**Supplementary material**

***Table S1*** Correlation coefficients resulting from the univariate correlation analysis for demographics, physical activity, subjective motor performance, and motor and cognitive performance

|  |  | **Age** | **Sex** | **BMI** | **Exercise** | **MABC AB** | **MABC C** | **VO2max** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **ST gait speed straight pathway** (m/s) |  | **-.341\*\*** | .041 | -.140 | -.061 | .033 | **.277\*** | .114 |
| **Information processing speed (Auditory Motor Task)** | DT gait speedCCR STCCR DTDTE motorDTE cognitive | -.090.102-.152**.340\***-.226 | .054-.091-.108.032-.030 | -.120.112-.052.070-.087 | .073.173-.120.203-.125 | -.075-.172.296-.215**.308\*** | .229**-.253\***.152-.115.147 | .128.081-.072-.061-.121 |
| **Verbal WM (Serial Subtraction Task)** | DT gait speedCCR STCCR DTDTE motorDTE cognitive | -.012.029-.025**.362\*\***-.070 | .139**-.273\*-.308\***.088-.126 | -.246.160-.030-.054-.076 | .078**.272\***.062.175-.229 | -.109-.100-.056**-.239\***.018 | .110-.078-.063-.214.024 | .153**.391\*\*.390\*\***.046-.040 |
| **Auditory WM (Auditory 2-Back Task)** | DT gait speedCCR STCCR DTDTE motorDTE cognitive | .146**.333\*\***.008**.583\*\*-.386\*\*** | .093.026-.064.070-.044 | .148.099.048**.310\***-.147 | .246.187.013**.354\*\***-.157 | -.121-.009-.023-.203.132 | .032-.007.085**-.257\***-.051 | .076.138.028.001-.237 |
| **Visuo-spatial WM (Clock Task)** | DT gait speedCCR STCCR DTDTE motorDTE cognitive | .156-.430\*\***-.349\*\*.571\*\***.094 | .226-.237.123.188**.308\*** | .086-.168-.157**.297\***.025 | .175-.026.008**.278\***.088 | -.035.085.077-.100.014 | .093.024.144**-.283\***.113 | .014.081-.226-.075-.211 |
| **Response inhibition (Auditory Stroop Task)** | DT gait speedCCR STCCR DTDTE motorDTE cognitive | .245**.249\***-.020**.514\*\*-.433\*\*** | .034.158.105.018.021 | .140.146.118.234-.093 | .188.209-.137**.259\*-.319\*** | -.039-.165.048-.166.169 | .218-.035.035.-106.175 | .114.045-.168-.021**-.340\***\* |
| **ST gait speed COD-pathway** (m/s) |  | **.245\*** | .034 | .140 | .188 | -.039 | .218 | .114 |
| **Information processing speed (TMT A** [cm/s] **/ TWT-2** [m/s]**)** | DT tracing speedDT gait speedDTE motorDTE cognitive | **.267\***.078-.156-.165 | .195.024.057-.236 | .218-.003-.120-.144 | .126.058-.177-.014 | -.255.122152.173 | -.217.196.046.193 | -.165.004-.077.177 |
| **Cognitive flexibility (TMT B** [cm/s] **/ TWT-3** [m/s]**)** | DT tracing speedDT gait speedDTE motorDTE cognitive | **.344\*\***.077-.067-.184 | -.004.061-.026.087 | -.013.129.052-.005 | **.280\***-.031-.081-.157 | -.135.114.213.188 | .116.189.020.032 | **.244\***-.017-.009-.121 |

Notes: BMI Body Mass Index; MABC Movement Assessment Battery; ST Single Task; DT Dual Task; DTE Dual Task Effects; CCR correct cognitive response; \* indicates *p* < .05; \*\* indicates *p* < .05; significant results in bold

