

Puberty, Brain Structure and Depressive Symptoms in Adolescent Girls

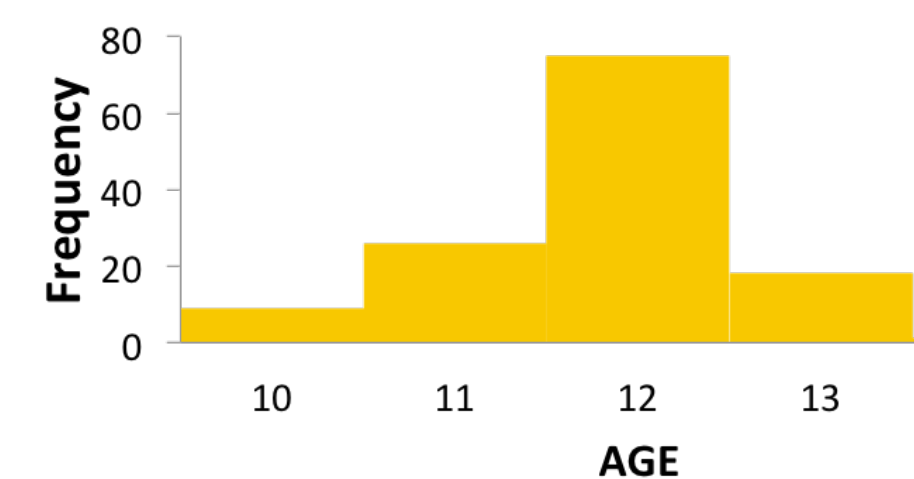
Introduction

- Adolescence is an important stage in the transition from childhood to adulthood, associated with an increasing range of problems, including depression (Dahl, Gunnar, 2009).
- One quarter of adolescents will experience major depressive disorder by the end of their teens (Kessler et al. 2001).
- Incidence of depression is same across sex during childhood, but twice as common in girls following puberty.
- There is also significant brain development during adolescence, including structural changes in cortical and subcortical areas that are implicated in emotional reactivity and regulation. These changes have been linked to pubertal development in human and animal research.
- Neurobiological mechanisms are hypothesized to be partly responsible for the association puberty and depressive symptoms in adolescents.
- The aims of this study are to better understand the association between puberty and structural brain development (Aim 1), depression and brain structure (Aim 2), and depression and puberty (Aim 3), during the transition to adolescence.**

