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Comparison of Four Cognitive Screening Tools: Clinical Utility in a Skilled Nursing Setting and Relationship to Discharge Location

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This evidence project, submitted by

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has been approved and accepted in partial fulfillment of the requirements for the degree of Master of Science in Occupational Therapy from the University of Puget Sound.

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Key words: Mini Mental State Examination (MMSE), Montreal Cognitive Assessment (MoCA), St. Louis University Mental Status Examination (SLUMS), mild cognitive impairment (MCI), cognition, discharge setting

Abstract

A systematic review of 34 articles was conducted to answer the following clinical questions posed by Joette Jindra, the Director of Rehabilitation, at ManorCare of Tacoma: "Which cognitive screen, out of the four we are currently using, most accurately measures a patient's functional cognitive performance?" and "How well do cognitive tools and measures predict a client's discharge setting from a skilled nursing facility (SNF)?". Results indicate the Montreal Cognitive Assessment (MoCA) to be the most clinically useful tool for detecting mild cognitive impairment (MCI) as it demonstrated the greatest sensitivity across studies and diagnoses. The evidence did not support the use of the Mini Mental State Examination (MMSE) as it has low sensitivity to detect MCI across diagnoses. There is limited psychometric data available regarding the St. Louis University Mental Status Exam (SLUMS) and Allen Cognitive Level Screen (ACLS). Additionally, the research suggests a relationship between clients' cognitive functioning and their discharge location. It is recommended that ManorCare change their cognitive screening protocols, requiring all patients to be screened using the MoCA as opposed to the MMSE, SLUMS, or ACLS based on the available evidence. This will ensure client safety and detection of mild to severe cognitive impairment when present. New research pertaining to the SLUMS and ACLS should be monitored as this may affect the current recommendation.

To translate knowledge and support the implementation of evidence-based practice, a 30 minute in-service was delivered during which the research process and findings were presented to a team of 15 rehabilitation professionals. Additionally, an informational MoCA resource packet was provided and discussed. Pre- and post- in-service surveys were conducted to determine the impact of the in-service presentation. Analysis of survey responses indicated the in-service and informational resource packet to be effective knowledge translation activities. It is recommended that a follow-up implementation study be conducted by graduate students at the University of Puget Sound to determine the extent that policy changes are adopted by ManorCare and to develop a chart review research project to examine the connection between patient MoCA scores and discharge settings.

Executive Summary

To meet the informational needs of the Director of Rehabilitation at ManorCare of Tacoma, two research questions were developed. The first question examined which cognitive screen used in this setting (MoCA, MMSE, ACLS, or SLUMS) most accurately measures a patient's functional cognitive performance. The second question examined how well cognitive tools and measures predict a client's discharge setting from a SNF. A search strategy, including inclusion and exclusion criteria, was developed for each research question. Inclusion and exclusion criteria ensured the articles included were recent, relevant to populations seen at ManorCare and appropriate for an English speaking population. Systematic search strategies were used to search the following databases for relevant studies: PubMed, ScienceDirect, ProQuest Central, CINAHL and Rehabilitation Measures. Following a preliminary presentation of findings to the Director of Rehabilitation, the inclusion criteria for both research questions was adjusted and additional studies were added to the Critically Appraised Topic (CAT) table.

To answer the first research question, researchers synthesized the available literature regarding the clinical utility of the MMSE, the MoCA, the SLUMS and the ACLS for populations seen in a skilled nursing setting. The majority of studies examined the utility of the MMSE and MoCA for detecting MCI in patients with chronic stroke or memory impairment; however, a few studies examined the tools' ability to detect MCI in patients with diabetes, orthopedic injuries, neurological conditions, and cardiac conditions. Across studies and diagnoses, the MoCA was found to have comparable or greater sensitivity to detect MCI than the MMSE. When the psychometric properties of the SLUMS and the MMSE were compared, the screens demonstrated comparable sensitivity and specificity for the detection of dementia. The SLUMS, however, demonstrated greater sensitivity for detecting MCI, which the MMSE failed to detect. Outside of this single study, minimal research has been conducted to compare psychometric properties of the SLUMS to other screening tools. Research is also lacking regarding the psychometric properties of the ACLS for populations admitted to a SNF. The literature

gathered to answer the second research question indicates a relationship between cognition and discharge location; those with intact cognition are more likely to be discharged to the community, whereas those with impaired cognition are more likely to be institutionalized.

Using the knowledge generated, occupational therapy practitioners can select the cognitive assessment that best fits their information needs. Because the MoCA is the most sensitive measure (ranging from 83 to 100 percent) when the standard score of 26 is used, its use will reduce the number of false negatives. Conversely, the MMSE will reduce the number of false positives. Depending on the reason for using a cognitive screen, either to identify or to rule out MCI, a clinician may choose to use one or the other, but should understand the limitations of each. This knowledge has additional implications for clients, families and educators. This information can be used to educate clients and their families regarding the possibility for error with cognitive screening. Families or caregivers should be instructed to contact a medical provider if they think the patient may have cognitive impairment that was not detected. Educators can use this information to inform course planning. Not only can this information be used to educate students in the rehabilitation field regarding the clinical utility of various cognitive screening tools, but educators may choose to place greater emphasis on MoCA administration protocols in the curriculum. Additional research is needed to expand the repertoire of studies examining the psychometric properties of the SLUMS and ACLS. Furthermore, researchers may consider conducting a retrospective study to establish the relationship between discharge location and client scores on a cognitive screen.

To convey the results of the CAT to the collaborating clinician and the rehabilitation department at ManorCare, a 30 minute in-service presentation was conducted. This in-service included a brief overview of the research design, a summary of the findings, recommendations for best practice, and instruction on MoCA administration protocols. Pre- and post- in-service surveys were administered before and after instructions on the administration of the MoCA were provided. Analysis of qualitative information from the surveys in conjunction with positive verbal feedback from participants supported

the efficacy of the in-service as a knowledge translation tool. Following the in-service, the Director of Rehabilitation discussed potential changes in protocol that would require the MoCA to be part of the admission evaluation process. It is recommended that the collaborative relationship with ManorCare be continued to determine if policy changes have been successfully enacted. Additionally, a chart review should be conducted to examine the relationship between clients' MoCA scores and discharge settings per the Rehabilitation Director's suggestion.

CRITICALLY APPRAISED TOPIC (CAT) PAPER

Focused Question:

Which cognitive screens currently being used by therapists at ManorCare of Tacoma most accurately measure a patient's functional cognitive performance?
How well do cognitive tools/measures predict a client's discharge setting from SNF?

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Updated review: 4/1/16

Clinical Scenario:

At ManorCare, a skilled nursing facility in Tacoma, Washington, patient results on a cognitive screen such as the Montreal Cognitive Assessment (MoCA), the St. Louis University Mental Status Exam (SLUMS), the Mini-Mental Status Examination (MMSE), or the Allen Cognitive Level Screen (ACLS) are referenced by doctors when making important decisions regarding discharge location. Cognitive screening is typically conducted by an occupational therapist, occupational therapy assistant, or a speech language pathologist. Therapists choose which tool to use based on their familiarity with each and/or the patient's diagnosis and presentation. Knowledge of predictive validity or other psychometric properties of each tool are not always taken into account when making these decisions. A critically appraised topic table will allow for synthesis and comparisons among the cognitive screening tools that are used by therapists at ManorCare of Tacoma, facilitating their ability to make evidence-based decisions when choosing which cognitive screening tool to use. Additionally, a critically appraised topic table will help to determine which screening tools provide the most predictive power in regards to discharge setting from a SNF. If the therapists are able to use the cognitive assessment with the most predictive power, a doctor will be able to make a more informed decision regarding the most appropriate discharge setting for a patient, resulting in improved client outcomes.

After presenting preliminary results to the Director of Rehabilitation at ManorCare of Tacoma, the diagnosis of dementia was moved from the exclusion criteria to the inclusion criteria because many patients who are admitted to ManorCare also present with pre-existing cognitive impairment. Including studies that examine the clinical utility of the four aforementioned cognitive screening tools for use with clients with dementia will allow greater generalizability of findings to the populations seen at ManorCare of Tacoma.

Review Process
Procedures for the selection and appraisal of articles

Question 1:

Inclusion criteria

Articles were chosen if:

- The study examined at least one of the four cognitive assessments used in this setting (ACLS, MMSE, SLUMS or MoCA) and provided psychometric data.

Exclusion criteria

Articles were excluded if:

- The study was published prior to 2000.
- The study did not examine a cognitive screen listed in the inclusion criteria.
- The study examined psychometric properties of a version used outside of the United States.

Question 2:

Inclusion criteria:

Articles were chosen if:

- The study was conducted in a SNF or similar setting.
- The study examined the relationship between cognitive functioning and discharge setting.
- The study examined a cognitive assessment measure.
- The study pertained to diagnoses seen in this setting (see diagnoses in search terms table listed below).

Exclusion criteria

Articles were excluded if:

- The study was published prior to 2000.
- The study examined psychometric properties of a version used outside of the United States.
- The study examined cognitive screens not available to occupational therapists.
- The study pertained to diagnoses not commonly treated in this setting.

Updated search:

Inclusion criteria:

Articles were chosen if:

- The study examined at least one of the four cognitive assessments used in this setting (ACLS, MMSE, SLUMS or MoCA).
- The study examined a population with dementia.
- The study examined discharge disposition.
- The study examined a SNF or similar rehabilitation setting.

Exclusion criteria

Articles were excluded if:

- The study was published prior to 2000.
- The study examined diagnoses other than dementia.
- The study examined psychometric properties of a version used outside of the United States.

Search Strategy

We used the following search strategies for the two components of our research question using PubMed and then adapted the strategy for other databases.

1. First component of researchable question:

A. (Cogniti$) AND (measure$) AND (psychometrics OR clinimetrics)
B. (Allen Cognitive Level Screen-5 OR St. Louis University Mental Status OR Mini Mental Status Exam OR Montreal Cognitive Assessment) AND (psychometrics)
C. (ACLS-5 OR SLUMS OR MMSE OR MoCA) AND (reliability OR validity) AND ("cognitive performance" OR "cognitive function")
D. ("St. Louis University Mental Status" OR SLUMS) AND (psychometrics)
E. ("Allen Cognitive Level Screen" OR ACLS) AND (psychometrics)

2. Second component of researchable question:

A. ("Cognitive performance" OR "cognitive function") AND (predictive validity) AND (discharge setting)
B. (Cognition) AND (predict) AND (discharge)
C. (Cognition OR "mental state") AND ("discharge setting") AND ("skilled nursing")

Additionally, we searched for articles pertaining to the ACLS, SLUMS, MoCA and MMSE on the Rehabilitation Measures Database.

Key Search Terms

Keywords	**Synonym(s)**	**Alternative spelling**
Allen Cognitive Level Screen	Large Allen Cognitive Screen	ACLS LACLS
Cardiac conditions	Congestive heart failure Coronary artery disease Myocardial infarction	CHF CAD MI
Cognitive level	Cognitive status Mental functioning Mental capacity Cognition Cognitive impairment Cognitive function Cognitive performance	
Cognitive screen	Cognitive assessment Cognitive evaluation Cognitive test Cognitive measure	
Dementia*	Mild cognitive impairment Alzheimer's disease	MCI AD
Diabetes	Diabetes mellitus	DM
Discharge	Release	
Discharge setting	Discharge disposition Discharge placement Discharge location Community placement Discharge living situation	
Mini-Mental State Examination	MMSE	
Montreal Cognitive Assessment	MOCA	
Orthopedic injury	Fracture Hip fracture Pelvic fracture	
Outcomes	Results	
Pulmonary conditions	Chronic obstructive pulmonary disorder	COPD
Prediction		
Psychometrics	Clinimetrics	
Reliability		

Renal dysfunction	Kidney disease End stage renal disease	ESRD
Sensitivity		
Skilled Nursing Facility	General Activation Service	SNF GAS
Specificity		
St. Louis University Mental Status Examination	SLUMS	
Stroke	Cerebrovascular accident Brain Hemorrhage Cerebral ischemia	CVA
Surgical wounds	Wound care	
Total joint replacement	Total knee replacement Total hip replacement Total knee arthroplasty Total hip arthroplasty	
Validity		

**updated search term*

Databases Searched
PubMed (Medline)
CINAHL
ScienceDirect
ProQuest Central
Rehabilitation Measures

Quality Control/Peer Review Process:

Our research began with the following question, "How well do cognitive screening tools like the MMSE, MoCA, SLUMS and ALCS predict a patient's discharge setting?" We then took this broad clinical question and broke it into two researchable components:
"Which cognitive screens most accurately measure a patient's functional cognitive performance?" and "How well do cognitive tools/measures predict a client's discharge setting from a SNF?"

Based on these questions, we generated a list of key terms. Key terms included the names of the cognitive screens that are currently used at ManorCare, the diagnoses that are commonly seen, and terms directly from the clinical question. Our initial search did not yield psychometric studies for the ACLS or the SLUMS. To acquire this information, we added the Rehabilitation Measures database to our search strategy where we searched for the ACLS, SLUMS, MMSE and MoCA individually. This search yielded 3 articles. Additionally, the inclusion and exclusion criteria used in our first research question were modified to include research conducted in settings other than skilled nursing facilities as the predictive validity of a cognitive assessment is not dependent on setting.

Following our initial search and presentation of results, the diagnosis of dementia was moved from the exclusion criteria to the inclusion criteria. To gather research regarding the efficacy of the four aforementioned screening tools in clients with memory impairment, we used the same search strategies, however, included any articles that had previously been excluded due to administration to a memory care or dementia population.

Our various search strategies yielded between 0 and 33,198 articles. Of those rejected, the primary reasons included: irrelevance to the topic, cognitive tools used outside of the United States, article publication dates prior to the year 2000, duplicate articles, or articles related to populations that are not seen at ManorCare. More specific information regarding how many articles were found, rejected and reviewed can be found in the search strategy table below. Key players in our review process included: occupational therapy student colleagues, a faculty advisor and the university's science library liaison.

Search Strategy and Results

Search Strategy	Date of Search	Database Searched	Results of Search	Articles Kept	Articles Discarded and Why
(Instructor search)	9/29/15	UPS Master's Theses Database	N/A	1	N/A
1A	10/23/15	PubMed	3	0	3 Not relevant or did not meet inclusion criteria.
1A	10/23/15	CINAHL	No results found	-	-
1A	10/23/15	ScienceDirect	No results found	-	-
1A	11/16/15	ProQuest Central	11	0	11 Irrelevant to topic.
1B	10/23/15	PubMed	144	6	138 Most did not meet inclusion criteria, some met exclusion criteria with diagnoses not seen in our SNF setting.
1B	10/23/15	CINAHL	23	0	23 Did not meet inclusion criteria. Two of these articles met inclusion criteria, but were duplicates from PubMed search.
1B	10/23/15	ScienceDirect	13	1	12 Did not meet inclusion criteria.
1B	11/16/15	ProQuest Central	5839	1	5838 Not peer-reviewed.
1B	11/15/15	Rehabilitation Measures	41	3	38 Did not meet inclusion criteria or duplicate article.
1C	10/23/15	PubMed	146	0	146

					Versions outside the United States.
1C	10/23/15	CINAHL	40	0	40 Did not meet inclusion criteria or not relevant.
1C	10/23/15	ScienceDirect	6363	3	6360 Versions outside the United States or related to psychiatric patients.
1C	11/16/15	ProQuest Central	5839	0	5839 Irrelevant to topic.
1D	11/11/15	PubMed	39	0	39 Irrelevant to topic.
1D	11/15/15	CINAHL	No results found	-	-
1D	11/11/15	ScienceDirect	97	0	97 Not peer-reviewed.
1D	11/16/15	ProQuest Central	68	0	68 Irrelevant to topic.
1E	11/11/15	PubMed	1	0	1 Irrelevant to topic.
1E	11/15/15	CINAHL	12	0	12 Articles concerned with mental health.
1E	11/11/15	ScienceDirect	123	0	123 Irrelevant to topic.
1E	11/16/15	ProQuest Central	45	0	45 Irrelevant to topic.
2A	10/24/15	PubMed	2	0	2 Irrelevant to topic.
2A	10/24/15	CINAHL	No results found	-	-
2A	10/24/15	ScienceDirect	2814	1	2813 Assessment versions outside of the United States or related to populations not in inclusion criteria.
2A	11/16/15	ProQuest Central	7916	0	7916 Duplicates.
2B	10/24/15	PubMed	128	1	127 Did not meet inclusion criteria.
2B	10/24/15	CINAHL	72	0	72 Irrelevant to topic.

2B	10/24/15	ScienceDirect	6744	2	6742 Irrelevant to topic.
2B	11/16/15	ProQuest Central	7650	0	7650 Not peer-reviewed.
2C	10/26/15	PubMed	1	0	1 Irrelevant to topic.
2C	11/11/15	CINAHL	No results found	-	-
2C	11/16/15	ScienceDirect	24	1	23 Irrelevant to topic.
2C	11/16/15	ProQuest Central	27	0	27 Irrelevant to topic.
					Total articles kept: 20

Updated Search and Results

Search Strategy	Date of Search	Database Searched	Results of Search	Articles Kept	Articles Discarded and Why
2B	3/7/16	CINAHL	72	1	71 Articles concerned with mental health, did not meet inclusion criteria.
2C	3/7/16	CINAHL	33198	0	33198 Met exclusion criteria.
2B	3/7/16	PubMed	130	0	130 Duplicate articles, did not meet inclusion criteria.
2C	3/7/16	PubMed	1	0	1 Did not meet inclusion criteria.
2B	3/7/16	ProQuest Central	8229	0	8229 Did not meet inclusion criteria, met exclusion criteria.
2C	3/7/16	ProQuest Central	25	0	25 Did not meet inclusion criteria.
2B	3/7/16	ScienceDirect	6964	0	6964 Did not meet inclusion criteria, duplicate articles.
2C	3/7/16	ScienceDirect	26	0	26 Did not meet inclusion criteria.
1A	3/8/16	PubMed	3	0	3 Did not meet inclusion criteria, not relevant.

