The Predictive Validity of the MoCA-LD for Assessing Mental Capacity in Adults with Intellectual Disabilities

ABSTRACT

Mental capacity assessments currently rely on subjective opinion. Researchers have yet to explore the association between key cognitive functions of rational decision-making and mental capacity classifications for people with intellectual disabilities.

Sixty-three adults completed the Montreal Cognitive Assessment, which yielded estimates of their overall cognitive ability (MoCA-LD) as well as their memory, attention, language and executive functioning. Differences in scores were explored for those who had, and lacked, capacity and logistic regression was used to test the predictive validity of each measure.

There were significant differences between both groups for all measures. Logistic regression identified MoCA-LD as a significant predictor of capacity assessment outcomes. ROC curve analysis provided novel, evidence-based benchmarks to help guide clinical practice based on individual MoCA-LD scores.

This study offers a foundation for more objective approaches to mental capacity assessment. This demonstrates that assessments of cognitive ability can yield information that is helpful for mental capacity evaluations.

INTRODUCTION

People make decisions on a regular basis, though the quality of these decisions can vary greatly. A decision regarding what to have for dinner, for example, is likely to be a more considered, and rational, process when at home with your partner compared to after a night out with your friends consuming alcohol. It is not always the case that a bad decision reflects a lack of *capacity* to make a sound judgment (Summerfield & Tsetsos, 2015). Regardless, the right to make decisions, and remain an autonomous agent, is a fundamental human right in modern society and is a core element of health-care law (Griffith, 2017). In England, the legislation guiding clinical practice regarding decision-making, and how decisions can be made on another person's behalf, is the Mental Capacity Act (MCA: Department of Health, 2005). The five key principles guiding this legal document include the presumption that every person has the capacity to make decisions (unless proven otherwise), and that an "unwise" decision is not enough evidence to claim that someone lacks capacity (Department for Consitutional Affairs, 2007). Instead, responsible professionals or carers are required to prove the absence of mental capacity by means of assessment. Such an assessment includes two stages: firstly, establishing whether the person has an impairment of, or a disturbance in, the functioning of their mind or brain; and if so, then secondly establishing whether this means the person is unable to make a specific decision when required (Department for Consitutional Affairs, 2007; Department of Health, 2005).

Individuals with intellectual disabilities necessarily meet the stage one assessment criterion. Thus, where there are any concerns about decision making, the emphasis is on stage two of the MCA assessment: establish whether they can make a specific decision by evaluating their ability to understand, weigh-up, retain and communicate relevant information. If there is evidence that one or more of these abilities is impaired, then a person is classified as lacking capacity at the time

of the assessment (Department of Health, 2005). This approach to the assessment of capacity is described as *functional* because it is specific to the type of decision being made, as well as the point in time at which it occurs (Donnelly, 2009). It is striking, however, that the MCA gives little specific guidance about what this assessment should entail. The MCA Code of Practice, for example, states only that in order to be considered capable of retaining information "*The person must be able to hold the information in their mind long enough to use it to make an effective decision*" (Department for Consitutional Affairs, 2007. p.47). This provision of guidance in only the broadest terms means that evaluations of mental capacity are often highly subjective, and their outcome can be easily influenced by the assessor (Donnelly, 2009; Keene, 2017). There is currently no established gold standard approach to mental capacity assessment (Jayes, Palmer, & Enderby, 2017).

It is highly unlikely that any single test or measure could definitively confirm (or refute) someone's capacity across contexts, so clinicians must be guided by information from a range of sources. Moreover when someone has an intellectual disability, a comprehensive assessment of their mental capacity can be particularly challenging and time consuming. Few of the available assessments have strong psychometric reliability and validity applicable to this population (Lamont, Jeon, & Chiarella, 2013). This group requires nuanced consideration of their specific cognitive abilities, irrespective of how severe their overall intellectual impairments may appear. Yet none of the assessments that are currently available directly target the specific domains that have been theoretically linked to (typical) decision-making. Instead, they rely heavily on the use of vignettes or semi-structured interviews to illicit information relevant to the functional criteria specified in the MCA. This means there is a serious risk of incorrect assumptions being made about an individual's ability to make decisions independently, which may result in less autonomy, being

afforded less responsibility and feeling disempowered (Bradbury-Jones, Rattray, Jones, & MacGillivray, 2013): core issues that the MCA was designed to ameliorate.