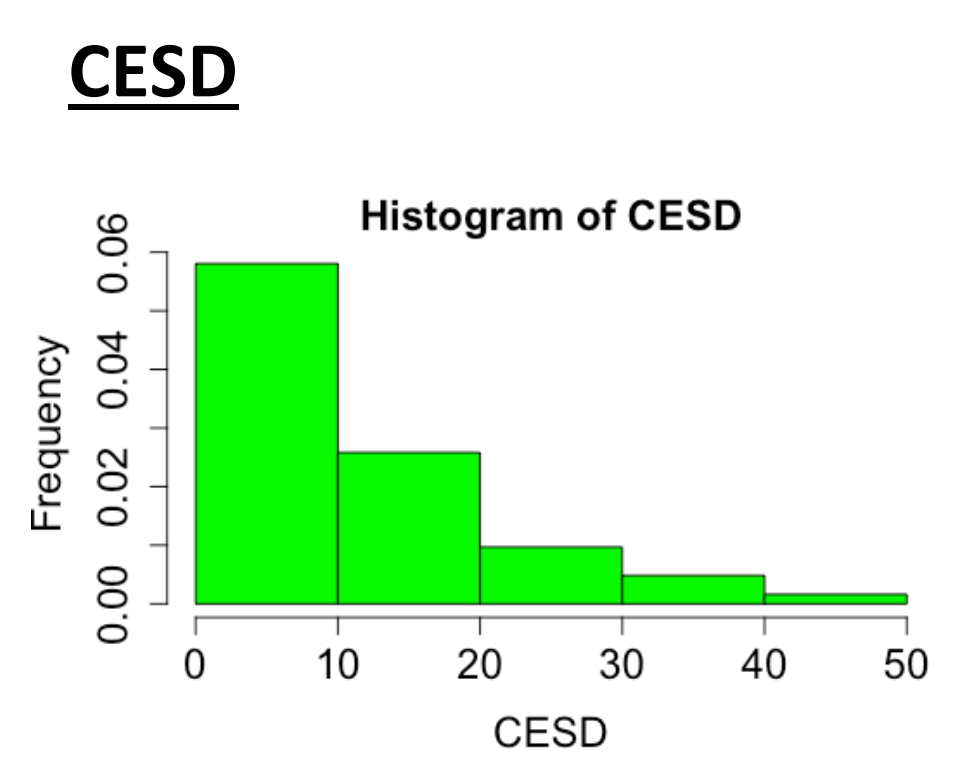
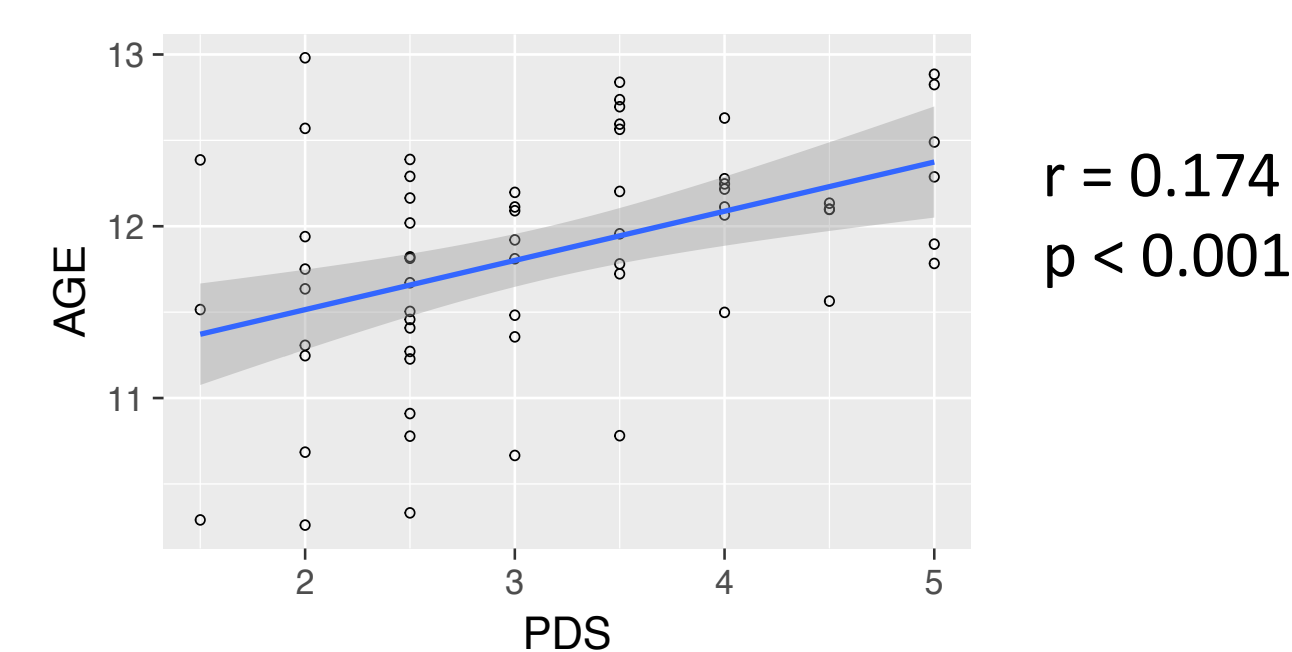
