The Influence of Reproductive Stage on Cerebellar Network Connectivity Across Adulthood

Hannah K. Ballard[1], T. Bryan Jackson[2], Jessica A. Bernard[1,2]

[1]Texas A&M University Institute for Neuroscience
[2]Department of Psychological and Brain Sciences, Texas A&M University

Lifespan Cognitive & Motor Neuroimaging Laboratory

Introduction

• As females are disproportionately affected by aging[1], understanding the biological underpinnings of sex differences in the aging brain is crucial

• Hormone changes with menopause may play an important role in aging, as estrogens demonstrate neuroprotective effects[2]

• The cerebellum (CBLM) is impacted in aging, showing sex-specific differences, and is also susceptible to the effects of estrogen[3]

• As such, investigating differences in CBLM networks is of interest in the context of menopause

• Here, we evaluated the influence of reproductive stage on CBLM network connectivity

Methods

• We used raw imaging data from the Cambridge Centre for Ageing and Neuroscience (Cam-CAN) repository[4]

• Structural and resting state MRI, and information regarding age, sex, and menopause variables, was acquired for 591 subjects (298 females)

• Crus I and Lobule V were our CBLM seeds, and reproductive stage was categorized for female groups using the STRAW+10 criteria[5]

• Age-matched male control groups were formed using age range and sample size of female groups

• The default preprocessing pipeline in CONN toolbox was used for analysis
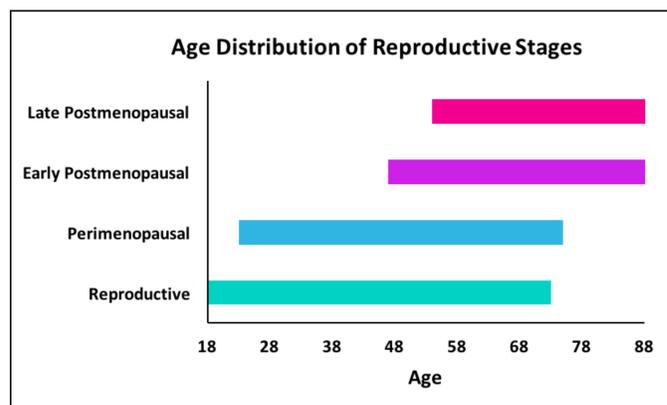
Figure 1. Distribution of age for female groups using age range. Reproductive (n = 107), Perimenopausal (n = 35), Early Postmenopausal (n = 33), and Late Postmenopausal (n = 123).

