The webinar, "**The Development of Normative Data and Comparison Standards for the Cognition Measures Employed in the CLSA**" will begin shortly.

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CLSA Webinar Series

The Development of Normative Data and Comparison Standards for the Cognition Measures Employed in the CLSA

Presented by Dr. Holly Tuokko

12 to 1 p.m. ET | January 16, 2018

Change in cognitive functioning is characteristic of normal aging and is evident beginning in mid-life. However, changes in cognition also may be associated with underlying pathology such as Alzheimer Disease.

The research team, led by Dr. Holly Tuokko and funded by the Alzheimer Society of Canada and the Pacific Alzheimer Research Foundation, is examining detailed information about the cognitive performance of English and French-speaking participants in the Canadian Longitudinal Study on Aging (CLSA). The researchers are characterizing typical performances of neurologically healthy people on the cognitive measures employed in the CLSA for use as standards when identifying cognitive impairment. They are also developing various easily-accessed, plain language tools (e.g., derived variables, online tools for generating cognitive classification) for use by clinicians and researchers regarding cognitive functioning as measured in the CLSA.

Register online at http://bit.ly/clsawebinars

Webinars will be broadcast using WebEx
Further instructions will be sent by email

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The Development of Normative Data and Comparison Standards for the Cognition Measures Employed in the CLSA

Holly Tuokko, PhD, RPsych
University of Victoria

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PURPOSE OF THE SESSION

- **Provide a snapshot of the procedures used to develop the Canadian comparative standards for the CLSA cognition measures**
- **To solicit input regarding the tools being generated for use by researchers and clinicians**

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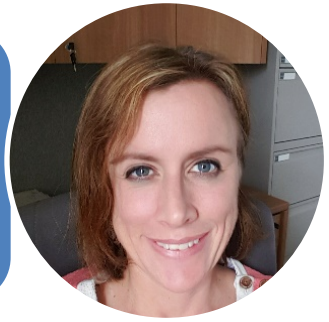
Our Team

Dr. Holly Tuokko
University of Victoria
Victoria, B.C.

Dr. Megan E. O'Connell
University of Saskatchewan,
Saskatoon, Sask.

Dr. Martine Simard
Laval Université,
Québec City, Québec

Dr. Vanessa Taler
University of Ottawa,
Ottawa, Ontario



Stacey Voll
Dr. Helena Kadlec
David Holt
University of Victoria

Dr. Lauren Griffith
McMaster University
Hamilton, Ontario

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Funding

Funding for our research is provided by

Société Alzheimer Society CANADA

Pacific Alzheimer Research Foundation

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Our Aims: The purpose of our funding

- Examine how Canadians typically perform on measures of cognitive functioning
- Understand the health and lifestyle factors that affect cognitive functions
- To develop sets of normative comparison standards for the measures of cognitive function from the CLSA for French- and English-speaking Canadians
- To create a tools for interpretation that can be used to generate classification of individuals for use in research and clinical practice
- To lay the foundation for refinement of the Canadian norms for cognitive measures in French and English, as longitudinal data from CLSA becomes available

Why are Canadian comparison standards needed?

- Existing normative standards based on non-Canadian samples
- Existing normative standards may be outdated
- Existing normative standards for measures may not cover the full spectrum of ages from mid-life to later life

Why are Canadian comparison standards needed?

- Existing normative standards may not take into consideration important health and lifestyle factors
- Existing normative standards may be available for individual measures only

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Cognitive Measure	CLSA	
	Comprehensive (n=30,184)	Tracking (n=21,241)
Memory		
Rey Auditory Verbal Learning Test (trial 1 recall and 5 minutes delayed recall)	✓	✓
Executive Function		
Mental Alteration Test	✓	✓
Miami Prospective Memory Test	✓	-
Stroop (Victoria version)	✓	-
Controlled Oral Word Association Test (FAS)	✓	-
Animal Fluency	✓	✓
Psychomotor Speed		
Choice Reaction Times	✓	–

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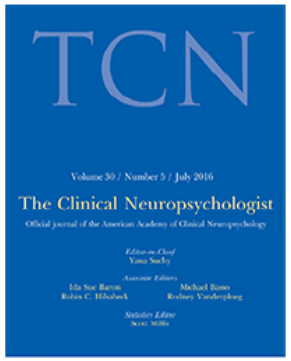

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Cognitive measures in the Canadian Longitudinal Study on Aging

Holly Tuokko, Lauren E. Griffith, Martine Simard & Vanessa Taler

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Methodology behind the standards

