Biological and Neurological Processes of Adolescence

Russell D. Romeo, Ph.D.

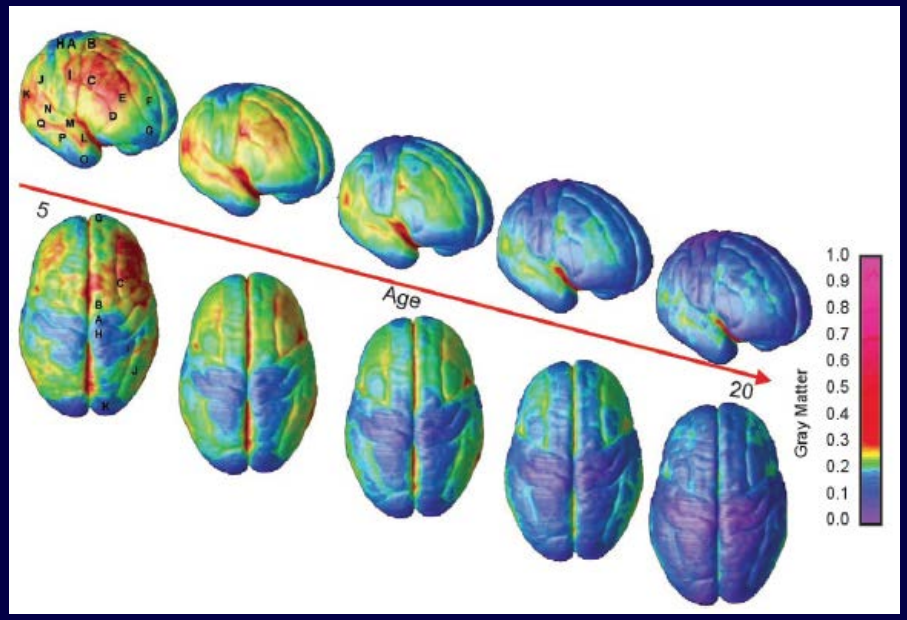
Barnard College of Columbia University
Department of Psychology
Neuroscience and Behavior Program

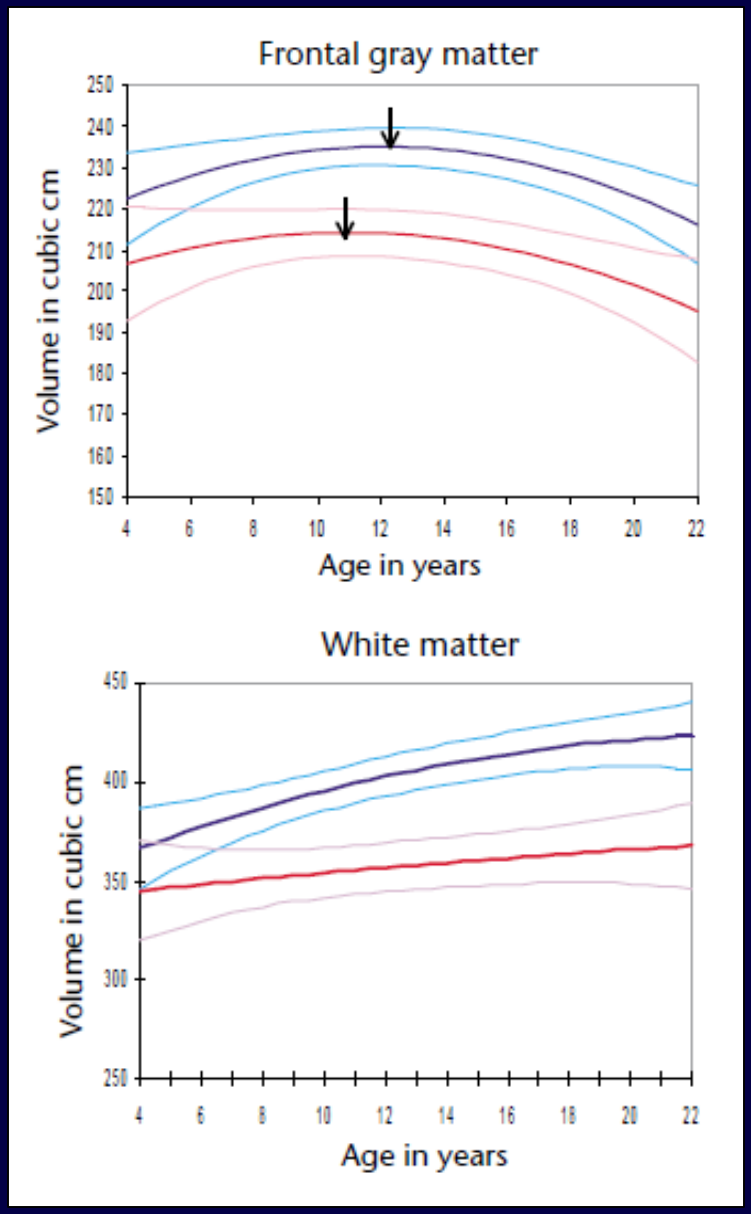
Puberty and Adolescence in Rodents
(Utility of Animal Models)

