Compulsive Sexual Behaviour: incentive motivation

SSA 2016
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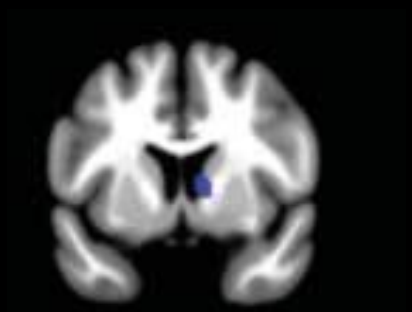
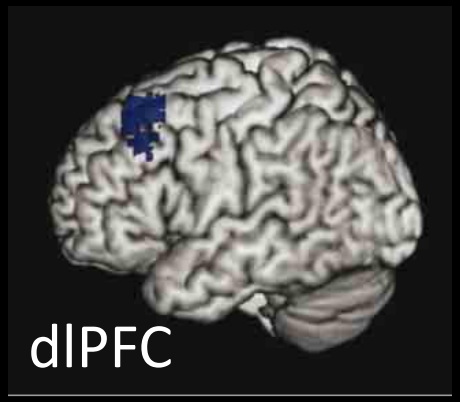
UNIVERSITY OF CAMBRIDGE



Caudate

Putamen



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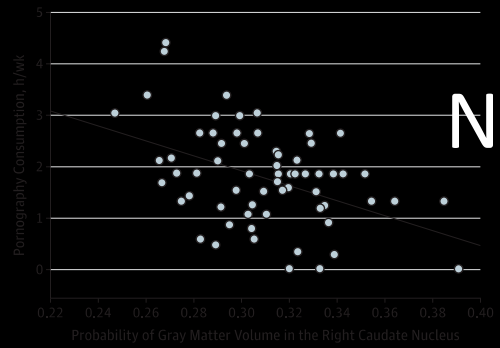
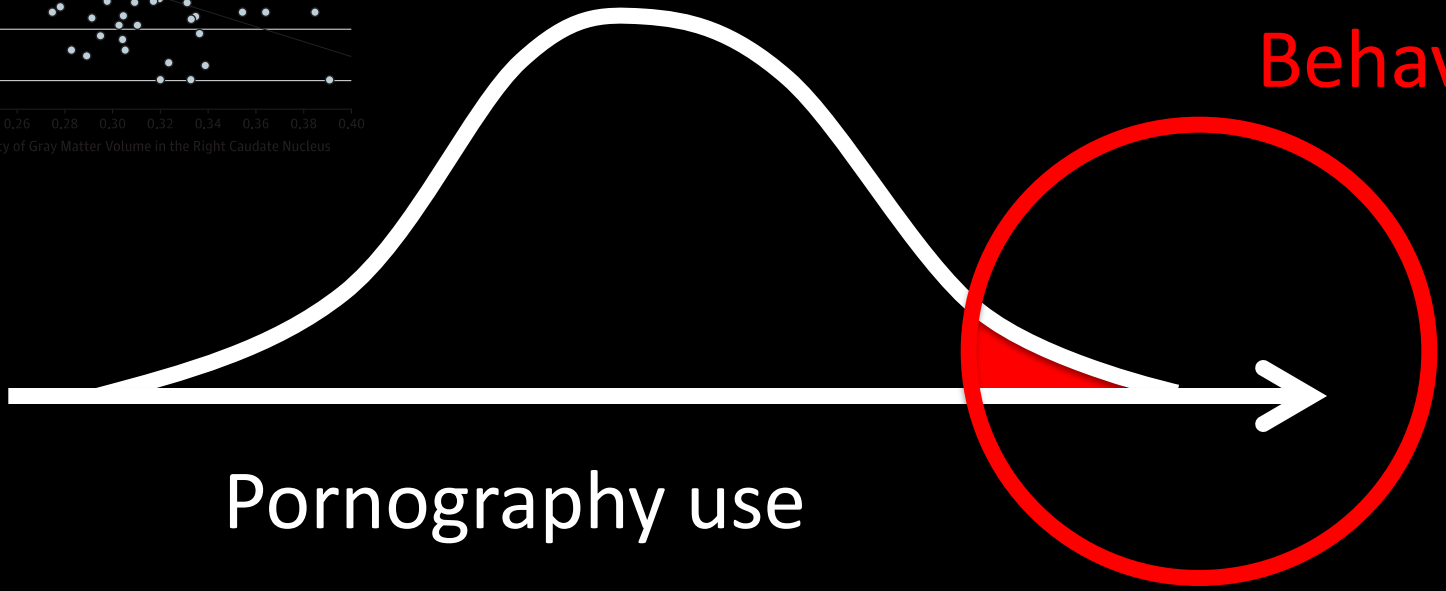


Non-problematic use

Compulsive Sexual Behaviour

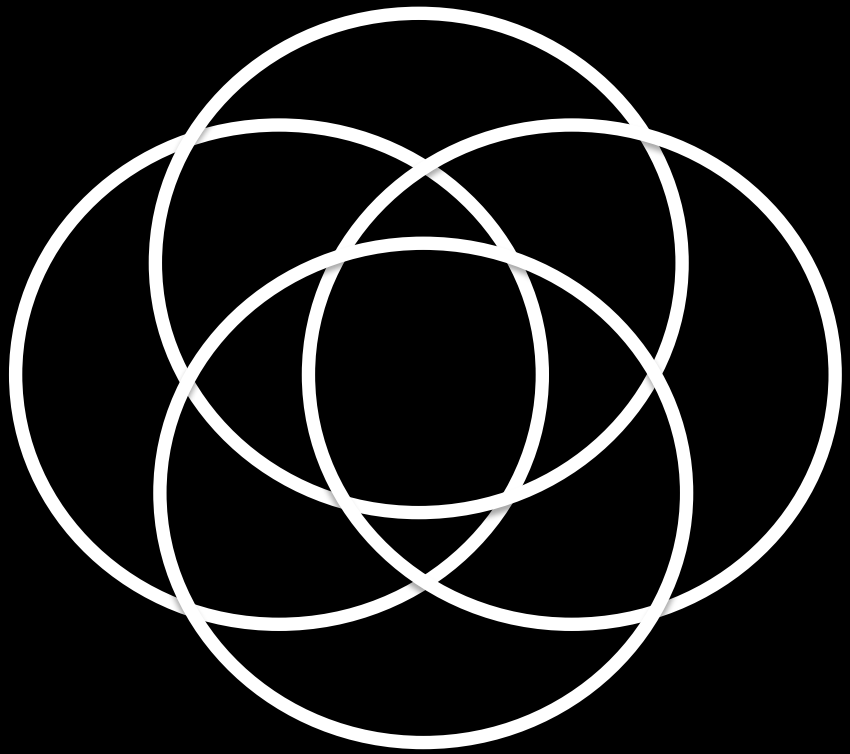


Pornography use

Problematic

Kuhn, JAMA Psychiatry, 2014

Behavioural addiction



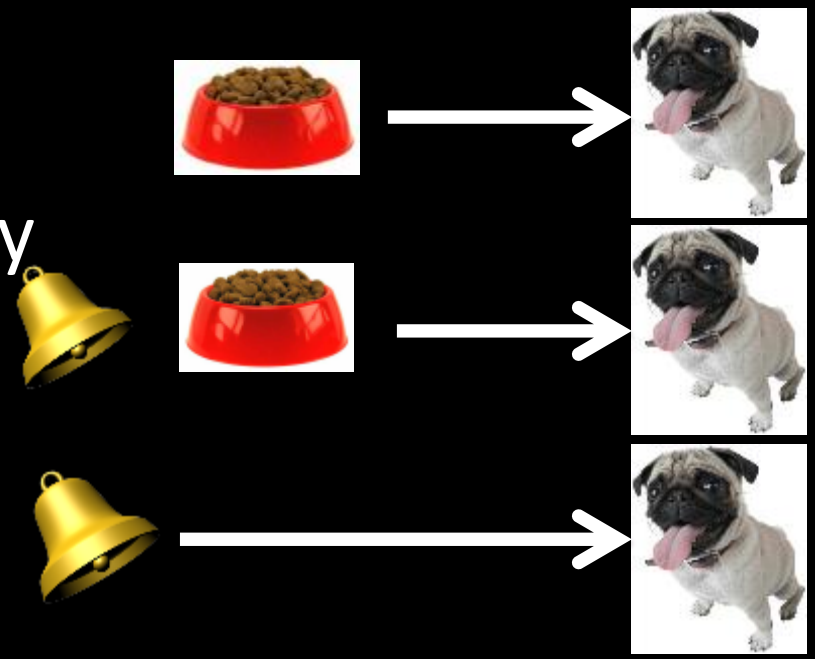
Impulse control disorder

Obsessive compulsive spectrum disorder

Excessive desire

Addiction theories

- Incentive motivation:
  - Neutral cues paired with (drug) reward develop incentive properties:
    - Conditioned responses?
    - Wanting (cue anticipation) but not liking?
    - Attract attention?
    - Conditioning?
- Impulsivity to compulsivity
- Negative reinforcement



Excessive appetites versus disorder?

