**JINS Rogers et al. Supplementary Materials**

**Supplementary Table 1. NEUROCOGNITIVE TEST BATTERY. The neuropsychological test battery included seven neurocognitive domains with at least two test measures per domain.**

|  |  |  |
| --- | --- | --- |
| **COGNITIVE DOMAIN**  | **TEST** | **SOURCE** |
| **CITATION** |
| **Verbal Fluency** | Controlled Oral Word Association Test – Letter Fluency (F-A-S) | Benton, Hamsher, and Sivan (1994) |
| Category Fluency (Animals) | Benton et al. (1994) |
| Action/Verb Fluency (“Things people do”) | Piatt et al. (1999) |
| **Executive Functions** | Wisconsin Card Sorting Test (64-item) | Kongs, Thompson, Iverson, and Heaton (2000) |
| Trail Making Test, Part B | Reitan and Wolfson (1993) |
| Stroop Color and Word Test – Interference  | Golden (1978) |
| **Working Memory**  | WMS-III Spatial Span Subtest; or WAIS-III Letter Number Sequence | Wechsler (1997b); Wechsler (1997a) |
| Paced Auditory Serial Addition Task (PASAT) | Gronwall and Sampson (1974) |
| **Learning** | Hopkins Verbal Learning Test – Revised (HVLT-R) – Total Learning | Brandt and Benedict (2001) |
| Brief Visuospatial Memory Test – Revised (BVMT-R) – Total Learning | Benedict (1997) |
| **Memory**  | HVLT–R Delayed Recall | Brandt and Benedict (2001) |
| BVMT–R Delayed Recall | Benedict (1997) |
| **Speeded Information Processing** | WAIS-III Digit Symbol subtest | Wechsler (1997a) |
| WAIS-III Symbol Search subtest | Wechsler (1997a) |
| Trail Making Test, Part A | Reitan and Wolfson (1993) |
| Stroop Color and Word Test – Color Naming  | Golden (1978) |
| **Motor** | Grooved Pegboard Test (dominant and nondominant hands) | Kløve (1963) |
| **Note:** WMS-III = Wechsler Memory Scale – 3rd edition; WAIS-III = Wechsler Adult Intelligence Scale – 3rd Edition. |

**Supplementary Table 2. Cannabis Use Characteristics T Score Models**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Global T Score Models** | Age at First Use | Years Since Most Recent Use | Cumulative Density of Use | Age at First DSM-IV Use Disorder  | Years Since Most Recent Use Disorder |
| (Intercept) | 49.664 \*\*\* | 49.607 \*\*\* | 49.654 \*\*\* | 49.700 \*\*\* | 49.732 \*\*\* |
| (Intercept) 95% CI | [48.817, 50.512]  | [48.761, 50.454]  | [48.810, 50.497]  | [48.883, 50.516]  | [48.411, 51.053]  |
| b estimate  | 0.1 | -0.011 | 0.017 | 0.265 \*\*\* | -0.002 |
| b estimate 95% CI | [-0.323, 0.523]  | [-0.149, 0.127]  | [-0.354, 0.388]  | [0.123, 0.407]  | [-0.083, 0.078]  |
| **Verbal T Score Models** |
| (Intercept) | 51.717 \*\*\* | 51.574 \*\*\* | 51.760 \*\*\* | 51.751 \*\*\* | 51.814 \*\*\* |
| (Intercept) 95% CI | [50.409, 53.026]  | [50.266, 52.882]  | [50.463, 53.056]  | [50.450, 53.051]  | [49.775, 53.852]  |
