

Supplementary Materials for

A developmental reduction of the excitation:inhibition ratio in association cortex during adolescence

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Supplemental Data

Table S1. Effects of covariates on correct classification.

Covariate	Statistic	<i>p</i> value
Age	-1.14	0.26
Alprazolam blood level (ng/mL)	0.82	0.42
FD	0.24	0.81
Relaxed	0.89	0.38
SIS	-0.23	0.82
STAI: pre-scan	-1.12	0.26
STAI: post-scan	0.35	0.73
STAI: trait	-0.15	0.88
Sex	0.05	0.83
Condition	0.00	1.00
Order	0.23	0.63

Note: Continuous variables were evaluated using t-tests and categorical variables were evaluated using chi-square tests. “Condition” refers to whether the classified session was drug or placebo. “Order” refers to whether the session occurred on the first or second day of the study. “Relaxed” refers to self-reported feelings of relaxation. Abbreviations: FD=Mean framewise displacement, SIS=Structured Interview for Schizotypy total score, STAI=State Trait Anxiety Inventory.

Table S2. Regression table for developmental generalized additive models (GAM).

Predictors	All connections			Transmodal connections			Unimodal connections		
	<i>Estimates</i>	<i>SE</i>	<i>p</i>	<i>Estimates</i>	<i>SE</i>	<i>p</i>	<i>Estimates</i>	<i>SE</i>	<i>p</i>
(Intercept)	-24.01	2.10	<.001	-5.97	1.23	<.001	-9.57	0.94	<.001
Sex	-0.94	1.27	.459	0.93	0.75	.213	-0.63	0.57	.271
FD	53.41	15.95	<.001	45.38	9.37	<.001	20.02	7.14	.005
Omissions	1.24	0.18	<.001	0.47	0.11	<.001	0.55	0.08	<.001
Smooth predictors	<i>F</i> (<i>edf</i>)	<i>p</i>	<i>Age-range</i>	<i>F</i> (<i>edf</i>)	<i>p</i>	<i>Age-range</i>	<i>F</i> (<i>edf</i>)	<i>p</i>	<i>Age-range</i>
s(Age)	2.45(2.8)	.037	12.9-16.7	9.96(1)	.0017	8.2-21.7	3.59(1)	.059	-

Note: Age-range is the span of the spline fit in which the derivative is significantly greater than zero (see Methods). *SE*: standard error; *edf*: estimated degrees of freedom for penalized thin plate regression spline.

Table S3. Classification results and age effects for alternative parcellation atlases.

Parcellation	SVM classification				Age effect		Age-range
	AUC	$p_{\text{permutation}}$	Accuracy	$p_{\text{permutation}}$	$F(\text{edf})$	p	
Schaefer 200	.707	.001	65.5%	.003	13.13(2.7)	<.001	11.4-17.1
AAL	.707	<.001	63.5%	.003	8.90(1.4)	.001	11.8-19.5
Multi-modal Parcellation Atlas	.726	<.001	70.0%	<.001	30.5(1)	<.001	8.0-21.7
Gordon Cortical Atlas	.665	.005	67.9%	<.001	2.73(2.4)	<.001	11.9-16.5

Results are also visually depicted in **Supplemental Figure 2**. Age-range (years) is the span of the spline fit in which the derivative is significantly greater than zero (see Online Methods). AUC: Area under the receiver operating curve; edf: estimated degrees of freedom from the penalized thin plate regression spline.

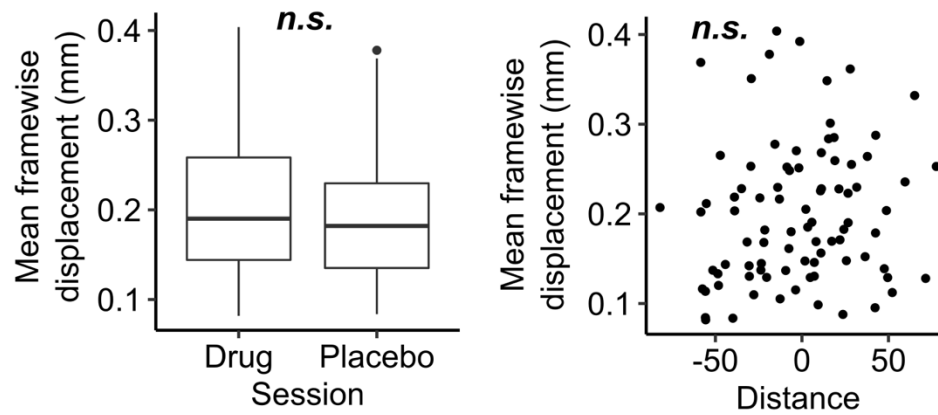


Figure S1. Head motion is not associated with the pharmacological manipulation or classifier performance. Left: A summary of in-scanner head motion (mean framewise displacement) did not differ between drug and placebo sessions ($t_{paired} = 1.44, p = .16$). Right: The same metric of head motion was also not associated with model-predicted distance from the classification plane ($r = .13, p = .24$).

■ AAL ■ Gordon Cortical Atlas ■ Multi-modal Parcellation Atlas ■ Schaefer 200 ■ Schaefer 400

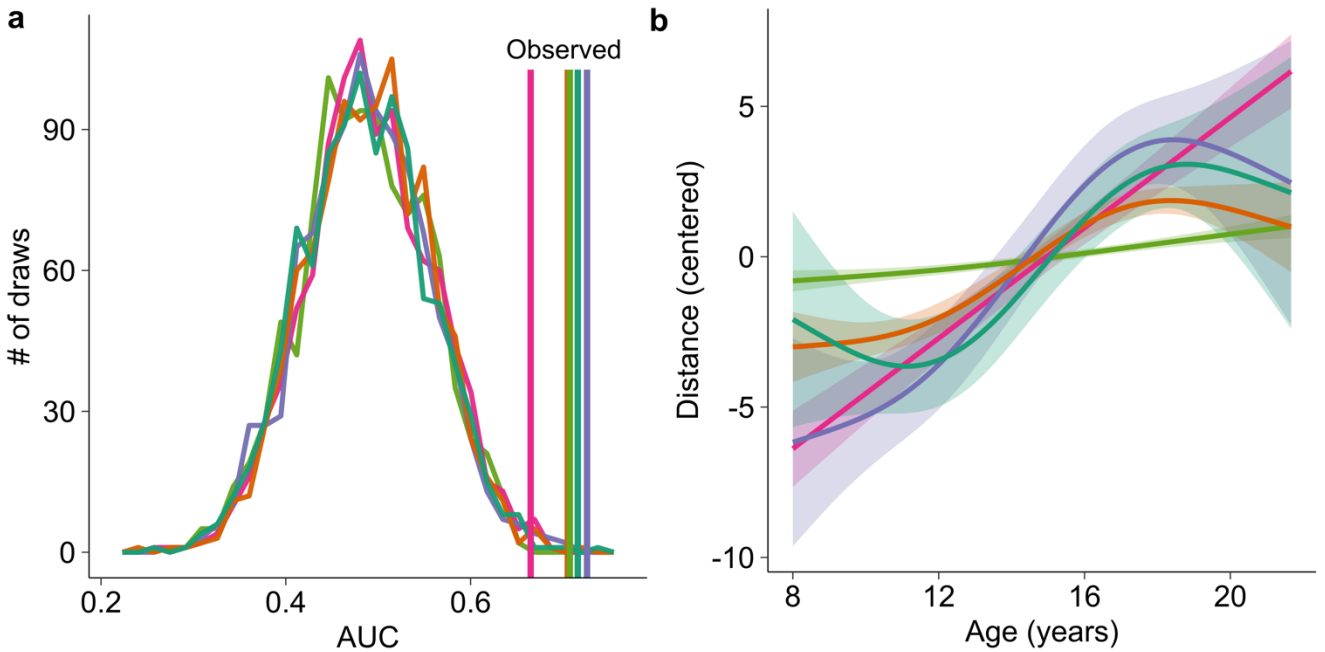


Figure S2. Classification and developmental effects are robust to alternative cortical parcellation schemes. **a)** Classifier performance. All binary SVM classifiers identified drug and placebo sessions in 10-fold cross-validation with an AUC values that exceeded the randomly permuted null AUC distributions (see **Supplemental Table 1**). **b)** When the models from panel **a)** were applied to the developmental dataset, models trained on all parcellation schemes produced distance metrics that significantly increased with age during adolescence, indicating age-related reductions in the E:I ratio. Distance metrics are centered to facilitate comparisons between the model predictions. GAM model statistics are reported in **Table S2**.