Between 30-60 days of age, rats/mice undergo somatic, physiological, behavioral, and neurobiological changes akin to puberty and adolescence in humans.

- Growth spurt
- Gonadal hormones ↑
- Play behavior ↓ Mating behavior ↑
- Changes in neuroanatomical structure

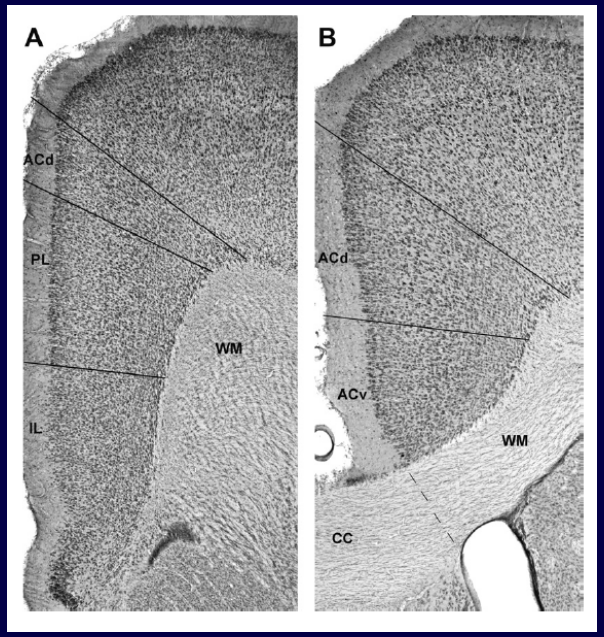
Adolescent Changes in Gray and White Matter in Humans

