate the amount of time required to collect data, to test the clinical assessment tools, to trial the data collection form and to
identify unforeseen limitations to the research design. No changes to the study protocol were made following the pilot study and therefore this data were included in the final statistical analysis.

2.6.3 Assessment Process

Demographic and baseline clinical information were obtained from the participant’s medical chart by the primary researcher. This included age, gender, education level, presenting complaint, number of co-morbidities, number of medications and social history. This information was recorded in the data collection form (Appendix 7). The primary researcher administered all of the clinical assessments to ensure the assessment process was standardised. The clinical assessment measures used in the study consisted of the MoCA (Appendix 8), the ACE-III (Appendix 9) and the EFPT (Appendix 10). Training in administering and scoring the assessments was not required as the primary researcher was experienced in using the tools in routine clinical practice. In some cases, a cognitive screen (MoCA or ACE-III) had already been conducted with participants by their treating OT prior to their enrollment in the study. In such cases, the primary researcher administered an alternative version of the cognitive screening test with participants during data collection to eliminate possible learning effects.

The clinical assessment tools were administered over two sessions to minimise the effects of participant fatigue. The assessment process was standardised and all clinical evaluations were administered according to standardised test instructions.
The cognitive screening tests (MoCA and ACE-III) were administered in the first session which took place in a quiet environment on the ward and lasted approximately 20-30 minutes. The second session was completed the following day and involved administration of the functional assessment (EFPT). The second session took place in the OT department and lasted approximately 30-45 minutes.

2.6.4 Description of Service

Participants received routine OT input in the acute hospital setting during the course of the study consisting of comprehensive assessment, patient-centered goal-setting, intervention and discharge planning. This was in the context of a multidisciplinary team service consisting of input from the medical team, nursing staff and health and social care professionals as appropriate.

2.7 Clinical Assessment Tools

2.7.1 The Executive Function Performance Test (EFPT)

The Executive Function Performance Test (EFPT; Baum et al., 2003) is a performance-based standardised assessment of functional capacity. It can help OTs to determine the level of support needed by people with cognitive impairments to complete IADLs (Baum et al., 2008). The tool serves three main purposes: a) to determine which executive functions are impaired, b) to determine an individual’s capacity for independent functioning and c) to determine the amount of assistance required for task completion (Baum et al., 2007). It is composed of four real-world
tasks that are necessary to support independent living namely cooking, telephone usage, medication management and bill payment (Gillen, 2009). It takes approximately 30-45 minutes to administer. The tool uses a structured cueing and scoring system to assess cognitive skills and functional abilities. The total score range is 0-100 with higher scores indicating more severe deficits. The EFPT has been validated in studies with various populations including people with dementia (Baum and Edwards, 1993), multiple sclerosis (Goverover et al., 2009), stroke (Baum et al., 2008; Cederfeldt et al., 2011; Cederfeldt et al., 2015) and schizophrenia (Katz et al., 2007). It has excellent inter-rater reliability (ICC=0.91) and internal consistency (\( \alpha =0.94 \)) (Baum et al., 2008).

2.7.2 The Montreal Cognitive Assessment (MoCA)

The MoCA is a brief cognitive screening test that was developed by Nasreddine et al. (2005) to assist health care professionals in the detection of MCI. This tool is widely used in international clinical practice to evaluate cognitive skills (Julayanont et al., 2012). It requires approximately 10 minutes to administer and one minute to score. The total possible score is 30 points with a score of 26 or above considered normal (Nasreddine et al., 2005). The tool assesses multiple cognitive domains including attention, concentration, executive functions, memory, language, visuospatial skills, conceptual thinking, calculation and orientation (Trzepacz et al., 2015). It has high sensitivity (average 86\%, range 77\%-96\%) and specificity (average 88\%, range 50\%-98\%) for detecting MCI and AD (Julayanont et al., 2012). It has excellent test-retest reliability (\( r=0.92 \)) and good internal consistency (\( \alpha =0.83 \)) within a MCI population (Nasreddine et al., 2005).
2.7.3 *The Addenbrooke’s Cognitive Examination (ACE-III)*

The ACE-III was developed by Hsieh et al. (2013) to provide a brief cognitive test sensitive to the early stages of dementia. It is an updated version of the previous Addenbrooke’s Cognitive Examination-Revised (ACE-R) which is one of the most widely used cognitive assessments in routine clinical practice with geriatric populations (Larner, 2007; Mioshi et al., 2006). The tool takes approximately 15 minutes to administer and five minutes to score. The total score is 100 and the cut-off for dementia is 82-88/100 (Crawford et al., 2012). It assesses five cognitive domains of attention, memory, verbal fluency, language and visuospatial abilities. The ACE-III correlates significantly with the ACE-R (r=0.99), demonstrating similar levels of sensitivity (93%-100%) and specificity (96%-100%) for detecting dementia (Hsieh et al., 2013). The ACE-III has excellent internal reliability (α=0.88-0.93) and inter-rater reliability (ICC=0.98) (Hseih et al., 2013; Matias-Guiu, 2015).

2.8 **Statistical Methods**

The Statistical Package for the Social Sciences (SPSS) Version 22.0 for Windows (IBM Corp., 2013) was used to analyse the data. Data were examined for normality using skewness and kurtosis values, normal probability plots, histograms and the Shapiro-Wilk’s test. Descriptive statistics were used to describe the demographic and clinical characteristics of the group, using parametric and non-parametric methods as appropriate.
Spearman’s rank-order correlation coefficient test for non-parametric data was used to examine the relationship between IADL function and cognitive test performance. Cohen (1988) criteria were used to determine the strength of the relationships between variables where 0.01-0.29 was considered a small correlation, 0.30-0.49 was considered a moderate correlation and 0.50-1.0 was considered a large correlation. Spearman’s rank correlation coefficient was also used to examine the relationship between IADL function and individual cognitive subdomains of the MoCA and ACE-III tests.

Univariable linear regression analysis was carried out to examine the influence of various demographic and cognitive variables on IADL function. Variables that were significant at the 0.15 level in the univariable regression analysis were entered into a multivariable linear regression model. McCowan et al. (2011) stated that variables must have a p-value of ≤ 0.15 in univariable analysis to be entered into a multivariable model. The multivariable regression model was used to examine whether any of the cognitive and demographic factors were independently associated with IADL function. All tests (with the exception of the univariable analyses) were completed with a 0.05 level of significance. The results are presented in Chapter Three.
CHAPTER 3 RESULTS

3.1 Introduction

The aim of this research was to explore the relationship between cognitive test performance and IADL function in older adults with MCI in the acute hospital setting.

The objectives were:

1. To determine which global cognitive screening tool (MoCA or ACE-III) is most strongly related to IADL function in older adults with MCI.

2. To examine the relationship between individual cognitive subdomains of the MoCA/ACE-III tests and IADL function in older adults with MCI.

3. To examine the influence of various cognitive and demographic variables on IADL function in older adults with MCI.

3.2 Participant Flow

Recruitment took place from October 2015 to February 2016. Fifty-three patients were identified by gatekeepers as eligible for inclusion in the study and provided with information leaflets. Forty-seven patients consented to participate in the research. The final study sample consisted of 40 participants. The flow of patients through the study is outlined in Figure 3.1.
3.3 Demographic Characteristics of Participants

The mean (±SD) age of the participants was 79.9 (±8.1) years with 52.5% (n=21) being female. Seventy-five percent (n=30) of participants were recruited from general medical wards and 25% (n=10) from the care of the older person service. The median (IQR) number of comorbidities of the sample was 4 (2). The participants required a mean (±SD) of 8.4 (±3.4) medications and 85% had polypharmacy (taking
>4 medications). Seventy percent (n=28) of the sample lived alone. Of the 30% (n=12) who lived with others, 15% (n=6) lived with a spouse, 10% (n=4) lived with offspring and 5% (n=2) lived with a sibling.

### Table 3.1 Demographic characteristics of participants (n=40)

<table>
<thead>
<tr>
<th>Demographic Characteristics</th>
<th>Mean (±SD)</th>
<th>79.9 (±8.1) years</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gender/ Sex</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td></td>
<td></td>
</tr>
<tr>
<td>52.5% (n=21)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>47.5% (n=19)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Nationality</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Irish</td>
<td></td>
<td></td>
</tr>
<tr>
<td>English</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Scottish</td>
<td></td>
<td></td>
</tr>
<tr>
<td>92.5% (n=37)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.0% (n=2)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.5% (n=1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Presenting condition</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fall/ collapse</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Respiratory condition</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Functional decline</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cardiac condition</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Back pain</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cancer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Osteoarthritis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Venous leg ulceration</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other: GI bleed, bleeding permcath site</td>
<td></td>
<td></td>
</tr>
<tr>
<td>32.5% (n=13)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>22.5% (n=9)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12.5% (n=5)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.5% (n=3)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.0% (n=2)</td>
<td></td>
<td></td>
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<tr>
<td>5.0% (n=2)</td>
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<td></td>
</tr>
<tr>
<td>5.0% (n=2)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.0% (n=2)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Recruitment source</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>General medicine</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Care of the older person</td>
<td></td>
<td></td>
</tr>
<tr>
<td>75.0% (n=30)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>25.0% (n=10)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Highest education level attained</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Primary</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Secondary</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Third level</td>
<td></td>
<td></td>
</tr>
<tr>
<td>40.0% (n=16)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>52.5% (n=21)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.5% (n=3)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Marital status</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Widowed</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Single</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Married</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Divorced/ separated</td>
<td></td>
<td></td>
</tr>
<tr>
<td>45.0% (n=18)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>30.0% (n=12)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15.0% (n=6)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10/0% (n=4)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Living status</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lives alone</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lives with others</td>
<td></td>
<td></td>
</tr>
<tr>
<td>70.0% (n=28)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>30.0% (n=12)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Self-reported cognitive impairment</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td></td>
<td></td>
</tr>
<tr>
<td>95.0% (n=38)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.0% (n=2)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Number of comorbidities</strong></td>
<td>Median (IQR)</td>
<td>4 (2)</td>
</tr>
<tr>
<td><strong>Number of medications</strong></td>
<td>Mean (±SD)</td>
<td>8.4 (±3.4)</td>
</tr>
</tbody>
</table>

GI=gastro-intestinal; IQR = interquartile range; n= number of participants; SD = standard deviation
Approximately 32% (32.5%, n=13) of participants were admitted following a fall or collapse. Respiratory-related conditions accounted for 22.5% (n=9) of presenting conditions and functional decline accounted for 12.5% (n=5) of the sample. Forty percent (n=16) of the sample achieved primary level education, 52.5% (n=21) continued to secondary level and only 7.5% (n=3) progressed to third level education. Ninety-five percent (n=38) of participants reported subjective cognitive deficits. Full details regarding the demographic characteristics of participants are provided in Table 3.1.

### 3.4 Clinical Characteristics of Participants

The median (IQR) MoCA total score for the sample was 20(4) whereby the score range is 0-30 and higher scores indicate better cognitive performance. The median ACE-III total score was 70 (17) whereby the score range is 0-100 and higher scores indicate better cognitive functioning. The mean (±SD) EFPT total score was 23.34 (±9.0) whereby the score range is 0-100 and lower scores are indicative of better functional performance. Participants had greatest difficulty with the EFPT subtask of bill payment with a mean (±SD) score of 8.92 (±3.0). Participants had least difficulty with the EFPT subtask of medication management with a mean (±SD) score of 4.18 (±2.32). A clinical profile of participants’ cognitive and functional assessment scores is presented in Table 3.2.
Table 3.2 Clinical characteristics of participants (n=40)

<table>
<thead>
<tr>
<th>Cognitive and Functional Assessment Scores</th>
<th>Mean (SD)</th>
<th>Median (IQR)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MoCA total score (0-30)</td>
<td>20.33 (±2.02)</td>
<td>20 (4)</td>
</tr>
<tr>
<td>MoCA subtest scores:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Visuospatial/ executive (0-5)</td>
<td>2.4 (±0.90)</td>
<td>2 (1)</td>
</tr>
<tr>
<td>Naming (0-3)</td>
<td>2.3 (±0.80)</td>
<td>2.5 (1)</td>
</tr>
<tr>
<td>Attention (0-6)</td>
<td>5.33 (±0.97)</td>
<td>6 (1)</td>
</tr>
<tr>
<td>Language (0-3)</td>
<td>1.95 (±0.55)</td>
<td>2 (0)</td>
</tr>
<tr>
<td>Abstraction (0-2)</td>
<td>1.5 (±0.55)</td>
<td>2 (1)</td>
</tr>
<tr>
<td>Delayed recall (0-5)</td>
<td>0.90 (±1.30)</td>
<td>0 (2)</td>
</tr>
<tr>
<td>Orientation (0-6)</td>
<td>5.28 (±0.75)</td>
<td>5 (1)</td>
</tr>
<tr>
<td>ACE-III total score (0-100)</td>
<td>65.98 (±9.81)</td>
<td>70 (17)</td>
</tr>
<tr>
<td>ACE-III subtest scores:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Attention/ orientation (0-18)</td>
<td>14.18 (±2.57)</td>
<td>14.5 (4)</td>
</tr>
<tr>
<td>Memory (0-26)</td>
<td>15.38 (±5.06)</td>
<td>16 (7.75)</td>
</tr>
<tr>
<td>Fluency (0-14)</td>
<td>5.58 (±2.27)</td>
<td>5 (3.75)</td>
</tr>
<tr>
<td>Language (0-26)</td>
<td>18.75 (±4.20)</td>
<td>19.5 (6.75)</td>
</tr>
<tr>
<td>Visuospatial (0-16)</td>
<td>11.35 (±1.70)</td>
<td>11 (3)</td>
</tr>
<tr>
<td>EFPT total score (0-100)</td>
<td>23.34 (±9.0)</td>
<td>23.5 (11)</td>
</tr>
<tr>
<td>EFPT task scores:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Simple cooking (0-25)</td>
<td>5.55 (±2.88)</td>
<td>5 (5)</td>
</tr>
<tr>
<td>Telephone usage (0-25)</td>
<td>4.68 (±2.16)</td>
<td>5 (2.25)</td>
</tr>
<tr>
<td>Medication management (0-25)</td>
<td>4.18 (±2.32)</td>
<td>4 (4)</td>
</tr>
<tr>
<td>Bill payment (0-25)</td>
<td>8.92 (±3.0)</td>
<td>9 (4)</td>
</tr>
<tr>
<td>EPFT construct scores:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Initiation (0-20)</td>
<td>0.61 (±1.39)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>Organisation (0-20)</td>
<td>2.61 (±2.42)</td>
<td>2 (3)</td>
</tr>
<tr>
<td>Sequencing (0-20)</td>
<td>10.45 (±2.87)</td>
<td>11 (4.25)</td>
</tr>
<tr>
<td>Judgement and safety (0-20)</td>
<td>6.71 (±2.78)</td>
<td>6.5 (4)</td>
</tr>
<tr>
<td>Completion (0-20)</td>
<td>2.97 (±1.95)</td>
<td>3 (3)</td>
</tr>
</tbody>
</table>