One particular decision that is often called into question under the MCA is an individual's capacity to consent to medical treatment. Other types of decision, such as where to live, are also commonly evaluated in clinical settings (Jayes et al., 2017). The ability to consent to treatment, however, is particularly crucial for people with intellectual disabilities because of their elevated risk of experiencing mental illness (Ferguson & Murphy, 2014) and developing chronic health problems (Department of Health, 2001). There is a strong imperative to optimise the mental capacity assessment process and ensure that people with intellectual disabilities have the opportunity to make their own decisions when they are cognitively able to do so.

Numerous researchers suggest there is scope to use objective measures of cognitive functioning to strengthen the mental capacity assessment process and provide objective data to help inform, (though critically not uniquely determine) assessment outcomes (Arscott, Dagnan, & Kroese, 1999; Goldsmith, Skirton, & Webb, 2008; Holzer, Gansier, Moczynski, & Folstein, 1997; Wong, Clare, Holland, Watson, & Gunn, 2000). It remains unclear, however, what cognitive functions should be targeted when considering someone's mental capacity, particularly if they have an intellectual disability. It is an open question whether their process of rational decision-making involves the same cognitive functions as for typical individuals. One integrated review concluded that overall cognitive ability is linked to mental capacity classifications when someone has an intellectual disability, and that verbal ability and working memory have a selectively greater impact on decision-making capacity than other commonly implicated functions such as attention (Goldsmith et al., 2008). Others have highlighted the particular importance of executive

functioning for this group, which is linked to the ability to weigh up information related to a decision (Wilner, Bailey, Parry, & Dymond, 2010).

In general terms, these various cognitive domains are consistent with those proposed to underpin deliberative (cf. automatic and unconscious) judgments in psychological theories of typical decision making. According to the dual-process theory of decision making, for example, rational decision-making in typical adults comprises two distinct processes: one is fast, automatic and unconscious (a Type One process) and the other is slow, deliberative and conscious (a Type Two process) (Evans, 2008; Evans & Over, 1996; Evans & Stanovich, 2013). This theory highlights that a 'Type Two' process is essential for a person to make rational decisions and involves the cognitive functions of working memory and executive function (Evans & Stanovich, 2013) as well as attention and language (Suleman & Kim, 2015). When applying this theoretical framework to mental capacity assessment, if a person was unable to engage a Type Two process, this would support a lack of mental capacity. The four cognitive functions associated with a Type Two process certainly align with the conceptual considerations specified in the MCA (Edge, Oyefeso, Evans, & Evans, 2016; Wilner, Bailey, Parry, & Dymond, 2010), but researchers have yet to test empirically for links between these functions and 'real life' mental capacity assessment outcomes when someone has an intellectual disability.

The current study aims to examine whether the cognitive functions theoretically predicted to be important for mental capacity classifications in typically developed adults, are also important when someone has an intellectual disability. Based on the literature reviewed, we hypothesise that people who lack the capacity to consent to treatment will score significantly lower than those who do have capacity on measures of overall cognitive ability, executive function, memory, language and attention. Further, as several of these functions have been identified as important for people

with intellectual disabilities, we will investigate whether performance on any or all of these measures can help to accurately predict mental capacity assessment outcomes.

METHOD

Sample

This study utilised data from an independent hospital, located in the East of England. The hospital is registered with the Care Quality Commission as a service provider for people with intellectual disabilities who may also have a comorbid mental-health problem, autism spectrum disorder (ASD), forensic history or personality disorder. Retrospective data regarding the outcome of assessments for cognitive functioning and mental capacity were extracted from historic clinical records for 63 adults aged between 18 and 61 years (see Table 1 for demographic details). After routine clinical assessment, each of these individuals had been deemed to either have ($N = 24$), or lack ($N = 39$) the capacity to make decisions about their medical treatment. There were varying levels of intellectual disability in the final sample with the majority (81 per cent) falling in the mild and borderline intellectual disability ranges. These classifications were determined by the diagnosis information stated in the extracted electronic records. Most of the sample (67 per cent) were male. Ethical approval was granted by a local University Ethics Committee. The use of retrospective data was also given ethical approval and agreed by the hospital's Research Governance Committee. All data records were deidentified prior to extraction and analysis.

