**Supplementary Table S1**

*Ten principal cognitive function tests used to compute global cognition scores.*

|  |  |  |
| --- | --- | --- |
| **No** | **Test** | **Reference** |

|  |  |  |
| --- | --- | --- |
| 1 | Wechsler Adult Intelligence Scale-III (WAIS-III) Digit Symbol-Coding | Wechsler, 2003 |
| 2 | Trail Making Test A  | Tombaugh, 2004 |
| 3 | Boston Naming Test  | Kaplan et al., 2001 |
| 4 | Animal Fluency  | Spreen, 1977 |
| 5 | FAS Fluency  | Benton, 1967 |
| 6 | Trail Making Test B  | Reitan and Wolfson, 1993 |
| 7 | Wechsler Adult Intelligence Scale-Revised (WAIS-R) Block Design  | Wechsler, 1981 |
| 8 | Wechsler Memory Scale-III (WMS-III) Logical Memory Story A delayed recall  | Wechsler, 1997 |
| 9 | Rey Auditory Verbal Learning Test  | Strauss et al., 2006 |
| 10 | the Benton Visual Retention Test  | Benton et al., 1996 |

**Supplementary Table S2**

*G-Theory model estimates’ calculation including component variances, formula for the design of person by item by occasion, express as P x I x O.*

|  |  |
| --- | --- |
| **Indices** | **Characteristic (Formula)** |
| $$X= $$ | observed score of a person on a particular item across occasions |
| $$μ$$ | grand mean of *X* |
| *+X*p | person effect (μp – μ) |
| *+X*i | item effect (μi – μ) |
| *+X*o | occasion effect (μo – μ) |
| *+X*pi | person x item effect (μpi – μp – μi + μ) |
| *+X*po | person x occasion effect (μpo – μp – μo + μ) |
| *+X*io | item x occasion effect (μio – μi – μo + μ) |
| *+X*pio | residual/person x item x occasion effect (μpio – μpi – μpo - μio + μp + μi + μo - μ) |
| σ2p | person variance component (MSp – MSpi – MSpo + MSpio)∕nino |
| σ2i | item variance component (MSi−MSpi−MSio+MSpio)∕npno |
| σ2o | occasion variance component (MSo – MSio – MSpo + MSpio)∕nino |
| σ2pi | person x item variance component(MSpi−MSpio)∕no |
| σ2po | person x occasion variance component (MSpo−MSpio)∕ni |
| σ2io | item x occasion variance component (MSio−MSpio)∕np |
| σ2pio | residual/ person x item x occasion variance component: (MSpio) |
| $$σ\_{δ}^{2}$$ | relative error variance ($ \frac{σ\_{pi}^{2}}{n\_{i}}+\frac{σ\_{po}^{2}}{n\_{o}}+\frac{σ\_{pio}^{2}}{n\_{i}n\_{o}}$)  |
| σ2Δ | absolute error variance ($\frac{σ\_{0}^{2}}{n\_{o}}+\frac{σ\_{i}^{2}}{n\_{i}}+\frac{σ\_{pi}^{2}}{n\_{i}}+\frac{σ\_{po}^{2}}{n\_{o}}+\frac{σ\_{io}^{2}}{n\_{i}n\_{o}}+\frac{σ\_{pio}^{2}}{n\_{i}n\_{o}}$) |
| *Gr* | relative G-coefficient ($\frac{σ\_{p}^{2}}{σ\_{p}^{2}+ σ\_{δ}^{2}}$) |
| *Ga* | absolute G-coefficient ($\frac{σ\_{p}^{2}}{σ\_{p}^{2}+ σ\_{Δ}^{2}}$) |
| SCI | state component index ($\frac{σ\_{po}^{2}}{σ\_{po}^{2}+ σ\_{p}^{2}})$ |
| TCI | trait component index ($\frac{σ\_{p}^{2}}{σ\_{po}^{2}+ σ\_{p}^{2}}$) |

Note: MS stands for the mean of effect square; ni: number of items; no: number of occasions; np: number of persons/participants