ACE-III = Addenbrooke’s Cognitive Examination; EFPT = Executive Function Performance Test; IQR = interquartile range; MoCA = Montreal Cognitive Assessment; SD = standard deviation. Note: MoCA\textsuperscript{1} – higher scores indicate better cognitive performance; ACE-III\textsuperscript{2} – higher scores indicate better cognitive performance; EFPT\textsuperscript{3} – lower scores indicate better functional performance.
3.5 Correlations between EFPT and Cognitive Screening Tests

The correlation between EFPT total scores and MoCA/ACE-III total scores was calculated using Spearman’s rank-order correlational coefficient test for non-parametric data. A p-value of less than 0.05 was considered to indicate statistical significance and all reported p-values were two-sided. Results showed a small non-significant negative correlation between EFPT total scores and MoCA total scores ($r = -0.22$, $p < 0.19$). There was a moderate negative significant correlation between EFPT total scores and ACE-III total scores ($r = -0.41$, $p < 0.05$). Table 3.3 shows Spearman’s correlations between EFPT total scores and cognitive screening test total scores. Furthermore, Figures 3.2 and 3.3 show scatter plot diagrams of the relationship between EFPT total scores and MoCA/ACE-III total scores.

<table>
<thead>
<tr>
<th>Cognitive Screens</th>
<th>Correlation Coefficient</th>
<th>Sig</th>
<th>Intensity of Correlation</th>
</tr>
</thead>
<tbody>
<tr>
<td>MoCA</td>
<td>-0.22</td>
<td>0.19</td>
<td>Small negative</td>
</tr>
<tr>
<td>ACE-III</td>
<td>-0.41</td>
<td>0.05**</td>
<td>Moderate negative</td>
</tr>
</tbody>
</table>

ACE-III = Addenbrooke’s Cognitive Examination; EFPT= Executive Function Performance Test; MoCA = Montreal Cognitive Assessment; Sig = significance.

** Correlation is significant at the 0.05 level (2-tailed).
Figure 3.2  Scatter plot diagram of the relationship between EFPT total scores and MoCA total scores

Figure 3.3  Scatter plot diagram of the relationship between EFPT total scores and ACE-III total scores
3.6 Correlations between EFPT Scores and Cognitive Subdomains of the MoCA and ACE-III

Spearman’s rank-order correlational coefficient was used to examine the relationship between EFPT scores and individual cognitive subdomains of the MoCA and ACE-III tests. There were significant moderate negative correlations between the visuospatial/ executive subdomain of the MoCA and EFPT total score (r= -0.35, p< 0.03), cooking oatmeal (r= -0.32, p<0.05), telephone usage (r= -0.37, p<0.02) and bill payment (r= -0.37, p<0.02) subscales. The memory domain of the ACE-III also showed significant moderate negative correlations with EFPT total score (r= -0.44, p<0.01), cooking oatmeal (r= -0.35, p<0.03) and bill payment (r= -0.33, p<0.05) subscales. Furthermore, there were significant large negative correlations between the visuospatial section of the ACE-III and EFPT total score (r= -0.54, p< 0.01) and all four subscales of cooking oatmeal (r= -0.53, p<0.01), telephone usage (r= -0.61, p<0.01), medication management (r= -0.50, p<0.01) and bill payment (r= -0.52, p<0.01) subscales. Table 3.4 shows Spearman’s correlations between EFPT scores and individual cognitive subdomains of the MoCA and ACE-III.
Table 3.4  Correlations between EFPT and individual cognitive subdomains of the MoCA and ACE-III Tests

<table>
<thead>
<tr>
<th></th>
<th>Cooking Oatmeal</th>
<th>Telephone Usage</th>
<th>Medication Management</th>
<th>Bill Payment</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>MoCA</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Visuospatial/ Executive</td>
<td>-0.32*</td>
<td>-0.37*</td>
<td>-0.24</td>
<td>-0.37*</td>
<td>-0.35*</td>
</tr>
<tr>
<td>Naming</td>
<td>-0.04</td>
<td>-0.08</td>
<td>0.04</td>
<td>-0.01</td>
<td>-0.02</td>
</tr>
<tr>
<td>Attention</td>
<td>0.04</td>
<td>0.11</td>
<td>-0.06</td>
<td>0.02</td>
<td>0.11</td>
</tr>
<tr>
<td>Language</td>
<td>-0.04</td>
<td>-0.05</td>
<td>-0.04</td>
<td>0.13</td>
<td>0.08</td>
</tr>
<tr>
<td>Abstraction</td>
<td>0.13</td>
<td>-0.03</td>
<td>-0.05</td>
<td>0.04</td>
<td>0.10</td>
</tr>
<tr>
<td>Delayed Recall</td>
<td>-0.09</td>
<td>0.24</td>
<td>-0.05</td>
<td>-0.02</td>
<td>-0.06</td>
</tr>
<tr>
<td>Orientation</td>
<td>-0.15</td>
<td>0.04</td>
<td>-0.20</td>
<td>-0.10</td>
<td>-0.14</td>
</tr>
<tr>
<td>Total</td>
<td>-0.26</td>
<td>-0.06</td>
<td>-0.28</td>
<td>-0.25</td>
<td>-0.22</td>
</tr>
<tr>
<td><strong>ACE-III</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Attention/orientation</td>
<td>-0.10</td>
<td>0.07</td>
<td>-0.12</td>
<td>-0.07</td>
<td>-0.03</td>
</tr>
<tr>
<td>Memory</td>
<td>-0.35*</td>
<td>-0.30</td>
<td>-0.29</td>
<td>-0.33*</td>
<td>-0.44**</td>
</tr>
<tr>
<td>Fluency</td>
<td>-0.09</td>
<td>-0.01</td>
<td>0.13</td>
<td>-0.01</td>
<td>0.02</td>
</tr>
<tr>
<td>Language</td>
<td>-0.24</td>
<td>-0.26</td>
<td>-0.13</td>
<td>-0.31</td>
<td>-0.26</td>
</tr>
<tr>
<td>Visuospatial</td>
<td>-0.53**</td>
<td>-0.61**</td>
<td>-0.50**</td>
<td>-0.52**</td>
<td>-0.54**</td>
</tr>
<tr>
<td>Total</td>
<td>0.43**</td>
<td>-0.33*</td>
<td>-0.28</td>
<td>-0.42**</td>
<td>-0.41**</td>
</tr>
</tbody>
</table>

ACE-III = Addenbrooke’s Cognitive Examination; EFPT = Executive Function Performance Test; MoCA = Montreal Cognitive Assessment

** Correlation is significant at the 0.01 level (2-tailed).
* Correlation is significant at the 0.05 level (2-tailed).

3.7  The Influence of Various Cognitive and Demographic Factors on EFPT Scores

Univariable linear regression analysis was conducted to explain the relationship between EFPT scores and the independent variables of age, gender, education level, number of medications, number of comorbidities, MoCA total score and ACE-III.
total score. ACE-III total scores explained 19% of variance in EFPT scores as indicated by the highest $r^2$ value. The independent variables of age and gender explained 11% and 10% of variance respectively in participants’ EFPT scores. MoCA total scores explained just 6% of variance in the EFPT. This means that 94% of variance in EFPT scores can be attributed to factors other than those captured in the MoCA test. Table 3.5 shows full details of the univariable regression analysis.

Table 3.5  Univariable linear regression analysis examining the influence of various cognitive and demographic variables on EFPT scores

<table>
<thead>
<tr>
<th></th>
<th>R</th>
<th>$r^2$</th>
<th>%</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>0.33</td>
<td>0.11</td>
<td>11%</td>
<td>0.04*</td>
</tr>
<tr>
<td>Gender</td>
<td>0.32</td>
<td>0.10</td>
<td>10%</td>
<td>0.05*</td>
</tr>
<tr>
<td>Education</td>
<td>0.17</td>
<td>0.03</td>
<td>3%</td>
<td>0.32</td>
</tr>
<tr>
<td>No. of Medications</td>
<td>0.14</td>
<td>0.02</td>
<td>2%</td>
<td>0.42</td>
</tr>
<tr>
<td>No. of Comorbidities</td>
<td>0.08</td>
<td>0.01</td>
<td>1%</td>
<td>0.64</td>
</tr>
<tr>
<td>MoCA Total Score</td>
<td>0.25</td>
<td>0.06</td>
<td>6%</td>
<td>0.13*</td>
</tr>
<tr>
<td>ACE-III Total Score</td>
<td>0.43</td>
<td>0.19</td>
<td>19%</td>
<td>0.01*</td>
</tr>
</tbody>
</table>

EFPT = Executive Function Performance Test; $r =$ correlation coefficient; $r^2 =$ coefficient of determination; p-value = significance; $\% =$ percentage shared variance, No= number

*Variable is significant at the 0.15 level.
3.8 Multivariable Regression Model

Independent variables of age, gender, ACE-III total score and MoCA total score were entered into a multivariable linear regression model as they were significant at the 0.15 level in the univariable regression analysis. The multivariable regression model was used to examine whether any of these cognitive or demographic factors were independently associated with EFPT scores. These independent variables together explained 35% of the variability in EFPT scores, meaning that 65% of variance in EFPT scores was attributed to factors other than age, gender, ACE-III total scores and MoCA total scores. Variables of gender (beta=-0.39, p<0.02) and ACE-III total score (beta=-0.55, p<0.01) remained significantly independently associated with EFPT scores in the multivariable linear regression analysis. Table 3.6 shows the multivariable model.

<table>
<thead>
<tr>
<th></th>
<th>Beta-Coefficient</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>0.07</td>
<td>0.66</td>
</tr>
<tr>
<td>Gender</td>
<td>-0.39</td>
<td>0.02*</td>
</tr>
<tr>
<td>ACE-II total score</td>
<td>-0.55</td>
<td>0.01**</td>
</tr>
<tr>
<td>MoCA total score</td>
<td>0.16</td>
<td>0.39</td>
</tr>
</tbody>
</table>

ACE-III= Addenbrooke’s Cognitive Examination; MoCA= Montreal Cognitive Assessment

* Correlation is significant at the 0.05 level (2-tailed).

** Correlation is significant at the 0.01 level (2-tailed).
3.9 **Summary of Results**

- Low correlations were observed between EFPT total scores and overall performance on the MoCA cognitive screen.

- Significantly moderate correlations were observed between EFPT total scores and overall performance on the ACE-III cognitive screen.

- The visuospatial/executive domain of the MoCA was significantly moderately correlated to EFPT total score along with subscales of cooking oatmeal, telephone usage and bill payment.

- The memory domain of the ACE-III was significantly moderately correlated to EFPT total score and subscales of cooking oatmeal and bill payment.

- The visuospatial domain of the ACE-III was significantly largely correlated to EFPT total score and all four subscales of cooking oatmeal, telephone usage, medication management and bill payment.

- Variables of gender and ACE-III total scores were significantly independently associated with EFPT scores in a multivariable regression model.

- The results of the study will be discussed in greater detail in Chapter 4.
CHAPTER 4 DISCUSSION

4.1 Introduction

The aim of the current study was to explore the relationship between cognitive test performance and IADL function in older adults with MCI in the acute hospital setting. The results demonstrated low-moderate correlations between EFPT total scores and MoCA/ACE-III total scores. The visuospatial component of the ACE-III tool was consistently and largely correlated with EFPT total scores and all four subscale scores. Domains of memory and executive function were also moderately correlated with IADL performance as measured by the EFPT. A multivariable regression model showed that variables of gender and ACE-III total scores were significantly independently associated with EFPT scores.

4.2 Review of Participants’ Demographic Characteristics

The baseline demographic characteristics of the study participants were comparable to related studies (Aretouli and Brandt, 2010; Reppermund et al., 2011; Vermeersch et al., 2015). Similar to results found by Reppermund et al. (2011) and Vermeersch et al. (2015), the mean (±SD) age of the sample was 79.9 (±8.1), with the majority being female. The median (IQR) number of co-morbidities was 4 (2). There was a high level of poly-pharmacy (≥ 4 medications, 85%, n=34). The most common presenting condition of participants was that of a fall/ collapse. The World Health Organisation (2007) state that falls are a common reason for hospital admission amongst older adults.
4.3 **Review of Participants’ Clinical Characteristics**

The study sample comprised a heterogeneous group of older adults with MCI in the acute hospital setting. The median (IQR) MoCA total score for the sample was 20(4) whereby scores of 18-25/30 indicate mild cognitive impairment. This demonstrates that the majority of participants were in the later stages of MCI. Nasreddine et al. (2005) provided normative data for the MoCA test and found that score of 22.12 is the norm for individuals with MCI. The median (IQR) ACE-III total score for the sample was 70(17) whereby the total score range is 0-100 and higher scores indicate better cognitive functioning. The mean (±SD) ACE-R score for patients with MCI in a study by Mioshi et al. (2006) was 84.2 (±7.3), again indicating that the population of the current study may be more cognitively impaired than MCI populations in related studies. The large IQR of ACE-III scores in the current study indicate that there was a wide spread of ACE-III scores amongst participants. The mean (±SD) EFPT total score for the sample was 23.3 (±9.0). EFPT total scores range from 0-100 whereby lower scores indicate better functional performance.