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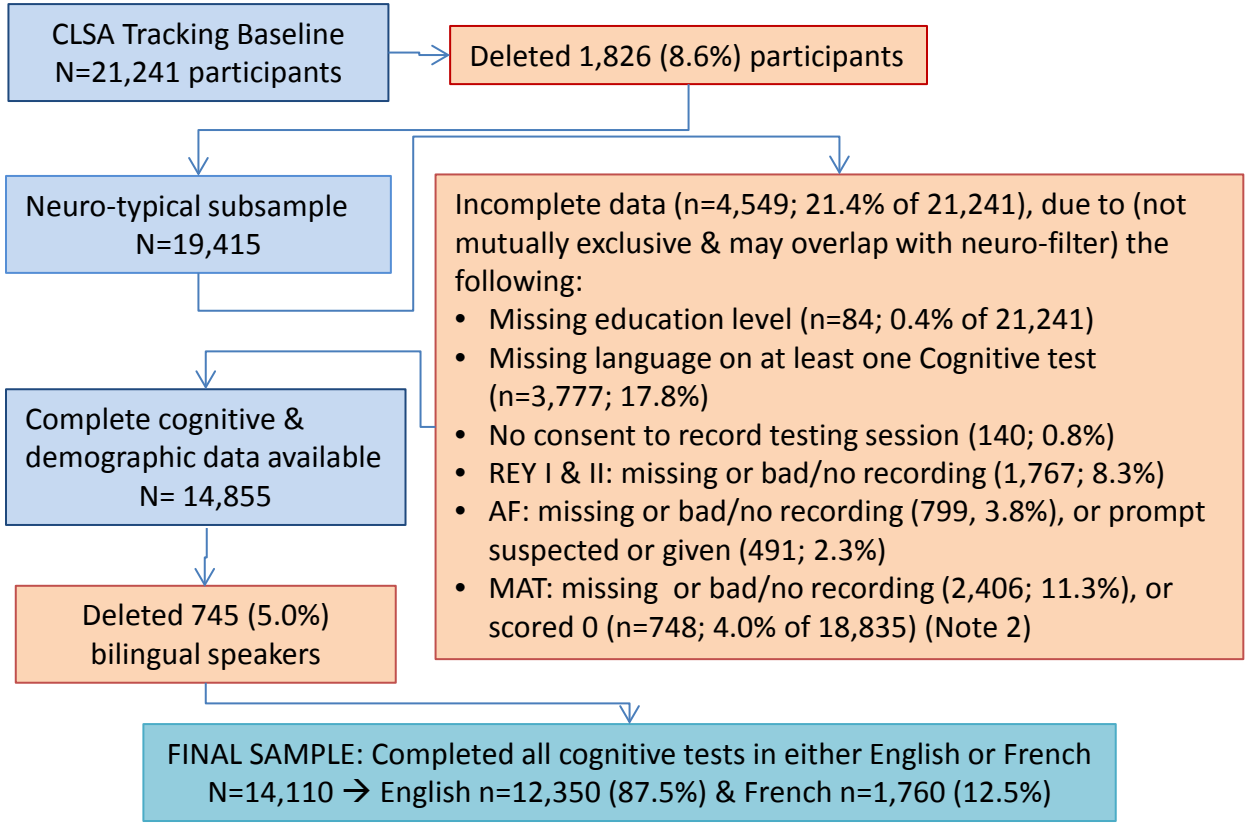
TRACKING ~ BASELINE DATA (V.3.0) SAMPLE SELECTION



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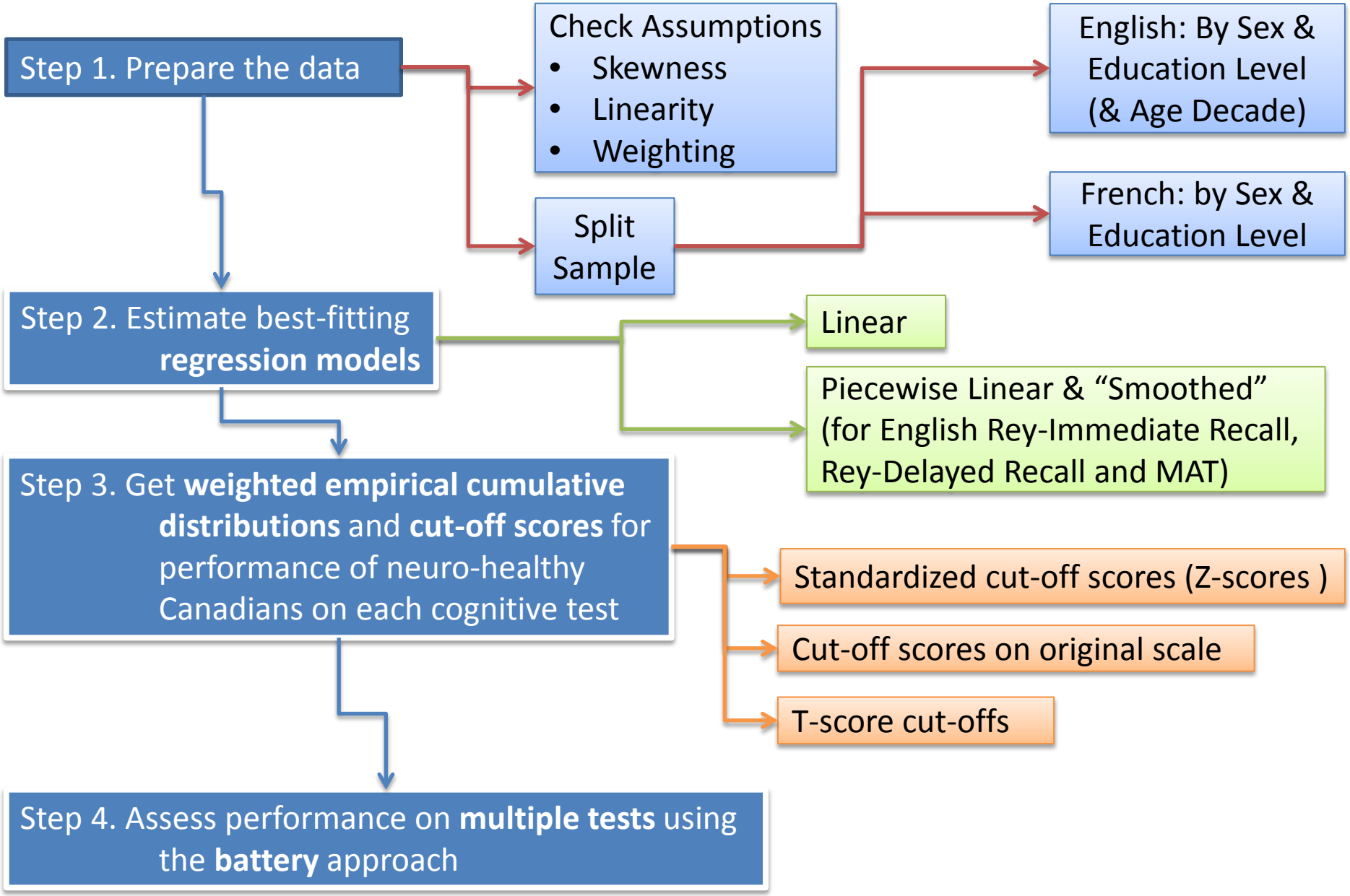
What Variables are related to cognitive test scores?

