Aggression-related changes in orbitofrontal cortex during repeated exposure to media violence

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People see a lot of violence

• By the age of 18, the average person has seen over 200,000 acts of violence on television

• 61% of television programs contain violence

• Many popular films depict significant amounts of violence and bloodshed
  • Kill Bill, Saw, Gladiator, Terminator, Braveheart
Can media violence inspire real-life aggressive behavior?

• Longitudinal
  • Johnson et al (Science, 2002)
  • Huesmann, Eron (Dev Psychol, 2003)

• Cross-sectional
  • Singer et al (J Am Ac Child Adol Psych, 1998)
What are the neural networks involved in aggression?

Orbitofrontal gyrus
Hypotheses:

1) Repeated contact with violent media will result in diminished response within orbitofrontal cortex, manifest as gradual response attenuation during the stimulus presentation.

2) As a confirmation of its relevance to violent behavior, response magnitudes in this area will correlate with individual differences in trait aggression.
violent

fearful/neutral

2-3 sec  15 sec

CLIP  FIX  CLIP  FIX  CLIP  FIX  CLIP

violent

fearful/neutral
n=6
Cronbach’s $\alpha=0.88$
violent

fearful/neutral

2-3 sec   15 sec

CLIP   FIX   CLIP   FIX   CLIP   FIX   CLIP
mixed effects t-test, significant at p<0.05 (corrected)
Hemodynamic responses in right orbitofrontal cortex

Results embargoed
Hemodynamic responses in attention-related areas (MT, FEF, PEF)

Results embargoed
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Why is hypoactivity in orbitofrontal cortex relevant to aggression?
• Involved in monitoring associations between stimuli, responses, outcomes
• Lesions cause deficits in rule-learning, immoral/inconsiderate behavior
• Connected to the hippocampus

• Involved in suppressing unwanted or inappropriate behaviors
• Lesions cause disinhibited behaviors, mania
• Connected to the premotor cortex, amygdala
rOFC activated during response inhibition tasks

rOFC functional deficits associated with disinhibited behaviors
If right lateral OFC inhibits throughput to motor planning regions, then rOFC response attenuation should be accompanied by increased activation in motor regions.
Results embargoed
Relationship to aggression

• Failure of the lateral OFC mechanism likely underlies impulsive and unpremeditated aggression. (Davidson et al. *Science*: 2000)

• Impulsive murderers have less activity in lateral OFC than premeditative murders and controls, who do not differ. (Raine et al. *Behav Sci Law*: 1998)

• Murderers without psychosocial deprivation have less glucose metabolism in right lateral OFC than murderers with deprivation and controls, who do not differ. (Raine et al. *Neuropsychiatry, Neuropsychology, and Behavioral Neurology*: 1998)
Proposed mechanism:

• Repeated contact with violent media causes impulsive aggression.

• Repeated contact with violent media causes response attenuation in right lateral orbitofrontal cortex.

• Hyporesponsiveness in the lateral OFC associated with impulsive aggression.

• Response attenuation in rOFC may link exposure to media violence and consequent impulsive aggressive behavior.
Thanks.

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