- Greater liking, hedonic, pleasure of outcome rather than wanting, effort, incentive cue based
- Differences in timing of attentional bias

Hypersexual disorder: proposed DSM5 criteria (Kafka, 2010; Reid, 2012)

- Recurrent intense sexual fantasies urges or behaviours and 4 of the following:
- Excessive time spent
- Response to dysphoric mood
- Response to stress
- Repeated unsuccessful attempts to control
- Physical or emotional harm
- Clinically significant distress or impairment in function / role
- Specify if: masturbation, pornography, sexual behavior with consenting adults, cybersex, telephone sex and strip clubs

Sexual addiction (Carnes, 2001)

- 3 of the following:
- Failure to resist impulses
- Longer than intended
- Repeated unsuccessful attempts to control
- Excessive time spent
- Preoccupation
- Impairment in function / role
- Continued despite impairment
- Escalation to achieve effect
- Giving up or limiting social, occupational or recreational activities
- Distress, anxiety or restlessness if unable to engage in behaviour

Subject characteristics

- Job loss (10%)
- Relationship (90%)
- Sexual dysfunction (52%)
- Suicidal ideation (10%)
- Large amount of money spent (14%)

- Pornography use
  - CSB: 13.21 (9.85) h/wk (25%); HV: 1.75 (3.36) h/wk (4.5%) ($p<0.0001$)
- Cybersex (24%)
- Escorts (19%)

DSM-5 field trial for hypersexual disorder (Reid et al., 2012)

- Pornography use (81.1%)
- Masturbation (78.3%)
- Cybersex (18.1%)
- Sex with consenting adults (44.9%)

Cues in compulsive sexual behaviours

Neutral cues

+

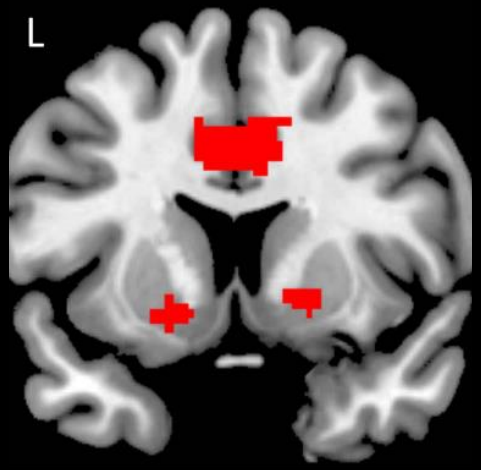
Drug reward

↓

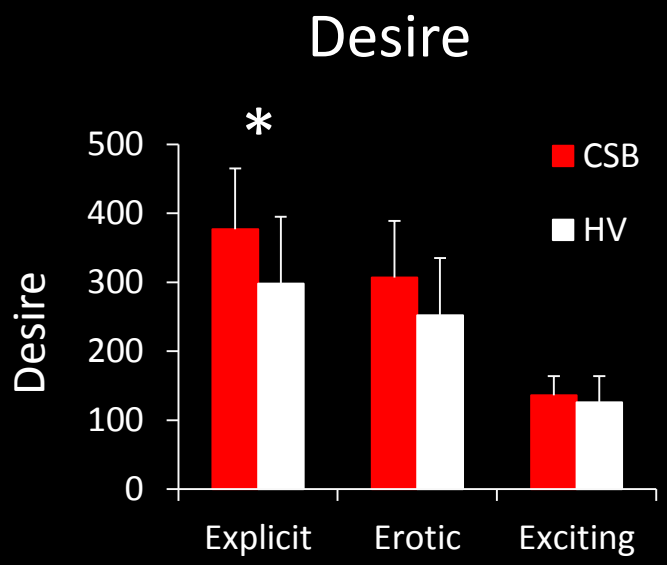
Conditioned cues

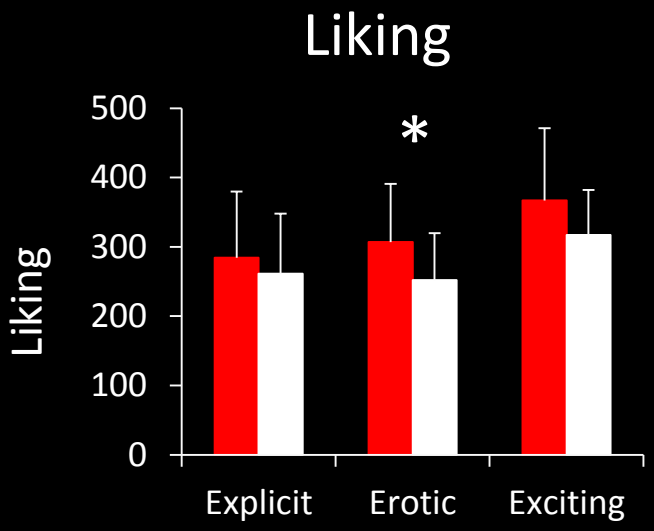
Unconscious trigger:
Craving
Relapse

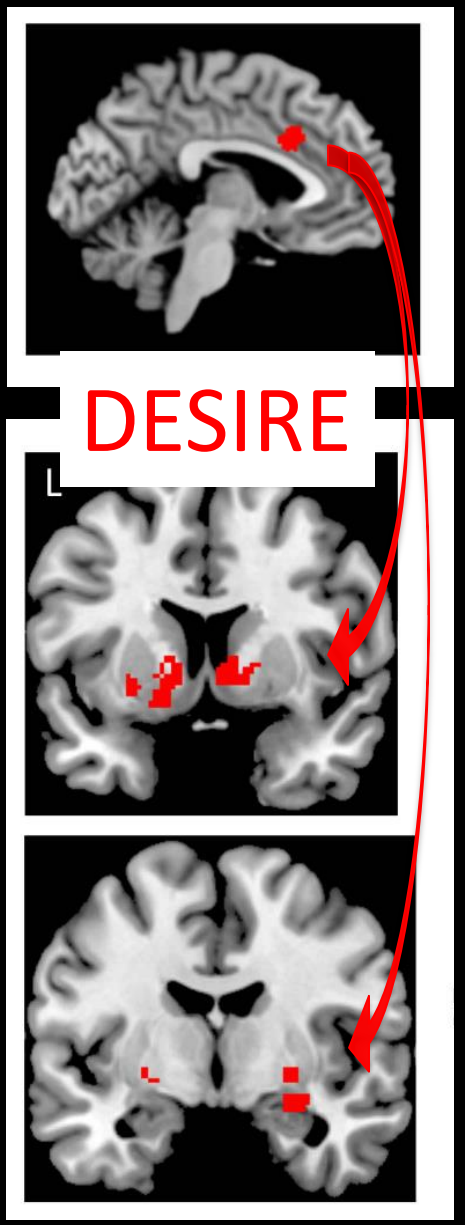
Sexual cue reactivity and wanting versus liking