- Age – some cognitive test scores decrease nonlinearly with age in English sample
- Education level – highly skewed
- Sex – no differences
- Language – differences on some cognitive test scores
- “Secondary” covariates examined
  - Self-rated general health
  - Self-rated mental health
  - Depression (yes/no based on CES-D10)
  - Self-rated eyesight
  - Self-rated hearing

DATA ANALYSIS: Summary of steps



Step 3. Obtaining empirical weighted cumulative distributions and cut-off scores

For each participant, have
1) Observed Cog Test Score (Y)
2) Predicted Cog Test Score (Y'): from best-fitting regression model for that person

Compute each participant's **residual** score
$(Y' - Y)$

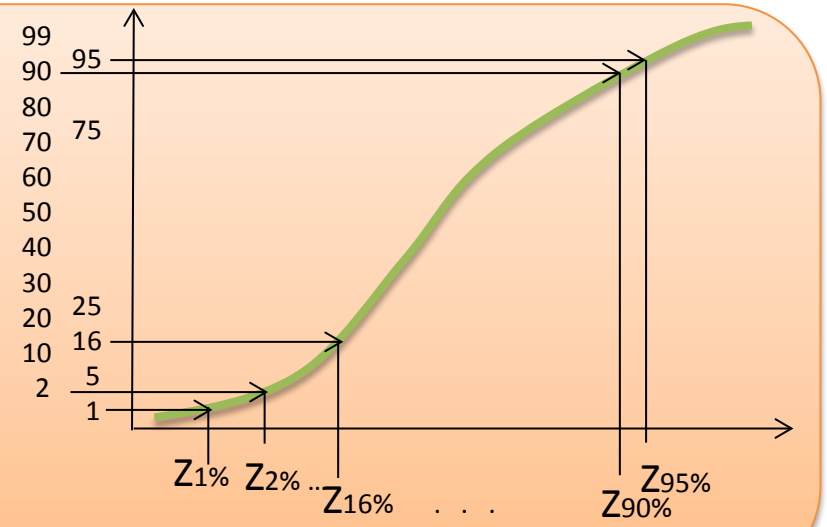
For each Sex-Education(and AgeDecade) group, obtain M_resid, SD_resid of the residuals

Compute each participant's **standardized residual** score:

$$Z\_resid = \frac{(Y' - Y) - M\_resid}{SD\_resid}$$

For each Sex-Education (and AgeDecade) group, obtain
- *Weighted* (using CLSA inflation weights) cumulative frequency distribution of the standardized residuals, and
- Z-scores corresponding to the percentile ranks (PR) of interest
{Z_{PR}, for PR=1, 2, 5…., 99}

