# Supplemental Materials 2. Additional Methods and Results

## **Psychometric Characteristics of the Selected Neuropsychological Measures**

### *WISC-IV/WAIS-IV Coding and Digit Span*

The Weschler Intelligence Scale for Children Fourth Edition (WISC-IV; Wechsler, 2014) contains 15 subtests and is validated for children and adolescents aged 6 to 16 years old. The Weschler Adult Intelligence Scale Fourth Edition (WAIS-IV; Wechsler, 2008) contains 15 subtests, and is validated for 16 years old and up. Selected measures for the present study include the Coding and Digit Span subtests only.

WISC-IV. Internal consistency values for individual subtests across all ages range from 72-.95, and 32-day test-retest coefficients range from .86-.93 (Wechsler, 2003). Practice effects over one month on the WISC-IV are small, with the largest effect observed for ages 6 to 7 years old (Kaufman et al., 2006).

WAIS-IV. Internal consistency values for individual subtests across all ages range from 71-.96, and 22-day test-retest coefficients range from .74-.90. Interscorer agreement of all WAIS-IV standardization forms was .97-.98 (Wechsler, 2008). Two independent scorers of WAIS-IV standardization record forms had an agreement ranging from .98-.99.

### *Conner’s Continuous Performance Test 2nd Edition (CPT-II)*

The CPT-II is the second most widely used measure of attention in clinical settings across all age groups according to a large survey of clinical neuropsychologists in Canada and the United States (Rabin et al., 2016). The CPT-II is a visual paradigm used for the evaluation of attention and response inhibition components of EF. The standard version of the CPT-II can be administered to children 6 years and up and takes approximately 15 minutes to complete. For 5-year-old children, the Conner’s Kiddie CPT (K-CPT) is used. The Kiddie version is shorter in duration and uses pictures instead of letters as stimuli. Construct validity has been established (Egeland & Kovalik-Gran, 2010; Fernández-Marcos et al., 2018). In undergraduate students, internal consistency for omissions was α=.85 (Shaked et al., 2020). The 3-month test-retest reliability for omissions is good (ICC=.84; Conners & Staff, 2000).

### *D-KEFS Color-Word Interference Test and Verbal Fluency Test*

The Delis-Kaplan Executive Functions System (D-KEFS; Delis et al., 2001) consists of nine independent tests, that may be administered individually or as a battery. The D-KEFS is a reliable and valid measure of EF in children and adults, ages 8 years and up. Selected measures for the present study include the Color-Word Interference Test (Color Naming and Inhibition contrast) and Verbal Fluency test (Letter fluency condition).

Internal consistency for the D-KEFS Letter Fluency for 8-19 years old range from α=.68-.81, with 8-year-olds showing the lower reliability. Test-retest reliability coefficients for Letter Fluency for children aged 8-19 years old is r=.67.

The reliability of contrast scores was not published in the test manual, therefore an independent study computed the reliability of a difference score, and found an adequate reliability for the Color-Word Inhibition Test Inhibition vs Color Naming contrast r=.696 for ages 8-19 years (Crawford et al., 2008). Test-retest reliability coefficient for Color Naming and Inhibition condition separately within 8-to-19-years-old are r=0.79 and 0.90, respectively.

# References

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**Supplemental Materials 2 Figure 1**. Neuropsychological outcomes distribution at four weeks and twelve weeks following pediatric concussion



*Notes.* CPT-II = Continuous Performance Test 2nd Edition; D-KEFS = Delis-Kaplan Executive Functions System; WAIS-IV = Wechsler Adult Intelligence Scale Fourth Edition; WISC-IV = Wechsler Intelligence Scale for Children Fourth Edition