Ventral striatum
Dorsal cingulate
Amygdala

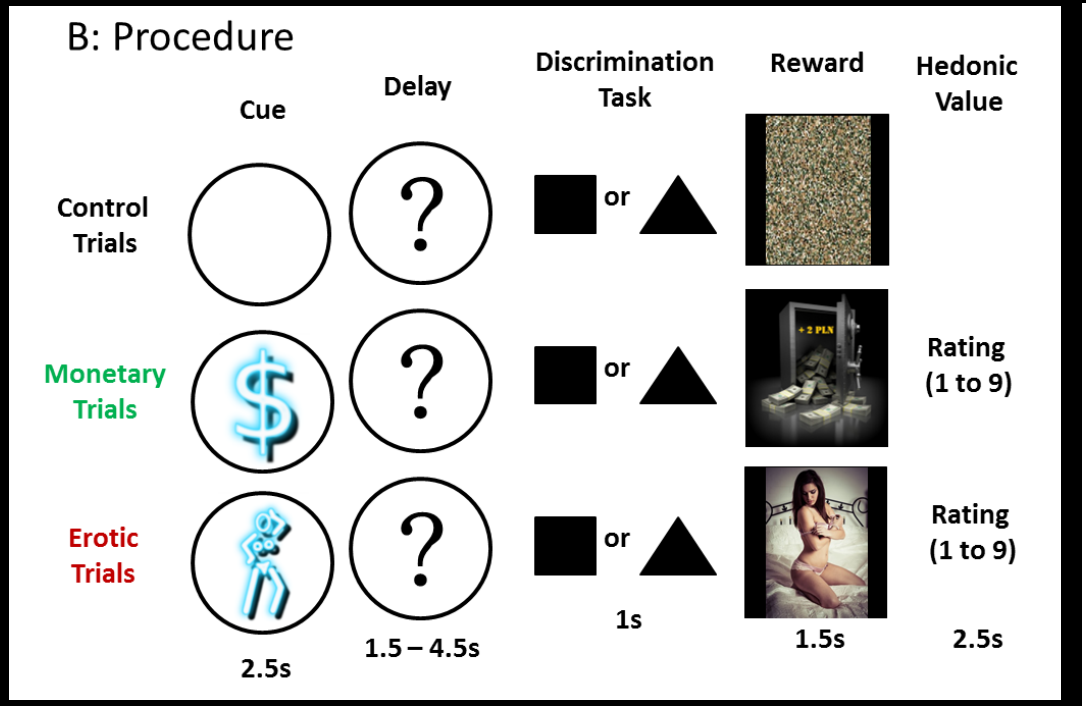


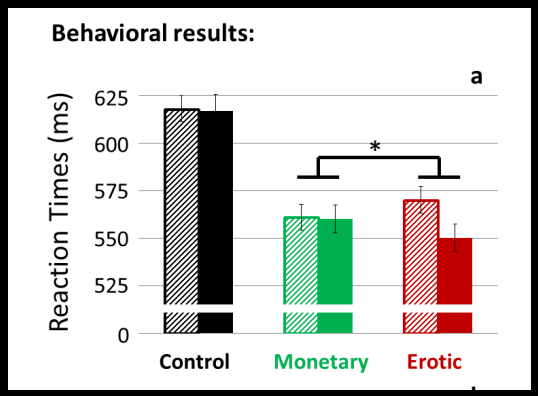


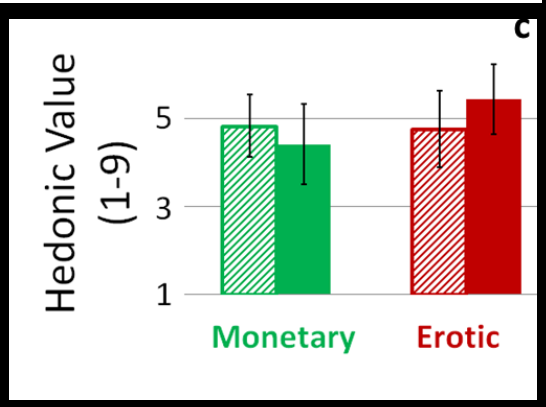


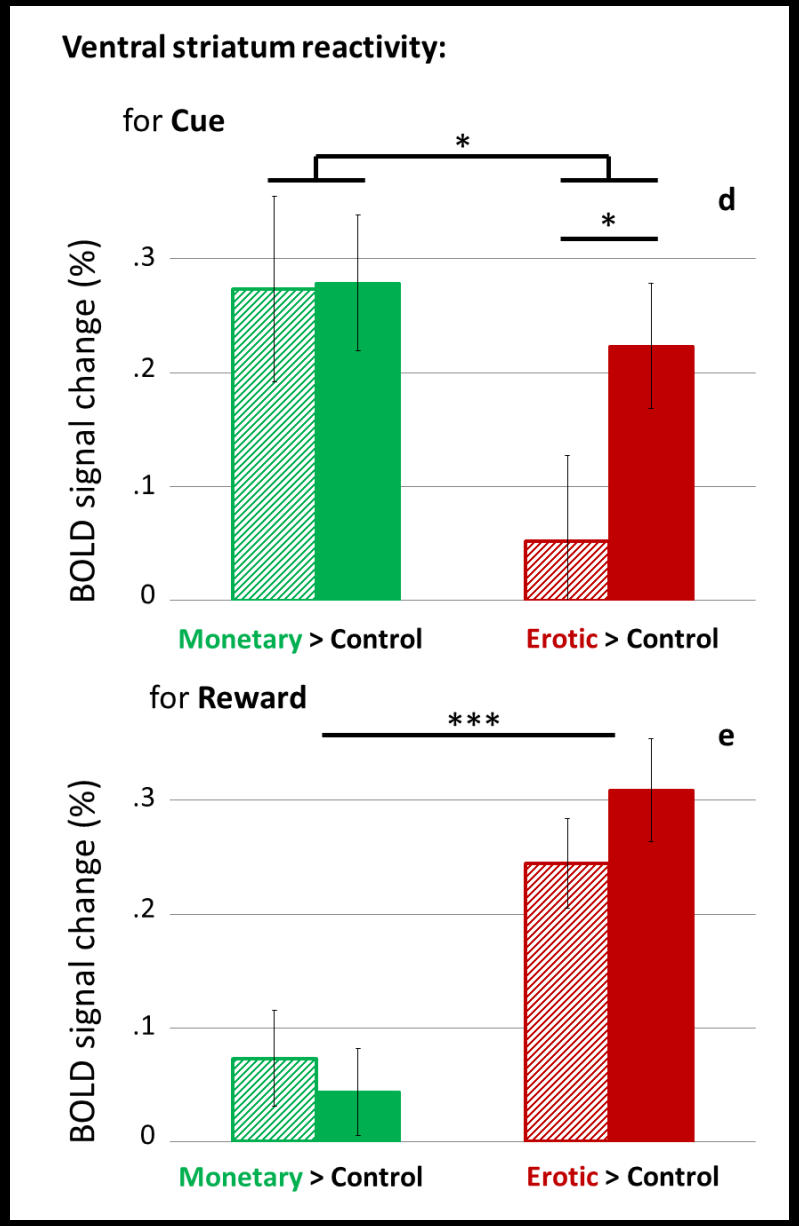
Voon et al., Plos One, 2014

Dissociating wanting (cue reactivity and reaction time) and linking (outcome and hedonic value)









