**Supplemental materials**

Table S1. The category and items adapted in the Chinese version of the MBT.

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Form A** | | | | |  | **Form B** | | | | |
| Original | |  | Adaptation | |  | Original | |  | Adaptation | |
| Category | Items |  | Category | Items |  | Category | Items |  | Category | Items |
| Male name | Paul  Harry |  | No change | *Zhang Tao*张涛  *Wang Yong*王勇 |  | State | Florida  Colorado |  | Province  *Sheng省* | Jiangsu  Guangdong |
| Money | Dime  Peso |  | No change | Jiao  Yuan |  | Female name | Susan  Laura |  | No change | Li juan  Liu li |
| Tree | Hickory  Elm |  | No change | Alamo  Willow |  | Dance | Waltz  Foxtrot |  | No change | Ballet  Ballroom dancing |
| Fish | Tuna  Herring |  | No change | Crucian  grass carp |  | Flower | Carnation  Tulip |  | No change | Chinese rose  Peony |
|  |  |  |  |  |  | Distance | Inch  Mile |  | No change | Centimeter  Kilometer |
|  |  |  |  |  |  | Herb | Parsley  Dill |  | No change | corn coriander |

Table S2. Variables of MBT of the study participants.

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | AD (n=26) | aMCI (n=67) | SCI (n=30) | NC (n=41) | *p-*value | *F* | 95% CI of Post hoc tests | | | | | |
|  | aMCI vs. AD | SCI vs. AD | NC vs. AD | SCI vs. aMCI | NC vs. aMCI | NC vs. SCI |
| FR | 3.54(3.70) | 9.70(5.57) | 17.03(5.79) | 17.51(5.26) | <0.001 | 50.21 | [3.75, 8.57] ‡ | [10.68, 16.31] ,¶ | [11.36, 16.59] \* | [5.02, 9.65] ¶ | [5.74, 9.88] \* | [-2.05, 3.01] |
| PFR | 0.69(1.09) | 3.00(2.75) | 7.03(3.44) | 7.51(3.22) | <0.001 | 45.22 | [1.02, 3.60] # | [4.83, 7.85] ¶ | [5.42, 8.22] \* | [2.79, 5.28] ¶ | [3.40, 5.62] \* | [-0.88, 1.83] |
| TDFR | 2.58(3.57) | 9.00(6.05) | 17.75(5.63) | 17.61(6.13) | <0.001 | 52.83 | [3.83, 9.01] ‡ | [12.12, 18.23] ¶ | [12.22, 17.84] \* | [6.23, 11.27] ¶ | [6.39, 10.83] \* | [-2.89, 2.61] |
| PDFR | 0.46(1.03) | 2.88(2.65) | 7.39(3.24) | 8.17(4.17) | <0.001 | 49.60 | [1.03, 3.81] # | [5.29, 8.57] ¶ | [6.20, 9.22] \* | [3.16, 5.87] ¶ | [4.10, 6.48] \* | [-0.70, 2.25] |
| TDPR | 9.04(4.77) | 18.16(7.08) | 25.57(4.96) | 27.54(3.67) | <0.001 | 66.16 | [6.50, 11.75] ‡ | [13.45, 19.62] ¶ | [15.65, 21.34] \* | [4.88, 9.93] ¶ | [7.15, 11.60] \* | [-0.78, 4.71] |
| PDPR | 1.32(2.12) | 5.69(3.86) | 10.57(3.70) | 11.98(3.17) | <0.001 | 63.47 | [2.77, 5.96] ‡ | [7.38, 11.12] ¶ | [8.93, 12.38] \* | [3.35, 6.42] ¶ | [4.94, 7.64] \* | [-0.26, 3.07] |
| SPI | 0.73(0.39) | 0.64(0.22) | 0.81(0.12) | 0.84(0.16) | <0.001 | 7.18 | [-0.19, 0.03] | [-0.04, 0.21] | [-0.01, 0.23] | [0.07, 0.27] | [0.10,0.28] \* | [-0.09, 0.13] |
| IBI | 0.12 (0.11) | 0.28(0.14) | 0.41(0.08) | 0.42(0.07) | <0.001 | 53.81 | [0.11, 0.20] ‡ | [0.23, 0.34] ¶ | [0.24, 0.34] \* | [0.09, 0.18] ¶ | [0.09, 0.18] \* | [-0.05, 0.05] |
| DBI | 0.11 (0.14) | 0.27(0.14) | 0.40(0.10) | 0.43(0.06) | <0.001 | 45.07 | [0.10, 0.21] ‡ | [0.22, 0.35] ¶ | [0.25, 0.37] \* | [0.08, 0.18] ¶ | [0.11, 0.21] \* | [-0.03, 0.09] |
| BRR | 0.74 (0.65) | 0.89 (0.42) | 0.95(0.23) | 1.07(0.21) | 0.018 | 3.47 | [-0.05, 0.36] | [-0.01, 0.45] | [0.11, 0.55] † | [-0.1, 0.2] | [0.02, 0.33] † | [-0.07, 0.30] |