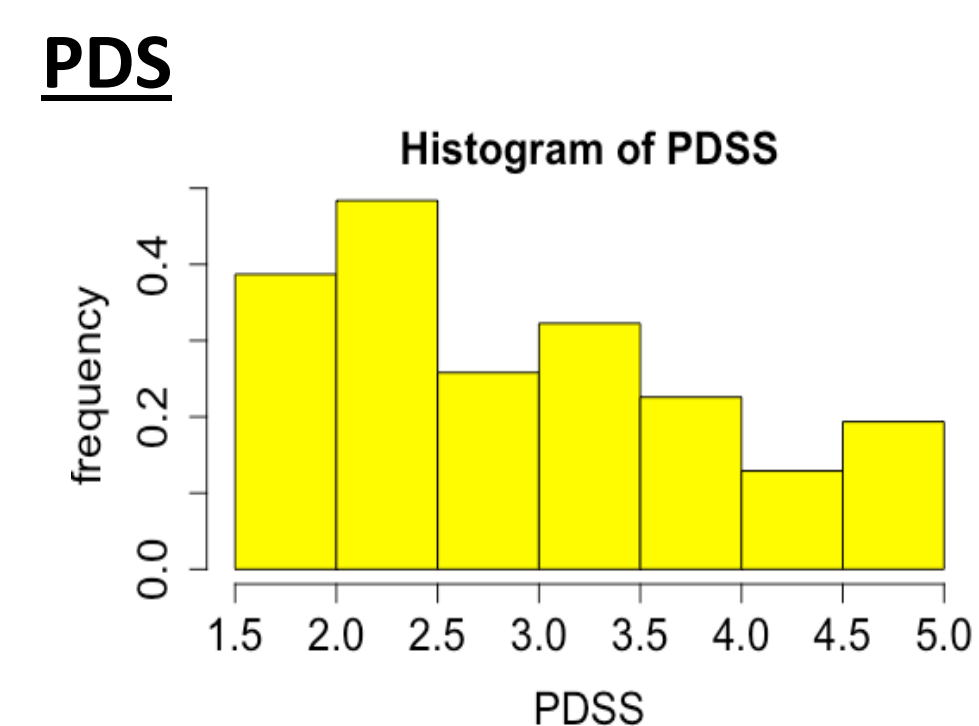
Methods

