**Supplemental Table 1. Sample Characteristics**

|  |  |  |
| --- | --- | --- |
|  | **Younger Adults** | **Older Adults** |
| N | 42 | 37 |
| Age, years (mean (std), range) | 20 (1.48), 18-25 | 70 (6.90), 60-89 |
| Gender (M/F) | 15/27 | 18/19 |
| Education, years (mean (std)) | 14.2 (2.0), 11-20 | 16.0 (4.3), 6-26+ |
| Visuomotor Expertise (mean (std), range) | 52.65 (6.70), 40.54-65.66 | 53.92 (9.71), 41.41-87.96 |
| Computer Experience (mean (std), range) | 3.50 (0.99), 2-6 | 2.84 (1.15), .33-5.67\* |
| Subjective Sleepiness (mean (std), range) | 3.55 (1.44), 1-6 | 2.32 (1.20), 1-5\*\* |
| Psychomotor Vigilance (mean (std), range) | 0.14 (0.73), -2.21-1.79 | -0.17 (1.10), -3.51-1.511 |
| Actigraphy Days (mean (std), range) | 6.55 (1.13), 3-8 | 5.89 (1.65), 3-8\* |

Notes. Sleep data were missing for 3 younger adults; Spatial navigation strategy task data were missing for 3 younger adults and 5 older adults; Cognitive mapping task data were missing for 2 younger adults and 6 older adults; Route learning data were missing for 5 younger adults and 5 older adults; Stress data were missing for 2 younger adults and 4 older adults. \*p<.05; \*\*p<.001; p<.10. Years of education was only available for 21 younger adults and 22 older adults. All younger adults were college students, except 1.

**Supplemental Table 2. Descriptive statistics**

|  |  |  |  |
| --- | --- | --- | --- |
|  | ***Older Adults*** | ***Young Adults*** | ***p-value*** |
|  |  |  |  |
| *Strategy Index* | .60 (.04)  .27 – 1 | .71 (.04)  0 – 1 | .04 |
| *Cognitive Mapping*  *(average correct)* | 3.89 (.30)  .75 – 8.5 | 7.34 (.31)  2.5 – 10.5 | <.001 |
| *Route Learning*  *(seconds)* | 158.03 (10.87)  103.93 – 322.39 | 108.9 (1.66)  99.27 – 140.98 | <.001 |
| *Sleep Fragmentation* | 25.1 (1.03)  13.05 – 35.92 | 23.45 (1.1)  10.08 – 43.43 | .28 |
| *Total Sleep Time*  *(minutes)* | 292 (11.9)  192 – 469 | 351 (11.34)  230 – 495 | <.001 |
| *Intradaily Variability* | .74 (.03)  .33 – 1.30 | .82 (.04)  .35 – 1.33 | .14 |

**Notes.** Mean (standard deviation) and range are presented. Data are with outliers included. High scores on the strategy index indicate greater relative shortcut use. High scores on cognitive mapping indicate better performance. High scores on route learning indicate worse performance.

**Supplemental Table 3. Age associations with sleep, rest-activity fragmentation, and navigation.**

|  |  |
| --- | --- |
| ***Outcome Variable*** | **β (SE)** |
| *Sleep Fragmentation* | .06(.14) |
| *Total Sleep Time* | -.39(.10)\*\*\* |
| *Intradaily Variability* | -.34 (.13)\*\* |
| *Strategy Index* | -.25(.15)† |
| *Cognitive Mapping* | -.66(.09)\*\*\* |
| *Route Learning* | .62(.09)\*\*\* |

**Notes.** Data are with outliers included. Rest-activity fragmentation estimated as intradaily variability. High scores on the strategy index indicate greater relative shortcut use. High scores on cognitive mapping indicate better performance. High scores on route learning indicate worse performance. Standardized path coefficients are presented. SE= standard error. \*\*\**p*<.001, \*\**p*<.01, \**p*<.05 , †p<.10

**Supplemental Table 4. Sleep and rest-activity fragmentation associations with navigation (with outliers)**

|  |  |  |  |
| --- | --- | --- | --- |
|  | ***Sleep Fragmentation*** | ***Total***  ***Sleep Time*** | ***Intradaily Variability*** |
| *Outcome Variable (Y)* |  |  |  |
| *Strategy Index* | .07(.11) | -.19(.11) | -.09(.12) |
| *Cognitive Mapping* | -.21(.10)\* | .05(.08) | -.25(.07)\*\*\* |
| *Route Learning* | -.12(.11) | .12(.11) | .18 (.09) |

**Notes.** Data are with outliers included. High scores on the strategy index indicate greater relative shortcut use. High scores on cognitive mapping indicate better performance. High scores on route learning indicate worse performance. Standardized path coefficients are presented. \*\*\**p*<0.001, \*\**p*<.01, \**p*<.05