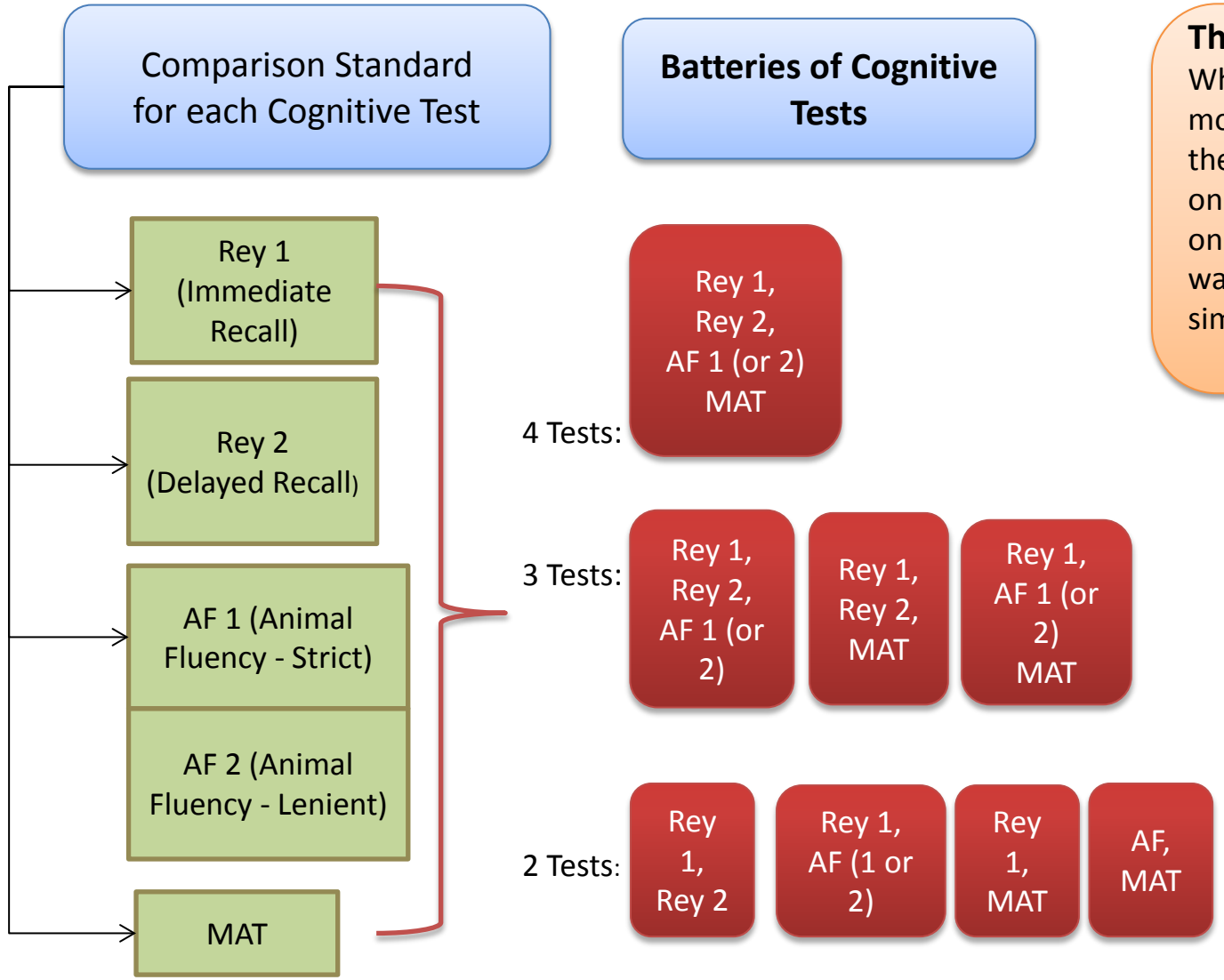
Weighted Cumulative %



Transform { Z_{PR} } to scores on the original scale { C_{PR} }:
$C = Z \times SD\_group + M\_group$

Transform { Z_{PR} } to T-scores { T_{PR} }:
$T = Z \times 10 + 50$

Step 4. Assessing performance on **multiple tests** using the **battery** approach



The ISSUE with Multiple Tests:
When a clinician assesses a client on more than one test, the probability that the client will fall in an "atypical" range on at least one of those tests increases, only because there are multiple tests. We want to avoid misdiagnosing people simply on such chance occurrences.

We can control for this!

Tools for Researchers and Clinicians

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Derived variables

- Percentile rank for each participant for each cognitive measure

- Impaired/Not impaired for battery

Web-based Clinical Tool

- Mock Up

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Welcome to

Comparative Standards for Cognitive Measures

based on CLSA data

Continue

Please enter your client's information:

Age Number input * Required

valid age from 45 to 89

Sex ○ Female ◉ Male * Required

Language ○ English ◉ French * Required

Education Level 1 Less than high school * Required

1 Less than high school
2 High school grad
3 Some post secondary
4 Post secondary degree

Continue

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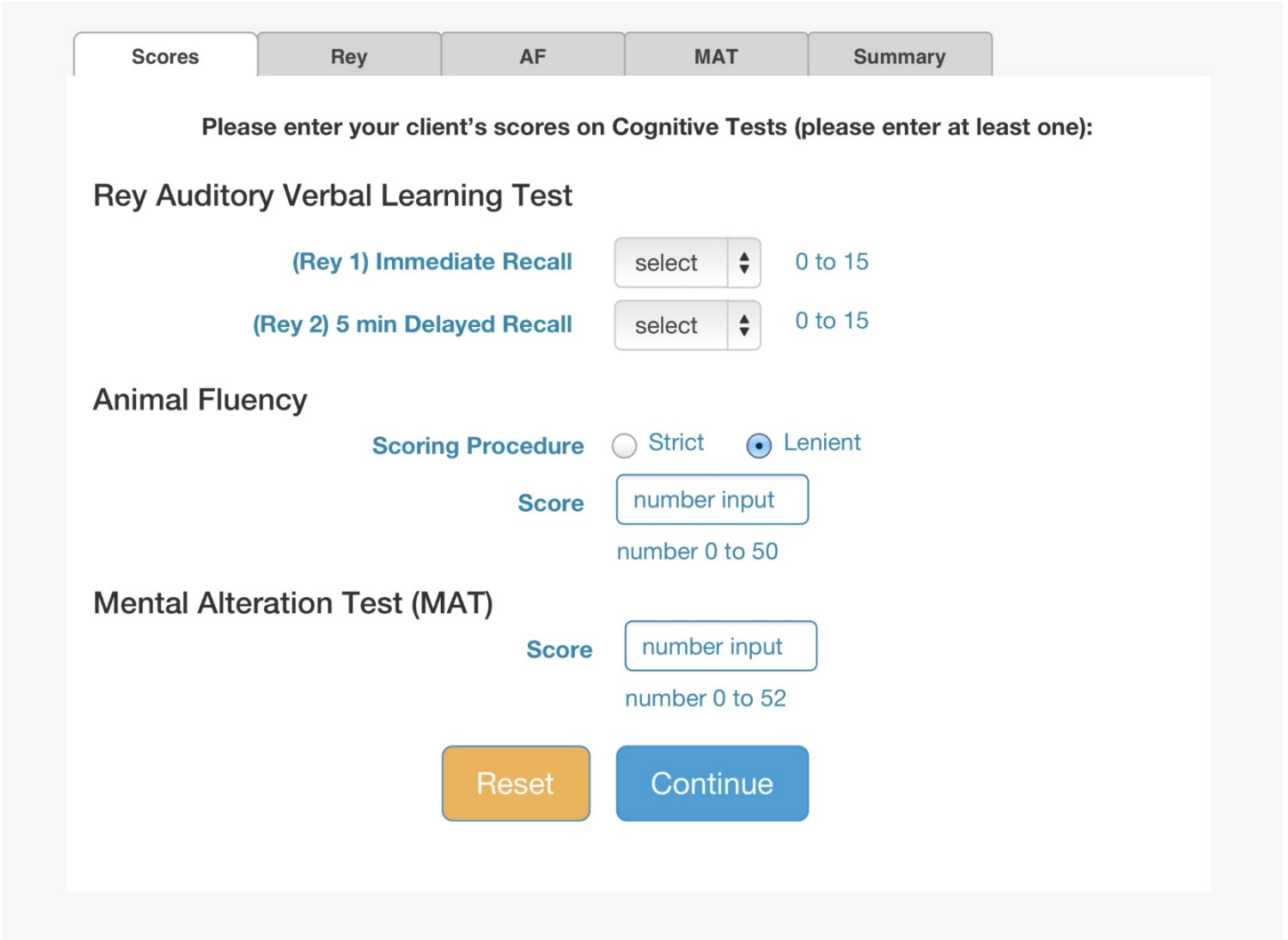