| b estimate  | 0.2 | -0.047 | -0.081 | 0.232 \*  | -0.005 |
| b estimate 95% CI | [-0.454, 0.855]  | [-0.259, 0.166]  | [-0.650, 0.488]  | [0.007, 0.458]  | [-0.129, 0.118]  |
| **Executive Functions T Score Models** |
| (Intercept) | 48.897 \*\*\* | 48.818 \*\*\* | 48.794 \*\*\* | 48.912 \*\*\* | 48.513 \*\*\* |
| (Intercept) 95% CI | [47.771, 50.023]  | [47.691, 49.945]  | [47.666, 49.922]  | [47.790, 50.033]  | [46.748, 50.277]  |
| b estimate  | 0.322 | 0.047 | -0.117 | 0.238 \*  | 0.026 |
| b estimate 95% CI | [-0.240, 0.884]  | [-0.137, 0.231]  | [-0.613, 0.379]  | [0.043, 0.433]  | [-0.081, 0.133]  |
| **Information Processing Speed T Score Models** |
| (Intercept) | 51.350 \*\*\* | 51.390 \*\*\* | 51.379 \*\*\* | 51.526 \*\*\* | 52.553 \*\*\* |
| (Intercept) 95% CI | [50.214, 52.487]  | [50.255, 52.525]  | [50.243, 52.515]  | [50.412, 52.641]  | [50.799, 54.307]  |
| b estimate  | -0.224 | -0.045 | 0.169 | 0.178 | -0.076 |
| b estimate 95% CI | [-0.792, 0.344]  | [-0.230, 0.140]  | [-0.331, 0.669]  | [-0.016, 0.372]  | [-0.183, 0.030]  |
| **Learning T Score Models** |
| (Intercept) | 47.432 \*\*\* | 47.288 \*\*\* | 47.269 \*\*\* | 47.267 \*\*\* | 47.101 \*\*\* |
| (Intercept) 95% CI | [46.246, 48.618]  | [46.096, 48.480]  | [46.083, 48.456]  | [46.101, 48.433]  | [45.222, 48.980]  |
| b estimate  | 0.434 | 0.03 | 0.107 | 0.373 \*\*\* | 0.011 |
| b estimate 95% CI | [-0.160, 1.027]  | [-0.164, 0.224]  | [-0.413, 0.628]  | [0.171, 0.575]  | [-0.102, 0.125]  |
| **Memory T Score Models** |
| (Intercept) | 48.101 \*\*\* | 47.976 \*\*\* | 47.935 \*\*\* | 47.881 \*\*\* | 47.485 \*\*\* |
| (Intercept) 95% CI | [46.805, 49.396]  | [46.674, 49.278]  | [46.641, 49.228]  | [46.595, 49.166]  | [45.441, 49.530]  |
| b estimate  | 0.507 | 0.07 | 0.093 | 0.316 \*\*  | 0.026 |
| b estimate 95% CI | [-0.142, 1.155]  | [-0.142, 0.281]  | [-0.474, 0.661]  | [0.094, 0.539]  | [-0.098, 0.150]  |
| **Working Memory T Score Models** |
| (Intercept) | 49.538 \*\*\* | 49.650 \*\*\* | 49.656 \*\*\* | 49.589 \*\*\* | 48.970 \*\*\* |
| (Intercept) 95% CI | [48.140, 50.935]  | [48.258, 51.042]  | [48.269, 51.042]  | [48.205, 50.974]  | [46.800, 51.140]  |
| b estimate  | 0.026 | 0.098 | -0.112 | 0.235 | 0.053 |
| b estimate 95% CI | [-0.672, 0.725]  | [-0.129, 0.324]  | [-0.721, 0.498]  | [-0.005, 0.476]  | [-0.079, 0.185]  |
| **Motor Functioning T Score Models** |
| (Intercept) | 48.199 \*\*\* | 48.130 \*\*\* | 48.384 \*\*\* | 48.422 \*\*\* | 48.558 \*\*\* |
| (Intercept) 95% CI | [46.644, 49.754]  | [46.583, 49.677]  | [46.826, 49.943]  | [46.925, 49.920]  | [46.166, 50.950]  |
| b estimate  | -0.386 | -0.186 | -0.033 | 0.411 \*\*  | -0.005 |
| b estimate 95% CI | [-1.163, 0.391]  | [-0.438, 0.066]  | [-0.718, 0.653]  | [0.150, 0.671]  | [-0.150, 0.141]  |