**Supplementary Table S3**

*Variance components of Person (P), Occasion (O) and P x O interaction together with state component index (SCI) for each individual item of the MAC-Q and the IQCODE (n = 232x5).*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Items** | **P** | **O** | **PxO** | **SCI** |
| **MAC-Q** |  |  |  |  |
| a: Remembering the name of a person just introduced to you? | 0.092 | 0.001 | 0.040 | 0.30 |
| b: Recalling telephone numbers or post codes that you use on a daily or weekly basis? | 0.088 | 0.010 | 0.054 | 0.38 |
| c: Recalling where you have put objects (such as keys) in your home or office? | 0.095 | 0.002 | 0.027 | 0.22 |
| d: Remembering specific facts from a newspaper or magazine article you have just finished reading? | 0.104 | 0.001 | 0.018 | 0.15 |
| e: Remembering the item(s) you intended to buy when you arrive at the supermarket store or pharmacy? | 0.022 | 0.003 | 0.042 | **0.66** |
| f: In general, how would you describe your memory as compared to 10 years ago? | 0.073 | 0.007 | 0.059 | 0.45 |
| **IQCODE** |  |  |  |  |
| 1. Remembering things about family and friends (e.g. occupations, birthdays, addresses) | 0.112 | 0.003 | 0.024 | 0.18 |
| 2. Remembering things that have happened recently | 0.121 | 0.001 | 0.021 | 0.15 |
| 3. Recalling conversations a few days later | 0.072 | 0.005 | 0.026 | 0.27 |
| 4.Remembering his/her address and telephone number | 0.083 | 0.006 | 0.054 | 0.39 |
| 5. Remembering what day and month it is | 0.080 | 0.003 | 0.019 | 0.19 |
| 6. Remembering where things are usually kept | 0.096 | 0.001 | 0.026 | 0.21 |
| 7. Remembering where to find things which have been put in a different place from usual | 0.069 | 0.001 | 0.013 | 0.16 |
| 8. Knowing how to work familiar machines around the house | 0.059 | 0.002 | 0.038 | 0.39 |
| 9. Learning to use a new gadget or machine around the house | 0.150 | 0.005 | 0.063 | 0.30 |
| 10. Learning new things in general | 0.129 | 0.002 | 0.021 | 0.14 |
| 11. Following a story in a book or on TV | 0.155 | 0.001 | 0.027 | 0.15 |
| 12. Making decisions on everyday matters | 0.054 | 0.003 | 0.037 | 0.41 |
| 13. Handling money for shopping | 0.063 | 0.007 | 0.061 | 0.49 |
| 14. Handling financial matters e.g. the pension, dealing with the bank | 0.058 | 0.003 | 0.022 | 0.28 |
| 15. Handling other everyday arithmetic problems (e.g.knowing how much food to buy, knowing how long between visits from family or friends) | 0.060 | 0.002 | 0.027 | 0.31 |
| 16. Using his/her intelligence to understand what'sgoing on and to reason things through | 0.048 | 0.000 | 0.012 | 0.20 |

Note: Number in bold reflects item measuring dynamic (state) pattern

**Supplementary Table S4a**

*D-study reliability estimates and variance components for the Person (P) × Occasion (O) × Item (I) design including interactions for MAC-Q with subtracting one item at a time*

