The Relationship Between Cognitive Performance Assessments and the Mental Capacity Functional Test: A Systematic Review

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Abstract

Aim: Investigating the relationship between neurocognitive performance and the 2005 Mental Capacity Act (MCA) functional test in adults with a neurological diagnosis.

Methods: Cochrane Library, MEDLINE, PubMed, CINAHL, PsycINFO, EMBASE, Scopus and Web of Science were searched in April 2021. Included studies reported cognitive test outcomes in adults with neurological diagnoses in relation to one or more of the four pillars of the MCA functional test ('understanding', 'retention', 'using and weighing-up information', 'communication'). A narrative synthesis was structured in accordance with each pillar of the functional test. The NIH observational studies tool enabled quality assessment.

Results: Of the 3,996 studies screened, 34 were included. Significant relationships between cognitive scores and capacity outcomes were identified in all but one study. The most consistent finding related to tests of information processing, executive functioning, and attention/working memory correlating strongly with 'understanding' in different samples. The relationships between other pillars and cognitive outcomes were seldom reported, with inconsistent findings.

Conclusions: The pillars of the functional test are seldom referred to separately. Further research which clearly operationalises the pillars of capacity assessed is required to elucidate both the utility and limits of cognitive measures in supporting complex functional assessments in line with the MCA.

Key words: Mental capacity; cognition; neuropsychology; neurodegeneration; neurological injury; systematic review

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The freedom for an individual to make autonomous, serious, and life changing decisions is dependent upon their mental capacity at any given time. The 2005 MCA was introduced to provide a legislative framework for assessing mental capacity in individuals aged over 16 years in England and Wales in a way that aimed to support vulnerable individuals to play an active role in decisions about their welfare¹. Accordingly, the MCA is underpinned by five key principles; capacity should be assumed unless proven otherwise, all practicable steps should be taken to allow an individual to make a decision, if they have capacity they are entitled to make any decision they wish, if lacking capacity all decisions should be made in the individual's best interest, and any decision made in a person's best interest should be the least restrictive option¹.

The MCA defines a two-stage test for assessing an individual's capacity. First, there must be evidence of an impairment or disturbance of the mind or brain which may impact their ability to make a decision¹. Conditions that may result in such impairment include transient disturbances caused by delirium or alcohol use, as well as long-lasting conditions, such as psychiatric disorders or neurological injury or illness². Subsequently, an assessor should complete a four-pillar functional test of the individual's ability to (i) understand, (ii) retain, (iii) use or weigh-up the information, and then (iv) communicate a decision using any means¹. Importantly, any failing of these aspects in decision making must be attributed to the impairment or disturbance in mind or brain in order to deem an individual to be lacking capacity to make a decision. Capacity should only be assessed with regards to a particular decision, at a specific time, and in a specific situation.

Although the MCA¹ is a very important piece of legislation and the implementation has allowed for the protection and empowerment of individuals who lack mental capacity, several issues remain unresolved regarding its use. A House of Lord's Select Committee³ investigated the effectiveness of the MCA in practice in 2014 and concluded that, "Our evidence suggests that capacity is not always assumed when it should be. Capacity assessments are not often carried out; when they are, the quality is often poor". The most notable uncertainties are around who should conduct the assessments, how assessments should be performed, and what degree of impairment constitutes incapacity⁴. A systematic review of studies of the Act's implementation by Hinsliff-Smith et al.⁵ found that although mandatory staff training was frequently provided, overall understanding of the Act was poor

and the application was inconsistent across clinical settings. This is unsurprising as there are currently no gold standard mental capacity assessment tools available for use and unstructured determinations of capacity are common practice. Consequently, capacity assessments have received substantial criticism from patients and carers for the subjective and inconsistent nature of each assessment⁶. This is an important concern as mental capacity decisions can dictate an individual's ability to retain independent control over numerous aspects of their lives⁴. For example, a capacity assessment of an individual with dementia may be used to determine whether they are capable of giving informed consent to treatment decisions, participating in research, managing their finances, living independently, creating a will, or retaining the ability to drive⁷.

Cognition plays a crucial role in autonomous decision making as mental capacity is mediated by several cognitive functions. It has been suggested that in order to gain a more comprehensive understanding of an individual's ability to make a decision in line with legal standards, standardized capacity assessment tools should be used in conjunction with measures of cognitive performance^{4,8}. Current NICE guidance states that the use of cognitive assessment tools that are not primarily designed to assess capacity may yield information relevant to the assessment⁹. Similarly, recent British Psychological Society (BPS) guidance on the assessment of mental capacity indicates that cognitive measures can provide useful, informative data which assists the practitioner to come to an opinion regarding one or more elements of an individual's ability to meet the requirements of both stages of the MCA functional test¹⁰. However, it is unclear as to how performance on standardized assessments of specific cognitive functions relate to the four pillars underlying the functional test of mental capacity in UK legislation¹.

As proposed by Grisso and Appelbaum¹¹, decisional capacity is considered to involve four dimensions: understanding, appreciation, reasoning, and expressing a choice. This four-component model predominates the contemporary definition of what denotes "decisionally capable"¹². Various cognitive models have been offered in theorizing the role of specific cognitive domains in each component of healthcare decision making. Different cognitive functions are thought to impact certain dimensions of decisional capacity more heavily than others. For example, Palmer et al.¹² states that 'reasoning' may draw on both working memory in addition to executive functions such as abstraction, planning and foresight. The authors argue that by using neurocognitive measures, clinicians can highlight reasons why an

individual may be experiencing difficulties with decision-making and can optimize their chances of playing an active role in their decision-making by capitalizing on their cognitive strengths.

It remains unclear as to which selective deficits in cognition are associated with the four-pillars of decision-making capacity as set out by the MCA¹. The aim of this review is to further understand how performance on neurocognitive measures relates to an individual's mental capacity as defined by the MCA¹ and each pillar of the functional test. The authors specifically aim to investigate the literature concerning adult participants with acquired neurological injuries and neurodegenerative conditions denoting a 'disturbance in the brain' (as stated in the MCA), as opposed to neurodevelopmental and psychiatric populations.

Methods

This review was conducted in accordance with preferred reporting for systematic reviews and meta-analyses guidelines¹³, and was registered with PROSPERO (CRD42020168984). A protocol was prepared but not made publicly available.

Search Strategy

The following databases were systematically searched in April 2021 using a detailed search strategy made in consultation with a neuropsychologist: The Cochrane Library, MEDLINE, PubMed, CINAHL, PsycINFO, EMBASE, Scopus and Web of Science. Search terms pertained to mental capacity, cognitive assessment, and neurological disease or injury (**Supplementary 1**). Search results were limited to studies in the English language. A hand search of relevant reference lists was also completed. Titles and abstracts were screened against inclusion criteria by the primary researcher. Selected full texts were then screened against the criteria by both the primary and secondary researcher. Inter-rater reliability was calculated using Cohen's kappa statistic to ascertain the scoring agreement between the two investigators. A third researcher was consulted if necessary.