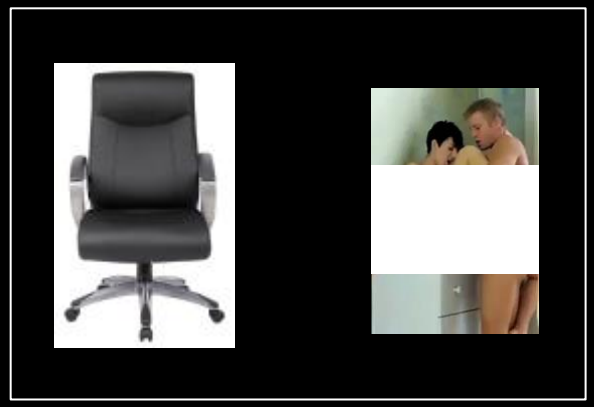
Gola et al., submitted

Is attention drawn to sexual cues?
Dot Probe task

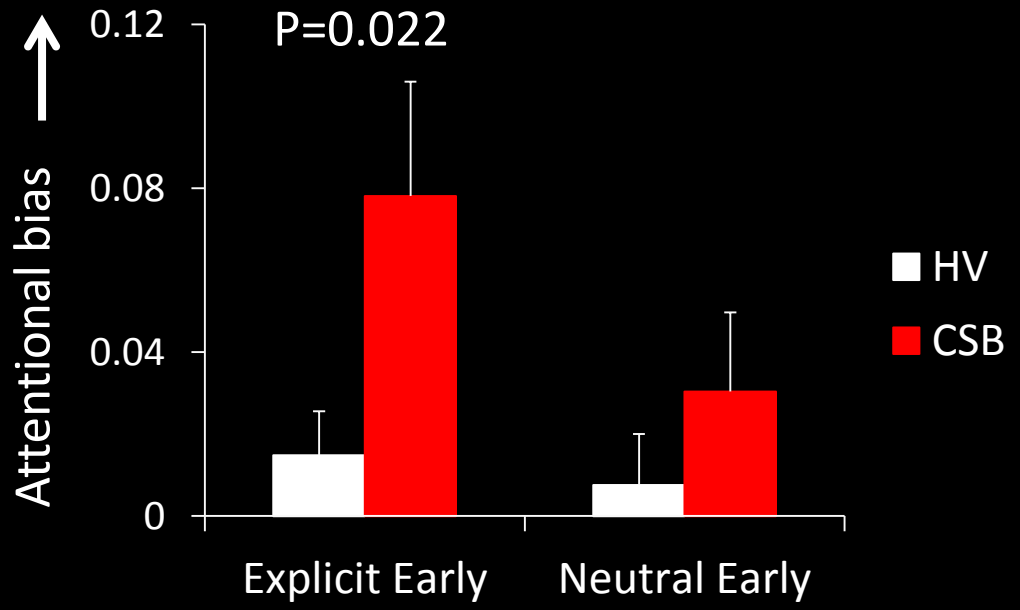
Faster reaction time to drug cue in substance use disorders

CSB subjects have enhanced EARLY (<350 ms from cue onset) attentional bias to explicit stimuli

Explicit



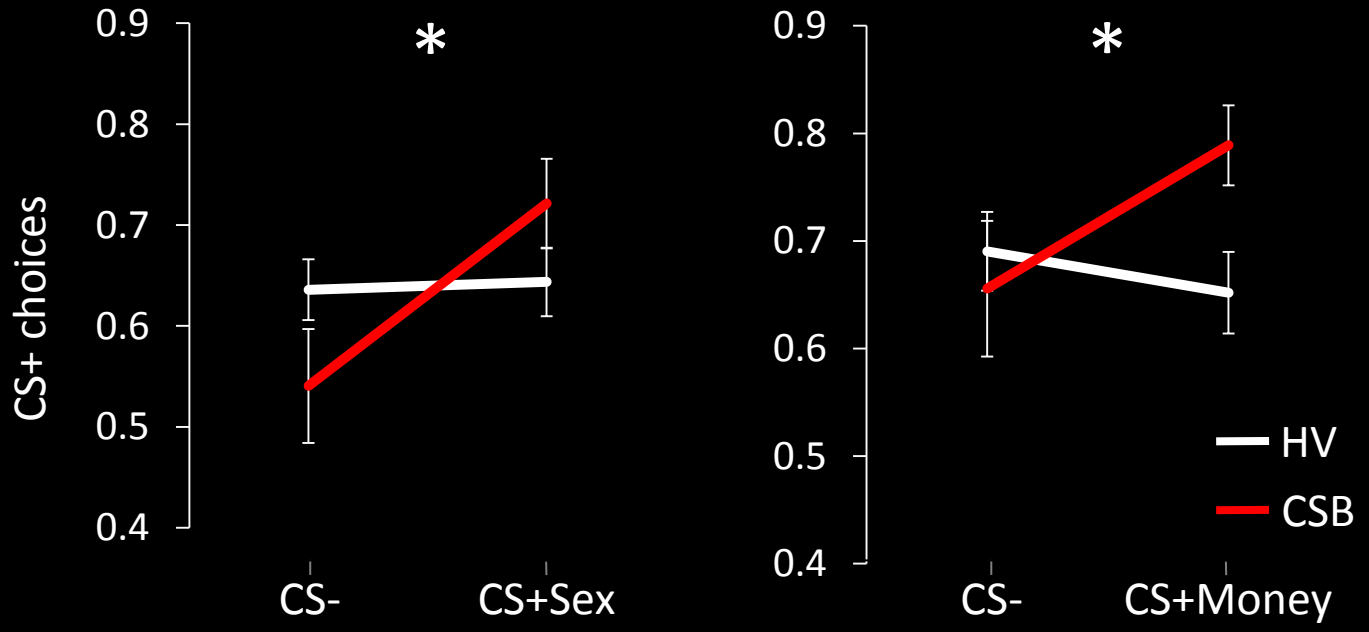
Neutral



Car enthusiasts:
Enhanced LATE attentional bias

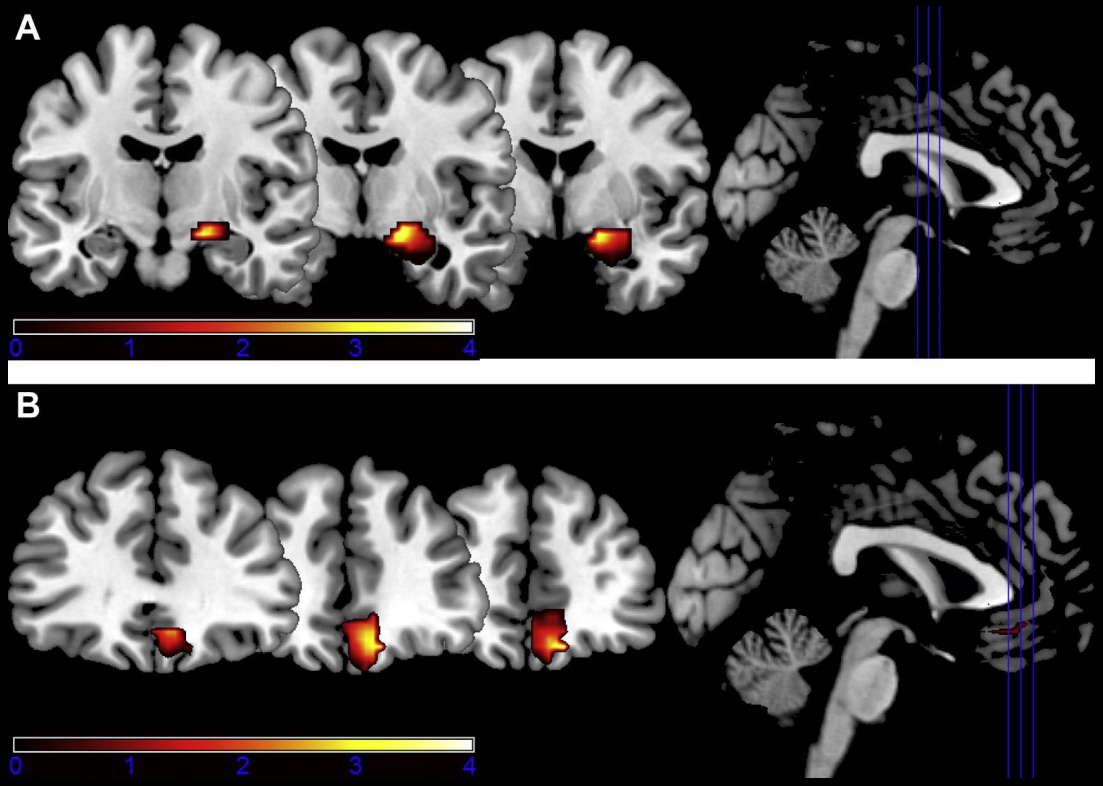
Mechelmans et al, Plos One, 2014

Do CSB condition to sexual rewards?
CSB prefer cues conditioned to salient rewards

