

**Appendix 1** to Mous SE, White T, Muetzel RL, et al. Cortical morphology as a shared neurobiological substrate of attention-deficit/hyperactivity symptoms and executive functioning: a population-based pediatric neuroimaging study. *J Psychiatry Neurosci* 2016.

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**Table S1.** Spearman correlations NEPSY-II-NL subtestscores and corresponding domainscore ( $n=1,307$ )

	Overall score	Attention and Executive Functioning domain score	Language domain score	Memory and Learning domain score	Sensorimotor Functioning domain score I: speed accuracy interaction	Sensorimotor Functioning domain score II: pencilifts	Visuospatial Processing domain score
Auditory Attention							
Total score	0.56*	0.61*	n/a	n/a	n/a	n/a	n/a
Commission errors	-0.41*	-0.42*	n/a	n/a	n/a	n/a	n/a
Omission errors	-0.56*	-0.61*	n/a	n/a	n/a	n/a	n/a
Inhibition errors	-0.26*	-0.29*	n/a	n/a	n/a	n/a	n/a
Response Set							
Total score	0.70*	0.80*	n/a	n/a	n/a	n/a	n/a
Commission errors	-0.59*	-0.68*	n/a	n/a	n/a	n/a	n/a
Omission errors	-0.70*	-0.80*	n/a	n/a	n/a	n/a	n/a
Inhibition errors	-0.49*	-0.53*	n/a	n/a	n/a	n/a	n/a
Statue							
Total score	0.33*	0.48*	n/a	n/a	n/a	n/a	n/a
Total movements	-0.30*	-0.42*	n/a	n/a	n/a	n/a	n/a
Total sounds	-0.18*	-0.32*	n/a	n/a	n/a	n/a	n/a
Total eye openings	-0.28*	-0.41*	n/a	n/a	n/a	n/a	n/a
Word Generation							
Total of correct words Animals	0.55*	n/a	0.85*	n/a	n/a	n/a	n/a
Total of correct words Foods/Drinks	0.54*	n/a	0.87*	n/a	n/a	n/a	n/a
Memory for Faces							

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Total score	0.34*	n/a	n/a	0.52*	n/a	n/a	n/a
Memory for Faces – delayed							
Total score	0.33*	n/a	n/a	0.50*	n/a	n/a	n/a
Narrative Memory							
Total score free and cued recall	0.62*	n/a	n/a	0.82*	n/a	n/a	n/a
Total score free recall	0.66*	n/a	n/a	0.84*	n/a	n/a	n/a
Total score recognition	0.41*	n/a	n/a	0.56*	n/a	n/a	n/a
Visuomotor Precision							
Total speed accuracy interaction score	-0.53*	n/a	n/a	n/a	-0.96*	n/a	n/a
Total pencil lifts	-0.04	n/a	n/a	n/a	n/a	-0.99*	n/a
Arrows							
Total score	0.47*	n/a	n/a	n/a	n/a	n/a	0.83*
Geometric Puzzles							
Total score	0.32*	n/a	n/a	n/a	n/a	n/a	0.63*
Route Finding							
Total score	0.56*	n/a	n/a	n/a	n/a	n/a	0.75*
% variance explained first component PCA	25.15	35.41	78.61	50.90	n/a	n/a	58.86

*Note.* NEPSY = neuropsychological assessment. n/a = not applicable. \* $p < 0.01$

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**Table S2.** Association between CBCL ADHP score\* and NEPSY-II-NL overall- and domainscores

	Overall score*			Attention and Executive Functioning domain score*			Language domain score			Memory and Learning domain score		
	B (95% CI)	$\beta$	<i>p</i>	B (95% CI)	$\beta$	<i>p</i>	B (95% CI)	$\beta$	<i>p</i>	B (95% CI)	$\beta$	<i>p</i>
<i>Model I (unadjusted)</i>	-0.04 (-0.06;-0.02)	-0.12	<0.001	-0.06 (-0.08;-0.03)	-0.15	<0.001	-0.04 (-0.12;0.05)	-0.03	0.44	-0.00 (-0.09;0.08)	-0.00	0.95
<i>Model II (adjusted)</i>	-0.02 (-0.04;0.01)	-0.05	0.18	-0.04 (-0.07;-0.02)	-0.12	0.002	0.05 (-0.04;0.14)	0.04	0.29	0.06 (-0.03;0.15)	0.05	0.17
<i>Model II+IQ</i>	-0.01 (-0.03;0.01)	-0.03	0.44	-0.04 (-0.07;-0.01)	-0.11	0.004	0.06 (-0.03;0.15)	0.05	0.19	0.08 (-0.01;0.17)	0.07	0.07

