Today’s webinar will answer....

1. What is the RBANS, and how is the updated version different than the original version?
2. What are the neurocognitive areas assessed by the RBANS and what scores are available?
3. What normative information is available, and what clinical groups have been studied with reference to dementia?
4. Can I measure change over time using the parallel versions?
5. What does a case example for a dementia related assessment look like using the RBANS as part of an assessment?

(RBANS)™: Original Design Goals

- Originally based on Dr. Randolph’s work in a Dementia Clinic in 1980s, and the need for an assessment that had...
  1. Administration time less than 30 minutes
  2. Level of difficulty appropriate for both typical adults as well as adults with moderately severe dementia
  3. Measurement of five neurocognitive domains, with scaled score profiles
  4. Alternate forms for repeat testing
  5. Portability for ease of bedside administration

Purpose of RBANS

- A “core” battery: to detect and describe dementia in the elderly.
- Neuropsychological “screening battery” that only takes 25 minutes or less to administer
- Tracking change over time, including progression or recovery
  - Repeat evaluations using alternate forms.

- 2012: Revision of original 1998 RBANS
- Now normed on adolescents and adult aged 12 to 89 years
- Four parallel forms: A, B, C, D
- Manual provides critical values for comparing index scores when comparing a client’s performance over time
- Individual Subtest scores now available in addition to index scores
- Revised manual with adolescent information and RBANS-specific research conducted since original 1998 publication.
All 4 parallel forms can be purchased as a ‘combo kit’ or individually.

Standardisation and Clinical Studies
Normative Sample N=540
- ages 20-89 (6 groups of N=90)
Additional sample of 150 adolescents to expand normative age range
- ages 12-19 (3 groups of 50)
Demographic normative information also provided in manual based on:
- Education level of the client’s Parent (for ages 12-19)
- Education level of client (for adults)
In addition to normative sample, a Clinical sample was also taken (N=404)

Clinical Validity and Special Group Studies
Clinical sample in manual N=404
- Alzheimer’s Disease
- Vascular Dementia
- HIV Dementia
- Huntington’s Disease
- Parkinson’s Disease
- Depression
- Schizophrenia
- Closed Head Injury

RBANS Domains

Administration and Scoring

All you need to administer
Domains and Subtests

Immediate Memory
- List Learning
- Story Memory

Visuospatial/Constructional
- Figure Copy
- Line Orientation

Language
- Picture Naming
- Semantic Fluency

Attention
- Digit Span
- Coding

Delayed Memory
- List Recall
- List Recognition
- Story Recall
- Figure Recall

Immediate Memory: a measure of initial encoding and learning of complex and simple verbal information

List Learning
- 10 word list, 4 learning trials
- words are: low age of acquisition
- no warning of later delayed recall

Immediate Memory

List Learning
Trial 1
Say I am going to read you a list of words. I want you to listen carefully and, when I finish, repeat back as many words as you can. You don't have to say them in the same order that I do—just repeat back as many words as you can remember, in any order. Okay?

Record responses in order.
Scoring: 1 point for each word correctly recalled on each trial.

Immediate Memory

Story Memory
Trial 1
Say I am going to read you a short story. I'd like you to listen carefully and, when I finish, repeat back as much of the story as you can remember. Try and use the same wording, if you can. Okay?

Read the story below, then say Now repeat back as much of that story as you can.

Immediate Memory

Story Memory
Trial 2
Say I am going to read that same story again. When I finish, I want you to again repeat back as much of the story as you can remember. Try to repeat it as exactly as you can.

Read the story below, then say Now repeat back as much of that story as you can.
Immediate Memory

**Story Memory**
Scoring: 1 point for verbatim recall of bold, italic words or alternatives, shown below in colour within parentheses. Record intrusions or variations in the Responses column.

Visuospatial/Constructional: a measure of basic visuospatial perception and the ability to copy a design from a model

**Figure Copy**
Show examinee a multipart geometric drawing and ask examinee to make an exact copy while the drawing remains on display.

Visuospatial/Constructional

**Figure Copy**
Scoring:
- 1 point for correctness and completeness (drawing), and
- 1 point for proper placement.
- See Appendix 1 in Stimulus Booklets for complete scoring criteria and scoring examples.

Visuospatial/Constructional

**Line Orientation**
20 seconds per item
- Present the sample item, and say These two lines down here (indicate) match two of the lines on top. Can you tell me the numbers, or point to the lines that they match? Correct any errors and make sure the examinee understands the task.
- Continue with Items 1–10.
- Scoring: 1 point for each line correctly identified.