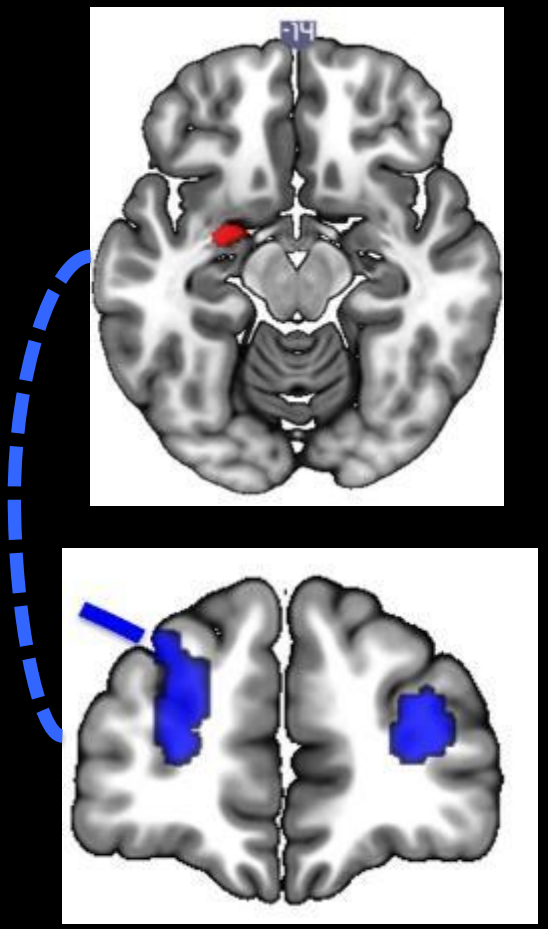


CSB have greater amygdala volume and reactivity during conditioning with lower prefrontal-amygdala connectivity

Conditioning to sexual cues: CSB - HV

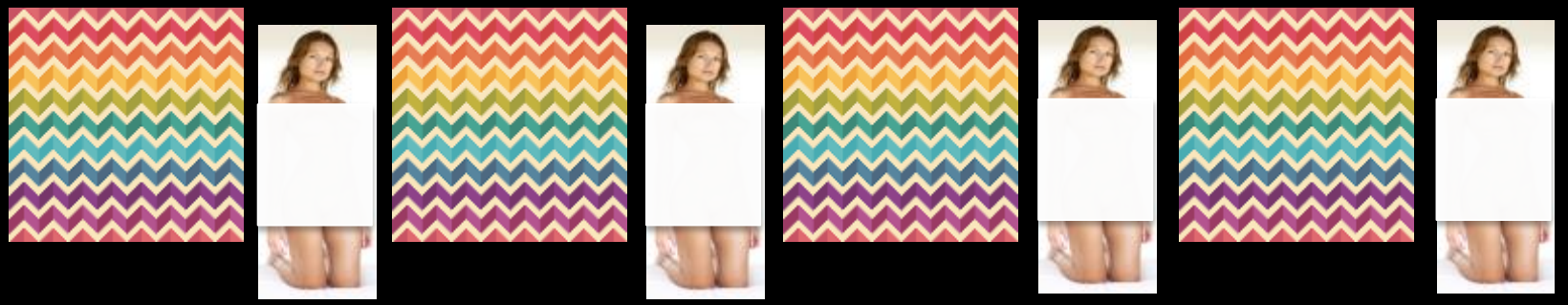


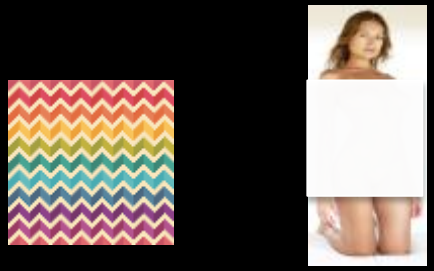
Volume and functional connectivity at rest



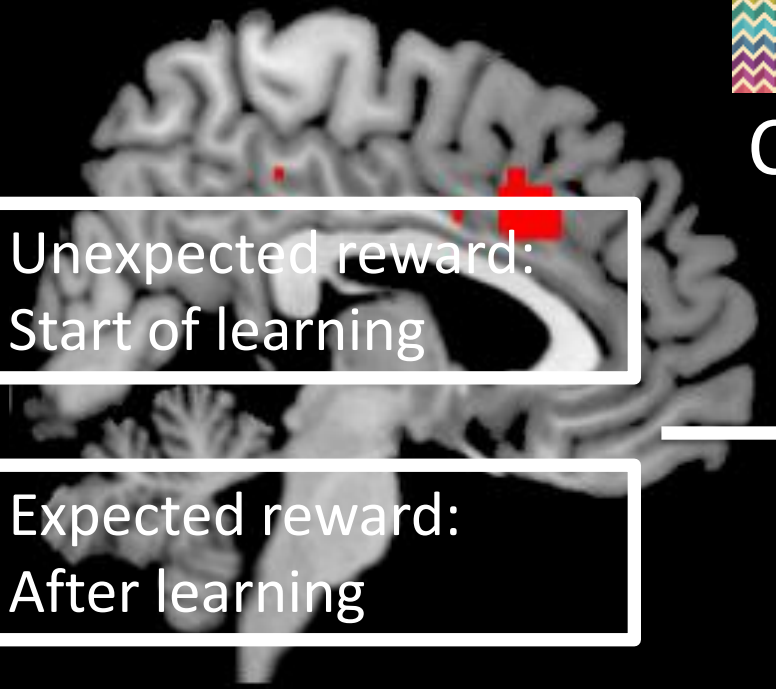
Klucken et al., J Sex Med, 2016
Schmidt et al., HBM, 2016

Activity to the sexual expected outcome during conditioning decreases faster with repetition



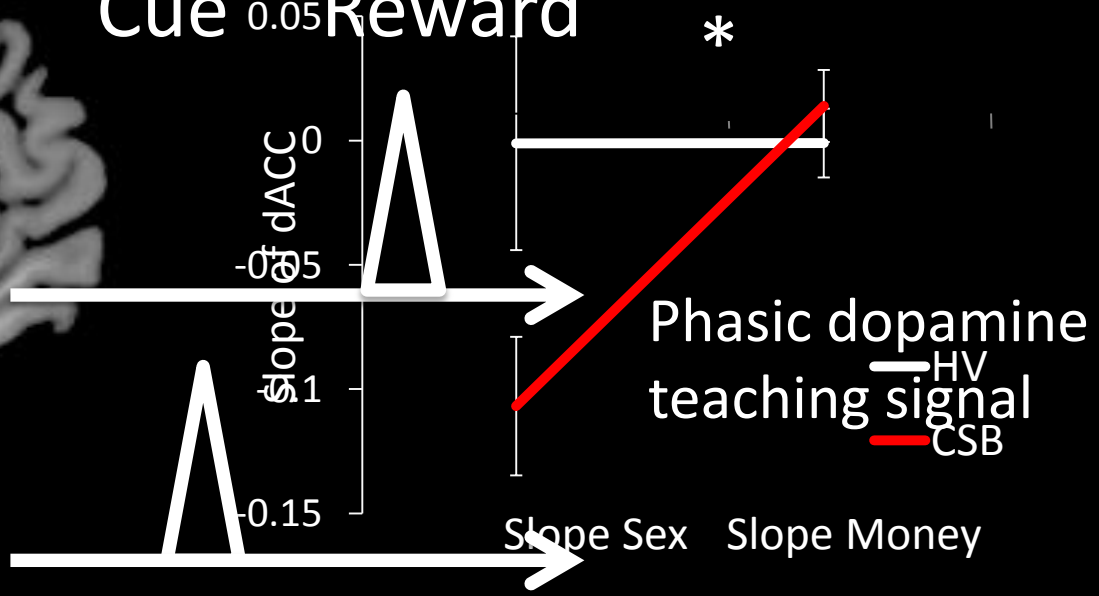


Cue Reward



Unexpected reward:
Start of learning

Expected reward:
After learning

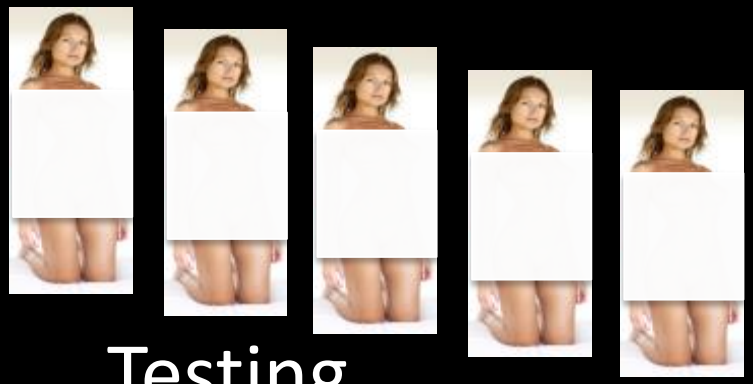


Can we link the habituation to novelty? Novelty seeking predicts compulsive drug use in rodents and binge drinking in adolescent humans