	Sensorimotor Functioning domain score I: speed accuracy interaction			Sensorimotor Functioning domain score II: pencil lifts			Visuospatial Processing domain score*		
	B (95% CI)	$\beta$	<i>p</i>	B (95% CI)	$\beta$	<i>p</i>	B (95% CI)	$\beta$	<i>p</i>
<i>Model I (unadjusted)</i>	-0.03 (-0.05;-0.01)	-0.09	0.01	-0.03 (-0.06;0.01)	-0.05	0.13	-0.02 (-0.04;0.01)	-0.05	0.19
<i>Model II (adjusted)</i>	-0.02 (-0.04;0.01)	-0.05	0.15	-0.03 (-0.06;0.01)	-0.06	0.12	0.00 (-0.02;0.03)	0.01	0.84
<i>Model II + IQ</i>	-0.01 (-0.04;0.01)	-0.05	0.22	-0.03 (-0.07;0.01)	-0.06	0.09	0.02 (-0.01;0.04)	0.04	0.22

*Note.* CBCL = Child Behavior Checklist; ADHP = attention-deficit/hyperactivity problems; NEPSY = neuropsychological assessment. Both determinant (CBCL) and outcome (NEPSY) were residualized for age during assessment in all models. Model I is unadjusted. Model II was adjusted for child gender, ethnicity, gestational age at birth, birth weight, psychostimulant use, maternal education, drinking during pregnancy, smoking during pregnancy and household income. The B's are not interpretable since square root transformed scores (\*) were used in the analyses. A higher CBCL ADHP score indicates more attention and hyperactivity problems, a higher NEPSY score indicates better functioning.

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**Table S3.** Vertex-wise analyses of CBCL ADHP score and NEPSY-II-NL ATT/EF score with cortical morphology

	Cluster size (mm <sup>2</sup> )	Talairach coordinates			No. of vertices within cluster	Clusterwise (corrected) <i>p</i> -value
		TalX	TalY	TalZ		
<b>CBCL ADHP &amp; cortical thickness</b>						
<b>Left Hemisphere</b>						
Caudal middlefrontal	1049.32	-34.1	6.8	20.0	2039	0.009
<b>Right Hemisphere</b>						
Postcentral	6397.91	49.3	-13.2	47.9	15175	<0.001
Lateral occipital	1940.74	26.4	-91.9	13.1	2766	<0.001
Superior temporal	1470.95	48.1	-16.0	-7.8	3118	<0.001
Cuneus	1677.35	11.5	-69.9	23.1	2529	<0.001
<b>NEPSY-II-NL ATT/EF &amp; cortical thickness</b>						
<b>Left Hemisphere</b>						
none	N/A	N/A	N/A	N/A	N/A	N/A
<b>Right Hemisphere</b>						
none	N/A	N/A	N/A	N/A	N/A	N/A
<b>CBCL ADHP &amp; gyrification</b>						
<b>Left Hemisphere</b>						
Frontal/temporal/parietal (LH1)	37822.11	-4.9	-62.3	26.6	74434	<0.001
Superior parietal/postcentral (LH2)	3903.37	-35.0	-29.7	61.0	9520	<0.001
<b>Right Hemisphere</b>						
Frontal/temporal/parietal (RH1)	36480.54	20.8	24.5	49.5	74882	<0.001
<b>NEPSY-II-NL ATT/EF &amp; gyrification</b>						
<b>Left Hemisphere</b>						
Inferior parietal (LH3)	4359.38	-39.8	-77.9	19.2	8686	<0.001
Frontal (LH4)	1933.25	-21.6	52.9	2.2	2880	0.04
<b>Right Hemisphere</b>						
Frontal/parietal (RH2)	12178.87	22.8	-4.6	44.1	26051	<0.001
Frontal/temporal (RH3)	6222.21	44.2	35.6	-1.1	14233	<0.001
Occipital (RH4)	2489.04	31.6	-77.6	-4.1	3333	0.01