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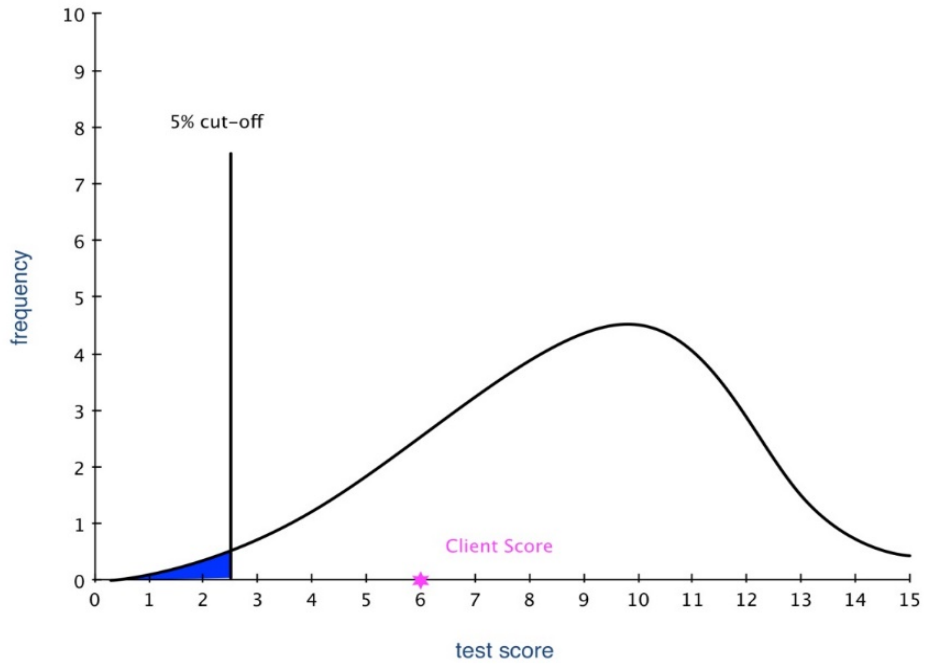
Scores | Rey | AF | MAT | Summary

Rey 1 Rey 2 Forgetting

Rey Auditory Verbal Learning Test

Your client's score compared to (**English/French**) speaking Canadian (**men/women**) of age (**age**) and education level (**education level**):

Rey 1 (Immediate Recall)