Language: a measure of expressive language functioning, ie semantic fluency and picture naming

**Picture Naming**
20 seconds per item
- Ask examinee to name each picture.
- Give semantic cue only if picture obviously misperceived.
- Scoring: 1 point for each item named spontaneously or following semantic cue.

Attention: a measure of simple auditory registration and visual scanning and processing speed

**Digit Span**
- forward span only
- one trial at each string length unless failed
**Attention**

**Digit Span**
- Say I am going to say some numbers, and I want you to repeat them after me. Okay?
- Read the numbers at the rate of 1 per second. Only read the second string in each set if the first string was failed.
- Discontinue after failure of both strings in any set.
- Scoring: 2 points for the first string correct, 1 point for the second string correct, and 0 points for both strings failed.

**Delayed Memory Index:** a measure of delayed recall and recognition for verbal and visual information
- **List Recall** – recall words from List Learning
- **List Recognition** – read 20 words (10 targets, 10 distracters) and ask examinee to say Yes if word was on original list and No if word was not on list.
- **Story Recall** – retell story learned earlier
  - cue given – tell me that story about a fire . . .
- **Figure Recall** – draw from memory figure shown earlier.

**Scoring**
Qualitative Description of RBANS Index Scores

<table>
<thead>
<tr>
<th>Index Score</th>
<th>Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>130 and above</td>
<td>Very Superior</td>
</tr>
<tr>
<td>120-129</td>
<td>Superior</td>
</tr>
<tr>
<td>110-119</td>
<td>High Average</td>
</tr>
<tr>
<td>90-109</td>
<td>Average</td>
</tr>
<tr>
<td>80-89</td>
<td>Low Average</td>
</tr>
<tr>
<td>70-79</td>
<td>Borderline</td>
</tr>
<tr>
<td>69 and below</td>
<td>Extremely Low</td>
</tr>
</tbody>
</table>

Classification Descriptors for Subtest Scaled Scores

<table>
<thead>
<tr>
<th>Scaled Score</th>
<th>Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>16 and above</td>
<td>Very Superior</td>
</tr>
<tr>
<td>14-15</td>
<td>Superior</td>
</tr>
<tr>
<td>12-13</td>
<td>High Average</td>
</tr>
<tr>
<td>8-11</td>
<td>Average</td>
</tr>
<tr>
<td>6-7</td>
<td>Low Average</td>
</tr>
<tr>
<td>4-5</td>
<td>Borderline</td>
</tr>
<tr>
<td>3 and below</td>
<td>Extremely Low</td>
</tr>
</tbody>
</table>

Classification Descriptors for Percentile Bands

<table>
<thead>
<tr>
<th>Percentile Bands</th>
<th>Band Descriptor</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt; 75</td>
<td>High Average</td>
</tr>
<tr>
<td>26-75</td>
<td>Average</td>
</tr>
<tr>
<td>10-25</td>
<td>Low Average</td>
</tr>
<tr>
<td>3-9</td>
<td>Borderline</td>
</tr>
<tr>
<td>≤ 2</td>
<td>Extremely Low</td>
</tr>
</tbody>
</table>
Standardisation and Clinical Studies

- Manual provides critical values for comparing index scores when comparing a client's performance over time.

<table>
<thead>
<tr>
<th>Table A.4 Critical Values Required for Statistical Significance Between RBANS Alternate Forms, All Ages</th>
</tr>
</thead>
<tbody>
<tr>
<td>A to B</td>
</tr>
<tr>
<td>-------</td>
</tr>
<tr>
<td>Millimonths</td>
</tr>
<tr>
<td>Immediate Memory</td>
</tr>
<tr>
<td>Visuospatial/Constructional</td>
</tr>
<tr>
<td>Attention</td>
</tr>
<tr>
<td>Language</td>
</tr>
<tr>
<td>Immediate Memory</td>
</tr>
<tr>
<td>Total Scale</td>
</tr>
</tbody>
</table>

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Case Example and Special Group Clinical Studies

Case Example: William aged 73, married, retired lawyer and businessman

- Is there evidence for some type of acquired impairment?
- What is the nature of the deficits?
- What is the likely associated disease process?
- What interventions are appropriate?
- WIAT III Total Reading = 120
- WAIS IV Full Scale = 114
- WMS IV Auditory Memory Index = 96
- Boston Naming: 48/60 correct
- Rey Complex Figure, Copy Score – 34/36 correct

Example:

- Performance is indicative of a new learning impairment, with possible mild anoma.
- Strong evidence for an acquired impairment, primarily in the domain of anterograde memory
- AD most likely aetiology, based on profile as well as progressive nature reported by family, and William's lack of insight.
- Reassessment in 6 months using Form B recommended.