*Note.* CBCL = Child Behavior Checklist; ADHP = attention-deficit/hyperactivity problems; NEPSY = neuropsychological assessment; ATT/EF = Attention and Executive Functioning. The CBCL and NEPSY scores were square root transformed. Analyses corrected for gender, age during scanning used as nuisance factor. Monte Carlo Simulation ( $p < 0.05$ ) was applied to correct for multiple testing. TalX = Talairach region X plane; TalY = Talairach region Y plane; TalZ = Talairach region Z plane.

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**Table S4.** Gender stratified cluster-wise regression analyses of the association between CBCL ADHP score, NEPSY-II-NL ATT/EF score and cortical thickness

Cluster	DETECTION BOYS (n=407)			DETECTION GIRLS (n=369)		
	CBCL ADHP & cortical thickness			CBCL ADHP & cortical thickness		
	B (95% CI)	$\beta$	<i>p</i>	B (95% CI)	$\beta$	<i>p</i>
<b>Left Hemisphere</b>						
Caudal middle frontal	-0.04 (-0.07;-0.01)	-0.13	0.013	-0.04 (-0.07;-0.01)	-0.15	0.006
<b>Right Hemisphere</b>						
Postcentral	-0.05 (-0.08;-0.03)	-0.25	<0.001	-0.04 (-0.07;-0.02)	-0.20	<0.001
Lateral occipital	-0.06 (-0.09;-0.03)	-0.20	<0.001	-0.05 (-0.07;-0.02)	-0.17	0.001
Superior temporal	-0.05 (-0.09;-0.02)	-0.16	0.017	-0.05 (-0.08;-0.02)	-0.16	0.002
Cuneus	-0.04 (-0.07;-0.02)	-0.16	0.002	-0.04 (-0.07;-0.01)	-0.16	0.003
<b>NEPSY-II-NL ATT/EF &amp; cortical thickness</b>						
Cluster	B (95% CI)	$\beta$	<i>p</i>	B (95% CI)	$\beta$	<i>p</i>
<b>Left Hemisphere</b>						
none found	-	-	-	-	-	-
<b>Right Hemisphere</b>						
none found	-	-	-	-	-	-

*Note.* CBCL = Child Behavior Checklist; ADHP = attention-deficit/hyperactivity problems; NEPSY = neuropsychological assessment; ATT/EF = Attention and Executive Functioning. The CBCL ADHP and NEPSY ATT/EF scores were square root transformed, therefore B's are not interpretable. Both determinant (CBCL/NEPSY) and outcome (thickness) were residualized for age during assessment/scanning. Analyses adjusted for child gender, ethnicity, gestational age at birth, birth weight, psychostimulant use, IQ, maternal education, drinking during pregnancy, smoking during pregnancy and household income. A higher CBCL ADHP score indicates more attention and hyperactivity symptoms, a higher NEPSY score indicates better functioning.

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**Table S5.** Gender stratified cluster-wise regression analyses of the association between CBCL ADHP score, NEPSY-II-NL ATT/EF score and gyrification

Cluster	DETECTION BOYS (n=407) CBCL ADHP & gyrification			DETECTION GIRLS (n=369) CBCL ADHP & gyrification		
	B (95% CI)	$\beta$	<i>p</i>	B (95% CI)	$\beta$	<i>p</i>
<b>Left Hemisphere</b>						
Frontal/temporal/parietal (LH1)	-0.04 (-0.06;-0.01)	-0.15	0.006	-0.03 (-0.06;-0.01)	-0.14	0.010
Superior parietal/postcentral (LH2)	-0.04 (-0.08;0.00)	-0.11	0.057	-0.04 (-0.07;-0.00)	-0.12	0.034
<b>Right Hemisphere</b>						
Frontal/temporal/parietal (RH1)	-0.04 (-0.07;-0.01)	-0.14	0.015	-0.03 (-0.06;-0.01)	-0.13	0.019
Cluster	NEPSY-II-NL ATT/EF & gyrification			CBCL ADHP & gyrification		
	B (95% CI)	$\beta$	<i>p</i>	B (95% CI)	$\beta$	<i>p</i>
<b>Left Hemisphere</b>						
Inferior parietal (LH3)	0.02 (-0.06;0.10)	0.03	0.546	0.12 (0.03;0.20)	0.14	0.007
Frontal (LH4)	0.02 (-0.03;0.08)	0.04	0.431	0.09 (0.03;0.15)	0.15	0.006
<b>Right Hemisphere</b>						
Frontal/parietal (RH2)	0.08 (-0.01;0.17)	0.10	0.075	0.11 (0.03;0.19)	0.15	0.010
Frontal/temporal (RH3)	0.02 (-0.13;0.17)	0.02	0.750	0.22 (0.07;0.36)	0.15	0.004
Occipital (RH4)	-0.01 (-0.09;0.07)	-0.01	0.812	0.16 (0.07;0.24)	0.20	<0.001

