

# Comparing the Montreal Cognitive Assessment and the Rowland Universal Dementia Assessment Scale (RUDAS) For the Screening of Dementia

P3-010

Kaden Lam<sup>1</sup>, Meng Wang<sup>1</sup>, Landon Perlett<sup>1</sup>, Eric E. Smith<sup>1</sup>, Zahinoor Ismail<sup>1,2</sup>, Aravind Ganesh<sup>1</sup>  
Department of Clinical Neurosciences, Cumming School of Medicine, University of Calgary<sup>1</sup>  
Clinical and Biomedical Sciences, Faculty of Health and Life Sciences, University of Exeter<sup>2</sup>

The MoCA and the RUDAS perform comparably when screening for dementia. Future studies comparing diagnostic performance of screening tools should incorporate a blinded “gold standard” to remove potential influence.

| INTRODUCTION                                                                                                                                                                                                                                                                                                                                                                                                                 | METHODS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | RESULTS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | CONCLUSIONS               | REFERENCES                                                                            |                     |                           |                           |          |      |             |  |  |  |  |  |  |                 |                  |                  |                  |                  |                  |                     |                 |                  |                  |                  |                  |                  |                   |            |                  |                        |                        |                  |                     |          |          |  |  |  |  |  |  |                |                  |                  |                  |                  |                  |                     |                 |                  |                  |                  |                  |                  |                     |            |                   |                 |                  |                   |                 |          |  |                                                       |  |                                   |      |                                 |       |                                 |                                                 |      |                                 |       |                                |                                                  |      |                              |       |                              |                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|---------------------------------------------------------------------------------------|---------------------|---------------------------|---------------------------|----------|------|-------------|--|--|--|--|--|--|-----------------|------------------|------------------|------------------|------------------|------------------|---------------------|-----------------|------------------|------------------|------------------|------------------|------------------|-------------------|------------|------------------|------------------------|------------------------|------------------|---------------------|----------|----------|--|--|--|--|--|--|----------------|------------------|------------------|------------------|------------------|------------------|---------------------|-----------------|------------------|------------------|------------------|------------------|------------------|---------------------|------------|-------------------|-----------------|------------------|-------------------|-----------------|----------|--|-------------------------------------------------------|--|-----------------------------------|------|---------------------------------|-------|---------------------------------|-------------------------------------------------|------|---------------------------------|-------|--------------------------------|--------------------------------------------------|------|------------------------------|-------|------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"><li>- MoCA and RUDAS are cognitive screening tools that guide dementia diagnoses<sup>1,2</sup></li><li>- RUDAS is suggested to be better suited in diverse settings<sup>2</sup></li><li>- The diagnostic performance of the RUDAS compared to the MoCA is unclear<sup>2</sup></li></ul> <p>Our study objective was to compare the ability of the MoCA and RUDAS to screen for dementia</p> | <ul style="list-style-type: none"><li>- Prospective Registry of Persons with Memory Symptoms (n=1,370)</li><li>- Patients with cognitive complaints referred to Cognitive Neurosciences Clinics in Calgary, Canada</li><li>- Full Cohort: patients that had MoCA and/or RUDAS scores were compared to the attending physicians’ working diagnosis</li><li>- Subgroup: patients that had both MoCA and RUDAS scores were compared to a gold-standard, MoCA/RUDAS-blinded, physician-adjudicated diagnosis</li><li>- Calculated sensitivity, specificity, predictive values, accuracy, and area-under-the-curve (AUC)</li><li>- Quantile regression to examine how scores varied by sociocultural factors.</li></ul> | <p>Table 1. Diagnostic Performance of the MoCA and RUDAS to Screen for Dementia in a Memory Clinic Population using conventional cut-off scores (≤17 for MoCA, ≤22 for RUDAS) for Patients in the Full Cohort and the Subgroup</p> <table><tr><th></th><th>Sensitivity</th><th>Specificity</th><th>Positive Predictive Value</th><th>Negative Predictive Value</th><th>Accuracy</th><th>AUC*</th></tr><tr><td colspan="7">Full Cohort</td></tr><tr><td>MoCA (n = 1333)</td><td>84.3 [80.8-78.8]</td><td>59.0 [55.9-62.1]</td><td>49.1 [45.7-52.5]</td><td>88.9 [86.3-91.4]</td><td>67.1 [64.6-69.5]</td><td>0.743 [0.651-0.835]</td></tr><tr><td>RUDAS (n = 146)</td><td>35.9 [23.9-48.0]</td><td>93.9 [88.4-99.4]</td><td>82.1 [66.9-97.4]</td><td>65.3 [56.8-73.7]</td><td>68.5 [60.9-76.1]</td><td>0.681 [0.574-787]</td></tr><tr><td>Difference</td><td>48.4 [48.3-48.5]</td><td>-34.9 [-35.0 to -34.8]</td><td>-43.0 [-33.2 to -32.8]</td><td>23.6 [23.5-23.7]</td><td>-1.4 [-1.5 to -1.3]</td><td>p = 0.20</td></tr><tr><td colspan="7">Subgroup</td></tr><tr><td>MoCA (n = 119)</td><td>57.3 [43.4-71.2]</td><td>83.2 [74.5-91.9]</td><td>65.9 [49.6-82.1]</td><td>73.5 [60.4-86.6]</td><td>70.5 [64.6-76.4]</td><td>0.688 [0.583-0.782]</td></tr><tr><td>RUDAS (n = 119)</td><td>59.3 [39.5-79.0]</td><td>78.7 [70.4-89.0]</td><td>58.4 [37.7-79.1]</td><td>76.8 [67.3-86.2]</td><td>71.7 [65.5-77.9]</td><td>0.653 [0.534-0.753]</td></tr><tr><td>Difference</td><td>-2.0 [-24.4-20.5]</td><td>4.5 [-6.6-15.7]</td><td>7.5 [-17.0-32.0]</td><td>-3.3 [-18.3-11.8]</td><td>-1.2 [-9.1-6.7]</td><td>p = 0.48</td></tr></table> <p>*Area under the receiver-operating characteristics curve (AUC) was obtained using separate logistic regressions each stratified for age, sex, language, race, or years of education.