|  \*\*\* p < 0.001; \*\* p < 0.01; \* p < 0.05. |

**Supplementary Table 3. Cannabis Use Characteristics Impairment Models**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Global Impairment Models** | Age at First Use | Years Since Most Recent Use | Cumulative Density of Use | Age at First DSM-IV Use Disorder  | Years Since Most Recent Use Disorder |
| (Intercept) | 0.216 \*\*\* | 0.224 \*\*\* | 0.215 \*\*\* | 0.214 \*\*\* | 0.261 \*\*\* |
| (Intercept) 95% CI | [0.144, 0.324]  | [0.151, 0.332]  | [0.144, 0.320]  | [0.141, 0.324]  | [0.143, 0.477]  |
| b estimate  | 0.951 | 1.009 | 0.996 | 0.933 | 0.986 |
| b estimate 95% CI | [0.777, 1.164]  | [0.947, 1.076]  | [0.834, 1.190]  | [0.851, 1.023]  | [0.948, 1.024]  |
| **Verbal Impairment Models** |
| (Intercept) | 0.195 \*\*\* | 0.186 \*\*\* | 0.180 \*\*\* | 0.181 \*\*\* | 0.122 \*\*\* |
| (Intercept) 95% CI | [0.129, 0.295]  | [0.121, 0.284]  | [0.117, 0.276]  | [0.118, 0.277]  | [0.059, 0.253]  |
| b estimate  | 1.134 | 0.989 | 1.022 | 0.989 | 1.03 |
| b estimate 95% CI | [0.921, 1.396]  | [0.921, 1.061]  | [0.856, 1.220]  | [0.916, 1.069]  | [0.991, 1.072]  |
| **Executive Functions Impairment Models** |
| (Intercept) | 0.413 \*\*\* | 0.417 \*\*\* | 0.412 \*\*\* | 0.393 \*\*\* | 0.478 \*\* |
| (Intercept) 95% CI | [0.295, 0.579]  | [0.298, 0.583]  | [0.294, 0.576]  | [0.278, 0.555]  | [0.285, 0.800]  |
| b estimate  | 1.001 | 1.008 | 1.028 | 0.946 | 0.986 |
| b estimate 95% CI | [0.845, 1.184]  | [0.954, 1.064]  | [0.892, 1.186]  | [0.881, 1.016]  | [0.955, 1.019]  |
| **Information Processing Speed Impairment Models** |
| (Intercept) | 0.168 \*\*\* | 0.161 \*\*\* | 0.168 \*\*\* | 0.163 \*\*\* | 0.201 \*\*\* |
| (Intercept) 95% CI | [0.109, 0.259]  | [0.103, 0.252]  | [0.109, 0.260]  | [0.105, 0.253]  | [0.104, 0.389]  |
| b estimate  | 1.086 | 0.992 | 0.922 | 0.984 | 0.981 |
| b estimate 95% CI | [0.873, 1.350]  | [0.922, 1.067]  | [0.726, 1.171]  | [0.907, 1.069]  | [0.939, 1.025]  |
| **Learning Impairment Models** |
| (Intercept) | 0.455 \*\*\* | 0.441 \*\*\* | 0.468 \*\*\* | 0.469 \*\*\* | 0.595 \* |
| (Intercept) 95% CI | [0.326, 0.635]  | [0.314, 0.620]  | [0.337, 0.650]  | [0.335, 0.656]  | [0.360, 0.984]  |
| b estimate  | 0.952 | 0.965 | 0.935 | 0.936 | 0.981 |
| b estimate 95% CI | [0.806, 1.125]  | [0.912, 1.022]  | [0.795, 1.100]  | [0.872, 1.005]  | [0.950, 1.013]  |
| **Memory Impairment Models** |
| (Intercept) | 0.526 \*\*\* | 0.528 \*\*\* | 0.563 \*\*\* | 0.551 \*\*\* | 0.66 |
| (Intercept) 95% CI | [0.380, 0.729]  | [0.382, 0.732]  | [0.408, 0.776]  | [0.400, 0.760]  | [0.403, 1.082] |
| b estimate  | 0.926 | 0.977 | 0.801 \*  | 0.978 | 0.986 |