Belin, NPP, 2011; Nees, NPP, 2012

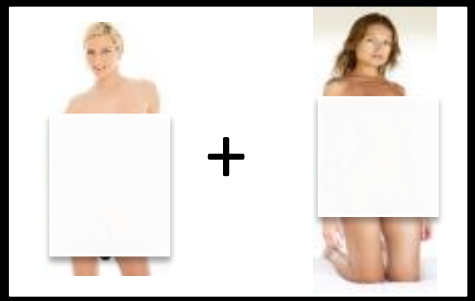
Habituation of sexual outcome correlates with preference for sexual novelty

Familiarization



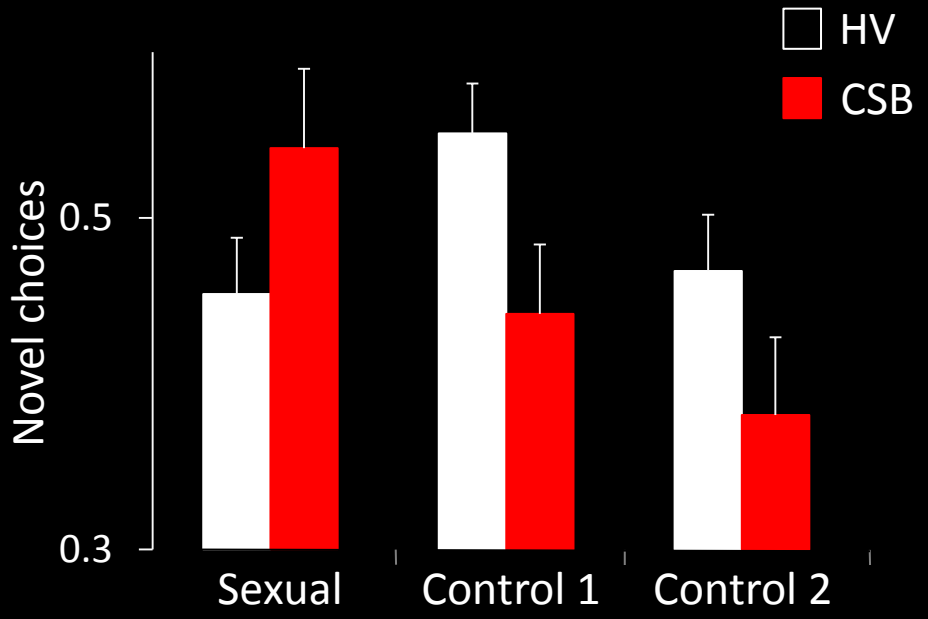
Testing

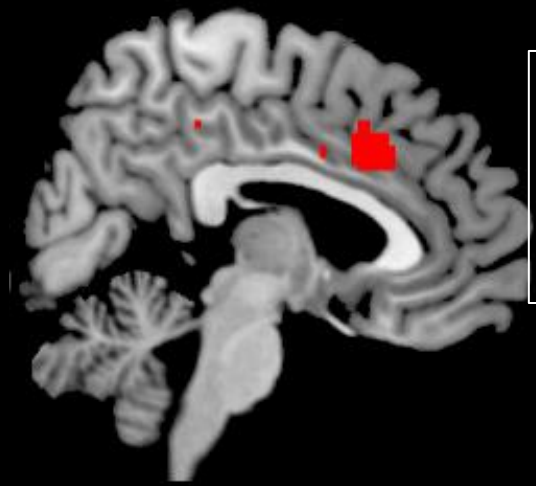
Novel Familiar



50%

Group x Valence: p<0.05

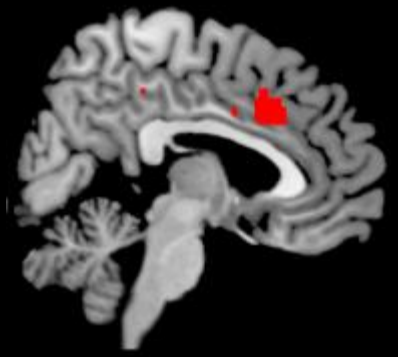


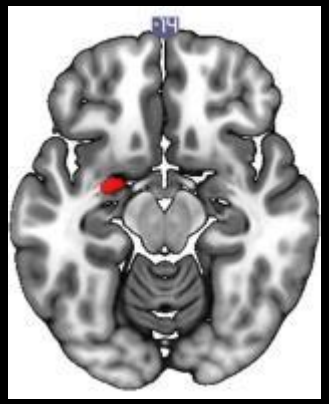


Slope correlates with sexual novelty preference

Evidence for incentive motivation

- Sexual cues (anticipation) activate a similar salience network to drug cues in addiction
- Greater wanting (desire) rather than liking
- Captures early attention bias
- Greater preference for conditioned cues
- Greater amygdala volume and activity for sexual conditioning process and decreased prefrontal – amygdala functional connectivity
- Activity to the sexual expected outcome decreases faster with repetition correlates with preference for sexual novelty





Acknowledgments

Therapist referrals:
- Geraldine Myers
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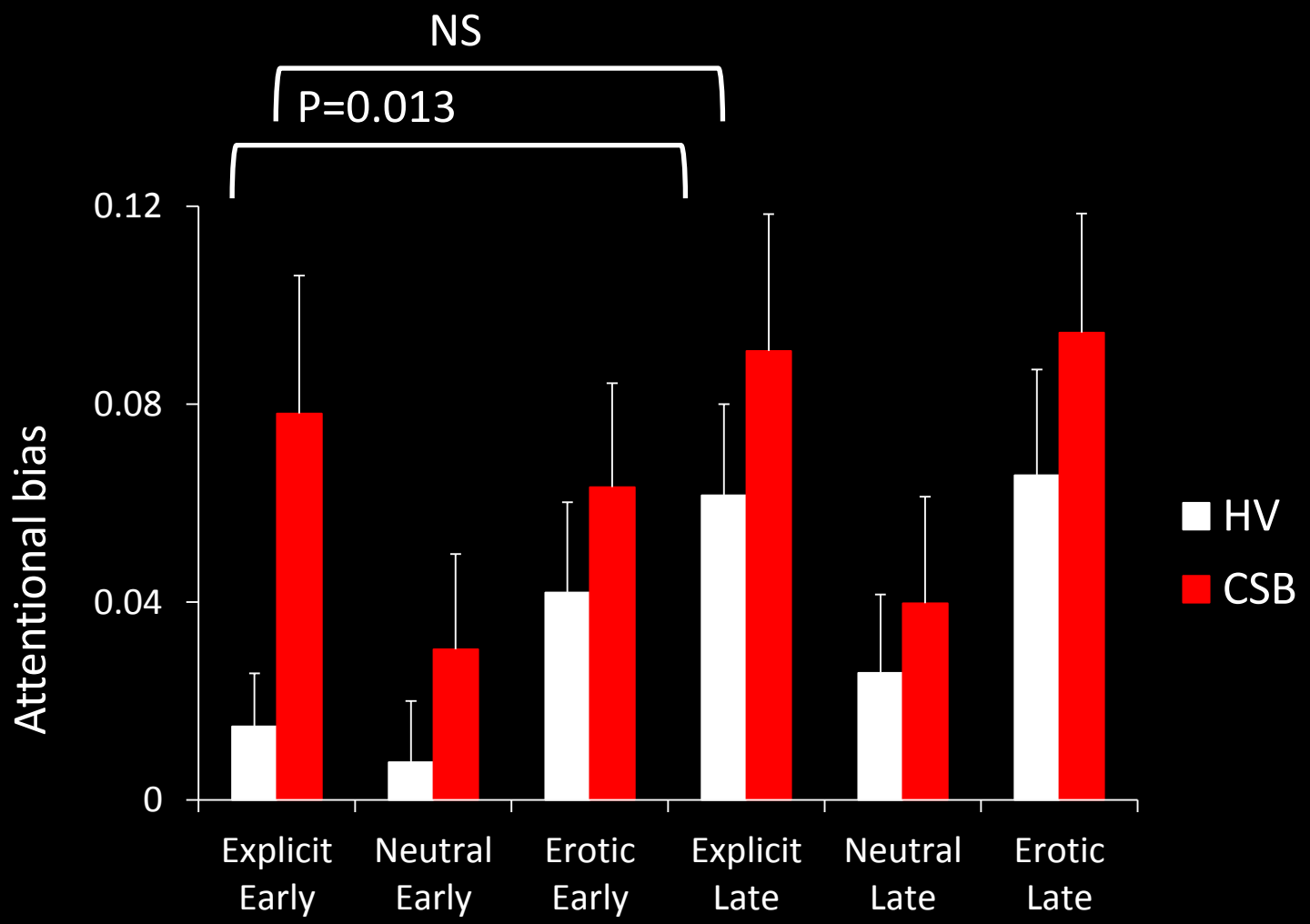
- Thaddeus Birchard

