Supplemenraty material – Model metrics

Table S1. Association between Need For Cognition score (continuous) and Overall Cognition

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **B** | **95% CI** | **p-value** | **R2** | **Adjusted R2** |
| Model 1 | 0.344 | 0.292 – 0.395 | <0.001 | 0.040 | 0.040 |
| Model 2 | 0.217 | 0.173 – 0.262 | <0.001 | 0.401 | 0.401 |
| Model 3 | 0.213 | 0.169 – 0.258 | <0.001 | 0.406 | 0.404 |
| Model 4 | 0.207 | 0.162 – 0.252 | <0.001 | 0.408 | 0.406 |

B = unstandardized regression coefficient; CI = confidence interval

Model 1: Adjusted for MRI lag time and intracranial volume for volumetric MRI markers

Model 2: Model 1 + adjusted for age, sex, education, T2DM

Model 3: Model 2 + adjusted for BMI, hypertension, history of cardiovascular disease, depression, antidepressants, cholesterol, and lipid-modifying medication

Model 4: Model 3 + adjusted for smoking status, physical activity, DHDI

\* Main model

Table S2. Association between Need For Cognition score (continuous) and Memory

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **B** | **95% CI** | **p-value** | **R2** | **Adjusted R2** |
| Model 1 | 0.244 | 0.169 – 0.319 | <0.001 | 0.010 | 0.009 |
| Model 2 | 0.188 | 0.117 – 0.258 | <0.001 | 0.275 | 0.274 |
| Model 3 | 0.187 | 0.116 – 0.257 | <0.001 | 0.278 | 0.275 |
| Model 4 | 0.188 | 0.115 – 0.260 | <0.001 | 0.278 | 0.275 |

B = unstandardized regression coefficient; CI = confidence interval

Model 1: Adjusted for MRI lag time and intracranial volume for volumetric MRI markers

Model 2: Model 1 + adjusted for age, sex, education, T2DM

Model 3: Model 2 + adjusted for BMI, hypertension, history of cardiovascular disease, depression, antidepressants, cholesterol, and lipid-modifying medication

Model 4: Model 3 + adjusted for smoking status, physical activity, DHDI

\* Main model

Table S3. Association between Need For Cognition score (continuous) and Processing Speed

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **B** | **95% CI** | **p-value** | **R2** | **Adjusted R2** |
| Model 1 | 0.357 | 0.298 – 0.416 | <0.001 | 0.032 | 0.032 |
| Model 2 | 0.216 | 0.161 – 0.271 | <0.001 | 0.310 | 0.310 |
| Model 3 | 0.211 | 0.156 – 0.266 | <0.001 | 0.315 | 0.131 |
| Model 4 | 0.198 | 0.141 – 0.254 | <0.001 | 0.320 | 0.317 |

B = unstandardized regression coefficient; CI = confidence interval

Model 1: Adjusted for MRI lag time and intracranial volume for volumetric MRI markers

Model 2: Model 1 + adjusted for age, sex, education, T2DM

Model 3: Model 2 + adjusted for BMI, hypertension, history of cardiovascular disease, depression, antidepressants, cholesterol, and lipid-modifying medication

Model 4: Model 3 + adjusted for smoking status, physical activity, DHDI

\* Main model

Table S4. Association between Need For Cognition score (continuous) and Executive Functioning and Attention

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **B** | **95% CI** | **p-value** | **R2** | **Adjusted R2** |
| Model 1 | 0.430 | 0.368 – 0.492 | <0.001 | 0.042 | 0.042 |
| Model 2 | 0.248 | 0.186 – 0.310 | <0.001 | 0.218 | 0.217 |
| Model 3 | 0.243 | 0.181 – 0.304 | <0.001 | 0.223 | 0.220 |
| Model 4 | 0.236 | 0.173 – 0.300 | <0.001 | 0.223 | 0.220 |

B = unstandardized regression coefficient; CI = confidence interval

Model 1: Adjusted for MRI lag time and intracranial volume for volumetric MRI markers

Model 2: Model 1 + adjusted for age, sex, education, T2DM

Model 3: Model 2 + adjusted for BMI, hypertension, history of cardiovascular disease, depression, antidepressants, cholesterol, and lipid-modifying medication