1A	3/8/16	CINAHL	No results found	-	-
1A	3/8/16	ScienceDirect	No results found	-	-
1A	3/8/16	ProQuest Central	11	0	11 Did not meet inclusion criteria, not relevant.
1B	3/8/16	PubMed	152	3	149 Did not meet inclusion criteria, not relevant, duplicate articles.
1B	3/8/16	CINAHL	22	0	22 Did not meet inclusion criteria, duplicate articles from PubMed search.
1B	3/8/16	ScienceDirect	8	0	8 Did not meet inclusion criteria, not relevant.
1B	3/8/16	ProQuest Central	920	2	918 Did not meet inclusion criteria, not relevant.
1C	3/8/16	ProQuest Central	10948	3	10945 Duplicate articles from previous search strategy, did not meet inclusion criteria.
1C	3/9/16	PubMed	431	2	429 Did not meet inclusion criteria, dated prior to 2000.
1C	3/9/16	CINAHL	58	0	58 Not relevant, pertaining to mental health.
1C	3/9/16	ScienceDirect	6564	1	6563 Duplicate articles from other databases, did not meet inclusion criteria.
2A	3/9/16	ProQuest Central	7478	2	7476 Pertaining to mental health, dated prior to 2000, not relevant.
2A	3/9/16	PubMed	8	0	8 Irrelevant to topic.
2A	3/9/16	CINAHL	No results found	-	-
2A	3/9/16	ScienceDirect	2913	0	2913 Did not meet inclusion criteria, not relevant.
					Total articles kept: 14
Total articles included in CAT tables: 34					

Results of Search

Summary of Study Designs of Articles Selected for the CAT Table

Pyramid Side	Study Design/Methodology of Selected Articles	Number of Articles Selected
Experimental	___Meta-Analyses of Experimental Trials ___Individual Blinded Randomized Controlled Trials ___Controlled Clinical Trials ___Single Subject Studies	
Outcome	___Meta-Analyses of Related Outcome Studies ___Individual Quasi-Experimental Studies ___Case-Control Studies ___One Group Pre-Post Studies	
Qualitative	___Meta-Syntheses of Related Qualitative Studies ___Small Group Qualitative Studies ___brief vs. prolonged engagement with participants ___triangulation of data (multiple sources) ___interpretation (peer & member-checking) ___a posteriori (exploratory) vs. a priori (confirmatory) interpretive scheme ___Qualitative Study on a Single Person	
Descriptive	_**X**_**S**ystematic Reviews of Related Descriptive Studies _**X**_Association, Correlational Studies ___Multiple Case Studies (Series), Normative Studies ___Individual Case Studies	**34**
Comments:		

Research Question 1: Psychometrics of Cognitive Screens

CAT Table 1: Psychometric Properties of the Mini Mental State Exam (MMSE)

Author(s), Year	Study Objectives	Study Design/ Level of Evidence	Assessments or Screens Being Compared	Psychometrics	Population/ Setting	Summary of Results	Limitations
Nys, van Zandvoort, de Kort, Jansen, Kappelle, & de Haan (2005)	To evaluate the construct validity of the MMSE as a cognitive screening tool in hospitalized stroke patients.	Correla-tional cohort study AOTA level: IV Pyramid level: D2	MMSE	The MMSE had an AUC of 0.67 (standard error = 0.11) (p = 0.13) when differentiating cognitively intact patients from cognitively impaired patients. Considered a range of cut-off scores from 23-29, no cutoff score could produce sensitivity greater than 80% or specificity greater than 60%. When applying cut-off score of 24: Sensitivity: 34.8% Specificity: 70%	*Population/Setting:* stroke patients in an inpatient stroke unit (*n* = 34) and healthy controls living in the community (*n* = 34). *N* = 68	The MMSE is statistically no better than chance at identifying cognitive impairment in patients post-stroke. The MMSE is an invalid tool for differentiating cognitively intact persons from cognitively impaired persons; especially if the impairments are related to executive functioning, abstract reasoning, and visual perception.	Study was conducted in a stroke unit rather than a SNF. Over 70% of the patients were those with subcortical lacunar stroke. This limits the generalizability to other forms of stroke and diagnoses seen in a SNF. The modest sample size also limits generalizability.
Bassuk & Murphy (2003)	To assess the psychometric properties of the Modified Mini-Mental State Exam (3MS).	Correla-tional Study AOTA level: IV Pyramid level: D2	Modified MMSE (3MS) and Original Mini-Mental State Exam (MMSE)	Interrater reliability (intraclass correlation coefficient = 0.98) Internal consistency (coefficient alpha = 0.91) Test-retest reliability = 0.78 Correlation between 3MS and MMSE = 0.95	*Population:* community dwelling adults aged 65 or older who were residents of a county in Canada and who took the 3MS as part of a population-based longitudinal study. *N* = 885	Interrater reliability and internal consistency of the 3MS were high. Risk factors for low scores include older age, less education, and male gender. The 3MS can be used as a measure of global cognitive performance among elderly persons.	An independent assessment of cognitive function was not available therefore the validity of the 3MS could not be determined. 3MS scores were converted to MMSE scores for comparison; derived MMSE scores may not be equivalent to the scores that would have been obtained if the MMSE had been used, therefore correlations between 3MS and MMSE may be overestimated.

Author(s), Year	Study Objectives	Study Design/ Level of Evidence	Assessments or Screens Being Compared	Psychometrics	Population/ Setting	Summary of Results	Limitations
Paquay, De Lepeleire, Schoenmakers Ylief, Fontaine, & Buntinx (2007)	To compare the diagnostic accuracy of the Cognitive Performance Scale (CPS) and the Mini-Mental State Exam (MMSE) for the detection of cognitive impairment in nursing home residents.	Correla-tional study AOTA level: IV Pyramid level: D2	MMSE CPS (of the Minimum Data Set of the Resident Assessment Instrument (MDS/RAI)) The Cambridge Examination for Mental Disorders of the Elderly–Revised (CAMDEX-R) was used as the reference standard.	CAMDEX-R prevalence of cognitive impairment: 75% *MMSE* (cut-off score of 23) Sensitivity: 97% Specificity: 59% Positive Predictive Value: 88% Negative Predictive Value: 85% *CPS* Sensitivity: 81% Specificity: 80% Positive Predictive Value: 92% Negative Predictive Value: 57%	*Population/Setting:* residents aged 65 years or older living in 42 different nursing homes (range of "low" and "high" care institutions). The number of residents per institution varied from 1 to 18. *N* = 198	The CPS and MMSE demonstrated similar ability to detect cognitive impairment in nursing home residents.	As a result of the selection procedure the prevalence of cognitive impairment was relatively high and not representative for the general population of nursing home residents; this might limit the transferability of the measures of diagnostic accuracy.
Lacy, Kaemmerer, & Czipri (2015)	To assess the utility of the MMSE as a screening tool among older adults undergoing evaluation at a memory clinic.	Retro-spective correla-tional study AOTA level: IV Pyramid level: D2	MMSE	Cut-off score of 25. Patients scoring above 25, over half exhibited moderate memory impairment, more than 25% showed severe impairment. Patients with perfect (30/30) or near perfect (29/30) scores, 43% displayed moderate to severe memory impairment.	*Population/setting:* participants were between the ages of 65 and 95 referred from a University outpatient memory clinic. *N* = 304	Results indicate that the MMSE lacks the sensitivity required of a clinical screening tool and will often miss MCI when present. Newer screening measures have shown greater sensitivity and should be used over the MMSE.	All participants were memory center referrals and 67% of participants were African American which may limit generalizability.

CAT Table 2: Psychometric Properties of the Montreal Cognitive Assessment (MoCA)

Author(s), Year	Study Objectives	Study Design/ Level of Evidence	Assessments or Screens Being Compared	Psychometrics	Population/ Setting	Summary of Results	Limitations
Chan, Khan, Oliver, Gill, Werring, & Cipolotti (2014)	To examine to what extent intact cognition, as indicated by the MoCA, reflects intact cognition as indicated by neuro-psychological assessment.	Retro-spective correlational study AOTA level: IV Pyramid level: D2	MoCA	When applying a cut-off score of 25 the MoCA demonstrated the following: Sensitivity: 82% Specificity: 70% Positive predictive value: (PPV) 97% Negative predictive value (NPV): 23%	*Population/ setting:* patients in the Acute Stroke Unit at the National Hospital for Neurology and Neurosurgery in London, England. Patients were tested with the MoCA and a neuropsychological assessment within 3 months of admission. *N* = 136	The MoCA demonstrated good sensitivity, moderate specificity, very good PPV, but poor NPV. These results suggest that the MoCA is a useful screening tool for identifying gross cognitive impairment, however, not for domain-specific impairment.	This study was conducted in a large hospital and screening was conducted by neuro-psychologists rather than therapists. Patients were administered varying neuropsychological assessments rather than a standardized battery. The results of this study can only be applied to the stroke population and cannot be generalized to other diagnoses.
Goldstein, Ashley, Miller, Alexeeva, Zanders, & King (2014)	To assess the validity of the MoCA in detecting MCI.	Correlational study AOTA level: IV Pyramid level: D2	MoCA	Cut off score of 26: Sensitivity: 100% Specificity: 31% Cut off score of 25: Sensitivity: 100% Specificity: 44% Cut off score of 24: Sensitivity: 95% Specificity: 63% Cut off score of 23: Sensitivity: 84% Specificity: 69% Cut off score of 22: Sensitivity: 74% Specificity: 88%	*Population/setting:* African American patients in an urban outpatient memory disorder clinic. *N* = 81	The MoCA is a valid screening tool for cognitive impairment, but has a higher likelihood of falsely classifying persons without cognitive impairment as having MCI. The MoCA has less specificity and more sensitivity as the cut-off score is increased.	Study is limited by the type of population studied and the subjects' comorbidities.

CAT Table 3: Comparison of Screens

Author(s), Year	Study Objectives	Study Design/ Level of Evidence	Assessments or Screens Being Compared	Psychometrics	Population/ Setting	Summary of Results	Limitations
Cumming, Churilov, Linden, & Bernhardt (2013)	To determine the validity of the MoCA and MMSE as screening tools for cognitive impairment post-stroke.	Retro-spective correlational study AOTA level: IV Pyramid level: D2	MoCA MMSE	*MoCA* (optimal cut-off score 23/24) Sensitivity: 92% Specificity: 67% *MMSE* (optimal cut-off score 26/27) Sensitivity: 82% Specificity: 76%	*Population:* stroke (ischemic or intracerebral hemorrhage) patients over 18 years old without major visual, language or hearing impairment were evaluated 3 months post stroke. Mean age = 72.1 years (SD = 13.9) Mean education = 10.5 years (SD = 3.9) *Setting:* Acute Stroke Unit. *N* = 60	MoCA has better sensitivity, whereas the MMSE has better specificity. Rates for both screening tools indicate acceptable validity and are fair clinical indicators of cognitive impairment after stroke.	No control for age or education - both of which can affect MoCA and MMSE scores. Study was conducted in an acute stroke unit and therefore may not be generalizable to a SNF.
Toglia, Fitzgerald, O'Dell, Mastrogiovanni, & Lin (2011)	To compare the MoCA and MMSE global and subscores in classifying MCI in patients with mild stroke and to explore the relationship between admission and discharge functional status.	Retro-spective analysis of data AOTA level: IV Pyramid level: D2	MoCA MMSE The motor subscale of the Functional Independence Measure (FIM) was used to assess discharge functional status.	*MoCA* (cut-off score of 26) Sensitivity: 89% Internal reliability: Cronbach α=.78 Associations with discharge functional status: (*r*=.40; *P*<.001) *MMSE* (cut-off score of 27) Sensitivity: 63% Internal reliability: Cronbach α=.60 Associations with discharge functional status: (*r*=.30; *P*<.05)	*Population:* patients post stroke with mild neurologic and cognitive deficits. Mean age = 70 years, median time post stroke = 8.5 days. *Setting:* an acute rehabilitation unit of a large hospital. *N* = 72	The MoCA showed less of a ceiling effect than the MMSE. The MoCA visuoexecutive subscore was the strongest predictor of functional status and improvement in global and subscores. MoCA appears to be a more sensitive screening tool than the MMSE in detecting MCI in patients post stroke.	Study had a narrow sample because patients with severe strokes or moderate to severe cognitive and language impairments were excluded. The sample was also primarily white with high mean education levels so results cannot be generalized to the entire stroke population.

Author(s), Year	Study Objectives	Study Design/ Level of Evidence	Assessments or Screens Being Compared	Psychometrics	Population/ Setting	Summary of Results	Limitations
Hawkins, Gathright, Gunstad, Dolansky, Redle, Josephson, & Hughes (2014)	To compare the ability of the MoCA and the MMSE to accurately identify cognitive impairment in patients with heart failure (HF).	Retro-spective correlational study AOTA level: IV Pyramid level: D2	MoCA MMSE	*MoCA* (cut-off score of 26) Sensitivity: 79% Specificity: 40% The MoCA correctly classified 65% of patients, Wilk's lambda=.91, $\chi 2(1)=9.89$, $p<.01$ *MMSE* (cut-off score of 24) Sensitivity: 28% Specificity: 92% The MMSE correctly classified 68% of patients, Wilk's lambda=.87, $\chi 2(1)=14.26$, $p<.001$.	*Population:* Patients with documented heart failure diagnosis between the ages of 50 and 85. *Setting:* Inpatient and outpatient cardiology practices. *N* = 106	The MoCA and MMSE both have adequate sensitivity for use with patients with HF. Both tests will incorrectly classify one third of patients. When using the standard cut-off score, the MMSE has better specificity and the MoCA has better sensitivity.	Standard cut-off scores were modified for best sensitivity. Therefore, rates are only true when using the cut-off scores used in their analysis. All rates were lower when using the standard cut-off score.
Alagiakrishnan, Zhao, Mereu, Senior, & Senthilselvan (2013)	To compare the ability of the MoCA to the MMSE for diagnosing MCI in Type 2 Diabetes Mellitus (DM) population.	Prospective Pilot Study AOTA level: IV Pyramid level: D2	MoCA MMSE	*MoCA* (cut-off score of 26) Sensitivity: 67% Specificity: 93% Positive Predictive Value: 84% Negative Predictive Value: 56% *MMSE* (cut-off for MCI = scores between 19 and 29, corrected for age and education) Sensitivity: 13% Specificity: 93% Positive Predictive Value: 66% Negative Predictive Value: 51%	*Population:* adults age 50 years or above with Type 2 DM, without depression or dementia. *Setting:* community dwelling adults who attend diabetes education clinics. *N* = 30	MoCA appears to be a better screening tool than the MMSE for MCI in a diabetic population.	Study was conducted with community dwelling adults so may not be generalizable to a SNF population. Small sample size also limits generalizability.

Author(s), Year	Study Objectives	Study Design/ Level of Evidence	Assessments or Screens Being Compared	Psychometrics	Population/ Setting	Summary of Results	Limitations
Sweet, Van Adel, Metcalf, Wright, Harley, Leiva, & Taler (2011)	To evaluate the psychometric characteristics of the MoCA in a geriatric rehab program and its ability to predict rehabilitation outcome.	Correlational study AOTA level: IV Pyramid level: D2	MoCA MMSE The FIMmotor was used to assess functional status.	*MoCA* (cut-off score of 26) Sensitivity: 80% Specificity: 30% *MMSE* (cut-off score of 24) Sensitivity: 40% Specificity: 90% Sensitivity and specificity of cognitive measures for detecting successful rehabilitation candidates were derived using cross-tabulations.	*Population:* geriatric rehab patients, 70-102 yo. *Diagnoses:* orthopedic injuries, neurological conditions, medically complex conditions, and cardiac issues. *Setting*: geriatric rehabilitation inpatient program in Canada. *N* = 47	The MoCA appears to have acceptable psychometric properties as a screening tool. The MoCA has better sensitivity than the MMSE and the attention subscale has comparable specificity. The MoCA may be a more useful tool for detecting cognitive impairment and predicting rehabilitation outcome in this population.	Information on discharge destination, illness comorbidity, and depressive symptoms were collected, but this information was only available for a portion of the sample due to incomplete clinical documentation.
Nasreddine, Phillips, Bédirian, Charbonneau, Whitehead, Collin, Cummings, & Chertkow (2005)	To assess the sensitivity and specificity of the MoCA in patients with MCI, Alzheimer's disease (AD), and normal elderly controls.	Validation study AOTA level: IV Pyramid level: D2	MoCA MMSE	*MoCA* (cut-off score of 26) Sensitivity to detect MCI: 90% Sensitivity to detect AD: 100% Specificity: 87% *MMSE* (cut-off score of 26) Sensitivity to detect MCI: 18% Sensitivity to detect AD: 78% Specificity: 100%	*Population:* *n* = 94, patients with MCI *n* = 93, patients with AD *n* = 90, healthy elderly controls *Setting:* participants were recruited from a community clinic and an academic center. *N* = 277	The MoCA is a brief cognitive screening tool with high sensitivity and specificity for detecting MCI. The MoCA demonstrates superior sensitivity to the MMSE when using a cut-off score of 26.	Study participants were recruited from memory clinics and the community, so results may not be generalizable to a SNF population.

Author(s), Year	**Study Objectives**	**Study Design/ Level of Evidence**	**Assessments or Screens Being Compared**	**Psychometrics**	**Population/ Setting**	**Summary of Results**	**Limitations**
Olson, Iverson, Carolan, Parkinson, Brooks, & McKenzie (2011)	To compare the diagnostic accuracy of two commonly used cognitive screening tests.	Correlational study AOTA level: IV Pyramid level: D2	MoCA MMSE	*MoCA* (cut-off score of 25) Sensitivity: 61.9% Specificity: 55.6% *MMSE* (cut-off score of 26) Sensitivity: 19% Specificity: 94.4%	*Population:* patients with brain tumors and brain metastases, ages 20-74 yo. *N* = 39	The MMSE had extremely poor sensitivity. While the MoCA had better sensitivity, the study demonstrated that both the MoCA and the MMSE did not have an optimal cut-off score that was sufficiently sensitive and specific.	Selection bias may exist as subjects were not randomly selected.
Freitas, Simões, Alves, Vicente, & Santana (2012)	To validate the MoCA, as well as its short form, for screening vascular dementia (VaD) patients.	Correlational study AOTA level: IV Pyramid level: D2	MoCA full version MoCA short version MMSE	*MoCA full version* (cut-off score 17) AUC = .950, 95% IC = .868-.988 *MoCA short version* (cut-off score of 8) AUC = .936, 95% IC = .849-.981 *MMSE* (cut-off score of 26) AUC = .860, 95% IC = .754-.932	*Population/setting:* patients were recruited from the dementia clinic at a university hospital. *Diagnosis:* *n* = 34 patients with vascular dementia *n* = 34 patients with Alzheimer's disease *n* = 34 healthy controls *N* = 102	The MoCA is a psychometrically valid and reliable tool for cognitive screening in VaD patients, showing excellent discriminant validity and diagnostic accuracy. The results of the MoCA for sensitivity, specificity, positive and negative predictive values, and classification accuracy were superior compared to the MMSE.	The study was conducted in Portugal and therefore may not be generalizable or easily compared to other studies as the Portuguese population has a lower education level in comparison with the MoCA's original study population.

Author(s), Year	Study Objectives	Study Design/ Level of Evidence	Assessments or Screens Being Compared	Psychometrics	Population/ Setting	Summary of Results	Limitations
Hsu, Fan, Huang, Wang, Chen, Chiu, & Bai (2015)	To compare the predictive ability of the MMSE and the MoCA to diagnose dementia in a community based study.	Prospective cohort study AOTA level: IV Pyramid level: D2	MoCA MMSE	*MoCA* (cut-off score of 28.5) Sensitivity: 78% Specificity: 94% *MMSE* (cut-off score of 23.5) Sensitivity: 38% Specificity: 92%	*Population/setting:* residents of a community neighboring a teaching hospital, age 60 years or older. *N* = 276	The MoCA has a higher predictive ability than the MMSE for diagnosing dementia in a community based sample with a broader range of education level.	This is a community based study and so may not be generalizable to the SNF setting. This study was conducted in Taiwan and may not be generalizable to other regions or populations.
Larner (2012)	To determine the clinical utility of the MoCA as a screening tool for cognitive impairment for patients referred to a memory clinic - alone and in combination with the MMSE.	Prospective study AOTA level: IV Pyramid level: D2	MoCA MMSE	*MoCA* (cut-off score of 26) Sensitivity: 97% Specificity: 60% *MMSE* (cut-off score of 26) Sensitivity: 65% Specificity: 89	*Population/setting:* patients referred to a memory care clinic between the ages of 20 and 87 (*M* = 61). *Diagnoses:* 36% with dementia diagnosis 19% with MCI diagnosis 57% with no MCI *N* = 150	The MoCA shows greater sensitivity for the diagnosis of MCI when both the MoCA and MMSE use the standard cut-off score of 26. The MoCA should be administered to patients with cognitive complaints, as the MMSE is more likely to produce a normal score.	The study was conducted using clients who had been referred to a memory clinic; therefore the comparison group has some underlying cognitive concern. Results may not be generalizable to a skilled nursing facility.

