



## PRINCIPLES OF TEST USAGE IN CLINICAL NEUROPSYCHOLOGICAL ASSESSMENT

This document consists of two sections:

1. **Conceptual Underpinnings (pages 1 to 3)**
2. **Framework for a Comprehensive Test Selection (pages 4 to 6)**

### 1. CONCEPTUAL UNDERPINNINGS

In modern clinical neuropsychology (Lezak et al., 2012), **the choice of tests is based on a hypothesis testing model of neuropsychological evaluation, and not a psychometric model.** The orientation, therefore, is functional rather than test-based, and there is no set test battery, or specifically prescribed test that should be used in this context. Test scores should **never** be used in isolation. They form part of an overall data base including the clinical history and observations of the patient derived on interview and during testing.

Test choice is dependent on: (i) the nature of the brain injury, and (ii) the type of evaluation. The type of evaluation can broadly be divided into two modes of assessment: (i) **screening** and (ii) **comprehensive** modes of assessment.

#### Screening Assessment

Brief screening for the presence and extent of brain impairment, and/or or screening to acquire an estimate of general intellectual ability, should always be viewed as **preliminary**, usually warranting more comprehensive testing to confirm and elaborate findings arising out of the initial screening.

Screening tests may include a tool such as Folstein's Mini Mental State Examination, or the use of one or two single tests in isolation, that are frequently impaired in the presence of diffuse brain injury, such as the Wechsler Digit Symbol Coding, Symbol Digit Modalities and/or the Trail Making test. Cursory measures used to estimate a general level of intellectual ability are the Ravens Progressive Matrices, or the Goodenough Draw-a-Person test. Such cursory testing should never be considered anything but extremely preliminary, requiring referral for more comprehensive psychometric evaluation. Where life-changing circumstances are dependent on the investigation, for instance in a medico-legal disability claim, such screening examinations used in isolation can be considered a scientifically and ethically unacceptable modus operandi on which to base final recommendations.

Some longer screening tests include computerized programmes such as the Cambridge Brain Sciences test, the Vienna test system, the CNS Vital Signs test, the ImPACT test. These tests are **suitable for use as screening instruments, as serial assessments, or as part of a more comprehensive neuropsychological**



**assessment that includes contextualization in a clinical history, mental state examination, and the possible use of additional tests. They are not a substitute for a full clinical neuropsychological evaluation, and are not diagnostic in their own right.**

The purpose of an initial screening might be to acquire a quick, economical indication of the presence of brain dysfunction where this is suspected, for instance in a hospital setting, to guide the need for follow-up evaluation. **If applied, the limitation of such screening evaluation should always be clearly noted.**

### **Comprehensive Assessment**

It has long been recognized that there is no single test, brief screening test, or even a comprehensive set battery of tests that can rule in, or rule out the presence of brain damage (Lezak et al., 2012). That discredited route was based on the assumption of brain injury being a "single entity", or an entirely predictive entity. However, brain injury is correctly recognized as a multi-faceted phenomenon, and, depending on the nature and extent of the injury, it requires an individualized, case-related investigation.

Typically, a comprehensive examination would take into consideration the need to investigate a spectrum of functional modalities, in each case including an up to date selection of tests, recently approved and recommended for use within the national and international neuropsychological academic communities. Brief screening tests may be incorporated into a comprehensive battery if it is considered that they can add clinically relevant data in the overall evaluation. However, as indicated above, these should not serve in place of a more in-depth evaluation. Tests chosen should be demographically appropriate with respect to variables such as age, language of origin, level and quality of education, and where this is not possible for some reason the limitation of the test choice should be noted.

In short, a comprehensive test battery should be motivated in terms of: (i) the pathology being investigated, and (ii) the demographic characteristics of the case. To exemplify this approach, a SACNA approved test framework is provided below (pages 3 – 4). **It is important that the tests listed are not seen to be prescriptive. This is not an exclusive, or all-inclusive list, but merely serves to exemplify tests that fall within the ten functional parameters that have been delineated here that can be considered as a sound basis for a comprehensive test selection.**

It is the responsibility of a clinician to be knowledgeable about the most recent advances in assessment tools, and the relevant cross-cultural literature particularly as this relates to test norming for valid assessment practices in a multicultural and multilingual milieu. If an earlier version of a test rather than the latest edition is used, due motivation for its use must be supplied. For example, a reason might be that the



earlier test content is more suitable for a particular case, and/or there are more demographically relevant norms.