| b estimate 95% CI | [0.787, 1.090]  | [0.926, 1.031]  | [0.647, 0.992]  | [0.922, 1.037]  | [0.956, 1.016] |
| **Working Memory Impairment Models** |
| (Intercept) | 0.474 \*\*\* | 0.475 \*\*\* | 0.458 \*\*\* | 0.456 \*\*\* | 0.543 \* |
| (Intercept) 95% CI | [0.341, 0.658]  | [0.342, 0.660]  | [0.329, 0.637]  | [0.326, 0.637]  | [0.328, 0.898]  |
| b estimate  | 0.998 | 1.002 | 1.037 | 0.949 | 0.988 |
| b estimate 95% CI | [0.847, 1.177]  | [0.950, 1.057]  | [0.902, 1.192]  | [0.886, 1.016]  | [0.957, 1.019]  |
| **Motor Functioning Impairment Models** |
| (Intercept) | 0.488 \*\*\* | 0.467 \*\*\* | 0.469 \*\*\* | 0.447 \*\*\* | 0.460 \*\* |
| (Intercept) 95% CI | [0.352, 0.676]  | [0.336, 0.650]  | [0.337, 0.651]  | [0.316, 0.634]  | [0.276, 0.768]  |
| b estimate  | 1.078 | 0.989 | 1.046 | 0.903 | 1.001 |
| b estimate 95% CI | [0.916, 1.269]  | [0.936, 1.044]  | [0.911, 1.202]  | [0.832, 1.004]  | [0.970, 1.032]  |

**Supplementary Table 4. Methamphetamine Use Characteristics T Score Models**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Global T Score Models** | Age at First Use | Years Since Most Recent Use | Cumulative Density of Use | Age at First DSM-IV Use Disorder  | Years Since Most Recent Use Disorder |
| (Intercept) | 48.502 \*\*\* | 48.415 \*\*\* | 48.414 \*\*\* | 48.505 \*\*\* | 48.448 \*\*\* |
| (Intercept) 95% CI | [47.702, 49.303]  | [47.608, 49.222]  | [47.610, 49.218]  | [47.720, 49.290]  | [47.383, 49.512]  |
| b estimate  | 0.135 | 0.1 | -0.722 | 0.025 | 0.005 |
| b estimate 95% CI | [-0.001, 0.271]  | [-0.366, 0.565]  | [-1.796, 0.351]  | [-0.052, 0.103]  | [-0.222, 0.231]  |
| **Verbal T Score Models** |
| (Intercept) | 50.674 \*\*\* | 50.481 \*\*\* | 50.478 \*\*\* | 50.571 \*\*\* | 50.069 \*\*\* |
| (Intercept) 95% CI | [49.482, 51.867]  | [49.280, 51.683]  | [49.272, 51.684]  | [49.389, 51.754]  | [48.466, 51.673]  |
| b estimate  | 0.174 | 0.455 | -0.409 | 0.043 | 0.116 |
| b estimate 95% CI | [-0.029, 0.376]  | [-0.237, 1.147]  | [-2.017, 1.199]  | [-0.073, 0.159]  | [-0.224, 0.457]  |
| **Executive Functions T Score Models** |
| (Intercept) | 47.782 \*\*\* | 47.723 \*\*\* | 47.722 \*\*\* | 47.982 \*\*\* | 47.589 \*\*\* |
| (Intercept) 95% CI | [46.736, 48.829]  | [46.683, 48.764]  | [46.686, 48.758]  | [46.952, 49.012]  | [46.193, 48.984]  |
| b estimate  | 0.136 | 0.08 | -0.942 | 0.056 | 0.109 |
| b estimate 95% CI | [-0.042, 0.313]  | [-0.520, 0.680]  | [-2.326, 0.442]  | [-0.045, 0.158]  | [-0.188, 0.406]  |
| **Information Processing Speed T Score Models** |
| (Intercept) | 50.486 \*\*\* | 50.383 \*\*\* | 50.381 \*\*\* | 50.366 \*\*\* | 50.841 \*\*\* |
| (Intercept) 95% CI | [49.350, 51.623]  | [49.256, 51.510]  | [49.255, 51.507]  | [49.260, 51.472]  | [49.350, 52.332]  |