Author(s), Year	Study Objectives	Study Design/ Level of Evidence	Assessments or Screens Being Compared	Psychometrics	Population/ Setting	Summary of Results	Limitations
Dong, Lee, Basri, Collinson, Merchant, Venketasu-bramani & Chen (2012)	To examine the discriminant validity of the MoCA and MMSE in detecting patients at high risk for dementia based on the presence of single domain (sd) versus multi domain (md) MCI.	Prospective study AOTA level: IV Pyramid level: D2	MoCA MMSE	*MoCA* (cut-off score of 19/20) Sensitivity: 83% Specificity: 86% *MMSE* (cut-off score of 23/24) Sensitivity: 72% Specificity: 83%	*Population/setting:* patients referred to a memory clinic. Mean age = 72.7 *Diagnoses:* 59.1% with dementia diagnosis 26.5% with MCI diagnosis 14.3% with no MCI *N* = 230	The MoCA is superior to the MMSE in detecting patients at higher risk of dementia based on findings of md- versus sd- MCI as it shows greater sensitivity and specificity when optimal cut-off scores are applied.	This study was conducted using patients from a memory clinic in Singapore – results may not be generalizable to a SNF setting in the US. Sensitivity and specificity change when the standardized cut-off scores are used as opposed to the optimal cut-off scores.
Smith, Gildeh, & Holmes (2007)	To validate the MoCA in a memory clinic for detection of MCI and dementia with comparison to the MMSE.	Prospective study AOTA level: IV Pyramid level: D2	MoCA MMSE	*MoCA* (cut-off score of 26) Sensitivity: 83% Specificity: 50% *MMSE* (cut-off score of 26) Sensitivity: 17% Specificity: 100%	*Population:* patients referred to memory clinic. Mean age = 73.6 *Diagnoses:* 48% with dementia diagnosis 34% with MCI diagnosis 18% with no MCI *N* = 67	In patients with a previous MCI diagnosis, the MoCA is a helpful tool for identifying those at risk for developing dementia 6 months post-testing. The MoCA is useful as a brief screening tool; however, researchers conclude that the MoCA has no advantage in detecting MCI over the MMSE.	Comparison group had a high proportion of psychiatric illness which may have impacted results. Memory clinic setting limits generalizability to SNF. Small sample size places additional limits on external validity.

Author(s), Year	**Study Objectives**	**Study Design/ Level of Evidence**	**Assessments or Screens Being Compared**	**Psychometrics**	**Population/ Setting**	**Summary of Results**	**Limitations**
Roalf, Moberg, Xie, Wolk, Moelter, & Arnold (2013)	To compare the validity and clinical utility of the MoCA and MMSE as tools for diagnosing dementia and MCI, as compared to a full neuro-psychological battery.	Correlational study AOTA level: IV Pyramid level: D2	MoCA MMSE	**Healthy control vs. dementia** *MoCA* (cut-off score of 23) Sensitivity: 94% Specificity: 96% *MMSE* (cut-off score of 28) Sensitivity: 96% Specificity: 97% **Healthy control vs. MCI** *MoCA* (cut-off score of 25) Sensitivity: 84% Specificity: 79% *MMSE* (cut-off score of 29) Sensitivity: 82% Specificity: 73% **MCI vs. dementia** *MoCA* (cut-off score of 19) Sensitivity: 77% Specificity: 80% *MMSE* (cut-off score of 25) Sensitivity: 77% Specificity: 83%	*Population/setting:* patients referred to a memory clinic/AD center. *Diagnoses:* 55% with dementia diagnosis 21% with MCI diagnosis 24% with no MCI *N* = 587	Findings indicate that both the MoCA and MMSE can be used as relatively accurate tools for detecting dementia and MCI. Researchers conclude that the MoCA has greater classification accuracy (sensitivity) than the MMSE.	Use of optimal cut-off scores may not reflect cut-off scores used in clinical practice. Researchers did not account for cognitive co-morbidities.

Author(s), Year	Study Objectives	Study Design/ Level of Evidence	Assessments or Screens Being Compared	Psychometrics	Population/ Setting	Summary of Results	Limitations
Stewart, O'Riley, Edelstein, & Gould (2012)	To examine current literature related to the MOCA, SLUMS and MMSE and compare performance on these measures across a sample of participants.	Within subject correlational study AOTA level: IV Pyramid Level: D2	MoCA MMSE SLUMS	MMSE positively correlated with: MoCA: r = 0.90 SLUMS: r = 0.83 MMSE cut-off score of 24 MoCA cut-off score of 26 SLUMS cut-off score to detect dementia: 19 for less than high school education, 20 for high school education or greater	*Population:* patients with cognitive impairments, residents of LTC facility, 48-89 yo with 0-15 years of formal education. *Setting:* rural, licensed, Medicare-certified long-term care facility. *N* = 40	All three tests are equipped to identify moderate to severe cognitive impairment. MMSE is less able to identify MCI than the MoCA and SLUMS. MoCA and SLUMS assess different aspects of cognition not addressed in MMSE and are appropriate screening tools to use in place of the MMSE.	All participants had cognitive impairment, no research was done on a normative population, small sample size and limited ethnic and racial diversity in the population studied. There were a small number of women in the sample and diagnoses were limited to dementia or psychiatric disorders.

Author(s), Year	**Study Objectives**	**Study Design/ Level of Evidence**	**Assessments or Screens Being Compared**	**Psychometrics**	**Population/ Setting**	**Summary of Results**	**Limitations**
Tariq, Tumosa, Chibnall, Perry, & Morley (2006)	To compare the SLUMS and the MMSE for detecting dementia and mild neurocognitive disorder (MNCD) in patients (pts) with less than high school education (<HS) and patients with high school education or greater (>HS).	Correlational study AOTA level: IV Pyramid level: D2	SLUMS (cut-off scores from 15 - 29.5 were analyzed and optimal cut off scores were identified) MMSE (cut-off scores from 21 - 29.5 were analyzed and optimal cut off scores were identified)	*SLUMS for MNCD in pts <HS* (cut-off score of 23.5) Sensitivity: 92% Specificity: 81% *MMSE for MNCD in pts <HS* (cut-off score of 25.5) Sensitivity: 60% Specificity: 65% *SLUMS for MNCD in pts >HS* (cut-off score of 25.5) Sensitivity: 95% Specificity: 76% *MMSE for MNCD in pts >HS* (cut-off score of 29.5) Sensitivity: 75% Specificity: 48% *SLUMS for dementia in pts <HS* (cut-off score of 19.5) Sensitivity: 100% Specificity: 98% *MMSE for dementia in pts <HS* (cut-off score of 26.5) Sensitivity: 81% Specificity: 87% *SLUMS for dementia in pts >HS* (cut-off score of 21.5) Sensitivity: 98% Specificity:100% *MMSE for dementia in pts >HS* (cut-off score of 27.5) Sensitivity: 89% Specificity: 86%	*Population/setting:* patients at the VA Geriatric Research, Education, and Clinical Center. Mean age = 75.3 *N* = 702	The SLUMS and MMSE have comparable sensitivities and specificities in detecting dementia. The SLUMS is better at detecting MNCD, which the MMSE failed to detect.	The data were collected from primarily white, male patients at a VA medical center which limits generalizability. There is also limitation in the methodology in that the same clinicians who administered the SLUMS and MMSE made the classifications of dementia, MNCD, and normal cognitive functioning.

CAT Table 4: Systematic Reviews

Author, Year	Study Objectives	Study Design/Level of Evidence	Number of Papers Included, Inclusion and Exclusion Criteria	Outcome Measures	Summary of Results	Study Limitations
Ismail, Rajji, & Shulman (2009)	To review the recent literature on cognitive screening with a focus on brief cognitive screening methods in primary care and geriatric services.	Systematic Review AOTA level: I Pyramid Level: D1	*Papers included: 679* The Medline search engine was used with three keyword search terms. Reference lists of retrieved articles were reviewed for relevant contributing articles. *Inclusion criteria:* articles published in English since 1998, articles focusing on attitudes toward cognitive screening, current screening practices, promising new instruments, and recent updates on established instruments. Instruments recommended from previous reviews of cognitive screening and those identified in surveys as most frequently used in primary care and geriatric settings were emphasized in this review.	• Mini-Mental State Examination (MMSE) • Standardized MMSE (SMMSE) • Clock Drawing Test (CDT) Mini-Cog • Memory Impairment Screen (MIS) • General Practitioner Assessment of Cognition GPCOG) • Abbreviated Mental Test (AMT) • Addenbrooke's Cognitive Examination (ACE) • The Montreal Cognitive Assessment (MoCA) • Rowland Universal Dementia Assessment Scale (RUDAS)	Despite significant limitations, the MMSE is the most frequently used cognitive screening tool. The best value of the MMSE is in ruling out dementia. The Mini-Cog, MIS, and the GPCOG have been recognized for utility in primary care. The MoCA and the RUDAS are gaining credibility due to improvements in sensitivity, addressing executive functioning, and decreasing susceptibility to cultural and educational bias.	The article did not contain a methods section to provide details about study design and search method, so search methodology cannot be evaluated or verified.

Author, Year	Study Objectives	Study Design/Level of Evidence	Number of Papers Included, Inclusion and Exclusion Criteria	Outcome Measures	Summary of Results	Study Limitations
van Heugten, Walton, & Hentschel (2015)	To review studies investigating convergent, criterion, and predictive validity of multi-domain cognitive screening tools administered in the first four weeks post stroke.	Systematic review AOTA level: I Pyramid Level: D1	*Papers included: 51* *Inclusion Criteria:* studies focusing on stroke patients who had multi-domain, shorter than 1 hour, cognitive assessments administered during the acute phase (<4 weeks post-stroke) *Exclusion Criteria:* articles that did not fulfill all 5 criteria	• Addenbrooke's Cognitive Exam Revised (ACE-R) • Abbreviated Mental Test-4 &10 (AMT-4 & AMT-10 • Assessment of Stroke and other Brain damage (ASB) • Comprehensive cognitive neurological test in stroke (CoCoNUTS) • Cog-4 • FIMcog • Higher Cortical Function Deficit Tests (HCFD) • LOTCA • Mindstreams ™ computerized cognitive assessment • MMSE • Modified-MMSE (3MS) • MoCA • Repeated Battery for the Assessment of Neuropsychological Status (RBANS) • Screening Instrument for Neuropsychological Impairment in Stroke (SINS) • Short Portable Mental Status Questionnaire (SPMSQ)	***Convergent validity:*** Strong inter-correlation between the LOTCA, MMSE and FIMcog; ¾ parts of the Cog-4 and the Mindstreams ™ global score was correlated with the MoCA; LOTCA was found to have the strongest correlation with functional outcomes (in comparison to FIMcog and MMSE). ***Criterion validity:*** After applying the sensitivity/specificity criterion (80%/60%), only the MMSE, MoCA and HCFD remained out of 15 studies; one study found the MMSE to have adequate sensitivity while others found that changing the cut-off scores did not improve sensitivity or specificity of the MMSE; MoCA fit the criterion in ⅚ studies with the other study yielding a specificity of 90% and a sensitivity of 78%. HCFD fulfilled the criterion, however, only in one study. ***Predictive validity:*** MMSE examined in 13 studies looking at prediction of mood, cognition and functional outcomes, mixed results; MoCA used in 3 studies was found to predict long-term cognitive impairment, results mixed in predicting functional outcomes. **Conclusions:** The MMSE is the most widely used screening tool, but has insufficient criterion validity. The MoCA is the best candidate for a cognitive screen that covers the most affected cognitive domains.	Many of the studies looked at less popular cognitive assessments and were only included in one or two studies - this made it difficult to make a judgment on their utility.

Author, Year	Study Objectives	Study Design/Level of Evidence	Number of Papers Included, Inclusion and Exclusion Criteria	Outcome Measures	Summary of Results	Study Limitations
Koski (2013)	To review recent literature regarding the validity of the MoCA for patients with CVA.	Systematic Review AOTA level: I Pyramid Level: D1	*Papers included: 30* The Medline search engine was used with keyword search terms. Reference lists of retrieved articles were reviewed for relevant contributing articles. *Inclusion criteria:* Articles published since 2005; articles focusing on different types of CVA including TIA, ICA, stroke, silent cerebral infarct and leukoariaosis.	• MoCA	Cut-off score of 26: Sensitivity: 87% Specificity: 63% Cut-off score of 25: Sensitivity: 77% Specificity: 82% Cut-off score of 24: Sensitivity: 88% Specificity: 71% Cut-off score of 23: Sensitivity: 78% Specificity: 77% Results indicate that the MoCA is sensitive to cognitive impairment post CVA. A relationship exists between MoCA scores and the results of neuropsychological assessment. The MoCA may predict future response to therapy.	Extended length of time between MoCA administration and neuropsychological assessment may have influenced findings. Study did not include age and education matched control group for cut-off score findings.

Research Question 2: Cognition and Discharge Disposition

Author(s), Year	Study Objectives	Study Design/ Level of Evidence	Populations/ Diagnoses/ Setting	Cognitive Measures/ Outcome Variables	Summary of Results	Study Limitations
Nguyen, PrvuBettger, Guerrier, Hirsch, Thomas, Pugh & Rhoads III (2015)	To examine which socio-demographic and clinical characteristics are associated with discharge home versus discharge to a SNF after acute IP rehab.	Retrospective cohort study AOTA level: IV Pyramid level: D2	*Population*: Adult patients with stroke RIC code 1 (stroke) admitted over 4 year period (2008-2011), 19-98 yo. *Setting:* Three inpatient acute rehab centers (2 urban, 1 rural) part of the same provider system with the same stroke rehab practice guidelines. *N* = 2,085	*Cognitive Measure:* FIMcog scores *Secondary Variables:* FIMmotor, stroke severity, age of onset, racial background, marital status, insurance	Patients with cognitive deficits (odds ratio = 0.79), dysphagia (OR = 0.83), who are insured through Medicare (OR = 0.69), who are divorced (OR =0.61) or are older (OR = 0.98) are more likely to be discharged from an acute hospital setting to a SNF (as opposed to discharge to home). Cognitive FIM on admission was not associated with discharge disposition.	This study does not provide information regarding the strength of cognitive deficit as a predictive variable for discharge home versus discharge to a SNF.
Rabadi, Rabadi, Edelstein, & Peterson (2008)	To determine whether cognitively impaired stroke patients benefit from admission to an acute rehab unit.	Retrospective correlational study AOTA level: IV Pyramid Level: D2	*Population:* Stroke patients admitted within a 24-month period, 22-96 yo. Sample was divided into 4 groups based on admission MMSE score. *Setting:* Acute stroke rehab unit in a hospital. *n* = 233 cognitively intact (MMSE score ≥ 25) *n* = 139 MCI (MMSE score 21-24) *n* = 165 moderate cognitive impairment (MMSE score 10-20) *n* = 131 severe cognitive impairment (MMSE score ≤ 9) *N* = 668	*Cognitive Measure:* FIMcog score *Secondary Variables:* FIM efficiency, length of stay (LOS) and discharge disposition (home vs. not-home)	The change in FIM total score and FIM efficiency was similar between cognitively intact and cognitively impaired groups. However, the cognitively intact individuals had significantly improved FIMcog scores, shorter LOS and more home discharges. The results suggest that despite severe neurologic impairments and disability, cognitively impaired stroke patients (MMSE scores ≤ 24) can make significant functional gains during rehabilitation and many can be discharged home.	Pre-morbid cognitive ability not assessed. Other factors could limit home discharge (having a caregiver, family support, etc.)Also, improvement in FIMcog may be associated with improved depression.

Author(s), Year	Study Objectives	Study Design/ Level of Evidence	Populations/ Diagnoses/ Setting	Cognitive Measures/ Outcome Variables	Summary of Results	Study Limitations
Reistetter, Graham, Deutsch, Granger, Markello, & Ottenbacher (2010)	To evaluate the ability of patient functional status to differentiate between community and institutional discharges after rehabilitation for stroke.	Retrospective, cross sectional AOTA level: IV Pyramid Level: D2	*Population:* Adults who had their first stroke between 2006-2007, who were living in the community prior to onset, > 18 yo. *Setting:* Inpatient rehab centers in the US; data compiled in UDSMR database. *N* = 157,066	*Cognitive Measure:* FIMcog score *Secondary Variable:* Discharge setting	71% of patients were discharged to the community. FIM total score was equally correlated with the discharge setting as were the FIMmotor and the FIMcog.	FIMcog does not have sensitivity or specificity and thus is not predictive.
Zwecker, Levenkrohn, Fleisig, Zeilig, Ohry, & Adunsky (2002)	To determine which of three cognitive screens (MMSE, LOTCA and the FIMcog) best predicts a stroke patient's functional outcome at discharge.	Retrospective cohort study AOTA level: IV Pyramid Level: D2	*Population:* 1 week post-stroke patients, 47-87 yo. *Setting:* Geriatric neurologic rehabilitation department. *N* = 66	*Cognitive Measures:* Loewenstein Occupational Therapy Cognitive Assessment (LOTCA), MMSE, and the FIMcog *Secondary Variables:* FIMmotor and the Montebello Rehabilitation Factor Score (MRFS)	Tools were equally effective in predicting a patient's functional outcome. Correlations between scores on each screen at admission and functional outcomes are as follows: LOTCA: r = .34, p <.01 FIMcog: r = .34, p <.01 MMSE: r = .30, p <.05 No test was significantly better at predicting functional outcomes. The authors suggest that the MMSE is more useful in the initial assessment of stroke patients due to the simplicity of administration, whereas the LOTCA is time-consuming to administer and the FIM cognitive subscale is not convenient for initial assessment.	This study does not compare the use of other established cognitive screens which may have better validity than the MMSE in predicting functional outcome at discharge.

Author(s), Year	Study Objectives	Study Design/ Level of Evidence	Populations/ Diagnoses/ Setting	Cognitive Measures/ Outcome Variables	Summary of Results	Study Limitations
Heruti, Lusky, Dankner, Ring, Dolgopiat, Barell, Levenkrohn, Adunsky (2002)	To assess whether, and to what extent, cognitive outcomes influence overall functional outcomes among stroke patients.	Prospective cohort study AOTA level: IV Pyramid level: D2	*Population:* Stroke patients admitted to the geriatric rehabilitation unit of a large, urban, academic hospital in Israel over a three year period (1996-1998), > 60 yo. *Setting:* Geriatric rehabilitation unit. *N* = 315	*Cognitive measures:* MMSE *Secondary Variables:* FIMstatus, Montebello Rehabilitation Factor Score (MRFS)	A significant correlation exists between cognitive impairment and limits in functional gains/ poor rehabilitation outcomes. Better rehabilitation outcomes were observed in patients with higher admission cognitive status, (odds ratio 2.0; 95% confidence interval, 1.5–2.5). These results support the use of the MMSE as a cognitive screen on admission.	This study did not compare the MMSE against any other cognitive screen used by the SNF (MoCA, SLUMS, ACLS). Since this study was conducted in Israel, it may not be generalizable to the United States.
van der Zwaluw, Valentijn, Nieuwenhuis-Mark, Rasquin, & Heugten (2011)	To determine the feasibility of cognitive screening in the acute phase post-stroke. To determine whether cognitive screening data predicts discharge destination and to determine if cognitive tests differ in predictive value.	Correlational cohort study AOTA level: IV Pyramid Level: D2	*Populations:* Patients with first stroke between 11/2004-2/2007 with MMSE > 15, 44-91 yo, excluding patients with aphasia, pre-stroke mental health comorbidity or foreign language speakers. *Setting:* Stroke unit of a hospital in the Netherlands. *N = 188*	*Cognitive Measures:* MMSE, Cognitive Screening Test (CST), Clock Drawing Test *Secondary Variables:* Barthel Index (BI) scores	Patients discharged to dependent situations were those who had significantly worse scores on all three cognitive tests. The CST with the BI was the most predictive of discharge as the BI predicted discharge home with 47% variance. The MMSE was not significantly predictive of discharge destination.	Other factors than cognitive and physical functioning may dictate whether the patient is discharged home or to an institution; other screens that assess more cognitive domains such as executive functioning, abstract reasoning, speed of information processing may add to the effectiveness of the cognitive profile.