Right Crus I

Reproductive Females > Late Postmenopausal Females

Age-Matched Male Comparison

Reproductive Females > Late Postmenopausal Females

Age-Matched Male Comparison

Right Lobule V

Reproductive Females > Late Postmenopausal Females

Age-Matched Male Comparison

Reproductive Females > Late Postmenopausal Females
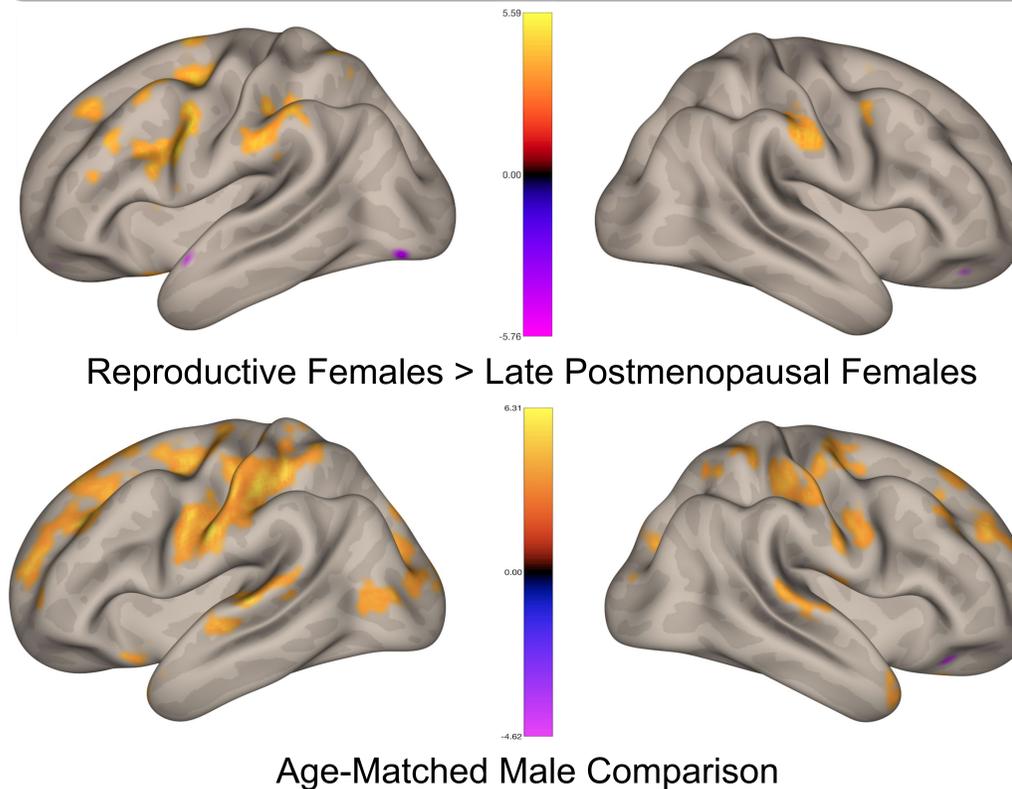
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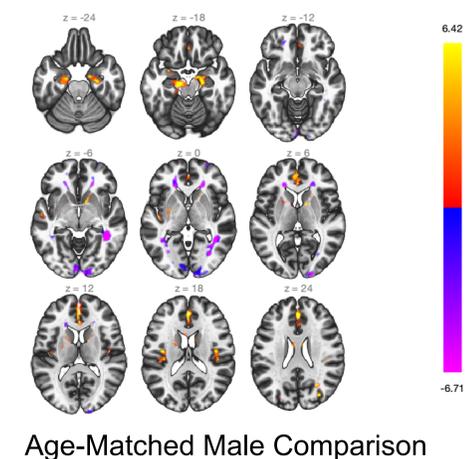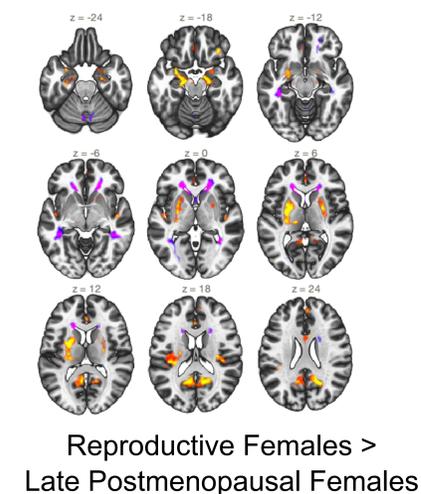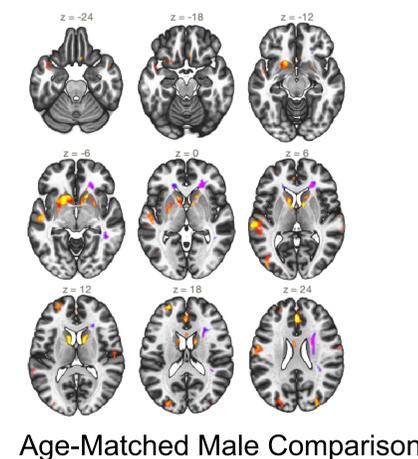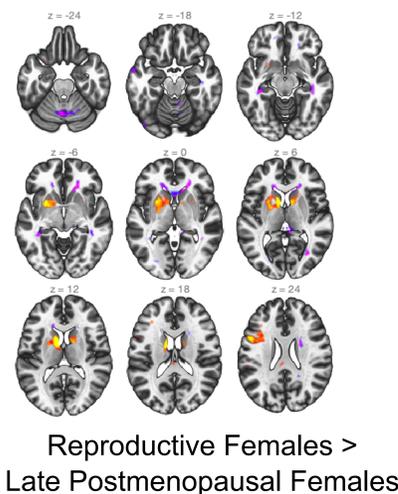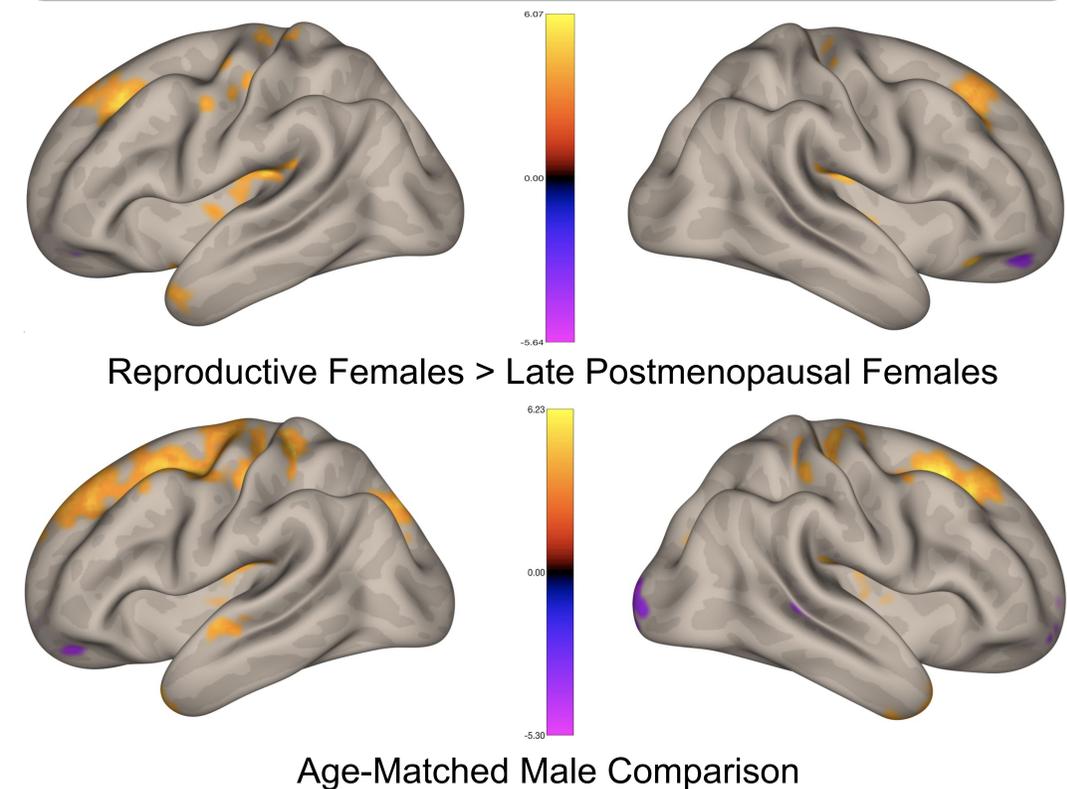
Discussion

• Compared to reproductive, late postmenopausal females show reduced CBLM-striatal and CBLM-cortical connectivity, but greater connectivity within the CBLM

• Age-matched male control groups do not show the same subcortical differences as females, and cortical patterns differ between sexes

• This suggests that menopause, and the associated hormone changes, may influence CBLM network differences within aging females, and sex-specific differences in the aging brain may be related to these biological characteristics

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