**Motivation for test usage should be based on carefully argued scientific grounds, regardless of whether a test is cited in a particular text, or listed as an HPSCA registered test. Any source or listing is open to critical review on conceptual grounds, and may for instance be outdated. On scholarly grounds, the applicability of a listed test might not be upheld for valid clinical application in a particular case.**

Importantly, whatever test is used, whether listed below or not, it must be applied in a scholarly manner, taking into account the test's uses, its particular strengths and limitations, and available norm bases, as described in the core texts of Lezak et al. (2012), Strauss et al. (2006), and Mitrushina et al. (2005). As can be gleaned from these texts, there are multiple possible test choices that might be called upon to carry out particular assessment tasks, or target various functions. Clinicians are encouraged creatively and critically to use the template that follows as a guide in the development of their own test kit.

A recommended approach is to use one of the internationally recognized Wechsler intelligence tests to provide broad coverage of various core functions, some of which can yield an indication of premorbid intellectual ability. The Wechsler test might be used in conjunction with one or more of the brief screening tests for added information, but should not be replaced by any of them. In addition, the comprehensive Wechsler intelligence test should be accompanied by a series of tests in specialized areas that warrant in-depth investigation for the particular case in question.

### **Remote Testing**

In situations where only remote testing is possible, it may be useful to employ a computerized test that offers a mechanism to apply remote testing, rather than not to test at all. *It goes without saying that use of a computerized test, especially under remote conditions, is only a consideration where it is certain that the examinee is computer literate.* If a psychologist uses a computerized instrument for any purpose, all the same norming issues would apply as with our other US based tests. Therefore, in the absence of local norms, one should be extremely cautious about using such a test on educationally disadvantaged individuals for whom the US norms would have dubious validity. On the other hand the norms are likely to be suitable for use with English speaking South Africans or even African first language individuals coming from educationally advantaged backgrounds.

If the route of remote computerized testing is taken, all the normal ethical considerations for telecommunication interventions should apply, and an evaluation of the strength and weaknesses of using the test for a particular purpose need to be clearly stated in the report. For instance, if a test does not include any measure of



old acquired learning on which to base an estimate of premorbid ability, this might nevertheless be gleaned from taking a comprehensive educational and occupational history; possible indicators from the test scatter itself; getting the add-on of some telephonic testing of verbal functions from the Wechsler tests (such as Similarities and Comprehension).

The usual concerns about acquiring a valid assessment under computerized remote testing situations need to be considered and addressed. If any problems are suspected in that regard, as in any regular testing situation, these need to be specified in the report, and/or the test should be re-administered while taking due account of practice effects. As with any neuropsychological assessment, the use of a remote computerized test does not obviate the need to contextualize the test findings within a comprehensive history and mental state examination to the extent that this is possible via telecommunication.

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## 2. FRAMEWORK FOR A COMPREHENSIVE TEST BATTERY

### **DISCLAIMER:**

***This is not an exclusive, or all-inclusive list, but merely serves to exemplify tests that fall within the functional parameters that have been delineated here to serve as a framework for a comprehensive test selection. SACNA does not uphold the notion of a set test battery, but rather advocates the use of an individualized test battery that is compiled to answer a specific question, and that is demographically appropriate for use with a specific examinee. Therefore, the listed tests are suggested options for consideration in a particular case evaluation, rather than an endorsement of their use by SACNA per se. The choice of tests for use in any setting, whether it be for clinical, educational or medico-legal purposes, is the professional responsibility of the practitioner, who must review the empirical merits and shortcomings of any psychometric test they wish to employ as part of such an individualized evaluation, and be in a position to support its use on empirical grounds.***

The list will be reviewed, updated and extended from time to time by the SACNA executive, being responsive to clinical and scholarly feedback, and ongoing developments in the field.



## GENERAL FUNCTIONS

The tests are listed from more to less comprehensive evaluation:

### 1. In Depth Tests of General Cognitive Ability

**(These tests cover a spectrum of functional modalities in some depth including tests of old acquired learning on which to base a premorbid estimate)**

Wechsler Adult Intelligence Scale (Adult) (Latest Edition)  
Wechsler Intelligence Scale for Children (Latest Edition)  
Wechsler Pre-School and Primary Scale of Intelligence (Latest Edition)  
Early Learning Outcomes Measure (ELOM)

### 2. In Depth Test of Neurocognitively Oriented Ability

**(This test covers a spectrum of functional modalities in some depth that are sensitive to brain impairment, but does not tap into tests of old acquired learning on which to base a premorbid estimate)**

NEPSY-II

### 3. Computerized Tests of Cognitive Ability

**(These tests cover a spectrum of functional modalities that are sensitive to brain impairment but do not tap into tests of old acquired learning on which to base a premorbid estimate; they can be administered in remote applications)**

Cambridge Brain Sciences (CBS)  
CNS Vital Signs (CNS VS)  
Vienna Test System  
ImPACT Computerized Test

### 4. Brief Paper and Pencil General Screening Tests

**(These tests provide cursory examination of a spectrum of cognitive functions)**

CANTAB  
Montreal Cognitive Assessment (MoCA)  
Mini-Mental State Examination (MMSE)



## 5. Minimalist Paper and Pencil Screening Tests of Cognitive Ability

(These tests provide an extremely limited indicator of non-verbal ability only)

Ravens Progressive Matrices  
Goodenough Draw-a-Person Test

### SPECIFIC FUNCTIONS

Subtests from the tests of 'General Function' listed above, will apply to areas of specific function as listed below, but are not listed again, e.g. Digit Span for attention; Digit Symbol Coding for visuospatial speeded function; processing speed or memory components of the CNS Vital Signs or ImPACT computerized tests. What follows are lists of additional tests within areas of specific functional modalities.