Model 4: Model 3 + adjusted for smoking status, physical activity, DHDI

\* Main model

Table S5. Association between Need For Cognition score (continuous) and Cognitive Impairment

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **OR** | **95% CI** | **p-value** | **Pseudo R2** |
| Model 1 | 0.805 | 0.656 – 0.987 | 0.037 | 0.001 |
| Model 2 | 0.585 | 0.466 – 0.734 | <0.001 | 0.019 |
| Model 3 | 0.602 | 0.479 – 0.757 | <0.001 | 0.023 |
| Model 4 | 0.632 | 0.498 – 0.801 | <0.001 | 0.028 |

OR = odds ratio; CI = confidence interval

Model 1: Adjusted for MRI lag time and intracranial volume for volumetric MRI markers

Model 2: Model 1 + adjusted for age, sex, education, T2DM

Model 3: Model 2 + adjusted for BMI, hypertension, history of cardiovascular disease, depression, antidepressants, cholesterol, and lipid-modifying medication

Model 4: Model 3 + adjusted for smoking status, physical activity, DHDI

\* Main model

Table S6. Association between Need For Cognition score (continuous) and Cerebral Small Vessel Disease

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **B** | **95% CI** | **p-value** | **Pseudo R2** |
| Model 1 | 0.656 | 0.546 – 0.787 | <0.001 | 0.010 |
| Model 2 | 0.736 | 0.597 – 0.908 | 0.004 | 0.103 |
| Model 3 | 0.740 | 0.599 – 0.913 | 0.005 | 0.109 |
| Model 4 | 0.725 | 0.584 – 0.900 | 0.004 | 0.110 |

B = unstandardized regression coefficient; CI = confidence interval

Model 1: Adjusted for MRI lag time and intracranial volume for volumetric MRI markers

Model 2: Model 1 + adjusted for age, sex, education, T2DM

Model 3: Model 2 + adjusted for BMI, hypertension, history of cardiovascular disease, depression, antidepressants, cholesterol, and lipid-modifying medication

Model 4: Model 3 + adjusted for smoking status, physical activity, DHDI

\* Main model

Table S7. Association between Need For Cognition score (continuous) and White Matter Hyperintensities volume

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **B** | **95% CI** | **p-value** | **R2** | **Adjusted R2** |
| Model 1 | -0.100 | -0.145 – -0.055 | <0.001 | 0.013 | 0.013 |
| Model 2 | -0.036  | -0.080 – 0.008 | 0.110 | 0.188 | 0.187 |
| Model 3 | -0.030  | -0.074 – 0.014 | 0.185 | 0.199 | 0.196 |
| Model 4 | -0.026 | -0.072 – 0.020 | 0.263 | 0.196 | 0.193 |

B = unstandardized regression coefficient; CI = confidence interval

Model 1: Adjusted for MRI lag time and intracranial volume for volumetric MRI markers

Model 2: Model 1 + adjusted for age, sex, education, T2DM

Model 3: Model 2 + adjusted for BMI, hypertension, history of cardiovascular disease, depression, antidepressants, cholesterol, and lipid-modifying medication

Model 4: Model 3 + adjusted for smoking status, physical activity, DHDI

\* Main model

Table S8. Association between Need For Cognition score (continuous) and Cerebrospinal Fluid volume

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **B** | **95% CI** | **p-value** | **R2** | **Adjusted R2** |
| Model 1 | -3.217 | -6.253 – -0.180 | 0.038 | 0.402 | 0.402 |
| Model 2 | 0.063 | -2.626 – 2.752 | 0.963 | 0.599 | 0.599 |
| Model 3 | 0.216 |  -2.479 – 2.910 | 0.875 | 0.602 | 0.601 |
| Model 4 | 0.462 | -2.290 – 3.214 | 0.742 | 0.605 | 0.603 |

B = unstandardized regression coefficient; CI = confidence interval

Model 1: Adjusted for MRI lag time and intracranial volume for volumetric MRI markers

Model 2: Model 1 + adjusted for age, sex, education, T2DM

Model 3: Model 2 + adjusted for BMI, hypertension, history of cardiovascular disease, depression, antidepressants, cholesterol, and lipid-modifying medication

Model 4: Model 3 + adjusted for smoking status, physical activity, DHDI

\* Main model

Table S9. Association between Need For Cognition score (tertiles) and Overall Cognition