***Table S2*** Results from the multiple regression analysis with stepwise regression

|  |  |  | **Standardized beta** | **t** | **p** | **Partial R2** | **R2** | **Significance of model** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **ST gait speed straight pathway** (m/s) |  | age | -.320 | -2.59 | .012 | .087 | .087 | .012 |
| **Information processing speed (Auditory Motor Task)** | DT gait speedCCR STCCR DTDTE motorDTE cognitive | ---ageMABC AB | ---.390.313 | ---3.262.40 | ---.002.020 | ---.152.098 | ---.138.081 | ---.002.020 |
| **Verbal WM (Serial Subtraction Task)** | DT gait speedCCR STCCR DTDTE motorDTE cognitive | -VO2maxBMIVO2maxageBMI- | -.438.244.357.428-.267- | -3.702.062.913.34-2.08- | -.001.044.005.001.042- | -.155.058.128.144- | -.186.113.110.062- | -.001.005.004- |
| **Auditory WM (Auditory 2-Back Task)** | DT gait speedCCR STCCR DTDTE motorDTE cognitive | -age-ageage | -.380-.506-.405 | -3.15-4.51-2.91 | -.003-<.001.006 | -.144-.256.164 | -.130-.244.145 | -.003-<.001.006 |
| **Visuo-spatial WM (Clock Task)** | DT gait speedCCR STCCR DTDTE motorDTE cognitive | -ageageageage | --.427-.326.518.378 | --3.56-2.634.652.97 | -.001.011<.001.004 | -.182.106.268.143 | -.168.091.256.127 | -.001.011<.001.004 |
| **Response inhibition (Auditory Stroop Task)** | DT gait speedCCR STCCR DTDTE motorDTE cognitive | -ageExerciseageageMABC AB | -.327-.258.464-.362.300 | -2.66-2.034.03-2.902.41 | -.010.047<.001.005.020 | -.107.066.216.198.083 | .-.092.050.202.253 | -.010.047<.001<.001 |
| **ST gait speed COD-pathway** (m/s) |  | ExerciseMABC C | .309.252 | 2.522.06 | .015.044 | .078.063 | .111 | .012 |
| **Information processing speed (TMT A** [cm/s] **/ TWT-2** [m/s]**)** | DT tracing speedDT gait speedDTE motorDTE cognitive | MABC ABVO2max--- | -.336-.276--- | -2.65-2.17--- | .010.034--- | .067.070--- | .107--- | .014--- |
| **Cognitive flexibility (TMT B** [cm/s] **/ TWT-3** [m/s]**)** | DT tracing speedDT gait speedDTE motorDTE cognitive | age--- | .291--- | 2.33--- | .023--- | .085--- | .069--- | .023--- |

Notes: BMI Body Mass Index; MABC Movement Assessment Battery; ST Single Task; DT Dual Task; DTE Dual Task Effects; CCR correct cognitive response; \* indicates *p* < .05; \*\* indicates *p* < .05