</p> <p>Table 2. Predictors of MoCA and RUDAS scores and Evaluation of Normality of Populations from Shapiro-Wilk W test from Full Cohort Analysis</p> <table><tr><th></th><th colspan="2">Score difference (in points) From Quantile regression</th></tr><tr><td rowspan="2">Age (per additional year) n = 119</td><td>MoCA</td><td>-0.18 [-0.21 – -0.15] p ≤ 0.001</td></tr><tr><td>RUDAS</td><td>-0.13 [-0.24 – -0.02] p = 0.018</td></tr><tr><td rowspan="2">First Language (English vs non-English) n = 114</td><td>MoCA</td><td>-3.00 [-4.01 – -1.99] p ≤ 0.001</td></tr><tr><td>RUDAS</td><td>-2.00 [-5.01 – 1.00] p = 0.191</td></tr><tr><td rowspan="2">Years of Education (per additional year) n = 110</td><td>MoCA</td><td>0.40 [0.27 – 0.53] p ≤ 0.001</td></tr><tr><td>RUDAS</td><td>0.40 [0.01 – 0.79] p = 0.043</td></tr></table> |                           | Sensitivity                                                                           | Specificity         | Positive Predictive Value | Negative Predictive Value | Accuracy | AUC* | Full Cohort |  |  |  |  |  |  | MoCA (n = 1333) | 84.3 [80.8-78.8] | 59.0 [55.9-62.1] | 49.1 [45.7-52.5] | 88.9 [86.3-91.4] | 67.1 [64.6-69.5] | 0.743 [0.651-0.835] | RUDAS (n = 146) | 35.9 [23.9-48.0] | 93.9 [88.4-99.4] | 82.1 [66.9-97.4] | 65.3 [56.8-73.7] | 68.5 [60.9-76.1] | 0.681 [0.574-787] | Difference | 48.4 [48.3-48.5] | -34.9 [-35.0 to -34.8] | -43.0 [-33.2 to -32.8] | 23.6 [23.5-23.7] | -1.4 [-1.5 to -1.3] | p = 0.20 | Subgroup |  |  |  |  |  |  | MoCA (n = 119) | 57.3 [43.4-71.2] | 83.2 [74.5-91.9] | 65.9 [49.6-82.1] | 73.5 [60.4-86.6] | 70.5 [64.6-76.4] | 0.688 [0.583-0.782] | RUDAS (n = 119) | 59.3 [39.5-79.0] | 78.7 [70.4-89.0] | 58.4 [37.7-79.1] | 76.8 [67.3-86.2] | 71.7 [65.5-77.9] | 0.653 [0.534-0.753] | Difference | -2.0 [-24.4-20.5] | 4.5 [-6.6-15.7] | 7.5 [-17.0-32.0] | -3.3 [-18.3-11.8] | -1.2 [-9.1-6.7] | p = 0.48 |  | Score difference (in points) From Quantile regression |  | Age (per additional year) n = 119 | MoCA | -0.18 [-0.21 – -0.15] p ≤ 0.001 | RUDAS | -0.13 [-0.24 – -0.02] p = 0.018 | First Language (English vs non-English) n = 114 | MoCA | -3.00 [-4.01 – -1.99] p ≤ 0.001 | RUDAS | -2.00 [-5.01 – 1.00] p = 0.191 | Years of Education (per additional year) n = 110 | MoCA | 0.40 [0.27 – 0.53] p ≤ 0.001 | RUDAS | 0.40 [0.01 – 0.79] p = 0.043 | <ul style="list-style-type: none"><li>- MoCA and RUDAS have similar accuracy and AUC to screen for dementia</li><li>- Full cohort: MoCA had a higher sensitivity while RUDAS had a higher specificity</li><li>- Subgroup: no significant differences between MoCA and RUDAS</li><li>- Future studies should consider using a blinded “gold standard”</li><li>- RUDAS is less influenced by language</li></ul> | <ol style="list-style-type: none"><li>1. Davis DH, Creavin ST, Yip JL, et al. Montreal Cognitive Assessment for the detection of dementia. <i>Cochrane Database Syst Rev</i>; 2021. Epub ahead of print 13 July 2021. DOI: 10.1002/14651858.CD010775.pub3.</li><li>2. Naqvi RM, Haider S, Tomlinson G, et al. Cognitive assessments in multicultural populations using the Rowland Universal Dementia Assessment Scale: a systematic review and meta-analysis. <i>Can Med Assoc J</i> 2015; 187: E169–E175.</li></ol> |
|                                                                                                                                                                                                                                                                                                                                                                                                                              | Sensitivity                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Specificity                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Positive Predictive Value | Negative Predictive Value                                                             | Accuracy            | AUC*                      |                           |          |      |             |  |  |  |  |  |  |                 |                  |                  |                  |                  |                  |                     |                 |                  |                  |                  |                  |                  |                   |            |                  |                        |                        |                  |                     |          |          |  |  |  |  |  |  |                |                  |                  |                  |                  |                  |                     |                 |                  |                  |                  |                  |                  |                     |            |                   |                 |                  |                   |                 |          |  |                                                       |  |                                   |      |                                 |       |                                 |                                                 |      |                                 |       |                                |                                                  |      |                              |       |                              |                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Full Cohort                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                           |                                                                                       |                     |                           |                           |          |      |             |  |  |  |  |  |  |                 |                  |                  |                  |                  |                  |                     |                 |                  |                  |                  |                  |                  |                   |            |                  |                        |                        |                  |                     |          |          |  |  |  |  |  |  |                |                  |                  |                  |                  |                  |                     |                 |                  |                  |                  |                  |                  |                     |            |                   |                 |                  |                   |                 |          |  |                                                       |  |                                   |      |                                 |       |                                 |                                                 |      |                                 |       |                                |                                                  |      |                              |       |                              |                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| MoCA (n = 1333)                                                                                                                                                                                                                                                                                                                                                                                                              | 84.3 [80.8-78.8]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 59.0 [55.9-62.1]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 49.1 [45.7-52.5]          | 88.9 [86.3-91.4]                                                                      | 67.1 [64.6-69.5]    | 0.743 [0.651-0.835]       |                           |          |      |             |  |  |  |  |  |  |                 |                  |                  |                  |                  |                  |                     |                 |                  |                  |                  |                  |                  |                   |            |                  |                        |                        |                  |                     |          |          |  |  |  |  |  |  |                |                  |                  |                  |                  |                  |                     |                 |                  |                  |                  |                  |                  |                     |            |                   |                 |                  |                   |                 |          |  |                                                       |  |                                   |      |                                 |       |                                 |                                                 |      |                                 |       |                                |                                                  |      |                              |       |                              |                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| RUDAS (n = 146)                                                                                                                                                                                                                                                                                                                                                                                                              | 35.9 [23.9-48.0]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 93.9 [88.4-99.4]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 82.1 [66.9-97.4]          | 65.3 [56.8-73.7]                                                                      | 68.5 [60.9-76.1]    | 0.681 [0.574-787]         |                           |          |      |             |  |  |  |  |  |  |                 |                  |                  |                  |                  |                  |                     |                 |                  |                  |                  |                  |                  |                   |            |                  |                        |                        |                  |                     |          |          |  |  |  |  |  |  |                |                  |                  |                  |                  |                  |                     |                 |                  |                  |                  |                  |                  |                     |            |                   |                 |                  |                   |                 |          |  |                                                       |  |                                   |      |                                 |       |                                 |                                                 |      |                                 |       |                                |                                                  |      |                              |       |                              |                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Difference                                                                                                                                                                                                                                                                                                                                                                                                                   | 48.4 [48.3-48.5]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | -34.9 [-35.0 to -34.8]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | -43.0 [-33.2 to -32.8]    | 23.6 [23.5-23.7]                                                                      | -1.4 [-1.5 to -1.3] | p = 0.20                  |                           |          |      |             |  |  |  |  |  |  |                 |                  |                  |                  |                  |                  |                     |                 |                  |                  |                  |                  |                  |                   |            |                  |                        |                        |                  |                     |          |          |  |  |  |  |  |  |                |                  |                  |                  |                  |                  |                     |                 |                  |                  |                  |                  |                  |                     |            |                   |                 |                  |                   |                 |          |  |                                                       |  |                                   |      |                                 |       |                                 |                                                 |      |                                 |       |                                |                                                  |      |                              |       |                              |                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Subgroup                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                           |                                                                                       |                     |                           |                           |          |      |             |  |  |  |  |  |  |                 |                  |                  |                  |                  |                  |                     |                 |                  |                  |                  |                  |                  |                   |            |                  |                        |                        |                  |                     |          |          |  |  |  |  |  |  |                |                  |                  |                  |                  |                  |                     |                 |                  |                  |                  |                  |                  |                     |            |                   |                 |                  |                   |                 |          |  |                                                       |  |                                   |      |                                 |       |                                 |                                                 |      |                                 |       |                                |                                                  |      |                              |       |                              |                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| MoCA (n = 119)                                                                                                                                                                                                                                                                                                                                                                                                               | 57.3 [43.4-71.2]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 83.2 [74.5-91.9]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 65.9 [49.6-82.1]          | 73.5 [60.4-86.6]                                                                      | 70.5 [64.6-76.4]    | 0.688 [0.583-0.782]       |                           |          |      |             |  |  |  |  |  |  |                 |                  |                  |                  |                  |                  |                     |                 |                  |                  |                  |                  |                  |                   |            |                  |                        |                        |                  |                     |          |          |  |  |  |  |  |  |                |                  |                  |                  |                  |                  |                     |                 |                  |                  |                  |                  |                  |                     |            |                   |                 |                  |                   |                 |          |  |                                                       |  |                                   |      |                                 |       |                                 |                                                 |      |                                 |       |                                |                                                  |      |                              |       |                              |                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| RUDAS (n = 119)                                                                                                                                                                                                                                                                                                                                                                                                              | 59.3 [39.5-79.0]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 78.7 [70.4-89.0]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 58.4 [37.7-79.1]          | 76.8 [67.3-86.2]                                                                      | 71.7 [65.5-77.9]    | 0.653 [0.534-0.753]       |                           |          |      |             |  |  |  |  |  |  |                 |                  |                  |                  |                  |                  |                     |                 |                  |                  |                  |                  |                  |                   |            |                  |                        |                        |                  |                     |          |          |  |  |  |  |  |  |                |                  |                  |                  |                  |                  |                     |                 |                  |                  |                  |                  |                  |                     |            |                   |                 |                  |                   |                 |          |  |                                                       |  |                                   |      |                                 |       |                                 |                                                 |      |                                 |       |                                |                                                  |      |                              |       |                              |                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Difference                                                                                                                                                                                                                                                                                                                                                                                                                   | -2.0 [-24.4-20.5]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 4.5 [-6.6-15.7]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 7.5 [-17.0-32.0]          | -3.3 [-18.3-11.8]                                                                     | -1.2 [-9.1-6.7]     | p = 0.48                  |                           |          |      |             |  |  |  |  |  |  |                 |                  |                  |                  |                  |                  |                     |                 |                  |                  |                  |                  |                  |                   |            |                  |                        |                        |                  |                     |          |          |  |  |  |  |  |  |                |                  |                  |                  |                  |                  |                     |                 |                  |                  |                  |                  |                  |                     |            |                   |                 |                  |                   |                 |          |  |                                                       |  |                                   |      |                                 |       |                                 |                                                 |      |                                 |       |                                |                                                  |      |                              |       |                              |                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|                                                                                                                                                                                                                                                                                                                                                                                                                              | Score difference (in points) From Quantile regression                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                           |                                                                                       |                     |                           |                           |          |      |             |  |  |  |  |  |  |                 |                  |                  |                  |                  |                  |                     |                 |                  |                  |                  |                  |                  |                   |            |                  |                        |                        |                  |                     |          |          |  |  |  |  |  |  |                |                  |                  |                  |                  |                  |                     |                 |                  |                  |                  |                  |                  |                     |            |                   |                 |                  |                   |                 |          |  |                                                       |  |                                   |      |                                 |       |                                 |                                                 |      |                                 |       |                                |                                                  |      |                              |       |                              |                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Age (per additional year) n = 119                                                                                                                                                                                                                                                                                                                                                                                            | MoCA                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | -0.18 [-0.21 – -0.15] p ≤ 0.001                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                           |                                                                                       |                     |                           |                           |          |      |             |  |  |  |  |  |  |                 |                  |                  |                  |                  |                  |                     |                 |                  |                  |                  |                  |                  |                   |            |                  |                        |                        |                  |                     |          |          |  |  |  |  |  |  |                |                  |                  |                  |                  |                  |                     |                 |                  |                  |                  |                  |                  |                     |            |                   |                 |                  |                   |                 |          |  |                                                       |  |                                   |      |                                 |       |                                 |                                                 |      |                                 |       |                                |                                                  |      |                              |       |                              |                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|                                                                                                                                                                                                                                                                                                                                                                                                                              | RUDAS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | -0.13 [-0.24 – -0.02] p = 0.018                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                           |                                                                                       |                     |                           |                           |          |      |             |  |  |  |  |  |  |                 |                  |                  |                  |                  |                  |                     |                 |                  |                  |                  |                  |                  |                   |            |                  |                        |                        |                  |                     |          |          |  |  |  |  |  |  |                |                  |                  |                  |                  |                  |                     |                 |                  |                  |                  |                  |                  |                     |            |                   |                 |                  |                   |                 |          |  |                                                       |  |                                   |      |                                 |       |                                 |                                                 |      |                                 |       |                                |                                                  |      |                              |       |                              |                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| First Language (English vs non-English) n = 114                                                                                                                                                                                                                                                                                                                                                                              | MoCA                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | -3.00 [-4.01 – -1.99] p ≤ 0.001                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                           |                                                                                       |                     |                           |                           |          |      |             |  |  |  |  |  |  |                 |                  |                  |                  |                  |                  |                     |                 |                  |                  |                  |                  |                  |                   |            |                  |                        |                        |                  |                     |          |          |  |  |  |  |  |  |                |                  |                  |                  |                  |                  |                     |                 |                  |                  |                  |                  |                  |                     |            |                   |                 |                  |                   |                 |          |  |                                                       |  |                                   |      |                                 |       |                                 |                                                 |      |                                 |       |                                |                                                  |      |                              |       |                              |                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|                                                                                                                                                                                                                                                                                                                                                                                                                              | RUDAS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | -2.00 [-5.01 – 1.00] p = 0.191                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                           |                                                                                       |                     |                           |                           |          |      |             |  |  |  |  |  |  |                 |                  |                  |                  |                  |                  |                     |                 |                  |                  |                  |                  |                  |                   |            |                  |                        |                        |                  |                     |          |          |  |  |  |  |  |  |                |                  |                  |                  |                  |                  |                     |                 |                  |                  |                  |                  |                  |                     |            |                   |                 |                  |                   |                 |          |  |                                                       |  |                                   |      |                                 |       |                                 |                                                 |      |                                 |       |                                |                                                  |      |                              |       |                              |                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Years of Education (per additional year) n = 110                                                                                                                                                                                                                                                                                                                                                                             | MoCA                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 0.40 [0.27 – 0.53] p ≤ 0.001                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                           |                                                                                       |                     |                           |                           |          |      |             |  |  |  |  |  |  |                 |                  |                  |                  |                  |                  |                     |                 |                  |                  |                  |                  |                  |                   |            |                  |                        |                        |                  |                     |          |          |  |  |  |  |  |  |                |                  |                  |                  |                  |                  |                     |                 |                  |                  |                  |                  |                  |                     |            |                   |                 |                  |                   |                 |          |  |                                                       |  |                                   |      |                                 |       |                                 |                                                 |      |                                 |       |                                |                                                  |      |                              |       |                              |                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|                                                                                                                                                                                                                                                                                                                                                                                                                              | RUDAS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 0.40 [0.01 – 0.79] p = 0.043                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                           |                                                                                       |                     |                           |                           |          |      |             |  |  |  |  |  |  |                 |                  |                  |                  |                  |                  |                     |                 |                  |                  |                  |                  |                  |                   |            |                  |                        |                        |                  |                     |          |          |  |  |  |  |  |  |                |                  |                  |                  |                  |                  |                     |                 |                  |                  |                  |                  |                  |                     |            |                   |                 |                  |                   |                 |          |  |                                                       |  |                                   |      |                                 |       |                                 |                                                 |      |                                 |       |                                |                                                  |      |                              |       |                              |                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                           | CONTACT                                                                               |                     |                           |                           |          |      |             |  |  |  |  |  |  |                 |                  |                  |                  |                  |                  |                     |                 |                  |                  |                  |                  |                  |                   |            |                  |                        |                        |                  |                     |          |          |  |  |  |  |  |  |                |                  |                  |                  |                  |                  |                     |                 |                  |                  |                  |                  |                  |                     |            |                   |                 |                  |                   |                 |          |  |                                                       |  |                                   |      |                                 |       |                                 |                                                 |      |                                 |       |                                |                                                  |      |                              |       |                              |                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                           | Email: Kaden.lam@ucalgary.ca                                                          |                     |                           |                           |          |      |             |  |  |  |  |  |  |                 |                  |                  |                  |                  |                  |                     |                 |                  |                  |                  |                  |                  |                   |            |                  |                        |                        |                  |                     |          |          |  |  |  |  |  |  |                |                  |                  |                  |                  |                  |                     |                 |                  |                  |                  |                  |                  |                     |            |                   |                 |                  |                   |                 |          |  |                                                       |  |                                   |      |                                 |       |                                 |                                                 |      |                                 |       |                                |                                                  |      |                              |       |                              |                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                           |  |                     |                           |                           |          |      |             |  |  |  |  |  |  |                 |                  |                  |                  |                  |                  |                     |                 |                  |                  |                  |                  |                  |                   |            |                  |                        |                        |                  |                     |          |          |  |  |  |  |  |  |                |                  |                  |                  |                  |                  |                     |                 |                  |                  |                  |                  |                  |                     |            |                   |                 |                  |                   |                 |          |  |                                                       |  |                                   |      |                                 |       |                                 |                                                 |      |                                 |       |                                |                                                  |      |                              |       |                              |                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |