

Data Supplement for Luby et al., Developmental Trajectories of the Orbitofrontal Cortex and Anhedonia in Middle Childhood and Risk for Substance Use in Adolescence in a Longitudinal Sample of Depressed and Healthy Preschoolers. *Am J Psychiatry* (doi: 10.1176/appi.ajp.2018.17070777)

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FIGURE S1. Individual Subject Intercepts and Slopes from Multilevel Models of Orbital Frontal Cortex (OFC) Volume Residuals and OFC Thickness by Time-Varying CDI-C Anhedonia T-Score by Marijuana and Alcohol (≥ 5 Drinks) Frequency Category (N=135)

TABLE S1. Multilevel Models of Orbital Frontal Cortex (OFC) Volume Residuals and OFC Thickness by Time-Varying CDI-C Anhedonia T-Score Covarying for Baseline Anhedonia Severity (N=150)

DV: OFC Volume Residuals	Estimate	SE	t	p
Intercept	-0.0485	0.2289	-0.21	0.8326
Age at scan	-0.1032	0.0322	-3.21	0.0018
Age at scan squared	-0.0249	0.0121	-2.05	0.0419
Male gender	0.0264	0.2968	0.09	0.9291
Baseline anhedonia severity score	0.0122	0.1243	0.10	0.9222
MDD core score without anhedonia	-0.0293	0.0253	-1.16	0.2485
CDI-C anhedonia T-score	0.0008	0.0059	0.13	0.8930
Baseline anhedonia severity score X Age at scan	-0.0302	0.0212	-1.43	0.1574
MDD core score without anhedonia X Age at scan	-0.0007	0.0151	-0.05	0.9639
CDI-C anhedonia T-score X Age at scan	-0.0125	0.0036	-3.44	0.0007
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DV: OFC Thickness (mm)	Estimate	SE	t	p
Intercept	10.8865	0.0516	211.20	<0.0001
Age at scan	-0.1499	0.0096	-15.57	<0.0001
Age at scan squared	-0.0114	0.0039	-2.93	0.0040
Male gender	0.0498	0.0661	0.75	0.4520
Baseline anhedonia severity score	0.0292	0.0276	1.06	0.2917
MDD core score without anhedonia	-0.0105	0.0089	-1.18	0.2383
CDI-C anhedonia T-score	0.0013	0.0021	0.63	0.5306
Baseline anhedonia severity score X Age at scan	-0.0078	0.0064	-1.23	0.2236
MDD core score without anhedonia X Age at scan	-0.0074	0.0051	-1.45	0.1476
CDI-C anhedonia T-score X Age at scan	-0.0036	0.0012	-3.14	0.0022

TABLE S2. General Linear Models of Relationship between Individual Subject Intercepts and Slopes from Multilevel Linear Models (MLM) of Orbital Frontal Cortex (OFC) Volume Residuals and OFC Thickness by Time-Varying CDI-C Anhedonia and Age of Onset of Alcohol or Marijuana Use (N=135)

	Estimate	SE	t	p
DV: Intercept from MLM of OFC volume residuals				
Intercept	-1.5703	1.0214	-1.54	0.1266
Age of marijuana/alcohol onset	0.0933	0.0683	1.37	0.1740
Male gender	-0.3030	0.2929	-1.03	0.3028
Caucasian race	0.4325	0.2948	1.47	0.1447
DV: Slope from MLM of OFC volume residuals				
Intercept	-0.1236	0.0482	-2.57	0.0114
Age of marijuana/alcohol onset	0.0002	0.0032	0.07	0.9415
Male gender	0.0016	0.0138	0.12	0.9086
Caucasian race	0.0013	0.0139	0.10	0.9234
DV: Intercept from MLM of OFC thickness				
Intercept	10.4984	0.2265	46.36	<0.0001
Age of marijuana/alcohol onset	0.0200	0.0151	1.32	0.1881
Male gender	-0.0107	0.0649	-0.16	0.8697
Caucasian race	0.1116	0.0654	1.71	0.0902
DV: Slope from MLM of OFC thickness				
Intercept	-0.1644	0.0055	-29.81	<0.0001
Age of marijuana/alcohol onset	0.0005	0.0004	1.30	0.1955
Male gender	0.0023	0.0016	1.46	0.1474
Caucasian race	0.0010	0.0016	0.62	0.5347

TABLE S3. Zero-Inflated Poisson Regression Models of Summed Marijuana Use and Alcohol Use (≥ 1 Drink) Frequency Categories by Individual Subject Intercepts and Slopes from Multilevel Linear Models (MLM) of Orbital Frontal Cortex (OFC) Volume Residuals and OFC Thickness by Time-Varying CDI-C Anhedonia (N=135)

	Estimate	SE	t	p
Zero-inflated: marijuana/alcohol abstinence				
Intercept	7.3181	4.5701	1.60	0.1093
Intercept from MLM of OFC volume residuals	-0.2403	0.2018	-1.19	0.2337
Caucasian race	1.1217	0.7136	1.57	0.1159
Male gender	-0.5157	0.6440	-0.80	0.4232
Age at last assessment	-0.4982	0.2869	-1.74	0.0825
Continuous: frequency of use				
Intercept	-3.6198	2.2906	-1.58	0.1140
Intercept from MLM of OFC volume residuals	-0.1837	0.0681	-2.70	0.0070
Caucasian race	-0.0665	0.3139	-0.21	0.8322
Male gender	0.1760	0.2975	0.59	0.5542
Age at last assessment	0.2351	0.1403	1.68	0.0938
Zero-inflated: marijuana/alcohol abstinence				
Intercept	8.5647	4.3483	1.97	0.0489
Slope from MLM of OFC volume residuals	8.0330	4.5698	1.76	0.0788
Caucasian race	0.4597	0.6028	0.76	0.4457
Male gender	-0.1505	0.6254	-0.24	0.8098
Age at last assessment	-0.5014	0.2718	-1.84	0.0651
Continuous: frequency of use				
Intercept	-3.2931	2.2219	-1.48	0.1383
Slope from MLM of OFC volume residuals	1.1100	1.5322	0.72	0.4688
Caucasian race	-0.4648	0.2822	-1.65	0.0995
Male gender	0.4218	0.2851	1.48	0.1389
Age at last assessment	0.2303	0.1344	1.71	0.0866

(Continued)

(TABLE S3 continued)

	Estimate	SE	t	p
Zero-inflated: marijuana/alcohol abstinence				
Intercept	15.6567	11.4337	1.37	0.1709
Intercept from MLM of OFC thickness	-0.8297	1.0983	-0.76	0.4500
Caucasian race	0.5345	0.7467	0.72	0.4741
Male gender	-0.7725	0.8167	-0.95	0.3442
Age at last assessment	-0.4466	0.3527	-1.27	0.2055
Continuous: frequency of use				
Intercept	9.4339	4.0998	2.30	0.0214
Intercept from MLM of OFC thickness	-1.3128	0.3809	-3.45	0.0006
Caucasian race	-0.4220	0.2894	-1.46	0.1448
Male gender	0.1267	0.3030	0.42	0.6759
Age at last assessment	0.3107	0.1483	2.09	0.0362
Zero-inflated: marijuana/alcohol abstinence				
Intercept	-0.8716	14.4247	-0.06	0.9518
Slope from MLM of OFC thickness	-54.7522	83.3655	-0.66	0.5113
Caucasian race	1.1266	0.9843	1.14	0.2524
Male gender	-0.5647	0.8693	-0.65	0.5159
Age at last assessment	-0.5533	0.4241	-1.30	0.1919
Continuous: frequency of use				
Intercept	-13.9348	4.5380	-3.07	0.0021
Slope from MLM of OFC thickness	-58.7356	18.1782	-3.23	0.0012
Caucasian race	-0.2284	0.2742	-0.83	0.4049
Male gender	0.2648	0.3145	0.84	0.3999
Age at last assessment	0.2963	0.1600	1.85	0.0640

TABLE S4. Zero-Inflated Poisson Regression Models of Summed Marijuana Use and Alcohol Use (Intoxication) Frequency Categories by Individual Subject Intercepts and Slopes from Multilevel Linear Models (MLM) of Orbital Frontal Cortex (OFC) Volume Residuals and OFC Thickness by Time-Varying CDI-C Anhedonia (N=135)

	Estimate	SE	t	p
Zero-inflated: marijuana/alcohol abstinence				
Intercept	6.2264	5.2485	1.19	0.2355
Intercept from MLM of OFC volume residuals	-0.2982	0.2155	-1.38	0.1664
Caucasian race	1.2873	0.8442	1.52	0.1273
Male gender	-0.5439	0.7354	-0.74	0.4596
Age at last assessment	-0.4471	0.3281	-1.36	0.1730
Continuous: frequency of use				
Intercept	-4.5683	2.4259	-1.88	0.0597
Intercept from MLM of OFC volume residuals	-0.2034	0.0688	-2.95	0.0031
Caucasian race	-0.0582	0.3288	-0.18	0.8595
Male gender	0.1809	0.3142	0.58	0.5647
Age at last assessment	0.2856	0.1485	1.92	0.0545
Zero-inflated: marijuana/alcohol abstinence				
Intercept	7.7063	4.8414	1.59	0.1114
Slope from MLM of OFC volume residuals	8.4115	4.9894	1.69	0.0918
Caucasian race	0.3857	0.6794	0.57	0.5702
Male gender	-0.0475	0.7172	-0.07	0.9472
Age at last assessment	-0.4569	0.3031	-1.51	0.1317
Continuous: frequency of use				
Intercept	-4.2438	2.3730	-1.79	0.0737
Slope from MLM of OFC volume residuals	0.7926	1.5946	0.50	0.6191
Caucasian race	-0.5187	0.2969	-1.75	0.0806
Male gender	0.4690	0.3019	1.55	0.1203
Age at last assessment	0.2790	0.1428	1.95	0.0508

(Continued)

(TABLE S4 continued)

	Estimate	SE	t	p
Zero-inflated: marijuana/alcohol abstinence				
Intercept	19.7539	12.6272	1.56	0.1177
Intercept from MLM of OFC thickness	-1.4138	1.2673	-1.12	0.2646
Caucasian race	0.6041	0.9302	0.65	0.5160
Male gender	-1.0446	1.0583	-0.99	0.3236
Age at last assessment	-0.3236	0.4322	-0.75	0.4540
Continuous: frequency of use				
Intercept	10.1336	4.1581	2.44	0.0148
Intercept from MLM of OFC thickness	-1.4960	0.3583	-4.18	<0.0001
Caucasian race	-0.4633	0.2946	-1.57	0.1158
Male gender	0.1088	0.3151	0.35	0.7299
Age at last assessment	0.3821	0.1527	2.50	0.0123
Zero-inflated: marijuana/alcohol abstinence				
Intercept	-1531.923	22.2912	-68.72	<0.0001
Slope from MLM of OFC thickness	-13209	7.8829	-1675.6	<0.0001
Caucasian race	187.2070	374.8997	0.50	0.6175
Male gender	30.4853	78.8427	0.39	0.6990
Age at last assessment	-54.5973	25.1266	-2.17	0.0298
Continuous: frequency of use				
Intercept	-18.0471	2.7392	-6.59	<0.0001
Slope from MLM of OFC thickness	-68.1939	13.0628	-5.22	<0.0001
Caucasian race	-0.4292	0.2200	-1.95	0.0511
Male gender	0.4715	0.2178	2.16	0.0304
Age at last assessment	0.4354	0.1092	3.99	<0.0001