Notes: AD, Alzheimer’s disease; aMCI, amnesic mild cognitive impairment; SCI, Subjective Cognitive Impairment; NC, cognitively normal elderly individuals; CI, confidence interval; FR, Total Free Recall; PFR, Pairs in Free Recall; TPR, Total Paired Recall; PRP, Paired Recall Pairs; TDFR, Total Delayed Free Recall; PDFR, Pairs in Delayed Free Recall; TDPR, Total Delayed Paired Recall; PDPR, Pairs in Delayed Paired Recall, SPI, Semantic proactive interference; IBI, Immediate binding index; DBI, Delayed binding index; BRR, Binding retention rate.\* Compared to NC, *p* < 0.001; † Compared to NC, *p* < 0.05; ‡ Compared to MCI, *p* < 0.001; #, Compared to MCI, *p* < 0.05; ¶ Compared to SCI, *p* < 0.001.

Table S3. The ICC of the test-retest reliability analysis for the MBT variables (N=22).

|  |  |  |  |
| --- | --- | --- | --- |
| Index | ICC | Lower 95% CI | Upper 95% CI |
| FR | 0.902 | 0.765 | 0.959 |
| PFR | 0.890 | 0.735 | 0.954 |
| TPR | 0.958 | 0.898 | 0.982 |
| PRP | 0.931 | 0.833 | 0.971 |
| TDFR | 0.910 | 0.778 | 0.963 |
| PDFR | 0.887 | 0.772 | 0.954 |
| TDPR | 0.942 | 0.857 | 0.976 |
| PDPR | 0.930 | 0.828 | 0.972 |
| SPI | 0.037 | -1.318 | 0.600 |
| IBI | 0.887 | 0.728 | 0.953 |
| DBI | 0.935 | 0.840 | 0.974 |
| BRR | 0.371 | -0.631 | 0.758 |

Notes: For ICCs, a two-way random absolute agreement single measures model was used. CI: confidence interval; FR, Total Free Recall; PFR, Pairs in Free Recall; TPR, Total Paired Recall; PRP, Paired Recall Pairs; TDFR, Total Delayed Free Recall; PDFR, Pairs in Delayed Free Recall; TDPR, Total Delayed Paired Recall; PDPR, Pairs in Delayed Paired Recall, SPI, Semantic proactive interference; IBI, Immediate binding index; DBI, Delayed binding index; BRR, Binding retention rate.

Table S4. Comparisons of the MBT measures (AUC ≥ 0.80) with Z test.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| MBT measures | aMCI vs. NC |  | aMCI vs. SCI | aMCI vs.NC and SCI | aMCI vs. AD |
| PDFR vs. TDFR | **0.865 vs. 0.832 (*p* = 0.034)** |  | 0.856 vs. 0.854 (*p* = 0.897) | 0.861 vs. 0.840 (*p* = 0.108) | 0.800 vs. 0.803 (*p* = 0.707) |
| TDPR vs. PRP | **0.896 vs. 0.854 (*p* = 0.020)** |  | 0.823 vs. 0.843 (*p* = 0.410) | 0.867 vs. 0.850 (*p* = 0.293) | 0.850 vs. 0.854 (*p* = 0.946) |
| PDFR vs. TPR | 0.866 vs. 0.863 (*p* = 0.916) |  | 0.856 vs. 0.837 (*p* = 0.563) | 0.862 vs. 0.852 (*p* = 0.715) | **0.800 vs. 0.856 (*p* = 0.046)** |
| TDPR vs. IBI | **0.896 vs. 0.837 (*p* = 0.009)** |  | 0.823 vs. 0.837 (*p* = 0.644) | 0.867 vs. 0.837 (*p* = 0.157) | 0.848 vs. 0.815 (*p* = 0.497) |
| PDPR vs. IBI | **0.885 vs. 0.837 (*p* = 0.019)** |  | 0.825 vs. 0.837 (*p* = 0.731) | 0.861 vs. 0.837 (*p* = 0.258) | 0.832 vs. 0.815 (*p* = 0.687) |

Notes: AD, Alzheimer’s disease; aMCI, amnestic mild cognitive impairment; NC, cognitively normal elderly individuals; SCI, subjective cognitive impairment; AUC: area under the ROC curve; PRP, Paired Recall Pairs; TDFR, Total Delayed Free Recall; PDFR, Pairs in Delayed Free Recall; TPR, Total Paired Recall; TDPR, Total Delayed Paired Recall; PDPR, Pairs in Delayed Paired Recall; IBI, Immediate binding index. The comparison of MBT measures was statistically significant in bold.