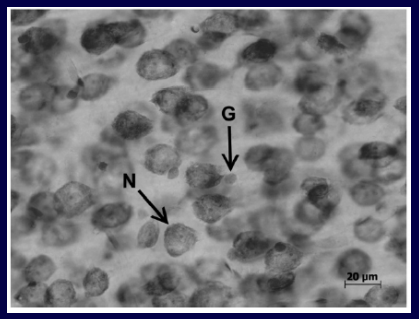


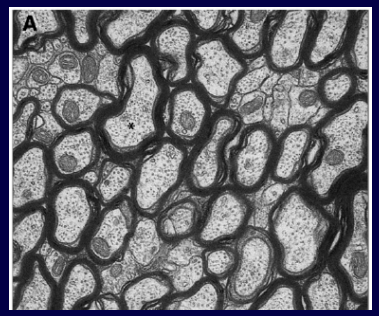


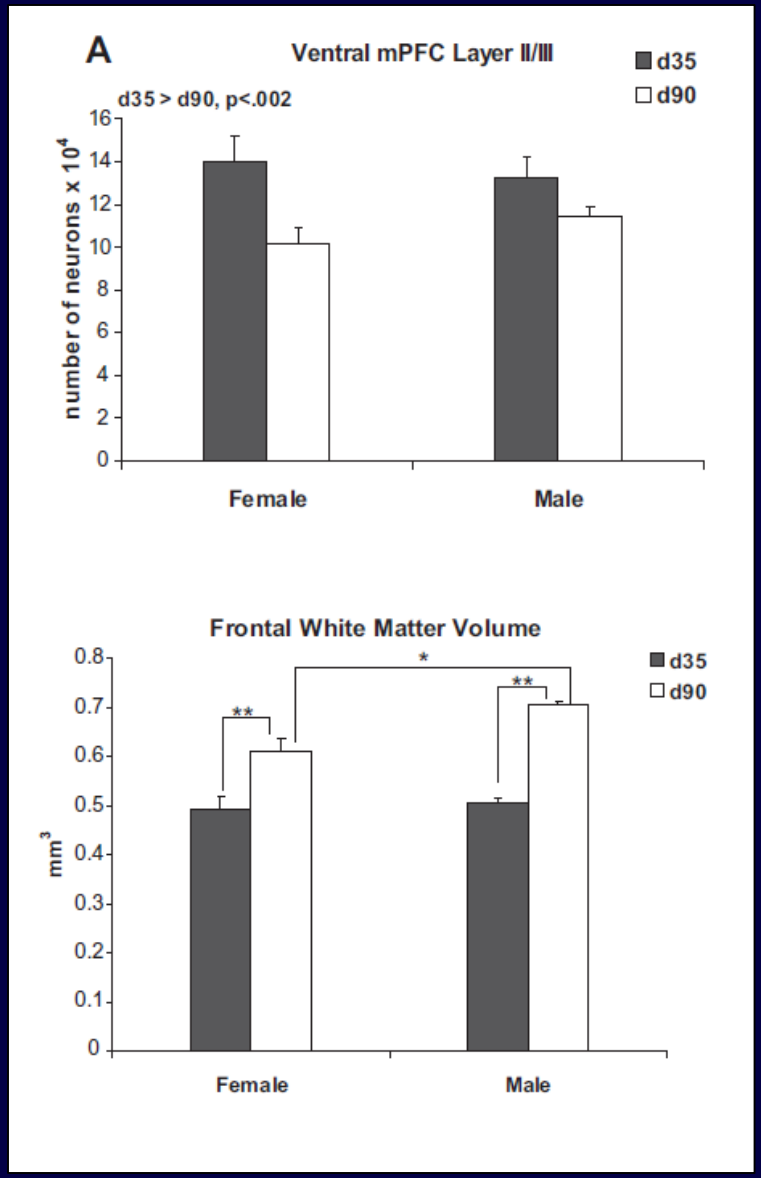
Giedd *et al.* 1999 *Nature Neuroscience* 2:861-863

Adolescent Changes in Gray and White Matter in Rats



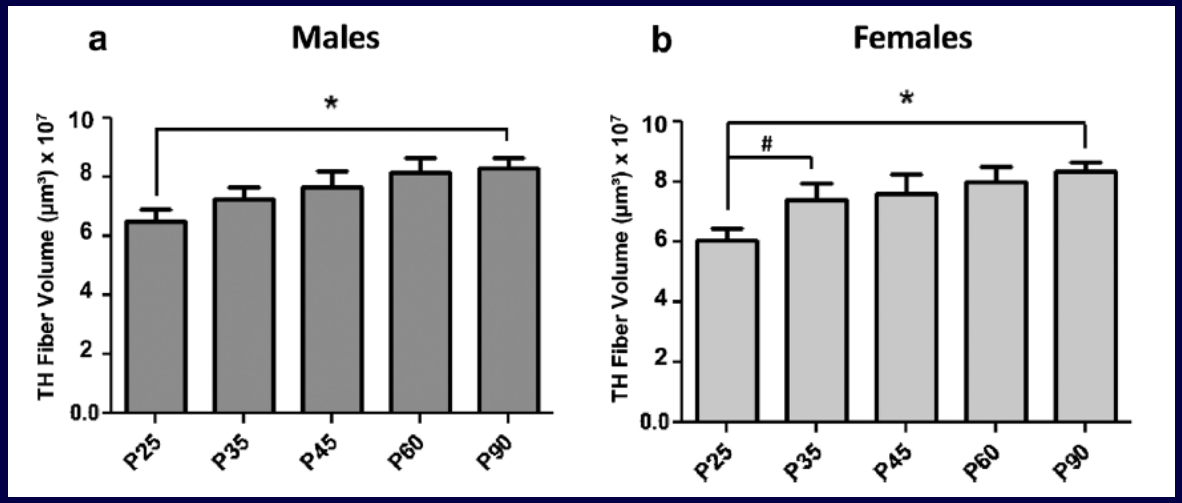






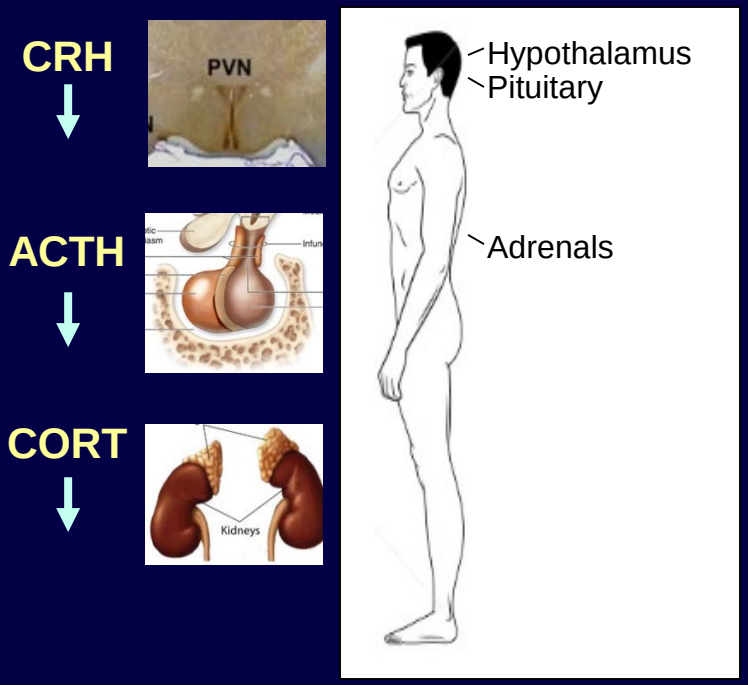
Markham *et al.* 2007 *Neuroscience* 144:961-968

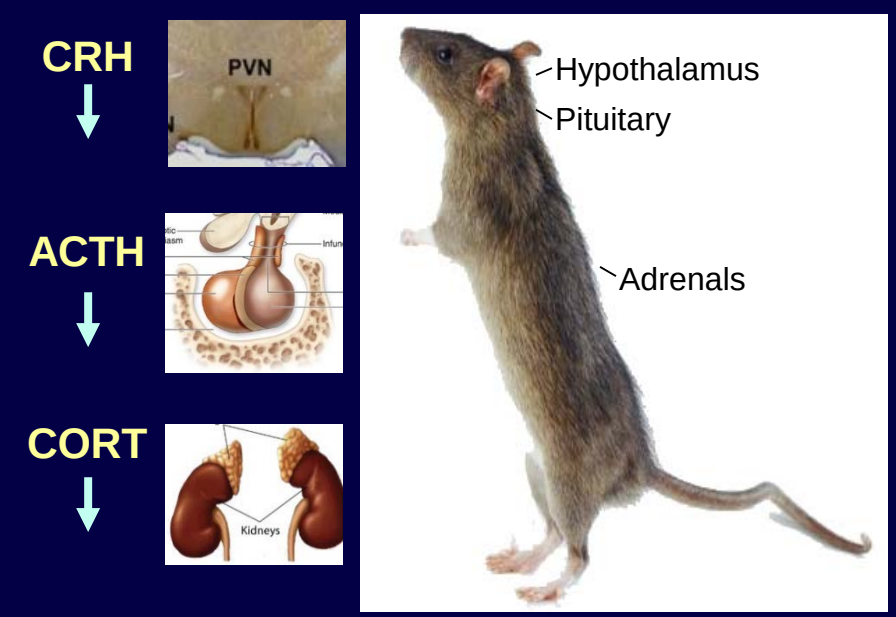
Delving Deeper: Cellular and Molecular Changes

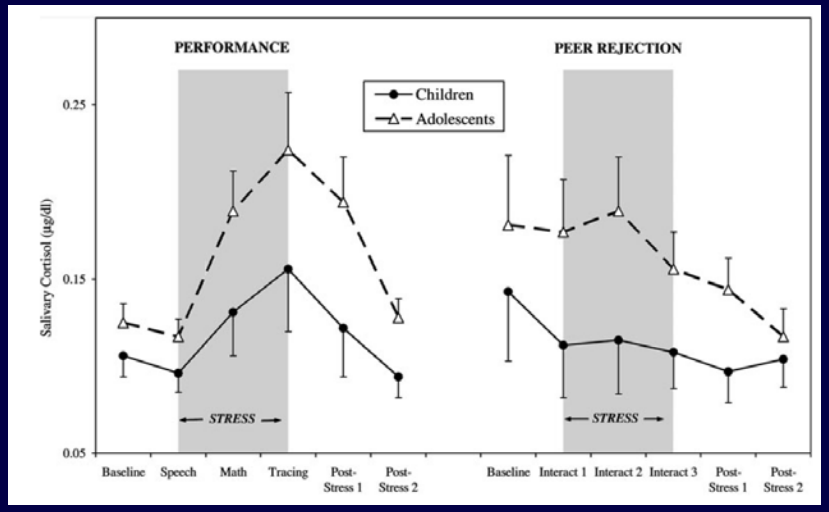


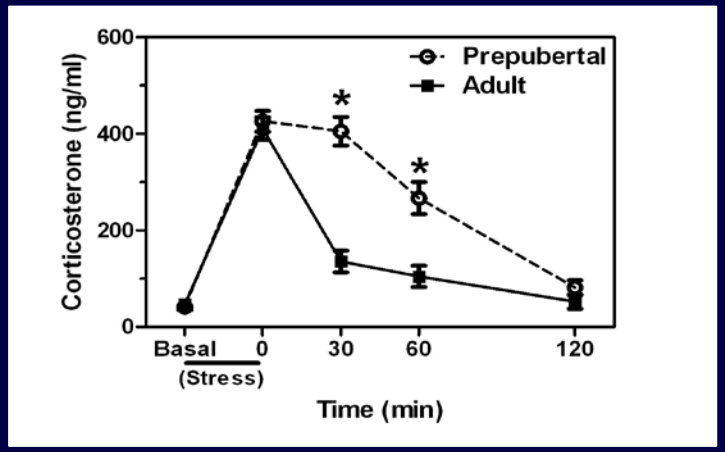
Willing *et al.* 2017 *Developmental Psychobiology* 59:583-589

Hypothalamic-Pituitary-Adrenal (HPA) Axis





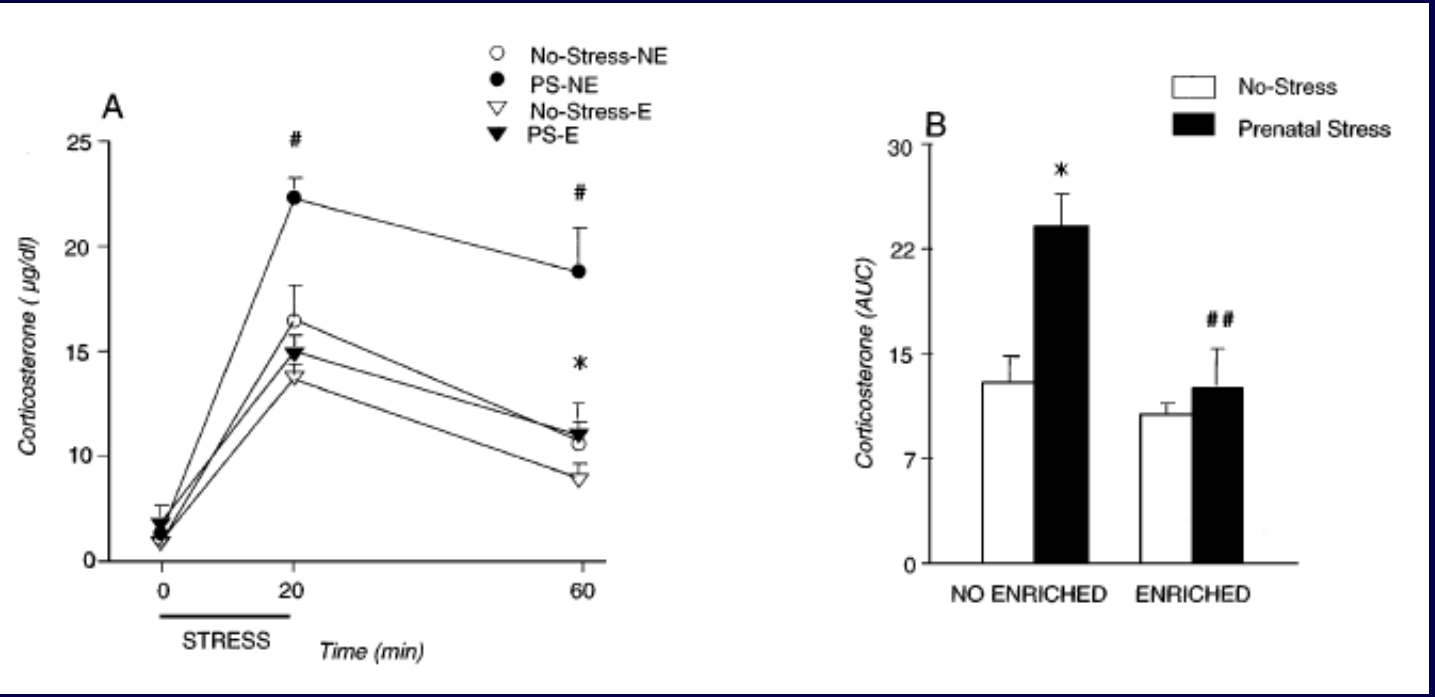




Stroud *et al.* 2009 *Development and Psychopathology* 21:47-68

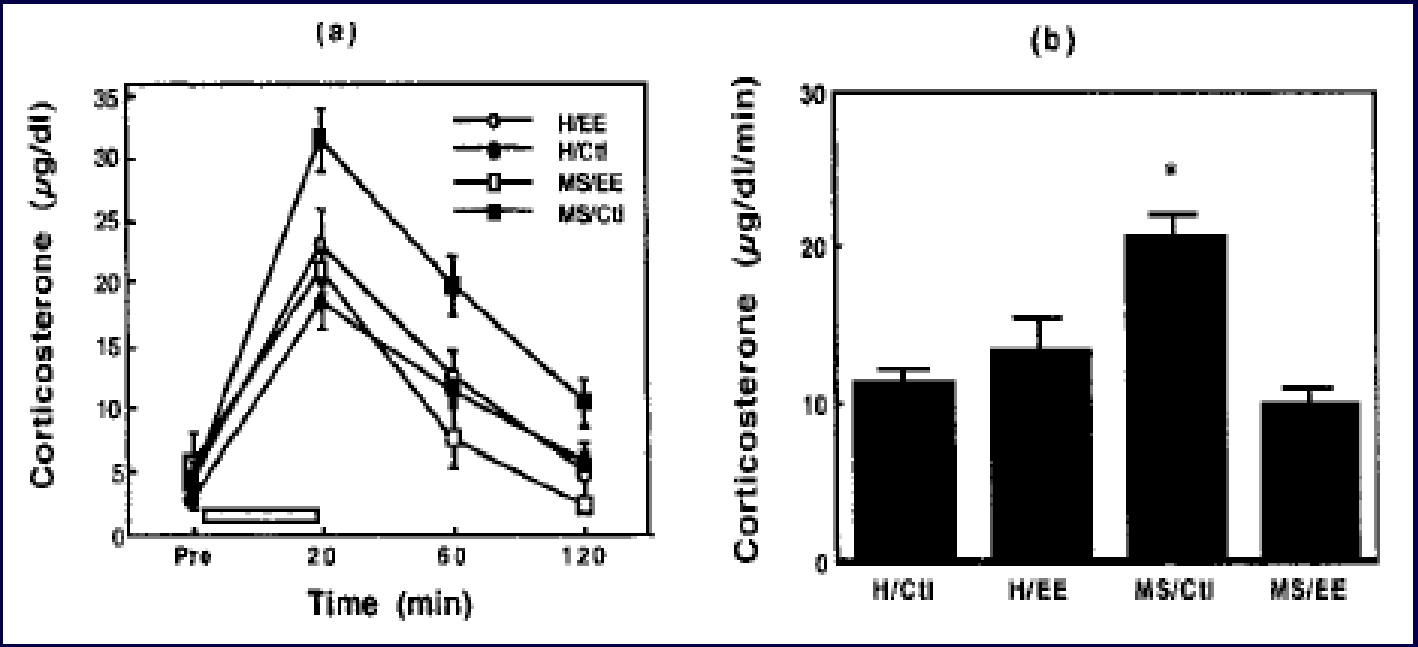
Romeo 2018 *Frontiers in Neuroendocrinology* 49:43-51

Environmental Enrichment during Adolescence Reverses the Effects of Prenatal Stress on HPA Reactivity



Morley-Fletcher *et al.* 2003 *European Journal of Neuroscience* 18:3367-3374

Environmental Enrichment during Adolescence Reverses the Effects of Maternal Separation on HPA Reactivity



Francis *et al.* 2002 *Journal of Neuroscience* 22:7840-7843

Social Interactions during Adolescence Mitigate Lesion-Induced Decrements in Behavior