Follow up:

William declined any type of pharmacologic treatment for his memory loss, and did not return for follow-up examination until 18 months later. At this point, his FSIQ was 108, his RBANS Total Score was 74, and his BNT score was 40. According to family members, there was clear evidence of functional decline. The diagnosis was revised to probable Alzheimer's disease.

William's RBANS Total Score dropped 18 points in the 18 months between testing on Form A and Form B. A difference of 13.5 points or more between Form A and B would be considered significant at the .05 level.
Clinical Validity and Special Group Studies

Clinical sample in manual N=404

- Alzheimer’s Disease
- Vascular Dementia
- HIV Dementia
- Huntington’s Disease
- Parkinson’s Disease
- Depression
- Schizophrenia
- Closed Head Injury

Alzheimer’s Disease (AD)

- AD is perhaps the most common of the late-life forms of dementia.
- Anterograde memory impairment is one of the earliest appearing and most salient of cognitive deficits in this disorder
  - the inability to store, retain, or recall new knowledge

Vascular Dementia

- Ischemic cerebrovascular disease primarily affects subcortical white matter and subcortical nuclei
- Associated neurocognitive deficits would be expected to be predominantly within the domains of attentional and visuospatial functions.

Alzheimer’s Disease (AD)

- Immediate Memory and Language scores were also markedly impaired
- In contrast, individuals with AD scored significantly better on the Attention and Visuospatial/Constructional Indexes, which are more preserved.

VAD and AD

- Results were consistent with this expectation:
  - The lowest mean index score of the AD sample was on Delayed Memory and Immediate Memory and Language scores were also significantly below the scores of the Vascular Dementia group.
  - In contrast, individuals with AD scored better on the Attention and Visuospatial/Constructional Indexes than the VAD group.

This table shows the mean scores obtained in a sample of 138 AD patients

This table shows a group of 32 patients with mild AD compared to a group of 32 patients with vascular dementia.
Mixed AD/VaD

- Some proportion of patients exhibit features of both AD and VaD.
- These patients present with:
  - radiological evidence of significant ischemic infarctions
  - clinical features of severe short-term memory problems
  - with anomia that cannot be accounted for by the pattern of infarcts.

The RBANS Profile in mixed AD/VaD, from the mean index scores is essentially a combination of both impairment patterns, resulting in flattening of the overall profile.

<table>
<thead>
<tr>
<th>Mixed Alzheimer's/ Vascular Dementia</th>
</tr>
</thead>
<tbody>
<tr>
<td>RBANS Indexes</td>
</tr>
<tr>
<td>Mean</td>
</tr>
<tr>
<td>Immediate Memory</td>
</tr>
<tr>
<td>Vascular/Constructional</td>
</tr>
<tr>
<td>Language</td>
</tr>
<tr>
<td>Attention</td>
</tr>
<tr>
<td>Delayed Memory</td>
</tr>
<tr>
<td>Total Scale</td>
</tr>
<tr>
<td>N</td>
</tr>
</tbody>
</table>

HIV Dementia

- HIV infection can result in neurocognitive compromise from direct HIV infection of the brain, as well as through opportunistic infection of the central nervous system.
- Minimal direct HIV infection involving subcortical white matter manifests as attentional/working memory impairments.

HIV Dementia

- 15 patients diagnosed with HIV dementia showed an RBANS Total score (mean 48.9) was the lowest of any clinical group presented.
- Lowest mean scores were found in Immediate Memory (mean 48.9), Attention (mean 54.3) and Delayed Memory (mean 43.7).
- Highest Index scores were found in the Language Index and Visuospatial/Constructional Index (mean 60 in each).

Huntington’s Disease

- HD is a rare, inherited neurological disease with onset in the midlife.
- Intellectual performance is characterised by relatively preserved verbal comprehension in contrast to impaired perceptual organisation and attentional functions.
- Greater difficulties are usually seen with retrieval than with recognition memory tasks.
- The following comparison shows a comparison of HD and AD, which demonstrates:
  - Higher language scores for HD compared to AD
  - Lower visuo-spatial and attention scores for HD compared to AD
  - Higher Delayed Memory scores for HD compared to AD
  - Both AD and HD groups are below the matched non-clinical group means.