Author(s), Year	Study Objectives	Study Design/ Level of Evidence	Populations/ Diagnoses/ Setting	Cognitive Measures/ Outcome Variables	Summary of Results	Study Limitations
Pitman (2010)	To determine the association between scores on the LACLS and the MMSE among patients in a SNF, and if they have predictive validity for discharge disposition.	Retrospective correlational study AOTA level: IV Pyramid level: D2	*Population:* Residents of one SNF over a 32.5 month period (2009-2012) who had MMSE & LACLS scores within 1 week of admission administered by OTR/COTA/OTS, 65-100 yo. *Setting:* WA skilled nursing facility. *N* = 122	*Cognitive Measures:* MMSE scores and the Large Allen Cognitive Level Screen (LACLS) scores *Secondary Variables:* discharge setting, age, sex, length of stay, primary diagnosis	No correlations were found between MMSE and LACLS and discharge disposition across diagnoses. The LACLS was a statistically significant predictor of discharge disposition among orthopedic patients; although this should not be used as the sole indicator of discharge disposition.	Primary diagnoses of this SNF may not be representative. Secondary diagnoses may have an impact on cognitive status. Age could be a confounding factor; at this SNF younger patients were more often admitted for orthopedic issues and the younger population had higher scores on cognitive assessments.
Geubbels, Nusselein, van Heugten, Valentijn & Rasquin (2015)	To assess the predictive value of MoCA scores in determining discharge placements.	Correlational study AOTA level: IV Pyramid level: D2	*Population:* First-ever stroke victims, one week post-stroke, age > 40 yo. *Setting:* hospital stroke unit. *N* = 221	*Cognitive Measure:* MoCA Scores *Secondary variables:* age, Barthel Index Scores	MoCA scores and discharge destination: $r = 0.37$ The results indicate that the MoCA alone does not predict whether an individual gets discharged to a dependent or independent living situation. Age and level of disability are the more predictive factors.	Cannot be fully generalized to mean that cognition does not predict discharge in that only one cognitive measure was used.

Author(s), Year	Study Objectives	Study Design/ Level of Evidence	Populations/ Diagnoses/ Setting	Cognitive Measures/ Outcome Variables	Summary of Results	Study Limitations
Joray, Wietlisbach, & Büla (2004)	To examine the relationship of cognitive impairment at hospital admission, to 6-month outcome (hospital readmission, nursing home admission, and death).	Correlational study AOTA level: IV Pyramid level: D2	*Population/setting:* medical inpatients age 75 or older admitted to an academic medical center. *N* = 401	*Cognitive Measure:* MMSE (cognitive impairment defined as a score <24)	Cognitive impairment was present in 129 patients, but was only detected in 48 by the MMSE. Cognitive impairment was associated with death and nursing home admission. In this population, cognitive impairment was frequent, rarely detected, and associated with nursing home admission during follow-up. Acute hospitalizations present an opportunity to better detect cognitive impairment and prevent adverse outcomes.	Further cognitive assessments were not performed to determine the exact nature of the impairments. Only a single evaluation of cognitive performance was conducted so patients may have been misclassified if they had cognitive changes during their hospital stay.
Sands, Yaffe, Covinsky, Chren, Counsell, Palmer, & Landefeld (2013)	To determine whether performance on a cognitive screen at the time of admission predicts functional recovery after hospitalization.	Correlational study AOTA level: IV Pyramid level: D2	*Population/setting:* All participants were patients at one of two teaching hospitals, age 70 or older (*M* = 80). *Diagnoses:* 28% with dementia diagnosis 14% with MCI diagnosis 58% no diagnosis *N* = 2,557	*Cognitive measure:* Short Portable Mental Status Questionnaire (SPMSQ) and chart review for diagnosis of dementia *3 domains of functional interview:* ADL IADL Functional mobility	Patients with greater cognitive impairment were more likely to live in a nursing home for the first time post discharge. 29% of patients with severe cognitive impairment were discharged to a nursing home. 13% of patients with MCI were discharged to a nursing home. 7.5% of patients with little or no cognitive impairment were discharged to a nursing home. Those with greater cognitive impairment had more impaired recovery in the 3 domains questions during the functional interview (ADL, IADL and mobility) at 90 days post discharge.	The SPMSQ is not a screen used by ManorCare. Personal report of functioning may be biased. Cognitive status of respondent may impact accuracy of response.

Summary of Key Findings:

Summary of Experimental Studies

N/A

Summary of Outcome Studies

N/A

Summary of Qualitative Studies

N/A

Summary of Descriptive Studies

Research Question 1:

The sensitivity and specificity of the MMSE, MoCA and SLUMS were examined based on their ability to accurately detect cognitive impairment in patients with varying diagnoses. The ACLS is not included in our summary of key findings because research regarding the psychometric properties when used with populations seen at ManorCare is lacking (Pitman, 2010). Most of the studies included in the CAT examine the MoCA and the MMSE for their ability to detect cognitive impairment in patients with chronic stroke or memory impairment; however, a few studies examine the tools' ability to detect cognitive impairment in patients with diabetes, orthopedic injuries, neurological conditions, and cardiac conditions.

MoCA vs. MMSE for detecting cognitive impairment in CVA patients

When utilized within a chronic stroke population, the MoCA demonstrated greater sensitivity with regards to detection of cognitive impairment than the MMSE in two of the reviewed studies (Cumming et al., 2013; Toglia et al., 2011). The enhanced sensitivity of the MoCA to detect MCI was further supported by a single study that compared the MoCA's ability to detect MCI in stroke patients to the results of a full neuropsychological evaluation (Chan et al., 2014). Whereas the MoCA consistently demonstrated greater sensitivity in identifying cognitive impairment when administered to stroke patients, the MMSE demonstrated greater specificity across studies when administered to stroke patients (Chan et al., 2014; Cumming et al., 2013; Toglia et al., 2011). In a systematic review of cognitive screens used post-stroke, Koski (2013) noted that there is a consensus that the MoCA covers domains of cognition not covered by the MMSE. Although the MMSE is the most-widely used cognitive screening tool, one article found that the MMSE was no better than chance at identifying cognitive impairment in a study of post-stroke patients (Nys et al., 2005).

MoCA vs. MMSE vs. SLUMS for detecting cognitive impairment in a memory impaired population

When administered to patients with memory impairment to detect MCI or dementia, the MoCA demonstrated superior psychometric properties to the MMSE in five of seven reviewed studies (Dong et al., 2012; Frietas et al., 2012; Hsu et al., 2015; Larner, 2012; Olson et al., 2012). Generally, the MoCA demonstrated greater sensitivity for detecting MCI or dementia while the MMSE demonstrated greater specificity (Dong et al., 2012; Larner, 2012; Olson et al., 2012). However, two studies found the MoCA to have both better sensitivity and specificity than the MMSE (Frietas et al., 2012; Hsu et al., 2015). In those studies that did not find evidence to support the use of the MoCA over the MMSE, researchers concluded that the two screens demonstrated comparable efficacy (Roalf et al., 2013; Smith, Gildeh & Holmes, 2007). Not one study found the MMSE to be a more efficacious clinical tool.

In addition to the previously described studies which compared the psychometric properties of the MMSE and the MoCA, three additional studies were reviewed. When the psychometric properties of the MoCA were examined in isolation, the MoCA was found to be a valid screening tool for cognitive impairment, but again has a greater chance of classifying someone without cognitive impairment as having MCI due to the high level of sensitivity, but decreased specificity (Goldstein et al., 2014). When the psychometric properties

of the MMSE were examined in isolation, the MMSE lacked the sensitivity needed to accurately determine MCI when present. In fact, of those participants who were determined to have no cognitive impairment by the MMSE, full neuropsychological testing revealed cognitive impairment in at least half of those participants (Lacey, Kaemmerer, & Czipri, 2015). Finally, when the psychometric properties of the SLUMS and the MMSE were compared, the screens demonstrated comparable sensitivity and specificity for the detection of dementia. The SLUMS, however, demonstrated greater sensitivity for detecting MCI, which the MMSE failed to detect (Tariq et al., 2006).

Across studies, results indicate that a high cut-off score improves the sensitivity of the MMSE (Lacy, Kaemmerer, & Czipri, 2015; Tariq et al., 2006; Roalf et al. 2013). When applying the standard cut-off score of 26, the MMSE demonstrated sensitivity levels between 17 and 81 percent (Olson et al., 2011; Tariq et al., 2006; Larner, 2012; Smith, Gildeh & Holmes, 2007). When applying the standard cut-off score of 26, the MoCA demonstrated sensitivity levels between 83 and 100 percent (Goldstein et al., 2014; Larner, 2012; Smith, Gildeh & Holmes, 2007; Koski, 2013). As a general trend, the MoCA demonstrates greater sensitivity and lesser specificity as the cut-off score is increased.

MoCA vs. MMSE vs. SLUMS for detecting cognitive impairment in an Elderly Population with Mixed Diagnoses

When administered to elderly persons with mixed diagnoses, the MMSE demonstrated good psychometric properties in two studies focusing specifically on the MMSE (Bassuk & Murphy, 2003; Paquay et al., 2007). However, when studies compared the MMSE to the MoCA, the MoCA demonstrated superior sensitivity in detecting cognitive impairment across studies (Hawkins et al, 2014; Ismail, Rajji & Shulman, 2009; Nasreddine et al., 2005; Sweet et al., 2011). In a single study that compared the MoCA, MMSE and SLUMS in a mixed-diagnosis population, all three were able to identify moderate to severe cognitive impairment. The MMSE demonstrated lesser ability to identify MCI than the MoCA and SLUMS (Stewart et al., 2007). Finally, in a systematic review of thirteen studies, the MoCA was found to predict long-term cognitive impairment more effectively than the MMSE. Results regarding the sensitivity and specificity of the MMSE across various diagnoses are inconclusive (van Heugten, et al., 2015). These findings support the use of all three cognitive screens, however, indicate that the MoCA may have better sensitivity and therefore be the best tool for identifying MCI. The SLUMS also appears to be a valid tool in detecting cognitive impairment in a mild cognitively impaired population, however, research regarding its psychometric properties is limited.

Research Question 2:

Ten studies examined the effects of a patient's cognitive function on their discharge setting using scores from the MoCA, MMSE, Loewenstein Occupational Therapy Cognitive Assessment (LOTCA), the Short Portable Mental Status Questionnaire (SPMSQ) and the cognitive subtest of the Functional Independence Measure (FIM) to arrive at their findings. Of the ten studies reviewed, eight studies found that individuals with intact cognition are more likely to be discharged back into the community than individuals with cognitive impairments (Heruti et al., 2002; Joray, Wietlisbach & Bula, 2004; Nguyen et al., 2015; Rabadi et al., 2008; Reistetter et al., 2010; Sands et al., 2013; van der Zwaluw et al., 2011; Zwecker et al., 2002). Individuals with cognitive impairment were more likely to be moved into a nursing home or otherwise institutionalized. Two studies found no relationship between cognitive screening performance and discharge location (Geubbels et al., 2015; Pitman, 2010). Rather, age and diagnosis were the greatest indicators of discharge setting.

It is important to note that the reviewed studies used varying cut-off scores when defining what constitutes cognitive impairment and that cognitive impairment is not the only factor which predicts discharge setting. Although normal cognition is correlated with community discharge, cognition should not be the only factor taken into account when predicting or recommending a patient's discharge location.

Implications for Consumers:

Patients at ManorCare of Tacoma

This information is important to the patients at ManorCare of Tacoma and their families. A patient's cognitive function is tested by a therapist when they come to ManorCare. Their score on this test is used to decide where it is recommended that they go when they leave the facility, either back home or to a long term care facility. In this way, the results of a cognitive test influence a patient's plan of care. Patients and their caregivers should know that the MMSE, MoCA, and SLUMS have all been shown to be useful, but they are not perfect. Generally in this situation, the MoCA is more likely to indicate cognitive impairment when someone does not actually have cognition impairment. On the other hand, the MMSE is more likely to miss diagnosing cognitive impairment when present. Little information is available regarding the SLUMS or ACLS. Clients should know that there is a chance that the test did not provide accurate information. Families or caregivers should contact a medical provider if they think the patient may have cognitive problems that were not detected.

Educators of OT Practice

This information has important implications for educators as well. Because the MoCA demonstrated the greatest clinical utility in identifying true cognitive impairment across studies, professors might consider emphasizing the MoCA when teaching occupational therapy students about cognitive assessments. The MMSE should also be introduced, as it is widely used in practice and research, however, students should be educated regarding its limitations. It is also important that educators monitor current research in the area of cognitive screening, specifically additional studies of the SLUMS and ACLS for use with populations seen in skilled nursing. This will prepare students to best utilize evidence-based assessments in their future practice.

Implications for Practitioners:

The information gathered is directly related to occupational therapy practice in a skilled nursing setting. Using this information, occupational therapy practitioners can select the cognitive assessment that will most accurately reflect their client's cognitive function based on their diagnosis. Our findings indicate that the MoCA has better sensitivity and the MMSE has better specificity at the cut-off score of 26. This finding is consistent among a range of cut-off scores (19-29). In other words, the MoCA has a better true positive rate and is better at indicating a MCI when an impairment is, in fact, present. The MMSE has a better true negative rate and will indicate a lack of cognitive impairment when an impairment truly is not present. Clinically, the MMSE is the most useful for ruling out a diagnosis of cognitive impairment. However, in the SNF setting, the MoCA is more clinically useful because therapists need to determine if a patient has a cognitive impairment. There were similar findings for other diagnostic populations including: heart failure, diabetes mellitus, and orthopedic injuries. These results have important implications for practitioners. The MoCA will be better at catching all clients with cognitive impairment because of its higher level of sensitivity. The MMSE will be better at ruling out cognitive impairment because of its higher specificity. Depending on the reason for using a cognitive screen (either to identify or to rule out cognitive impairment) a clinician may choose to use one or the other, but should understand the limitations of each.

Research is lacking regarding the psychometric properties of the SLUMS or ACLS for use with diagnoses seen at ManorCare. As such, if a clinician chooses to use one of these screens they should know that psychometric properties have not been well-researched, if at all, for use with these populations. These screens may or may not accurately evaluate a patient's cognitive functioning.

Implications for Researchers:

Further research is needed regarding the psychometric characteristics of the SLUMS and ACLS in populations seen in skilled nursing. Additional studies of these two screens may improve or expand upon the use of evidence-based cognitive screening in a skilled nursing setting. Further research should focus on each screen's ability to predict discharge destination for a broader range of diagnoses. Additional diagnoses may include: orthopedic injuries, diabetes, kidney dysfunction, heart and lung conditions, and/or surgical wounds. Researchers might also look at the relationships between scores and functional skills. Those researchers that are evaluating the psychometric characteristics of cognitive screening tools in memory populations might consider the use of healthy controls that have not been referred to the memory clinic to reduce the potential for cognitive concern within the comparison group. Finally, researchers might consider the relationship between a patient's cognition and their scores on measures of occupational performance as an indicator of discharge setting.

Bottom Line for Occupational Therapy Practice/ Recommendations for Best Practice:

Occupational therapists can use the evidence presented to guide their clinical decision-making when choosing which cognitive screen to use with their patient. The literature indicates that, across diagnoses and settings, the MoCA has better sensitivity, while the MMSE has better specificity when the standard cut-off score (26) is used. In a clinical setting, it is most important to identify a cognitive impairment if it exists because the presence of cognitive impairment has serious implications for a patient's safety, independence and functional outcomes. These are important considerations when determining the most appropriate discharge setting for a patient. Because the MoCA is more sensitive to identifying cognitive impairment, it is the better cognitive screening tool for clinicians to use to inform the discharge planning process.

Although it is the most sensitive, practitioners should be aware of the psychometric limitations of the MoCA. In comparison to other cognitive screening tools, the MoCA has lower specificity. Specificity refers to the percentage of healthy people who are correctly identified as not having MCI. Clinicians should use their observations, caregiver and/or family report, and the results of evidence-based screens when reporting a patient’s cognitive status to the physician. It is also recommended that clinicians follow up with their patients after discharge to ensure that cognitive impairment is not interfering with daily functioning. If cognitive impairment was not identified by a screen, but a patient appears to have cognitive difficulty, he or she should be referred to a psychologist for a full neuropsychological evaluation.

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Involvement Plan

Introduction

Two meetings with our collaborating clinician revealed that our exclusion criteria were too specific. While ManorCare does not admit clients specifically for dementia, it is a common co-morbidity that should have been included in our initial search. During the follow up meeting, we discussed how the knowledge we have collected can best be implemented in practice. Our collaborating clinician suggested an in-service presentation to her rehabilitation team. Additionally, she expressed interest in a resource packet containing assessment materials for the recommended screening tool as indicated by our findings, as she and her therapists have limited time to search for and compile cognitive screen materials.

Our plan for translating evidence-based knowledge into clinical practice involved three phases. In the first phase, we repeated our search of the literature using the search strategy and databases used previously, but with broader selection criteria. Any articles that were previously excluded because they addressed populations with dementia were included. The information from these articles was synthesized and added to our CAT table and implications sections. In the second phase, a resource packet containing the information related to the recommended assessment measure was developed. After creating the resource packet, we developed an in-service presentation to the rehabilitation team at ManorCare. In the third phase, we evaluated the outcomes of the first two phases. We followed up with our collaborating clinician and identified potential ideas for continued contact between ManorCare and students at the University of Puget Sound to conduct additional research related to this topic.

Contextual factors impacting knowledge translation

Knowledge translation refers to the process of "applying ideas, insights and discoveries, generated through basic scientific inquiring to the treatment or prevention of human disease and improvement of individual and social welfare" (Palinkas & Soydan, 2012, p. 9). To translate the findings of our scientific inquiring, we used the RE-AIM model, developed by Russell E. Glasgow. This model facilitates understanding and monitoring of the success of knowledge translation in a clinical setting. This is achieved by considering who the knowledge should reach, if dissemination has been effective, how to develop organizational support for a change, how to ensure information is delivered properly and how to incorporate the information so that changes are maintained over the long-term (Palinkas & Soydan, 2012, p. 65-67).

Organizational factors: Effective knowledge translation can be affected by organizational factors including "organizational structure, culture and climate, work attitudes, leadership, social influences, and readiness or support for innovation" (Palinkas & Soydan, 2012, p. 105). Within the context of ManorCare, the knowledge translation process could be affected by a physician's request for certain cognitive screen scores. Our collaborating clinician indicated that several referring doctors base their discharge setting recommendation on the client's MMSE score and therefore want that information from the therapist. If the occupational therapists begin to use a specific screen exclusively, some doctors may still request the MMSE scores to guide their decision-making. This might inhibit the therapist motivation for administering the new screen as it may require providing an explanation for the physician, which could slow the process of

operations. It might be more time-saving for occupational therapists to administer the MMSE rather than try to persuade a physician to accept another screen. However, discussion among therapists regarding physician education about the limitations of the MMSE for detecting cognitive impairment indicated that there is willingness to address organizational barriers to change.

Departmental factors: The knowledge translation process could be affected by the norms that have been established within the rehabilitation department. At ManorCare, speech language pathologists have typically been responsible for administering the MoCA, whereas occupational therapists more commonly administer the ACLS. While there is no formal designation for specific professions to administer specific screens, there may be resistance to change in the standard protocols (Hoffmann, Bennett & Del Mar, 2013, p. 377). However, this is something that the Director of Rehabilitation is working to address and has indicated willingness to provide support to the therapists as they adjust to changes in protocol.

Individual factors: The knowledge translation process could be affected by individual therapists and clients. Currently, therapists decide which cognitive screen to use with their clients based on a number of factors. These factors include the therapist's knowledge of cognitive screens, familiarity and comfort administering screens, and access to the screens and associated materials. Therapists may be resistant to using unfamiliar screens (Law & MacDermid, 2014, p. 199). That said, therapists now have access to all of the MoCA screening materials and have been given a basic introduction to its use. Individual client factors affecting the knowledge translation process include medical history, reason for admission to ManorCare, and physical/cognitive status. These individual factors may facilitate or inhibit the knowledge translation process. Depending on client factors, such as physical impairment, cognitive screens may be more or less appropriate for some patients. However, the resource packet provided to the therapists provides information regarding how to administer and score the MoCA if a patient is unable to complete test items due to physical limitations. Additionally, therapists have received information about the MoCA-Blind which can be used to screen patients with visual impairment.