**Supplemental Materials 2 Table 1**. Wald chi-square table for WISC-IV/WAIS-IV Coding scaled score

|  |  |  |  |
| --- | --- | --- | --- |
| **Factor** | **Chi-Square** | **df** | ***p*-value** |
| Symptom burden (Factor+Higher Order Factors) | 3.93 | 4 | .415 |
| All Interactions | 1.66 | 2 | .437 |
| Nonlinear | 2.683 | 2 | .262 |
| Sex (Factor+Higher Order Factors) | 10.05 | 3 | **.018 \*** |
| All Interactions | 1.66 | 2 | .437 |
| Age | 4.95 | 2 | .084 |
| Nonlinear | .13 | 1 | .718 |
| Week | 18.58 | 1 | **<.001 \*\*\*** |
| Maximum symptom duration from previous concussion(s) (weeks) | 11.16 | 5 | **.048 \*** |
| History of learning disabilities | 8.29 | 1 | **.004 \*\*** |
| History of attention deficit (hyperactivity) disorder | .63 | 1 | .428 |
| History of depression | 1.13 | 1 | .288 |
| History of anxiety | .12 | 1 | .726 |
| History of developmental disorders | 1.47 | 1 | .226 |
| History of sleep disorder | 6.84 | 1 | **.009 \*\*** |
| Personal history of migraine | 5.59 | 1 | **.018 \*** |
| Mechanism of injury | 5.81 | 3 | .121 |
| Symptom burden\*Sex (Factor+Higher Order Factors) | 1.66 | 2 | .437 |
| Nonlinear | 1.42 | 1 | .233 |
| TOTAL NONLINEAR | 2.89 | 3 | .410 |
| TOTAL NONLINEAR+INTERACTION | 3.63 | 4 | .459 |
| TOTAL | 98.92 | 23 | **<.001 \*\*\*** |
| Phi=.69, Obs=426, Cluster=286 |
| Excluded=196 (31.5%), Missing covariates only=57 (9.2%) |

*Notes*. Symptom burden was operationalized as the Post-Concussion Symptom Inventory average item delta score rescaled on 0-6. Bold fond denotes significance.

**Supplemental Materials 2 Table 2**. Covariate effects for WISC-IV/WAIS-IV Coding scaled score

|  |  |  |
| --- | --- | --- |
| **Variable** | **Contrast** | **Estimate (95%CI)** |
| Sex | Female: Male | 1.04 (0.34, 1.75) |
| Age | 14.21: 9.14 (Diff = 5.07) | -0.58 (-1.13, -0.02) |
| Week | Week 12: Week 4 | 0.72 (0.39, 1.05) |
| Maximum symptom duration from previous concussion(s) (weeks) | <1 week: Never had concussion | 1.14 (0.18, 2.10) |
|  | 1-2 weeks: Never had concussion | 0.35 (-0.83, 1.54) |
|  | 3-4 weeks: Never had concussion | -0.12 (-1.76, 1.53) |
|  | 5-8 weeks: Never had concussion | -2.56 (-4.85, -0.27) |
|  | >8 weeks: Never had concussion | -0.01 (-1.69, 1.67) |
| History of learning disability | Yes: No | -1.72 (-2.89, -0.55) |
| History of attention deficit disorder  | Yes: No | 0.51 (-0.76, 1.78) |
| History of other developmental disorders | Yes: No | -1.08 (-3.07, 0.91) |
| History of depression | Yes: No | -0.22 (-1.43, 1.00)  |
| History of anxiety | Yes: No | -1.07 (-2.79, 0.66) |
| History of sleep disorder  | Yes: No | 2.39 (0.56, 4.18)  |
| History of migraine | Yes: No | -1.14 (-2.08, -0.19) |
| Mechanism of injury | Non-sport/Fall: Sports/Recreation | 0.11 (-5.76, 0.79) |
|  | Motor vehicle collision: Sports/Recreation | -2.33 (-4.36, -0.30) |
|  | Assault: Sports/Recreation | 0.91 (-1.76, 3.58) |

*Notes*. For binary variables, ‘No’ was set as the reference. The largest level was set as a reference for all other categorical variables. For continuous predictors, p75 was compared to p25.

**Supplemental Materials 2 Table 3**. Sex-specific contrasts and estimates of effect size associated with high and low symptom burden for WISC-IV/WAIS-IV Coding scaled score

|  |  |  |
| --- | --- | --- |
| **Contrast** | **Sex** | **Est. (95%CI)** |
| Symptom burden (p75 vs p25) = 0.65:0 | Male | 0.48 (-0.16, 1.13) |
| Symptom burden (p90 vs p10) = 1.41:0 | Male | 0.33 (-0.43, 1.09) |
| Symptom burden (p75 vs p25) = 0.65:0 | Female | -0.22 (-1.07, 0.63) |
| Symptom burden (p90 vs p10) = 1.41:0 | Female | -0.43 (-1.48, 0.62) |

*Notes*. Symptom burden was operationalized as the Post-Concussion Symptom Inventory average item delta score rescaled on 0-6

**Supplemental Materials Table 4**. Wald chi-square table for Conner’s CPT-II Omission t-score

|  |  |  |  |
| --- | --- | --- | --- |
| **Factor** | **Chi-Square** | **df** | ***p*-value** |
| Symptom burden (Factor+Higher Order Factors) | 4.96 | 4 | .291 |
| All Interactions | 3.50 | 2 | .173 |
| Nonlinear | 1.13 | 2 | .568 |
| Sex (Factor+Higher Order Factors) | 3.51 | 3 | .320 |
| All Interactions | 3.50 | 2 | .173 |
| Age | 41.46 | 2 | **<.001 \*\*\*** |
| Nonlinear | 14.67 | 1 | **<.001 \*\*\*** |
| Week | .26 | 1 | .612 |
| Maximum symptom duration from previous concussion(s) (weeks) | 3.46 | 5 | .630 |
| History of learning disabilities | 7.97 | 1 | **.005 \*\*** |
| History of attention deficit (hyperactivity) disorder | .06 | 1 | .807 |
| History of depression | .50 | 1 | .480 |
| History of anxiety | 3.84 | 1 | .050 |
| History of developmental disorders | .12 | 1 | .727 |
| History of sleep disorder | 2.85 | 1 | .091 |
| Personal history of migraine | .12 | 1 | .730 |
| Mechanism of injury | 2.12 | 3 | .548 |
| Symptom burden\*Sex (Factor+Higher Order Factors) | 3.50 | 2 | .173 |
| Nonlinear | .67 | 1 | .414 |
| TOTAL NONLINEAR | 15.46 | 3 | **.001 \*\*** |
| TOTAL NONLINEAR+INTERACTION | 18.07 | 4 | **.001 \*\*** |
| TOTAL | 63.75 | 23 | **<.001 \*\*\*** |
| Phi=.30, Obs=402, Cluster=278 |
| Excluded=220 (35.4%), Missing covariates only=52 (8.4%) |

*Notes*. Symptom burden was operationalized as the Post-Concussion Symptom Inventory average item delta score rescaled on 0-6. Bold fond denotes significance.

**Supplemental Materials 2 Table 5**. Covariate effects for Conner’s CPT-II Omission t-score

|  |  |  |
| --- | --- | --- |
| **Variable** | **Contrast** | **Estimate (95%CI)** |
| Sex | Female: Male | -1.10 (-4.35, 2.14) |
| Age | 14.21: 9.14 (Diff = 5.07) | -5.22 (-7.70, -2.75) |
| Week | Week 12: Week 4 | -0.57 (-2.78, 1.64) |
| Maximum symptom duration from previous concussion(s) (weeks) | <1 week: Never had concussion | -3.08 (-7.37, 1.21) |
|  | 1-2 weeks: Never had concussion | 0.10 (-5.07, 5.26) |
|  | 3-4 weeks: Never had concussion | -0.76 (-8.02, 6.49) |
|  | 5-8 weeks: Never had concussion | 4.65 (-6.03, 15.32) |
|  | >8 weeks: Never had concussion | -2.92 (-10.35, 4.52) |
| History of learning disability | Yes: No | 7.53 (2.30, 12.75) |
| History of attention deficit disorder  | Yes: No | -0.70 (-6.31, 4.91) |
| History of other developmental disorders | Yes: No | -3.24 (-12.22, 5.74) |
| History of depression | Yes: No | -5.34 (-10.69, 0.00) |
| History of anxiety | Yes: No | -1.35 (-8.95, 6.24) |
| History of sleep disorder  | Yes: No | 6.73 (-1.08, 14.53) |
| History of migraine | Yes: No | 0.75 (-3.51, 5.00) |
| Mechanism of injury | Non-sport/Fall: Sports/Recreation | 0.22 (-2.89, 3.31) |
|  | Motor vehicle collision: Sports/Recreation | -6.33 (-15.29, 2.63) |
|  | Assault: Sports/Recreation | 2.06 (-10.49, 14.60) |

*Notes*. For binary variables, ‘No’ was set as the reference. The largest level was set as a reference for all other categorical variables. For continuous predictors, p75 was compared to p25.

**Supplemental Materials 2 Table 6**. Sex-specific contrasts and estimates of effect size associated with high and low symptom burden for Conner’s CPT-II Omission t-score

|  |  |  |
| --- | --- | --- |
| **Contrast** | **Sex** | **Est. (95%CI)** |
| Symptom burden (p75 vs p25) = 0.65:0 | Male | -2.80 (-6.51, 0.92) |
| Symptom burden (p90 vs p10) = 1.41:0 | Male | -3.39 (-7.66, 0.89) |
| Symptom burden (p75 vs p25) = 0.65:0 | Female | 1.63 (-3.12, 6.42) |
| Symptom burden (p90 vs p10) = 1.41:0 | Female | 3.16 (-2.50, 8.82) |

*Notes*. Symptom burden was operationalized as the Post-Concussion Symptom Inventory average item delta score rescaled on 0-6.

**Supplemental Materials 2 Table 7**. Wald chi-square table for WISC-IV/WAIS-IV Backward Digit Span scaled score

|  |  |  |  |
| --- | --- | --- | --- |
| **Factor** | **Chi-Square** | **df** | ***p*-value** |
| Symptom burden (Factor+Higher Order Factors) | 9.85 | 4 | .043 \* |
| All Interactions | 2.30 | 2 | .317 |
| Nonlinear | 2.15 | 2 | .341 |
| Sex (Factor+Higher Order Factors) | 2.83 | 3 | .418 |
| All Interactions | 2.30 | 2 | .317 |
| Age | 5.90 | 2 | .052 |
| Nonlinear | 5.85 | 1 | **.016 \*** |
| Week | .91 | 1 | .340 |
| Maximum symptom duration from previous concussion(s) (weeks) | 2.46 | 5 | .783 |
| History of learning disabilities | 7.06 | 1 | **.008 \*\*** |
| History of attention deficit (hyperactivity) disorder | .010 | 1 | .935 |
| History of depression | 1.32 | 1 | .251 |
| History of anxiety | .00 | 1 | .948 |
| History of developmental disorders | .00 | 1 | .948 |
| History of sleep disorder | .02 | 1 | .901 |
| Personal history of migraine | .34 | 1 | .561 |
| Mechanism of injury | 1.95 | 3 | .583 |
| Symptom burden\*Sex (Factor+Higher Order Factors) | 2.30 | 2 | .317 |
| Nonlinear | .90 | 1 | .343 |
| TOTAL NONLINEAR | 8.41 | 3 | .038 \* |
| TOTAL NONLINEAR+INTERACTION | 8.99 | 4 | .061 |
| TOTAL | 31.70 | 23 | .106 |
| Phi=.58, Obs=426, Cluster=286 |
| Excluded=196 (31.5%), Missing covariates only=57 (9.2%) |

*Notes*. Symptom burden was operationalized as the Post-Concussion Symptom Inventory average item delta score rescaled on 0-6. Bold fond denotes significance.

**Supplemental Materials 2 Table 8**. Covariate effects for WISC-IV/WAIS-IV Backward Digit Span scaled score

|  |  |  |
| --- | --- | --- |
| **Variable** | **Contrast** | **Estimate (95%CI)** |
| Sex | Female: Male | 0.40 (-0.31, 1.10) |
| Age | 14.21: 9.14 (Diff = 5.07) | -0.23 (-0.77, 0.32) |
| Week | Week 12: Week 4 | 0.18 (-0.19, 0.56) |
| Maximum symptom duration from previous concussion(s) (weeks) | <1 week: Never had concussion | -0.12 (-1.07, 0.83) |
|  | 1-2 weeks: Never had concussion | -0.53 (-1.70, 0.64) |
|  | 3-4 weeks: Never had concussion | 0.00 (-1.61, 1.62) |
|  | 5-8 weeks: Never had concussion | 0.48 (-1.81, 2.77) |
|  | >8 weeks: Never had concussion | 0.93 (-0.73, 2.59) |
| History of learning disability | Yes: No | -1.57 (-2.73, -0.41) |
| History of attention deficit disorder  | Yes: No | 0.05 (-1.20, 1.31) |
| History of other developmental disorders | Yes: No | 1.15 (-0.82, 3.13) |
| History of depression | Yes: No | -0.04 (-1.24, 1.16) |
| History of anxiety | Yes: No | 0.06 (-1.65, 1.76) |
| History of sleep disorder  | Yes: No | -0.12 (-1.65, 1.88) |
| History of migraine | Yes: No | -0.28 (-1.20, 0.65) |
| Mechanism of injury | Non-sport/Fall: Sports/Recreation | 0.20 (-0.48, 0.87) |
|  | Motor vehicle collision: Sports/Recreation | -1.01 (-3.02, 1.00) |
|  | Assault: Sports/Recreation | -0.89 (-3.57, 1.79) |

*Notes*. For binary variables, ‘No’ was set as the reference. The largest level was set as a reference for all other categorical variables. For continuous predictors, p75 was compared to p25.

**Supplemental Materials 2 Table 9**. Sex-specific contrasts and estimates of effect size associated with high and low symptom burden for WISC-IV/WAIS-IV Backward Digit Span scaled score

|  |  |  |
| --- | --- | --- |
| **Contrast** | **Sex** | **Est. (95%CI)** |
| Symptom burden (p75 vs p25) = 0.65:0 | Male | -0.67 (-1.38, 0.04) |
| Symptom burden (p90 vs p10) = 1.41:0 | Male | -0.76 (-1.58, 0.07) |
| Symptom burden (p75 vs p25) = 0.65:0 | Female | -0.45 (-1.36, 0.47) |
| Symptom burden (p90 vs p10) = 1.41:0 | Female | -0.93 (-2.04, 0.18) |

*Notes*. Symptom burden was operationalized as the Post-Concussion Symptom Inventory average item delta score rescaled on 0-6.

**Supplemental Materials 2 Table 10**. Wald chi-square table for D-KEFS Verbal Fluency scaled score

|  |  |  |  |
| --- | --- | --- | --- |
| **Factor** | **Chi-Square** | **df** | ***p*-value** |
| Symptom burden (Factor+Higher Order Factors) | 10.48 | 4 | **.033 \*** |
| All Interactions | 3.27 | 2 | .195 |
| Nonlinear | .04 | 2 | .979 |
| Sex (Factor+Higher Order Factors) | 6.02 | 3 | .111 |
| All Interactions | 3.27 | 2 | .195 |
| Age | 1.26 | 2 | .532 |
| Nonlinear | 1.13 | 1 | .289 |
| Week | 21.53 | 1 | **<.001 \*\*\*** |
| Maximum symptom duration from previous concussion(s) (weeks) | 5.43 | 5 | .366 |
| History of learning disabilities | 7.82 | 1 | **.005 \*\*** |
| History of attention deficit (hyperactivity) disorder | 1.78 | 1 | .183 |
| History of depression | .50 | 1 | .481 |
| History of anxiety | 1.10 | 1 | .295 |
| History of developmental disorders | .10 | 1 | .753 |
| History of sleep disorder | .22 | 1 | .643 |
| Personal history of migraine | 1.63 | 1 | .202 |
| Mechanism of injury | 2.80 | 3 | .423 |
| Symptom burden\*Sex (Factor+Higher Order Factors) | 3.27 | 2 | .195 |
| Nonlinear | .03 | 1 | .863 |
| TOTAL NONLINEAR | 1.20 | 3 | .754 |
| TOTAL NONLINEAR+INTERACTION | 4.40 | 4 | .354 |
| TOTAL | 64.43 | 23 | **<.001 \*\*\*** |
| Phi=.77, Obs=369, Cluster=250 |
| Excluded=253 (40.7%), Missing covariates only=48 (7.7%) |

*Notes*. Symptom burden was operationalized as the Post-Concussion Symptom Inventory average item delta score rescaled on 0-6. Bold fond denotes significance.