Recruitment: letters distributed by schools in the greater Eugene/Springfield area, UO Department of Psychology's Developmental Database, DSN lab website, flyers posted around community or at community events/organization.

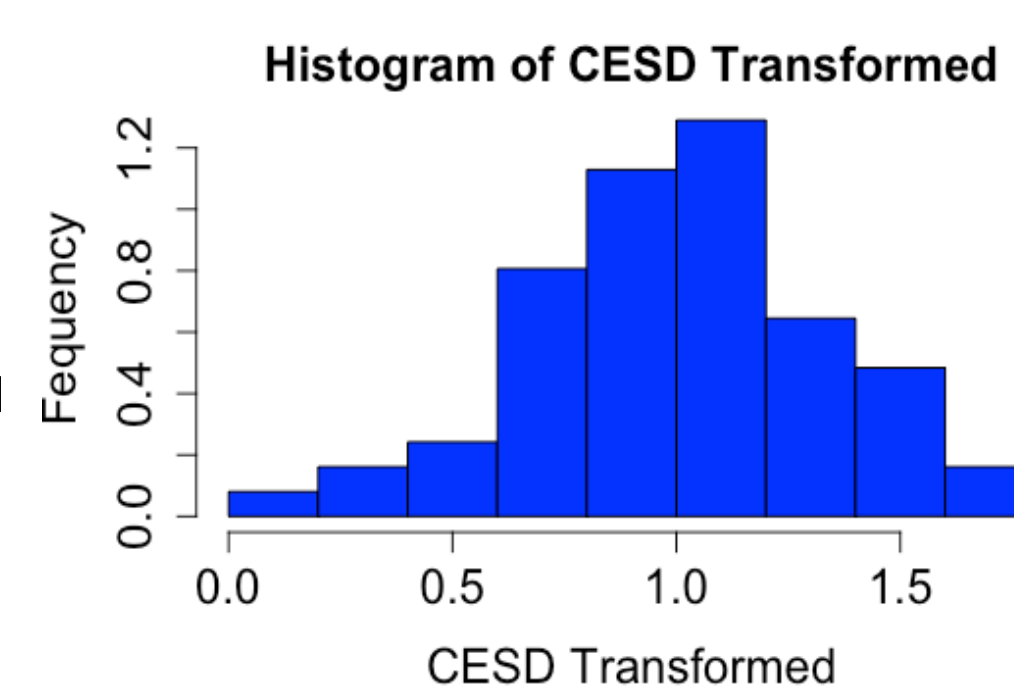
Demographics: Sample: 130 females
 >> 62 analyzed
 Mean: 11.78
 SD: 0.685