Importantly, there are very few, if any tests that apply purely to any one modality, and some might be listed across several modalities. Such tests have been listed according to a primary aspect called upon to complete the test. The tests appear in an order that is recommended for report writing purposes, with broad modalities clustered together, and modalities that are dependent on more primary modalities appearing later than the underlying modality (e.g. language functions precede verbal memory; unspeeded visuospatial ability precedes visual memory).

#### 1. Tests of Hand Motor Function

Finger Tapping Test  
Purdue Pegboard  
Grooved Pegboard

#### 2. Tests of Visuospatial Ability (Unspeeded)

Beery Beery-Buktenica Developmental Test of Visual-Motor Integration (Latest Edition)  
Bender Visual-Motor Gestalt Test  
Hooper Visual Organization Test (VOT)  
Rey Complex Figure Test  
Raven's Progressive Matrices Test



### **3. Tests of Visuospatial Ability (Speeded)**

Symbol Digit Modalities Test (Oral and Written)  
Trail Making Test (Child and Adult)  
Colour Trails Test  
Design Fluency Test

### **4. Tests of Verbal Function**

Boston Naming Test  
Letter/Phonemic Verbal Fluency Tests (FAS; S(I)BL)  
Category/Semantic Verbal Fluency Tests (Fruit, Animals)  
Unstructured Verbal Fluency Test (Words in one minute)  
Token Test

### **5. Tests of General Memory Function (Verbal and Visual)**

Wechsler Memory Scale (Latest Edition).  
Repeatable Battery for the Assessment of Neuropsychological Status (Latest Edition)

### **6. Tests of Verbal Memory**

Tests of verbal memory in the Wechsler Memory Scale, e.g.  
Associate Learning; Logical Memory  
Rey Auditory Verbal Learning Test  
Frances Hemp Shopping List  
Selective Reminding tests

### **7. Tests of Visual Memory**

Tests of intentional memory in the Wechsler Memory Scale, e.g.,  
Visual Reproduction

Tests of visual learning

Rey Visual Designs Learning Test (RVDLT)  
Brief Visuospatial Memory Test-Revised (BVRT)

Tests of incidental recall used as adjuncts to the standard administration of a test, e.g.

Digit Symbol Incidental Recall (Immediate and Delayed)  
Bender Gestalt Recall, Wepner administration (Immediate and Delayed)  
Rey Complex Figure Recall (Immediate and Delayed)



**A test of incidental recall should never be used as the only memory test. Lack of intention to recall, as well as the functions called upon to complete the standard administration of the test, may explain poor performance.**

#### **8. Tests of Working Memory**

- Letter-Number Sequencing
- Digit Span Backwards
- Paced Auditory Serial Attention Test
- Trail Making Test Part B

#### **9. Tests of Executive Function**

- Tower of London
- Wisconsin Card Sorting Test
- Stroop Test
- Go No-Go Task
- Luria Motor Sequences
- Porteus Maze Test
- Delis Kaplan Executive Function System (D-KEFS)

#### **10. Tests of Attention, Concentration and Vigilance**

- Corsi Block-Tapping Test
- Cancellation Test (Letter and Bells)
- A continuous performance task (like the Connor)

#### **11. Tests of Effort**

- Test of Memory Malingering (TOMM)
- Rey 15 Item Test
- Hiscock Forced-Choice Test





## REFERENCES

- Lezak, M., Howieson, D., Bigler, E., & Tranel, D. (2012). *Neuropsychological Assessment* (5<sup>th</sup> ed.). Oxford: Oxford University Press, Inc.
- Mitrushina, M. N., Boone, K. B., Razani, L. J., & D'Elia, L. F. (2005). *Handbook of normative data for neuropsychological assessment* (2<sup>nd</sup> ed.). New York: Oxford.
- Strauss, E., Sherman, E. M. S., & Spreen, O. (2006). *A compendium of neuropsychological tests* (3<sup>rd</sup> ed.). Oxford: Oxford University Press.

## NOTE

Basic template prepared by Ann Edwards with additions by members of the prevailing SACNA executive including Annelies Cramer, Frances Hemp, Menachem Mazabow, Trevor Reynolds, Sharon Truter (first submission October 2018; updated January 2021).