Inclusion and Exclusion Criteria

Studies were included if they met the following criteria: peer-reviewed quantitative or mixed method scientific studies; adult participants ≥ 18 years with a neurological injury or neurodegenerative condition; assessed mental capacity of participants for any decision, in

accordance with one or more elements included in the functional test for mental capacity in England and Wales ('understanding'; 'retention'; 'ability to use and weigh-up information'; 'communication of a decision') or 'overall' mental capacity, as set out under the MCA¹; assessing one or more cognitive domain using standardized measures of cognitive functioning; cognitive scores were considered as potential predictors of one or more element included in the functional test for mental capacity.

Studies were excluded if they involved mixed populations, e.g. healthy controls, mental health diagnoses, neurodevelopmental disorders or intellectual disabilities alongside the targeted population where the results are not disaggregated; assessed 'overall' mental capacity of participants using a legal standard that is not in accordance with the functional test set out in the MCA¹, whereby no reasonable conclusion could be drawn relating to any element of the English and Welsh functional test ('understanding'; 'retention'; 'ability to use and weigh-up information'; 'communication of a decision'); or did not consider cognitive scores as potential predictors of decisional capacity. Additionally, all case-reports, theses, conference abstracts, and review papers were excluded.

Quality Assessment

Internal validity and bias within studies was assessed using the National Heart, Lung, and Blood Institute Study Quality Assessment Tool for Observational Cohort and Cross-Sectional Studies¹⁴ (NIH; see [Supplementary 2](#)). Study quality was assessed in accordance with the primary aims of the paper and quality rating was carried out independently by two researchers. Inter-rater reliability was calculated using Cohen's kappa statistic to ascertain the scoring agreement ($\kappa = 0.61$).

Data Extraction

Data extraction was completed with a modified version of the Cochrane Public Health data extraction and assessment template¹⁵. This included research aims and inclusion criteria, methods, study design, study setting, name of the cognitive test(s) used, the cognitive domain(s) tested, the outcome scores reported, participant characteristics (including health condition), the capacity instrument used, and the analysis of the relationship between cognitive outcomes and mental capacity assessment outcomes e.g. relationship to a particular pillar of the functional test set out in section 3 of the MCA¹.

Data Synthesis

Studies reporting the relationship between standardised assessments of cognitive functioning and ‘overall’ decisional capacity in line with the MCA¹, as opposed to findings in relation to each of the four pillars of the functional test, were initially considered in line with cognitive neuropsychological theory and associated models within a section titled ‘overall mental capacity’. Where possible, study findings were subsequently grouped in accordance with the four pillars of the functional test set out in section 3 of the MCA¹.

Subsequently, study findings relating to each pillar were synthesised in accordance with established cognitive domains e.g. attention/working memory. This was in line with the approach taken by many of the included studies. Where possible, cognitive tests were categorised by cognitive domain in accordance with original studies. However, due to variability in domain allocation of the same test across studies, tentative allocations were made based on the majority. This approach allowed for findings to be considered in line with cognitive neuropsychological theory and associated models, to draw conclusions regarding how standardised assessments of specific cognitive functions may relate to key constructs underlying each of the four pillars of the functional test.

The MCA¹ is a legal framework for England and Wales, however, other countries apply different legal standards when assessing mental capacity. Such studies were included if they applied a mental capacity tool akin to at least one of the four pillars of the functional test set out in the MCA¹ e.g. the MacArthur Competence Assessment Tool for Treatment (Mac-CAT-T)¹¹. In these instances, conclusions were drawn regarding aspects of the assessment that are indisputably related to the functional test, such as ‘understanding’ and ‘expression/communication of a decision’. The domain-specific criteria for each mental capacity tool used in includes studies is outlined in [Supplementary 3](#).

Results

Following the removal of duplicates, 3,996 articles were identified for screening. Titles and abstracts were screened, resulting in 137 articles eligible for full-text screening. Substantial agreement was found between the two researchers ($\kappa = 0.77$) and any disagreements were discussed, and a consensus was reached. Following full-text review, 34 articles were included (Figure 1).

Figure 1.*Flow Chart of Study Screening Against Inclusion and Exclusion Criteria***[INSERT FIGURE 1 HERE]****Study Characteristics**

Studies were predominantly cross-sectional, although one study was a single-blind RCT¹⁶ and two studies included longitudinal follow-up^{17,18}. Of the 34 studies included, 22 reported analyses of cognitive relationship to capacity as the primary aim ([Supplementary 4](#))¹⁷⁻³⁸. The remaining 12 studies reported the analyses of interest as a secondary objective^{16,39-49} with primary objectives including, for example, exploring rates of mental capacity in defined populations. Where studies reported on more than one distinct group of participants with a neurodegenerative condition or neurological injury, results were considered separately^{30,31,34,44,45}. Likewise, if a sample was considered at multiple time-points, results were considered separately¹⁷. Consequently, 40 samples were included from 34 studies. Table 1 provides detailed methodological information regarding each study.

Publications spanned 8 countries, although most were carried out in the USA ($n = 20$)^{17,19-21,23-26,29,30,32,34,36,38,40-42,47-49}, followed by China^{27,44-46} and the UK^{16,22,28,35} ($n = 4$, respectively), and Italy ($n = 2$)^{18,37}; Canada, Germany, Sweden and Brazil hosted one study each. All but three inpatient samples^{17,28,34} recruited outpatients or those living in the community. Sample sizes ranged from 13 to 613 participants. Study samples included participants with dementia ($n = 13$)^{19,22-24,26,27,32,35,37-39,46,47}, mild cognitive impairment (MCI; $n = 1$)²⁵, Parkinson's disease (PD; $n = 2$)^{29,40}, relapsing-remitting multiple sclerosis (RRMS; $n = 1$)¹⁶, progressive MS ($n = 1$)⁴², progressive supranuclear palsy (PSP, $n = 1$)⁴¹, amyotrophic lateral sclerosis (ALS, $n = 1$)¹⁸, stroke ($n = 1$)²⁸, malignant glioma (MG; $n = 2$)^{48,49}, brain metastasis (BM; $n = 2$)^{21,36}, and traumatic or acquired brain injury (TBI/ABI; $n = 2$)^{17,31}. Study samples with mixed neurological populations included those with either dementia or MCI^{30,33,43-45}, dementia or ABI³¹, BM or MG²⁰, or varying degrees of TBI³⁴. The findings of these mixed populations were pooled^{20,33,43} or reported separately^{30,31,34,44,45} within each of these studies.