Procedure

The sample utilized retrospective clinical data from the hospital's admission protocol that is stored in patient records. Every person admitted to the hospital is asked to complete several psychological assessments including a brief neuropsychological cognitive assessment. When an individual is required to take medication as part of their treatment while staying at the hospital, they are also legally required to have an assessment of their capacity to consent to treatment and administration of medication following the guidelines specified in the MCA (Department of Health, 2005). This assessment of capacity is completed at the hospital, in person, by a consultant psychiatrist who is identified as the patients' responsible clinician under the Mental Health Act (Department of Health, 1983). Records for patients who were admitted to the hospital between September 2012 and August 2017 were inspected. Out of 162 records, a complete neuropsychological assessment report was available for 79 patients (38.8 per cent). The data from these assessments was extracted and matched with mental capacity assessment outcomes contained in the patient's clinical files before being de-identified. Only records for people who had both a completed neuropsychological assessment and a capacity assessment outcome were included in this study, yielding a final sample of 63 patients (79.7 per cent of those who had completed a neuropsychological assessment).

Measures

Cognitive functioning was measured using the Montreal Cognitive Assessment (MoCA; Nasreddine et al., 2005). The MoCA is a brief (10-15 minute) pen and paper assessment consisting of 12 separate tasks that target different areas of cognitive functioning. Scores on these various tests can be summed to generate a 'global functioning' score between 0 and 30. Good internal consistency ($\alpha = 0.83$) and test-retest reliability ($r = 0.92$, $p < 0.001$) has been confirmed with a variety of different populations including individuals with Alzheimer's and Mild Cognitive Impairment (Nasreddine et al., 2005). Good internal consistency ($\alpha = 0.78$) has also been

confirmed when using the test for people with intellectual disabilities (Edge et al., 2016). Construct validity is supported by significant correlations with performance on a comprehensive test battery comprising a number of different neuropsychological measures: items from the Brief Visuospatial Memory Test; Hopkins Verbal Learning Test; Weschler Memory Scale; Delis-Kaplan Executive Function System, Boston Naming Test and Wechsler Adult Intelligence Scale (see Vogel, Banks, Cummings, & Miller, 2015).

In the current study, all individuals completed the full MoCA test (version 3) which was administered, in person, by a member of the psychology department employed by the hospital as part of a routine initial assessment procedure. Each department member had at least an undergraduate degree in psychology including four assistant psychologists and one senior clinical psychologist. The initial assessment procedure for the hospital requires that staff members follow the administration and scoring instructions for the MoCA provided by the test authors (Nasreddine, Phillips, & Chertkow, 2011). Overall cognitive ability was estimated using the eight items that best discriminate between high and low performing individuals with intellectual disabilities. The good psychometric properties of this more specialised MoCA-Learning Disability (MoCA-LD) have been confirmed for the population of interest (Edge, et al., 2016). Levels of ability in the four specific cognitive functions were estimated by summing scores for the MoCA-LD items that share high factor loadings with standard neuropsychological measures (Vogel et al., 2015). Further details are provided in Table 2.

Analysis

The two mental capacity groups (i.e., 'has capacity', 'lacks capacity') did not differ in their chronological age (p =.65). Given their unequal sizes, Mann Whitney tests were used to investigate any differences between the two groups. The predictive validity for each measure of cognitive functioning (overall; and subscale scores for memory, attention, language and executive functioning) was explored using a binary logistic regression. Given the limited literature available regarding the cognitive predictors of mental capacity assessments in people with intellectual disabilities it was not possible to speculate which, if any, of the measures would make the strongest predictor. A backward stepwise method was, therefore, used for entry of the variables. Using this method, the regression model initially contains all predictors and the contribution of each one is evaluated mathematically. If a predictor is not making a significant contribution to the model it is removed and the process is repeated until only significant predictors remain (Field, 2018). It is worth noting, however, that the outcomes for this approach can be influenced by the sample size; larger samples have a greater tendency to show several significant predictors and smaller samples are more likely to show few significant predictors (Field, 2018). Receiver Operating Characteristic (ROC) curve analysis was then used to identify an optimal cut-off value for any significant predictors to determine capacity classification based on the values ability to detect True Negatives (people who genuinely lack capacity) and False Positives (people incorrectly classified as having capacity).

RESULTS

Examination of the cognitive profile across the participant sample confirms clear differences between those clinically deemed to have vs lack the mental capacity to make independent decisions about their medical treatment across all domains of functioning (see Fig. 1).

Although the variability of scores in both groups is striking, those deemed to have capacity consistently scored significantly higher on the measure for executive functioning, memory, attention and language. A similar result was also observed for scores of overall cognitive ability (see Table 3).

Logistic Regression

Binomial logistic regression was used to determine whether it was possible to predict participants' mental capacity classifications based on their executive functioning, memory, attention, language, and overall cognitive ability. Preliminary visual inspection of the overall distribution of the data (histograms and z-scores) confirmed that all continuous variables were normally distributed except for attention, which had moderate positive skew that was corrected with square-root transformation. Following the Box-Tidwell (1962) procedure, all predictors were confirmed to be linearly related to the logit of the dependent variable. A backwards stepwise regression method produced 5 models from which only overall cognitive ability (MoCA-LD) significantly predicted mental capacity classifications ($\chi^2(1) = 16.301$, $p < .001$), explaining 31% of the variance in mental capacity classifications (Nagelkerke R^2)[1]. None of the four specific cognitive functions of interest were identified as statistically significant predictors of mental capacity on their own, or when considered alongside other variables (see Table 4). Though the current sample size was considered large enough to detect effects with a logistic regression model containing one predictor (Green, 1991), a post-hoc G-Power analysis (Faul, Erdfelder, Lang, &

[1] A logistic regression model comprising of total MoCA scores was also significant, $\chi^2(1) = 13.433$, $p < .001$ though was less accurate compared to MoCA-LD, correctly classifying 69% of cases.

Buchner, 2007) suggested that a sample size of at least 125 participants would help to reduce the likelihood of a type II error when using a model with four, or more, predictors.

Predictive Validity

As participants' MoCA-LD scores were the only significant predictors of mental capacity classifications, this was the only variable included in subsequent analysis. The area under the ROC curve for participants' MoCA-LD scores was .78, 95% CI [.663, .898] (Fig. 2) which constitutes an acceptable level of discrimination (Hosmer, Lemeshow, & Sturdivant, 2013). The common rates and indices showed that a cut off value of greater than, or equal to, 13 on the MoCA-LD had 73 percent accuracy and yielded the highest sensitivity (70.8%) and specificity (74.4%) for the sample. In order to help clinicians utilise MoCA-LD scores to inform mental capacity assessment, further information regarding the common rates and indices for each given value is shown in Table 5. This also includes the likelihood of someone with intellectual disabilities having the capacity to consent to treatment based on the specificity of each value.

DISCUSSION

Mental capacity assessments for people with intellectual disabilities can be complicated, challenging to facilitate, and heavily reliant on subjective clinical opinion (Jayes et al., 2017; Keene, 2017). There are currently no specialised, evidence-based mental capacity assessment tools for this group, which partly reflects a limited knowledge about the relationship between cognitive functions and decision-making outcomes in this diverse population. The current study aimed to address this knowledge gap by testing directly the links between outcomes of clinical assessments

of mental capacity in an applied setting and four theoretically important cognitive functions, as well as overall cognitive ability.

Based on the literature review, it was hypothesised that people who lack the capacity to consent to medical treatment would be less likely to demonstrate the cognitive functions traditionally associated with rational decision-making in typically developed adults. As predicted, there was a significant difference between the two mental capacity groups in their performance on measures of executive functioning, memory, attention, and language. The groups also differed in their levels of overall cognitive ability. Interestingly, application of a logistic regression model revealed that none of these individual cognitive functions significantly predicted the outcomes of clinical mental capacity assessments. Instead, it was found that only a model of *overall* ability was significant.

This result is perhaps slightly surprising, given that the overall cognitive ability measure is comprised of items which relate to the four functions of interest. Yet the regression results are interpreted here as important evidence of a high degree of variability in the specific cognitive deficits demonstrated by individuals with intellectual disabilities. If specific cognitive functions were consistently informative regarding whether individuals have or lack capacity, then, assuming the study is appropriately powered, they should be confirmed empirically as a significant predictor of this outcome variable. Instead a substantial overlap of the scores was observed across the two capacity groups in each domain. This lack of consistency in cognitive strengths and weaknesses is undoubtedly what makes mental capacity assessments with this population so challenging. Encouragingly, however, the results of this study indicate that a global (i.e., combined) measure of an individual's abilities across these cognitive domains may nevertheless provide a helpful guide for judgments of mental capacity.