*Note.* CBCL = Child Behavior Checklist; ADHP = attention-deficit/hyperactivity problems; NEPSY = neuropsychological assessment; ATT/EF = Attention and Executive Functioning. The CBCL ADHP and NEPSY ATT/EF scores were square root transformed, therefore B's are not interpretable. Both determinant (CBCL/NEPSY) and outcome (gyrification) were residualized for age during assessment/scanning. Analyses adjusted for child gender, ethnicity, gestational age at birth, birth weight, psychostimulant use, IQ, maternal education, drinking during pregnancy, smoking during pregnancy and household income. A higher CBCL ADHP score indicates more attention and hyperactivity symptoms, a higher NEPSY score indicates better functioning.

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**Table S6.** Cluster-wise regression analyses of the association between CBCL ADHP score, NEPSY-II-NL ATT/EF score and cortical thickness, without children scoring above clinical CBCL cut-off (n=744)

<b>DETECTION CBCL ADHP &amp; cortical thickness</b>			
<b>Cluster</b>	<b>B (95% CI)</b>	<b><math>\beta</math></b>	<b><i>p</i></b>
<b>Left Hemisphere</b>			
Caudal middle frontal	-0.04 (-0.06;-0.02)	-0.13	<0.001
<b>Right Hemisphere</b>			
Postcentral	-0.05 (-0.06;-0.03)	-0.20	<0.001
Lateral occipital	-0.05 (-0.07;-0.02)	-0.16	<0.001
Superior temporal	-0.05 (-0.08;-0.03)	-0.15	<0.001
Cuneus	-0.05 (-0.07;-0.02)	-0.16	<0.001
<b>NEPSY-II-NL ATT/EF &amp; cortical thickness</b>			
<b>Cluster</b>	<b>B (95% CI)</b>	<b><math>\beta</math></b>	<b><i>p</i></b>
<b>Left Hemisphere</b>			
none found	-	-	-
<b>Right Hemisphere</b>			
none found	-	-	-

*Note.* CBCL = Child Behavior Checklist; ADHP = attention-deficit/hyperactivity problems; NEPSY = neuropsychological assessment; ATT/EF = Attention and Executive Functioning. The CBCL ADHP and NEPSY ATT/EF scores were square root transformed, therefore B's are not interpretable. Both determinant (CBCL/NEPSY) and outcome (thickness) were residualized for age during assessment/scanning. Analyses adjusted for child gender, ethnicity, gestational age at birth, birth weight, psychostimulant use, IQ, maternal education, drinking during pregnancy, smoking during pregnancy and household income. A higher CBCL ADHP score indicates more attention and hyperactivity symptoms, a higher NEPSY score indicates better functioning.

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**Table S7.** Cluster-wise regression analyses of the association between CBCL ADHP score, NEPSY-II-NL ATT/EF score and gyrification, without children scoring above clinical CBCL cut-off (n=744)