Capacity Assessments

Twenty-one studies assessed capacity to consent to treatment^{16-21,24,27,30,33,34,38-44,46,47,49}. Of these, all but two studies^{16,38} used standardised capacity tools. The most frequently used capacity tool was the Capacity to Consent to Treatment Instrument (CCTI)^{17,20,21,24,30,34,38,40-42,47,49,50}. Other tools used include the Mac-CAT-T^{11,18,24,27,39,43,46}, Linguistic Instrument for Medical Decision-Making (LIMD)^{33,51}, Assessment of Capacity for Everyday Decision-Making (ACED)^{44,52}, and Hopkins Competency Assessment Test (HCAT)^{19,53}. Nine studies assessed capacity to consent to research^{23,25,26,29,32,35-37,48} and six of these used standardised capacity instruments^{25,26,29,32,36,48}. The most used tool was the MacArthur Competence Assessment Tool-Research (Mac-CAT-R)^{25,26,29,32,54}. Other tools used were the Capacity to Consent to Research Instrument (CCRI)^{36,48}, and non-standardised tools including: a 17-item Informed Consent Questionnaire (ICQ)²³, an informed consent form³⁷, and a legally applicable protocol based on the MCA^{1,35}. One study⁴⁵ assessed financial capacity using the ACED⁵². One study assessed capacity to appoint a lasting power of attorney (PoA)²², and another assessed capacity to make a discharge decision²⁸ using a non-standardized, but legally applicable protocol based on the MCA¹. One study collated findings from a range of capacity decisions using a non-standardised semi-structured capacity interview³¹. See [Supplementary 3](#) for a summary of all mental capacity tools used by included studies

[INSERT TABLE 1 HERE]

Reported Outcomes

Included studies predominantly reported correlational analyses exploring the relationship between mental capacity outcome and cognitive performance^{16,17,19-21,25,27,29,30,32,36-43,46,48,49}. ‘Capacity outcome’ was frequently operationalised by scores achieved on each capacity standard assessed by a capacity tool (e.g., ‘Understanding’; [Supplementary 3](#)). Several studies^{17,19-21,24,27,30,33,34,36,38,40-42,44,45,47-49} carried out regression analyses to determine whether cognitive performance predicted capacity scores.

Eleven studies categorised capacity dichotomously (e.g. capacity vs no capacity)^{18,20-23,26,28,29,31,32,35} and used logistic regression to predict impaired or intact capacity^{18,20-23,29,35}, ROC analysis to report optimal cut-off scores^{20-22,26,31,32}, or *t*-tests and non-parametric equivalents to explore whether impaired or intact capacity groups significantly differed in

performance on cognitive tests²⁸. Two studies also reported predictive equations to indicate incapacity^{20,21} (see [Supplementary 4](#) for a summary of analyses and main findings).

Cognitive Measures and ‘Overall Capacity’

‘Overall capacity’ refers to capacity as a unitary concept and fails to consider each of the four pillars of decision making set out in the MCA¹ independently. Five studies^{22,28,31,33,35} explored the relationship between a cognitive measure, such as the Alzheimer’s Disease Assessment Cognitive Subscale (ADAS-Cog) or the Mini-Mental State Examination (MMSE), and overall capacity.

Warner et al³⁵ found that lower ADAS-Cog score and age were associated with an increased likelihood of ‘overall capacity’ ($OR = 0.830$; $OR = 0.916$) respectively, but did not find a significant association with MMSE in an AD population. In a further AD sample, Gregory et al²² reported that increasing MMSE score was associated with an increased likelihood of ‘overall capacity’ ($OR = 1.6$). These authors reported an optimal MMSE cut-off score of ≤ 18 for ‘overall incapacity’. However, findings from a further study indicate an MMSE cut-off score of ≤ 22 for ‘overall incapacity’ in an AD population and a cut-off score of ≤ 24 in an ABI population³¹.

Findings from an acute inpatient stroke population suggested no association between tests assessing a range of cognitive domains and ‘overall capacity’²⁸. However in a community AD/MCI sample, Stormoen et al³³ found that the WAIS-R ‘similarities’ and ‘information’ subtests, along with inference tests, which draw on both executive functioning and receptive language/semantic knowledge, to be the strongest predictors of ‘overall capacity’ based on the LIMD tool. Their model explained 73% of the variance in ‘overall capacity’.

There is variability in reported findings exploring the relationship between ‘overall capacity’ and global measures and limited findings exploring the relationship between ‘overall capacity’ and specific cognitive domains. Most studies in this review explored the relationship between cognitive measures and distinct capacity standards (e.g., understanding), which will now be explored in more detail. Notably, no studies reported the relationship between cognitive performance and ‘the ability to retain information’ or the ‘ability to use and weigh-up information’ explicitly. However, some studies did address ‘reasoning’ and

‘appreciation’ as legal standards and the relationship between this standard and the standard of ‘using and weighing up information’ will subsequently be considered.

Cognitive Measures and ‘Understanding’

Global Measures

Global measures such as the MMSE and ADAS-Cog were commonly carried out in populations with dementia, although the association between performance and ‘understanding’ varied ($r = 0.28-0.64$ MMSE, see Figure 2; $r = -0.3 - -0.63$ ADAS-Cog)^{25,27,32,38,39,43,46}. Regression analyses suggested that the MMSE explained small amounts of variance in AD and MCI populations when confounding variables are taken into account ($R^2 = 0.27-0.4$)^{44,45}, or 45% variance when a semantic fluency test is also included²⁷. A further study suggested that decreasing scores on the MMSE, and increasing scores on the ADAS-Cog were associated with an increased likelihood of impaired ‘understanding’ ($OR = 0.87$; $OR = 1.07$) in an AD sample²³. Kim and Caine²⁶ reported MMSE scores <19 showed high specificity (85%) but low sensitivity (41.2%) for incapacity in ‘understanding’. Moreover, the authors found MMSE scores >26 showed high sensitivity (94.1%) but low specificity (30%) for incapacity in ‘understanding’. Similarly, Palmer et al³² reported an optimal MMSE cut-off score of <24 and yielded 61.5% sensitivity and 87% specificity in detecting incapacity in ‘understanding’.

Attention/ Working Memory

Multiple studies reported medium-strong positive correlations between ‘understanding’ and measures of verbal attention and working memory ($r = 0.45-0.83$)^{16,17,19-21,30,37,38,41,42,48,49}. Word learning and recall tests, such as the Hopkins Verbal Learning Test (HVLT) were found to strongly correlate with ‘understanding’ in populations with MG and BM ($r = 0.65-0.83$)^{20,21,48,49} in all but one study³⁶. Subsequent regression analyses supported this, with findings suggesting that the HVLT explained high levels of variance in ‘understanding’ in these populations^{20,21,49}. Tests including the California Verbal Learning Test 2 (CVLT-2) trials 1-5, the Selective Reminding Test (SRT) trails 1-6, a composite memory score derived from an Auditory Verbal Learning Test (AVLT), story recall, and verbal span also evidenced medium-strong associations with ‘understanding’ ($r = 0.45-0.78$) in MCI, AD, MS, and TBI samples^{16,17,30,37,42}. Several studies suggest that the Weschler Logical Memory I (WMS-LM-1) measure was strongly associated with ‘understanding’ in populations including TBI, MCI,

AD, and progressive MS ($r = 0.55-0.69$)^{17,30,38,42}. Subsequent regression analyses supported this^{17,30}.