The predictive utility of scores on the MoCA-LD make this measure a potentially valuable part of the professional toolkit when evaluating mental capacity in individuals with an intellectual disability. It cannot, and should not, be used as a stand-alone diagnostic test. It could, however, contribute to a multifaceted assessment, comprising quantitative and qualitative assessment of an individual's decision-making abilities. ROC curve analysis indicated that a score of 13 on the MoCA-LD serves as the most statistically appropriate threshold: providing the best balance between correctly identifying those who had capacity (true positives) and those who did not (true negatives). For the sample in this study, using a cut-off score of 13 would have allowed for the right classification 73 percent of the time. That said, given that a core principle guiding the application of the MCA is the presumption that the person has capacity unless proven otherwise (Department of Health, 2005), it is critically important to also carefully consider the specificity for each value as well as the given false negative rate. Clinicians are advised to thoughtfully consider *all* the information provided in Table 5 when interpreting individual MoCA-LD scores.

Once again, it is important to stress that clinical judgments of mental capacity *should not* be based on MoCA-LD scores alone. Nevertheless, it seems clear that the significant predictive value of scores on this measure could make a helpful and objective contribution to these complex evaluations, which must also include consideration of broader contextual factors and an individual's clinical presentation. The strength of these conclusions are tempered by limitations of the study design. Most crucially, as the mental capacity assessments were completed historically by different clinicians, it has not been possible to confirm that the resulting classifications used as outcome variables in the analyses were themselves free of clinical bias (Donnelly, 2009; Keene, 2017). Replication of the current results is therefore highly desirable, ideally with established inter-

rater reliability of mental capacity classifications (Lamont et al., 2013) and with individuals from the community, as well as hospital settings, to increase generalisability of the findings.

Many research papers have highlighted the difficulties often encountered when trying to recruit people with learning disabilities to participate in research (Cameron & Murphy, 2006). Investigations of an individual's ability to make decisions are particularly constrained by issues associated with prospective participants' ability to provide informed consent to actively provide data to be used in research. The current study skirted these issues through the use of deidentified, retrospective data – but was, therefore, limited to the data currently available in the hospital records. The researchers had no control over the measures administered, the distribution of intellectual disabilities (i.e., severity levels) and mental capacity classifications, or any comorbid mental health conditions. As a result, most of the final sample were classified as having an intellectual disability in either the mild or borderline range and were male. This limits the generalisability of the results for females as well as people in the moderate, severe and profound range. Most critically, while the sample size was adequate for group comparisons, it was underpowered for regression analyses with five predictor variables. This could explain why none of the four targeted cognitive functions were identified as significant predictors when previous studies have identified executive function and memory as important (Goldsmith et al., 2008; Wilner et al., 2010), as well as language and verbal ability (Fisher et al., 2006; Jayes et al., 2017). Future studies should aim to address this limitation by increasing the sample size to 125 participants or more as indicated by the post-hoc G-power analysis. Finally, the current study focused on only one type of decision: the capacity to consent to medical treatment under the Mental Health Act (Department of Health, 1984). As the MCA requires that assessments should be decision and time specific (Department for Consitutional

Affairs, 2007; Department of Health, 2005) further research should also see if the results obtained in this study extend to other types of important decision (e.g. regarding living arrangements).

CONCLUSION

The current study highlights the complexity, and potentially subjective nature, of mental capacity assessment in people with intellectual disabilities. Despite some limitations, this study provides important evidence supporting the utility of cognitive ability measures during mental capacity assessments for people with intellectual disabilities. The MCA states that in order to be deemed to have mental capacity, a person needs to be able to weigh-up, retain, communicate and understand information relevant to a decision (Department for Consitutional Affairs, 2007; Department of Health, 2005). Yet, despite over 11 years of legal discussions, development and research since this document was produced, it has remained unclear whether there are objectively measurable thresholds for these outcomes (Wong, 1997). The findings from the present study confirm that cognitive ability measures, like the MoCA-LD, may helpfully inform mental capacity assessments and increase the objectivity of this process. Further research is required – which can navigate the complexities associated with participant consent - to help build the required knowledge base to ultimately provide individuals with intellectual disabilities with greater autonomy and control over important aspects of their lives and scope to, occasionally, make bad decisions without the risk of losing their independence.

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