4.4 **IADL Deficits in MCI**

The mean (±SD) EFPT total score of 23.3 (±9.0) in this study indicated that the sample had mild functional deficits. This is in line with a growing body of evidence which states that individuals with MCI demonstrate mild deficits in IADL functioning (Aretouli and Brandt, 2010; Marshall et al., 2011; Reppermund et al., 2011; Vermeersch et al., 2015). There has been controversy as to whether functional deficits should be included in the diagnostic criteria for MCI (Giovannetti et al., 2008). Results of the current study support recent research stating that IADL impairment should be added to the diagnostic criteria for MCI.
Findings from the current study highlight the need for OTs to consider IADL function when assessing older adults with MCI in the acute hospital setting. Participants in the current study had most difficulty with the bill payment (mean 8.92, ±SD 3.0) and cooking (mean 5.55 ±SD 2.88) subtests of the EFPT. The score range for each subtest is 0-25 with lower scores indicating better functional performance. The main areas of executive functioning which were impaired in the current study were those of judgement/ safety (mean 6.71 ±SD 2.78) and sequencing (mean 10.45, ±SD 2.87). The score range for each of the executive function component scores is 0-25 with lower scores indicating better executive functioning. The functional and executive deficits demonstrated by MCI patients in the current study are similar to the findings of previous studies. Research has consistently shown that financial management is impaired in MCI (Griffith et al., 2003; Jekel et al., 2015) which parallels the results of the current study. Giovannetti et al. (2008) found that IADL deficits in MCI were related to inefficient and imprecise execution of task steps which is reflected by poor sequencing scores in the current study. Furthermore, Ciro et al. (2015) suggested that IADL deficits in MCI were related to adequacy and quality of task performance rather than safety and independence. This is in contrast to the results of the current study where the judgement/ safety domain was one of the executive skills in which participants were most impaired.

4.5 Relationship between IADL Function and Global Cognitive Screens
The MoCA and ACE-III tests were used in the current study to assess global cognitive functioning. These tools are commonly used by OTs in acute hospital settings as they are quick and easy to administer, screen several cognitive domains and are based on good clinical practice with geriatric populations (Vermeersch et al.,
The current study found a low non-significant correlation between MoCA total scores and EFPT total scores. A moderate significant correlation was found between ACE-III total scores and EFPT total scores. The ACE-III had a stronger relationship with IADL function than the MoCA. This may be secondary to the fact that the ACE-III has a greater number of subtests focusing on higher-level cognitive skills such as visuospatial integration and executive functioning. The results of the current study support use of the ACE-III rather than the MoCA when assessing individuals with MCI in the acute hospital setting due to its stronger relationship to functional status.

The overall low-moderate relationship between cognitive test performance and functional abilities in the current study is in line with previous research. Royall et al. (2007) found that cognition only explained 21% of variance in functional outcomes in a meta-analysis of 68 studies. The univariable regression analysis conducted in the current study showed that the ACE-III explained 19% of variance in EFPT scores and the MoCA only explained 6% of variance EFPT scores. The low variance in functional status explained by cognitive screening tools is likely due to the fact that ADL function is multi-dimensional and depends on a combination of person, environment and task-specific factors (Marcotte and Grant, 2009).

The findings of the current study add to the existing literature on the relationship between global cognitive tests and functional domains in MCI and dementia populations. There is a general lack of consensus in the literature regarding the
strength of the relationship between cognitive screening tests and functional status. An explorative study by Vermeersch et al. (2015) found moderate to large negative correlations (ranging from r= -0.28 to -0.61) between IADL function and global cognitive measures for individuals with AD, MCI and healthy controls. These findings contrast the findings from the current study whereby low-moderate correlations were evident. However, the differing results may due to the fact that the cognitive and functional measures used in the study by Vermeersch et al. (2015) (MMSE, CAMCOG, Advanced Activities of Daily Living Tool) were more simplistic and less reliant on high-cognitive demand.

Furthermore, Yantz et al. (2010) examined the relationship between cognitive test performance and performance on a standardised cooking task (Rabideau Kitchen Evaluation, RKE) within a stroke population. Spearman’s correlations between the functional task of meal preparation and the MMSE cognitive screen showed a large negative correlation (r=-0.73) indicating a strong relationship between the MMSE cognitive screen and the functional task of cooking. This stands in contrast to the results of the current study whereby low-moderate correlations were found between cognitive test performance and IADL function. This contrast may be due to the differences in cognitive and functional assessment tools used as the MMSE and RKE appear to be less cognitively-demanding when compared to the MoCA, ACE-III and EFPT, particularly in relation to executive cognition and visuospatial skills.
Results from a study by Toglia et al. (2011) revealed that both the MoCA and MMSE cognitive screens demonstrated moderate correlations with discharge functional status, with the MoCA showing marginally stronger associations ($r=0.40$; $P<0.01$) than the MMSE ($r=0.30$; $P<0.05$). The relationship between the MoCA and IADL function in the current study was slightly lower ($r=-0.22$, $p<0.19$) when compared the study by Toglia et al. (2011). It is important to note that the MMSE relies on several cognitive abilities however it does not examine executive function components which are proven to be important for IADL task completion.

The current study provided a broad overview of the relationship between performance on global cognitive screening tests and IADL function in older adults with MCI in the acute hospital setting. It addressed the identified gap in the literature as it utilised cognitive screening tools that are commonly used by OTs in the acute hospital setting (MoCA and ACE-III) in addition to a standardised assessment of IADL function (EFPT). However, it is evident that comparison with previous related studies is difficult secondary to the variability in global cognitive screening tools and functional assessments used.

4.6 Relationship between IADL Function and Cognitive Subdomains

The results of the current study demonstrated that a range of specific cognitive domains are relevant to performance of IADLs including memory, executive function and visuospatial skills. This is not surprising given the cognitively diverse nature of IADL tasks. The present study found moderate correlations between IADL
function and the cognitive domain of visuospatial/ executive skills on the MoCA in addition to the memory domain of the ACE-III. The current study also found that the visuospatial component of the ACE-III was significantly largely correlated with EFPT total scores in addition to all functional subcomponent of cooking, telephone usage, medication management and bill payment.

Findings from the current study demonstrate the link between underlying memory, executive and visuospatial components on the functional execution of several IADL tasks such as cooking, telephone usage, medication management and bill payment. This highlights the importance of ensuring that assessment of such underlying cognitive skills is completed in clinical practice when working with older adults with MCI. The current study adds important evidence to the literature as it encourages healthcare professionals to examine patients’ performance in subdomains of cognitive screens rather than just looking the total score.

The current study suggests that different cognitive domains may be important for different IADL tasks. Results showed that cooking and bill payment were most strongly related to visuospatial, executive and memory skills; telephone usage was most strongly related to visuospatial and executive skills and medication management was most strongly related to visuospatial skills. Marcotte and Grant (2009) suggested that measures of executive functioning were related with driving behaviour whereas working memory appeared to be strongly associated with money management. While findings from the current study support this link between
memory and money management, the current study also found that visuospatial abilities as measured in both MoCA and ACE III were significantly correlated with money management. Furthermore, Yantz et al. (2010) found that several cognitive domains from neuropsychological testing were significantly related to functional cooking skills in patients with stroke. Results suggested that functional cooking task performance was related to intact cognitive abilities in the domains of delayed verbal memory, simple auditory attention and visuospatial skills as well as overall global cognitive performance. These results are similar to the findings from the current study.

Research has shown that executive skills are related to functional capacity. The current study found that the executive subdomain of the MoCA was moderately related to IADL function as measured by the EFPT. Research by Bell-McGinty et al. (2002) found that executive skills explained a large variance in functioning (up to 54%) in a group of older adults. However it’s important to note that Bell-McGinty et al. (2002) did not control for overall cognitive abilities when investigating the relationship between executive functions and performance on ADLs and it could therefore be argued that the global cognitive measures obscured the true influence of the specific domain of executive functioning. In contrast to the results of the study by Bell-McGinty et al. (2002), a meta-analysis conducted by Royall et al. (2007) found a small to modest variance in functional outcome explained by executive function and general cognitive measures. Unfortunately each individual cognitive subdomain of the MoCA and ACE-III tests could not be placed in the regression model of the current study due to the relatively small sample size.
Similar to the current study, Aretouli and Brandt (2010), De Paula and Malloy-Diniz (2013) and Hanks et al. (1999) found that executive skills were related to functional capacity. Aretouli and Brandt (2010) examined everyday functioning in MCI and its relationship with the executive function skills of planning/problem-solving, working memory and judgement. Results demonstrated that one executive function component (working memory) contributed significantly to functional status after controlling for demographic, health-related and other cognitive factors. In addition, Hanks et al. (1999) demonstrated that executive functioning and verbal memory were strongly related to functional outcome six months following discharge from rehabilitation in a sample of 90 participants with TBI, orthopaedic and spinal cord injury diagnoses. Similarly, De Paula and Malloy-Diniz (2013) found that executive function skills were significantly related to functional status in older adults with mild AD or MCI (n=118), accounting for approximately 30% of variance in function.

A body of research has shown that memory and learning are strong predictors of functional capacity (Gross et al., 2012; Marcotte and Grant, 2009). The current study reflects this as the ACE-III domain of memory was significantly related to EFPT total score and subtests of cooking oatmeal and bill payment. Results from a study by Toglia et al. (2011) showed that the MMSE memory subtests of orientation, registration and recall were predictive of the FIM physical subscale and motor relevant functional efficiency in a study of 72 participants post stroke. In addition, Vermeersch et al. (2015) demonstrated that the memory section of the CAMCOG reflected the strongest associations with functional decline. In addition, Springate and Tremont (2012) found that the Minnesota Cognitive Acuity Screen orientation subscale was one of the strongest subscales in predicting functional status in the
sample of participants with dementia or MCI as it was uniquely predictive of all Clinical Dementia Rating Scale domains.

The current study showed that a range of cognitive domains are related to IADL function as measured by the EFPT. This is in agreement with findings from a study by Farias et al. (2003) who examined the relationship between neuropsychological performance and daily functioning in individuals with AD. This study found that domains of apraxia, visual spatial abilities, immediate memory and executive function were most frequently correlated with the functional domains of the Direct Assessment of Functional Status tool. In addition, domains of immediate memory, executive function, confrontation naming and apraxia were most consistently related with the functional domains of the Instrumental Activities of Daily Living measure. It is important to note that a wide variety of cognitive and functional assessment tools were used in previous research and these measured many different constructs which makes comparison between studies difficult.

The EFPT tool used in the current study provided a comprehensive assessment of executive functions and overall IADL functional capacity however it was lengthy to administer. Furthermore, it did not examine everyday technology, an IADL that is becoming more relevant to individuals with MCI. Further research is required regarding development of a psychometrically-sound, straightforward, time-efficient screening tool that will assist OTs in assessment, rehabilitation and discharge planning for individuals with MCI in the acute hospital setting.
4.7 Additional Factors Associated with IADL Function

Multivariable regression analysis completed in the current study showed that only 35% of variance in IADL function was attributed to the demographic and cognitive variables of age, gender, MOCA total score and ACE-III total score. This indicates that 65% of IADL is explained by other factors. Joliffe et al. (2015) highlighted that many factors impact on an individual’s occupational functioning and performance in addition to cognition such as physical skills and mood. Furthermore, Vermeersch et al. (2015) stated that functional capacity is associated with a variety of factors other than cognition such as physical, emotional and social variables. Marcotte and Grant, (2009) found that cognitive impairment can lead to cognitive deficits, however this still depends on a combination of the person, environment and occupational specific factors. This complexity may explain why cognitive test performance alone did not fully explain the functional capabilities of the participants in the current study.

4.8 Clinical Relevance

The findings of the current study have important implications for clinical practice. An important finding of the study is that IADL function can be impaired in individuals with MCI. Although the functional impairments in MCI are typically not as severe as dementia, MCI patients may still require assistance with more cognitively-demanding daily activities. This highlights the importance of addressing IADL function among patients with MCI in the acute hospital setting to optimise assessment, rehabilitation, discharge planning and healthcare policy. Furthermore, results of this study are in agreement with recent body of empirical evidence stating that mild IADL deficits should be included in the diagnostic criteria for MCI.
The current study also found that the MoCA and ACE-III cognitive screening tools had a poor-modest relationship with EFPT scores in older adults with MCI. This low-moderate relationship makes clinical sense. Patients often perform better on cognitive screening tests compared with functional tasks and vice versa. It is evident that use of cognitive screens alone is not sufficient to allow clinical decisions to be made regarding functional capacity of individuals with MCI. The use of functional assessment is crucial in assisting clinicians to fully understand the functional capabilities of this client group.

Domains of memory, executive functioning and visuospatial skills had a moderate-large relationship with EFPT scores in older adults with MCI in this study. This highlights the importance of interpreting scoring patterns on cognitive screening tools rather than just examining the total score. OTs should ensure careful assessment of these cognitive skills in individuals with MCI due to their association with functional impairments. A combination of cognitive and functional assessments may be useful in comprehensively assessing older adults with MCI in the acute care setting.