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | MAC-Q without item a | MAC-Q without item b | MAC-Q without item c | MAC-Q without item d | MAC-Q without item e | MAC-Q without item f |
| Facets | σ2 | % | σ2 | % | σ2 |  | σ2 | % | σ2 | % | σ2 | % |
| P | 0.049 |  | 0.036 |  | 0.040 |  | 0.038 |  | 0.050 |  | 0.053 |  |
| I | 0.001 | 3.9 | 0.001 | 4.1 | 0.001 | 3.6 | 0.000 | 0.0 | 0.001 | 3.9 | 0.000 | 3.3 |
| O | 0.001 | 5.8 | 0.001 | 4.9 | 0.001 | 4.3 | 0.001 | 4.5 | 0.001 | 5.6 | 0.000 | 1.3 |
| PI | 0.005 | 32.6 | 0.007 | 41.9 | 0.006 | 36.3 | 0.006 | 35.9 | 0.007 | 39.8 | 0.005 | 35.3 |
| PO | 0.001 | 7.2 | 0.002 | 10.4 | 0.002 | 10.6 | 0.002 | 12.8 | 0.002 | 9.4 | 0.001 | 10.8 |
| IO | 0.001 | 4.6 | 0.000 | 2.2 | 0.001 | 3.8 | 0.001 | 4.1 | 0.001 | 3.3 | 0.001 | 4.3 |
| PIO | 0.007 | 46.0 | 0.006 | 36.5 | 0.007 | 41.3 | 0.007 | 42.7 | 0.006 | 37.9 | 0.006 | 45.0 |
| GM | 3.213 |  | 3.208 |  | 3.232 |  | 3.249 |  | 3.232 |  | 3.207 |  |
| SE | 0.048 |  | 0.046 |  | 0.047 |  | 0.041 |  | 0.050 |  | 0.038 |  |
| *Gr* | 0.80 |  | 0.71 |  | 0.73 |  | 0.71 |  | 0.77 |  | **0.81** |  |
| *Ga* | 0.77 |  | 0.69 |  | 0.70 |  | 0.69 |  | 0.75 |  | **0.80** |  |
| TCI | 0.83 |  | 0.95 |  | 0.95 |  | 0.95 |  | 0.96 |  | 0.98 |  |
| SCI | 0.17 |  | 0.05 |  | 0.05 |  | 0.05 |  | 0.04 |  | 0.02 |  |

**Supplementary Table S4b**

*D-study reliability estimates and variance components for the Person (P) × Occasion (O) × Item (I) design including interactions for MAC-Q with subtracting an occasion*

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Without occasion 1 | Without occasion 2 | Without occasion 3 | Without occasion 4 | Without occasion 5 |
| Facets | σ2 | % | σ2 | % | σ2 | % | σ2 | % | σ2 | % |
| P | 0.041 |  | 0.045 |  | 0.041 |  | 0.047 |  | 0.048 |  |
| I | 0.000 | 2.0 | 0.000 | 2.1 | 0.000 | 2.9 | 0.000 | 1.2 | 0.001 | 4.3 |
| O | 0.001 | 7.6 | 0.001 | 5.0 | 0.000 | 2.7 | 0.001 | 7.4 | 0.001 | 6.8 |
| PI | 0.006 | 37.1 | 0.005 | 31.3 | 0.004 | 31.6 | 0.004 | 25.6 | 0.005 | 29.1 |
| PO | 0.002 | 14.8 | 0.002 | 11.6 | 0.002 | 13.6 | 0.002 | 14.9 | 0.002 | 13.3 |
| IO | 0.000 | 2.4 | 0.001 | 4.7 | 0.000 | 3.8 | 0.001 | 4.4 | 0.001 | 3.8 |
| PIO | 0.006 | 36.0 | 0.007 | 45.3 | 0.006 | 45.4 | 0.007 | 46.5 | 0.007 | 42.5 |
| GM | 3.208 |  | 3.240 |  | 3.198 |  | 3.235 |  | 3.237 |  |
| SE | 0.046 |  | 0.046 |  | 0.038 |  | 0.047 |  | 0.051 |  |
| *Gr* | 0.75 |  | 0.77 |  | 0.77 |  | 0.79 |  | 0.78 |  |
| *Ga* | 0.72 |  | 0.75 |  | 0.76 |  | 0.76 |  | 0.75 |  |
| TCI | 0.95 |  | 0.96 |  | 0.95 |  | 0.96 |  | 0.96 |  |
| SCI | 0.05 |  | 0.04 |  | 0.05 |  | 0.04 |  | 0.04 |  |

**Supplementary Table S5**

*D-study reliability estimates and variance components for the Person (P) × Occasion (O) × Item (I) design including interactions for IQCODE with subtracting items with different SCI benchmarks, and occasions*

