# HIV and the Central Nervous System – Diagnosing HAND


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# HIV neurobehavioural disturbances

## HIV Associated Neurocognitive Disorders (HAND)

**Primary HAND**
- Asymptomatic neurocognitive impairment
- Mild neurocognitive disorder
- HIV-associated dementia

**Secondary HAND**
- Infection
- Neoplasia
- Cerebrovascular
- Nutritional
- Treatment related

## Emotional & behavioral impact

**New Onset**
- Depression
- Anxiety
- Adjustment disorders
- HIV mania
- HIV psychosis

**Pre-exist / recurrent / comorbid**
- Mood disorders
- Substance use disorders
- Other mental disorders

**Modified according to Igor Grant, San Diego**

# How can clinicians identify patients at greater risk of HAND? (Modified after Mind Exchange, Prague, 2014)

| Disease | Treatment | Co-morbidities | Demographic |
|---|---|---|---|
| • Low CD4 nadir<br>• High plasma, CSF VL<br>• Low current CD4<br>• Hx HIV-related CNS disease<br>• Longer HIV duration | • Poor adherence<br>• ARV interruptions<br>• Non-optimal ARV regimen<br>• Low ARV duration- related to treatment failure<br>• Potential neurotoxicity<br>• Lower CPE | • HCV +<br>• Hx acute CV event<br>• CV risk factors<br>• Anemia and thrombocytopenia<br>• Psychiatric disorder<br>• Traumatic brain injury<br>• SUD | • Older individuals<br>• Low education<br>• Lower socio-economic status<br>• Lack of access to care<br>• Poverty |

# Diagnostic Approach to HAND in Clinical Practice

You can:

- Screen for the probability of developing HAND
- **Short-Diagnose HAND (Neuropsychological Assessment according to the „Frascati-Criteria“)**
- **Diagnose HAND**
- Monitor HAND

# The Cogstate

Laptop based **(10 mins)**

A score of ≥80 on any of the tasks is considered unimpaired

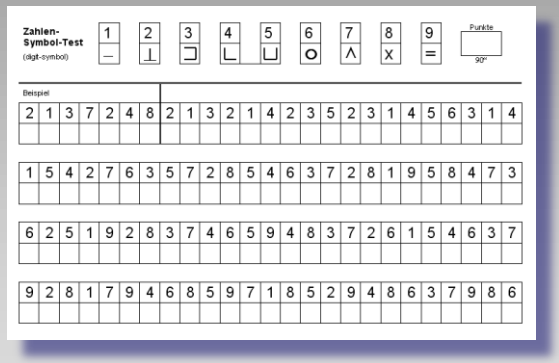
Brief battery measures attention/vigilance, processing speed, working memory, and visual learning

Can be used to detect change in cognitive function over very brief intervals (minutes), and longer intervals (weeks or months)


Cysique *et al. Arch Clin Neuropsychol* 2006; 21:185–94

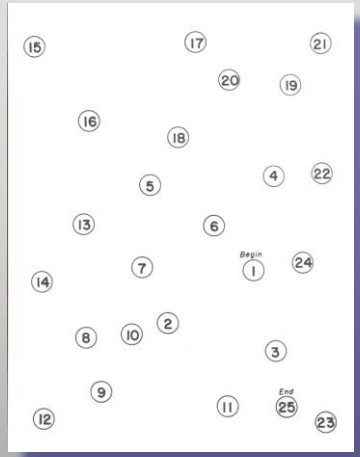
# Test Examples for „Short-Diagnosing“ HAND

Digit symbol test




Grooved pegboard

Trail-making test 1+2




Motor Test Battery, Arendt et al., 1990

ANI = Asymptomatic Neurocognitive Disorder
MCND = Mild Neurocognitive Disorder
HAD = HIV-Associated Dementia

# Stroop Color Test

# Diagnosing HAND

# Diagnosing HAND

Broad Neuropsychological Test Battery

Imaging Procedures

Cerebrospinal Fluid (CSF) Analysis

# Neuropsychological Domains

**Verbal**

•Letter Fluency (F-A-S)

**Motor**

• Grooved Pegboard

•Motor Test Battery (Arendt et al., 1990)

**Attention/Working Memory**

• WAIS-3 Letter Number Sequencing

• Paced Auditory Serial Addition Test

**Abstraction/Executive Functioning**

• WCST-64

• Trails B

**Learning**

•Hopkins Verbal Learning Test (HVLT-R)

• Brief Visuospatial Memory Test (BVMT-R)

**Processing Speed**

• WAIS-3 Symbol Search

• WAIS-3 Digit Symbol

• Trails A

**Delayed Recall**

• HVLT-R Delayed Recall

• BVMT-R Delayed Recall

# Brain imaging Techniques in HIV/AIDS-Research

## Structures

– Structural MRI, CT – Diffusion-weighted MRI

## Neurochemical Systems

– MR-spectroscopy (neurochemical and cerebral metabolites in neurons & glia)– PET with different tracers – (esp. dopamine-rezeptors & transporter-density)

## Physiology

– perfusion-MRI (regional cerebral blood flow) – PET (FDG) (glucose metabolism)

## Brain Activation and networks

– BOLD fMRI with cognitive tasks (regional oxygenation and perfusion changes)– non-activated-fMRI (to examine neuronal networks)

# Basic CSF analysis

Cells, protein, glucose

HIV-RNA

Biomarkers

- Markers of inflammation and degeneration (B2M, neopterin, neurofilaments, tau and phospho-tau)
- Neurotoxic host factors (quinolinic acid, NO)
- Markers of apoptosis
- Markers of CNS cell damage