X Percentile Equivalent to T-score of Y

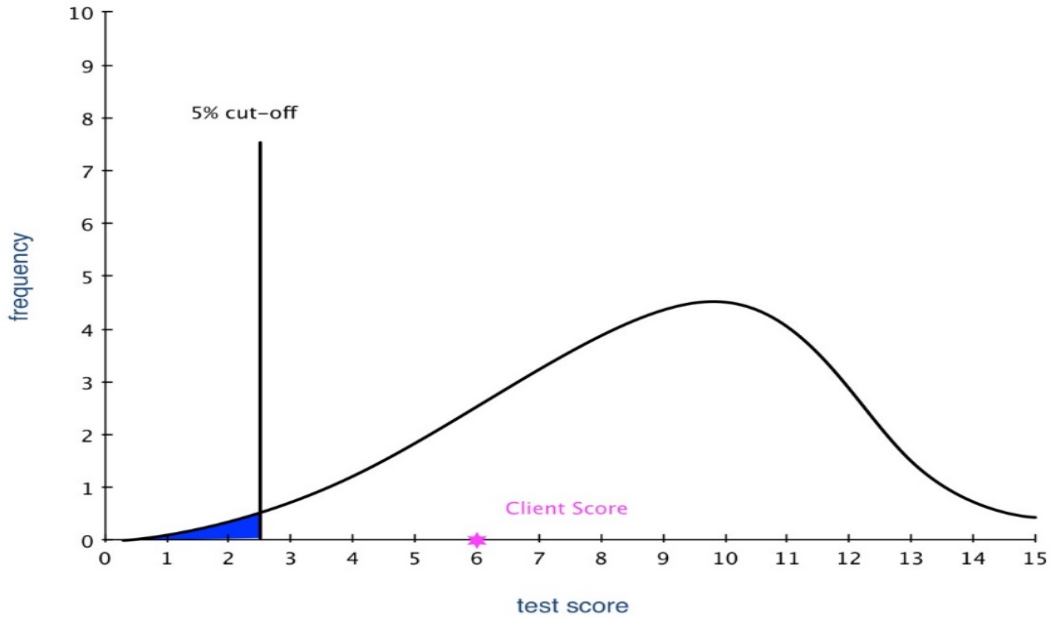
Scores | Rey | AF | MAT | Summary

Rey 1 **Rey 2** Forgetting

Rey Auditory Verbal Learning Test

Your client's score compared to (**English/French**) speaking Canadian (**men/women**) of age (**age**) and education level (**education level**):

Rey 2 (5 min Delayed Recall)



X Percentile Equivalent to T-score of Y

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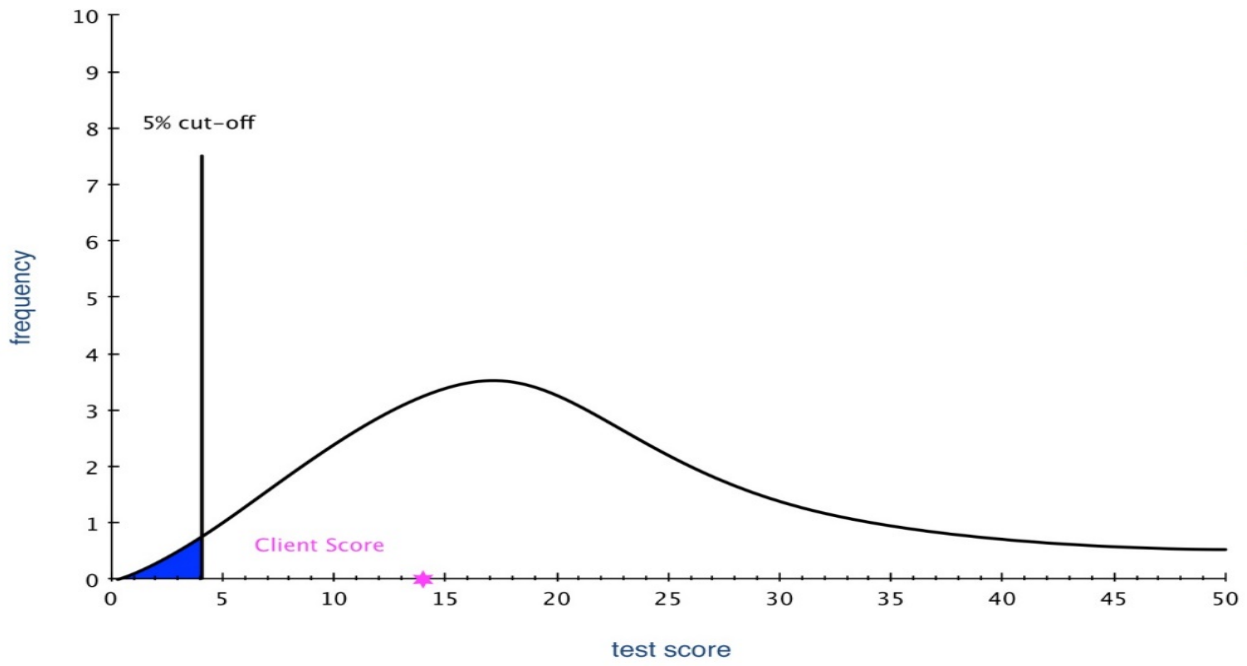
Scores | Rey | AF | MAT | Summary

Strict **Lenient**

Animal Fluency

Your client's score compared to (**English/French**) speaking Canadian (**men/women**) of age (**age**) and education level (**education level**):

Lenient scoring procedure



X Percentile Equivalent to T-score of Y

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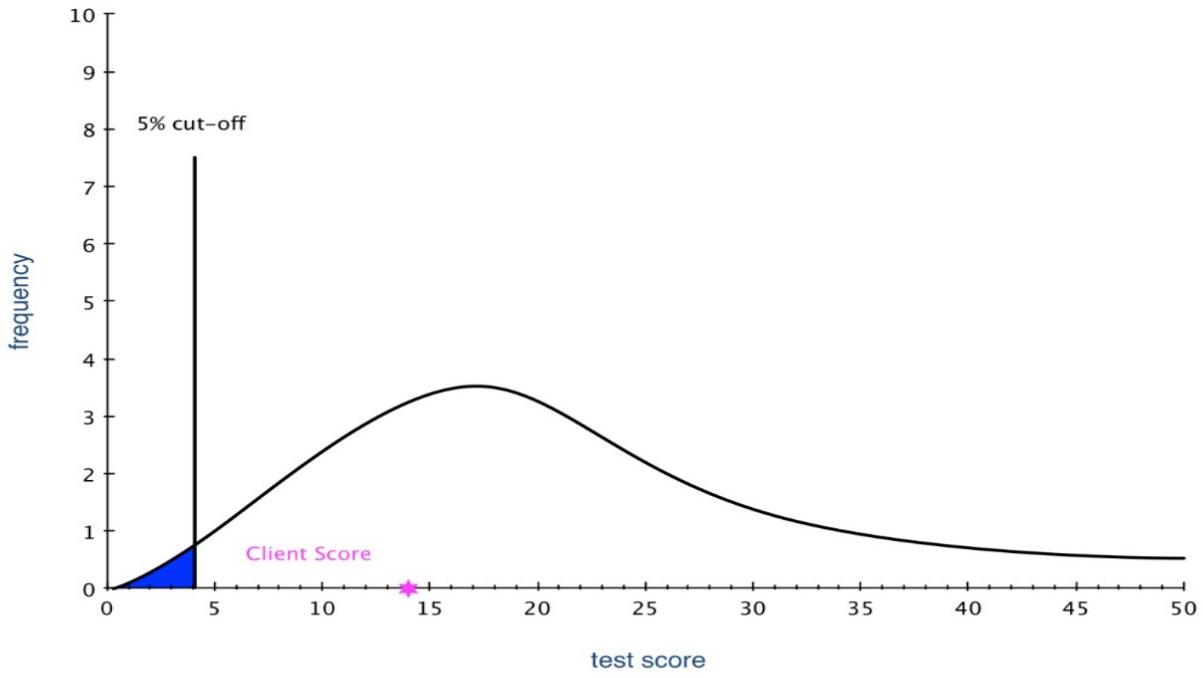
Scores | Rey | AF | MAT | Summary