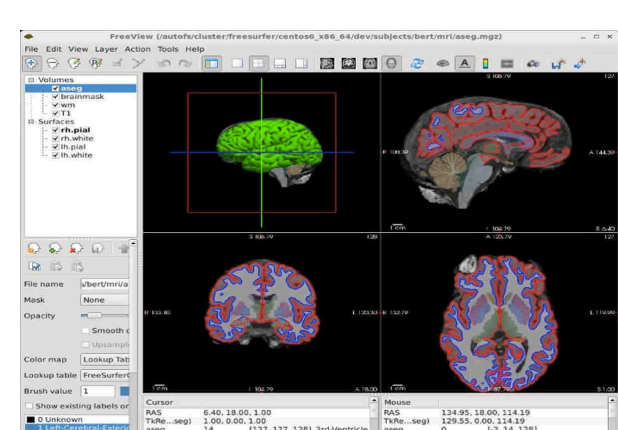
Measures: Structural MRI, Pubertal Development Scale (PDS), Center for Epidemiologic Depression Scale – Child (CESD)



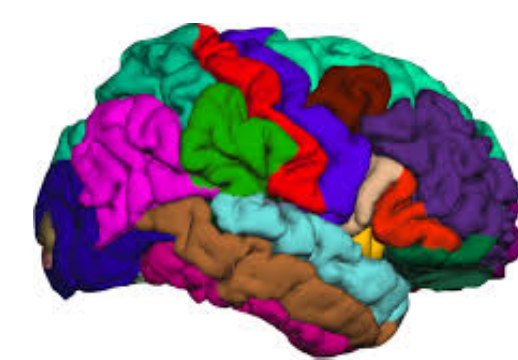
Log Transformed



Structural MR Scanning



FreeSurfer



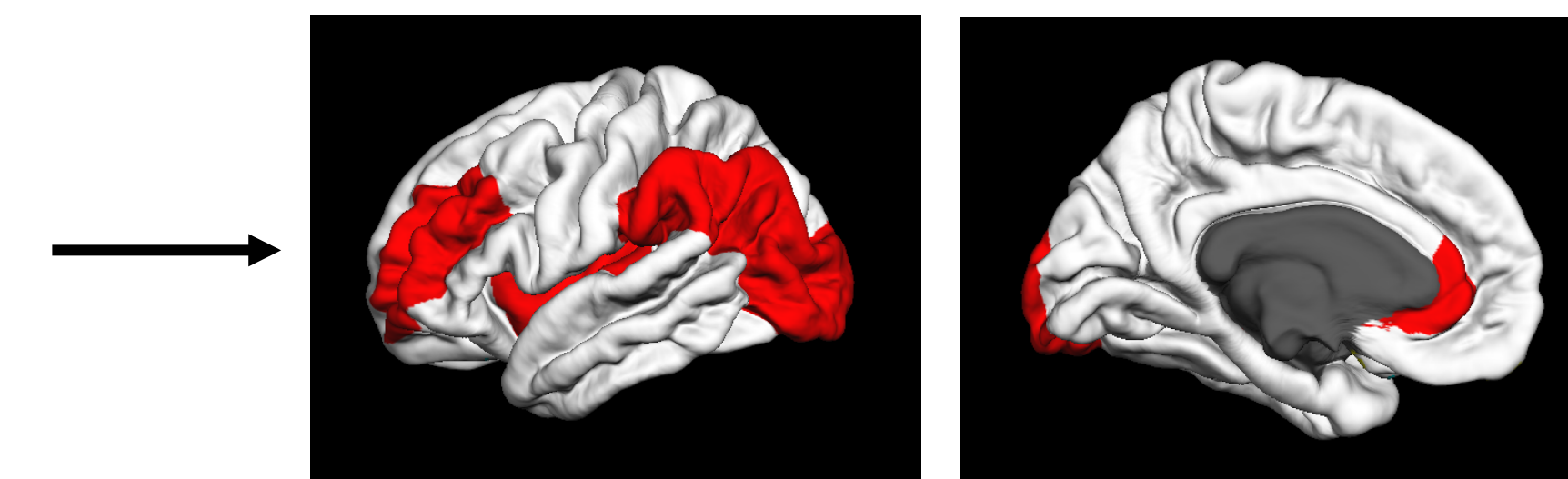
87 brain regions extracted and analyzed

Results

Aim 1: Puberty and brain structure

Associations between PDS and brain structures (not controlling for age)

Brain Region	β coefficient	P value
Right inferior parietal	-0.041	0.001
Left transverse temporal	-0.080	0.003
Right lateral occipital	-0.044	0.006
Left supramarginal	-0.038	0.019
Left inferior parietal	-0.034	0.028
Left rostral middle frontal	-0.028	0.030
Left rostral anterior cingulate	-0.049	0.033
Right insula	-0.041	0.049
Left pallidum	62.514	0.040



Associations between PDS and brain structures (controlling for age)

Brain Region	β coefficient	P value
Right inferior parietal	-0.033	0.0016
Left transverse temporal	-0.065	0.024
Right insula	-0.050	0.031
Left pallidum	71.183	0.036

NB: Only reporting regions with $p < .05$

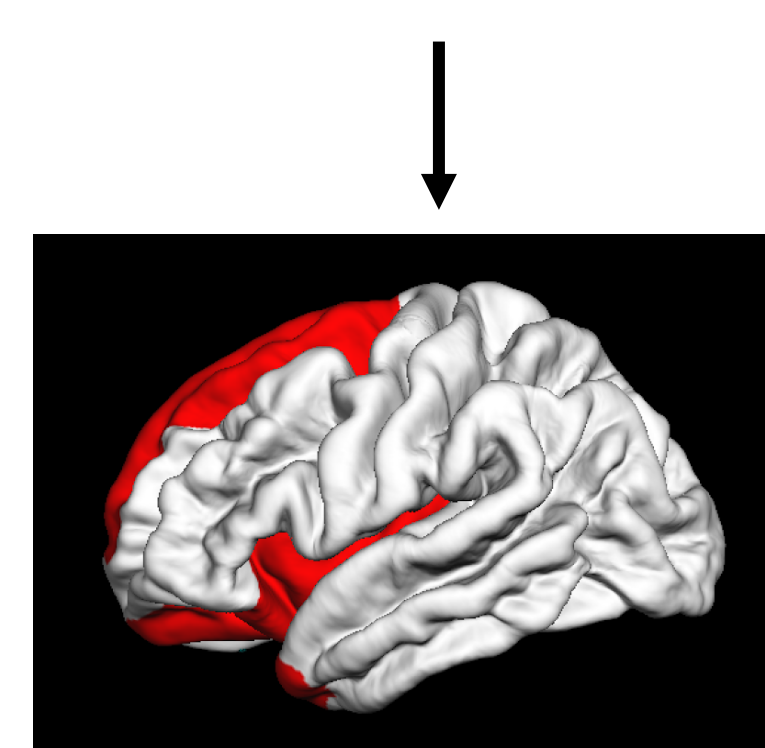
NB: Only reporting regions with $p < .05$

Aim 2: Depression and brain structure

Association between depression and brain structures (controlling for age)