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | Items with SCI≤0.30 | Items with SCI<0.40 | Without occasion 1 | Without occasion 2 | Without occasion 3 | Without occasion 4 | Without occasion 5 |
| Facets | σ2 | % | σ2 | % | σ2 |   | σ2 | % | σ2 | % | σ2 | % | σ2 | % |
| P | 0.023 |   | 0.019 |  | 0.021 |  | 0.019 |  | 0.020 |  | 0.019 |  | 0.019 |  |
| I | 0.000 | 2.2 | 0.000 | 2.3 | 0.000 | 2.7 | 0.000 | 1.3 | 0.000 | 2.0 | 0.000 | 1.7 | 0.000 | 2.0 |
| O | 0.000 | 1.4 | 0.000 | 2.7 | 0.000 | 2.7 | 0.000 | 1.9 | 0.000 | 0.3 | 0.000 | 3.5 | 0.000 | 3.1 |
| PI | 0.004 | 60.2 | 0.002 | 48.3 | 0.001 | 37.1 | 0.001 | 34.1 | 0.001 | 32.1 | 0.001 | 33.3 | 0.001 | 36.1 |
| PO | 0.001 | 15.6 | 0.001 | 27.3 | 0.001 | 37.1 | 0.002 | 42.3 | 0.002 | 43.7 | 0.002 | 41.3 | 0.002 | 40.2 |
| IO | 0.000 | 1.6 | 0.000 | 1.5 | 0.000 | 1.7 | 0.000 | 1.7 | 0.000 | 1.9 | 0.000 | 1.5 | 0.000 | 1.4 |
| PIO | 0.001 | 19.0 | 0.001 | 17.9 | 0.001 | 18.8 | 0.001 | 18.7 | 0.001 | 20.1 | 0.001 | 18.6 | 0.001 | 17.2 |
| GM | 3.127 |  | 3.146 |  | 3.160 |  | 3.149 |  | 3.164 |  | 3.152 |  | 3.151 |  |
| SE | 0.021 |  | 0.019 |  | 0.019 |  | 0.017 |  | 0.016 |  | 0.018 |  | 0.019 |  |
| *Gr* | 0.79 |  | 0.83 |  | 0.86 |  | 0.85 |  | 0.85 |  | 0.85 |  |  0.84 |  |
| *Ga* | 0.78 |  | 0.82 |  | 0.85 |  | 0.84 |  | 0.84 |  | 0.84 |  |  0.83 |  |
| TCI | 0.96 |  | 0.95 |  | 0.95 |  | 0.90 |  | 0.91 |  | 0.90 |  | 0.90 |  |
| SCI | 0.04 |  | 0.05 |  | 0.05 |  | 0.10 |  | 0.09 |  | 0.10 |  | 0.10 |  |

**Supplementary Table S6**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | **Occasion 1** | **Occasion 2** | **Occasion 3** | **Occasion 4** | **Occasion 5** | **ICC(95%CI)** |
| **MAC-Q (6-item)** |  |  |  |  |  |  |
| Mean (SD) | 20.14 (2.45) | 18.64\* (2.00) | 19.98 (2.03) | 20.32 (2.16) | 20.31 (2.29) | 0.84(0.80-0.87) |
| Cronbach’s alpha | 0.73 | 0.57 | 0.76 | 0.76 | 0.75 |  |
| **MAC-Q (5-item)** |  |  |  |  |  |  |
| Mean (SD) | 16.51 (1.84) | 16.09\* (1.50) | 16.04\* (1.69) | 16.36 (1.80) | 16.36 (1.85) | 0.81(0.77-0.84) |
| Cronbach’s alpha | 0.67 | 0.63 | 0.72 | 0.72 | 0.69 |  |
| **IQCODE** |  |  |  |  |  |  |
| Mean (SD) | 49.61 (3.32) | 49.10 (3.49) | 49.51 (4.38) | 49.08 (5.88) | 52.45\* (6.82) | 0.70(0.63-0.75) |
| Cronbach’s alpha | 0.84 | 0.88 | 0.92 | 0.95 | 0.95 |  |

*Means, standard deviation (SD), Cronbach’s alpha, and intraclass correlation coefficient (ICC) for the MAC-Q 5 and 6 item versions and the IQCODE (n=232).*

Note: \*Mean differences are significant compared to occasion 1 (Bonferroni corrected); There were significant main effects of occasion observed on the MAC-Q (6-item) scale scores (*F*(231,4)=50.58, *p*<0.001; on the MAC-Q (5-item) scale scores (*F*(231,4)=5.25, *p*<0.001; and on the IQCODE scale scores (*F*(231,4)=27.63, *p*<0.001 with significance increase at the last occasion (5) compare to previous occasions.

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