| b estimate  | 0.071 | -0.194 | -0.641 | 0 | -0.155 |
| b estimate 95% CI | [-0.122, 0.264]  | [-0.843, 0.456]  | [-2.145, 0.863]  | [-0.109, 0.109]  | [-0.472, 0.162]  |
| **Learning T Score Models** |
| (Intercept) | 45.520 \*\*\* | 45.460 \*\*\* | 45.458 \*\*\* | 45.465 \*\*\* | 45.472 \*\*\* |
| (Intercept) 95% CI | [44.426, 46.613]  | [44.356, 46.564]  | [44.355, 46.560]  | [44.387, 46.544]  | [44.016, 46.927]  |
| b estimate  | 0.186 \*  | 0.098 | -0.537 | 0.029 | -0.007 |
| b estimate 95% CI | [0.001, 0.372]  | [-0.538, 0.734]  | [-2.007, 0.933]  | [-0.076, 0.135]  | [-0.316, 0.303]  |
| **Memory T Score Models** |
| (Intercept) | 46.610 \*\*\* | 46.506 \*\*\* | 46.500 \*\*\* | 46.545 \*\*\* | 46.308 \*\*\* |
| (Intercept) 95% CI | [45.392, 47.827]  | [45.262, 47.750]  | [45.265, 47.735]  | [45.311, 47.779]  | [44.653, 47.964]  |
| b estimate  | 0.2 | 0.19 | -1.405 | 0.047 | 0.075 |
| b estimate 95% CI | [-0.007, 0.406]  | [-0.526, 0.907]  | [-3.052, 0.242]  | [-0.074, 0.168]  | [-0.277, 0.427]  |
| **Working Memory T Score Models** |
| (Intercept) | 48.092 \*\*\* | 48.067 \*\*\* | 48.069 \*\*\* | 48.145 \*\*\* | 47.712 \*\*\* |
| (Intercept) 95% CI | [46.803, 49.381]  | [46.797, 49.337]  | [46.794, 49.343]  | [46.884, 49.405]  | [46.021, 49.402]  |
| b estimate  | 0.111 | 0.456 | -0.252 | 0.044 | 0.127 |
| b estimate 95% CI | [-0.107, 0.330]  | [-0.276, 1.188]  | [-1.955, 1.451]  | [-0.080, 0.168]  | [-0.232, 0.487]  |
| **Motor Functioning T Score Models** |
| (Intercept) | 47.616 \*\*\* | 47.562 \*\*\* | 47.559 \*\*\* | 47.737 \*\*\* | 48.250 \*\*\* |
| (Intercept) 95% CI | [46.178, 49.055]  | [46.145, 48.980]  | [46.145, 48.973]  | [46.328, 49.146]  | [46.363, 50.137]  |
| b estimate  | 0.09 | -0.272 | -1.171 | -0.038 | -0.17 |
| b estimate 95% CI | [-0.154, 0.334]  | [-1.089, 0.545]  | [-3.060, 0.717]  | [-0.177, 0.100]  | [-0.571, 0.231]  |
|  \*\*\* p < 0.001; \*\* p < 0.01; \* p < 0.05. |

**Supplementary Table 5. Methamphetamine Use Characteristics Impairment Models**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Global Impairment Models** | Age at First Use | Years Since Most Recent Use | Cumulative Density of Use | Age at First DSM-IV Use Disorder  | Years Since Most Recent Use Disorder |
| (Intercept) | 0.319 \*\*\* | 0.322 \*\*\* | 0.324 \*\*\* | 0.301 \*\*\* | 0.275 \*\*\* |
| (Intercept) 95% CI | [0.228, 0.448]  | [0.231, 0.450]  | [0.232, 0.452]  | [0.215, 0.422]  | [0.173, 0.437]  |
| b estimate  | 0.974 | 1.078 | 1.032 | 0.992 | 1.031 |
| b estimate 95% CI | [0.918, 1.032]  | [0.895, 1.298]  | [0.663, 1.607]  | [0.959, 1.027]  | [0.938, 1.133]  |
| **Verbal Impairment Models** |
| (Intercept) | 0.198 \*\*\* | 0.222 \*\*\* | 0.216 \*\*\* | 0.211 \*\*\* | 0.183 \*\*\* |