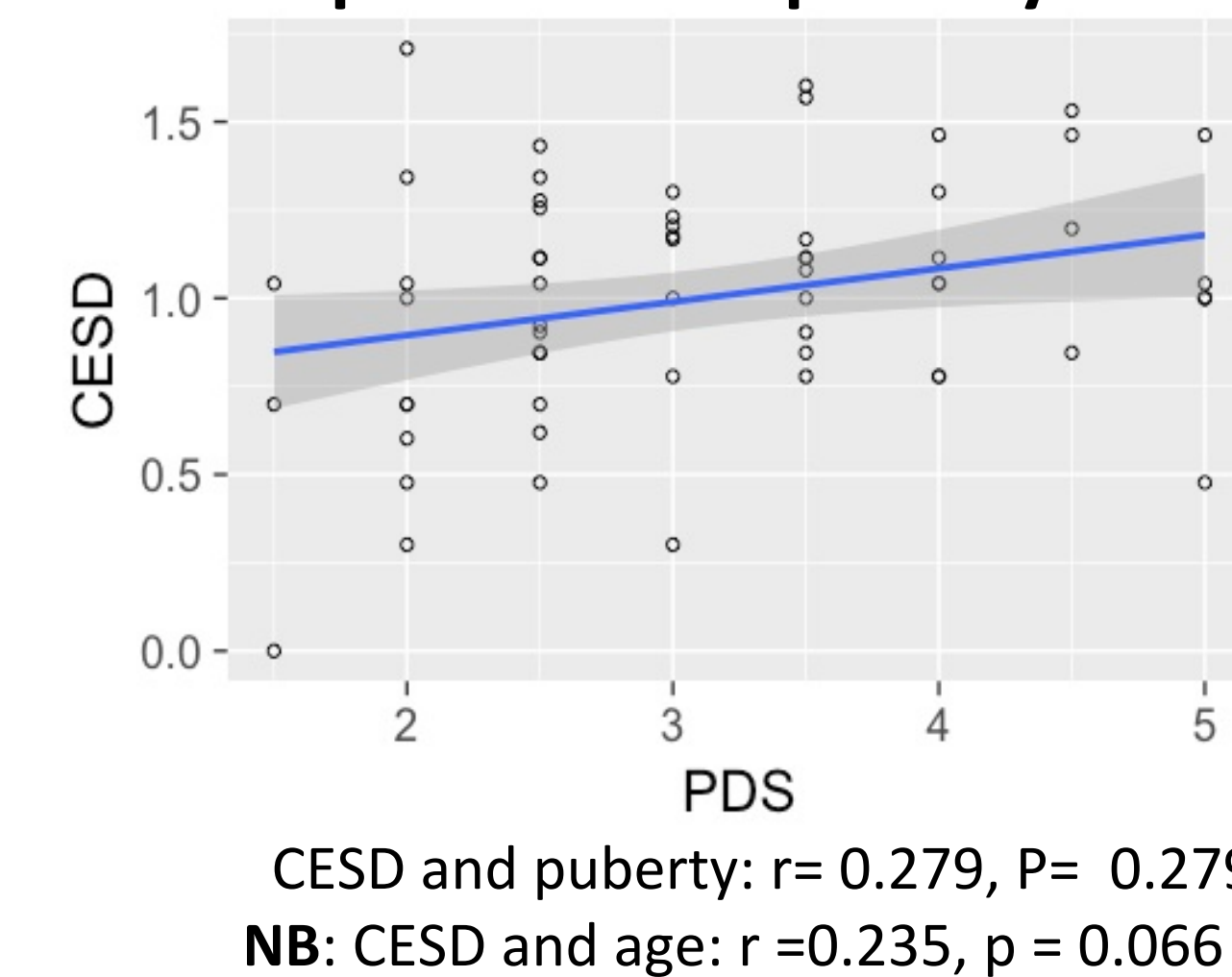
Brain Region	β coefficient	P value
Left lateral orbitofrontal	0.031	0.014
Left temporal pole	0.202	0.044
Right superior frontal	0.096	0.030
Left superior frontal	0.097	0.042
Right insula	-0.148	0.019