Cambridge University:
- Paula Banca
- Daisy Mechelmans
- Tom Mole
- Michael Irvine
- Laurel Morris
- Simon Mitchell

Yale University
- Marc Potenza

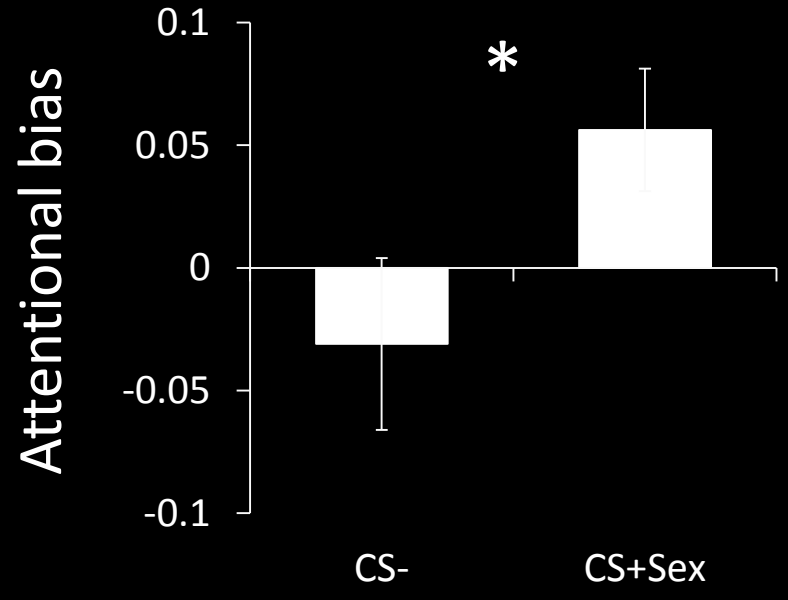
Early versus late attentional bias



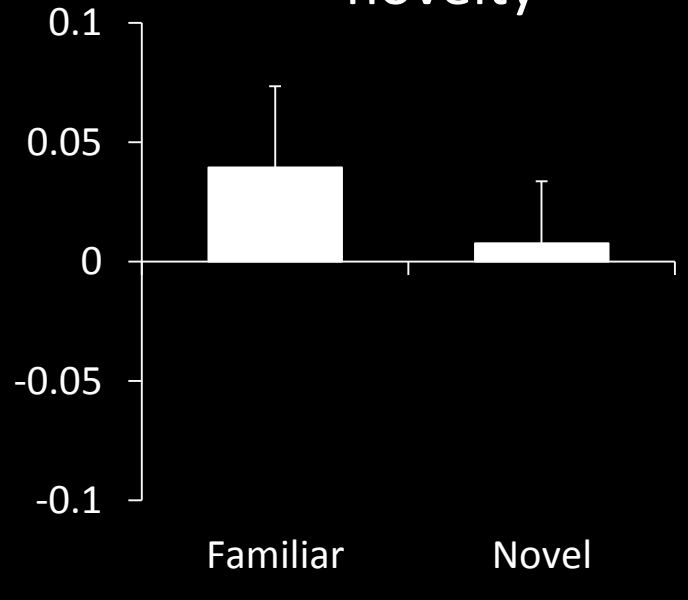
How is conditioning or novelty related to attentional bias?

Attentional bias is associated with preference for conditioned sexual cues (Approach) but NOT sexual novelty