TABLE S5. Zero-Inflated Poisson Regression Models of Summed Marijuana Use and Alcohol Use (≥ 5 Drinks) Frequency Categories by Individual Subject Intercepts and Slopes from Multilevel Linear Models (MLM) of Orbital Frontal Cortex (OFC) Volume Residuals and OFC Thickness by Gender and Age at Scan (N=135)

	Estimate	SE	t	p
Zero-inflated: marijuana/alcohol abstinence				
Intercept	6004.6465	1.3440	4467.63	<0.0001
Intercept from MLM of OFC volume residuals	101.8468	59.5607	1.71	0.0873
Caucasian race	1637.1016	0.5137	3186.78	<0.0001
Male gender	-1015.944	0.1402	-7247.1	<0.0001
Age at last assessment	-412.2505	6.9031	-59.72	<0.0001
Continuous: frequency of use				
Intercept	-4.3161	2.7611	-1.56	0.1180
Intercept from MLM of OFC volume residuals	-0.2052	0.0992	-2.07	0.0386
Caucasian race	-0.5163	0.4334	-1.19	0.2335
Male gender	0.2823	0.3620	0.78	0.4355
Age at last assessment	0.2131	0.1671	1.28	0.2022
Zero-inflated: marijuana/alcohol abstinence				
Intercept	48.9189	24.3465	2.01	0.0445
Slope from MLM of OFC volume residuals	-45.1625	24.8531	-1.82	0.0692
Caucasian race	37.0511	1.6560	22.37	<0.0001
Male gender	-30.1093	1.6633	-18.10	<0.0001
Age at last assessment	-3.7158	1.8161	-2.05	0.0408
Continuous: frequency of use				
Intercept	-3.9511	3.2599	-1.21	0.2255
Slope from MLM of OFC volume residuals	-4.8356	1.9194	-2.52	0.0118
Caucasian race	0.1433	0.5682	0.25	0.8008
Male gender	0.1243	0.3906	0.32	0.7503
Age at last assessment	0.1698	0.1981	0.86	0.3914

(Continued)

(TABLE S5 continued)

	Estimate	SE	t	p
Zero-inflated: marijuana/alcohol abstinence				
Intercept	-338.1297	60.5102	-5.59	<0.0001
Intercept from MLM of OFC thickness	639.6419	638.5777	1.00	0.3165
Caucasian race	695.3749	462.4330	1.50	0.1327
Male gender	-721.8514	427.7706	-1.69	0.0915
Age at last assessment	-422.5340	445.7912	-0.95	0.3432
Continuous: frequency of use				
Intercept	6.8272	4.9064	1.39	0.1641
Intercept from MLM of OFC thickness	-1.0804	0.4528	-2.39	0.0170
Caucasian race	-0.9892	0.4319	-2.29	0.0220
Male gender	0.4492	0.3681	1.22	0.2223
Age at last assessment	0.2478	0.1856	1.34	0.1818
Zero-inflated: marijuana/alcohol abstinence				
Intercept	-2.5635	14.4445	-0.18	0.8591
Slope from MLM of OFC thickness	-255.9680	123.4695	-2.07	0.0382
Caucasian race	10.1565	4.0780	2.49	0.0128
Male gender	-2.1831	2.5008	-0.87	0.3827
Age at last assessment	-2.7153	1.3735	-1.98	0.0481
Continuous: frequency of use				
Intercept	-17.4777	4.4291	-3.95	<0.0001
Slope from MLM of OFC thickness	-82.0076	19.3728	-4.23	<0.0001
Caucasian race	0.0559	0.5847	0.10	0.9238
Male gender	0.5753	0.3968	1.45	0.1471
Age at last assessment	0.2233	0.2027	1.10	0.2706

FIGURE S1. Individual Subject Intercepts and Slopes from Multilevel Models of Orbital Frontal Cortex (OFC) Volume Residuals and OFC Thickness by Time-Varying CDI-C Anhedonia T-Score by Marijuana and Alcohol (≥ 5 Drinks) Frequency Category (N=135)

