



## GUIDELINES ON 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 8)**

### 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. Assessments are individualized, yielding test scores which form part of an overall data base including the clinical history and observations of the examinee derived on interview and during testing. The type of evaluation can broadly be divided into two modes of assessment: (i) **screening** and (ii) **comprehensive.**

#### Screening Assessment

Brief screening for the presence and extent of brain impairment, and/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.

Frequently employed paper-and-pencil screening measures include the Mini Mental State Examination (MMSE) or the Montreal Cognitive Assessment (MoCA). Single tests that are frequently impaired in the presence of diffuse brain injury can also be used for screening, such as the Wechsler Digit Symbol Coding, Symbol Digit Modalities or Trail Making tests. 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 preliminary, requiring referral for more comprehensive psychometric evaluation where a problem is indicated.** Where life-changing circumstances are dependent on the investigation, for instance in a medico-legal disability claim, screening measures such as these used in isolation are not a valid basis for a final opinion.

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.

**Screening with Remote Testing.** In situations where only remote testing is possible, it may be useful to employ a computerized test that offers a mechanism for 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- or UK-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 such norms would have dubious validity. On the other hand, US- or UK-based norms for English speaking individuals are likely to be suitable for use with English speaking South Africans and African first language individuals coming from educationally advantaged backgrounds.

If remote computerized testing is undertaken, 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 needs 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, indications from the test scatter itself, or doing some additional telephonic testing of verbal functions from the Wechsler tests (such as Similarities and Comprehension). 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. If the validity of a particular remote assessment is suspected this needs to be specified in the report, and/or the test should be re-administered while taking due account of practice effects.

In sum, the purpose of screening whether in person, or by remote testing might be to acquire a quick, economical indication of the presence of brain dysfunction where this is suspected, for instance in hospital settings, or in sports concussion management settings, to guide the need for follow-up evaluation, or where remote test applications are called for. This type of assessment used in isolation provides pointers for further investigation rather than being diagnostic. 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 the presence of brain damage in or out (Lezak et al., 2012). That is a discredited route based on the assumption that brain injury is a “single entity”, or an entirely predictive entity. 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 recommended for use within the national and international neuropsychological academic communities. Brief screening tests may be incorporated into a comprehensive battery if 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 for core influential 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.

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 defensible scientific grounds, regardless of whether a test is cited in a particular text or listed as an HPSCA registered test. In other words, being listed is not a defensible reason for the use of a test. Any source or listing is open to critical review in terms of its applicability in a particular case. As delineated in the core texts of Lezak et al. (2012), Sherman et al. (2020), and Mitrushina et al. (2005) there are multiple possible test choices that might be called upon to carry out assessment tasks.

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. A Wechsler intelligence test might be used in conjunction with one or more of the brief screening tests of general cognitive ability 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 case in question. To exemplify this approach, a SACNA approved test framework is provided below.

**It is important that the tests listed are not seen to be prescriptive. Moreover, this is not an exclusive way of categorizing tests, and nor is it an all-inclusive list of tests.**<sup>1</sup> Clinicians are encouraged creatively and critically to use the template that follows below as a guide in the development of their own test kit. **The use of the latest editions of a test are usually preferred**, unless there is a defensible reason for the use of an earlier edition, such as the availability of more relevant norms, or more suitable test content for a particular situation.



## 2. FRAMEWORK FOR A COMPREHENSIVE TEST BATTERY <sup>1</sup>

The template is divided into two parts:

- (i) 'General Functions' which lists tests that incorporate a spectrum of cognitive abilities;
- (ii) 'Specific Functions' including tests that cover more discrete cognitive abilities.

**When investigating ability within the various modalities, be aware of possible impairment in a related function that might explain diminished test performance.**

In the modality of motor function, consider apraxia as well as physical injury to the arm and hands. Low levels of literacy can affect many tests and it should be checked whether the examinee knows the alphabet, can count sequentially (e.g. to complete a test such as Trail Making Test) and can read and write. For functions that involve a visual component, such as visuospatial perception and visual memory, check whether an examinee is visually compromised in any way, and that spectacles are being used during testing if these are needed. Similarly, review the hearing status of an examinee for all tasks involving auditory function, especially in the verbal memory modality, to ensure that hearing loss is not diminishing optimal test performance.