| (Intercept) 95% CI | [0.133, 0.294]  | [0.153, 0.322]  | [0.148, 0.317]  | [0.144, 0.307]  | [0.109, 0.309]  |
| b estimate  | 0.957 | 1.027 | 0.685 | 0.989 | 1.059 |
| b estimate 95% CI | [0.892, 1.027]  | [0.832, 1.268]  | [0.400, 1.171]  | [0.951, 1.027]  | [0.957, 1.172]  |
| **Executive Functions Impairment Models** |
| (Intercept) | 0.358 \*\*\* | 0.360 \*\*\* | 0.362 \*\*\* | 0.347 \*\*\* | 0.298 \*\*\* |
| (Intercept) 95% CI | [0.258, 0.497]  | [0.260, 0.498]  | [0.261, 0.500]  | [0.250, 0.480]  | [0.190, 0.468]  |
| b estimate  | 0.974 | 1.097 | 1.143 | 1.011 | 1.049 |
| b estimate 95% CI | [0.920, 1.031]  | [0.916, 1.313]  | [0.745, 1.752]  | [0.979, 1.043]  | [0.958, 1.149]  |
| **Information Processing Speed Impairment Models** |
| (Intercept) | 0.266 \*\*\* | 0.264 \*\*\* | 0.270 \*\*\* | 0.247 \*\*\* | 0.200 \*\*\* |
| (Intercept) 95% CI | [0.186, 0.379]  | [0.185, 0.377]  | [0.191, 0.383]  | [0.173, 0.354]  | [0.121, 0.331]  |
| b estimate  | 0.977 | 1.178 | 1.018 | 0.982 | 1.071 |
| b estimate 95% CI | [0.919, 1.039]  | [0.975, 1.423]  | [0.639, 1.621]  | [0.946, 1.019]  | [0.972, 1.181]  |
| **Learning Impairment Models** |
| (Intercept) | 0.607 \*\* | 0.611 \*\* | 0.612 \*\* | 0.602 \*\*\* | 0.611 \* |
| (Intercept) 95% CI | [0.449, 0.820]  | [0.455, 0.822]  | [0.456, 0.822]  | [0.448, 0.808]  | [0.411, 0.908]  |
| b estimate  | 0.953 | 0.948 | 0.986 | 0.997 | 0.994 |
| b estimate 95% CI | [0.904, 1.004]  | [0.797, 1.126]  | [0.665, 1.463]  | [0.968, 1.026]  | [0.914, 1.082]  |
| **Memory Impairment Models** |
| (Intercept) | 0.697 \* | 0.715 \* | 0.715 \* | 0.703 \* | 0.681 |
| (Intercept) 95% CI | [0.518, 0.938]  | [0.535, 0.957]  | [0.534, 0.957]  | [0.526, 0.939]  | [0.461, 1.007] |
| b estimate  | 0.953 | 1.062 | 1.193 | 1 | 1.008 |
| b estimate 95% CI | [0.905, 1.003]  | [0.899, 1.255]  | [0.811, 1.756]  | [0.972, 1.029]  | [0.928, 1.095] |
| **Working Memory Impairment Models** |
| (Intercept) | 0.608 \*\* | 0.593 \*\*\* | 0.593 \*\*\* | 0.609 \*\*\* | 0.588 \*\* |
| (Intercept) 95% CI | [0.451, 0.818]  | [0.441, 0.797]  | [0.441, 0.797]  | [0.454, 0.817]  | [0.396, 0.875]  |
| b estimate  | 0.979 | 0.957 | 1.144 | 0.989 | 1.004 |
| b estimate 95% CI | [0.931, 1.031]  | [0.806, 1.138]  | [0.773, 1.695]  | [0.961, 1.019]  | [0.923, 1.092]  |
| **Motor Impairment Models** |
| (Intercept) | 0.501 \*\*\* | 0.504 \*\*\* | 0.501 \*\*\* | 0.473 \*\*\* | 0.448 \*\*\* |
| (Intercept) 95% CI | [0.368, 0.681]  | [0.372, 0.682]  | [0.370, 0.680]  | [0.348, 0.641]  | [0.296, 0.677]  |
| b estimate  | 0.967 | 0.995 | 1.294 | 1.005 | 1.017 |
| b estimate 95% CI | [0.917, 1.020]  | [0.835, 1.185]  | [0.867, 1.932]  | [0.976, 1.036]  | [0.933, 1.109]  |
|  \*\*\* p < 0.001; \*\* p < 0.01; \* p < 0.05. |