***Table S3.*** Performance outcome measures in ST and DT conditions by grade (means ± standard deviation)

|  |  | **5th grade** | **8th grade** | **statistical analysis** |
| --- | --- | --- | --- | --- |
|  |  | **(*n*=42)** | **(*n*=27)** |  |
| **ST gait speed straight pathway** (m/s) |  | 1.90 ± 0.29 | 1.73 ± 0.29 | *t*(67) = 2.47, *p* = .016, d = -0.59 |
| **Information processing speed (Auditory Motor Task)** | DT gait speedCCR STCCR DTDTE motorDTE cognitive | 1.73 ± 0.320.25 ± 0.030.25 ± 0.03-8.97 ± 10.4-2.09 ± 9.31 | 1.69 ± 0.270.26 ± 0.010.25 ± 0.03-1.33 ± 13.8-5.98 ± 11.5 | *t*(67) = 0.60, *p* = .552, d = -0.13*t*(54) = -1.80, *p* = .078, d = 0.38*t*(65) = 0.73, *p* = .469, d = -0.18*t*(67) = -2.62, *p* = .011, d = 0.65*t*(59) = 1.46, *p* = .151, d = -0.38 |
| **Verbal WM (Serial Subtraction Task)** | DT gait speedCCR STCCR DTDTE motorDTE cognitive | 1.49 ± 0.270.20 ± 0.090.23 ± 0.12-21.3 ± 11.519.7 ± 53.4 | 1.50 ± 0.320.22 ± 0.150.24 ± 0.14-11.7 ± 17.918.9 ± 66.9 | *t*(67) = -0.19, *p* = .847, d = 0.03*t*(37) = -0.72, *p* = .479, d = 0.20*t*(65) = -0.36, *p* = .719, d = 0.09*t*(67) = -2.47, *p* = .018, d = 0.67*t*(62) = 0.57, *p* = .955, d = -0.01 |
| **Auditory WM (Auditory 2-Back Task)** | DT gait speedCCR STCCR DTDTE motorDTE cognitive | 1.47 ± 0.350.05 ± 0.070.06 ± 0.06-22.6 ± 14.669.6 ± 160 | 1.55 ± 0.280.12 ± 0.080.07 ± 0.06-9.32 ± 12.1-48.0 ± 54.2 | *t*(67) = -1.02, *p* = .309, d = 0.25*t*(67) = -3.44, *p* = .001, d = 0.85*t*(66) = -0.42, *p* = .673, d = 0.11*t*(67) = -3.94, *p* < .001, d = 0.97*t*(39) = 3.80, *p* < .001, d = -0.92 |
| **Visuo-spatial WM (Clock Task)** | DT gait speedCCR STCCR DTDTE motorDTE cognitive | 1.46 ± 0.270.05 ± 0.030.05 ± 0.03-23.1 ± 11.621.3 ± 96.2 | 1.55 ± 0.300.02 ± 0.020.02 ± 0.02-9.74 ± 13.2189 ± 316 | *t*(67) = -1.31, *p* = .196, d = 0.32*t*(65) = 4.31, *p* < .001, d = -0.97*t*(66) = 3.63, *p* = .001, d = -0.83*t*(67) = -4.42, *p* < .001, d = 1.09*t*(24) = -2.48, *p* = .021, d = 0.82 |
| **Response inhibition (Auditory Stroop Task)** | DT gait speedCCR STCCR DTDTE motorDTE cognitive | 1.54 ± 0.300.09 ± 0.050.10 ± 0.04-18.9 ± 11.622.4 ± 64.8 | 1.56 ± 0.260.11 ± 0.060.10 ± 0.07-8.69 ± 12.6-34.9 ± 53.3 | *t*(67) = -0.33, *p* = .742, d = 0.07*t*(67) = -1.59, *p* = .116, d = 0.39*t*(38) = 0.37, *p* = .716, d = -0.10*t*(67) = -3.45, *p* = .001, d = -0.59*t*(58) = .55, *p* < .001, d = -0.94 |
| **ST gait speed COD-pathway** (m/s) |  | 1.46 ± 0.22 | 1.58± 0.19 | *t*(67) = -2.32, *p* = .023, d = 0.58 |
| **Information processing speed (TMT A** [cm/s] **/ TWT-2** [m/s]**)** | DT tracing speedDT gait speedDTE motorDTE cognitive | 6.14 ± 1.541.05 ± 0.21-44.2 ± 29.3-311 ± 227 | 7.06 ± 1.321.09 ± 0.18-48.1 ± 27.0-374 ± 232 | *t*(67) = -2.56, *p* = .013, d = 0.63*t*(67) = -1.02, *p* = .312, d = 0.20*t*(67) = 0.55, *p* = .581, d = -0.14*t*(61) = 1.07, *p* = .293, d = -0.28 |
| **Cognitive flexibility (TMT B** [cm/s] **/ TWT-3** [m/s]**)** | DT tracing speedDT gait speedDTE motorDTE cognitive | 3.40 ± 0.870.78 ± 0.23-92.0 ± 54.1-215 ± 88.8 | 4.00 ± 0.820.83 ± 0.17-98.8 ± 47.5-217 ± 49.9 | *t*(67) = -2.86, *p* = .006, d = 0.71*t*(67) = -0.81, *p* = .422, d = 0.24*t*(65) = 0.53, *p* = .597, d = -0.13*t*(67) = 0.10, *p* = .924, d = -0.03 |