

An fMRI Investigation of the Effects of Prenatal Drug Exposure on Emotional Processing and Memory Performance

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INTRODUCTION

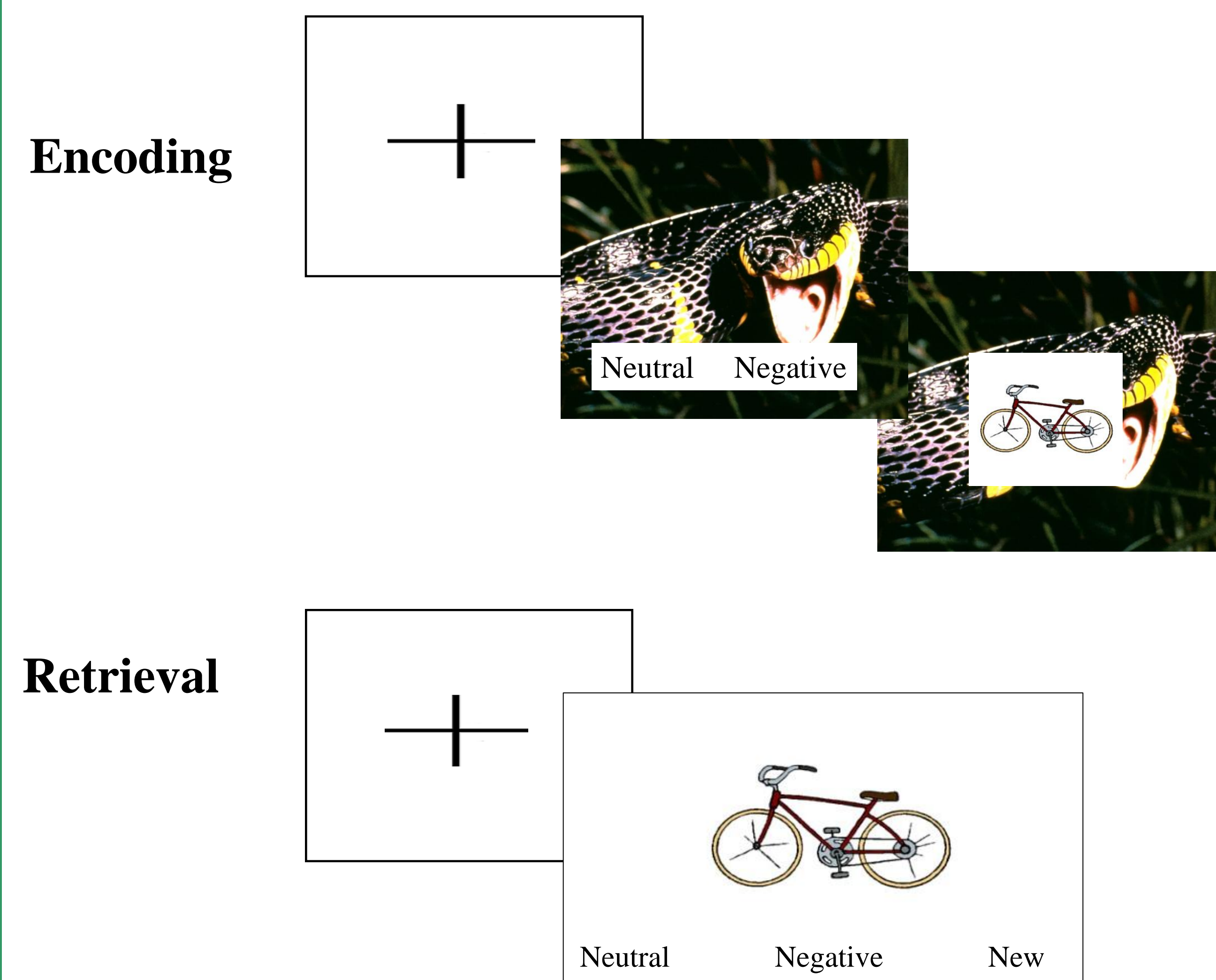
Drug use during pregnancy has the potential to negatively impact the development of the unborn child. Rodent models of the postnatal effects of prenatal drug exposure (PDE) provide evidence of impairments in emotional (Salas-Ramirez et al., 2011) and cognitive (Harvey, 2004) functioning with exposed animals exhibiting increased anxiety and cognitive deficits in comparison to controls. These preclinical studies have elucidated the neurobiological effects that PDE may have on the developing individual by altering the dopaminergic system ultimately leading to atypical development of the cortex and behavior. Given that humans encounter more complex environments and social interactions than rodents, exploration of how these neurobiological effects manifest through human development is strongly needed. Moreover, recent empirical evidence suggests that the effects of PDE on memory may be delayed until demands of adolescence (Betancourt et al., 2011). This study examined the effects of PDE on emotional processing and memory abilities in adolescents by employing an fMRI episodic memory paradigm designed to investigate the influence of emotion on memory.