Studies exploring the relationship between digit-span measures and ‘understanding’ were more variable. Several studies suggested that digit-span measures had a medium-strong association with ‘understanding’ across TBI, MG, and all but one³⁶ BM sample ($r = 0.45-0.69$, see Figure 2)^{17,20,21,48,49}. However, studies involving participants with dementia diagnoses found small associations between digit-span measures and ‘understanding’ ($r = -0.04-0.27$)^{19,27,39}. Of these, only the digit-span backwards measure was significant ($r = 0.24$, $p < 0.05$)³⁹.

Information Processing Speed

Performance on the trails A test had variable association with ‘understanding’ across populations and decisions ($r = -0.39 - -0.71$, see Figure 2)^{19-21,25,30,38,48}. Two studies found that performance on trails A was predictive of ‘understanding’ in AD populations ($R^2 = 0.5-0.89$)^{19,30}. Another study⁴⁷ reported that an ‘executive dysfunction error’, whereby an individual experiences a disruption of task awareness and processing, explained 23% variance in ‘understanding’ in an AD sample and explained 32% variance in trails A. Performance on digit-symbol coding measures had a medium-strong association with ‘understanding’ in RRMS, BM, and MG samples ($r = 0.44-0.70$)^{16,20,21,36}. Two studies found that performance on combined oral trails A and digit-symbol coding, or digit-symbol coding alone explained 54% variance in ‘understanding’ when combined with expressive language, attention/working memory, and executive functioning measures in PSP, BM, and MG samples^{20,41}. However, five studies did not include trails A in multivariate analyses because it failed to meet the significance level^{17,30,36,40,49}.

Executive Functioning

Several studies reported a medium to large association between various versions of the trails B switching task and ‘understanding’ across TBI, AD, MCI, MG, and BM populations ($r = -0.42 - -0.79$, see Figure 2)^{17,19-21,25,30,36,48,49}. Subsequent regression analyses supported the relationship between performance on trails switching tasks and ‘understanding’ in MCI, PSP and pooled brain metastasis and MG conditions^{17,20,30,34,36,41}. Reported associations were significant in all but three populations with AD^{19,30,38}. Studies suggested that measures of abstract thinking, such as ‘similarities’, had a more variable relationship to ‘understanding’ in

dementia, MCI, and PD populations ($r = 0.38-0.81$)^{19,25,27,29,38}. A numerical reasoning measure was strongly associated with ‘understanding’ in a RRMS population ($r = .68$)¹⁶. One study reported that the DRS ‘conceptualisation’ subdomain explained 70% variance in an AD population³⁸, while Okonkwo et al³⁰ included it in a model that explained up to 53% variance in an MCI population. Evidence suggests that executive elements of screening tools such as the EXIT-25, the abstraction or visuospatial/executive subdomains of the Montreal Cognitive Assessment (MoCA), the DRS conceptualisation or initiation/perseveration subdomains, and the Frontal Assessment Battery (FAB) were associated with ‘understanding’, but with variable effect size ($r = 0.29-0.81$)^{17,29,38,40,42}.

Expressive Language

Studies suggested that the expressive language measures most strongly correlated with ‘understanding’ were those which also assessed semantic language and executive functioning skills, such as category and letter fluency measures. Several studies reported medium-large associations between semantic fluency measures and ‘understanding’ in AD, TBI, MG, BM, and PSP populations ($r = 0.49-0.8$, see Figure 2)^{17,20,21,27,41,48,49}. Four studies found large associations between phonemic fluency measures and ‘understanding’ ($r = 0.48-0.8$) in TBI, BM, and MG populations^{17,20,21,48}. Increasing scores on a measure of phonemic fluency were associated with an increased likelihood of intact ‘understanding’ ($OR = 1.10$) in an ALS sample¹⁸. Further studies found that combined letter and category fluency scores had a medium-large association with ‘understanding’ ($r = 0.47-0.77$) in a sample with MCI and progressive MS respectively^{25,42}. Subsequent regression analyses suggested that category and letter fluency performance alone predicted between 59% and 71% variance in ‘understanding’ in samples with progressive MS and MG respectively^{42,48}. Two studies reported that a verbal learning/attention measure, such as WMS-LM-1 or HVLTL, together with a measure of category fluency predicted between 56% and 72% variance in ‘understanding’ in TBI and MG populations respectively^{17,49}. One study reported performance on both the HVLTL and a measure of letter fluency predicted 68% variance in ‘understanding’ in a sample with BM²¹. Gerstenecker et al²⁰ extended this by reporting a model which combined performance on phonemic fluency, HVLTL, digit-symbol coding, and trails switching, which predicted 54% variance in ‘understanding’ in a combined sample of individuals with MG and BM. Moro et al³⁷ reported that combined performance on measures of phonetic fluency, category fluency, trails A, and reversed span had a moderate association with ‘understanding’ ($r = 0.44$) in an AD sample. Two further studies including AD, MCI,

and PD populations did not include verbal fluency measures in multivariate analyses, because they failed to meet the significance level^{30,38,40}. Naming tests which perhaps relied less on executive functioning skills, such as the Boston Naming Test had variable association with ‘understanding’ across populations ($r = 0.25-0.72$)^{25,38,48} and explained 11% variance in ‘understanding’ in a population with mild-moderate AD³⁸. However, this finding was not shared by Okonkwo et al³⁰.

Receptive Language

Several studies reported the language comprehension test from various versions of the Wechsler Adult Intelligence Scale (WAIS) to be a good indicator of ‘understanding’ across MG, PD and mild/moderate AD populations ($r = 0.53-0.72$)^{38,40,48,49}. The relationship between performance on the less complex comprehension Token test and ‘understanding’ was more variable. For example, two studies reported large correlations ($r = 0.59-0.61$) in TBI and AD populations^{17,38}. However, two further studies found that this association was not significant in a PD and MCI population respectively^{25,40}. A subsequent regression analysis by Dreer et al¹⁷ reported that the Token test, together with the digit-span and trails B switching measures, predicted 71% variance in ‘understanding’ from baseline to 6 months in a moderate/severe TBI population. This indicates that receptive language measures may be more sensitive in people with more severe or enduring cognitive impairment. The Token test is often used as a measure of executive functioning in AD populations¹⁷. In line with this, one study found that an executive ‘loss of detachment error’, whereby an individual presents with an inability to maintain the hypothetical context of a decision situation, explained 29% variance in ‘understanding’ and was in part predicted by the Token test ($R^2 = 0.43$)⁴⁷.

Correlational studies suggested that measures assessing reading ability were a poor indicator of ‘understanding’ ($r = -0.1-0.36$) in MCI and BM populations^{21,25}. However, a proxy pre-morbid IQ measure (WTAR) based on reading ability had a strong association with ‘understanding’ in a RRMS sample ($r = 0.64$), perhaps as a measure of cognitive reserve¹⁶.