NB: Only reporting regions with $p < .05$

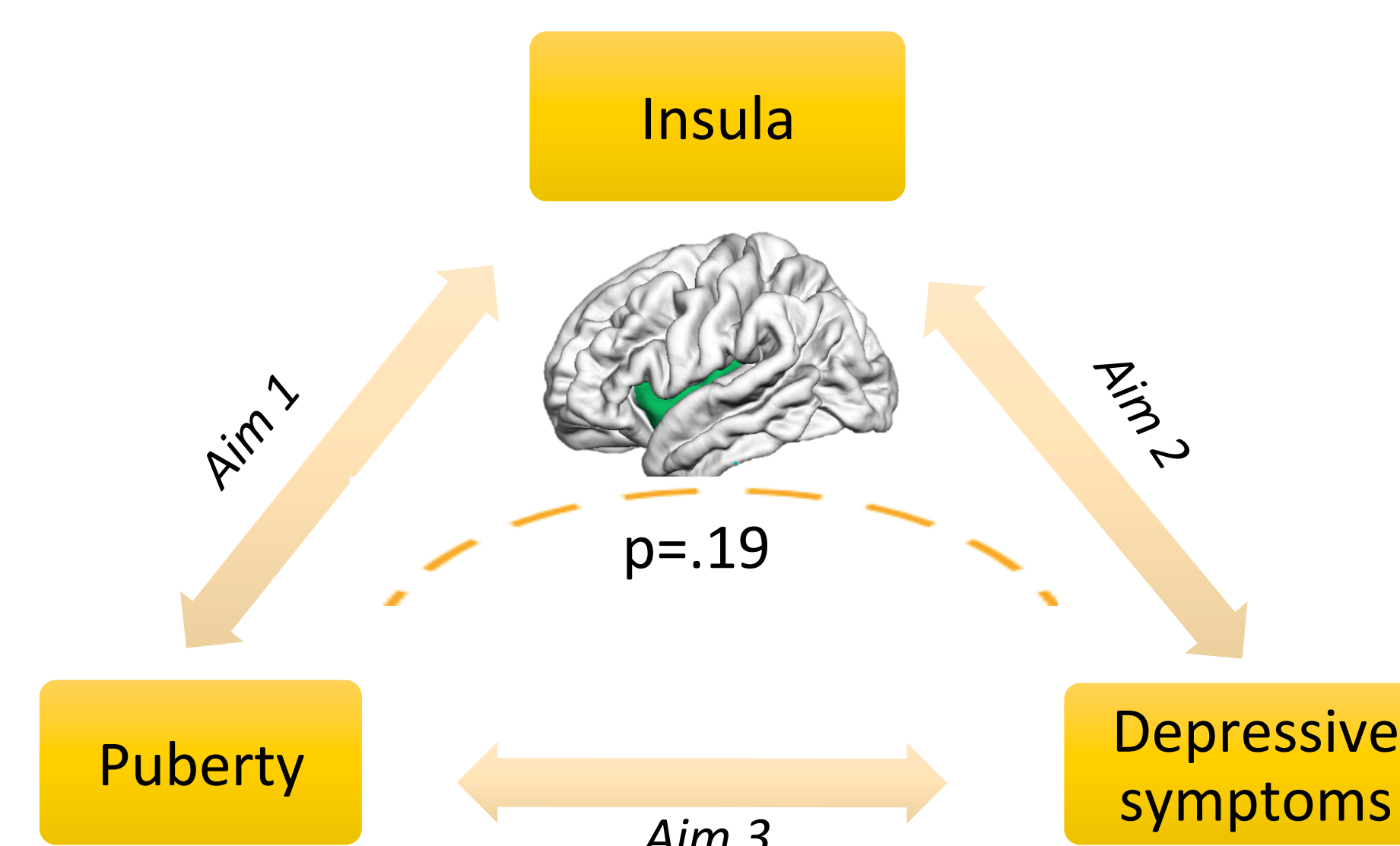


Aim 3: Depression and puberty

Association between depression and puberty



Mediation Model



Discussion

Aim 1:

- With increasing pubertal maturation, size of cortical brain structures decreased. The only exception was the pallidum, a subcortical structure, that increased in size.
- Similar findings when examining pubertal timing relative to same-aged peers.