IADL function is multi-dimensional and depends on a combination of person, environment and task specific factors (Marcotte and Grant, 2009). This complexity can help explain why cognitive testing alone may not fully explain an individual’s ability to perform IADL tasks. Most of the variability in functional performance could not be explained in the multivariable regression model used in the current study. For good clinical practice in OT within the acute care setting, the author
recommends objective evaluation of IADLs in addition to use of cognitive screening tests. This should enhance the detection of subtle functional deficits in early cognitive decline.
4.9 Limitations of the Study

- This study employed a cross-sectional design and therefore cannot reveal any direction of causality in the relationship between performance on cognitive screening tests and IADL function. Results from the correlational and regression analyses cannot be interpreted as establishing cause and effect relationships.

- This study was conducted in a one centre and participants were recruited from one geographical region. The demographic characteristics of participants in this setting may not reflect those in other acute hospitals in Ireland. Therefore, the results may not be applicable to other acute hospitals.

- The study sample was a non-random sample of convenience, with a higher proportion of women. Use of convenience sampling means that the opportunity to participate in the study was not equal for all individuals in the target population and study results are not necessarily generalisable to this population. In addition, the small sample size affected the number of variables that could be explored in the multiple regression analysis.

- The selection criteria for defining MCI may be questioned, since there is no universally accepted prescription for how the Peterson (2004)/ Winblad et al. (2004) criteria should be operationalised.
• The functional assessment (EFPT) tool was timely to complete in a fast-paced acute hospital setting. Furthermore, performance-based functional assessment tools can have limitations i.e. they are more labour intensive to administer. Future research should explore different functional assessment tools that may be more time-efficient to use within the acute hospital setting would.

• The study took place in the acute hospital setting whereby individuals were recovering from acute illness. Although measures were taken to best manage this in terms of selection criteria, it may have impacted on participants’ performance and overall results. Recovery from acute illness, change of medications and an unfamiliar environment are factors that need to be taken into account when interpreting the results.
4.10 **Recommendations for Future Research**

- Future research should include a large multi-centre study. Participants could be recruited from a larger geographical area, including a variety of public and private hospital systems, utilising random sampling methods. This would assist policy makers in planning and delivering effective services to address the needs of older adults with MCI in the acute hospital setting.

- A longitudinal component could be added to the study e.g. gathering information on discharge location and functional status six months post admission. A longitudinal study would capture the relationship between cognitive test performance and functional status over time and explore whether functional impairment on specific IADLs are predictors of further cognitive decline.

- It would be beneficial to explore the relationship between cognitive test performance and functional status in other clinical populations e.g. dementia, Parkinson’s disease, brain injury. Further research should also include evaluation of depressive symptoms and their impact on functional performance.
CONCLUSION

This study explored the relationship between performance on cognitive screening tests and IADL function in older adults with MCI in the acute care setting. Based on the results, the author recommends that cognitive screening tools should not be used in isolation during the process of cognitive assessment for individuals with MCI. The ACE-III test should be used appropriately in conjunction with objective evaluation of ADL functioning to generate a comprehensive profile of a patient's abilities. This study highlights the value of observation of actual functioning within a task and proves that cognitive screening alone cannot be used to make conclusions regarding occupational performance. Furthermore, the results help underline the importance of interpreting the scoring patterns on cognitive screening tests rather than just examining the overall score as certain cognitive domains appear to be more strongly related to IADL function than others.

The results from this study provide clinicians with a better understanding of the relationship between performance on cognitive screening tests and IADL function amongst older adults with MCI in the acute hospital setting. This study contributes to the body of existing empirical evidence investigating the relationship between cognitive and functional domains. The results impact on clinical practice and highlight the importance of OT in the cognitive and functional evaluation for individuals with MCI.

WORD COUNT: 10,863
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STANDARD APPLICATION FORM

For the Ethical Review of Health-Related Research Studies, which are not Clinical Trials of Medicinal Products For Human Use as defined in S.I. 190/2004

DO NOT COMPLETE THIS APPLICATION FORM IF YOUR STUDY IS A CLINICAL TRIAL OF A MEDICINAL PRODUCT

Title of Study:
The Relationship between Performance on Cognitive Screening Tests and Functional Abilities in Individuals with Dementia

Application Version No:  Version 2

Application Date:  10/08/2015

For Official Use Only – Date Stamp of Receipt by REC:
Appendix 1: Ethics Application Form

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This Application Form is divided into Sections.
*Sections A, B, C, D, E, J and K are Mandatory.

(Sections F, G, H, I and L are optional. Please delete Sections F, G, H, I and L if these sections do not apply to the application being submitted for review.)

IMPORTANT NOTE: Please refer to Section I within the form before any attempt to complete the Standard Application Form. Section I is designed to assist applicants in ascertaining if their research study is in fact a clinical trial of a medicinal product.

IMPORTANT NOTE: This application form permits the applicant to delete individual questions within each section depending on their response to the preceding questions. Please respond to each question carefully and refer to the accompanying Guidance Manual for more in-depth advice prior to deleting any question.
Appendix 1: Ethics Application Form

PLEASE ENSURE TO REFER TO THE ACCOMPANYING GUIDANCE MANUAL
WHEN COMPLETING THIS APPLICATION FORM.

SECTION A: GENERAL INFORMATION

SECTION A IS MANDATORY

A1 Title of the Research Study:

The Relationship between Performance on Cognitive Screening Tools and Functional Abilities in Individuals with Dementia

A2 (a) Is this a multi-site study?  No

If you chose ‘yes’ please delete questions A2 (e) and (f), If you chose ‘no’ please delete Questions A2 (b) (c) and (d)

A2 (e) If no, please name the principal investigator with overall responsibility for the conduct of this single-site study.

Title: Dr
Name: Joseph Duggan

Qualifications: MD, FRCPI
Position: Consultant Geriatrician
Department: Medicine for the Elderly
Organisation: Mater Misericordiae University Hospital
Address: Division of Medicine, Mater Misericordiae University Hospital, Eccles Street, Dublin 7
Tel: 01-8034242  E-mail: jduggan@mater.ie
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A2 (f) For single-site studies, please name the only site where this study will take place.

| Mater Misericordiae University Hospital (MMUH) |

A3. Details of Co-investigators:

Name of site (if applicable): Mater Misericordiae University Hospital

Title: Ms. Name: Elaine Scally
Qualifications: B.Sc in Occupational Therapy, NUI Galway
Position: Senior Occupational Therapist
Department: Occupational Therapy
Organisation: Mater Misericordiae University Hospital
Address: Occupational Therapy Department, Mater Misericordiae University Hospital, Eccles Street, Dublin 7
Tel: 01-80341115 E-mail: escally@mater.ie
Role in Research: Lead Co-Investigator

Name of site (if applicable): N/A

Title: Dr. Name: Helen French
Qualifications: PhD (NUI, RCSI), MSc, Dip Stat, B.Physio, MISCP
Position: Lecturer in Physiotherapy
Department: School of Physiotherapy
Organisation: Royal College of Surgeons in Ireland
Address: 123 St. Stephen’s Green, Dublin 2, Ireland
Tel: 01-4022258 E-mail: hfrench@rcsi.ie
Role in Research: Co-Investigator/MSc Supervisor

Name of site (if applicable): N/A

Title: Dr. Name: Tadhg Stapleton
Qualifications: PhD (TCD), M.Sc. (Rehabilitation and Research), B.Sc. (Hons.) (Curr. Occ)
Position: Assistant Professor (Occupational Therapy)
Department: Discipline of Occupational Therapy
Appendix 1: Ethics Application Form

**Organisation:** Trinity College Dublin  
**Address:** Trinity Centre for Health Sciences, St. James’s Hospital, St. James’s Street, Dublin 8  
**Tel:** 01-8963214  
**E-mail:** Tadhg.Stapleton@tcd.ie  
**Role in Research:** Co-Investigator

A4. Lead contact person who is to receive correspondence in relation to this application or be contacted with queries about this application.

**Name:** Elaine Scally  
**Position:** Senior Occupational Therapist  
**Organisation:** Mater Misericordiae University Hospital  
**Address for Correspondence:** Occupational Therapy Department, Mater Misericordiae University Hospital, Eccles Street, Dublin 7  
**Tel (work):** 01-8034115  
**Tel (mob.):** 086-1610024  
**E-mail:** escally@mater.ie

A5 (a) Is this study being undertaken as part of an academic qualification?  
**Yes**

If answer is **No**, please delete remaining questions in Section A

A5 (b) If yes, please complete the following:

**Student Name(s):** Elaine Scally  
**Academic Course:** MSc in Neurology and Gerontology  
**Academic Institution:** Royal College of Surgeons in Ireland

A5 (c) Academic Supervisor(s):

**Title:** Dr.  
**Name:** Helen French  
**Qualifications:** PhD (NUI, RCSI), MISCP  
**Position:** Lecturer in Physiotherapy  
**Department:** School of Physiotherapy
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**Organisation:** Royal College of Surgeons in Ireland  
**Address:** 123 St. Stephen’s Green, Dublin 2, Ireland  
**Tel:** 01-4022258  
**E-mail:** hfrench@rcsi.ie

### SECTION B: STUDY DESCRIPTORS

SECTION B IS MANDATORY

**B1. What is the anticipated start date of this study?**

October 2015, pending MMUH Research Ethics Committee approval.

**B2. What is the anticipated duration of this study?**

Six months.

**B3. Please provide a brief lay (plain English) description of the study. Please ensure the language used in your answer is at a level suitable for use in a research participant information leaflet.**

Determining how thinking skills affect functional abilities is an important area in dementia research. Cognitive tests are commonly used by healthcare professionals to assist in making decisions about a person’s ability to perform day to day tasks. However, findings from clinical practice show that performance on cognitive tests is not always consistent with performance of everyday functional abilities amongst individuals with dementia. The aim of this research study is to examine the relationship between performance on cognitive tests and everyday functional abilities in people with dementia in the acute hospital setting.

**B4. Provide brief information on the study background.**

Dementia is a syndrome that results in progressive deterioration of cognitive abilities caused by a number of different disorders (Gifford & Jones, 2009; Sheehan, 2012). The cognitive deficits in dementia are not confined to memory and may include impairments in language, praxis, attention, information processing and executive functions (Farias et al., 2003; Gifford & Jones, 2009; Weintraub et al., 2012). In
addition to cognitive deterioration, individuals with this disease also experience difficulty in completing activities of daily living (ADLs) such as meal preparation and managing finances (De Paula & Malloy-Diniz, 2013; Luttenberger et al., 2012; Wajman et al., 2014).

Occupational therapists (OTs) working in the acute care setting are routinely asked to make inferences regarding the ability of patients with dementia to complete various instrumental activities of daily living (IADLs) including cooking, shopping, paying bills and medication management (Borbasi et al., 2006). Cognitive screening tools such as the Montreal Cognitive Assessment (MoCA) and the Addenbrooke’s Cognitive Examination (ACE-III) are regularly administered by acute hospital OTs to assist in predicting the functional capacity of this client group. The relationship between cognitive and functional domains in dementia has been investigated in a number of studies (Baum et al., 1995; De Paula & Malloy-Diniz, 2013; Farias et al., 2003; Perry & Hodges, 2000) which have predominately yielded modest results, with neuropsychological performance generally accounting for moderate amounts of variance in function.

Previous studies investigating the relationship between cognitive and functional status in dementia populations share several limitations e.g. use of a wide variety of neuropsychological batteries which makes comparison between studies difficult, use of informant-based or self-report functional assessments and use of heterogeneous elderly patient populations.

The current study aims to extend the findings of previous research pertaining to the relationship between cognitive and functional domains in dementia. To address the limitations of previous studies, the current study will employ a performance-based measure of functional status (Executive Function Performance Test - EFPT) that is weighted towards cognitively-orientated IADLs. Cognitive screening tools that are routinely administered in OT practice within the acute care setting will be used to assess participants’ neuropsychological status.
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B5. **List the study aims and objectives.**

The aim of the study is to examine the relationship between performance on cognitive screening tools and functional abilities in individuals with dementia.

The objectives of the study are as follows:
- To determine which particular cognitive screening tool (MoCA or ACE-III) is most strongly associated with participants’ functional abilities.
- To establish which specific cognitive domains are most strongly related to participants’ functional abilities.
- To examine the impact of various demographic factors on participants’ functional abilities.

B6. **List the study endpoints / measurable outcomes (if applicable).**

The results of the statistical analyses will be used to establish the relationship between performance on cognitive screening tests and functional abilities in individuals with dementia.

B7. **Provide information on the study design.**

The study will use an observational cross-sectional study design to examine the relationship between performance on cognitive screening tool and functional abilities in individuals with dementia in the acute care setting. The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE, von Elm et al., 2008) Statement was reviewed when developing the research design.

B8. **Provide information on the study methodology.**

**Pilot Study:**

A pilot study will be completed prior to the main study. Two participants will be recruited and assessed by the lead co-investigator for the purpose of the pilot study. This will allow the lead co-investigator to estimate the amount of time required to
collect data, to test the outcome measures, to trial the data collection form and to identify unforeseen limitations to the research design.

Main Study:

Assessment Procedure:

Demographic and baseline clinical information will be obtained from the participants’ medical records by the lead co-investigator. This information will be recorded in the data collection form. The lead co-investigator will administer all of the assessment measures which will include the MoCA, the ACE-III and the EFPT. It is anticipated that training in administering and scoring the assessments will not be required as the researcher is experienced in using the assessments in her clinical work. The cognitive assessments can be administered both on the ward and in the OT department whereas the functional assessment can be completed in the OT department only. If participants are unable to complete all assessments in the initial session due to fatigue, they will be completed the following day. All of the assessments will be administered in a standardised order. Administration of the MoCA, ACE-III and the EFPT with each patient should take approximately 60-80 minutes in total.