Long-Term and ‘Overall’ Memory

WMS Logical Memory II (LM-2), a measure of delayed/long term memory, was strongly associated with ‘understanding’ and explained 44% variance in ‘understanding’ in an MCI population³⁰. Moreover, WMS-LM-2 explained 57.3% variance in ‘understanding’ when combined with measures of attention/working memory (WMS-LM-1) and expressive

language (BNT) in an AD sample²⁴. ‘Overall memory’ was assessed in several studies using a DRS memory subtest^{29,30,38,40} and explained between 6% and 68% variance in AD and PD populations, respectively^{30,40}.

Visuospatial/ Constructive Skills

One study reported constructive apraxia had a small, significant association with ‘understanding’ in an AD sample ($r = 0.26$)³⁷. However, an executive ‘non-responsive answers error’, whereby an individual provides an answer unrelated to the question presented, explained 15% variance in ‘understanding’ and was explained by variance in the DRS construction subtest ($R^2 = 0.15$)⁴⁷.

As no studies reported the relationship between cognitive performance and ‘retention’ or the ‘ability to use and weigh-up information’ explicitly, the relationship between cognitive performance and ‘communication of a decision’ (hereon ‘communication’; pillar four¹) will be discussed. Subsequently, how studies addressing ‘appreciation’ and ‘reasoning’ may relate to ‘weighing-up’ (pillar three¹) will be considered.

Figure 2.

Correlation Between Cognitive Tests and 'Understanding' Across Included Studies

[INSERT FIGURE 2 HERE]

Note. (i) MMSE; (ii) digit span test; (iii) trails A; (iv) trails B; (v) category fluency test; bold data point = $p < .05$ **ognitive**

Cognitive Measurers and ‘Communication of a Decision’

Eight studies reported correlations between cognitive measures and ‘communication’^{27,30,32,38-40,43,46}. Of these, all but one study⁴⁰ was in a dementia or mixed MCI/dementia population.

Global Measures

Studies reporting the association between performance on measures of global functioning (MMSE or ADAS-Cog) and ‘communication’ varied ($r = 0-0.46$ MMSE, see Figure 3; $r = -0.12 - -0.46$ ADAS-Cog)^{27,32,39,43,46}.

Figure 3.

Correlation Between MMSE Scores and ‘Communication’ Across Included Studies

[INSERT FIGURE 3 HERE]

Note. Bold data point = $p < .05$.

Attention/ Working Memory

On one hand, Dymek et al⁴⁰ reported that performance on the DRS memory subtest accounted for 55% variance in ‘communication’ in a PD sample. However, Gurrera et al²⁴, reported that combining measures of verbal attention/working memory, expressive language, and receptive/semantic language accounted for only 10.2% variance in ‘communication’ in an AD sample.

Expressive Language

Two studies^{27,38} reported significant associations between performance on category fluency or the BNT and ‘communication’, respectively ($r = 0.5-0.62$). Another study found that an executive ‘delegation error’, whereby an individual delegates responsibility for decision making to another person, accounted for 33% variance in ‘communication’ and was associated with variation in the BNT and DRS memory subtest ($R^2 = 0.15-0.21$, respectively)⁴⁷.

Receptive Language

One study found that an auditory comprehension measure accounted for 44% variance in ‘communication of a decision’ in an AD sample³⁸.

The relationship between global measures of cognition and ‘communication’ varies in AD samples. Findings suggest that the relationship between expressive language measures, such as the BNT, alongside the working memory subtest of the DRS have the strongest association with ‘communication’ although this is in a small number of samples.

No studies explicitly investigated the relationship between performance on cognitive measures and the ability to ‘use and weigh-up’ information as most studies adopted the standard of capacity set out by Appelbaum and Grisso⁵⁵. Therefore, the standards of ‘appreciation’ and ‘reasoning’ will now be considered in relation to ‘using and weighing up’ information.

‘Using and Weighing-Up’ Information and Appreciation/Reasoning

‘Appreciation’

The ability to ‘appreciate’, “requires recognition that one is suffering from a disorder and that the generally accepted risks and benefits of [the decision] apply to one’s own situation”⁵⁶.

‘Appreciation’ may thus be subsumed under parts of both the first and third pillar of the MCA^{1,57} (the ability to ‘understand’ and ‘use/ weigh-up’ information). This is supported by some English case law⁵⁸.

Global Measures

The association between performance on global measures of cognitive functioning and ‘appreciation’ was variable (MMSE: $r = 0.07-0.67$; ADAS-Cog: $r = -0.09 - -0.57$)^{25,27,32,38,39,43-46}. Two studies reported that the MMSE is not a significant predictor of ‘appreciation’ when controlling for confounding variables^{44,45}. Similarly, another study reported that the MMSE was unable to simultaneously show high sensitivity and specificity in predicting ‘appreciation’²⁶.

Attention/ Working Memory

Findings suggest that performance on cognitive measures relate to ‘appreciation’ in a similar way to ‘understanding’. For example, verbal learning measures appeared to have a moderate-strong association with ‘appreciation’ ($r = 0.35-0.69$) across most samples^{17,30,36,42,48,49}.

Moreover, the digit-span measure appeared to have a weak association with ‘appreciation’ in samples with dementia^{27,39}. Additionally, more complex working-memory measures, such as

‘arithmetic’ and PASAT, were significantly associated with ‘appreciation’ in populations with progressive MS and TBI ($r = 0.42-0.54$)^{17,42}.

Information Processing Speed and Executive Functioning

Information processing speed (trails A) and executive switching (trails B) measures were significantly associated with ‘appreciation’ ($r = -0.58 - -0.68$; $r = -0.41 - -0.65$, respectively) in MCI, AD, MG, and BM populations^{25,30,36,38,48,49}. Measures involving conceptualisation, judgement, and initiation had small-medium associations with ‘appreciation’ ($r = 0.32-0.54$)^{25,27,29,30,38}.

Expressive Language

Category fluency was strongly associated with ‘appreciation’ ($r = 0.6-0.77$)^{27,48,49}, predicting 54%-61% variance in MG samples alone, or combined with the HVLT^{48,49}. Phonemic fluency measures were moderately associated with ‘appreciation’ ($r = 0.48-0.49$) in AD and MG populations^{38,48}.

Receptive Language

Performance on language comprehension measures were most strongly associated with ‘appreciation’ in AD and MG populations ($r = 0.42-0.65$)^{38,48,49}. Performance on the Token test was moderately associated with ‘appreciation’ ($r = 0.44-0.49$) in TBI and AD samples^{17,38}. However, it was not significantly associated with ‘appreciation’ in an MCI population²⁵. Finally, performance on the visuospatial, constructional subtest of the DRS-2 had a strong association with ‘appreciation’ in a population with mild AD ($r = 0.53$)³⁰.

Long-term memory

Performance on verbal recall measures had a varied association with ‘appreciation’ ($r = 0.2-0.71$) in AD, MCI, PD, and MG populations^{25,27,29,30,49}.