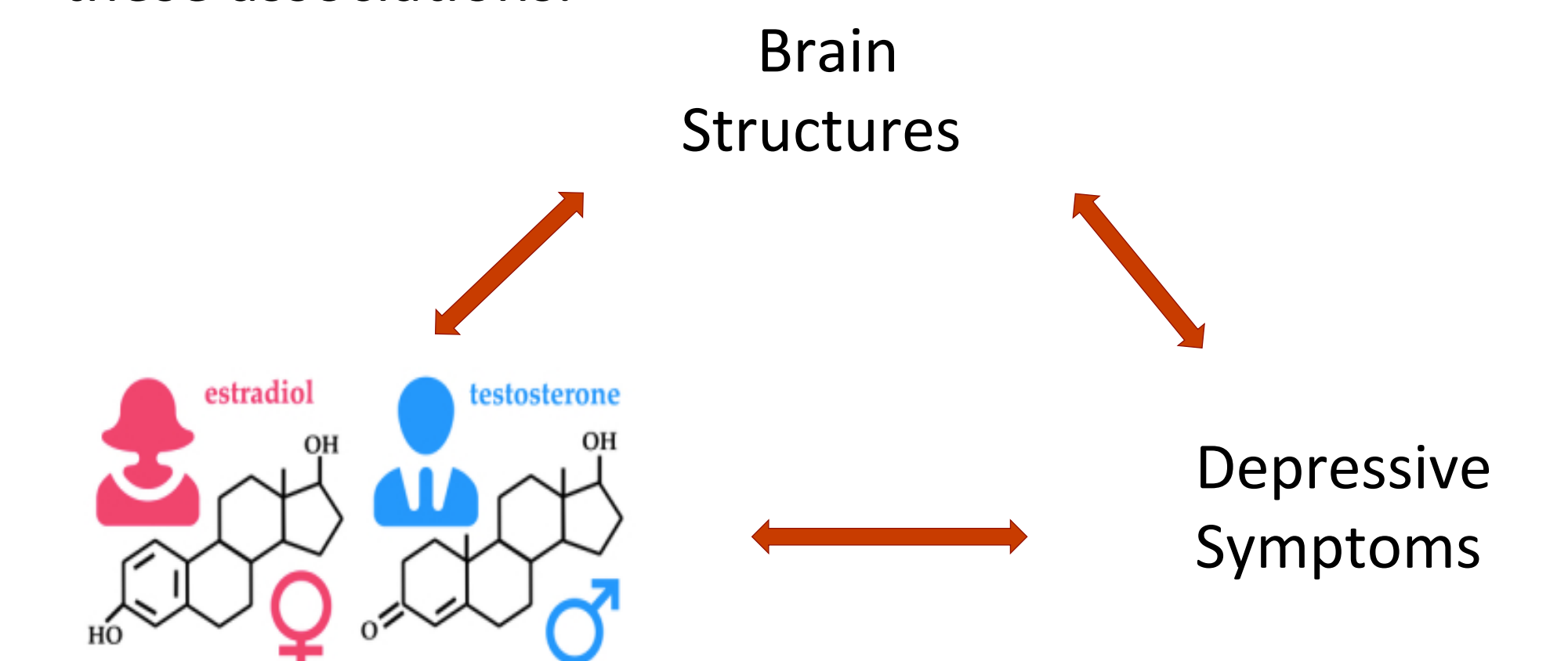
Aim 2

- With increasing depressive symptoms, the size of many cortical structures increased. But the opposite pattern was identified for the insula.
- Insula is believed to process convergent information to produce emotionally relevant context for sensory experience

Aim 3:

- Positive association between puberty and depressive symptoms.
- A mediation model failed to identify an indirect path between puberty and depression via insula structure.

Future studies: Examine role of pubertal hormones on these associations.



Citations

- Dahl, R. E., & Gunnar, M. R. (2009). Heightened stress responsiveness and emotional reactivity during pubertal maturation: Implications for psychopathology. *Development and Psychopathology*, 21(01), 1.
- Sequeira, Maija-Eliina, Sarah J. Lewis, Carolina Bonilla, George Davey Smith, and Carol Joinson. "Association of timing of menarche with depressive symptoms and depression in adolescence: Mendelian randomisation study." *The British Journal of Psychiatry* 210.1 (2016):

Acknowledgements

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