Parkinson’s Disease

- Parkinson’s Disease (PD) is a syndrome of involuntary movement.
- The mechanisms underlying cognitive impairment in PD are not as clear, and can be minimal in some patients.
- Individuals with PD may also be at higher risk for coexistent AD.
- Most reported deficits in PD are attentional and visuospatial, along with mild to moderate impairment of anterograde memory.
- Language is less affected although semantic fluency may be affected due to retrieval impairments.
Parkinson’s Disease

- The following table shows a group of 33 PD patients, in a relatively well-educated sample.
- The highest mean score is in the language index, and all scores are below the level expected based on pre-morbid estimates.

<table>
<thead>
<tr>
<th>RBANS Indexes</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Immediate Memory</td>
<td>83.8</td>
<td>21.1</td>
</tr>
<tr>
<td>Visuospatial/Constructional</td>
<td>87.2</td>
<td>17.4</td>
</tr>
<tr>
<td>Language</td>
<td>91.8</td>
<td>18.1</td>
</tr>
<tr>
<td>Attention</td>
<td>83.8</td>
<td>15.7</td>
</tr>
<tr>
<td>Delayed Memory</td>
<td>82.7</td>
<td>22.9</td>
</tr>
<tr>
<td>Total Scale</td>
<td>81.8</td>
<td>19.3</td>
</tr>
<tr>
<td>N</td>
<td>33</td>
<td></td>
</tr>
</tbody>
</table>

Other Disorders

- Depression
- Schizophrenia
- TBI

Performance of Sample Schizophrenia

<table>
<thead>
<tr>
<th>RBANS Indexes</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Immediate Memory</td>
<td>73.8</td>
<td>18.3</td>
</tr>
<tr>
<td>Visuospatial/Constructional</td>
<td>82.5</td>
<td>21.1</td>
</tr>
<tr>
<td>Language</td>
<td>83.5</td>
<td>17.5</td>
</tr>
<tr>
<td>Attention</td>
<td>77.2</td>
<td>17.5</td>
</tr>
<tr>
<td>Delayed Memory</td>
<td>74.9</td>
<td>19.1</td>
</tr>
<tr>
<td>Total Scale</td>
<td>72.8</td>
<td>16.6</td>
</tr>
<tr>
<td>N</td>
<td>59</td>
<td></td>
</tr>
</tbody>
</table>

Performance of Sample Depression in the elderly (mean age 69.9)

<table>
<thead>
<tr>
<th>RBANS Indexes</th>
<th>Mean</th>
<th>SD</th>
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</thead>
<tbody>
<tr>
<td>Immediate Memory</td>
<td>93.2</td>
<td>11.9</td>
</tr>
<tr>
<td>Visuospatial/Constructional</td>
<td>101.8</td>
<td>11.9</td>
</tr>
<tr>
<td>Language</td>
<td>88.9</td>
<td>19.4</td>
</tr>
<tr>
<td>Attention</td>
<td>92.8</td>
<td>18.4</td>
</tr>
<tr>
<td>Delayed Memory</td>
<td>91.9</td>
<td>9.9</td>
</tr>
<tr>
<td>Total Scale</td>
<td>91.4</td>
<td>13.2</td>
</tr>
<tr>
<td>N</td>
<td>13</td>
<td></td>
</tr>
</tbody>
</table>

Performance of Sample TBI

<table>
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<tr>
<th>RBANS Indexes</th>
<th>Mean</th>
<th>SD</th>
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</thead>
<tbody>
<tr>
<td>Immediate Memory</td>
<td>76.8</td>
<td>19.8</td>
</tr>
<tr>
<td>Visuospatial/Constructional</td>
<td>79.8</td>
<td>15.0</td>
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<td>Language</td>
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<td>14.9</td>
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<td>13.2</td>
</tr>
<tr>
<td>N</td>
<td>31</td>
<td></td>
</tr>
</tbody>
</table>

RBANS Application to Neurocognitive evaluations

- Clinical validity of RBANS is well-established (over 100 peer-reviewed references: references in manual and at www.rbans.com)
- Multiple publications validating the utility of the RBANS in dementia diagnosis/treatment planning (e.g., discriminability in mild dementia, prediction of functional ADLs, driving, correlation with biomarkers, etc.),
  - See Appendix C in RBANS Update Manual for references
Thank You!

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Questions?

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