Strict Lenient

Animal Fluency

Your client's score compared to (**English/French**) speaking Canadian (**men/women**) of age (**age**) and education level (**education level**):

Strict scoring procedure



X Percentile Equivalent to T-score of Y

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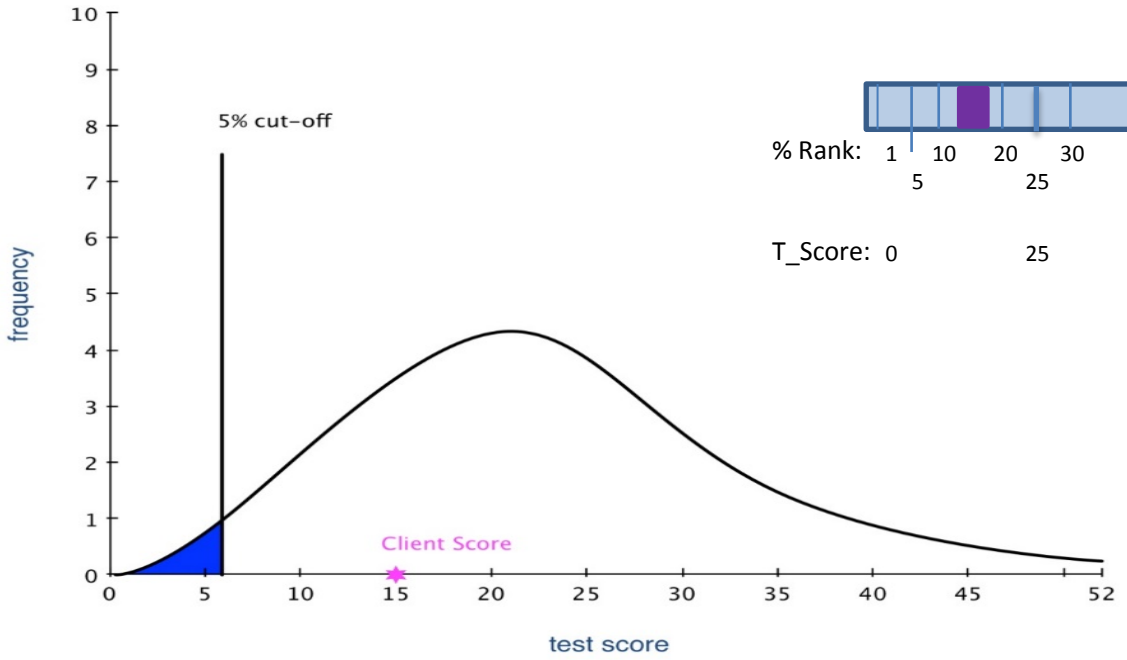
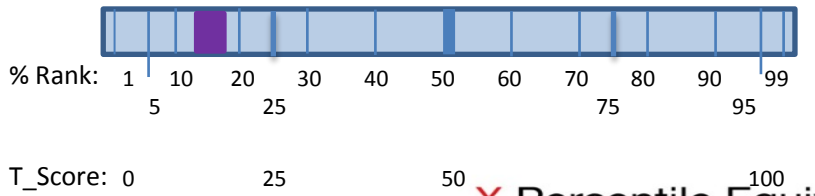
Scores | Rey | AF | MAT | Summary

Mental Alteration Test

Your client's score compared to (**English/French**) speaking Canadian (**men/women**) of age (**age**) and education level (**education level**):





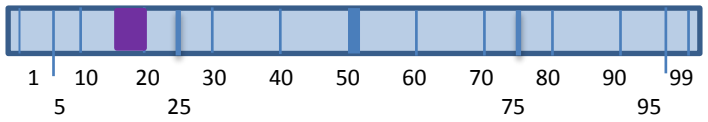
X Percentile Equivalent to T-score of Y

Scores	Rey	AF	MAT	Summary

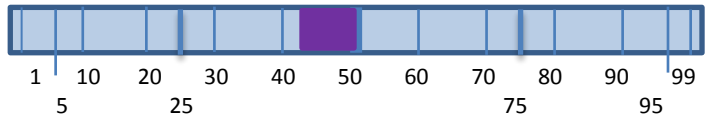
Summary
To determine whether a client deviates from the norm on several tests simultaneously, we recommend using the approach that …{more words to come here}

Your client's performance:

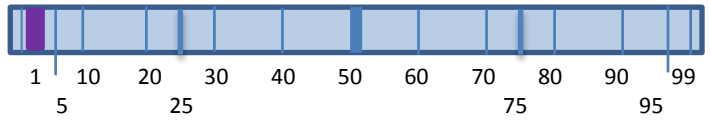
Rey-Immediate:



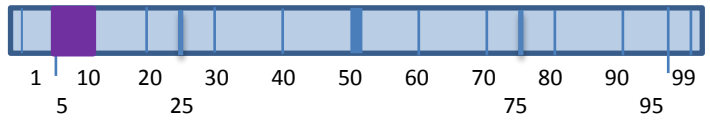
Rey-Delayed:



AF (S):



MAT:



Overall probability of being below ☐ % on 4 Tests is:

< 10%

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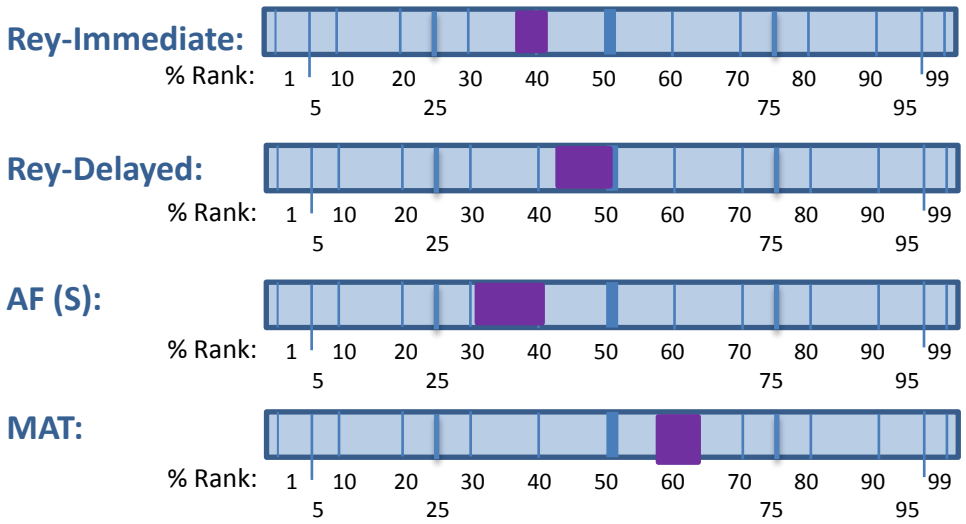
Scores	Rey	AF	MAT	Summary

Summary
To determine whether a client deviates from the norm on several tests simultaneously, we recommend using the approach that …{more words to come here}

Your client's performance:



Overall probability of being below ☐ % on 4 Tests is:

> 25%

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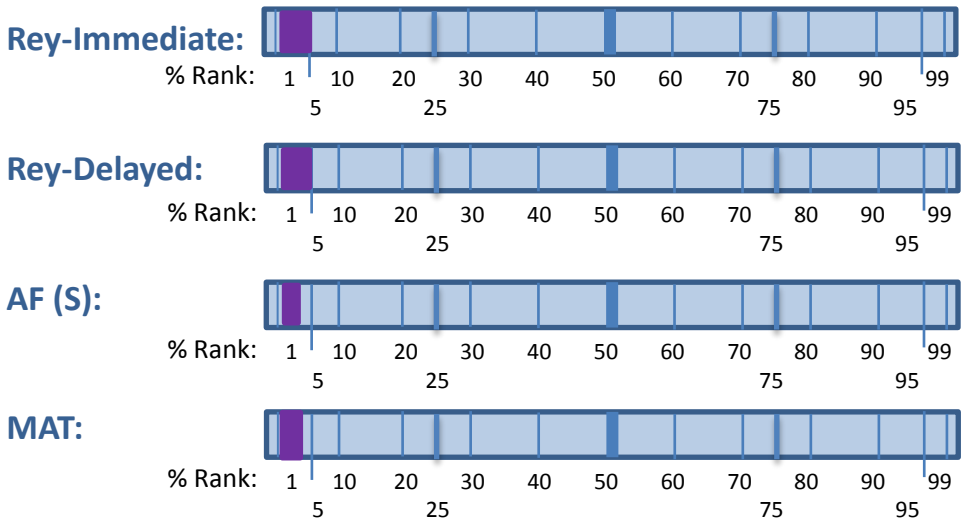
Scores	Rey	AF	MAT	Summary

Summary
To determine whether a client deviates from the norm on several tests simultaneously, we recommend using the approach that …{more words to come here}

Your client's performance:



Overall probability of being below ☐ % on 4 Tests is:

< 2%

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INPUT RE: TOOLS

1. Relevant?
2. User-friendly?
3. Preferences on derived variables?
4. Preferences on the look of web-based tool?
5. Is there an interest in acquisition of CLSA cognitive measures (administration and scoring) at a small cost (for cost recovery)?

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Additional Investigations

- Tracking versus Comprehensive
- English versus French
- Validity of the norms for identifying cognitive impairment at baseline

PURPOSE OF THE SESSION

- **Provide a snapshot of the procedures used to develop the Canadian comparative standards for the CLSA cognition measures**
- **To solicit input regarding the tools being generated for use by researchers and clinicians**

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Questions?

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Upcoming CLSA Webinars

“The Global Importance of Frailty and Pre-Frailty in Middle Aged Adults”

Dr. Darryl Leong

February 22, 2018 | 12 p.m. EST

Register: bit.ly/clsawebinars