Implementation Phases and Target Dates

Phase 1

Phase 1 involved updating our CAT to add the diagnosis of dementia. This diagnosis is of interest to our clinician because roughly half of the patients admitted to this site present with some form of cognitive impairment. Appraisal of research studies examining populations with dementia added valuable information to the original CAT table and implications sections for clinicians, educators, consumers and researchers. Furthermore, clinical implications are now more directly applicable to ManorCare of Tacoma. This addendum to the CAT included:

1. Updates to inclusion and exclusion criteria
2. Additional search results table
3. Additional CAT table entries
4. Revisions to the implications for clinicians, educators, consumers and researchers

Phase 2

Phase 2 involved the development of a resource packet for the cognitive tool that was found to be most effective in detecting mild cognitive impairment. This resource packet included:

1. Cognitive screening tool documents, including all versions for retesting purposes
2. Clinical guidelines including evidence for use of the cognitive screening tool as best practice and instructions and contraindications for use of the screening tool

Following development of the resource packet, the student therapists provided a 30 minute in-service to the rehabilitation team, which covered the following:

1. Summary of CAT
2. Implications for their practice setting
3. Resources and instructions for implementation including resource packet

Phase 3

Phase 3 included a follow up with our collaborating clinician regarding implementation of the designated cognitive screen and evaluation of outcomes.

Anticipated Timeline for Involvement Plan Completion

April 4th	Phase 1: Complete updates to CAT table and implications Phase 2: Begin development of resource packet based on results
April 11th	Phase 2: Complete resource packets, schedule in-service and prepare presentation materials
April 18th	Phase 2: Complete in-service
April 25th	Phase 3: Follow up with clinician and discuss ideas for continued research

Plan to monitor and evaluate the outcomes

To evaluate the outcomes of our implementation plan, we developed pre- and post- in-service surveys and administered them to the rehabilitation team at ManorCare. Following the in-service presentation we received feedback from the Director of Rehabilitation and discussed ideas for continued research and contact between ManorCare and occupational therapy students at the University of Puget Sound. In future collaborations, it is recommended that students follow up with our collaborating clinician and ascertain if any changes to departmental policy or protocol were made and document barriers and supports to new policy implementation. This collaboration could also further explore the relationship between cognitive scores and discharge location by creating a plan for tracking scores and discharge locations and reviewing and analyzing this information.

Knowledge Translation Activities and Products

To translate the knowledge that we gathered regarding best cognitive screening practices in a skilled nursing setting, we provided an in-service presentation to members of the rehabilitation team at ManorCare of Tacoma. In preparing for our in-service, we considered our audience including which professions would be attending, the allotted time available, the organization, individual factors affecting knowledge translation, and what information from the CAT would be most relevant to these clinicians.

Based on the results of our CAT, specifically the implications of the results for practitioners, the primary objectives of our in-service presentation were as follows: to report the findings of the CAT, including the MoCA's superior sensitivity to the MMSE; explain why a change in policy (i.e. using the MoCA instead of the MMSE) may be beneficial to their practice; and provide information on the administration and scoring of the MoCA.

In the 30 minutes allotted for our in-service, we discussed the following: a brief introduction to the project including the original clinical question, the process of creating the CAT, the results of the CAT, an introduction to the MoCA, an explanation of the various components of the MoCA, directions on administration and scoring, a question and answer portion, and a review of the accompanying resource packet. To supplement the verbal presentation, a printed MoCA resource packet was provided to the clinicians. The resource packet included an introduction to the MoCA, the administration instructions and scoring forms for all English versions of the test (including alternate versions for retesting, the basic form, and the blind form), and a frequently asked questions section (see Appendix A for a complete copy of the resource packet.) Information regarding the MoCA, including test forms, normative data, and references, can be found on the MoCA website which is easily accessible and free to

clinicians. The resource packet was intended to supplement the website, in that clinicians could use it as a quick reference guide or as a master copy to generate forms for clinic use.

The presentation proceeded as intended - clinicians asked relevant questions and provided positive feedback. The only unforeseen difficulty was covering the above information within the allotted 30 minutes; the end of the presentation was slightly rushed, but all information was presented within the available time. Pre- and post- in-service surveys were created and administered to determine the outcomes of our presentation (see Appendix B for pre- and post- surveys). The initial survey was administered after the results of the CAT were presented, but before information regarding the MoCA was delivered. The post in-service survey was administered at the conclusion of the presentation. Fifteen people were in attendance including the Director of Rehabilitation at ManorCare, the Regional Rehabilitation Director, and 13 clinicians including occupational therapists, occupational therapy assistants, and speech language pathologists. The surveys were administered to the 13 clinicians, and 12 surveys were returned (92% response rate). The results of the surveys and outcomes of the knowledge translation process are examined in the following section.

Knowledge Translation Interim Dates of Completion

Task	Anticipated Completion Date	Actual Completion Date	Notes
Phase 1: Complete updates to CAT table and implications. Phase 2: Begin development of resource packet based on results.	April 4th	April 6th	
Phase 2: Complete resource packets, schedule in-service and prepare presentation materials.	April 11th	April 17th	
Phase 2: Complete in-service.	April 18th	April 21st	This was our collaborating clinician's preferred date for the in-service because the Regional Rehabilitation Director was conducting a site visit at this time and wanted to attend the presentation.
Phase 3: Follow up with clinician and create plan for continued research.	April 25th	April 21st	A plan for continued research was discussed with our clinician at a meeting on February 18th. Following the in-service we spoke with our collaborating clinician about the presentation, providing the updated CAT results, the upcoming poster presentation, and reaffirmed the plan for continued research.

Knowledge Translation Outcomes and Effectiveness

To monitor the outcomes and effectiveness of the knowledge translation process, pre- and post- in-service surveys were completed by attendees. The initial survey consisted of five questions (see Appendix B). Questions were used to gain information about the attendees' profession (occupational therapist, occupational therapy assistant, speech language pathologist), how often they administer the MoCA, if they have had previous training on the MoCA, their confidence with administering the MoCA, and the cognitive screen they use most often and why.

The post- in-service survey consisted of four questions (see Appendix B). Again, attendees were asked to indicate their profession and their confidence with administering the MoCA. This information was used to determine if the in-service had any effect on attendees' comfort level with administering the MoCA. Attendees were also asked if they thought that they would use the MoCA more often given the information presented and why. In addition to the pre- and post- in-service surveys, the researchers made notes of discussion amongst the rehabilitation team during the in-service with regard to possible policy change.

The results of our pre- and post- in-service surveys suggest that the in-service presentation and informational packet were effective knowledge translation tools. This conclusion was further supported by verbal feedback from the Director of Rehabilitation, Regional Rehabilitation Director and the attendees who indicated that the information presented had been useful and informative.

Comparisons of quantitative pre- and post- in-service outcomes data revealed an average .87 point increase in clinician's confidence rating with administering the MoCA on a 10-point Likert scale. The average clinician rating at pre-test was 8.04 and 8.91 at post-test. This change indicates that, on average, clinicians felt more confident administering the MoCA after the in-

service presentation than they had prior. Several clinicians (primarily speech language pathologists) rated their comfort level as a 10 at both pre- and post- testing. A ceiling effect may have therefore limited the effect seen.

Comparison of qualitative pre- and post- in-service outcomes data revealed several themes. When asked to indicate why they think they will use the MoCA more often given the information presented, attendees reported: 1. Feeling more informed regarding the efficacy and superiority of the MoCA over the MMSE, 2. Increased confidence and knowledge of MoCA administration protocols, and 3. New knowledge of modifications to the MoCA for screening visually or physically impaired patients. One attendee said, "I feel more confident after reviewing the administration and now that I know it is more accurate, I will use it more." One hundred percent of in-service attendees responded "yes" to the question, "Do you think you will utilize the MoCA more often given the information presented?" Based on these findings, we conclude that the in-service presentation and informational packet were effective knowledge translation tools; however, a follow-up implementation study would be needed to determine the extent that discussed policy changes are adopted and sustained at ManorCare.

Evaluation of Overall Process of Project

During our first meeting with our collaborating clinician in October 2015, we were introduced to the research she was interested in having conducted at her facility. As the Director of Rehabilitation, she was interested in how cognitive screens relate to client discharge settings, if at all. Her hope was that we could develop a system for conducting chart reviews to track how patient scores on cognitive screens relate to their eventual discharge setting (as discharge decisions are often influenced by those scores). Although this research interested us, it extended beyond the scope of our assigned research project. As such, we explained the purpose of a critically appraised topic and how it could be used to provide her with foundational knowledge

for her area of interest. After we had presented the preliminary findings, she was convinced of the importance of acquiring the background information to frame her general research question.

When writing the proposal, we had to break our collaborating clinician's question into two researchable components - this created an unforeseen additional workload as we needed to create two search strategies, both of which needed to be conducted in all five databases. Additionally, we needed to create two separate CAT table formats - one for each question. Perhaps the greatest difficulty that we encountered in our research did not present itself until after we had presented the preliminary findings to our collaborating clinician. When creating our search strategy, we had decided to exclude articles that examined the utility of cognitive screening tools to identify cognitive impairment in patients with a dementia diagnosis. We made this decision because, during the initial meeting with our collaborating clinician, she did not mention dementia in her provided list of common diagnoses seen at ManorCare. She did not include it because dementia is never the primary diagnosis for admission into the SNF; however, many admitted individuals have comorbid diagnoses of dementia. In retrospect, we think that an additional meeting with our clinician between the approval of the proposal and conducting the search could have prevented this.

Conducting the search as outlined by the search strategy proved difficult as each database used a different keyword algorithm. The same search strategy returned between 0 and over 1,000 articles depending on the database and we felt limited by the search strategy we had developed. The lack of flexibility within the search strategy made it difficult to find articles within some databases, and difficult to eliminate irrelevant articles in others. In the future, we suggest that specific search strategies for each database be developed after conducting initial searches that yield a sufficient, yet manageable number of articles.

After determining the relevant articles, two CAT table formats were created - one for each research question. Because we divided the articles among three people, it was difficult to identify important themes or trends. We found it helpful to make entries as concise as possible and to organize the entries by which assessment(s) they evaluated or compared to make synthesizing the data manageable.

After we presented our preliminary findings to our collaborating clinician and received feedback regarding the exclusion of dementia from our CAT, we added "dementia" to our search terms. We then made a plan to conduct our searches again, but this time included those articles that examined the utility of cognitive screening tools for individuals with dementia diagnoses. Again, many searches yielded too few or too many results with little freedom to widen or narrow the search parameters. Examining the titles and/or abstracts of thousands of articles was largely inefficient and time-consuming. Following these searches, fourteen additional articles were incorporated into the original CAT tables, synthesized, and the implications of our findings were adjusted accordingly.

In developing our in-service, we considered barriers to knowledge translation at ManorCare and ways we might mitigate those barriers, including the creation of an informational resource packet for practicing clinicians to reference. This packet was developed to provide the clinicians with the necessary resources and information needed to administer the MoCA if a policy change was to be enacted. Additionally, we created a brief pre- and post- in-service survey to examine the effectiveness of the in-service presentation.

The in-service was an effective means of presenting our findings and to make suggestions for implementing evidence-based practice within the rehabilitation department. Not only was it an educational opportunity for the attendees, but it expanded our understanding of role

delineation between occupational therapists and speech language pathologists with regard to administering cognitive screening tools in a skilled nursing setting.

Recommendations for Future

Our collaborating clinician has expressed interest in continuing collaboration with occupational therapy students at the University of Puget Sound. She acknowledged the foundation that the CAT results will provide in bringing about procedural changes at ManorCare. She continues to have interest in the relationship between a patient's cognitive screen score and their eventual discharge location as indicated by chart review. Although we were not able to conduct that research for her, it may be something that future occupational therapy students can do. Given the information presented during the in-service and in our CAT, our collaborating clinician is in a better position to enact procedural changes that would ensure the MoCA is administered to every patient seen at ManorCare. This will simplify the procedure for future chart reviews and statistical analysis, as all clients will be scored on the same scale. This experience has confirmed to us that knowledge translation occurs more effectively when the collaborating clinician is invested in translating evidence-based practice into department policies and is eager to participate in research that will improve the provision of client-centered services.

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Appendix A
Resource Packet

Administering the Montreal Cognitive Assessment (MoCA)

ManorCare In-Service Presentation

Presented by: Liliya Bachinskaya, Alina Muller and Sally Winkel

University of Puget Sound: School of Occupational Therapy

Table of Contents

Introduction to the Montreal Cognitive Assessment

Background

- The Montreal Cognitive Assessment (MoCA) was developed in 1996 by Dr. Ziad Nasreddine in Montreal, Quebec.
- The MoCA test is a one-page, 30-point test administered in approximately 10 minutes.
- The test and administration instructions are freely accessible to registered clinicians at www.mocatest.org.
- The test is available in 55 languages.
- The test has been validated by numerous studies for detecting mild cognitive impairment.
- The MoCA test assesses multiple cognitive domains including: short-term memory, visuospatial abilities, executive functioning, attention, concentration, working memory, language and orientation.

Versions

- Standard MoCA has 3 versions: 7.1, 7.2, and 7.3 for retesting purposes
- MoCA – Basic
- MoCA – Blind
- MoCA – Mini
- Electronic MoCA

Montreal Cognitive Assessment
(MoCA)

Administration and Scoring Instructions

The Montreal Cognitive Assessment (MoCA) was designed as a rapid screening instrument for mild cognitive dysfunction. It assesses different cognitive domains: attention and concentration, executive functions, memory, language, visuoconstructional skills, conceptual thinking, calculations, and orientation. Time to administer the MoCA is approximately 10 minutes. The total possible score is 30 points; a score of 26 or above is considered normal.

1. Alternating Trail Making:

Administration: The examiner instructs the subject: *"Please draw a line, going from a number to a letter in ascending order. Begin here* [point to (1)] *and draw a line from 1 then to A then to 2 and so on. End here* [point to (E)]."

Scoring: Allocate one point if the subject successfully draws the following pattern: 1 −A- 2- B- 3- C- 4- D- 5- E, without drawing any lines that cross. Any error that is not immediately self-corrected earns a score of 0.

2. Visuoconstructional Skills (Cube):

Administration: The examiner gives the following instructions, pointing to the cube: *"Copy this drawing as accurately as you can, in the space below".*

Scoring: One point is allocated for a correctly executed drawing.
- Drawing must be three-dimensional
- All lines are drawn
- No line is added
- Lines are relatively parallel and their length is similar (rectangular prisms are accepted)

A point is not assigned if any of the above-criteria are not met.

3. Visuoconstructional Skills (Clock):

Administration: Indicate the right third of the space and give the following instructions: *"Draw a clock. Put in all the numbers and set the time to 10 past 11".*

Scoring: One point is allocated for each of the following three criteria:
- Contour (1 pt.): the clock face must be a circle with only minor distortion acceptable (e.g., slight imperfection on closing the circle);
- Numbers (1 pt.): all clock numbers must be present with no additional numbers; numbers must be in the correct order and placed in the approximate quadrants on the clock face; Roman numerals are acceptable; numbers can be placed outside the circle contour;
- Hands (1 pt.): there must be two hands jointly indicating the correct time; the hour hand must be clearly shorter than the minute hand; hands must be centred within the clock face with their junction close to the clock centre.

A point is not assigned for a given element if any of the above-criteria are not met.

4. Naming:

Administration: Beginning on the left, point to each figure and say: *"Tell me the name of this animal"*.

Scoring: One point each is given for the following responses: (1) lion (2) rhinoceros or rhino (3) camel or dromedary.

5. Memory:

Administration: The examiner reads a list of 5 words at a rate of one per second, giving the following instructions: *"This is a memory test. I am going to read a list of words that you will have to remember now and later on. Listen carefully. When I am through, tell me as many words as you can remember. It doesn't matter in what order you say them"*. Mark a check in the allocated space for each word the subject produces on this first trial. When the subject indicates that (s)he has finished (has recalled all words), or can recall no more words, read the list a second time with the following instructions: *"I am going to read the same list for a second time. Try to remember and tell me as many words as you can, including words you said the first time."* Put a check in the allocated space for each word the subject recalls after the second trial.
At the end of the second trial, inform the subject that (s)he will be asked to recall these words again by saying, *"I will ask you to recall those words again at the end of the test."*

Scoring: No points are given for Trials One and Two.

6. Attention:

Forward Digit Span: Administration: Give the following instruction: *"I am going to say some numbers and when I am through, repeat them to me exactly as I said them"*. Read the five number sequence at a rate of one digit per second.

Backward Digit Span: Administration: Give the following instruction: *"Now I am going to say some more numbers, but when I am through you must repeat them to me in the backwards order."* Read the three number sequence at a rate of one digit per second.

Scoring: Allocate one point for each sequence correctly repeated, (*N.B.*: the correct response for the backwards trial is 2-4-7).

Vigilance: Administration: The examiner reads the list of letters at a rate of one per second, after giving the following instruction: *"I am going to read a sequence of letters. Every time I say the letter A, tap your hand once. If I say a different letter, do not tap your hand"*.

Scoring: Give one point if there is zero to one errors (an error is a tap on a wrong letter or a failure to tap on letter A).

Serial 7s: Administration: The examiner gives the following instruction: *"Now, I will ask you to count by subtracting seven from 100, and then, keep subtracting seven from your answer until I tell you to stop."* Give this instruction twice if necessary.

Scoring: This item is scored out of 3 points. Give no (0) points for no correct subtractions, 1 point for one correction subtraction, 2 points for two-to-three correct subtractions, and 3 points if the participant successfully makes four or five correct subtractions. Count each correct subtraction of 7 beginning at 100. Each subtraction is evaluated independently; that is, if the participant responds with an incorrect number but continues to correctly subtract 7 from it, give a point for each correct subtraction. For example, a participant may respond "92 – 85 – 78 – 71 – 64" where the "92" is incorrect, but all subsequent numbers are subtracted correctly. This is one error and the item would be given a score of 3.

7. Sentence repetition:

Administration: The examiner gives the following instructions: *"I am going to read you a sentence. Repeat it after me, exactly as I say it* [pause]: *I only know that John is the one to help today."* Following the response, say: *"Now I am going to read you another sentence. Repeat it after me, exactly as I say it* [pause]: *The cat always hid under the couch when dogs were in the room."*

Scoring: Allocate 1 point for each sentence correctly repeated. Repetition must be exact. Be alert for errors that are omissions (e.g., omitting "only", "always") and substitutions/additions (e.g., "John is the one who helped today;" substituting "hides" for "hid", altering plurals, etc.).

8. Verbal fluency:

Administration: The examiner gives the following instruction: *"Tell me as many words as you can think of that begin with a certain letter of the alphabet that I will tell you in a moment. You can say any kind of word you want, except for proper nouns (like Bob or Boston), numbers, or words that begin with the same sound but have a different suffix, for example, love, lover, loving. I will tell you to stop after one minute. Are you ready?* [Pause] *Now, tell me as many words as you can think of that begin with the letter F.* [time for 60 sec]. *Stop."*

Scoring: Allocate one point if the subject generates 11 words or more in 60 sec. Record the subject's response in the bottom or side margins.

9. Abstraction:

Administration: The examiner asks the subject to explain what each pair of words has in common, starting with the example: *"Tell me how an orange and a banana are alike"*. If the subject answers in a concrete manner, then say only one additional time: *"Tell me another way in which those items are alike"*. If the subject does not give the appropriate response *(fruit)*, say, *"Yes, and they are also both fruit."* Do not give any additional instructions or clarification. After the practice trial, say: *"Now, tell me how a train and a bicycle are alike"*. Following the response, administer the second trial, saying: *"Now tell me how a ruler and a watch are alike"*. Do not give any additional instructions or prompts.

Scoring: Only the last two item pairs are scored. Give 1 point to each item pair correctly answered. The following responses are acceptable:
Train-bicycle = means of transportation, means of travelling, you take trips in both;
Ruler-watch = measuring instruments, used to measure.
The following responses are not acceptable: Train-bicycle = they have wheels; Ruler-watch = they have numbers.

10. Delayed recall:

Administration: The examiner gives the following instruction: *"I read some words to you earlier, which I asked you to remember. Tell me as many of those words as you can remember."* Make a check mark (√) for each of the words correctly recalled spontaneously without any cues, in the allocated space.

Scoring: Allocate 1 point for each word recalled freely without any cues.

Optional:
Following the delayed free recall trial, prompt the subject with the semantic category cue provided below for any word not recalled. Make a check mark (√) in the allocated space if the subject remembered the word with the help of a category or multiple-choice cue. Prompt all non-recalled words in this manner. If the subject does not recall the word after the category cue, give him/her a multiple choice trial, using the following example instruction, *"Which of the following words do you think it was, NOSE, FACE, or HAND?"*
Use the following category and/or multiple-choice cues for each word, when appropriate:

FACE:	category cue: part of the body	multiple choice: nose, face, hand
VELVET:	category cue: type of fabric	multiple choice: denim, cotton, velvet
CHURCH:	category cue: type of building	multiple choice: church, school, hospital
DAISY:	category cue: type of flower	multiple choice: rose, daisy, tulip
RED:	category cue: a colour	multiple choice: red, blue, green

Scoring: No points are allocated for words recalled with a cue. A cue is used for clinical information purposes only and can give the test interpreter additional information about the type of memory disorder. For memory deficits due to retrieval failures, performance can be improved with a cue. For memory deficits due to encoding failures, performance does not improve with a cue.

11. Orientation:

Administration: The examiner gives the following instructions: "Tell me the date today". If the subject does not give a complete answer, then prompt accordingly by saying: *"Tell me the [year, month, exact date, and day of the week]."* Then say: *"Now, tell me the name of this place, and which city it is in."*

Scoring: Give one point for each item correctly answered. The subject must tell the exact date and the exact place (name of hospital, clinic, office). No points are allocated if subject makes an error of one day for the day and date.

TOTAL SCORE: Sum all subscores listed on the right-hand side. Add one point for an individual who has 12 years or fewer of formal education, for a possible maximum of 30 points. A final total score of 26 and above is considered normal.

NAME :

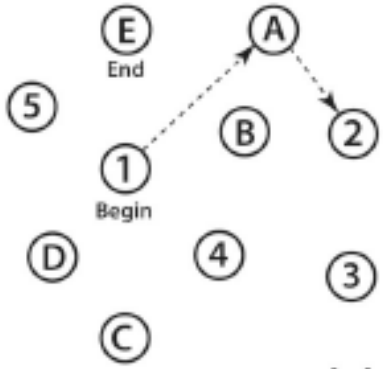
MONTREAL COGNITIVE ASSESSMENT (MOCA)

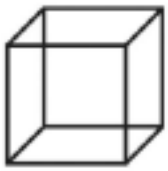
Education : Date of birth :

Version 7.1 Original Version

Sex : DATE :

VISUOSPATIAL / EXECUTIVE





Copy cube

[ ] [ ]

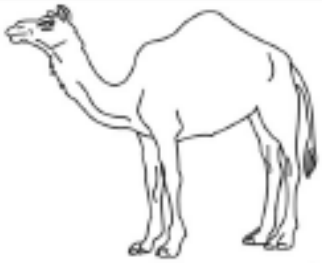
Draw CLOCK (Ten past eleven) [3 points]

[ ] Contour [ ] Numbers [ ] Hands

POINTS

___/5

NAMING



[ ] [ ] [ ]

___/3

MEMORY

Read list of words, subject must repeat them. Do 2 trials, even if 1st trial is successful. Do a recall after 5 minutes.

	FACE	VELVET	CHURCH	DAISY	RED
1st trial					
2nd trial					

No points

ATTENTION

Read list of digits (1 digit/ sec.).

Subject has to repeat them in the forward order [ ] 2 1 8 5 4

Subject has to repeat them in the backward order [ ] 7 4 2

___/2

Read list of letters. The subject must tap with his hand at each letter A. No points if ≥ 2 errors

[ ] F B A C M N A A J K L B A F A K D E A A A J A M O F A A B

___/1

Serial 7 subtraction starting at 100 [ ] 93 [ ] 86 [ ] 79 [ ] 72 [ ] 65

4 or 5 correct subtractions: **3 pts**, 2 or 3 correct: **2 pts**, 1 correct: **1 pt**, 0 correct: **0 pt**

___/3

LANGUAGE

Repeat : I only know that John is the one to help today. [ ]

The cat always hid under the couch when dogs were in the room. [ ]

___/2

Fluency / Name maximum number of words in one minute that begin with the letter F [ ] _____ (N ≥ 11 words)

___/1

ABSTRACTION

Similarity between e.g. banana - orange = fruit [ ] train – bicycle [ ] watch - ruler

___/2

DELAYED RECALL

	Has to recall words WITH NO CUE	FACE	VELVET	CHURCH	DAISY	RED
		[ ]	[ ]	[ ]	[ ]	[ ]
Optional	Category cue					
	Multiple choice cue					

Points for UNCUED recall only

___/5

ORIENTATION

[ ] Date [ ] Month [ ] Year [ ] Day [ ] Place [ ] City

___/6

www.mocatest.org

Normal ≥ 26 / 30

TOTAL ___/30

Add 1 point if ≤ 12 yr edu

Administered by: _____

Montreal Cognitive Assessment (MoCA)
Version 2

Administration and Scoring Instructions

The Montreal Cognitive Assessment (MoCA) was designed as a rapid screening instrument for mild cognitive dysfunction. It assesses different cognitive domains: attention and concentration, executive functions, memory, language, visuoconstructional skills, conceptual thinking, calculations, and orientation. Time to administer the MoCA is approximately 10 minutes. The total possible score is 30 points; a score of 26 or above is considered normal.

1. Alternating Trail Making:

Administration: The examiner instructs the subject: *"Please draw a line, going from a number to a letter in ascending order. Begin here* [point to (1)] *and draw a line from 1 then to A then to 2 and so on. End here* [point to (E)]."

Scoring: Allocate one point if the subject successfully draws the following pattern:
1 −A- 2- B- 3- C- 4- D- 5- E, without drawing any lines that cross. Any error that is not immediately self-corrected earns a score of 0.

2. Visuoconstructional Skills (Rectangle):

Administration: The examiner gives the following instructions, pointing to the **rectangle**: *"Copy this drawing as accurately as you can, in the space below".*

Scoring: One point is allocated for a correctly executed drawing.
- Drawing must be three-dimensional
- All lines are drawn
- No line is added
- The horizontal lines are relatively parallel.
- The object must be clearly rectangular (i.e., the shorter vertical sides cannot be more than ¾ of the length of the longer horizontal lines.

A point is not assigned if any of the above-criteria are not met.

3. Visuoconstructional Skills (Clock):

Administration: Indicate the right third of the space and give the following instructions: *"Draw a clock. Put in all the numbers and set the time to 5 past 4".*

Scoring: One point is allocated for each of the following three criteria:
- Contour (1 pt.): the clock face must be a circle with only minor distortion acceptable (e.g., slight imperfection on closing the circle);
- Numbers (1 pt.): all clock numbers must be present with no additional numbers; numbers must be in the correct order and placed in the approximate quadrants on the clock face; Roman numerals are acceptable; numbers can be placed outside the circle contour;
- Hands (1 pt.): there must be two hands jointly indicating the correct time; the hour hand must be clearly shorter than the minute hand; hands must be centred within the clock face with their junction close to the clock centre.

A point is not assigned for a given element if any of the above-criteria are not met.

4. Naming:

Administration: Beginning on the left, point to each figure and say: *"Tell me the name of this animal"*.

Scoring: One point each is given for the following responses: (1) giraffe; (2) bear (or specific varieties of bears); (3) hippopotamus (or hippo).

5. Memory:

Administration: The examiner reads a list of 5 words at a rate of one per second, giving the following instructions:
"This is a memory test. I am going to read a list of words that you will have to remember now and later on. Listen carefully. When I am through, tell me as many words as you can remember. It doesn't matter in what order you say them."
Mark a check in the allocated space for each word the subject produces on this first trial. When the subject indicates that (s)he has finished (has recalled all words), or can recall no more words, read the list a second time with the following instructions:
"I am going to read the same list for a second time. Try to remember and tell me as many words as you can, including words you said the first time."
Put a check in the allocated space for each word the subject recalls after the second trial.
At the end of the second trial, inform the subject that (s)he will be asked to recall these words again by saying,
"I will ask you to recall those words again at the end of the test."

Scoring: No points are given for Trials One and Two. Scoring is based on the delayed recall trial.

6. Attention:

Forward Digit Span: Administration: Give the following instruction: "*I am going to say some numbers and when I am through, repeat them to me exactly as I said them*". Read the five number sequence at a rate of one digit per second.

Backward Digit Span: Administration: Give the following instruction: "*Now I am going to say some more numbers, but when I am through you must repeat them to me in the backwards order.*" Read the three number sequence at a rate of one digit per second.

Scoring: Allocate one point for each sequence correctly repeated. (*N.B.*: the correct response for the backwards trial is 2-5-8).

Vigilance: Administration: The examiner reads the list of letters at a rate of one per second, after giving the following instruction: "*I am going to read a sequence of letters. Every time I say the letter A, tap your hand once. If I say a different letter, do not tap your hand*".

Scoring: Give one point if there is zero to one errors (an error is a tap on a wrong letter or a failure to tap on letter A).

Serial 7s: Administration: The examiner gives the following instruction: *"Now, I will ask you to count by subtracting 7 from 90, and then, keep subtracting 7 from your answer until I tell you to stop."* Give this instruction twice if necessary.

Scoring: This item is scored out of 3 points. Give no (0) points for no correct subtractions, 1 point for one correction subtraction, 2 points for two-to-three correct subtractions, and 3 points if the participant successfully makes four or five correct subtractions. Count each correct subtraction of 7 beginning at 100. Each subtraction is evaluated independently; that is, if the participant responds with an incorrect number but continues to correctly subtract 7 from it, give a point for each correct subtraction. For example, a participant may respond "82 – 75 – 68 – 61 – 54" where the "82" is incorrect, but all subsequent numbers are subtracted correctly. This is one error and the item would be given a score of 3.

7. **Sentence repetition**:

Administration: The examiner gives the following instructions: *"I am going to read you a sentence. Repeat it after me, exactly as I say it* [pause]:
A bird can fly into closed windows when it's dark and windy."

Following the response, say: *"Now I am going to read you another sentence. Repeat it after me, exactly as I say it* [pause]:
The caring grandmother sent groceries over a week ago."

Scoring: Allocate 1 point for each sentence correctly repeated. Repetition must be exact. Be alert for errors that are omissions (e.g., omitting "closed", "over") and substitutions/additions (e.g., "Birds can easily fly into closed windows . . ."; substituting "stormy" for "windy", altering plurals, etc.).

8. **Verbal fluency**:

Administration: The examiner gives the following instruction: *"Tell me as many words as you can think of that begin with a certain letter of the alphabet that I will tell you in a moment. You can say any kind of word you want, except for proper nouns (like Bob or Boston), numbers, or words that begin with the same sound but have a different suffix, for example, love, lover, loving. I will tell you to stop after one minute. Are you ready?* [Pause] *Now, tell me as many words as you can think of that begin with the letter S.* [time for 60 sec]. *Stop."*

Scoring: Allocate one point if the subject generates 11 words or more in 60 sec. Record the subject's response in the bottom or side margins.

9. **Abstraction**:

Administration: The examiner asks the subject to explain what each pair of words has in common, starting with the example: *"Tell me how a carrot and a potato are alike"*. If the subject answers in a concrete manner, then say only one additional time: *"Tell me another way in which those items are alike"*. If the subject does not give the appropriate response *(vegetable)*, say, *"Yes, and they are also both vegetable"*. Do not give any additional instructions or clarification.

After the practice trial, say: *"Now, tell me how a diamond and a ruby are alike"*.
Following the response, administer the second trial, saying: *"Now tell me how a cannon and a rifle are alike"*. Do not give any additional instructions or prompts.

Scoring: Only the last two item pairs are scored. Give 1 point to each item pair correctly answered. The following responses are acceptable:

diamond-ruby =	gem stones, precious stones, jewels;
cannon-rifle =	weapons, guns, used for hurting/killing people, used in war.

The following responses are **not** acceptable:

diamond-ruby =	from the earth
cannon-rifle:	fires/shoots; ammunition

10. Delayed recall:

Administration: The examiner gives the following instruction: *"I read some words to you earlier, which I asked you to remember. Tell me as many of those words as you can remember."*
Make a check mark (√) for each of the words correctly recalled spontaneously without any cues, in the allocated space.

Scoring: **Allocate 1 point for each word recalled freely without any cues.**

Optional:
Following the delayed free recall trial, prompt the subject with the semantic category cue provided below for any word not recalled. Make a check mark (√) in the allocated space if the subject remembered the word with the help of a category or multiple-choice cue. Prompt all non-recalled words in this manner. If the subject does not recall the word after the category cue, give him/her a multiple choice trial, using the following example instruction, *"Which of the following words do you think it was,* CAR, TRUCK, or PLANE*?"*
Use the following category and/or multiple-choice cues for each word, when appropriate:

TRUCK:	category cue: mode of transportation	multiple choice: car, truck, plane
BANANA:	category cue: type of fruit	multiple choice: pear, apple, banana
VIOLIN:	category cue: type of musical instrument	multiple choice: violin, harp, guitar
DESK:	category cue: type of furniture	multiple choice: chair, desk, bed
GREEN:	category cue: a colour	multiple choice: green, yellow, black

Scoring: **No points are allocated for words recalled with a cue.** A cue is used for clinical information purposes only and can give the test interpreter additional information about the type of memory disorder. For memory deficits due to retrieval failures, performance can be improved with a cue. For memory deficits due to encoding failures, performance does not improve with a cue.

11. Orientation:

Administration: The examiner gives the following instructions: "Tell me the date today". If the subject does not give a complete answer, then prompt accordingly by saying: *"Tell me the [year, month, exact date, and day of the week]."* Then say: *"Now, tell me the name of this place, and which city it is in."*

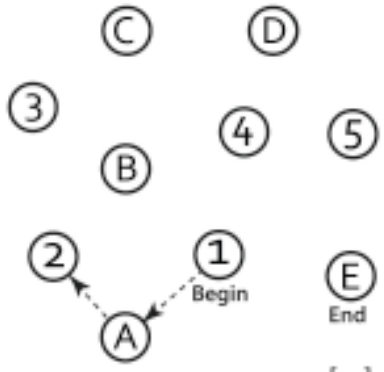
Scoring: Give one point for each item correctly answered. The subject must tell the exact date and the exact place (name of hospital, clinic, office). No points are allocated if subject makes an error of one day for the day and date.

TOTAL SCORE: Sum all subscores listed on the right-hand side. Add one point for an individual who has 12 years or fewer of formal education, for a possible maximum of 30 points. A final total score of 26 and above is considered normal.

MONTREAL COGNITIVE ASSESSMENT (MOCA®)
Version 7.2 Alternative Version

NAME :
Education : Date of birth :
Sex : DATE :

VISUOSPATIAL / EXECUTIVE



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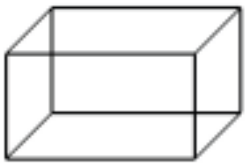


Draw CLOCK (Five past four)
(3 points)

[ ] Contour [ ] Numbers [ ] Hands

POINTS __/5

NAMING

[ ]

[ ]

[ ]

__/3

MEMORY

Read list of words, subject must repeat them. Do 2 trials, even if 1st trial is successful. Do a recall after 5 minutes.

	TRUCK	BANANA	VIOLIN	DESK	GREEN
1st trial					
2nd trial					

No points

ATTENTION

Read list of digits (1 digit/ sec.).

Subject has to repeat them in the forward order [ ] 3 2 9 6 5

Subject has to repeat them in the backward order [ ] 8 5 2

__/2

Read list of letters. The subject must tap with his hand at each letter A. No points if ≥ 2 errors

[ ] F B A C M N A A J K L B A F A K D E A A A J A M O F A A B

__/1

Serial 7 subtraction starting at 90 [ ] 83 [ ] 76 [ ] 69 [ ] 62 [ ] 55

4 or 5 correct subtractions: **3 pts**, 2 or 3 correct: **2 pts**, 1 correct: **1 pt**, 0 correct: **0 pt**

__/3

LANGUAGE

Repeat : A bird can fly into closed windows when it's dark and windy. [ ]
The caring grandmother sent groceries over a week ago. [ ]

__/2

Fluency / Name maximum number of words in one minute that begin with the letter S [ ] _____ (N ≥ 11 words)

__/1

ABSTRACTION

Similarity between e.g. carrot - potato = vegetable. [ ] diamond - ruby [ ] cannon - rifle

__/2

DELAYED RECALL

	Has to recall words WITH NO CUE	TRUCK [ ]	BANANA [ ]	VIOLIN [ ]	DESK [ ]	GREEN [ ]	Points for UNCUED recall only
Optional	Category cue						
	Multiple choice cue						

__/5

ORIENTATION

[ ] Date [ ] Month [ ] Year [ ] Day [ ] Place [ ] City

__/6

Adapted by : Z. Nasreddine MD, N. Phillips PhD, H. Chertkow MD

 www.mocatest.org

Normal ≥ 26 / 30

TOTAL __/30

Add 1 point if ≤ 12 yr edu

Administered by: _____

Montreal Cognitive Assessment (MoCA)
Version 3

Administration and Scoring Instructions

The Montreal Cognitive Assessment (MoCA) was designed as a rapid screening instrument for mild cognitive dysfunction. It assesses different cognitive domains: attention and concentration, executive functions, memory, language, visuoconstructional skills, conceptual thinking, calculations, and orientation. Time to administer the MoCA is approximately 10 minutes. The total possible score is 30 points; a score of 26 or above is considered normal.

1. Alternating Trail Making:

Administration: The examiner instructs the subject: *"Please draw a line, going from a number to a letter in ascending order. Begin here* [point to (1)] *and draw a line from 1 then to A then to 2 and so on. End here* [point to (E)]."

Scoring: Allocate one point if the subject successfully draws the following pattern: 1 −A- 2- B- 3- C- 4- D- 5- E, without drawing any lines that cross. Any error that is not immediately self-corrected earns a score of 0.

2. Visuoconstructional Skills (Cylinder):

Administration: The examiner gives the following instructions, pointing to the **cylinder**: *"Copy this drawing as accurately as you can, in the space below"*.

Scoring: One point is allocated for a correctly executed drawing.
- Drawing must be three-dimensional
- All lines/ovals are drawn
- No line is added
- The horizontal lines are relatively parallel.
- The objects at the end must be ovals rather than circles.
- The horizontal lines must touch the top/bottom of the ovals.

A point is not assigned if any of the above-criteria are not met.

3. Visuoconstructional Skills (Clock):

Administration: Indicate the right third of the space and give the following instructions: *"Draw a clock. Put in all the numbers and set the time to ten past nine"*.

Scoring: One point is allocated for each of the following three criteria:
- Contour (1 pt.): the clock face must be a circle with only minor distortion acceptable (e.g., slight imperfection on closing the circle);
- Numbers (1 pt.): all clock numbers must be present with no additional numbers; numbers must be in the correct order and placed in the approximate quadrants on the clock face; Roman numerals are acceptable; numbers can be placed outside the circle contour;
- Hands (1 pt.): there must be two hands jointly indicating the correct time; the hour hand must be clearly shorter than the minute hand; hands must be centred within the clock face with their junction close to the clock centre.

A point is not assigned for a given element if any of the above-criteria are not met.

4. Naming:

Administration: Beginning on the left, point to each figure and say: *"Tell me the name of this animal"*.

Scoring: One point each is given for the following responses: (1) donkey (or mule); (2) pig (or hog); (3) kangaroo.