‘Reasoning’

The ability to ‘reason with’ relevant information has been argued to have some overlap with engaging in a logical process of weighing options, as both require a judgement of how different information is valued, processed, and related to one another⁵⁷. However, ‘reasoning’ may overlap with a judgment of ‘rationality’, which contradicts precedent that ‘a person is not to be treated as unable to make a decision merely because he makes an unwise

decision'^{1,59}. Therefore, it is less clear how 'reasoning' relates to the four pillars of the MCA¹. Nevertheless, outcomes of included studies were similar to those relating to 'understanding' and 'appreciation'. Namely, performance on measures of verbal attention/working memory, information processing speed, executive switching, semantic verbal fluency, and delayed verbal memory were associated with 'reasoning'.

Study Quality

No study was excluded due to poor methodological quality. Outcomes were used to assess the internal validity and risk of bias for each study (see Table 2). Overall, 24 studies lacked sample size justification and may have been at risk of type-2 error^{16-19,22-27,29,31,33-35,37,40,43-49}. Many regression analyses exploring the question set out in this review were not conducted as tests of specific 'a priori' models, but were exploratory in nature, which places further limits on the interpretation of these analyses^{16,39-49}. Study inclusion and exclusion criteria were well-defined amongst all but three studies^{19,26,38}, though quite variable across studies. Nearly all studies (31/34) were cross-sectional in design, which limits conclusions being drawn regarding causal relationships between exposure and outcome variables over time. Capacity outcome was only assessed once in 76% of studies^{19-22,25-27,30-36,38-49}, limiting confidence in classification of capacity. Moreover, outcome assessors were only blinded to capacity status of participants in 44% of studies^{21,22,25,27-29,32-34,42,44-46,48,49}, whereas the remaining studies did not report blinding, which may reflect increased experimenter bias.

All studies had clear research questions. Participants were selected and recruited from the same or similar populations within all but two studies^{24,43}. Exposure and outcome measures were clearly defined, valid, reliable and implemented consistently across study participants in most studies^{16-21,24-27,29-34,36,39-49}. Studies often measured exposure variables as a continuous variable or across different levels, lending some credibility to the hypothesis of causality between exposure and outcome. Key potential confounding variables (e.g. age, severity/duration of diagnosis, years of education) were often measured or adjusted for statistically for their impact on the relationship between primary exposure and outcome measures in a large number of cases^{17-23,25,27,28,30-36,38-46,48,49}.

[INSERT TABLE 2 HERE]

Discussion

Thirty-four studies comprising 40 samples explored the relationship between neuropsychological performance on cognitive tests and performance on the functional test of mental capacity set out in the MCA¹. The magnitude of correlations and explained variance varied widely between studies, however significant relationships between these scores and capacity outcomes were identified in all but one study²⁸. Overall, the heterogeneity in samples, capacity measures, and psychometrics included does not allow for clear meta-analysis and thus no confident conclusions can be drawn regarding the utility of particular cognitive tests in supporting complex assessments of mental capacity. Instead, a broader overview of the consistent relationships is provided followed by a discussion of the potential usefulness of neurocognitive measures in supplementing mental capacity assessments.

‘Overall Capacity’

All five studies which adopted a definition of mental capacity in line with the MCA¹ assessed the relationship between cognitive performance and ‘overall mental capacity’^{22,28,31,33,35}.

Studies exploring the relationship between global measures of cognition, such as the MMSE, and ‘overall capacity’ suggest they are of limited clinical utility when assessing individuals’ capacity in borderline cases and may lead to incorrect assumptions about incapacity.

Two studies used measures of specific cognitive domains and reported opposing findings^{28,33}. This may reflect the different populations assessed, or the use of different cognitive and capacity measures. Mackenzie et al.²⁸ was the only study in this review to find no significant relationship between cognitive performance and capacity outcomes. Notably, in this study all members of the multi-disciplinary team reported low confidence in determining whether a patient had capacity to make a decision, and all unclear cases were not included in their analyses. This study also reported that 50% of acute stroke participants ‘failed’ tests across multiple domains, suggesting possible floor effects akin to dementia populations²⁸. Excluding the most complex capacity cases negates the benefits of including neuropsychological testing in capacity assessments^{9,10}. However, given the strengths in sample representation, this is perhaps a true reflection of the limited role of cognitive measures in contributing to capacity assessments in an acute hospital environment. Further research in clinical samples within the UK, applying assessments in line with the four pillars of the MCA¹ across representative samples is required.

Assessing the relationship between cognitive functioning and ‘overall mental capacity’ overarches the four-pillar model set out in the MCA¹, which implies that an individual may be able to perform differently on one pillar of the functional test than another. However, any failure on any of the four aspects results in an incapacity judgement. With that, these overall capacity measures may not be expected to relate to specific neurocognitive tests. However, the distinct multivariate predictor profiles for specific decision-making abilities across many included studies support the idea of certain pillars, including ‘understanding’ and ‘communication of a decision’ as discrete elements of decision-making capacity with distinct cognitive predictors⁴⁶. Consequently, studies which adopt a dichotomous view of capacity may neglect the impact different cognitive difficulties can have on meeting the requirements of the functional test. Therefore, findings will now be discussed in accordance with each standard of capacity, where possible.

‘Understanding’

Measures of global cognitive functioning, such as the MMSE, were primarily used to assess ‘understanding’ in MCI/AD populations. Findings were variable across studies^{19,27,30,32,38,39,43,46} and suggested cut-off scores seldom had concurrent high sensitivity and specificity^{26,32}. It is possible that the MMSE is not a consistently good predictor of ‘understanding’ due to its relative insensitivity in detecting executive function²⁶.

Studies suggest that tests exploring domains of attention/working memory, and higher-order cognitive abilities, such as executive functioning, information processing speed, and verbal fluency were largely correlated to ‘understanding’ in >60% of reported associations^{16,17,19-21,25,27,29,30,38,40-42,48,49}. However, measures of attention/working memory were often not associated with ‘understanding’ in studies whereby participants were able to retain and refer to written information during assessment^{25,36,48}. Similarly, Reen et al.¹⁶ found that visually presenting information improved MS patient’s understanding of treatments when compared to aurally presented information. This suggests that ‘understanding’ may overlap with the construct of ‘retention’ in a way that is difficult to separate, as the retained written information may have had the effect of minimising demands on working memory, thereby compensating for this cognitive skill. This is supported by a review of mental capacity judgments carried out by Keene et al⁶⁰, which reported that ‘the inability to retain information’ was only cited in conjunction with other functional disabilities in dispute cases, as opposed to being cited as the sole functional inability. This finding also emphasises the

notable impact that providing information in a mode accessible to the patient (such as written text) can have on increasing their ability to pass this aspect of the functional test. This is consistent with the MCA code of practice, which outlines the importance of taking all possible steps to support the patient in making the decision for themselves⁶¹.