**Supplemental Materials 2 Table 11**. Covariate effects for D-KEFS Verbal Fluency scaled score

|  |  |  |
| --- | --- | --- |
| **Variable** | **Contrast** | **Estimate (95%CI)** |
| Sex | Female: Male | 1.00 (0.12, 1.88) |
| Age | 14.21: 9.14 (Diff = 5.07) | -0.03 (-0.82, 0.75) |
| Week | Week 12: Week 4 | 0.85 (0.49, 1.20) |
| Maximum symptom duration from previous concussion(s) (weeks) | <1 week: Never had concussion | 0.37 (-0.83, 1.58) |
|  | 1-2 weeks: Never had concussion | -0.60 (-2.10, 0.81) |
|  | 3-4 weeks: Never had concussion | -1.81 (-3.95, 0.33) |
|  | 5-8 weeks: Never had concussion | -0.94 (-3.56, 1.69) |
|  | >8 weeks: Never had concussion | 0.90 (-1.04, 2.84) |
| History of learning disability | Yes: No | -1.98 (-3.36, -0.59) |
| History of attention deficit disorder  | Yes: No | 1.00 (-0.47, 2.47) |
| History of other developmental disorders | Yes: No | 0.83 (-1.47, 3.12) |
| History of depression | Yes: No | 0.75 (-0.65, 2.15) |
| History of anxiety | Yes: No | -0.32 (-2.33, 1.68) |
| History of sleep disorder  | Yes: No | -0.49 (-2.58, 1.59) |
| History of migraine | Yes: No | -0.71 (-1.80, 0.38) |
| Mechanism of injury | Non-sport/Fall: Sports/Recreation | -0.49 (-1.34, 0.37) |
|  | Motor vehicle collision: Sports/Recreation | -1.75 (-4.29, 0.78) |
|  | Assault: Sports/Recreation | -0.39 (-2.44, 2.66) |

*Notes*. For binary variables, ‘No’ was set as the reference. The largest level was set as a reference for all other categorical variables. For continuous predictors, p75 was compared to p25.

**Supplemental Materials 2 Table 12**. Sex-specific contrasts and estimates of effect size associated with high and low symptom burden for D-KEFS Verbal Fluency scaled score

|  |  |  |
| --- | --- | --- |
| **Contrast** | **Sex** | **Est. (95%CI)** |
| Symptom burden (p75 vs p25) = 0.65:0 | Male | -0.16 (-0.98, 0.65) |
| Symptom burden (p90 vs p10) = 1.41:0 | Male | -0.24 (-1.10, 0.63) |
| Symptom burden (p75 vs p25) = 0.65:0 | Female | -0.53 (-1.63, 0.58) |
| Symptom burden (p90 vs p10) = 1.41:0 | Female | -1.18 (-2.38, 0.02) |

*Notes*. Symptom burden was operationalized as the Post-Concussion Symptom Inventory average item delta score rescaled on 0-6.

**Supplemental Materials 2 Table 13**. Wald chi-square table for D-KEFS Color-Word Interference Test Inhibition vs. Color Naming contrast scaled score