PARTICIPANTS

Community Comparison Group (CC): $n=20$, mean age: 17.2 years(14.9-19.0), $SD=1.2$

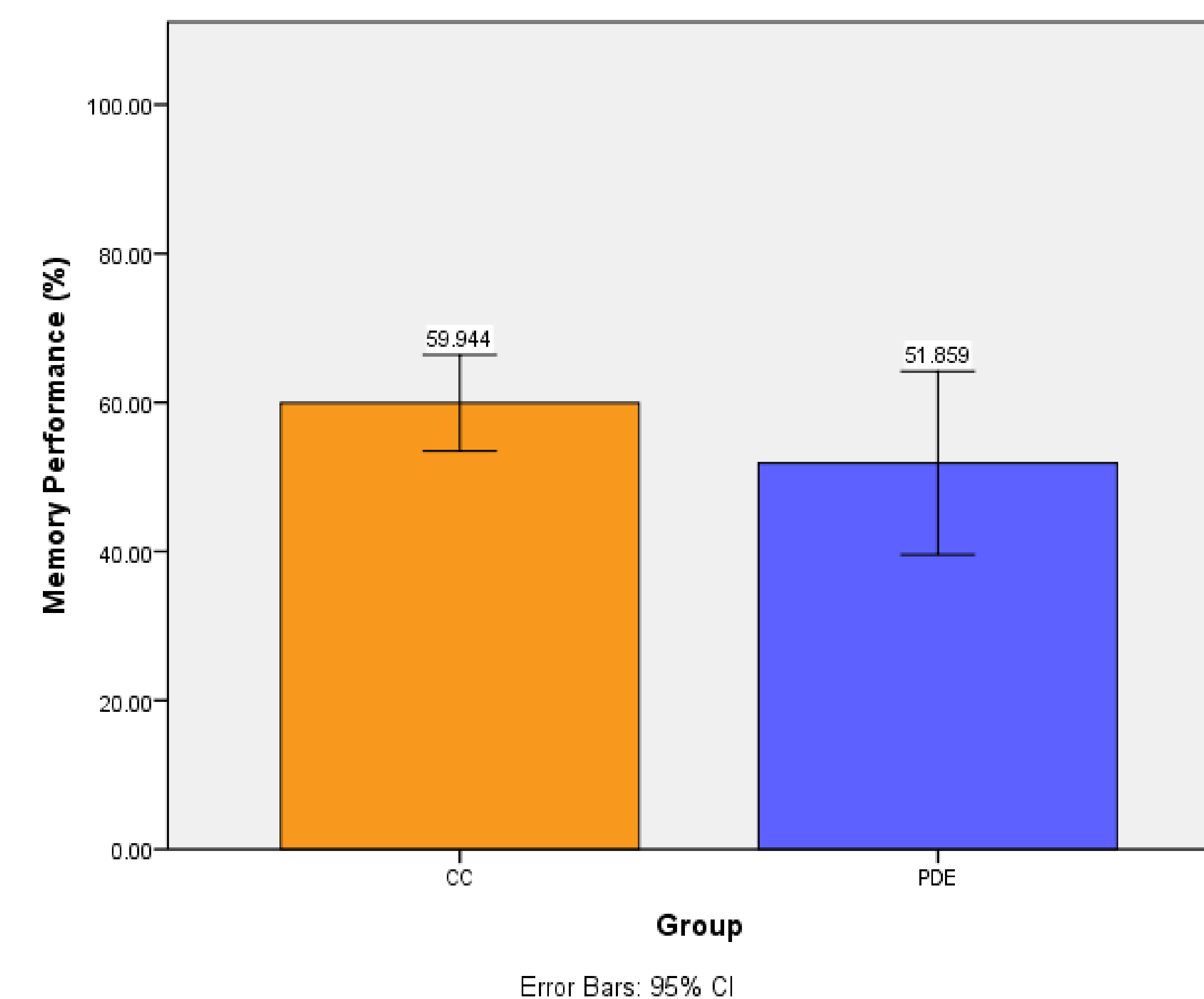
Prenatally Exposed Group (PDE): $n=13$, mean age: 18.5 years (17.4-19.8), $SD=0.8$