Findings also suggest emerging patterns of incongruence regarding the association between attention/working memory or executive functioning tests and ‘understanding’ in dementia samples, compared to other neurological samples. For example, tests such as digit-span and trails B indicated medium-large associations with ‘understanding’ in most samples, however in dementia samples these associations were often smaller or not reported due to lack of significance. AD has been associated with difficulties understanding, retaining, and organising detailed information regarding a decision⁴⁷. These cognitive impairments may lead to floor effects on memory and executive tests. This poses the risk of minimising the role of attention, working memory, and executive functioning in ‘understanding’ in this population^{27,30,38}. In line with this, several studies suggest that tasks requiring less complex executive functioning abilities (e.g., processing speed tasks such as trails A) are strongly associated with understanding, particularly in AD populations, and reflect the importance of internally processing relatively large amounts of information in the process of ‘understanding’. A longitudinal study in a TBI population reported that attention and working memory played a key role in ‘understanding’ initially, but ‘understanding’ over a 6-month period is primarily mediated by executive functioning and overall frontal lobe function¹⁷. On one hand, a further study in an ALS sample¹⁸ found that performance in ‘understanding’ did not significantly change over the course of one year, despite decline in phonemic fluency and executive function. However, the authors used less comprehensive cognitive measures, with a less cognitively impaired sample which may explain this discrepancy.

Overall, findings suggest global cognitive measures are of limited clinical utility when assessing individuals’ ‘understanding’ which may be due to their insensitivity to executive functioning. However, there are clear associations between domain specific cognitive measures and ‘understanding’, particularly in studies which perhaps incorporated ‘retention’ into their definition of ‘understanding’ by not allowing participants to refer to materials throughout the capacity assessment⁶². In contrast, where participants were able to refer to materials throughout (in accordance with the MCA), the association between tests of attention/working memory and ‘understanding’ often disappeared. The observed floor effects

in AD samples may indicate that domain-specific cognitive tests may have more clinical utility in other neurological samples.

‘Using and Weighing-Up’ Information and ‘Appreciation’/ ‘Reasoning’

The ability to ‘use and weigh-up’ information is reported to be at the heart of many legal capacity disputes in England and Wales⁶⁰. Despite this, no studies investigated the relationship between cognitive performance and the ability to ‘use and weigh-up information’ explicitly. It is possible that the cognitive skills underpinning the construct of ‘using and weighing-up’ information are difficult to operationalise through cognitive tests. Literature suggests that the process of ‘using and weighing-up’ information also requires an individual to draw on feedback from their own experiences and different social perspectives⁶². It has been suggested that a more holistic paradigm, which considers emotional and motivational influences of decision making alongside cognitive factors, may provide greater insight into impairments in mental capacity⁶³. Specifically, decisions may often be determined on the basis of an often unconscious, somatic signal to the brain representing the practical and emotional consequences of similar past decisions⁶³. Worthington⁶⁴ suggests that cognitive tests draw on so-called ‘cold’ executive skills of logical problem solving and are associated with dorsolateral pre-frontal cortex functioning (dlPFC). Despite this, those with ventromedial prefrontal cortex (vmPFC) damage are known to be impulsive⁶⁵ and show less sensitivity to the possibility of undesirable outcomes during decision making, which may override intact dlPFC functioning during the ‘weighing-up’ process⁶⁶. Further research should be carried out to understand the links between social cognition, emotional processing, and decision making, so that neuropsychologists can gain further insight into impairments in mental capacity in complex cases⁶⁴.

Most studies adopted the standard of capacity set out by Appelbaum and Grisso⁵⁵. Some have argued that ‘appreciation’ may be subsumed under parts of both the first and third pillar of the MCA^{1,57} (the ability to ‘understand’ and ‘use’ information). However, the ability to ‘reason with’ relevant information may overlap with a judgment of ‘rationality’, which contradicts with the MCA¹. Discussion regarding the legal similarities and differences between capacity standards is beyond the scope of this review, nonetheless findings suggest that performance on cognitive tests relate to the ‘appreciation’ and ‘reasoning’ capacity

standards in a similar way to ‘understanding’ which may indicate that they are underpinned by similar, broad, cognitive processes.

‘Communication’

Most studies did not report associations between performance on cognitive measures and ‘communication’ due to insufficient variability in scores^{17,25,30,34,40,42,44,47-49}. Studies reporting the association between performance on measures of global functioning and ‘communication’ varied^{27,32,39,43,46}. This may reflect findings which indicate that many individuals with cognitive impairment have been shown to communicate a decision equally as well as controls, even if their ability to meet other capacity standards is impaired^{24,44}. Of the eight studies which did report associations between cognitive performance and ‘communication’, seven were carried out in dementia populations. As AD progresses, individuals experience advancing receptive aphasia and characteristic difficulties with processing information which may compromise their ability to communicate³⁸. In line with this, studies suggest that performance on expressive language, semantic/receptive language, and working memory measures may be associated with ‘communication’ in dementia or MCI populations. However, due to the small number of studies reporting mixed results, it is difficult to draw firm conclusions and further research is required.

Study Quality

Several studies lacked appropriate statistical power and conducted exploratory analyses with overfit regression models. Despite most studies controlling for confounding variables when assessing the relationship between primary variables, many did not account for confounding variables such as severity/duration of impairment, age, or years of education when investigating the relationship between capacity outcome and cognition. As a result, it is challenging to draw confident conclusions about the causal relationship between performance on measures of cognitive functioning and mental capacity outcomes.

Studies which included similar populations often used different tools to diagnose neurodegenerative conditions or acquired neurological injuries. For example, with regards to studies recruiting participants with dementia, the majority of studies used the NINCDS/ADRDA criteria^{19,26,27,30,38,43-47}, yet others used the DSM-IV-TR diagnosis

criteria³⁹, DSM-IV criteria^{22,35}, or based their assessments on various measures and clinical opinion^{24,32,33}. Two studies did not report their diagnostic criteria^{23,31}. Additionally, many studies did not distinguish diagnoses subtypes within their samples and therefore it is not possible to distinguish results for subtypes of dementia, MS or PSP. Many studies recruited people with neurological or neurodegenerative conditions as volunteers at universities, which may not be representative of clinical populations^{19,21,43}. Also, for studies which recruited volunteers, capacity was not assessed for those who chose not to take part, which may affect the generalisability of findings.

Studies used a range of capacity assessment measures, many of which are reliable and valid, and most studies followed administration instructions. However, some studies adapted the application of assessment tools to reflect how assessments are carried out in clinical practice in an attempt to increase ecological validity, but perhaps at the cost of increasing measurement bias. Adaptations included additional learning trials, repetition of information, participant retention of the consent disclosure information during the assessment, and enabling participants to communicate their choice through gesture^{17,25,46,48}. There is an absence of validated and reliable tools assessing capacity in line with the MCA¹ and thus, studies carrying out capacity assessments in line with the MCA¹ were guided by case law^{22,28,35}. Two studies^{23,31} carried out capacity assessments using unstandardized vignettes. The high variability in both the delivery of tools and the stringency in legal standard make it difficult to compare findings and the validity and generalizability of conclusions drawn are unclear. Moreover, many studies recruited participants for the purposes of the research project and used hypothetical vignettes, which may also affect the validity of findings, as it may limit the extent to which participants cognitively and emotionally engaged with information and ‘weighed-up’ the benefits and disadvantages in the context of their own value systems and situations.