Table S5. The optimal cut-off points for the MBT variables for the detection of aMCI

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | aMCI vs. NC | | | | | | | | | | aMCI vs. AD | | | | | | |
|  | Optimal cut-off point | Sp | Sn | PPV | NPV | Yoden index |  | | Optimal cut-off point | | | Sp | Sn | PPV | NPV | Yoden index |  | |
| FR | 14 | 0.781 | 0.821 | 0.859 | 0.727 | 0.601 | |  | | 5 | | 0.761 | 0.808 | 0.568 | 0.911 | 0.569 |
| PFR | 5 | 0.756 | 0.791 | 0.841 | 0.689 | 0.547 | |  | | 1 | | 0.642 | 0.808 | 0.467 | 0.896 | 0.450 |
| TPR | 26 | 0.634 | 0.894 | 0.797 | 0.788 | 0.528 | |  | | **14** | | **0.773** | **0.808** | **0.583** | **0.911** | **0.581** |
| PRP | 7 | 0.902 | 0.636 | 0.913 | 0.607 | 0.539 | |  | | 3 | | 0.697 | 0.923 | 0.545 | 0.958 | 0.620 |
| TDFR | 10 | 0.878 | 0.612 | 0.891 | 0.581 | 0.490 | |  | | 4 | | 0.761 | 0.808 | 0.568 | 0.911 | 0.569 |
| PDFR | 4 | 0.829 | 0.716 | 0.873 | 0.642 | 0.546 | |  | | 0 | | 0.731 | 0.808 | 0.538 | 0.907 | 0.539 |
| **TDPR** | **25** | **0.707** | **0.896** | **0.833** | **0.806** | **0.603** | |  | | 14 | | 0.716 | 0.880 | 0.537 | 0.941 | 0.596 |
| PDPR | 10 | 0.683 | 0.896 | 0.822 | 0.800 | 0.578 | |  | | 2 | | 0.746 | 0.880 | 0.564 | 0.943 | 0.626 |
| SPI | 0.857 | 0.537 | 0.896 | 0.759 | 0.759 | 0.432 | |  | | 0.778 | | 0.923 | 0.955 | 0.625 | 0.771 | 0.164 |
| IBI | 0.318 | 0.927 | 0.621 | 0.932 | 0.603 | 0.584 | |  | | 0.200 | | 0.828 | 0.712 | 0.537 | 0.922 | 0.558 |
| DBI | 0.4 | 0.683 | 0.879 | 0.817 | 0.778 | 0.562 | |  | | 0.222 | | 0.636 | 0.875 | 0.467 | 0.933 | 0.511 |
| BRR | 0.833 | 1.000 | 0.403 | 1.000 | 0.526 | 0.403 | |  | | 0.500 | | 0.887 | 0.412 | 0.500 | 0.846 | 0.299 |

Notes: AD, Alzheimer’s disease; aMCI, amnestic mild cognitive impairment; NC, cognitively normal participants; Sn: sensitivity; Sp: specificity; PPV, positive predictive value; NPV, negative predictive value; FR, Total Free Recall; PFR, Pairs in Free Recall; TPR, Total Paired Recall; PRP, Paired Recall Pairs; TDFR, Total Delayed Free Recall; PDFR, Pairs in Delayed Free Recall; TDPR, Total Delayed Paired Recall; PDPR, Pairs in Delayed Paired Recall; SPI, Semantic proactive interference; IBI, Immediate binding index; DBI, Delayed binding index; BRR, Binding retention rate. The optimal cut-off score in bold.

 Figure S1. Correlation between the initial test and the retest of the MBT measures. TPR, Total Paired Recall; PRP, Paired Recall Pairs; TDFR, Total Delayed Free Recall; PDPR, Pairs in Delayed Paired Recall, IBI, Immediate binding index; DBI, Delayed binding index.