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  |  | **B** | **95% CI** | **p-value** | R2 | **Adjusted R2** |
| Model 1 | Low NFC | Reference |
|  | Medium NFC | 0.122 | 0.074 – 0.170 | <0.001 | 0.032 | 0.031 |
|  | High NFC | 0.283 | 0.235 – 0.331 | <0.001 |
| Model 2 | Low NFC | Reference |
|  | Medium NFC | 0.076 | 0.037 – 0.114 | <0.001 | 0.398 | 0.397 |
|  | High NFC | 0.172 | 0.130 – 0.213 | <0.001 |
| Model 3 | Low NFC | Reference |
|  | Medium NFC | 0.073 | 0.034 – 0.111 | <0.001 | 0.403 | 0.401 |
|  | High NFC | 0.169 | 0.127 – 0.211 | <0.001 |
| Model 4 | Low NFC | Reference |
|  | Medium NFC | 0.073 | 0.034 – 0.113 | <0.001 | 0.405 | 0.403 |
|  | High NFC | 0.165 | 0.123 – 0.208 | <0.001 |

B = unstandardized regression coefficient; CI = confidence interval

Model 1: Adjusted for MRI lag time and intracranial volume for volumetric MRI markers

Model 2: Model 1 + adjusted for age, sex, education, T2DM

Model 3: Model 2 + adjusted for BMI, hypertension, history of cardiovascular disease, depression, antidepressants, cholesterol, and lipid-modifying medication

Model 4: Model 3 + adjusted for smoking status, physical activity, DHDI

\* Main model

Table S10. Association between Need For Cognition score (tertiles) and Cerebral Small Vessel Disease

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  |  | **OR** | **95% CI** | **p-value** | **R2** |  |
| Model 1 | Low NFC | Reference |
|  | Medium NFC | 0.814 | 0.690 – 0.960 | 0.014 | 0.009 |  |
|  | High NFC | 0.727 | 0.614 – 0.862 | <0.001 |
| Model 2 | Low NFC | Reference |
|  | Medium NFC | 0.857 | 0.717 – 1.024 | 0.089 | 0.103 |  |
|  | High NFC | 0.819 | 0.675 – 0.993 | 0.042 |
| Model 3 | Low NFC | Reference |
|  | Medium NFC | 0.856 | 0.715 – 1.024 | 0.089 | 0.108 |  |
|  | High NFC | 0.820 | 0.675 – 0.996 | 0.046 |
| Model 4 | Low NFC | Reference |
|  | Medium NFC | 0.858 | 0.714 – 1.031 | 0.102 | 0.109 |  |
|  | High NFC | 0.819 | 0.671 – 0.999 | 0.049 |

OR = odds ratio; CI = confidence interval

Model 1: Adjusted for MRI lag time and intracranial volume for volumetric MRI markers

Model 2: Model 1 + adjusted for age, sex, education, T2DM

Model 3: Model 2 + adjusted for BMI, hypertension, history of cardiovascular disease, depression, antidepressants, cholesterol, and lipid-modifying medication

Model 4: Model 3 + adjusted for smoking status, physical activity, DHDI

\* Main model

Table S11. Association between Need For Cognition score (tertiles) and White Matter Hyperintensities volume

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  |  | **B** | **95% CI** | **p-value** | R2 | **Adjusted R2** |
| Model 1 | Low NFC | Reference |
|  | Medium NFC | -0.031 | -0.071 – 0.011 | 0.149 | 0.012 | 0.011 |
|  | High NFC | -0.079 | -0.122 – -0.037 | <0.001 |
| Model 2 | Low NFC | Reference |
|  | Medium NFC | -0.001 | -0.041 – 0.036 | 0.901 | 0.118 | 0.186 |
|  | High NFC | -0.023 | -0.064 – 0.018 | 0.277 |
| Model 3 | Low NFC | Reference |
|  | Medium NFC | -0.000 | -0.039 – 0.038 | 0.989 | 0.199 | 0.196 |
|  | High NFC | -0.018 | -0.059 – 0.023 | 0.392 |
| Model 4 | Low NFC | Reference |
|  | Medium NFC | 0.006 | -0.034 – 0.046 | 0.762 | 0.196 | 0.193 |
|  | High NFC | -0.014 | -0.057 – 0.029 | 0.518 |