5. Memory:

Administration: The examiner reads a list of 5 words at a rate of one per second, giving the following instructions:
"This is a memory test. I am going to read a list of words that you will have to remember now and later on. Listen carefully. When I am through, tell me as many words as you can remember. It doesn't matter in what order you say them."
Mark a check in the allocated space for each word the subject produces on this first trial. When the subject indicates that (s)he has finished (has recalled all words), or can recall no more words, read the list a second time with the following instructions:
"I am going to read the same list for a second time. Try to remember and tell me as many words as you can, including words you said the first time."
Put a check in the allocated space for each word the subject recalls after the second trial.
At the end of the second trial, inform the subject that (s)he will be asked to recall these words again by saying,
"I will ask you to recall those words again at the end of the test."

Scoring: No points are given for Trials One and Two. Scoring is based on the delayed recall trial.

6. Attention:

Forward Digit Span: Administration: Give the following instruction: "*I am going to say some numbers and when I am through, repeat them to me exactly as I said them*". Read the five number sequence at a rate of one digit per second.

Backward Digit Span: Administration: Give the following instruction: "*Now I am going to say some more numbers, but when I am through you must repeat them to me in the backwards order.*" Read the three number sequence at a rate of one digit per second.

Scoring: Allocate one point for each sequence correctly repeated, (*N.B.*: the correct response for the backwards trial is 4-7-1).

Vigilance: Administration: The examiner reads the list of letters at a rate of one per second, after giving the following instruction: "*I am going to read a sequence of letters. Every time I say the letter A, tap your hand once. If I say a different letter, do not tap your hand*".

Scoring: Give one point if there is zero to one errors (an error is a tap on a wrong letter or a failure to tap on letter A).

Serial 7s: Administration: The examiner gives the following instruction: *"Now, I will ask you to count by subtracting 7 from 80, and then, keep subtracting 7 from your answer until I tell you to stop."* Give this instruction twice if necessary.

Scoring: This item is scored out of 3 points. Give no (0) points for no correct subtractions, 1 point for one correction subtraction, 2 points for two-to-three correct subtractions, and 3 points if the participant successfully makes four or five correct subtractions. Count each correct subtraction of 7 beginning at 80. Each subtraction is evaluated independently; that is, if the participant responds with an incorrect number but continues to correctly subtract 7 from it, give a point for each correct subtraction. For example, a participant may respond "72 – 65 – 58 – 51 – 44" where the "72" is incorrect, but all subsequent numbers are subtracted correctly. This is one error and the item would be given a score of 3.

7. Sentence repetition:

Administration: The examiner gives the following instructions: *"I am going to read you a sentence. Repeat it after me, exactly as I say it* [pause]:
She heard his lawyer was the one to sue after the accident."

Following the response, say: *"Now I am going to read you another sentence. Repeat it after me, exactly as I say it* [pause]:
The little girls who were given too much candy got stomach aches."

Scoring: Allocate 1 point for each sentence correctly repeated. Repetition must be exact. Be alert for errors that are omissions (e.g., omitting "too much") and substitutions/additions (e.g., "…his lawyer sued after…"; "the girls", altering plurals, etc.).

8. Verbal fluency:

Administration: The examiner gives the following instruction: *"Tell me as many words as you can think of that begin with a certain letter of the alphabet that I will tell you in a moment. You can say any kind of word you want, except for proper nouns (like Bob or Boston), numbers, or words that begin with the same sound but have a different suffix, for example, love, lover, loving. I will tell you to stop after one minute. Are you ready?* [Pause] *Now, tell me as many words as you can think of that begin with the letter B.* [time for 60 sec]. *Stop."*

Scoring: Allocate one point if the subject generates 11 words or more in 60 sec. Record the subject's response in the bottom or side margins.

9. Abstraction:

Administration: The examiner asks the subject to explain what each pair of words has in common, starting with the example: *"Tell me how an orange and a banana are alike"*. If the subject answers in a concrete manner, then say only one additional time: *"Tell me another way in which those items are alike"*. If the subject does not give the appropriate response *(fruit)*, say, *"Yes, and they are also both fruit"*. Do not give any additional instructions or clarification.
After the practice trial, say: *"Now, tell me how an eye and an ear are alike"*.

Following the response, administer the second trial, saying: *"Now tell me how a trumpet and a piano are alike"*. Do not give any additional instructions or prompts.

Scoring: Only the last two item pairs are scored. Give 1 point to each item pair correctly answered. The following responses are acceptable:
Eye-ear = sensory organs, parts of the head, parts of the body;
Trumpet- piano = musical instruments, you can play them.

The following responses are **not** acceptable:
Eye-ear = parts of the face.

10. **Delayed recall:**

Administration: The examiner gives the following instruction: *"I read some words to you earlier, which I asked you to remember. Tell me as many of those words as you can remember."*
Make a check mark (√) for each of the words correctly recalled spontaneously without any cues, in the allocated space.

Scoring: **Allocate 1 point for each word recalled freely without any cues.**

Optional:
Following the delayed free recall trial, prompt the subject with the semantic category cue provided below for any word not recalled. Make a check mark (√) in the allocated space if the subject remembered the word with the help of a category or multiple-choice cue. Prompt all non-recalled words in this manner. If the subject does not recall the word after the category cue, give him/her a multiple choice trial, using the following example instruction, *"Which of the following words do you think it was*, BICYCLE, TRAIN, or BOAT*?"*
Use the following category and/or multiple-choice cues for each word, when appropriate:

TRAIN:	category cue: mode of transportation	multiple choice: bicycle, train, boat
EGG:	category cue: something you eat	multiple choice: sandwich, egg, carrot
HAT:	category cue: article of clothing	multiple choice: hat, glove, scarf
CHAIR:	category cue: type of furniture	multiple choice: table, chair, lamp
BLUE:	category cue: a colour	multiple choice: blue, brown, orange

Scoring: **No points are allocated for words recalled with a cue.** A cue is used for clinical information purposes only and can give the test interpreter additional information about the type of memory disorder. For memory deficits due to retrieval failures, performance can be improved with a cue. For memory deficits due to encoding failures, performance does not improve with a cue.

11. Orientation:

Administration: The examiner gives the following instructions: "Tell me the date today". If the subject does not give a complete answer, then prompt accordingly by saying: *"Tell me the [year, month, exact date, and day of the week]."* Then say: *"Now, tell me the name of this place, and which city it is in."*

Scoring: Give one point for each item correctly answered. The subject must tell the exact date and the exact place (name of hospital, clinic, office). No points are allocated if subject makes an error of one day for the day and date.

TOTAL SCORE: Sum all subscores listed on the right-hand side. Add one point for an individual who has 12 years or fewer of formal education, for a possible maximum of 30 points. A final total score of 26 and above is considered normal.

NAME :

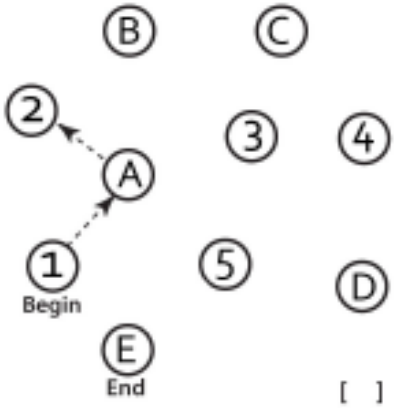
MONTREAL COGNITIVE ASSESSMENT (MOCA)

Version 7.3 Alternative Version

Education : Date of birth :

Sex : DATE :

VISUOSPATIAL / EXECUTIVE



Copy cylinder

[ ] [ ]

Draw CLOCK (Ten past nine)
(3 points)

[ ] Contour [ ] Numbers [ ] Hands

POINTS ___/5

NAMING

[ ]

[ ]

[ ]

___/3

MEMORY

Read list of words, subject must repeat them. Do 2 trials, even if 1st trial is successful. Do a recall after 5 minutes.

	TRAIN	EGG	HAT	CHAIR	BLUE
1st trial					
2nd trial					

No points

ATTENTION

Read list of digits (1 digit/ sec.).

Subject has to repeat them in the forward order [ ] 5 4 1 8 7

Subject has to repeat them in the backward order [ ] 1 7 4

___/2

Read list of letters. The subject must tap with his hand at each letter A. No points if ≥ 2 errors

[ ] F B A C M N A A J K L B A F A K D E A A A J A M O F A A B

___/1

Serial 7 subtraction starting at 80 [ ] 73 [ ] 66 [ ] 59 [ ] 52 [ ] 45

4 or 5 correct subtractions: **3 pts**, 2 or 3 correct: **2 pts**, 1 correct: **1 pt**, 0 correct: **0 pt**

___/3

LANGUAGE

Repeat : She heard his lawyer was the one to sue after the accident. [ ]

The little girls who were given too much candy got stomach aches. [ ]

___/2

Fluency / Name maximum number of words in one minute that begin with the letter B [ ] _____ (N ≥ 11 words)

___/1

ABSTRACTION

Similarity between e.g. banana - orange = fruit [ ] eye – ear [ ] trumpet – piano

___/2

DELAYED RECALL

	Has to recall words WITH NO CUE	TRAIN [ ]	EGG [ ]	HAT [ ]	CHAIR [ ]	BLUE [ ]	Points for UNCUED recall only
Optional	Category cue						
	Multiple choice cue						

___/5

ORIENTATION

[ ] Date [ ] Month [ ] Year [ ] Day [ ] Place [ ] City

___/6

Adapted by : Z. Nasreddine MD, N. Phillips PhD, H. Chertkow MD

www.mocatest.org

Normal ≥ 26 / 30

TOTAL ___/30

Add 1 point if ≤ 12 yr edu

Administered by: _____

Montreal Cognitive Assessment Basic (MoCA-B)
Administration and Scoring Instructions

The Montreal Cognitive Assessment (MoCA) was designed as a rapid screening instrument for mild cognitive impairment. The **Montreal Cognitive Assessment – Basic (MoCA-B)** was developed to facilitate the detection of mild cognitive impairment in illiterate and lower educated subjects. The MoCA-B assesses similar cognitive domains as the original MoCA: executive functions, language, orientation, calculations, conceptual thinking, memory, visuoperception, attention and concentration. Time to administer the MoCA-B is approximately 15 minutes. It is scored on 30 points.

All instructions may be repeated once except if otherwise specified.

START TIMING: The examiner writes the time (hour-minutes-seconds) in the right-hand column of the test sheet prior to administrating the first task (Executive Functions).

1. Executive Function (Alternating Trail Making)

The task is upside down to reduce manipulation of the test sheet; the examiner simply slides the test sheet across the table to the subject (the numbers should be upright for the subject).

Administration: The examiner gives the following instructions: *"Please draw a line alternating between a square with a number and a square with dots in increasing order. Begin here* [point to the square with the number 1] *and draw a line from the square with the number 1 to the square with one dot* [point to the square with one dot]. *Then draw a line to the square with the number 2* [point to the square with number 2] *then to the square with two dots* [point to the square with two dots] *and so on. End here* [point to the square with six dots]."

Scoring: The correct pattern is as follows:

- 1 point is allocated if the subject successfully draws the correct pattern on the first attempt without any errors or self-corrections.
- No points are allocated if the subject draws an incorrect pattern or makes an error, even if it is immediately self-corrected.

2. Immediate Recall

Administration: The examiner gives the following instructions: *"This is a memory test. I am going to read a list of words that you will have to remember now and later on. Listen carefully. When I am through, tell me as many words as you can remember. It doesn't matter in what order you*

say them." The examiner reads the list of five words at a rate of one word per second. A checkmark is made in the allocated space for each word the subject recalls on the first trial. When the subject indicates that (s)he has finished (has recalled all words or can recall no more words), the examiner gives the following instructions: *"I am going to read the same list a second time. When I am through, tell me as many words as you can remember, including words you said the first time."* The examiner reads the list a second time and makes a checkmark in the allocated space for each word the subject recalls on the second trial. At the end of the second trial, the examiner informs the subject that (s)he will be asked to recall these words again by saying: *"Try to remember these words as I will ask you to recall these again at the end of the test."*

Scoring: No points are given for Trials One and Two.

3. Fluency

Administration: The examiner gives the following instructions: *"I want you to name as many FRUITS as you can think of. I will tell you to stop after one minute. Go ahead.* [Begin timing. After 60 seconds say:] *Stop."*
The examiner records all the words to ensure that repeated words are not scored.

Scoring:

- 2 points are allocated if the subject generates 13 words or more.
- 1 point is allocated if the subject generates 8-12 words.
- No points are allocated if the subject generates 7 words or less.

4. Orientation

Administration: The examiner gives the following instructions: *"Without looking at your watch, tell me approximately what time it is."* The examiner then says: *"Now, tell me what day of the week it is and what month and year it is." "Tell me the name of this place and which city we are in."*

Scoring: 1 point is allocated for each correct answer. For the time, an answer within two hours of the actual time is accepted. The subject must give the exact day of the week, month, year, place (name of hospital, clinic, office) and city.

5. Calculation

Administration: The examiner gives the following instructions: *"Pretend you have several 1 dollar coins/bills and 5 and 10 dollar bills in your pocket. Please provide me with the maximum number of combinations to pay for an item that costs 13 dollars. You cannot ask for change."* If the subject provides a combination that requires change, provide the following prompt once: *"Are there any other combinations?"* The examiner records the subject's answers in the space provided.

Scoring:

- 3 points are allocated if the subject provides 3 or 4 correct combinations.
- 2 points are allocated if the subject provides 2 correct combinations.
- 1 point is allocated if the subject provided 1 correct combination.
- No points are allocated if the subject cannot provide any correct combination.

6. Abstraction

Administration: The subject is asked to provide the category to which a pair of words belongs to. The examiner gives the following example: *"To which category do an orange and a banana belong to?"* If the subject answers in a concrete manner, the examiner gives the following prompt once: *"Can you tell me another category these items belong to?"* If the subject does not respond correctly [Fruits], the examiner says: *"Yes, and they both belong to the category Fruits"*. No additional instruction or clarification is given. After the practice trial, the first trial is administered: *"Now, tell me which category do a train and a boat belong to?"* If the first response given is concrete, the examiner gives the following prompt once: *"Can you tell me another category these items belong to?"* The second and third trials are administered using the same instructions as the first trial (with one prompt permitted per item upon a concrete response).

Scoring: The practice item is not scored (only the last three items are scored). 1 point is given for each category correctly identified. The following responses are acceptable:

- train-boat : means of transportation, travelling, vehicles.
- north-south: cardinal directions, cardinal points, directions, hemispheres, regions.
- drum-flute: musical instruments.

The following responses are not acceptable:

- train-boat: made of iron, have engines, consume oil, petrol or gasoline.
- drum-flute: made from wood or any other material, produce sound.

7. Delayed Recall

Administration: The examiner gives the following instruction: *"I read some words to you earlier, which I asked you to remember. Tell me as many of those words as you can remember."* The examiner identifies each word correctly recalled without any cues by making a checkmark (√) in the allocated space.

Scoring: 1 point is allocated for each word recalled without any cues.

Cueing: Following the delayed free recall trial, the examiner provides a category (semantic) cue for each word the subject was unable to recall. Example: *"I will give you some hints to see if it helps you remember the words, the first word was a type of flower."* If the subject is unable to recall the word with the category cue, the examiner provides him/her with a multiple choice cue. Example: *"Which of the following words do you think it was ROSE, DAISY or TULIP?"* All non

recalled words are prompted in this manner. The examiner identifies the words the subject was able to recall with the help of a cue (category or multiple-choice) by placing a checkmark (V) in the appropriate space. The cues for each word are presented below:

ROSE:	category cue: type of flower	multiple choice: rose, daisy, tulip
CHAIR:	category cue: type of furniture	multiple choice: table, chair, bed
HAND:	category cue: body part	multiple choice: foot, hand, knee
BLUE:	category cue: colour	multiple choice: blue, brown, red
SPOON:	category cue: kitchen instrument	multiple choice: fork, spoon, knife

Scoring: No points are allocated for words recalled with a cue. The use of cues provides clinical information on the nature of the memory deficits. For memory deficit due to retrieval failures, performance can be improved with a cue. For memory deficits due to encoding failures, performance does not improve with a cue.

8. Visuoperception

Administration: Pointing to the drawing of the superimposed objects on the complementary work sheet, the examiner says: *"I would like you to look at this drawing and identify as many objects as you can. If you cannot name some of the objects, outline them with your finger or tell me about their function. You may not rotate the picture. You have 1 minute to identify as many objects as you can. Are you ready? Begin."* [Start timing].

The subject is stopped after 60 seconds. The examiner circles each object correctly identified on the scoring sheet.

Scoring: The drawing is composed of 10 objects: scissors, cup, T-shirt, watch, banana, leaf, lamp, key, candle and spoon.

- 3 points are allocated if the subject can identify 9-10 objects.
- 2 points are allocated if the subject can identify 6-8 objects.
- 1 point is allocated if the subject can identify 4-5 objects.
- No point is allocated if the subject can identify 3 objects or less.

9. Naming

Administration: Pointing to each animal on the complementary worksheet, the examiner says: *"Tell me the name of this animal."*

Scoring: 1 point is awarded for each correct answer:

- ZEBRA (Horse and donkey are not accepted.)
- PEACOCK (Bird, chicken or other kind of birds are not accepted.)
- TIGER (Cheetah, leopard and black tiger are not accepted.)
- BUTTERFLY (Insect or other kind of insects are not accepted.)

10. Attention

Numbers with White Background

Administration: Pointing to the row of numbers with a white background on the complementary worksheet, the examiner says: *"Looking at the row of numbers with a white background, please read out loud the numbers in the CIRCLES only. Do not read the numbers in the squares or triangles. Start here* [point to the beginning of the row (1)] *and end here* [point to the end of the row (5)]."

Scoring:

- 1 point is allocated if the subject completes the task with 1 error or less.
- No point is allocated if the subject completes the task with 2 errors or more.

An error is defined as follows: Reading a number which is not in a circle, omitting to read a number in a circle or reading numbers in the incorrect order (example: returning to a previous number). The number of errors is recorded in the space provided on the scoring sheet.

Numbers with Black Background

Administration: Pointing to the row of numbers with a white background on the complementary worksheet, the examiner says: *"Looking at the row of numbers with a dark background, please read out loud the numbers in the CIRCLES and SQUARES. Do not read the numbers in the triangles. Start here* [point to the beginning of the first row ( )], go through both rows [run your finger across the top then bottom row from left to right] and stop here [point to the end of the second row ( )]."

Scoring:

- 2 points are allocated if the subject completes the task with 2 errors or less.
- 1 point is allocated if the subject completes the task with 3 errors.
- No point is allocated if the subject completes the task with 4 errors or more.

An error is defined as follows: Reading a number which is not in a circle or a square, omitting to read a number in a circle or a square or reading numbers in the incorrect order (example: returning to a previous number). The number of errors is recorded in the space provided on the scoring sheet.

TOTAL SCORE: Sum all sub-item scores listed in the right-hand column of the scoring sheet. The maximum score is 30 points.

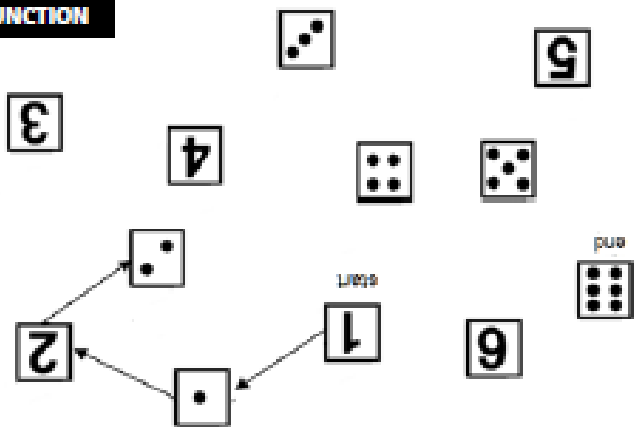
- To correct for any residual education bias, 1 point is added to the total score of subjects with less than 4 years of education (if score is <30).
- To correct for literacy, 1 point is added to the score of subjects considered illiterate, regardless of the participant's education level (if score is <30). Illiteracy is defined as the inability to read or write fluently in daily living.