<b>DETECTION CBCL ADHP &amp; gyrification</b>			
<b>Cluster</b>	<b>B (95% CI)</b>	<b>β</b>	<b>p</b>
<b>Left Hemisphere</b>			
Frontal/temporal/parietal (LH1)	-0.04 (-0.06;-0.02)	-0.16	<0.001
Superior parietal/postcentral (LH2)	-0.04 (-0.06;-0.01)	-0.11	0.007
<b>Right Hemisphere</b>			
Frontal/temporal/parietal (RH1)	-0.04 (-0.06;-0.02)	-0.14	<0.001
<b>NEPSY-II-NL ATT/EF &amp; gyrification</b>			
<b>Cluster</b>	<b>B (95% CI)</b>	<b>β</b>	<b>p</b>
<b>Left Hemisphere</b>			
Inferior parietal (LH3)	0.07 (0.01;0.13)	0.09	0.021
Frontal (LH4)	0.06 (0.02;0.11)	0.11	0.005
<b>Right Hemisphere</b>			
Frontal/parietal (RH2)	0.11 (0.04;0.17)	0.13	0.001
Frontal/temporal (RH3)	0.10 (-0.01;0.21)	0.07	0.073
Occipital (RH4)	0.07 (0.06;0.12)	0.08	0.030

*Note.* CBCL = Child Behavior Checklist; ADHP = attention-deficit/hyperactivity problems; NEPSY = neuropsychological assessment; ATT/EF = Attention and Executive Functioning. The CBCL ADHP and NEPSY ATT/EF scores were square root transformed, therefore B's are not interpretable. Both determinant (CBCL/NEPSY) and outcome (gyrification) were residualized for age during assessment/scanning. Analyses adjusted for child gender, ethnicity, gestational age at birth, birth weight, psychostimulant use, IQ, maternal education, drinking during pregnancy, smoking during pregnancy and household income. A higher CBCL ADHP score indicates more attention and hyperactivity symptoms, a higher NEPSY score indicates better functioning.

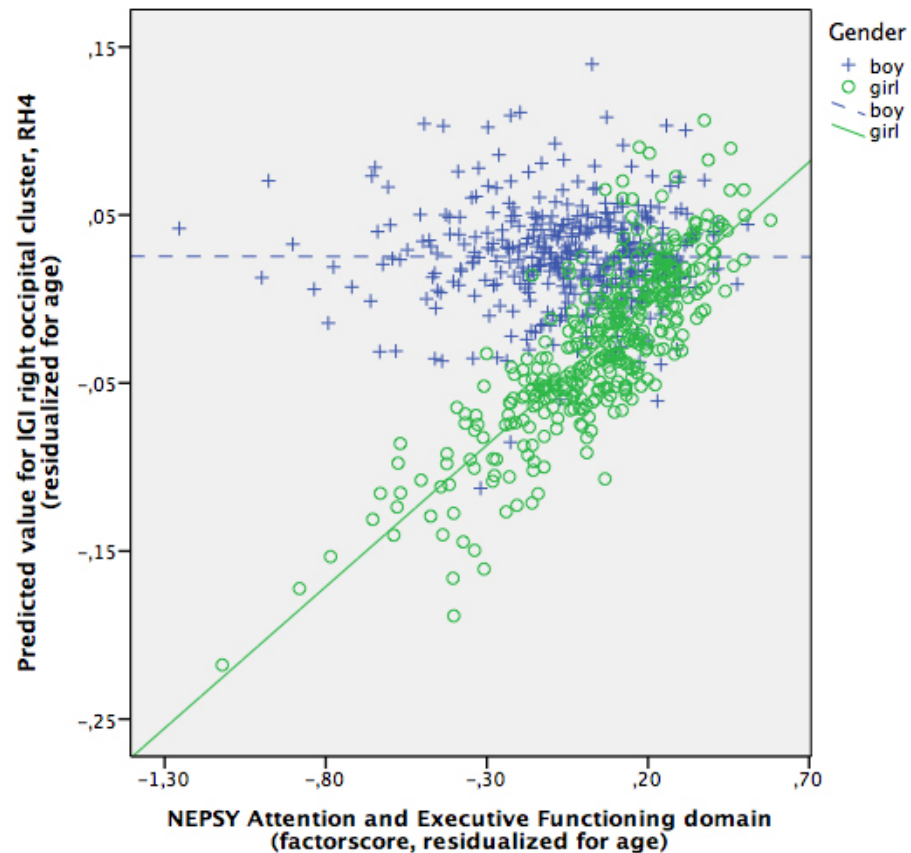


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**Fig. S1:** Gender interaction effect association NEPSY Attention and EF score and right hemisphere occipital gyrification cluster (RHG).