B = unstandardized regression coefficient; CI = confidence interval

Model 1: Adjusted for MRI lag time and intracranial volume for volumetric MRI markers

Model 2: Model 1 + adjusted for age, sex, education, T2DM

Model 3: Model 2 + adjusted for BMI, hypertension, history of cardiovascular disease, depression, antidepressants, cholesterol, and lipid-modifying medication

Model 4: Model 3 + adjusted for smoking status, physical activity, DHDI

\* Main model

Table S12. Association between Need For Cognition score (tertiles) and Cerebrospinal Fluid volume

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  |  | **B** | **95% CI** | **p-value** | R2 | **Adjusted R2** |
| Model 1 | Low NFC | Reference |
|  | Medium NFC | -1.218 | -4.033 – 1.596 | 0.396 | 0.402 | 0.402 |
|  | High NFC | -3.085 | -5.947 – -0.223 | 0.035 |
| Model 2 | Low NFC | Reference |
|  | Medium NFC | 0.133 | -2.206 – 2.472 | 0.991 | 0.599 | 0.599 |
|  | High NFC | -0.597 | -3.111 – 1.918 | 0.642 |
| Model 3 | Low NFC | Reference |
|  | Medium NFC | 0.310 | -2.027 – 2.649 | 0.795 | 0.602 | 0.601 |
|  | High NFC | -0.437 |  -2.954 – 2.080 | 0.734 |
| Model 4 | Low NFC | Reference |
|  | Medium NFC | 0.273 | -2.107 – 2.652 | 0.822 | 0.605 | 0.603 |
|  | High NFC | -0.132 | -2.694 – 2.430 | 0.919 |

B = unstandardized regression coefficient; CI = confidence interval

Model 1: Adjusted for MRI lag time and intracranial volume for volumetric MRI markers

Model 2: Model 1 + adjusted for age, sex, education, T2DM

Model 3: Model 2 + adjusted for BMI, hypertension, history of cardiovascular disease, depression, antidepressants, cholesterol, and lipid-modifying medication

Model 4: Model 3 + adjusted for smoking status, physical activity, DHDI

\* Main model

Table S13. Collinearity diagnostics model Need For Cognition (continuous) and Overall Cognition

|  |  |  |
| --- | --- | --- |
| **Variable** | **VIF** | **Tolerance** |
| NFC | 1.21 | 0.83 |
| Age | 1.10 | 0.91 |
| Sex | 1.07 | 0.94 |
| Education |  |  |
| Middle | 1.53 | 0.65 |
| High | 1.70 | 0.59 |

VIF = Variance Inflation Factor

Table S14. Collinearity diagnostics model Need For Cognition (continuous) and Executive Functioning, Memory and Processing Speed

|  |  |  |
| --- | --- | --- |
| **Variable** | **VIF** | **Tolerance** |
| NFC | 1.21 | 0.83 |
| Age | 1.10 | 0.91 |
| Sex | 1.07 | 0.94 |
| Education |  |  |
| Middle | 1.53 | 0.65 |
| High | 1.70 | 0.59 |

VIF = Variance Inflation Factor

Table S15. Collinearity diagnostics model Need For Cognition (continuous) and Cognitive Impairment

|  |  |  |
| --- | --- | --- |
| **Variable** | **VIF** | **Tolerance** |
| NFC | 1.22 | 0.82 |
| Age | 1.10 | 0.91 |
| Sex | 1.53 | 0.65 |
| Education |  |  |
| Middle | 1.55 | 0.65 |
| High | 1.74 | 0.58 |

VIF = Variance Inflation Factor

Table S16. Collinearity diagnostics model Need For Cognition (continuous) and Cerebral Small Vessel Disease, White Matter Hyperintensities volume and Cerebrospinal Fluid volume

|  |  |  |
| --- | --- | --- |
| **Variable** | **VIF** | **Tolerance** |
| NFC | 1.21 | 0.83 |
| Age | 1.10 | 0.91 |
| Sex | 1.52 | 0.66 |
| Education |  |  |
| Middle | 1.54 | 0.65 |
| High | 1.72 | 0.58 |

VIF = Variance Inflation Factor