Data Collection:

The majority of the data will be collected by the lead co-investigator. OT colleagues may complete one of the cognitive screening tests with participants prior to their enrollment into the research study as part of routine clinical practice. It is anticipated that this will not be a methodological issue as both the MoCA and ACE-III have good inter-rater reliability (Sheehan, 2012) and it is expected that there will only be a
few days between completion of the cognitive screen by the OT colleague and assessment by the lead co-investigator. A specific data collection form has been designed to gather demographic variables. The quantitative data collected will be at interval and ratio levels. Purpose-designed data extraction tables will be developed for recording of the data.

B9. Provide information on the statistical approach to be used in the analysis of your results (if appropriate) / source of any statistical advice.

Descriptive statistics will be employed to explore the data in relation to the key outcomes of interest and other variables such as age, gender, marital status, type of dementia, time since dementia diagnosis, social situation and frailty. The relationship between performance on cognitive screening tools and functional abilities will be computed using Pearson product-moment correlation coefficient test for continuous variables, Spearman’s rank ordered test for ordinal data and Chi-squared analysis for categorical data. SPSS software package will be employed for all statistical analyses. The co-investigators and academic supervisor were consulted in establishing the statistical approach for the study. A review of medical and psychological scientific literature was also used to inform this statistical approach.

B10 (a) Please justify the proposed sample size and provide details of its calculation (including minimum clinically important difference).

The mean number of participants used in other similarly designed studies that produced statistically significant results pertaining to the psychometric properties of the EFPT with stroke populations (Baum et al., 2008; Cederfeldt et al., 2011; Wolf et
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(Al., 2010) was calculated with a mean sample size of n=39. This study aims to have a sample size of n=40.

B10 (b) Where sample size calculation is impossible (e.g. it is a pilot study and previous studies cannot be used to provide the required estimates) then please explain why the sample size to be used has been chosen.

N/A.

B11. How many research participants are to be recruited in total?

40.

B12 (a) How many research participants are to be recruited in each study group (where applicable)? Please complete the following table (where applicable).

N/A.

<table>
<thead>
<tr>
<th>Name of Study Group:</th>
<th>Number of Participants in this Study Group:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dementia Group</td>
<td>40</td>
</tr>
</tbody>
</table>

B12 (b) Please provide details on the method of randomisation (where applicable).

N/A.

B13. How many research participants are to be recruited at each study site (where applicable)? Please complete the following table.
Appendix 1: Ethics Application Form

<table>
<thead>
<tr>
<th>Site:</th>
<th>Number of Research Participants at this site:</th>
</tr>
</thead>
<tbody>
<tr>
<td>MMUH</td>
<td>40</td>
</tr>
</tbody>
</table>

**SECTION C STUDY PARTICIPANTS**

**SECTION C IS MANDATORY**

**C1 PARTICIPANTS – SELECTION AND RECRUITMENT**

**C1.1 How will the participants in the study be selected?**

The study will use a clinical sample of convenience. Individuals with a presenting complaint or background history of dementia who are admitted to the MMUH under the care of the General Medicine or Medicine for the Elderly services will be considered for study selection. They must be referred to OT and they will be screened against inclusion and exclusion criteria.

**C1.2 How will the participants in the study be recruited?**

The lead co-investigator’s OT colleagues who work in the General Medicine and Medicine for the Elderly services will act as gatekeepers. The gatekeepers will review the medical charts of individuals referred to OT services covering these clinical areas who have a background medical history of dementia. The gatekeepers will notify the lead co-investigator of patients who fulfil the specified inclusion and exclusion criteria. The gatekeepers will provide suitable potential participants with the participant information leaflet.

**C1.3 What are the inclusion criteria for research participants? (Please justify, where necessary)**

*65 years of age and above
*Inpatients in MMUH within Care of the Older Person or General Medicine service
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*Referred to OT
*Diagnosis of dementia
*Medically stable
*Willing and able to provide informed consent
*Living at home and participating in at least one IADL at baseline
*Able to read and write
*Able to engage in functional assessment at times of recruitment with maximum support of assistance of one due to physical deficits

C1.4 What are the exclusion criteria for research participants? (Please justify, where necessary)

*Delirium
*Severe auditory or visual impairment that could significantly interfere with testing
*History of any neurological disease that could affect cognition
*Significant psychiatric disorder
*History of alcohol or drug abuse
*Learning disability

C1.5 Will any participants recruited to this research study be simultaneously involved in any other research project?
Not to my knowledge.

C2 PARTICIPANTS – INFORMED CONSENT

C2.1 (a) Will informed consent be obtained? Yes

C2.1 (b) If no, please justify. You must provide a full and detailed explanation as to why informed consent will not be obtained.

N/A.
C2.1 (c) If yes, please outline the consent process in full. (How will consent be obtained, when, by whom and from whom etc.)

Potential participants will be given a participant information leaflet (PIL) that has been developed following recommendations from the literature regarding communication strategies for individuals with dementia. This is to ensure the written information is as accessible as possible. The gatekeeper will discuss the contents of the PIL with every potential participant to facilitate their understanding of the written material. Voluntary informed consent will then be obtained from willing participants by the lead co-investigator. This consent form has also been developed following recommendations from the literature regarding communication strategies for individuals with dementia. This is also to ensure optimal accessibility of the written information.

C2.2 (a) Will participants be informed of their right to refuse to participate and their right to withdraw from this research study? **Yes**

C2.2 (b) If no, please justify.

N/A.

C2.3 (a) Will there be a time interval between giving information and seeking consent? **Yes**

C2.3 (b) If yes, please elaborate.

A period of 24 hours will be given before consent is sought.

C2.3 (c) If no, please justify and explain why an instantaneous decision is reasonable having regard to the rights of the prospective research participants and the risks of the study.

N/A.

| C3 | ADULT PARTICIPANTS (AGED 18 OR OVER) - CAPACITY |
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C3.1 (a) Will all adult research participants have the capacity to give informed consent?  **Yes**

If answer is **Yes**, please delete remaining questions in Section C3

C4  PARTICIPANTS UNDER THE AGE OF 18

C4.1 (a) Will any research participants be under the age of 18 i.e. Children?  **No**

If answer is **No**, please delete remaining questions in Section C4

C5  PARTICIPANTS - CHECKLIST

C5.1 Please confirm if persons from any of the following groups will participate in this study. This is a quick checklist to assist research ethics committee members and to identify whether study participants include persons from vulnerable groups and to establish what special arrangements, if any, have been made to deal with issues of consent. **It is recognised that not all groups in this listing will automatically be vulnerable or lacking in capacity. Please refer to the HSE’s National Consent Policy, particularly Part 3, Section 5.** Committees are particularly interested to know if persons in any of these groups are being targeted for inclusion, as per the inclusion criteria.

(a) Healthy Volunteers  **No**

(b) Patients  **Yes**

- Unconscious patients  **No**
- Current psychiatric in-patients  **No**
- Patients in an emergency medical setting  **No**
(c) Relatives / Carers of patients \( \text{No} \)

(d) Persons in dependent or unequal relationships \( \text{No} \)

- Students \( \text{No} \)
- Employees / staff members \( \text{No} \)
- Persons in residential care \( \text{No} \)
- Persons highly dependent on medical care \( \text{No} \)

(e) Intellectually impaired persons \( \text{No} \)

(f) Persons with a life-limiting condition \( \text{Yes} \)

(Please refer to guidance manual for definition)

(g) Persons with an acquired brain injury \( \text{Yes} \)

C5.2 If yes to any of the above, please comment on the vulnerability of the research participants, and outline the special arrangements in recognition of this vulnerability (if any).

The patient’s capacity to decide to take part in this study will be determined on a case-by-case basis. The gate keepers are qualified OTs whose clinical work involves assessing the cognitive functioning of patients with dementia. The gate keeper will determine that potential participants have sufficient attention, working memory and decision making skills at the time of applying the inclusion and exclusion criteria and when meeting potential participants to provide them with information on the study and the study’s information leaflet. The gate keeper will also liaise with the patient’s medical team to ensure that the patient has the capacity to provide informed consent for study participation.

In cases of doubt, the gate keeper will determine the answer of all four of the questions below is positive before concluding that the patient has capacity:
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1) Does the patient understand the information relevant to the decision?
2) Has the patient retained the information relevant to the decision?
3) Can the patient use of weigh up the information when making a decision?
4) Can the patient communicate their decision by some reliable means?

In patients where the answer to one or more of the above questions is negative or uncertain it will be determined if the reason for this is due to lack of capacity. If the reason for apparent lack of capacity is found to be a cognitive impairment, the patient will not be deemed capable of providing informed consent and will not be included in the study.

C5.3 Please comment on whether women of child-bearing potential, breastfeeding mothers, or pregnant women will be included or excluded in this research study.

No.

SECTION D RESEARCH PROCEDURES

SECTION D IS MANDATORY

D1 (a) What activities, procedures or interventions (if any) are research participants asked to undergo or engage in for the purposes of this research study?

Participants will be assessed using the MoCA, the ACE-III and the EFPT. It is relevant to note that administration of cognitive screening tests and the direct observation of patients completing activities of daily living are essential components of OT routine practice in dementia care. The data analysis of scores obtained on all measures is over and above routine care.

D1 (b) What other activities (if any) are taking place for the purposes of this research study e.g. chart review, sample analysis etc?
The lead co-investigator will review patients’ medical records (hard copy and electronic) as part of this research study.

D2. Please provide details below of any potential harm that may result from any of the activities, procedures, interventions or other activities listed above.

The non-serious harm of having to undergo the assessment measures may cause a minor inconvenience to the participants.

D3. What is the potential benefit that may occur as a result of this study?

Examining the relationship between performance on cognitive screening tools and functional status in individuals with dementia in the acute care setting will facilitate optimal provision of OT services to maximise functional recovery and rehabilitation outcomes for individuals with dementia.

D4 (a) Will the study involve the withholding of treatment?
N/A

D4 (b) Will there be any harms that could result from withholding treatment? N/A

D4 (c) If yes, please elaborate.
N/A.

D5 (a) How will the health of participants be monitored during the study, and who will be responsible for this?

The monitoring of participants’ health will be in keeping with current practice of monitoring patients during OT assessment and intervention.

D5 (b) How will the health of participants be monitored after the study, and who will be responsible for this?
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The monitoring of participants’ health after the study will be in keeping with current practice of the medical monitoring patients’ health as appropriate in the acute care and community settings.

D6 (a) Will the interventions provided during the study be available if needed after the termination of the study? [Yes]

D6 (b) If yes, please state the intervention you are referring to and state who will bear the cost of provision of this intervention?

If the participants’ scores on either the cognitive or functional assessment indicate deficits, they will receive OT interventions designed to address this aspect of their rehabilitation.

D7. Please comment on how individual results will be managed.

As the assessment procedures will be part of usual OT service provision, results will be recorded on the Hospital Information System (HIS) and Patient Centre and will be shared with the patients as part of their intervention planning. Results will also be shared with the participant’s treating OT so that they can be used as part of the patient’s intervention.

D8. Please comment on how aggregated study results will be made available.

Results of study findings will be collated and written up as an MSc thesis submission to the Royal College of Surgeons in Ireland (RCSI). Upon study completion, the participants will be invited to attend an oral presentation along with any interested MMUH staff members.

It is also aimed that this study’s findings will be submitted for publication in a peer-reviewed journal e.g. British Journal of Occupational Therapy or Age and Ageing. Findings will also be submitted for oral presentation at relevant national conferences e.g. the Irish Gerontological Society Postgraduate Study Day, the annual Association of Occupational Therapists in Ireland conference.
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D9. Will the research participant's general practitioner be informed that the research participant is taking part in the study (if appropriate)?  No

D10. Will the research participant's hospital consultant be informed that the research participant is taking part in the study (if appropriate)? Yes.

SECTION E DATA PROTECTION

SECTION E IS MANDATORY

E1 DATA PROCESSING - CONSENT

E1.1 (a) Will consent be sought for the processing of data? Yes

E1.1 (b) If no, please elaborate.

N/A.

E2 DATA PROCESSING - GENERAL

E2.1 Who will have access to the data which is collected?

The principal investigator (Dr Joseph Duggan) and the co-investigators (Ms Elaine Scally, Dr Helen French and Dr Tadhg Stapleton) will have access to the data which is collected.

E2.2 What media of data will be collected?

Data pertaining to the participant’s demographics will be coded numerically according to the order of recruitment into the study and will be stored electronically. Numerical data obtained from scores on the research instruments (MoCA, ACE-III...
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and EFPT) will be initially captured on a hard copy that will be destroyed (shredded) once data has been entered onto the electronic data extraction tables.

E2.3 (a) Would you class the data collected in this study as anonymous, irrevocably anonymised, pseudonymised, coded or identifiable data?

Coded. Numerals will be used to differentiate participants’ demographic characteristics and test scores.

E2.3 (b) If ‘coded’, please confirm who will retain the ‘key’ to re-identify the data?

Lead co-investigator – Ms Elaine Scally.

E2.4 Where will data which is collected be stored?

The data which has been collected will be stored on the workplace password protected PC that has been encrypted by the MMUH Information Management Services department. This PC is situated in the OT department.

E2.5 Please comment on security measures which have been put in place to ensure the security of collected data.

The PC is password-protected and has been encrypted by the Information Management Service department at the MMUH. An encrypted USB key will be used to transfer electronic data, where it will be stored by the academic supervisor located in the RCSI as per this College’s protocol.

E2.6 (a) Will data collected be at any stage leaving the site(s) of origin?

Yes

E2.6 (b) If yes, please elaborate.

As per the MMUH protocol, the electronic data obtained from assessment scores will be securely stored for a period of five years.
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E2.7 Where will data analysis take place and who will perform data analysis (if known)?

Data analysis will take place using the encrypted PC in the MMUH OT department. The lead co-investigator will perform the data analysis.

E2.8 (a) After data analysis has taken place, will data be destroyed or retained?

Electronic data will be retained. Hard copies of assessment scoring sheets will be destroyed once data has been entered onto the electronic data extraction tables.

E2.8 (b) Please elaborate.

Data will be stored securely for a period of five years as per the MMUH guidelines.

E2.8 (c) If destroyed, how, when and by whom will it be destroyed?

The lead co-investigator will destroy hard data (scoring sheets of MoCA, ACE-III and EFPT) via shredding once data has been entered electronically onto the data extraction tables.

E2.8 (d) If retained, for how long, for what purpose, and where will it be retained?

Electronic data will be securely stored by the academic supervisor for a period of five years as per the MMUH ethics committee guidelines.

E2.9 Please comment on the confidentiality of collected data.

Collected data will be coded. A separate document which will only contain the participants’ names and ID numbers will be stored on an encrypted password protected computer in the OT department at the MMUH. All clinical data pertaining to the participant will contain the ID number only and contain no identifiable details such as name, address or date of birth.
Appendix 1: Ethics Application Form

E2.10 (a) Will any of the interview data collected consist of audio recordings / video recordings? **No**

E2.10 (b) If yes, will participants be given the opportunity to review and amend transcripts of the tapes?

N/A.

E2.11 (a) Will any of the study data collected consist of photographs / video recordings? **No**

E2.11 (b) If yes, please elaborate.

N/A.

E3  ACCESS TO HEALTHCARE RECORDS

E3.1 (a) Does the study involve access to healthcare records (hard copy / electronic)? **Yes**

If answer is No, please delete remaining questions in Section E3

E3.1 (b) If yes, please elaborate.

The medical chart and the MMUH Patient Centre and HIS systems will be accessed by the lead co-investigator for the purpose of applying the inclusion and exclusion criteria to potential participants and in order to collect demographic characteristics. Specific data to be sought will include reports of any neuroimaging that have been completed to investigate the diagnosis of dementia and the patient’s past medical history and history of presenting complaint. Healthcare records will be read and contributed to in accordance with standard data gathering and documentation procedures as part of routine OT service provision within the MMUH.

E3.1 (c) Who will access these healthcare records?

The lead co-investigator.
Appendix 1: Ethics Application Form

E3.1 (d) Will consent be sought from patients for research team members to access their healthcare records? Yes

If answer is Yes, please delete remaining questions in Section E3

E3.2 (a) Who or what legal entity is the data controller in respect of the healthcare records?

MMUH Board.

E3.2 (b) What measures have been put in place by the data controller which may make access to healthcare records permissible without consent?

The lead co-investigator is an employed staff member of the MMUH. The lead co-investigator is bound by confidentiality via the terms of her employment contract with the MMUH and via the code of professional conduct specified in the Association of Occupational Therapists of Ireland’s Code of Professional Conduct.

SECTION F HUMAN BIOLOGICAL MATERIAL

F1 BODILY TISSUE / BODILY FLUID SAMPLES - GENERAL

F1 1 (a) Does this study involve human biological material? No

If the answer is No, please delete Section F

SECTION G RADIATION

G1 RADIATION – GENERAL

G1.1 (a) Does this study/trial involve exposure to radiation? No

If answer is No, please delete remaining questions in Section G
Appendix 1: Ethics Application Form

SECTION H MEDICAL DEVICES

H1 (a) Is the focus of this study/trial to investigate/evaluate a medical device? \textbf{No}

If answer is \textbf{No}, please delete remaining questions in Section H.

SECTION I MEDICINAL PRODUCTS / COSMETICS / FOOD AND FOODSTUFFS

I.1 NON-INTERVENTIONAL TRIALS OF MEDICINAL PRODUCTS

I1.1 (a) Does this study involve a medicinal product? \textbf{No}

If the answer is \textbf{No}, please delete remaining questions in subsection I1

I.2 COSMETICS

I2.1 (a) Does this study involve a cosmetic? \textbf{No}

If the answer is \textbf{No}, please delete remaining questions in subsection I2

I.3 FOOD AND FOOD SUPPLEMENTS

I3.1 (a) Does this study involve food or food supplements? \textbf{No}

If the answer is \textbf{No}, please delete remaining questions in subsection I3

SECTION J INDEMNITY AND INSURANCE

SECTION J IS MANDATORY

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Appendix 1: Ethics Application Form

**J1 Please confirm and provide evidence that appropriate insurance/indemnity is in place for this research study at each site.**

| Site in which this study is to take place (MMUH) is covered by the Clinical Indemnity Scheme. |

**J2 Please confirm and provide evidence that appropriate insurance/indemnity is in place for this research study for each investigator.**

| The principal investigator (Dr Joesph Duggan) and the lead co-investigator (Ms Elaine Scally) are covered by the Clinical Indemnity Scheme in the MMUH. Co-investigators Dr Helen French and Dr Tadhg Stapleton are covered by Indemnity Insurance in the Royal College of Surgeons in Ireland and Trinity College Dublin respectively. |

**J3.1 Please give the name and address of the organisation / or individual legally responsible for this research study?**

| RCSI. |

**J3.2 Where an organisation is legally responsible, please specify if this organisation is:**

- A pharmaceutical company  **No**
- A medical device company  **No**
- A university  **Yes**
- A registered charity  **No**
- Other  **No** If yes, please specify: N/A

**J3.3 Please confirm and provide evidence of any specific additional insurance / indemnity arrangements which have been put in place, if any, by this organisation / or individual for this research study?**
Appendix 1: Ethics Application Form

Additional insurance/indemnity arrangements are not required. Any unforeseen event that results in harm to a participant as a result of involvement in the study is covered by the Clinical Indemnity Scheme.

SECTION K  COST AND RESOURCE IMPLICATIONS, FUNDING AND PAYMENTS

SECTION K IS MANDATORY

K1  COST AND RESOURCE IMPLICATIONS

K1.1 Please provide details of all cost / resource implications related to this study (e.g. staff time, office use, telephone / printing costs etc.)

The main costs associated with this research project are that of study equipment and materials – stationery, photocopying, and use of computer.

K2  FUNDING

K2.1 (a) Is funding in place to conduct this study?  No

K2.1 (b) If no, has funding been sought to conduct this study?  From where? Please elaborate.

Funding has not been sought to conduct this study.

K2.1 (c) If yes, please state the source of funding (industry, grant or other), the name of the funder, the amount of funding and duration of funding.

<table>
<thead>
<tr>
<th>Source of funding (industry, grant or other):</th>
<th>N/A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name of Funder:</td>
<td>N/A</td>
</tr>
<tr>
<td>Amount of Funding:</td>
<td>N/A</td>
</tr>
</tbody>
</table>
### Appendix 1: Ethics Application Form

<table>
<thead>
<tr>
<th>K2.1(d)</th>
<th>Please provide additional details in relation to management of funds.</th>
</tr>
</thead>
<tbody>
<tr>
<td>N/A</td>
<td></td>
</tr>
</tbody>
</table>

| K2.1(e)  | Is the study funded by a ‘for profit’ organisation? **No**          |

| K2.2 (a) | Do any conflicts of interest exist in relation to funding or potential funding? **N/A** |

<table>
<thead>
<tr>
<th>K2.2 (b)</th>
<th>If yes, please elaborate.</th>
</tr>
</thead>
<tbody>
<tr>
<td>N/A</td>
<td></td>
</tr>
</tbody>
</table>

### K3 Payments to Investigators

| K3.1 (a) | Will any payments (monetary or otherwise) be made to investigators? **No** |

<table>
<thead>
<tr>
<th>K3.1 (b)</th>
<th>If yes, please provide details of payments (including amount).</th>
</tr>
</thead>
<tbody>
<tr>
<td>N/A</td>
<td></td>
</tr>
</tbody>
</table>

### K4 Payments to Participants

| K4.1 (a) | Will any payments / reimbursements (monetary or otherwise) be made to participants? **No** |

<table>
<thead>
<tr>
<th>K4.1 (b)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>N/A</td>
<td></td>
</tr>
</tbody>
</table>
Appendix 1: Ethics Application Form

K4.1 (b) If yes, please provide details of payments / reimbursements (including amount).

| N/A |

SECTION L ADDITIONAL ETHICAL ISSUES

L1 (a) Does this project raise any additional ethical issues?  No

If answer is No, please delete remaining questions in Section L.

PLEASE ENSURE THIS APPLICATION FORM IS FULLY COMPLETED AS INCOMPLETE SUBMISSIONS WILL NOT BE REVIEWED.
Appendix 2: MMUH Ethical Approval Letter

Mater Misericordiae University Hospital
Sisters of Mercy
Eccles Street, Dublin 7, Ireland

Ospidéal Ollscoile
Mater Misericordiae
Siúrachá na Trócaire
Sráid Eccles, Baile Átha Cliath 7, Éire

Tel: +353 1 8032000 Fax: +353 1 8032404 Email: mmh@mater.ie Web: www.mater.ie

Not for prescription purposes
Dr Joseph Duggan
Consultant Geriatrician
Medicine for the Older Person
Mater Misericordiae University Hospital
Eccles Street
Dublin 7
16th September 2015

Our Ref: 1/378/1739

RE: The relationship between performance on cognitive screening tests and functional abilities in individuals with Dementia

Revised title: The relationship between performance on cognitive screening tests and functional abilities in individuals with Mild Cognitive Impairment

Research Protocol, Version 2 10/08/2015
Letter of Notification to Participant’s Consultant
Participant Information Leaflet, Version 2: 10th August 2015
Consent Form, Version 2: August 2015

Dear Dr Duggan

I acknowledge receipt of your correspondences dated 16th September 2015 and 12th August 2015 addressing points of clarification, enclosing a revised Standard Application Form (Version 2 10th August 2015), revised Research Protocol (Version 2 10/08/2015), revised Participant Information Leaflet (Version 2: 10th August 2015), revised Consent Form (Version 2: August 2015), insurance details for the sponsor RCSI and requesting approval of a revised title for the above research study to be carried out at the Mater Misericordiae University Hospital (MMUH).

These correspondences have been noted, the revised documents and revised research study title have been approved.

Approval to proceed with this research study at the MMUH is granted; this approval is valid until 23rd July 2017.

It is your responsibility to adhere to the approved study protocol and ensure that all investigators involved with the research only use the approved documents without deviation (unless they have been approved by the Research Ethics Committee), to submit annual reports setting out the progress of the research (giving details of the number of participants who have been recruited, the number who have completed the study and details of any adverse events etc.) and to notify the Research Ethics Committee when the research is concluded.

The Mater Misericordiae University Hospital and Mater Private Hospital Research Ethics Committee would like to remind all investigators involved in research of their legal obligations under the law on Data Protection.

Yours sincerely

Prof Malcolm Kell
Chairman
Research Ethics Committee

c.c. Ms Elaine Scally, Occupational Therapist, Mater Misericordiae University Hospital

“Commitment to Excellence”

Director: Mr. Thomas Lynch (Chairman) Sr. Marguerite Rock, P.P. Tim Lynch, Prof. Stephen Kinlay, Ms. Mary Day, Sr. Eugene Nolan, Ms. Caroline Piggott, Mrs. Tanya King, Dr. Mary Coen, Brins, Mr. Eithne Shaw, Mr. Kevin O’Malley, Professors Desmond O’Donnell

Registered in Ireland No. 361402 Charity No. CHY203 Registered Office: Eccles Street, Dublin 7

P583 - Feb 15

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Appendix 3: RCSI Ethical Approval Letter

Royal College of Surgeons in Ireland
The Research Ethics Committee
121 St. Stephens Green, Dublin 2, Ireland.
Tel: +353 1 4022205 Email: recadmin@rcsi.ie

Dr David Smith, Acting Chair
Dr Niamh Clarke, Convenor

29th September 2015

Ms Elaine Scally
Occupational Therapy Department,
Mater Misericordiae University Hospital,
Eccles Street,
Dublin 7

<table>
<thead>
<tr>
<th>Ethics Reference No:</th>
<th>REC 1151 (accepted from Mater Private Hospital)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project Title:</td>
<td>The Relationship between Performance on Cognitive Screening Tests and Functional Abilities In Older Adults with Mild Cognitive Impairment</td>
</tr>
<tr>
<td>Researchers Name (lead applicant):</td>
<td>Ms Elaine Scally</td>
</tr>
<tr>
<td>Principal investigator on the project (PI):</td>
<td>Dr Joseph Duggan (Medicine for the Older Person Mater Misericordiae University Hospital)</td>
</tr>
<tr>
<td>Other individuals involved</td>
<td>Dr Helen French (RCSI School of Physiotherapy) and Dr Tadhg Stapleton (Discipline of Occupational Therapy, St. James’s Hospital)</td>
</tr>
</tbody>
</table>

Dear Ms Scally,

Thank you for your Research Ethics Committee (REC) application. The RCSI HREC accepts the ethical approval granted by the research study (details above) submitted by Ms Elaine Scally.

This letter provides approval for data collection for the time requested in your application and for an additional 6 months. This is to allow for any unexpected delays in proceeding with data collection. Therefore, this research ethics approval will expire on 29th October 2016.

Where data collection is necessary beyond this point, approval for an extension must be sought from the Research Ethics Committee.

This ethical approval is given on the understanding that:

- All personnel listed in the approved application have read, understand and are thoroughly familiar with all aspects of the study.
- Any significant change which occurs in connection with this study and/or which may alter its ethical consideration must be reported immediately to the REC, and an ethical amendment submitted where appropriate.
- Please submit a final report to the REC upon completion of your project.

We wish you all the best with your research.

Yours sincerely,

[Niamh Clarke (Convenor)]

[Dr David Smith (Acting Chair)]
PARTICIPANT INFORMATION LEAFLET

Version 2: 10th August 2015

Title of Study: The Relationship between Performance on Cognitive Screening Tests and Functional Abilities in Individual’s with Mild Cognitive Impairment

Lead Investigator: Elaine Scally, Senior Occupational Therapist, Mater Misericordiae University Hospital. Email: escall@mater.ie. Tel: 01-8034115

Research Supervisor: Dr. Helen French, Royal College of Surgeons in Ireland. Email: hfrench@rcsi.ie. Tel: 01-4022258

You are invited to take part in this research study. This leaflet will tell you about the purpose, risks and benefits of the study. Please read it carefully.