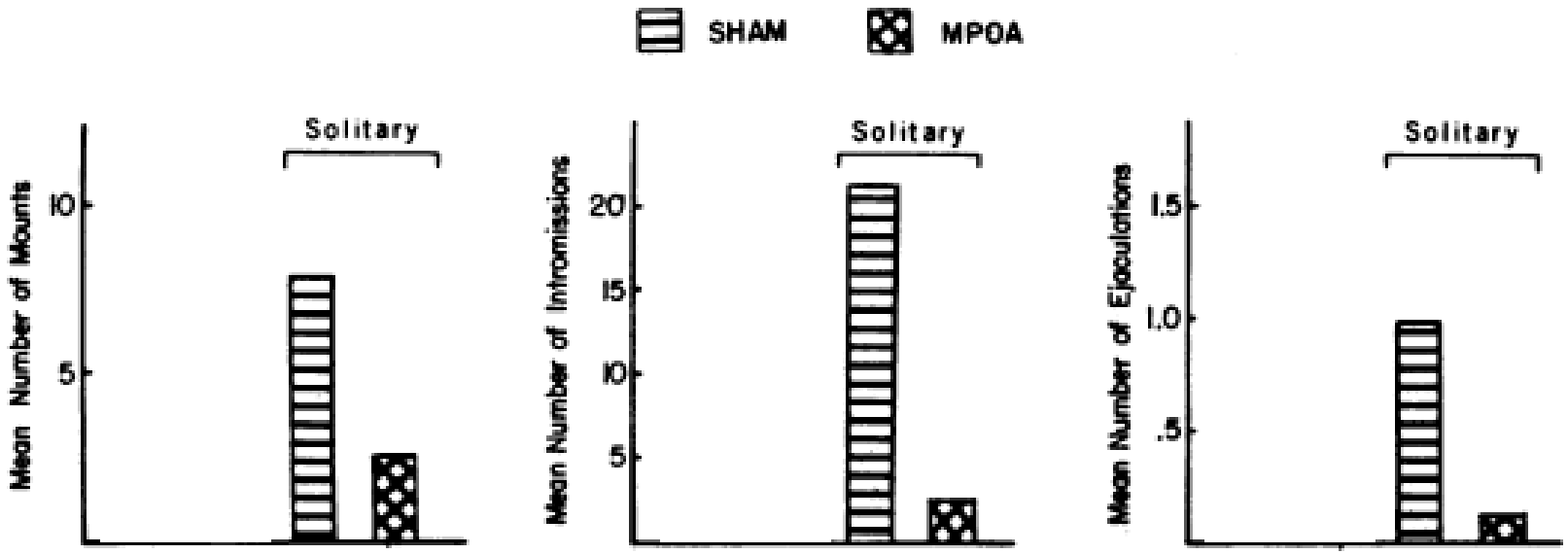


Fig. 2. Mean number of mounts, intromissions, and ejaculations displayed by male rats reared under social or solitary conditions and with lesions in the MPOA made prepuberally.

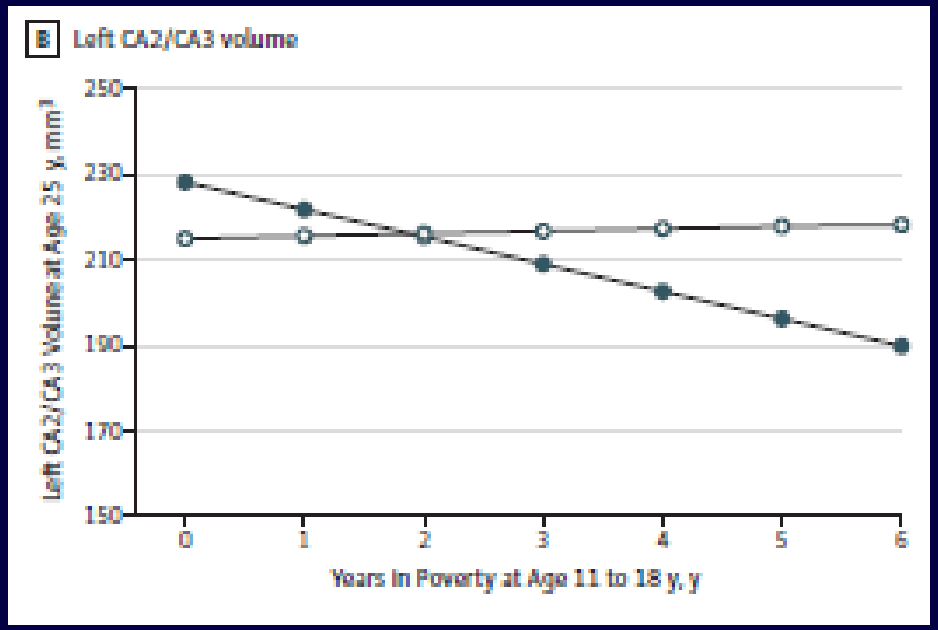
Twiggs *et al.* 1978 *Science*

Strong African American Families (SAAF) Program

JAMA Pediatrics | Original Investigation

Protective Prevention Effects on the Association of Poverty With Brain Development

Gene H. Brody, PhD; Joshua C. Gray, PhD; Tianyi Yu, PhD; Allen W. Barton, PhD; Steven R. H. Beach, PhD; Adrianna Galván, PhD; James MacKillop, PhD; Michael Windle, PhD; Edith Chen, PhD; Gregory E. Miller, PhD; Lawrence H. Sweet, PhD



Brody *et al.* 2017 *JAMA Pediatrics* 17:46-52

Conclusions

- Adolescence represents a sensitive period for interventions to offset or mitigate previous adversity.

- Given some of the similarities between biological and neurological processes in human and non-human animals, animal models can help reveal the mechanisms that mediate these interventions.

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