

## NINDS/NICHD-NCMRR NeuroRehab CDE Project Cognitive Subgroup Summary

The subgroup was assigned a list of existing NINDS CDE subdomains within their purview. The subgroup Chairs combined overlapping subdomains and edited titles for clarity. The existing NINDS CDE instruments assigned to the subgroup for review were allocated to the subdomains. The Chairs reviewed the list of measures and determined which should be reviewed by the Emotion Behavior Neuropsychology and Infant Pediatrics subgroups. Chairs made subdomain reviewer assignments based on volunteers and areas of expertise.

The subgroup expanded upon the NeuroRehab project instrument selection and classification criteria, to include factors specific to the cognition. Additional factors include availability of appropriate norms; specific abilities assessed; no significant floor/ceiling effects; practice effects minimal, and/or reduced by available alternate forms or norms; documented sensitivity to change.

Reviewers presented their feedback during teleconferences and the subgroup reached a consensus on the instruments to recommend for each subdomain. All the subgroup’s recommendations were classified as Supplemental – Highly Recommended. There were no NeuroRehab Core measures since not all diseases are vulnerable to cognitive impairments.

Measures selected to assess change in cognitive abilities over time would be different across intervention, natural course/history, and disease progression studies.

The subgroup reviewed measures for the adult population only. A separate Infant Pediatrics subgroup reviewed measures for the pediatric population. The subgroup discussed that within the adult population there are some assessments which may be appropriate for specific age ranges, but these specific recommendations were determined to be beyond the subgroup’s scope. The subgroup’s recommendations are broadly applicable to adult-onset neurocognitive conditions. Comments regarding use of measures for specific population, such as those with limited vision, motor function, or reading level, are noted within the instrument Notices of Copyright.

There are no formal neurorehabilitation standards established to which the CDEs can be compared.

The subgroup noted unique characteristics of NeuroRehab cognitive measures like test-retest reliability, practice effects, and multiple versions. Rehabilitation was considered as a general phenomenon that should be applicable across the different diseases. Reviewers looked globally at how an individual is functioning both in terms of performance and in real life.

### Summary of Recommendations

Subdomain	Instrument
Academic/Intellectual Functioning	Test of Premorbid Functioning
	Wechsler Adult Intelligence Scale - Fourth Edition (WAIS-IV)
	Word Reading Subtest of the Wide Range Achievement Test (WRAT-4)
Amnesia/Coma	Galveston Orientation and Amnesia Test (GOAT)
	JFK Coma Recovery Scale- Revised
Attention/Working Memory	Letter-Number Sequencing Subtest
	NIH Toolbox Flanker Inhibitory Control Attention Test
	Wechsler Adult Intelligence Scale-Fourth Edition (WAIS-IV) - Digit Span Subtest

Subdomain	Instrument
Cognitive Activity Limitations	Functional Independence Measure - Cognition Subscale (Cog-FIM)
	PROMIS Item Bank v2.0 - Cognitive Function
	PROMIS Item Bank v2.0 - Cognitive Function Abilities Subset
Cognitive Assessment	Brief Test of Adult Cognition by Telephone (BTACT)
	NIH Toolbox Cognitive Battery
	Repeatable Battery for Assessment of Neuropsychological Status (RBANS)
Executive Functioning	Five-Point Test (5-PT)
	Stroop Test - Incongruent
	Trail Making Test (TMT), Part B / Delis-Kaplan Executive Function System (D-KEFS) Trail Making Test, Condition 4
Eye Hand Motor	Grooved Pegboard Test
Language	Animal Naming/Fluency
	Controlled Oral Word Association Test (COWAT) Subtest of the Multilingual Aphasia Examination (MAE)
	Token Test
Memory	Brief Visuospatial Memory Test Revised (BVMT-R)
	Hopkins Verbal Learning Test - Revised (HVLN-R)
	Rey Auditory Verbal Learning Test (RAVLT)
Performance Validity Tests	Medical Symptom Validity Test (MSVT)
	Test of Memory Malingering (TOMM)
	Victoria Symptom Validity Test (VSVT)
Processing Speed	Processing Speed Index of the Wechsler Adult Intelligence Scale-Fourth Edition (WAIS-IV)
	Symbol Digit Modalities Test
	Trail Making Test (TMT), Delis-Kaplan Executive Function System (D-KEFS) Trail Making Test
Screening	Mini-Mental State Examination (MMSE)
	Montreal Cognitive Assessment (MoCA)
	Telephone Interview for Cognitive Status (TICS)
Visual	Judgment of Line Orientation (Benton JLO)
	Rey-Osterrieth Complex Figure Test (ROCF)

### Gap Areas

For NeuroRehab v1.0, the subgroup focused their review on existing NINDS/NIH CDE recommendations to determine what is relevant to neurorehabilitation research. The subgroup noted the need for new subdomains and instrument recommendations, which for this phase of the project are designated as Gap Areas. The subgroup identified the following Gap Areas in their review.

Instrument	Subdomain	Comments
Digit Vigilance	Attention/Working Memory	
Coding subtest from WAIS	Processing Speed	
Symbol search subtest from WAIS	Processing Speed	

Instrument	Subdomain	Comments
NIH Examiner	Executive Functioning	Theory-based, non-proprietary, computerized, normally distributed with IRT-based composite scores; does not have norms (intended for research)
Rancho Los Amigos Scale	Amnesia/Coma	
Multiple Errands Test	Cognitive ADL, Executive functioning and functional performance (standardized everyday functioning)	Can be used with those who have mild cognitive deficits and will identify some high-level executive function.
Executive Functional Route Finding Test	Cognitive ADL, Executive functioning and functional performance (standardized everyday functioning)	Performance based screening of executive function
Kettle Test	Cognitive ADL, Executive functioning and functional performance (standardized everyday functioning)	Evaluates ability for independent community living, screening measure based on cueing required. Used in strokes and older adults
Executive Function Performance Test	Cognitive ADL, Executive functioning and functional performance (standardized everyday functioning)	Performance based standardized assessment of executive functioning using everyday tasks, based on cueing
Assessment of Motor and Process Skills	Cognitive ADL, Executive functioning and functional performance (standardized everyday functioning)	Standardized performance-based observation assessment that allows for identification of cognitive difficulties impacting ADL and IADL
Weekly Calendar Planning Activity	Cognitive ADL, Executive functioning and functional performance (standardized everyday functioning)	Performance based screening of executive function
Activity Card Sorting Test	Cognition and functional cognition	Self-report test related to activities of daily living
	Social Cognition	An important subdomain because many disorders have deficits associated with it, especially psychiatric and substance use disorders.
	Theory of Mind	
	Language	Pragmatic language is associated with social cognition, sometimes falling under language assessment.
	Alexithymia	
	Frailty	Frailty index or medical comorbidity index is a great indicator of cognition.