|  |  |  |  |
| --- | --- | --- | --- |
| **Factor** | **Chi-Square** | **df** | ***p*-value** |
| Symptom burden (Factor+Higher Order Factors) | 2.48 | 4 | .649 |
| All Interactions | .75 | 2 | .688 |
| Nonlinear | .86 | 2 | .651 |
| Sex (Factor+Higher Order Factors) | 1.84 | 3 | .606 |
| All Interactions | .75 | 2 | .688 |
| Age | 2.34 | 2 | .310 |
| Nonlinear | 2.32 | 1 | .128 |
| Week | .18 | 1 | .674 |
| Maximum symptom duration from previous concussion(s) (weeks) | 4.21 | 5 | .520 |
| History of learning disabilities | .02 | 1 | .887 |
| History of attention deficit (hyperactivity) disorder | .07 | 1 | .799 |
| History of depression | .11 | 1 | .739 |
| History of anxiety | 3.07 | 1 | .080 |
| History of developmental disorders | 3.87 | 1 | **.049 \*** |
| History of sleep disorder | .14 | 1 | .710 |
| Personal history of migraine | .06 | 1 | .807 |
| Mechanism of injury | 2.87 | 3 | .412 |
| Symptom burden\*Sex (Factor+Higher Order Factors) | .75 | 2 | .688 |
| Nonlinear | .74 | 1 | .389 |
| TOTAL NONLINEAR | 3.41 | 3 | .333 |
| TOTAL NONLINEAR+INTERACTION | 3.42 | 4 | .490 |
| TOTAL | 19.03 | 23 | .699 |
| Phi=.31, Obs=353, Cluster=238 |
| Excluded=269 (43.2%), Missing covariates only=46 (7.4%) |

*Notes*. Symptom burden was operationalized as the Post-Concussion Symptom Inventory average item delta score rescaled on 0-6. Bold fond denotes significance.

**Supplemental Materials 2 Table 14**. Covariate effects for D-KEFS Color-Word Interference Test Inhibition vs. Color Naming contrast scaled score

|  |  |  |
| --- | --- | --- |
| **Variable** | **Contrast** | **Estimate (95%CI)** |
| Sex | Female: Male | -0.32 (-0.96, 0.30) |
| Age | 14.21: 9.14 (Diff = 5.07) | -0.18 (-0.78, 0.43) |
| Week | Week 12: Week 4 | 0.09 (-0.32, 0.50) |
| Maximum symptom duration from previous concussion(s) (weeks) | <1 week: Never had concussion | 0.38 (-0.44, 1.19) |
|  | 1-2 weeks: Never had concussion | -0.22 (-1.18, -0.74) |
|  | 3-4 weeks: Never had concussion | 0.88 (-0.50, 2.27) |
|  | 5-8 weeks: Never had concussion | -0.00 (-1.86, 1.86) |
|  | >8 weeks: Never had concussion | -0.76 (-2.06, 0.53) |
| History of learning disability | Yes: No | -0.07 (-1.01, 0.88) |
| History of attention deficit disorder  | Yes: No | 0.13 (-0.89, 1.15) |
| History of other developmental disorders | Yes: No | -0.27 (-1.82, 1.29) |
| History of depression | Yes: No | 0.84 (-0.10, 1.79) |
| History of anxiety | Yes: No | -1.36 (-2.71, -0.01) |
| History of sleep disorder  | Yes: No | 0.26 (-1.11, 1.63) |
| History of migraine | Yes: No | 0.09 (-0.64, 0.83) |
| Mechanism of injury | Non-sport/Fall: Sports/Recreation | 0.06 (0.52, 0.65) |
|  | Motor vehicle collision: Sports/Recreation | 1.44 (-0.23, 3.11) |
|  | Assault: Sports/Recreation | 0.06 (-2.449, 2.57)  |

*Notes*. For binary variables, ‘No’ was set as the reference. The largest level was set as a reference for all other categorical variables. For continuous predictors, p75 was compared to p25.

**Supplemental Materials 2 Table 12**. Sex-specific contrasts and estimates of effect size associated with high and low symptom burden for D-KEFS Color-Word Interference Test Inhibition vs. Color Naming contrast scaled score

|  |  |  |
| --- | --- | --- |
| **Contrast** | **Sex** | **Est. (95%CI)** |
| Symptom burden (p75 vs p25) = 0.65:0 | Male | 0.43 (-0.33, 1.19) |
| Symptom burden (p90 vs p10) = 1.41:0 | Male | 0.47 (-0.31, 1.25) |
| Symptom burden (p75 vs p25) = 0.65:0 | Female | -0.07 (-1.05, 0.92) |
| Symptom burden (p90 vs p10) = 1.41:0 | Female | 0.12 (-0.89, 1.13) |