Strengths and Limitations

Strengths of this review include a rigorous and comprehensive search of multiple databases spanning over 20 years of studies and a detailed quality appraisal process. However, the heterogeneity across criteria for diagnoses, capacity tools and cognitive measures hindered the ability to conduct a quantitative meta-analysis of results. With regards to publication bias, 13 included studies were carried out by one research group at the University of Alabama, Birmingham. However, these studies were of ‘fair’ to ‘good’ quality, with reasonably low

levels of bias. It is possible that studies which did not show an association between cognition and mental capacity were not published and thus not included in this review. Additionally, the quality assessment chosen, whilst designed for observational studies, may be limited when assessing cross-sectional studies. Indeed, studies were automatically deemed not to meet criteria for questions regarding follow-up, as these were not applicable. However, this is primarily due to the general lack of available tools to assess the quality of cross-sectional studies.

A wide range of cognitive tests were used across all included studies. Cognitive tests were categorized by cognitive domain in accordance with the majority of original studies in order to draw theory-based conclusions about relationships between performance and capacity. However, this posed a risk of oversimplifying the cognitive abilities involved when completing such tests. For example, letter fluency tasks were categorized as ‘executive functioning’ tasks in just under 50% of included papers, and as ‘verbal fluency’ or equivalent tasks in just over 50% of papers. This exemplifies that many tests draw on a range of cognitive processes. For example, the Token test measures auditory language comprehension and requires organization, manipulation and execution of simple and complex verbal commands. It also draws on skills of executive functioning such as selective attention, sequencing and inhibition of responses. This makes pinpointing specific cognitive mechanisms associated with standards of capacity complex and, due to the diversity of tasks used within each study, it is not possible to draw confident conclusions. Moreover, many studies use different versions of specific tests e.g. subtests of the WAIS-R or WAIS-III, making the comparison of findings difficult due to psychometric heterogeneity among different versions⁶⁷. Additionally, many of these tests are no longer used in clinical practice as they have been replaced by more up-to-date versions.

Clinical Implications

The MCA¹ has received considerable criticism for lacking objectivity since passing into law. In attempts to increase objectivity and improve confidence in judgements of capacity in complex cases, professional guidance has been issued in recent years, indicating that cognitive assessments may assist the practitioner in deciding whether an individual is able to meet the requirements of both stages of the functional test. Existing literature has hypothesised the relationships between the pillars of the functional test and associated cognitive functioning at face value⁶², however, this is the first review empirically exploring

the relationship between performance on cognitive tests and the functional test set out in the MCA¹.

Findings suggest that the relationship between ‘understanding’ and mental capacity has been explored most frequently across samples with neurological injury or neurodegenerative conditions. On one hand, this suggests that ‘understanding’ is the most cognitively mediated pillar. However, no studies explicitly explored the relationship between performance on cognitive tests and ‘retention’ or the ability to ‘use and weigh-up information’ as set out in the MCA¹. Moreover, many capacity tools subsumed ‘retention’ into the measure of ‘understanding’ and cognitive measures associated with the legal standards ‘appreciation’ and ‘reasoning’ were also congruent with those associated with ‘understanding’. This suggests that ‘understanding’, ‘retention’, ‘appreciation’, and ‘reasoning’ may all be sub-served by multiple general domains of cognitive functioning, such as memory and executive functioning^{30,36,68}.

Findings support the notion that ‘understanding’ and ‘communication’ have distinct cognitive predictors, in line with the assumption that they are discrete elements of decision-making capacity⁴⁶. Consequently, studies which adopt a dichotomous approach to capacity may neglect the impact that different cognitive difficulties can have on meeting the requirements of the functional test. This limits an assessor’s insight into how an individual’s capacity could be assessed and maximised in more complex and/or borderline cases.

For those without an AD diagnosis, word learning and recall measures (e.g., HVLTL, CVLT-2, and the WMS-LM1) combined with verbal fluency measures which draw upon executive functioning and semantic knowledge (e.g., letter and category naming measures) may be particularly useful in assessing ‘understanding’. Trails switching measures (e.g., trails B) and working memory/attention measures (e.g., digit-span) may also be useful in supporting an assessment of ‘understanding’ in non-AD populations. Alternatively, information processing speed measures which utilise executive functioning (e.g., trails A) along with word learning and recall tests (e.g., HVLTL, CVLT-2, and WMS-LM1) may contribute to a formulation of ‘understanding’ capacity in AD populations. Measures associated with ‘communication’ are less conclusive. However, it appears that measures assessing verbal semantic fluency (e.g., category fluency), along with simple verbal naming tests (e.g., BNT) may provide some insight when assessing individuals with AD. However, it is important to note that several

studies excluded individuals with communication difficulties. Thus, future research is needed to identify if cognitive measures may have utility in supporting assessments of capacity in populations with significant communication difficulties. It is important to emphasise that all capacity assessments should be carried out using a range of sources and that clinical judgement also plays a critical role in the contextual and dynamic nature of capacity assessments⁶⁹.

Conclusions

Overall, the heterogeneity between variables, outcomes and samples included prevent evidence-based conclusions being drawn about how specific tests of cognitive functioning may support clinicians in carrying out the functional test of mental capacity in line with clinical guidelines^{9,10}. Despite this, findings tentatively suggest that performance on cognitive assessments do significantly relate to a range of capacity outcomes across a number of neurological samples. In particular, for those without an AD diagnosis, word learning and recall tests, such as the HVLT, CVLT-2 and the LM1, combined with verbal fluency tasks which also tap into aspects of executive functioning and semantic knowledge such as letter and category naming tests respectively, may be particularly useful in assessing ‘understanding’. Trails switching tasks, such as trails B and working memory/attention tasks such as digit span may also be useful in supporting an assessment of ‘understanding’ in non-AD populations. For clinicians assessing capacity in individuals with an AD diagnosis, speed of information tasks which tap into executive functioning, such as trails A, along with word learning and recall tests such as the HVLT, CVLT-2 and LM1 may contribute to a formulation of ‘understanding’ capacity. Tests associated with ‘communication of a decision’ are less conclusive. However, it appears that tests assessing verbal semantic fluency, such as category fluency, along with simple verbal naming tests, such as the Boston Naming Test, may provide some insight when assessing individuals with AD. Concurrently, it is important to emphasise that all capacity assessments should be carried out using a range of sources and that clinical judgement also plays a critical role in the contextual and dynamic nature of capacity assessments⁶⁹. The evidence provided illustrates avenues for further, high powered research exploring the emerging trends over time, whilst accounting for confounding variables and social and emotional cognitive factors. This has the potential to inform future, more explicit, clinical guidance around the utility of cognitive testing in the context the functional test set out in the MCA¹.

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