METHODS



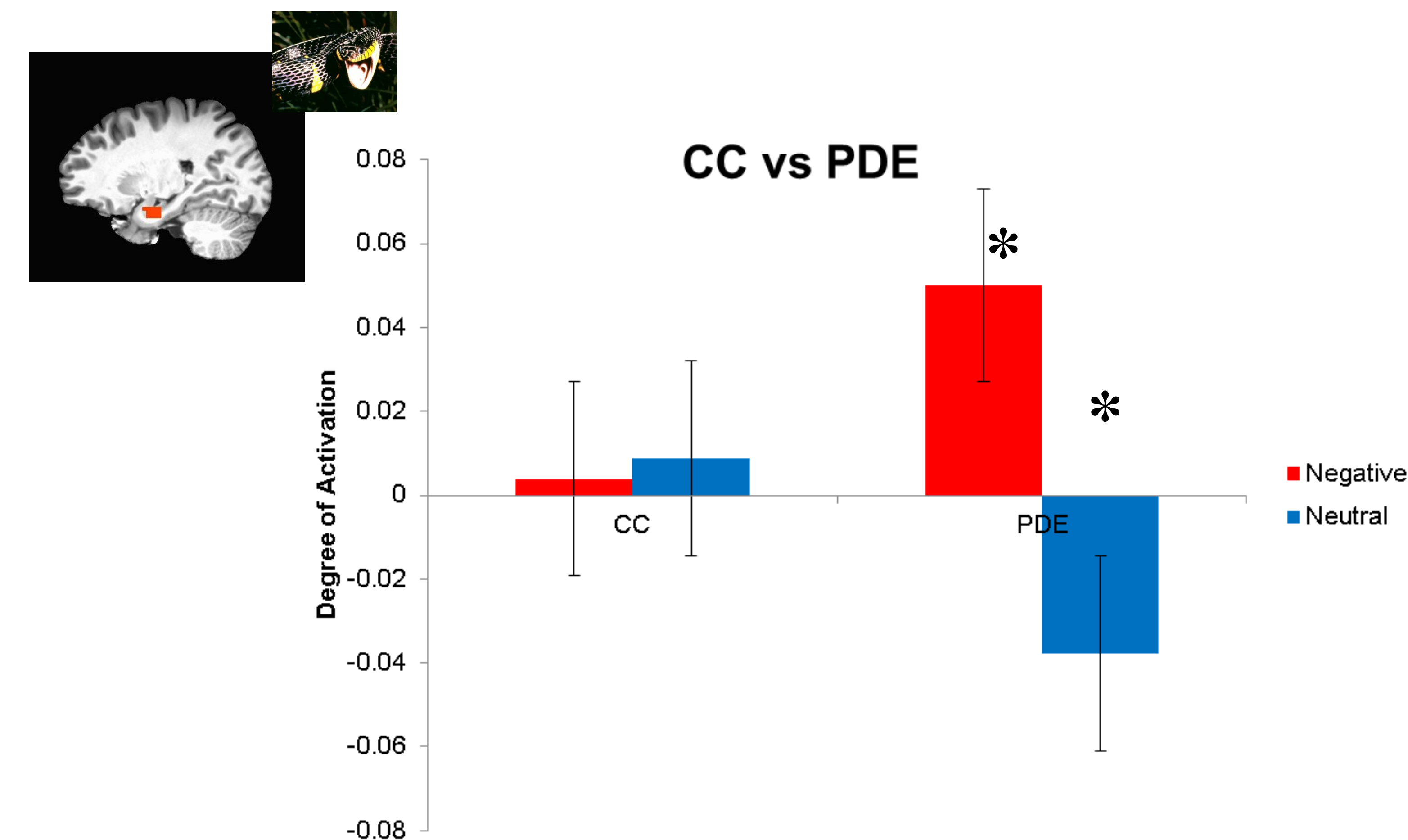
RESULTS

Behavior: Memory Performance



No main effect of group: $F(1,27)=2.939$; $p=0.098$

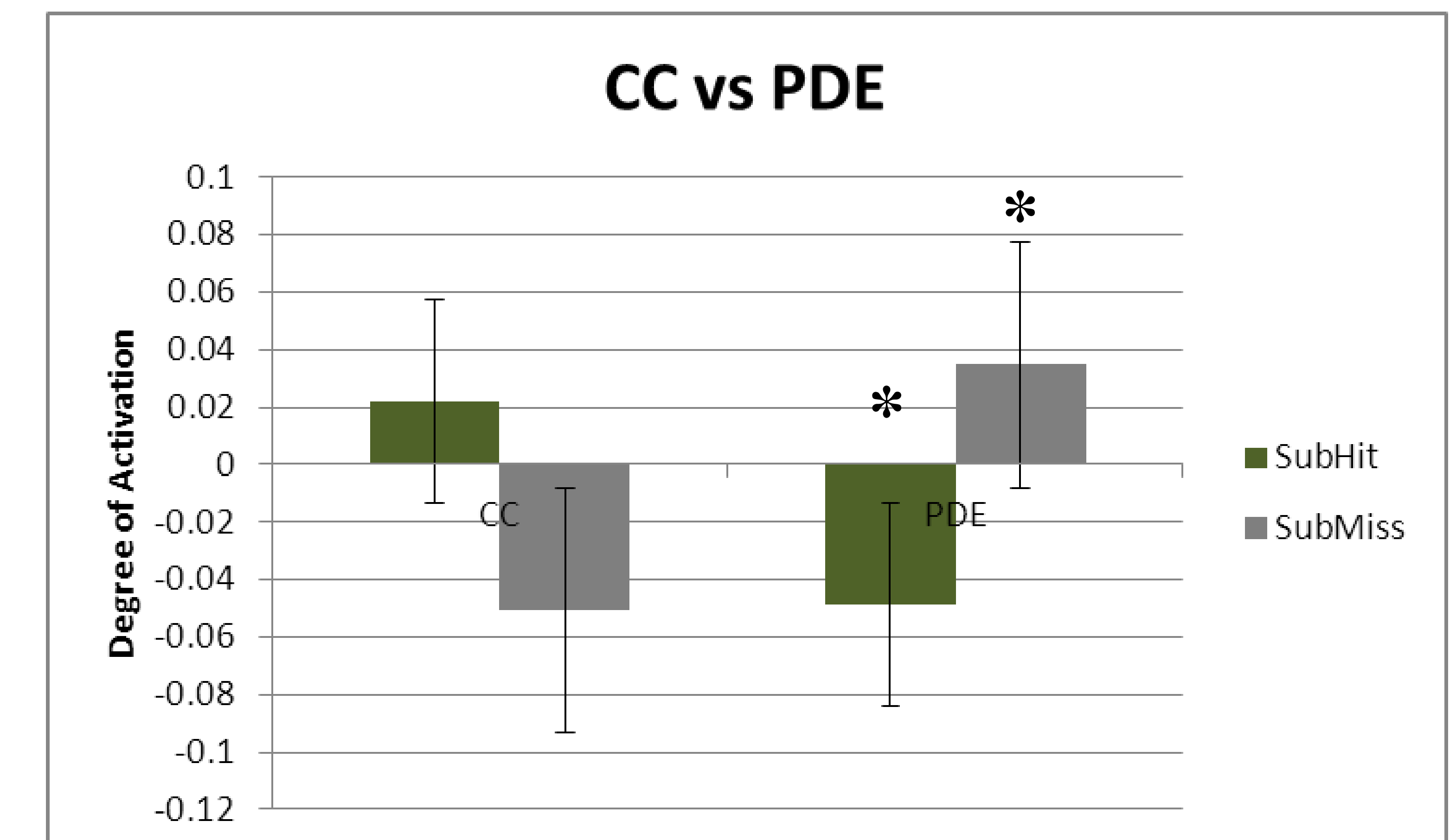
fMRI: Emotional Processing



Marginal Group X Valence Interaction with Age as Covariate, $F(1,28)=3.425$, $p=0.075$, **corrected**

RESULTS

fMRI: Memory Performance



Interaction group X condition $F(1,27)=7.40$, $p<0.05$

DISCUSSION

The exposed adolescents exhibited slightly lower performance ($p=.09$) on this memory task that included emotional stimuli. In terms of neural activation, the PDE group demonstrated increased activity in the amygdala when viewing emotional stimuli, which was not observed in the CC group. The PDE and CC groups' also showed different patterns of activation during memory encoding. Specifically, in the amygdala, the CC group showed greater activation for items that were subsequently remembered versus those that were subsequently missed. In contrast, the PDE group showed the opposite pattern with greater activation for subsequently missed compared to remembered items. These findings suggest differences in emotional processing and encoding during this emotional memory task, which is consistent with preclinical models showing effects of PDE has on brain regions that support emotional and cognitive functions.

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