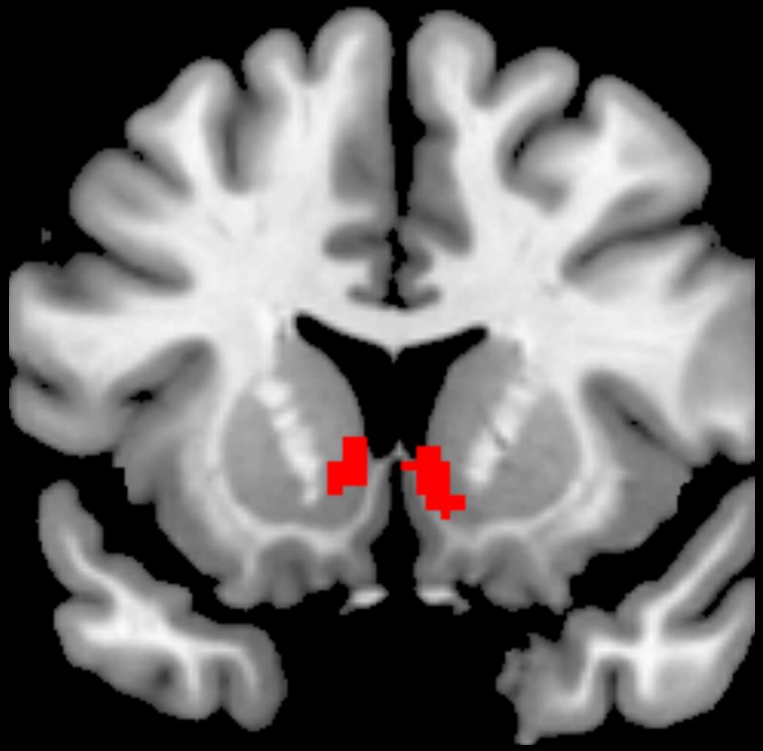
Sexual conditioned cues

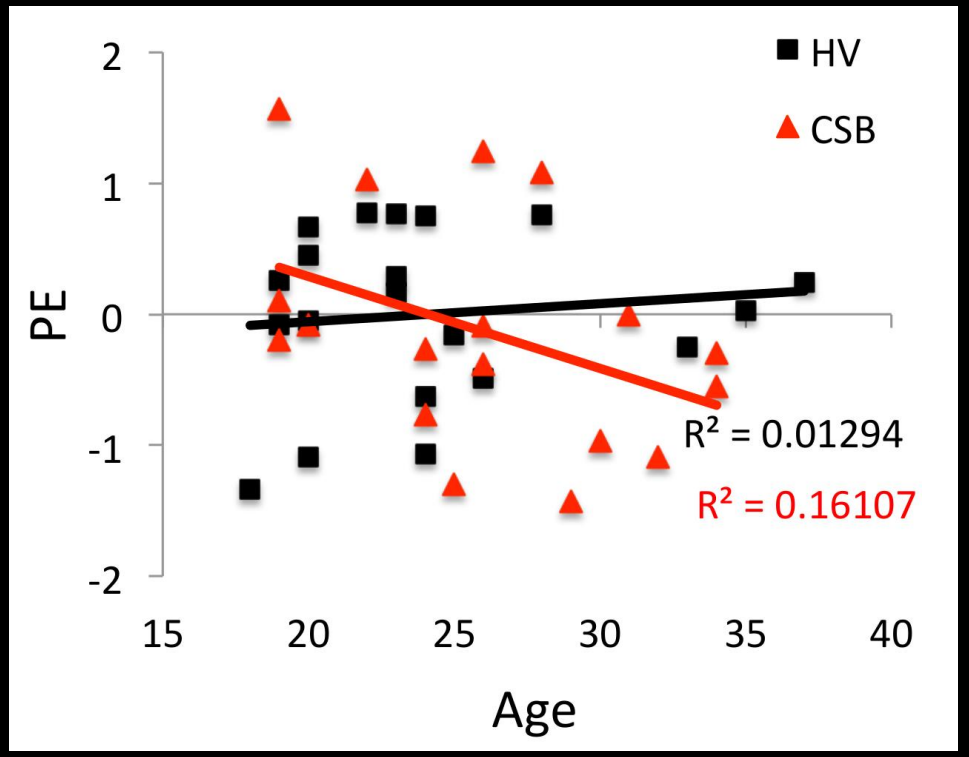


Sexual novelty

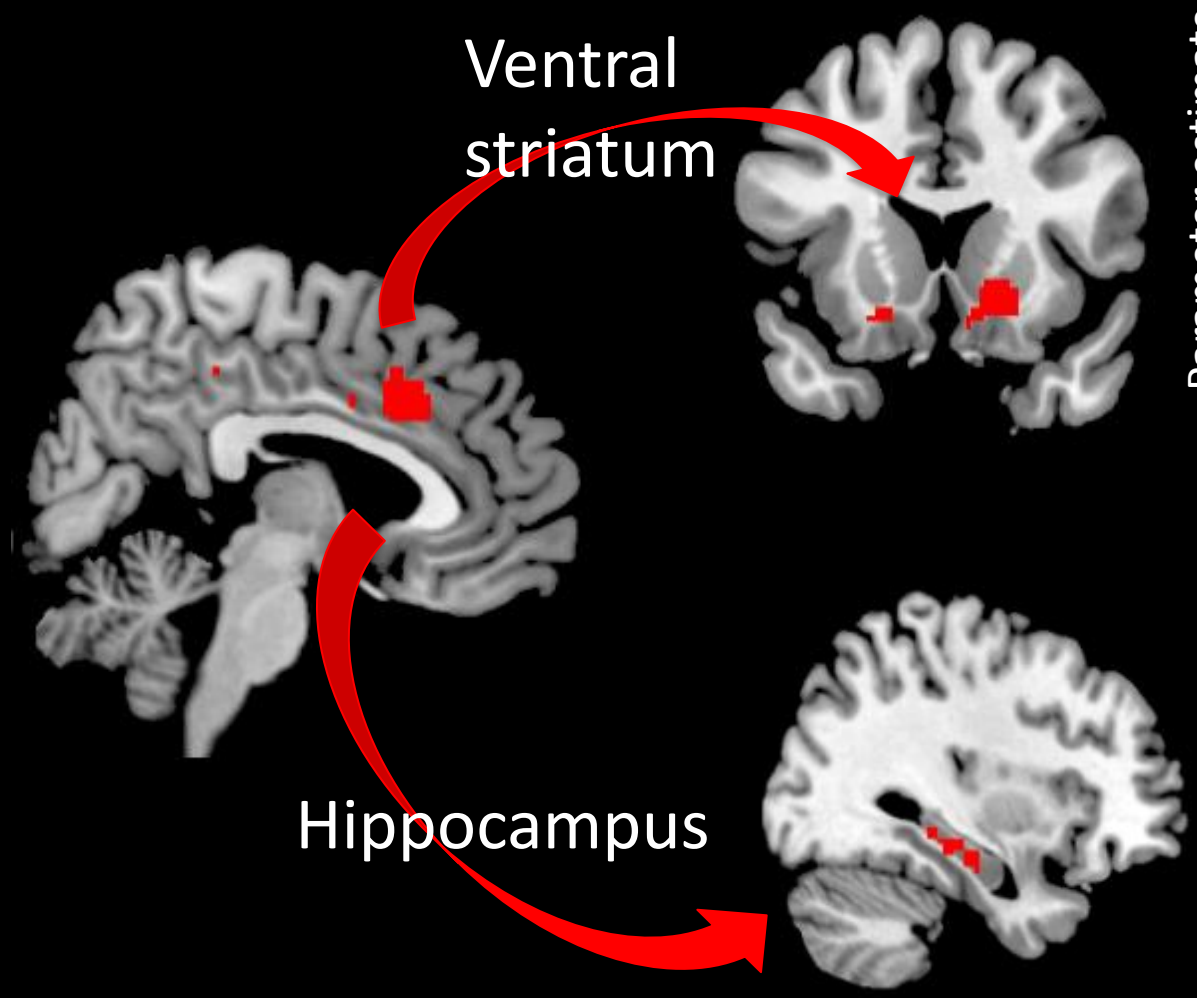


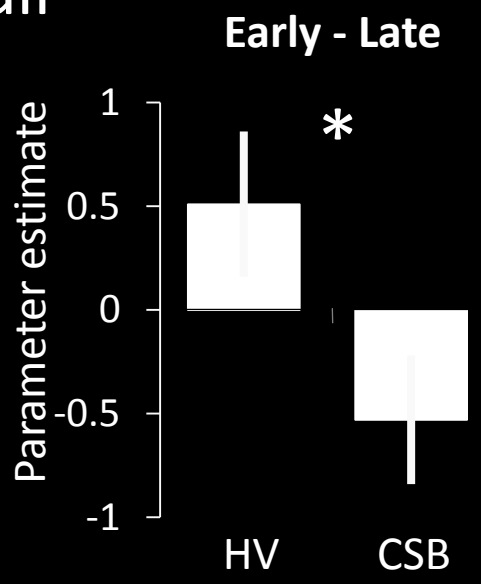
Ventral striatal activity interacts with age in compulsive sexual behaviour

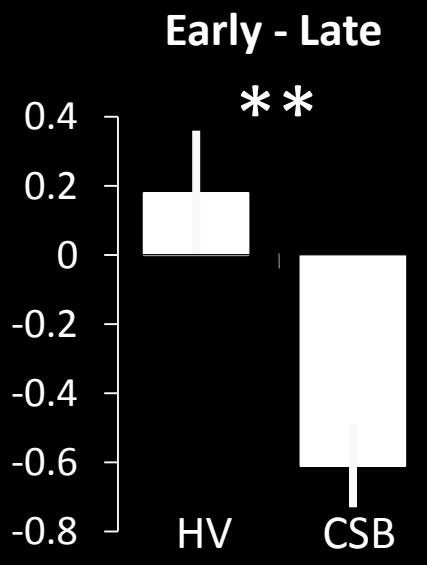




CSB have greater functional connectivity between dACC and hippocampus/ventral striatum with repeated exposure to sexual stimuli







Repeated sexual behaviour: neuroadaptation and amphetamine cross-sensitization: overlapping mechanisms

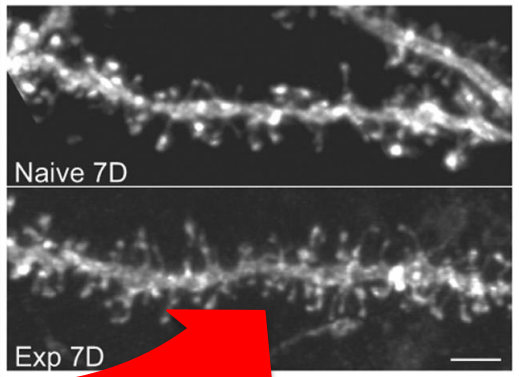
Mating to ejaculation:
4-5 sessions daily for 5 d
Testing amphetamine cross-sensitization model

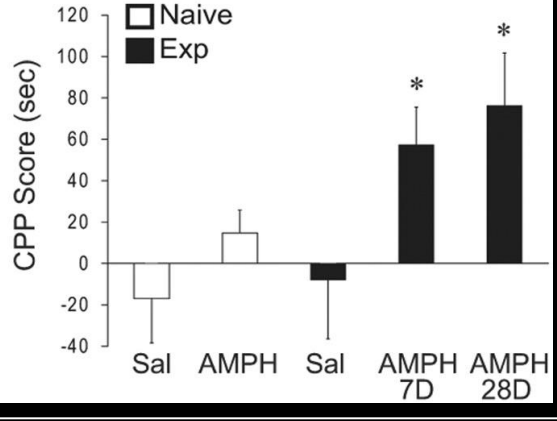
Pre-tx low dose or repeated methamphetamine increase compulsive sexual behaviours

Neuroadaptation following abstinence:

7d: dendritic arborization, dendrite spine density

7-28d: enhanced CPP to low dose amphetamine (cross-sensitization)





Mediated via:
ΔFosB and D1 receptor

Pitchers et al., 2010; 2014; Frohmader et al. 2010; 2011