**Supplemental Table 5. Stress as a moderator of sleep characteristics (with outliers)**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Age | Stress | SFI | | SFI x Stress | | Age x SFI | Age x Stress | Age x  Stress x SFI |
| *Strategy Index* | -.31(.16) | -.15(.13) | .04(.11) | | -.03(.09) | | -- | -- | -- |
| -.28(.16) | -.13(.14) | -.15(.13) | | .04(.12) | | .42(.24) | -.02(.17) | .10(.20) |
| *Cognitive Mapping* | -.67(.09)\*\*\* | .01(.12) | -.20(.10)\* | | .13(.11) | | -- | -- | -- |
| -.66(.08)\*\*\* | -.00(.16) | -.17(.16) | | .11(.16) | | -.05(.13) | .03(.12) | .03(.17) |
| *Route Learning* | .67(.11)\*\*\* | .15(.12) | .16(.11) | | .02(.10) | | -- | -- | -- |
| .67(.12)\*\*\* | .14(.13) | .12(.16) | | .03(.13) | | .04(.17) | .02(.16) | -.01(.15) |
|  |  |  |  | |  | |  |  |  |
|  | **Age** | **Stress** | **TST** | **TST x Stress** | | **Age x TST** | | **Age x Stress** | **Age x**  **Stress x TST** | |
| *Strategy Index* | -.38(.17)\* | -.15(.12) | -.20(.11) | -.03(.12) | | -- | | -- | -- | |
| -.40(.17)\* | -.10(.14) | -.06(.12) | -.09(.13) | | -.23(.19) | | -.09(.18) | -.01(.22) | |
| *Cognitive Mapping* | -.62(.10)\*\*\* | .02(.12) | .06(.08) | .09(.11) | | -- | | -- | -- | | |
| -.58(.10)\*\*\* | .01(.14) | .05(.10) | .02(.12) | | .11(.12) | | .08(.11) | .21(.15) | | |
| *Route Learning* | .72(.12)\*\*\* | .12(.12) | .11(.11) | -.10(.09) | | -- | | -- | -- | | |
| .69(.14)\*\*\* | .12(.12) | .22(.15) | -.08(.11) | | -.23(.16) | | -.04(.18) | -.15(.17) | | |

**Notes.** Data are with outliers included. Data represent standardized path coefficients with standard errors in parentheses. Higher scores on the strategy index indicate greater relative shortcut use. Higher scores on cognitive mapping indicate better performance. Higher scores on route learning indicate worse performance. SFI = sleep fragmentation; TST = total sleep time.

\*\*\**p*<0.001, \*\**p*<0.01, \**p*<0.05

**Supplemental Table 6. Physical activity (PA) as a moderator of sleep characteristics (with outliers)**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Age | PA | SFI | | SFI x PA | | Age x SFI | Age x PA | Age x  PA x SFI |
| *Strategy Index* | -.22(.15) | .10(.14) | .08(.12) | | -.02(.12) | | -- | -- | -- |
| -.11(.14) | .25(.14) | -.11(.12) | | .09(.13) | | .53(.20)\*\* | -.02(.19) | .20(.20) |
| *Cognitive Mapping* | -.67(.08)\*\*\* | -.07(.10) | -.23(.11)\* | | -.02(.11) | | -- | -- | -- |
| -.66(.09)\*\*\* | -.09(.15) | -.10(.15) | | -.22(.13) | | -.16(.13) | -.06(.13) | .21(.15) |
| *Route Learning* | .60(.10)\*\*\* | -.05(.12) | .11(.11) | | -.02(.10) | | -- | -- | -- |
| .58(.11)\*\*\* | .14(.10) | .07(.15) | | .13(.16) | | -.03(.15) | -.23(.18) | -.20(.18) |
|  |  |  |  | |  | |  |  |  |
|  | **Age** | **PA** | **TST** | **TST x PA** | | **Age x TST** | | **Age x PA** | **Age x**  **PA x TST** | |
| *Strategy Index* | -.27(.15) | .11(.13) | -.15(.12) | .21(.15) | | -- | | -- | -- | |
| -.20(.15) | .21(.16) | .01(.13) | -.14(.16) | | -.15(.18) | | .04(.17) | .51(.22)\* | |
| *Cognitive Mapping* | -.64(.10)\*\*\* | -.01(.11) | .05(.09) | .02(.10) | | -- | | -- | -- | | |
| -.63(.10)\*\*\* | .06(.17) | .07(.12) | -.02(.13) | | -.02(.11) | | -.10(.13) | .01(.12) | | |
| *Route Learning* | .68(.10)\*\*\* | -.01(.10) | .15(.10) | .27(.10)\*\* | | -- | | -- | -- | | |
| .70(.10)\*\*\* | .11(.16) | .24(.17) | .11(.14) | | -.07(.14) | | -.10(.16) | .18(.14) | | |

**Notes.** Data are with outliers included. Data represent standardized path coefficients with standard errors in parentheses. Higher scores on the strategy index indicate greater relative shortcut use. Higher scores on cognitive mapping indicate better performance. Higher scores on route learning indicate worse performance. SFI = sleep fragmentation; TST = total sleep time; PA = physical activity.

\*\*\**p*<0.001, \*\**p*<0.01, \**p*<0.05