### GENERAL FUNCTIONS

Tests that include a spectrum of general cognitive abilities, 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)  
Wechsler Intelligence Scale for Children  
Wechsler Pre-School and Primary Scale of Intelligence  
Wechsler Abbreviated Scale of Intelligence  
Early Learning Outcomes Measure (ELOM)



## 2. In Depth Tests of Neurocognitively Oriented Ability

**These tests cover a spectrum of functional modalities in some depth that are sensitive to brain impairment, but do not necessarily tap into tests of old acquired learning on which to base a premorbid estimate**

NEPSY-II  
Kaufman Assessment Battery for Children

## 3. Computerized Tests of Cognitive Ability

**These tests cover a spectrum of functional modalities that are sensitive to brain impairment but do not necessarily tap into tests of old acquired learning on which to base a premorbid estimate**

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 extremely cursory examination of a spectrum of cognitive functions to provide pointers for further investigation, and should never be used in isolation for diagnostic purposes**

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

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

**These tests provide a limited indication of non-verbal intellectual ability**

Ravens Progressive Matrices  
Goodenough Draw-a-Person Test

## SPECIFIC FUNCTIONS

What follows are lists of possible tests to choose from categorized within areas of specific functional modalities. Many subtests contained within the tests of 'General Function' apply to areas of specific function as delineated below, but are not listed again, e.g. Wechsler Intelligence Scale Digit Span and Digit Symbol Coding for



attention and visuospatial speeded function, respectively; processing speed and memory components of the CNS Vital Signs or ImPACT computerized tests.

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. Modalities that are dependent on more primary modalities are listed later than the underlying modality (e.g. verbal functions precede verbal memory; unspeeded visuospatial perception precedes visual memory).

### **1. Tests of Motor Function**

- Finger Tapping Test
- Purdue Pegboard
- Grooved Pegboard
- Coin Rotation Test
- Screening for Apraxia

### **2. Tests of Visuospatial Perception (Unspeeded)**

- Beery-Buktenica Developmental Test of Visual-Motor Integration
- Bender Visual-Motor Gestalt Test
- Hooper Visual Organization Test (VOT)
- Rey Complex Figure Test
- Modified Taylor Complex Figure Test
- Raven's Progressive Matrices Test
- Judgement of Line Orientation
- Drawing a Clock; Bicycle; Human Figure

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

- Symbol Digit Modalities Test (Oral and Written)
- Trail Making Test (TMT) (Child and Adult)
- Color Trails Test (CTT)
- Children's Color Trails Test (CCTT)
- Design Fluency Test
- Five Point Test
- Bells Cancellation Test





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

Boston Naming Test  
Letter/Phonemic Verbal Fluency Tests (e.g. FAS; S(I)BL)  
Category/Semantic Verbal Fluency Tests (e.g. Fruit, Animals)  
Unstructured Verbal Fluency Test (One-Minute Word Naming Test)  
Token Test  
Screening of Reading and Writing

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

Wechsler Memory Scale (WMS)  
Repeatable Battery for the Assessment of Neuropsychological Status

#### **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 (RAVLT)  
Hopkins Verbal Learning Test - Revised  
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, e.g.  
Rey Visual Designs Learning Test (RVDLT)  
Brief Visuospatial Memory Test-Revised (BVMT-R)

Tests of incidental recall added on to the standard test administration, 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 (TMT B)  
Screening for basic numerical and alphabetical knowledge

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

Tower of London  
Wisconsin Card Sorting Test  
Stroop Test (e.g. Stroop Color and Word Test and Victoria 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 Tests  
A continuous performance task (like the Connor)

## **11. Tests of Effort**

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

Many standard tests have embedded components that can be used to evaluate effort, e.g. RAVLT, BVMT-R, TMT, Digit Span, WMS Associate Learning.

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## 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.
- Sherman, Tan & Hrabok (2020). *A Compendium of Neuropsychological Tests. Fundamentals of Neuropsychological Assessment and Test Reviews for Clinical Practice* (4<sup>th</sup> ed.). Oxford: Oxford University Press.

## Notes:

<sup>1</sup>DISCLAIMER: The list of functional modalities and tests delineated here is not exclusive, or all-inclusive. Rather the aim has been to exemplify tests that fall within various functional parameters and thereby provide a conceptually coherent framework for a reasonably 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 which 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, neuropsychological or medico-legal purposes, is the professional responsibility of the practitioner, who must review the 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.

<sup>2</sup>Basic template prepared by Ann Edwards with additions by members of the prevailing SACNA executive committees, including Annelies Cramer, Frances Hemp, Menachem Mazabow, Trevor Reynolds, Sharon Truter (first submission October 2018; updated October, 2021).