If there is anything you are not clear about, the lead investigator will be happy to explain it to you. Please take as much time as you need to read it.

If you agree to take part in the study, you will need to sign an informed consent document. You should only consent when you feel that you understand what is being asked of you and you have had enough time to think about your decision. Your participation is entirely voluntary. If you initially decide to take part you can later change your mind without difficulty.

Why is this study being done?

This purpose of this study is to look at the relationship between how people with cognitive problems perform in cognitive tests and how they perform everyday activities.

Who is organising and funding this study?

Elaine Scally, a Senior Occupational Therapist in the Mater Misericordiae University Hospital, is carrying out this research. This study is part of a Master’s Degree project. Elaine’s supervisor is Dr. Helen French, a Lecturer in at the Royal College of Surgeons in Ireland.

Why am I being asked to take part?

You are being asked to take part because you are currently a patient in the Mater Misericordiae University Hospital and you have been referred to Occupational Therapy to improve your function and ability to do everyday tasks.

How will the study be carried out?

40 people will be taking part in this study. The study will take place on the ward and in the Occupational Therapy department. People who decide to take part in the study will be required to complete cognitive tests and functional assessments. The study will take place between September 2015 and March 2016.
Appendix 4: Participant Information Leaflet

What will happen to me if I agree to take part?

People who decide to take part in this study will need to complete cognitive tests and functional assessments with the researcher Elaine Scally. This will take approximately 60-80 minutes and will be completed over 1-2 sessions. The sessions will take place on the ward and in the Occupational Therapy department.

What are the benefits?

It is hoped that the results of this study can be used to ensure that Occupational Therapy services are provided in the best possible manner for people with mild cognitive impairment. Results from the tests will be provided to your treating Occupational Therapist and can be used as part of your treatment planning.

What are the risks?

If you decide to take part in this study it may cause some minor inconvenience to you as it will take approximately 60-80 minutes of your time.

Will it cost me anything to take part?

No it will not cost you anything to take part in this study.

Is the study confidential?

All information will be kept confidential. Your current hospital Consultant will be informed that you are taking part in the study. The researcher will need to look at your medical records in the chart and on the computer. All information collected from the assessments will be coded. This means a code number will be assigned to all of your identifiable personal information to protect confidentiality. The lead investigator is the only person who will have the key to this code.

Where can I get further information?

If you have any further questions about the study or if you want to opt out of the study, you can rest assured it won't affect the quality of treatment you get in the future. If you need any further information now or at any time in the future, please contact:

Name: Elaine Scally  
Phone: 01-8034115 (Monday – Friday 08.30-16.30)

Address: Occupational Therapy Department, Mater Misericordiae University Hospital, Eccles Street, Dublin 7

THANK YOU FOR CONSIDERING TO TAKE PART IN THE RESEARCH STUDY
CONSENT FORM

Version 2: 10th August 2015

Title of Study: The Relationship between Performance on Cognitive Screening Tests and Functional Abilities in Individual’s with Mild Cognitive Impairment

Lead Investigator: Elaine Scally, Senior Occupational Therapist, Mater Misericordiae University Hospital. Email: escally@mater.ie. Tel: 01-8034115

Research Supervisor: Dr. Helen French, Royal College of Surgeons in Ireland. Email: hfrench@rcsi.ie. Tel: 01-4022258

I have read and understood the Information Leaflet dated 10/08/2015 about this research project. The information has been fully explained to me and I have been able to ask questions, all of which have been answered to my satisfaction.  

<table>
<thead>
<tr>
<th>Yes ☐</th>
<th>No ☐</th>
</tr>
</thead>
</table>

I understand that I don’t have to take part in this study and that I can withdraw from the study at any time. I understand that I don’t have to give a reason for withdrawing from the study and I understand that withdrawal from the study won’t affect my future medical care.

<table>
<thead>
<tr>
<th>Yes ☐</th>
<th>No ☐</th>
</tr>
</thead>
</table>

I give permission for researchers to look at my medical records to get information. I have been assured that information about me will be kept private and confidential.

<table>
<thead>
<tr>
<th>Yes ☐</th>
<th>No ☐</th>
</tr>
</thead>
</table>

I have been given a copy of the Information Leaflet and this completed Consent Form for my records.

<table>
<thead>
<tr>
<th>Yes ☐</th>
<th>No ☐</th>
</tr>
</thead>
</table>

I agree to take part in the above research study.

| Yes ☐ | No ☐ |
Appendix 5: Participant Consent Form

Participant’s Name (BLOCK CAPITALS): _______________________
Participant’s Signature: _______________________
Date: _______________________

Researcher’s Name (BLOCK CAPITALS): _______________________
Researcher’s Signature: _______________________
Date: _______________________
Appendix 6: Letter of Notification to Consultant

Not for prescription purposes

Dr Joseph Duggan and Ms Elaine Scally
Medicine for the Elderly and Occupational Therapy Departments
Mater Misericordiae University Hospital
Eccles Street
Dublin 7

Dear Colleague,

This letter is to inform you that your patient (insert patient name) with MRN (insert patient's hospital number) has provided voluntary informed consent to participate in the research study ‘The Relationship between Performance on Cognitive Screening Tests and Functional Abilities in Older Adults with Mild Cognitive Impairment’.

This study which is being conducted in fulfilment of a MSc in Neurology and Gerontology with the Royal College of Surgeons in Ireland, aims to examine the relationship between performance on two commonly-used cognitive screening tools (the Montreal Cognitive Assessment and the Addenbrooke’s Cognitive Examination) and functional status (assessed by the Executive Function Performance Test) among individuals with mild cognitive impairment in the acute hospital setting.

Determining the relationship between cognitive and functional domains for individuals with mild cognitive impairment in the acute care setting will elucidate areas of rehabilitation requiring occupational therapy intervention to maximise functional recovery and rehabilitation outcomes for this patient group.

Yours sincerely,

Dr Joseph Duggan
Principal Investigator
Consultant Physician/ Geriatrician

Ms Elaine Scally
Lead Co-Investigator and Lead Contact Person
Senior Occupational Therapist

Directions: Mr. Thomas Lynch (Chairman), Sr. Margaretta Rock, Prof. Tom Lynch, Prof. Brendan Kinley, Ms. Mary Day, Sr. Eugene Nolan, Ms. Caroline Pigott, Ms Tanja King, Dr. Mary Carmel Byrne, Ms. Eddie Shaw, Mr. Kevin O’Malley, Professor Desmond Fitzgerald
Registered in Ireland No. 351402 Charity No. CHY203 Registered Office: Eccles Street, Dublin 7
# Data Collection Form

<table>
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<th>Participant Number:</th>
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<tbody>
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<td></td>
</tr>
<tr>
<td>Nationality:</td>
<td>Irish □</td>
</tr>
<tr>
<td></td>
<td>Other (write in) □ ______________</td>
</tr>
<tr>
<td>Gender:</td>
<td>Male □</td>
</tr>
<tr>
<td></td>
<td>Female □</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Reason for Admission to MMUH:</th>
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<tbody>
<tr>
<td>Recruitment Source:</td>
<td>Care of the Older Person □</td>
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<tr>
<td></td>
<td>General Medicine □</td>
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<table>
<thead>
<tr>
<th>Self-Reported Cognitive Impairment:</th>
<th>Yes □   No □</th>
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</thead>
</table>

<table>
<thead>
<tr>
<th>Co-morbidities:</th>
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<td></td>
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<th>Medications:</th>
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<table>
<thead>
<tr>
<th>Highest Educational Achievement:</th>
<th>Primary Level: □</th>
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<tr>
<td></td>
<td>Secondary Level: □</td>
</tr>
<tr>
<td></td>
<td>Third Level: □</td>
</tr>
</tbody>
</table>
# Appendix 7: Data Collection Form

## Marital Status:
- Single: □
- Married: □
- Widowed: □
- Divorced/ Separated: □

## Living Situation:
- Lives alone: □
- Lives with spouse: □
- Lives with offspring: □
- Lives with sibling: □
- Other: □

## Clinical Assessment Scores:

<table>
<thead>
<tr>
<th>Test</th>
<th>Total Score</th>
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<tbody>
<tr>
<td><strong>Executive Function Performance Test</strong></td>
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<td>Cooking:</td>
<td></td>
</tr>
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<td>Telephone Usage:</td>
<td></td>
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<td>Medication Management:</td>
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<td>Bill Payment:</td>
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<td>Initiation:</td>
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<td>Sequencing:</td>
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<td>Judgement and Safety:</td>
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<td>Completion:</td>
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<td><strong>Montreal Cognitive Assessment</strong></td>
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<td>Total Score:</td>
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<tr>
<td>Visuospatial/ Executive:</td>
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### Appendix 7: Data Collection Form

<table>
<thead>
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<th>Addenbrooke’s Cognitive Examination</th>
<th>Total Score:</th>
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<tr>
<td></td>
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</tr>
<tr>
<td></td>
<td>• Attention:</td>
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<td></td>
<td>• Memory:</td>
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<td></td>
<td>• Fluency:</td>
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<tr>
<td></td>
<td>• Language:</td>
</tr>
<tr>
<td></td>
<td>• Visuospatial:</td>
</tr>
</tbody>
</table>

- Naming:
- Attention:
- Language:
- Abstraction:
- Delayed Recall:
- Orientation:
# Appendix 8: Montreal Cognitive Assessment

## MONTREAL COGNITIVE ASSESSMENT (MOCA)

**Version 7.1 Original Version**

<table>
<thead>
<tr>
<th>VISUOSPATIAL / EXECUTIVE</th>
<th>NAMING</th>
<th>MEMORY</th>
<th>ATTENTION</th>
<th>LANGUAGE</th>
<th>ABSTRACTION</th>
<th>DELAYED RECALL</th>
<th>ORIENTATION</th>
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<td>Copy cube</td>
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<td>[ ]</td>
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<tr>
<td>Draw CLOCK (Ten past eleven) (3 points)</td>
<td>[ ]</td>
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<td>[ ]</td>
<td>[ ]</td>
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</tr>
<tr>
<td>Points</td>
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</tbody>
</table>

**Notes:**
- **MEMORY:** Read list of words, subject must repeat them. Do 2 trials, even if 1st trial is successful. Do a recall after 5 minutes.
- **ATTENTION:** Read list of digits (1 digit/sec.). Subject has to repeat them in the forward order. Subject has to repeat them in the backward order.
- **LANGUAGE:** Repeat: I only know that John is the one to help today. The cat always hid under the couch when dogs were in the room.
- **ABSTRACTION:** Similarity between e.g. banana - orange = fruit, train - bicycle = watch - ruler.
- **DELAYED RECALL:** Has to recall words with NO CUE.
- **ORIENTATION:** [ ] Date [ ] Month [ ] Year [ ] Day [ ] Place [ ] City

© Z.Nasreddine MD

www.mocatest.org

Normalized ±26 / 30

TOTAL ±30

Add 1 point if ≤ 12 yr edu
Appendix 9: Addenbrooke’s Cognitive Examination

**ADDENBROOKE’S COGNITIVE EXAMINATION – ACE-III**

**English Version A (2012)**

| Name: | Date of testing: ___/___/___ |
| Date of Birth: | Tester’s name: | |
| Hospital No. or Address: | Age at leaving full-time education: | |
| | Occupation: | |
| | Handedness: | |

**ATTENTION**

- **Ask: What is the Day**
  - Date
  - Month
  - Year
  - Season
  - Attention [Score 0-5]

- **Ask: Which No./Floor**
  - Street/Hospital
  - Town
  - County
  - Country
  - Attention [Score 0-5]

**ATTENTION**

- Tell: “I’m going to give you three words and I’d like you to repeat them after me: lemon, key and ball.”
  - After subject repeats, say “Try to remember them because I’m going to ask you later.”
  - Score only the first trial (repeat 3 times if necessary).
  - Register number of trials:
  - Attention [Score 0-3]

**ATTENTION**

- Ask the subject: “Could you take 7 away from 100? I’d like you to keep taking 7 away from each new number until I tell you to stop.”
  - If subject makes a mistake, do not stop them. Let the subject carry on and check subsequent answers (e.g., 93, 84, 77, 70, 63 – score 4).
  - Stop after five subtractions (93, 86, 79, 72, 66): ___ ___ ___ ___ ___

**MEMORY**

- **Ask: “Which 3 words did I ask you to repeat and remember?” ___ ___ ___ ___**

**FLUENCY**

- **Letters**
  - Say: “I’m going to give you a letter of the alphabet and I’d like you to generate as many words as you can beginning with that letter, but not names of people or places. For example, if I give you the letter “C”, you could give me words like “cat, cry, clock” and so on. But, you can’t give me words like Catherine or Canada. Do you understand? Are you ready? You have one minute. The letter I want you to use is the letter “P”.
  - Fluency [Score 0 – 7]

- **Animals**
  - Say: “Now can you name as many animals as possible. It can begin with any letter.”
  - Fluency [Score 0 – 7]
Appendix 9: Addenbrooke’s Cognitive Examination

### Memory

- Tell: "I’m going to give you a name and address and I’d like you to repeat the name and address after me. So you have a chance to learn, we’ll be doing that 3 times. I’ll ask you the name and address later."

Score only the third trial.

<table>
<thead>
<tr>
<th>1st Trial</th>
<th>2nd Trial</th>
<th>3rd Trial</th>
</tr>
</thead>
<tbody>
<tr>
<td>Harry Barnes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>73 Orchard Close</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kingsbridge</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Devon</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Memory

- Name of the current Prime Minister
- Name of the woman who was Prime Minister
- Name of the USA president
- Name of the USA president who was assassinated in the 1990s

### Language

- Place a pencil and a piece of paper in front of the subject. As a practice trial, ask the subject to “Pick up the pencil and then the paper” If incorrect, score 0 and do not continue further.

