Supplemental Digital Content 8. Estimates for mean values according to age group and exposure category*

Test	Age 8-12			Age 15-20		
	Unexposed	Single exposure	Multiple exposures	Unexposed	Single exposure	Multiple exposures
Psychometrist-administered						
WASI: Full Scale IQ Score	107.1 (105.3, 109.0)	106.7 (104.9, 108.4)	105.8 (103.9, 107.8)	104.3 (102.1, 106.4)	103.8 (101.8, 105.8)	103.0 (100.8, 105.2)
WASI: Matrix Reasoning subtest (TS)	54.1 (52.9, 55.3)	53.1 (52.1, 54.2)	52.5 (51.2, 53.8)	52.3 (51.0, 53.7)	51.4 (50.2, 52.6)	50.7 (49.4, 52.1)
WASI: Vocabulary subtest (TS)	54.1 (52.8, 55.4)	54.6 (53.2, 56.0)	54.2 (52.8, 55.6)	52.6 (51.0, 54.2)	53.1 (51.5, 54.6)	52.7 (51.0, 54.4)
WASI: Matrix − Vocabulary subtests (TS)	-0.01 (-1.21, 1.19)	-1.44 (-2.84, -0.05)	-1.68 (-3.15, -0.20)	-0.25 (-1.80, 1.29)	-1.69 (-3.24, -0.13)	-1.92 (-3.64, -0.21)
WASI: Proportion with Full Scale Score <85	2.9% (1.3%, 6.6%)	2.0% (0.9%, 4.8%)	3.8% (1.9%, 7.4%)	6.4% (2.6%, 15.1%)	4.5% (2.3%, 8.6%)	8.1% (4.1%, 15.6%)
WRAML-2: Attention/Concentration Index (StdS)	103.9 (101.8, 106.1)	104.5 (101.9, 107.2)	102.4 (99.8, 104.9)	104.0 (101.7, 106.4)	104.6 (102.1, 107.1)	102.5 (99.7, 105.2)
CPT-II: # Commissions (TS)	49.7 (48.0, 51.3)	49.5 (47.4, 51.5)	50.3 (48.8, 51.8)	51.9 (50.1, 53.7)	51.7 (49.8, 53.7)	52.5 (50.8, 54.3)
CPT-II: # Omissions (TS)	53.8 (51.3, 56.4)	52.1 (50.1, 54.0)	54.5 (52.2, 56.7)	52.9 (50.4, 55.3)	51.1 (48.8, 53.4)	53.5 (50.5, 56.5)
CPT-II: Hit Reaction Time (TS)	52.3 (50.8, 53.8)	52.5 (50.9, 54.1)	53.4 (51.9, 54.9)	50.6 (48.8, 52.4)	50.8 (48.8, 52.8)	51.7 (49.9, 53.5)
CPT-II: Hit Reaction Time Std Error (TS)	51.7 (50.0, 53.3)	51.4 (50.0, 52.8)	52.5 (51.0, 54.0)	47.8 (46.0, 49.6)	47.5 (45.9, 49.1)	48.7 (46.9, 50.4)
CPT-II: Variability (TS)	51.6 (50.1, 53.1)	51.1 (49.5, 52.7)	52.1 (50.6, 53.6)	48.4 (46.8, 50.0)	47.9 (46.2, 49.6)	48.9 (47.1, 50.7)
CPT-II: Detectability (TS)	51.2 (49.7, 52.7)	50.4 (48.4, 52.5)	52.7 (51.4, 54.0)	51.7 (50.1, 53.3)	50.9 (49.1, 52.7)	53.2 (51.6, 54.8)
WRAML-2: Verbal Memory Index (StdS)	106.3 (104.5, 108.0)	107.6 (105.5, 109.6)	105.5 (103.5, 107.4)	104.7 (102.8, 106.7)	106.0 (103.9, 108.1)	103.9 (101.6, 106.2)
WRAML-2: Story Memory Delay Recall subtest (SS)	11.6 (11.2, 11.9)	11.9 (11.5, 12.2)	11.2 (10.8, 11.6)	11.2 (10.8, 11.5)	11.5 (11.1, 11.9)	10.8 (10.4, 11.2)
WRAML-2: Verbal Learning Delay Recall subtest (SS)	10.3 (9.9, 10.7)	10.5 (10.0, 10.9)	10.5 (10.1, 10.9)	10.5 (10.1, 11.0)	10.7 (10.2, 11.1)	10.7 (10.2, 11.2)
WRAML-2: Delayed Verbal Recall composite (StdS)†	104.7 (103.3, 106.2)	105.8 (104.2, 107.5)	104.3 (102.7, 105.9)	104.2 (102.6, 105.9)	105.4 (103.6, 107.1)	103.8 (101.9, 105.8)
WRAML-2: Story Memory Recognition subtest (SS)	11.9 (11.6, 12.3)	12.0 (11.7, 12.4)	11.5 (11.1, 11.9)	11.3 (10.9, 11.7)	11.4 (11.0, 11.8)	10.9 (10.5, 11.3)
WRAML-2: Verbal Learning Recognition subtest (SS)	10.6 (10.3, 10.9)	10.7 (10.3, 11.1)	10.6 (10.3, 11.0)	10.6 (10.2, 11.0)	10.7 (10.3, 11.1)	10.7 (10.3, 11.1)
WRAML-2: Verbal Recognition Composite (StdS)	107.2 (105.5, 108.8)	107.9 (106.1, 109.8)	106.1 (104.3, 108.0)	105.4 (103.5, 107.3)	106.2 (104.1, 108.2)	104.4 (102.2, 106.5)
WRAML-2: Design Memory subtest (SS)	8.4 (8.1, 8.7)	8.5 (8.1, 8.9)	7.9 (7.4, 8.3)	9.6 (9.2, 10.0)	9.7 (9.2, 10.2)	9.0 (8.6, 9.5)
WRAML-2: Design Recognition subtest (SS)	9.8 (9.4, 10.2)	9.9 (9.5, 10.4)	9.9 (9.5, 10.3)	10.0 (9.5, 10.5)	10.1 (9.6, 10.6)	10.1 (9.6, 10.6)
D-KEFS Trail Making Test: Condition 1 (SS)	10.8 (10.4, 11.3)	10.7 (10.2, 11.2)	10.1 (9.6, 10.5)	10.9 (10.4, 11.3)	10.7 (10.2, 11.2)	10.1 (9.6, 10.5)
D-KEFS Trail Making Test: Condition 2 (SS)	11.6 (11.3, 11.9)	11.6 (11.3, 12.0)	10.9 (10.4, 11.3)	11.3 (10.9, 11.7)	11.3 (10.9, 11.7)	10.5 (10.1, 11.0)

Supplemental Digital Content 8. Estimates for mean values according to age group and exposure category*

Test	Age 8-12			Age 15-20		
	Unexposed	Single exposure	Multiple exposures	Unexposed	Single exposure	Multiple exposures
D-KEFS Trail Making Test: Condition 3 (SS)	10.9 (10.4, 11.3)	11.1 (10.7, 11.6)	10.1 (9.6, 10.7)	11.5 (11.0, 11.9)	11.7 (11.3, 12.1)	10.7 (10.2, 11.2)
D-KEFS Trail Making Test: Condition 4 (SS)	9.9 (9.4, 10.4)	10.2 (9.7, 10.6)	9.6 (9.1, 10.1)	10.1 (9.5, 10.6)	10.3 (9.9, 10.7)	9.7 (9.2, 10.2)
D-KEFS Trail Making Test: Condition 5 (SS)	11.8 (11.6, 12.1)	11.5 (11.2, 11.8)	11.4 (11.1, 11.7)	11.4 (11.1, 11.7)	11.1 (10.8, 11.4)	11.0 (10.7, 11.3)
D-KEFS Tower Test: Total Achievement Score(SS)	10.1 (9.8, 10.5)	10.1 (9.8, 10.5)	9.8 (9.4, 10.2)	10.0 (9.7, 10.4)	10.0 (9.7, 10.4)	9.7 (9.3, 10.1)
Wisconsin Card Sort: Perseverative Responses (TS)	55.5 (53.5, 57.4)	56.9 (54.8, 59.0)	54.1 (51.9, 56.3)	55.3 (53.5, 57.1)	56.8 (55.0, 58.6)	53.9 (51.7, 56.1)
Wisconsin Card Sort: Perseverative Errors (TS)	54.4 (52.6, 56.2)	56.0 (54.1, 57.8)	52.8 (50.8, 54.8)	54.9 (53.2, 56.7)	56.5 (54.9, 58.2)	53.4 (51.3, 55.4)
CTOPP: Rapid Naming Composite Score (StdS)	98.8 (96.8, 100.9)	96.8 (94.6, 99.0)	95.3 (93.1, 97.5)	96.4 (93.9, 98.8)	94.3 (91.9, 96.7)	92.8 (90.2, 95.5)
Boston Naming Test (StdS) ‡	100.3 (97.6, 103.0)	100.8 (98.1, 103.4)	98.8 (96.0, 101.5)	99.3 (96.0, 102.7)	99.8 (96.6, 103.0)	97.8 (94.6, 101.0)
D-KEFS Verbal Fluency: Category Fluency (SS)	11.3 (10.9, 11.7)	11.6 (11.1, 12.2)	11.0 (10.5, 11.5)	11.8 (11.3, 12.3)	12.1 (11.6, 12.6)	11.5 (11.0, 12.1)
Expressive language composite (StdS)†	103.5 (101.7, 105.3)	104.8 (102.9, 106.7)	102.4 (100.3, 104.5)	103.8 (101.3, 106.3)	105.1 (102.6, 107.6)	102.7 (100.1, 105.2)
Beery: Motor Coordination (StdS)	86.7 (84.8, 88.6)	86.6 (84.5, 88.7)	83.7 (81.4, 85.9)	88.4 (86.3, 90.5)	88.3 (86.3, 90.3)	85.3 (83.1, 87.6)
Grooved Pegboard dominant hand (StdS)	97.8 (94.9, 100.7)	95.6 (92.0, 99.1)	90.0 (86.6, 93.5)	102.4 (99.1, 105.7)	100.1 (97.0, 103.3)	94.6 (90.6, 98.7)
Grooved Pegboard other hand (StdS)	97.0 (93.2, 100.8)	93.3 (90.2, 96.4)	85.5 (81.3, 89.6)	103.0 (99.7, 106.3)	99.3 (96.2, 102.5)	91.5 (87.4, 95.7)
Fine motor composite (StdS)†	92.4 (90.5, 94.4)	91.1 (88.8, 93.4)	86.9 (84.5, 89.4)	95.5 (93.2, 97.7)	94.1 (92.0, 96.2)	89.9 (87.2, 92.7)
Beery: Visual-Motor Integration (StdS)	90.2 (88.4, 92.0)	87.7 (85.7, 89.8)	88.8 (87.0, 90.6)	88.1 (85.9, 90.3)	85.6 (83.3, 87.9)	86.7 (84.5, 88.9)
Beery: Visual Perception (StdS)	101.3 (99.5, 103.1)	100.7 (99.0, 102.3)	99.9 (98.2, 101.7)	96.7 (95.2, 98.2)	96.1 (94.5, 97.7)	95.4 (93.7, 97.1)
Judgment of Line Orientation (StdS)	96.8 (94.4, 99.3)	94.1 (91.2, 97.1)	96.5 (93.4, 99.5)	N/A‡	N/A‡	N/A‡
Visual-spatial abilities composite (StdS) †	99.4 (97.5, 101.2)	97.6 (95.4, 99.9)	98.4 (96.3, 100.5)	N/A‡	N/A‡	N/A‡
Parent report						
BRIEF: Global Executive Composite (TS)	45.6 (44.1, 47.2)	50.3 (48.3, 52.3)	48.9 (46.9, 50.9)	47.9 (45.8, 49.9)	52.5 (50.3, 54.6)	51.1 (48.9, 53.3)
Proportion with score > 60	10.2% (5.6%, 17.8%)	21.2% (15.2%, 28.9%)	18.5% (13.0%, 25.7%)	9.5% (5.0%, 17.6%)	20.0% (12.9%, 29.5%)	17.4% (11.3%, 25.9%)
CBCL: Internalizing Problems (TS)	47.4 (45.7, 49.1)	48.6 (46.6, 50.6)	50.4 (48.6, 52.2)	47.7 (45.7, 49.8)	48.9 (46.6, 51.1)	50.6 (48.5, 52.8)
Proportion with score > 60	11.8% (6.9%, 19.4%)	16.2% (11.0%, 23.3%)	20.0% (14.3%, 27.4%)	11.7% (6.5%, 20.2%)	16.1% (10.0%, 25.0%)	19.9% (13.1%, 29.0%)
CBCL: Externalizing Problems (TS)	43.7 (42.2, 45.2)	45.7 (43.8, 47.7)	47.6 (46.0, 49.2)	42.2 (40.5, 44.0)	44.2 (42.1, 46.4)	46.1 (44.2, 48.0)
Proportion with score > 60	4.0% (2.1%, 7.7%)	14.8% (9.1%, 23.2%)	11.2% (6.8%, 17.8%)	2.2% (1.0%, 4.9%)	8.5% (3.9%, 17.8%)	6.3% (3.0%, 12.8%)
CBCL: Total Problems (TS)	44.0 (42.0, 46.0)	46.1 (43.8, 48.4)	48.7 (46.8, 50.6)	43.3 (41.0, 45.6)	45.4 (43.0, 47.9)	48.1 (45.8, 50.3)

Supplemental Digital Content 8. Estimates for mean values according to age group and exposure category*

Test	Age 8-12			Age 15-20		
	Unexposed	Single exposure	Multiple exposures	Unexposed	Single exposure	Multiple exposures
Proportion with score > 60	8.6% (4.2%, 17.0%)	13.3% (8.8%, 19.7%)	18.2% (12.5%, 25.9%)	5.7% (2.5%, 12.2%)	8.9% (4.5%, 16.9%)	12.4% (7.2%, 20.4%)
CBCL: ADHD Problems (TS)	52.7 (51.4, 53.9)	54.1 (53.0, 55.2)	54.7 (53.6, 55.8)	52.4 (51.3, 53.5)	53.8 (52.7, 54.9)	54.4 (53.2, 55.5)
Proportion with score > 60	8.6% (4.3%, 16.6%)	13.8% (9.2%, 20.3%)	17.9% (12.4%, 25.0%)	7.0% (3.3%, 14.0%)	11.3% (6.6%, 18.9%)	14.8% (8.9%, 23.5%)
CLDQ: Math Scale (ZS)	0.07 (-0.13, 0.28)	0.24 (0.03, 0.45)	0.30 (0.10, 0.51)	-0.02 (-0.25, 0.21)	0.15 (-0.06, 0.36)	0.21 (-0.02, 0.44)
CLDQ: Reading Scale (ZS)	-0.30 (-0.42, -0.19)	-0.06 (-0.21, 0.09)	0.13 (-0.05, 0.31)	-0.27 (-0.43, -0.11)	-0.02 (-0.20, 0.15)	0.17 (-0.03, 0.37)

* Data presented are estimates for the mean with 95% confidence intervals according to exposure category for each age category, derived from logistic regression in the primary analysis (using inverse probability treatment weighting). Statistical comparisons between groups are presented in Supplemental Digital Content 7.

‡Because normative data was not available for the Judgement of Line Orientation for older subjects, standard scores could not be calculated. In addition, normative data was also not available for the Boston Naming Test for subjects aged 19 or 20, who were excluded from analysis.

†In addition to scores derived from the test developers, 4 study- specific composite scores were defined *a priori* from individual tests to increase the ability to detect effects when more than one instrument assessed a particular domain (see Supplemental Digital Content 3 for components of individual composites) and to simplify the consideration of a large number of individual assessments. Individual test scores were first converted to standard- scores using available normative data from either the test developers or available scientific literature. The individual standard-scores were then averaged to create an overall composite domain score (mean = 100, standard deviation = 15).

TS, T score (mean = 50, standard deviation = 10); SS, Scaled score (mean = 10, standard deviation = 3); StdS, Standard score (mean = 100, standard deviation = 15); ZS, Z score (mean =0, standard deviation = 1). D-KEFS, Delis-Kaplan Executive Function System; WASI, Wechsler Abbreviated Scale of Intelligence; WRAML-2, Wide Range Assessment of Memory and Learning- Second Edition; CPT II, Connor's Continuous Performance Test II; CTOPP, Comprehensive Test of Phonological Processing; VMI, visual motor integration; ADHD, attention deficit hyperactivity disorder; CLDQ, Colorado Learning Difficulties Questionnaire; CBCL, Child Behavior Checklist.