MONTREAL COGNITIVE ASSESSMENT (MOCA-B)

BASIC

Name _____
Sex _____ Age _____
Education _____ Date of exam _____
Administered by _____

EXECUTIVE FUNCTION — **SCORE**



START TIME _____

(/1)

IMMEDIATE RECALL — No point

Perform 2 trials even if 1st trial is successful

	ROSE	CHAIR	HAND	BLUE	SPOON
1st trial					
2nd trial					

FLUENCY — (/2)

Name maximum numbers of FRUITS in 1 minute

1._____ 2._____ 3._____ 4._____ 5._____ 6._____
7._____ 8._____ 9._____ 10._____ 11._____ 12._____
13._____ 14._____ 15._____ 16._____ 17._____ 18._____

N Items
2 points if N ≥13 or more
1 point if N=8-12
0 point if N= 7 or less

ORIENTATION — (/6)

[ ] time (± 2 hr) [ ] day [ ] month [ ] year [ ] place [ ] city

CALCULATION — (/3)

Provide 3 ways to pay using 1 dollar coins, 5 dollar and 10 dollar bills for an object that costs exactly "13 Dollars" (3 points if 3 ways, 2 points if 2 ways, 1 point if 1 way, 0 point if no correct way)

[ ] 1._____ [ ] 2._____ [ ] 3._____

ABSTRACTION — (/3)

To what category these objects belong to ? (e.g. orange - banana = fruit)

[ ] train - boat [ ] north - south [ ] drum - flute

DELAYED RECALL — (/5)

Points are awarded for recall with No cue (1point for each item)

Recall with	ROSE	CHAIR	HAND	BLUE	SPOON
No cue	[ ]	[ ]	[ ]	[ ]	[ ]
Recall with category cue	[ ]	[ ]	[ ]	[ ]	[ ]
Recall with multiple choice cue	[ ]	[ ]	[ ]	[ ]	[ ]

VISUOPERCEPTION — (/3)

Identify drawings. No more than 60 seconds. See complementary sheet.

scissors	T-shirt	banana	lamp	candle
watch	cup	leaf	key	spoon

3 points if N=9-10
2 points if N=6-8
1 point if N=4-5
0 point if N=0-3
N __

NAMING — (/4)

Identify animals. See complementary sheet. [ ] zebra [ ] peacock [ ] tiger [ ] butterfly

ATTENTION — (/1)

Name the numbers in circles. See complementary sheet. 1 5 8 3 9 2 0 3 9 4 0 2 1 6 8 7 4 6 7 5

ERROR ___ N
No point if 2 errors or more

Name the numbers in circles & squares: 3 8 5 1 3 0 2 9 2 0 4 9 7 8 6 1 5 7 6 4
See complementary sheet. 1 5 8 3 9 2 0 3 9 4 0 2 1 6 8 7 4 6 7 5

ERROR ___ N
2 points if 2 errors or less
1 point if 3 errors
0 point if 4 errors or more

(/2)

END TIME _____

Adapted by : Parunyou Julayanont MD
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Final Version June 04, 2014

TOTAL SCORE (/30)

Add 1 point if education <4 year AND add 1 point if illiterate

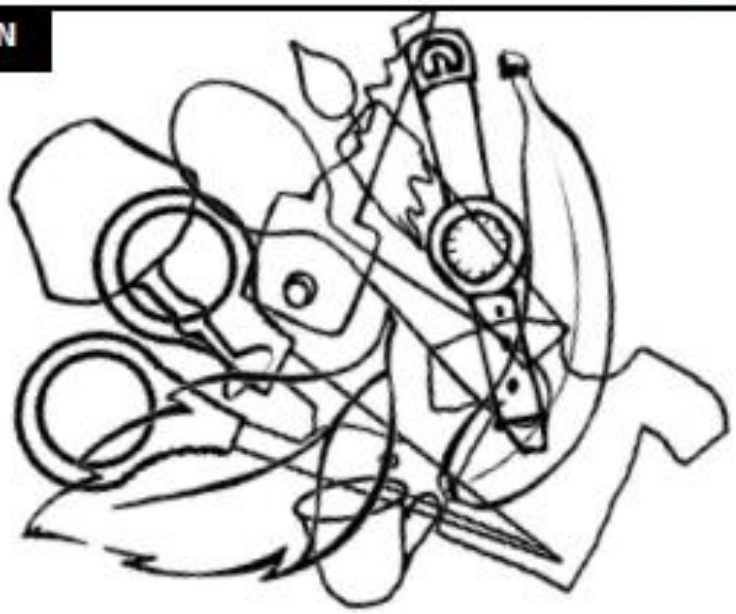
TOTAL TIME ____ min ____ sec

MONTREAL COGNITIVE ASSESSMENT (MOCA-B)

BASIC

COMPLEMENTARY WORKSHEET

VISUOPERCEPTION



NAMING

ATTENTION

1 5 8 3 9 2 0 3 9 4 0 2 1 6 8 7 4 6 7 5

3 8 5 1 3 0 2 9 2 0 4 9 7 8 6 1 5 7 6 4

1 5 8 3 9 2 0 3 9 4 0 2 1 6 8 7 4 6 7 5

Adapted by: Perunyou Julayanont MD Copyright: Z. Nasreddine MD Final Version June 04, 2014

Montreal Cognitive Assessment (MoCA)- BLIND

Administration and Scoring Instructions

The Montreal Cognitive Assessment (MoCA)- BLIND is an adapted version of the original MoCA, a rapid screening instrument for mild cognitive dysfunction. The MoCA-BLIND assesses different cognitive domains: attention and concentration, memory, language, conceptual thinking, calculations, and orientation. It contains the same items as the original MoCA except those requiring visual abilities have been removed. Time to administer the MoCA- BLIND is approximately 5-10 minutes. The total possible score is 22 points; a score of 18 or above is considered normal. This cutoff score is suggestive as it has not been validated thus far.

1. Memory:

Administration: The examiner reads a list of 5 words at a rate of one per second, giving the following instructions: *"This is a memory test. I am going to read a list of words that you will have to remember now and later on. Listen carefully. When I am through, tell me as many words as you can remember. It doesn't matter in what order you say them"*. Mark a check in the allocated space for each word the subject produces on this first trial. When the subject indicates that (s)he has finished (has recalled all words), or can recall no more words, read the list a second time with the following instructions: *"I am going to read the same list for a second time. Try to remember and tell me as many words as you can, including words you said the first time."* Put a check in the allocated space for each word the subject recalls after the second trial.
At the end of the second trial, inform the subject that (s)he will be asked to recall these words again by saying, *"I will ask you to recall those words again at the end of the test."*

Scoring: No points are given for Trials One and Two.

2. Attention:

Forward Digit Span: Administration: Give the following instruction: "*I am going to say some numbers and when I am through, repeat them to me exactly as I said them*". Read the five number sequence at a rate of one digit per second.

Backward Digit Span: Administration: Give the following instruction: "*Now I am going to say some more numbers, but when I am through you must repeat them to me in the backwards order.*" Read the three number sequence at a rate of one digit per second.

Scoring: Allocate one point for each sequence correctly repeated, (*N.B.*: the correct response for the backwards trial is 2-4-7).

Vigilance: Administration: The examiner reads the list of letters at a rate of one per second, after giving the following instruction: *"I am going to read a sequence of letters. Every time I say the letter A, tap your hand once. If I say a different letter, do not tap your hand"*.

Scoring: Give one point if there is zero to one errors (an error is a tap on a wrong letter or a failure to tap on letter A).

Serial 7s: Administration: The examiner gives the following instruction: *"Now, I will ask you to count by subtracting seven from 100, and then, keep subtracting seven from your answer until I tell you to stop."* Give this instruction twice if necessary.

Scoring: This item is scored out of 3 points. Give no (0) points for no correct subtractions, 1 point for one correction subtraction, 2 points for two-to-three correct subtractions, and 3 points if the participant successfully makes four or five correct subtractions. Count each correct subtraction of 7 beginning at 100. Each subtraction is evaluated independently; that is, if the participant responds with an incorrect number but continues to correctly subtract 7 from it, give a point for each correct subtraction. For example, a participant may respond "92 – 85 – 78 – 71 – 64" where the "92" is incorrect, but all subsequent numbers are subtracted correctly. This is one error and the item would be given a score of 3.

3. **Sentence repetition**:

Administration: The examiner gives the following instructions: *"I am going to read you a sentence. Repeat it after me, exactly as I say it* [pause]: ***I only know that John is the one to help today."*** Following the response, say: *"Now I am going to read you another sentance. Repeat it after me, exactly as I say it* [pause]: ***The cat always hid under the couch when dogs were in the room."***

Scoring: Allocate 1 point for each sentence correctly repeated. Repetition must be exact. Be alert for errors that are omissions (e.g., omitting "only", "always") and substitutions/additions (e.g., "John is the one who helped today;" substituting "hides" for "hid", altering plurals, etc.).

4. **Verbal fluency**:

Administration: The examiner gives the following instruction: *"Tell me as many words as you can think of that begin with a certain letter of the alphabet that I will tell you in a moment. You can say any kind of word you want, except for proper nouns (like Bob or Boston), numbers, or words that begin with the same sound but have a different suffix, for example, love, lover, loving. I will tell you to stop after one minute. Are you ready?* [Pause] *Now, tell me as many words as you can think of that begin with the letter F.* [time for 60 sec]. *Stop."*

Scoring: Allocate one point if the subject generates 11 words or more in 60 sec. Record the subject's response in the bottom or side margins.

5. **Abstraction**:

Administration: The examiner asks the subject to explain what each pair of words has in common, starting with the example: *"Tell me how an orange and a banana are alike"*. If the subject answers in a concrete manner, then say only one additional time: *"Tell me another way in which those items are alike"*. If the subject does not give the appropriate response *(fruit)*, say, *"Yes, and they are also both fruit."* Do not give any additional instructions or clarification. After the practice trial, say: *"Now, tell me how a train and a bicycle are alike"*. Following the response, administer the second trial, saying: *"Now tell me how a ruler and a watch are alike"*. Do not give any additional instructions or prompts.

Scoring: Only the last two item pairs are scored. Give 1 point to each item pair correctly answered. The following responses are acceptable:
Train-bicycle = means of transportation, means of travelling, you take trips in both;
Ruler-watch = measuring instruments, used to measure.
The following responses are **not** acceptable: Train-bicycle = they have wheels; Ruler-watch = they have numbers.

6. Delayed recall:

Administration: The examiner gives the following instruction: *"I read some words to you earlier, which I asked you to remember. Tell me as many of those words as you can remember."* Make a check mark (√) for each of the words correctly recalled spontaneously without any cues, in the allocated space.

Scoring: **Allocate 1 point for each word recalled freely without any cues.**

Optional:
Following the delayed free recall trial, prompt the subject with the semantic category cue provided below for any word not recalled. Make a check mark (√) in the allocated space if the subject remembered the word with the help of a category or multiple-choice cue. Prompt all non-recalled words in this manner. If the subject does not recall the word after the category cue, give him/her a multiple choice trial, using the following example instruction, *"Which of the following words do you think it was, NOSE, FACE, or HAND?"*
Use the following category and/or multiple-choice cues for each word, when appropriate:

FACE:	category cue: part of the body	multiple choice: nose, face, hand
VELVET:	category cue: type of fabric	multiple choice: denim, cotton, velvet
CHURCH:	category cue: type of building	multiple choice: church, school, hospital
DAISY:	category cue: type of flower	multiple choice: rose, daisy, tulip
RED:	category cue: a colour	multiple choice: red, blue, green

Scoring: **No points are allocated for words recalled with a cue.** A cue is used for clinical information purposes only and can give the test interpreter additional information about the type of memory disorder. For memory deficits due to retrieval failures, performance can be improved with a cue. For memory deficits due to encoding failures, performance does not improve with a cue.

7. Orientation:

Administration: The examiner gives the following instructions: "Tell me the date today". If the subject does not give a complete answer, then prompt accordingly by saying: *"Tell me the [year, month, exact date, and day of the week]."* Then say: *"Now, tell me the name of this place, and which city it is in."*

Scoring: Give one point for each item correctly answered. The subject must tell the exact date and the exact place (name of hospital, clinic, office). No points are allocated if subject makes an error of one day for the day and date.

TOTAL SCORE: Sum all subscores listed on the right-hand side. Add one point for an individual who has 12 years or fewer of formal education, for a possible maximum of 30 points. A final total score of 26 and above is considered normal.

MONTREAL COGNITIVE ASSESSMENT / MoCA-BLIND

Version 7.1 Original Version

Name:
Education:
Sex:
Date of birth:
Date:

MEMORY		FACE	VELVET	CHURCH	DAISY	RED	**POINTS**
Read list of words, subject must repeat them. Do 2 trials even if 1st trial is successful. Do a recall after 5 minutes.	1st trial						No points
	2nd trial						

ATTENTION

Read list of digits (1 digit/sec.) Subject has to repeat them in the forward order [ ] 2 1 8 5 4

Subject has to repeat them in the backward order [ ] 7 4 2 ___/ 2

Read list of letters. The subject must tap with his hand at each letter A. No point if ≥ 2 errors

[ ] F B A C M N A A J K L B A F A K D E A A A J A M O F A A B ___/ 1

Serial 7 subtraction starting at 100

[ ] 93 [ ] 86 [ ] 79 [ ] 72 [ ] 65

4 or 5 correct subtractions: **3 pts**, 2 or 3 correct: **2 pts**, 1 correct: **1 pt**, 0 correct: **0 pt** ___/ 3

LANGUAGE

Repeat: I only know that John is the one to help today. [ ]

The cat always hid under the couch when dogs were in the room. [ ] ___/ 2

Fluency / Name maximum number of words in one minute that begin with the letter F.

[ ] _____ (N ≥ 11 words) ___/ 1

ABSTRACTION

Similarity between e.g. banana - orange = fruit [ ] train - bicycle

[ ] watch - ruler ___/ 2

DELAYED RECALL	Has to recall words	FACE	VELVET	CHURCH	DAISY	RED		
	With no cue	[ ]	[ ]	[ ]	[ ]	[ ]	Points for UNCUED recall only	___/ 5
Optional	Category cue							
	Multiple choice cue							

ORIENTATION [ ] Date [ ] Month [ ] Year [ ] Day [ ] Place [ ] City ___/ 6

© Z. Nasreddine MD **www.mocatest.org** Normal ≥ 18 / 22

TOTAL ___/ 22

Add 1 point if ≤ 12 yr edu

Administered by:_____

Frequently Asked Questions

Administration

Who can administer the MoCA?
The test may be administered by anyone who understands and follows the instructions, but only a health professional with expertise in the cognitive field may interpret the results.

May test instructions be repeated?
Test instructions may be repeated once. Items tested on (the list of words, list of digits, list of letters, subtraction answers and phrases to repeat) may not be repeated.

Normative Data

What age group has the MoCA been validated for?
The MoCA has been validated for 55-85 year olds. For more information, please see the Normative Data section of the MoCA website.

Where can I get information on the test's validity and reliability?
You may refer to the Normative Data section and References section of the MoCA website.

Scoring

Can a subject use any aids for the calculation task?
The calculation must be performed mentally; therefore, the subject may not use his/her fingers nor a pencil and paper to execute the calculation task.

Does the subject receive a point for the contour of the clock if the numbers are organized in a circular manner but the circle is not drawn?
No, a circle must be drawn.

In the Memory section of the test, can more trials be administered if the subject is not able to encode all the words within the two trials?
No, only two trials are permitted.

How do I correct the score for education?
If the subject has 12 years of education or fewer, a point is added to his/her total score. Note that this number of years does not refer to a particular education level, for example, it does not refer to individuals that have or have not completed high school. The number of years of education must actually be counted starting after kindergarten (kindergarten must not be included in the count). Please note that the maximum score is 30, therefore, if a subject scores 30/30, a point is not added if he/she has 12 years of education or less.

Alternative Versions

When should versions 7.2 and 7.3 be used?
The alternative/equivalent versions of the MoCA should be used to decrease possible learning effects when the MoCA is administered repetitively, for example, every 3 months or less.

Interpretation of the MoCA

Who can interpret the MoCA?
Only a health professional with expertise in the cognitive field may interpret the results.

What are the severity levels for the MoCA?
The following ranges may be used to grade severity: 18-26 = mild cognitive impairment, 10-17= moderate cognitive impairment and less than 10= severe cognitive impairment. However, research for these severity ranges has not yet been established.

Is there a cut-off score between mild cognitive impairment (MCI) and Alzheimer's disease (AD)?
The cut-off score of 18 is usually considered to separate MCI from AD but there is overlap in the scores since, by definition, AD is determined by the presence of cognitive impairment in addition to loss of autonomy. The average MoCA score for MCI is 22 (range 19-25) and the average MoCA score for Mild AD (11-21).

MoCA-Basic

When would I use the MoCA-Basic?
When subjects are illiterate or have low education (less than 5 years).

Why is the Executive Function task upside down?
This was done purposefully to reduce test sheet manipulation. The administrator can simply slide the test sheet across the table to the subject for him/her to perform this task.

MoCA-Blind

How do I score the MoCA-Blind?
The MoCA Blind is scored out of 22 but is converted back to 30. Example: 19/22 converts back to 30 by performing the following equation: (19×30) ÷ 22. The total converted score is 25.9 or 26/30 which is considered in the normal range. Note that this conversion has not been validated. Please see the validation study for this version in the References section of the MoCA website.

MoCA-Mini

A short, 5-minute version of the test is in development. This version will cover mostly memory and executive functions. More information about the MoCA Mini will be available soon at www.mocatest.org

Electronic MoCA

An electronic version that can be completed on a tablet is in development. More information about electronic tests will be available soon at www.mocatest.org

Physical Disability

How can I score the test if the subject is unable to complete the written portion of the test because of a physical disability such as hemiplegia?

The test may be scored out of 25 and converted back to 30. Example: 21/25 converts back to 30 by performing the following equation: (21×30) ÷ 25. Total converted score is= 25.2 or 25/30 which is considered in the normal range. Please note that this conversion has not been validated.

Test-Retest

What is the test-retest time frame?

The test retest performance is very good at even one month with no significant learning effect. The alternative/equivalent versions of the MoCA should be used to decrease possible learning effects when the MoCA is administered repetitively, for example, every 3 months or less.

Reference

Montreal Cognitive Assessment. (2016). Retrieved from

http://www.mocatest.org/

Appendix B
Pre- and Post- In-service Surveys

Administering the Montreal Cognitive Assessment (MoCA) Initial Survey

How often do you administer the MoCA?

____ 1 or more times per week

____ A couple times per month

____ A couple times per year

____ I do not use the MoCA

Have you received previous training on MoCA administration procedures?

____ Yes

____ No

How confident are you in your ability to correctly administer the MoCA? Please indicate your level of confidence on a scale from 1 to 10. (1 = not confident at all, 10 = completely confident)

1 2 3 4 5 6 7 8 9 10

Which cognitive screening tool(s) (MoCA, SLUMS, ACLS, MMSE, etc.) do you use most often and why?

_____

_____

_____

_____

Administering the Montreal Cognitive Assessment (MoCA)

Post In-service Survey

How confident are you in your ability to correctly administer the MoCA following this in-service presentation? Please indicate your level of confidence on a scale from 1 to 10. (1 = not confident at all, 10 = completely confident)

1 2 3 4 5 6 7 8 9 10

Do you think you will utilize the MoCA more often given the information presented?

____ Yes

____ No

____ Maybe

Please briefly indicate why you selected the answer above:

_____

_____

_____

_____

Thank you for your responses!

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_____ Date: 5/12/16

Liliya Bachinskaya, OTS

_____ Date: 5/12/16

Alina Muller, OTS

_____ Date: 5/12/16

Sally Winkel, OTS