- If the subject is correct on the practice trial, continue with the following three commands below.
  - Ask the subject to ‘Place the paper on top of the pencil’
  - Ask the subject to ‘Pick up the pencil but not the paper’
  - Ask the subject to ‘Pass me the pencil after touching the paper’

  Note: Place the pencil and paper in front of the subject before each command.

### Language

- Ask the subject to write two (or more) complete sentences about his/her last holiday/weekend/Christmas. Write in complete sentences and do not use abbreviations.
  - Give 1 point if there are two (or more) complete sentences about the one topic; and give another 1 point if grammar and spelling are correct.

### Language

- Ask the subject to repeat: ‘caterpillar’; ‘eccentricity’; ‘unintelligible’; ‘statistician’
  - Score 2 if all are correct; score 1 if 3 are correct; and score 0 if 2 or less are correct.
<table>
<thead>
<tr>
<th>Language</th>
<th>Language</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ask the subject to repeat: ‘<em>All that glitters is not gold</em>’</td>
<td>[Score 0–1]</td>
</tr>
<tr>
<td>Ask the subject to repeat: ‘<em>A stitch in time saves nine</em>’</td>
<td>[Score 0–1]</td>
</tr>
<tr>
<td>Ask the subject to name the following pictures:</td>
<td>[Score 0–12]</td>
</tr>
<tr>
<td><img src="image1.png" alt="Picture" /></td>
<td><img src="image2.png" alt="Picture" /></td>
</tr>
<tr>
<td><img src="image3.png" alt="Picture" /></td>
<td><img src="image4.png" alt="Picture" /></td>
</tr>
<tr>
<td><img src="image5.png" alt="Picture" /></td>
<td><img src="image6.png" alt="Picture" /></td>
</tr>
<tr>
<td><img src="image7.png" alt="Picture" /></td>
<td><img src="image8.png" alt="Picture" /></td>
</tr>
<tr>
<td><img src="image9.png" alt="Picture" /></td>
<td><img src="image10.png" alt="Picture" /></td>
</tr>
<tr>
<td><img src="image11.png" alt="Picture" /></td>
<td><img src="image12.png" alt="Picture" /></td>
</tr>
<tr>
<td>Using the pictures above, ask the subject to:</td>
<td>[Score 0–4]</td>
</tr>
<tr>
<td>• Point to the one which is associated with the monarchy</td>
<td><img src="image13.png" alt="Response" /></td>
</tr>
<tr>
<td>• Point to the one which is a marsupial</td>
<td><img src="image14.png" alt="Response" /></td>
</tr>
<tr>
<td>• Point to the one which is found in the Antarctic</td>
<td><img src="image15.png" alt="Response" /></td>
</tr>
<tr>
<td>• Point to the one which has a nautical connection</td>
<td><img src="image16.png" alt="Response" /></td>
</tr>
</tbody>
</table>
### Appendix 9: Addenbrooke’s Cognitive Examination

#### Language
- **Ask the subject to read the following words:** (Score 1 only if all correct)
  - sew
  - pint
  - soot
  - dough
  - height

#### Visuospatial Abilities
- **Infinity Diagram:** Ask the subject to copy this diagram

- **Wire cube:** Ask the subject to copy this drawing (for scoring, see instructions guide).

- **Clock:** Ask the subject to draw a clock face with numbers and the hands at ten past five. (For scoring see instruction guide: circle = 1, numbers = 2, hands = 2 if all correct.)
Appendix 9: Addenbrooke’s Cognitive Examination

<table>
<thead>
<tr>
<th>VISUOSPATIAL ABILITIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>➢ Ask the subject to count the dots without pointing to them</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Visuospatial</th>
</tr>
</thead>
<tbody>
<tr>
<td>Score (0-4)</td>
</tr>
</tbody>
</table>

![Diagram of dot patterns]
## Appendix 9: Addenbrooke’s Cognitive Examination

### VISUOSPATIAL ABILITIES

- Ask the subject to identify the letters

<table>
<thead>
<tr>
<th>Visuospatial</th>
<th>(Score 0-4)</th>
</tr>
</thead>
</table>

![Images of letters K, M, A, T]

### MEMORY

- Ask "Now tell me what you remember about that name and address we were repeating at the beginning"

<table>
<thead>
<tr>
<th>Memory</th>
<th>(Score 0-7)</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Harry Barnes</th>
<th>73 Orchard Close</th>
<th>Kingsbridge</th>
<th>Devon</th>
</tr>
</thead>
<tbody>
<tr>
<td>忆</td>
<td>忆</td>
<td>忆</td>
<td>忆</td>
</tr>
</tbody>
</table>

- This test should be done if the subject failed to recall one or more items above. If all items were recalled, skip the test and score 5. If only part was recalled start by ticking items recalled in the shadowed column on the right-hand side, and then test not recalled items by telling the subject "ok, I'll give you some hints: was the name X, Y or Z?" and so on. Each recognised item scores one point, which is added to the point gained by recalling.

<table>
<thead>
<tr>
<th>Jerry Barnes</th>
<th>Harry Barnes</th>
<th>Harry Bradford</th>
<th>37</th>
<th>73</th>
<th>76</th>
</tr>
</thead>
<tbody>
<tr>
<td>Orchard Place</td>
<td>Oak Close</td>
<td>Orchard Close</td>
<td>recalled</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oakhampton</td>
<td>Kingsbridge</td>
<td>Darlington</td>
<td>recalled</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Devon</td>
<td>Dorset</td>
<td>Somersel</td>
<td>recalled</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### SCORES

<table>
<thead>
<tr>
<th>TOTAL ACE-III SCORE</th>
<th>/100</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attention</td>
<td>/18</td>
</tr>
<tr>
<td>Memory</td>
<td>/26</td>
</tr>
<tr>
<td>Fluency</td>
<td>/14</td>
</tr>
<tr>
<td>Language</td>
<td>/26</td>
</tr>
<tr>
<td>Visuospatial</td>
<td>/16</td>
</tr>
</tbody>
</table>
## Appendix 10: Executive Function Performance Test

### Executive Function Performance Test (EFPT): Form A

<table>
<thead>
<tr>
<th>TASK: Hand Washing</th>
<th>Independent</th>
<th>Verbal Guidance</th>
<th>Genuflex Guidance</th>
<th>Verbal Direct Instruction</th>
<th>Physical Assistance</th>
<th>Do-For Participant</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>INITIATION: beginning the task</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EXECUTION: carrying out the actions of the task through the use of organization, sequencing, and judgment</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Organization: arrangement of the tools/materials to complete the task</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sequencing: execution of steps in appropriate order</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Judgment &amp; Safety: avoidance of dangerous situation</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>COMPLETION: termination of task</td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

Total Score __________
Appendix 10: Executive Function Performance Test

Executive Function Performance Test (EFPT): Form B

<table>
<thead>
<tr>
<th>TASK: Sample Cooking</th>
<th>Independent</th>
<th>Verbal Guidance</th>
<th>Verbal Direct Instruction</th>
<th>Physical Assistance</th>
<th>Br. For Participant</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>INITIATION: Beginning the task</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Upon your request to start, participant moves to table to gather tools/materials for making oatmeal.</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>EXECUTION: Carrying out the actions of the task through the use of organization, sequencing, and judgment</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Organization: arrangement of the tools/materials to complete the task. Participant retrieves the items needed (pan, pot holder, measuring cup, oats, instructions, spoon).</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Sequencing: execution of steps in appropriate order. Participant performs steps according to the directions participant measures water, puts water into pan, turn on stove, sets heat according to what is needed, boils water, measures oats, puts oats into boiling water, stirs, turns off stove, uses pot holder to lift hot pan, and pours oats into bowl. Participant does not confuse steps, e.g., turns off stove before water boils, replacing oats in cupboard before measuring some out, but may measure oats before boiling the water or put salt in the water before or as it boils.</td>
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</tr>
<tr>
<td>Judgment &amp; Safety: avoidance of dangerous situations. Participant prevents or avoids danger, e.g., turns water off, does not lay pot holder near burner, turns burner off, uses pot holder to lift hot pan, etc.</td>
<td></td>
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</tr>
<tr>
<td>COMPLETION: termination of task</td>
<td></td>
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</tr>
<tr>
<td>Participant knows he/she is finished, e.g., pours oatmeal into bowl and moves away from pot. If participant washed dishes, he/she moves away from the sink, doesn’t continue to scrape the pan, etc.</td>
<td></td>
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</tr>
</tbody>
</table>

Total Score _______
### Appendix 10: Executive Function Performance Test

#### Executive Function Performance Test (EFPT): Form C

<table>
<thead>
<tr>
<th>TASK: Using the Telephone</th>
<th>Independent</th>
<th>Verbal Guidance</th>
<th>Gestural Guidance</th>
<th>Verbal Direct Instruction</th>
<th>Physical Assistance</th>
<th>Do For Participant</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>INITIATION:</strong> beginning the task</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Upon your request to start, participant moves to table to gather tools/materials for making a phone call</td>
<td></td>
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</tr>
<tr>
<td><strong>EXECUTION:</strong> carrying out the actions of the task through the use of organization, sequencing, and judgment</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td><strong>Organization:</strong> arrangement of the tools/materials to complete the task</td>
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</tr>
<tr>
<td>Participant retrieves the items needed (phone book, pencil, paper)</td>
<td></td>
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</tr>
<tr>
<td><strong>Sequencing:</strong> execution of steps in appropriate order</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Participant performs steps in appropriate sequence, e.g., looks up number, lifts receiver, dials number, reaches correct number, and tells you the correct answer. Participant does not confuse steps, e.g., dials number before looking it up; hangs up receiver in middle of dialing; puts away phone book instead of looking up number, etc.</td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Judgment &amp; Safety:</strong> avoidance of dangerous situation</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Participant prevents or avoids danger, e.g., dials the correct number, reports information accurately to you, replaces receiver on hook so phone can be used, etc.</td>
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</tr>
<tr>
<td><strong>COMPLETION:</strong> termination of task</td>
<td></td>
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</tr>
<tr>
<td>Participant knows he/she is finished, e.g., hangs up phone and does not continue pushing button</td>
<td></td>
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</tr>
</tbody>
</table>

**Total Score** ___
### Executive Function Performance Test (EFPT): Form D

**Task:** Taking Medication

<table>
<thead>
<tr>
<th>INITIATION: beginning the task</th>
<th>Independent 0</th>
<th>Verbal Guidance 1</th>
<th>Gestural Guidance 2</th>
<th>Verbal Direct Instruction 3</th>
<th>Physical Assistance 4</th>
<th>Do For Participant 5</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upon your request to start, participant moves to table to gather tools/materials for taking medication.</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

| EXECUTION: carrying out the actions of the task through the use of organization, sequencing, and judgment |               |                   |                     |                             |                      |                     |       |
| Organization: arrangement of the tools/materials to complete the task. Participant retrieves the items needed (medicine bottle, instructions, pills, glass). |               |                   |                     |                             |                      |                     |       |

| Sequencing: execution of steps in appropriate order. Participant performs steps in appropriate sequence, e.g., reads the directions on the pill bottle, opens pill bottle, pours pills into hand or onto table, chooses correct number of pills according to prescription, puts unused pills back into bottle, puts pills into mouth, swallows, and puts cap back on bottle. Participant does not confuse steps, e.g., puts cap on before takes pills out and counts them, drinks all the water before puts pills into mouth, etc. |               |                   |                     |                             |                      |                     |       |

| Judgment & Safety: avoidance of dangerous situation. Participant prevents or avoids danger, e.g., takes correct pills, counts and takes correct number of pills, doesn’t put water too near to the edge of table, doesn’t pour water outside of the cup, etc. |               |                   |                     |                             |                      |                     |       |

| COMPLETION: termination of task |               |                   |                     |                             |                      |                     |       |
| Participant knows he/she is finished, e.g., moves away from the task, doesn’t open pill bottle and play with pills, etc. |               |                   |                     |                             |                      |                     |       |

**Total Score ____**
### Executive Function Performance Test (EFPT): Form E

**Task:** Paying Two Bills

<table>
<thead>
<tr>
<th>Task</th>
<th>Independent</th>
<th>Verbal Guidance</th>
<th>Gestural Guidance</th>
<th>Verbal Direct Instruction</th>
<th>Physical Assistance</th>
<th>Do for Participant</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Initiation:</strong> beginning the task</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Upon your request to start, participant moves to table to gather tools/materials for paying two bills</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td><strong>Execution:</strong> carrying out the actions of the task through the use of organization, sequencing, and judgment</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Organization: arrangement of tools/materials to complete the task. Participant retrieves the items needed (pen, checkbook, bills, envelope, stamp)</td>
<td></td>
<td></td>
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<td></td>
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<td></td>
</tr>
<tr>
<td>Sequencing: execution of steps in appropriate order. Participant performs steps in appropriate sequence, e.g., locates the bill, checks the balance, writes the check for the correct amount, puts check into envelope and addresses it, puts stamp onto envelope and seals it, locates second bill, checks balance, etc. Participant does not confuse steps, e.g., writes check before checking the balance, seals envelope before putting check in, puts check into envelope before mailing it, etc.</td>
<td></td>
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</tr>
<tr>
<td>Judgment &amp; Safety: avoidance of dangerous situations. Participant presents or avoids danger, e.g., makes check cut in the correct amount and signs it, writes correct address, subtracts check amount from the balance, does not write second check (or indicates in some way that there are insufficient funds in the account to write the second check), etc.</td>
<td></td>
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</tr>
<tr>
<td>Completion: termination of task.</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Participant knows the task is finished, e.g., puts down the checkbook, doesn’t continue writing checks or paying with the bills or checkbook, etc.</td>
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</tbody>
</table>

**Total Score** _