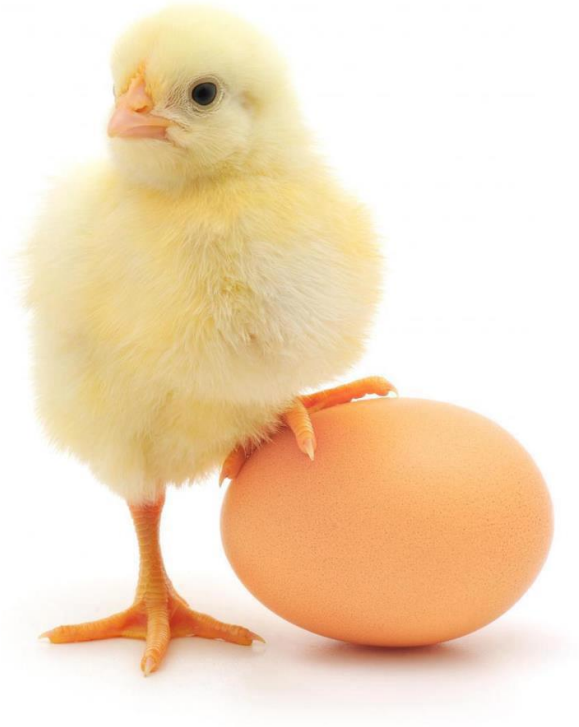
Impulsivity and altered reward processing as vulnerabilities for gambling disorder: A study in unaffected siblings



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Declaration of interests

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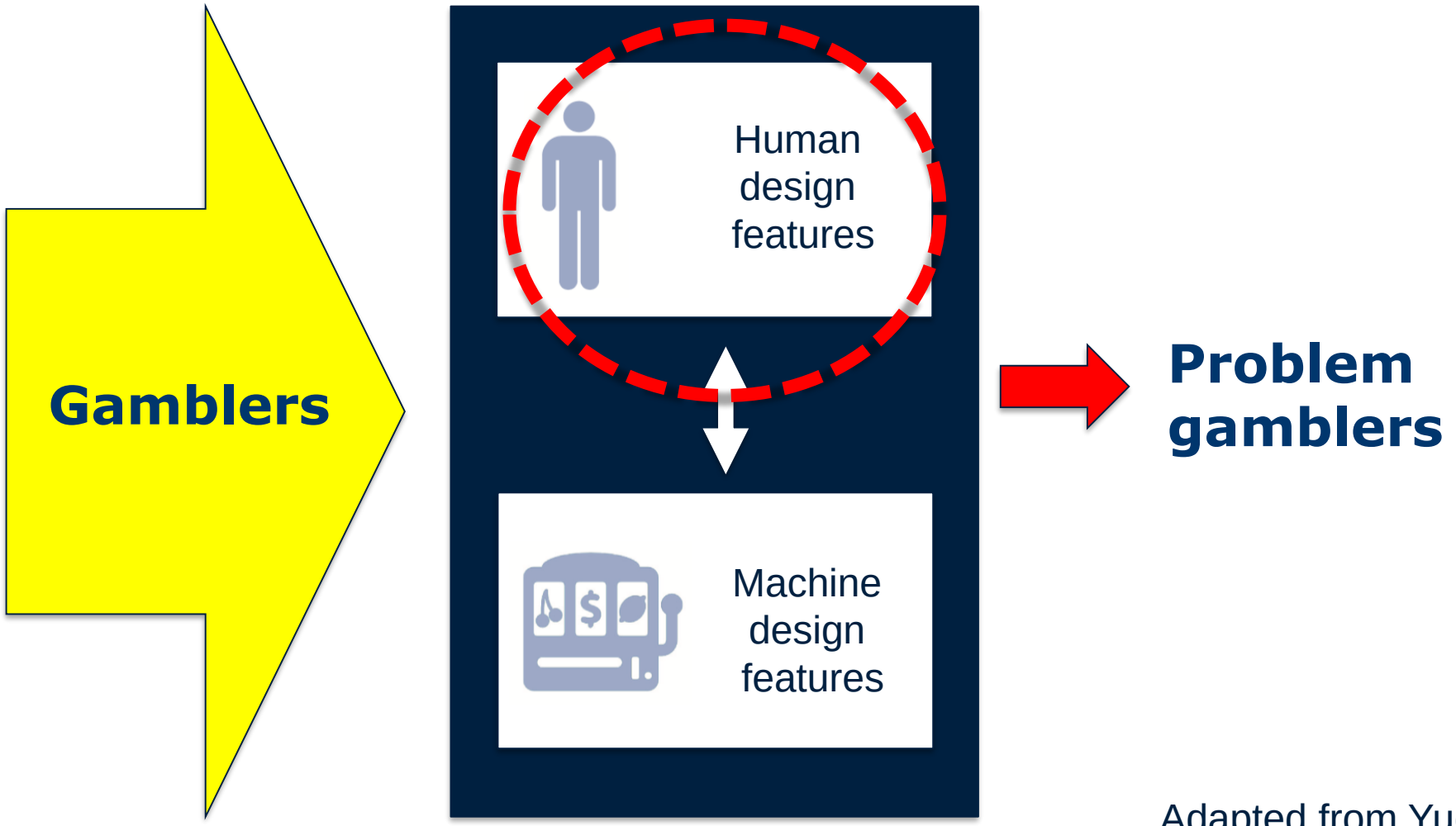
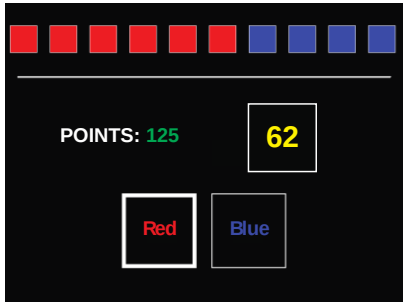
Understanding problem gambling



Adapted from Yucel et al. (2018)

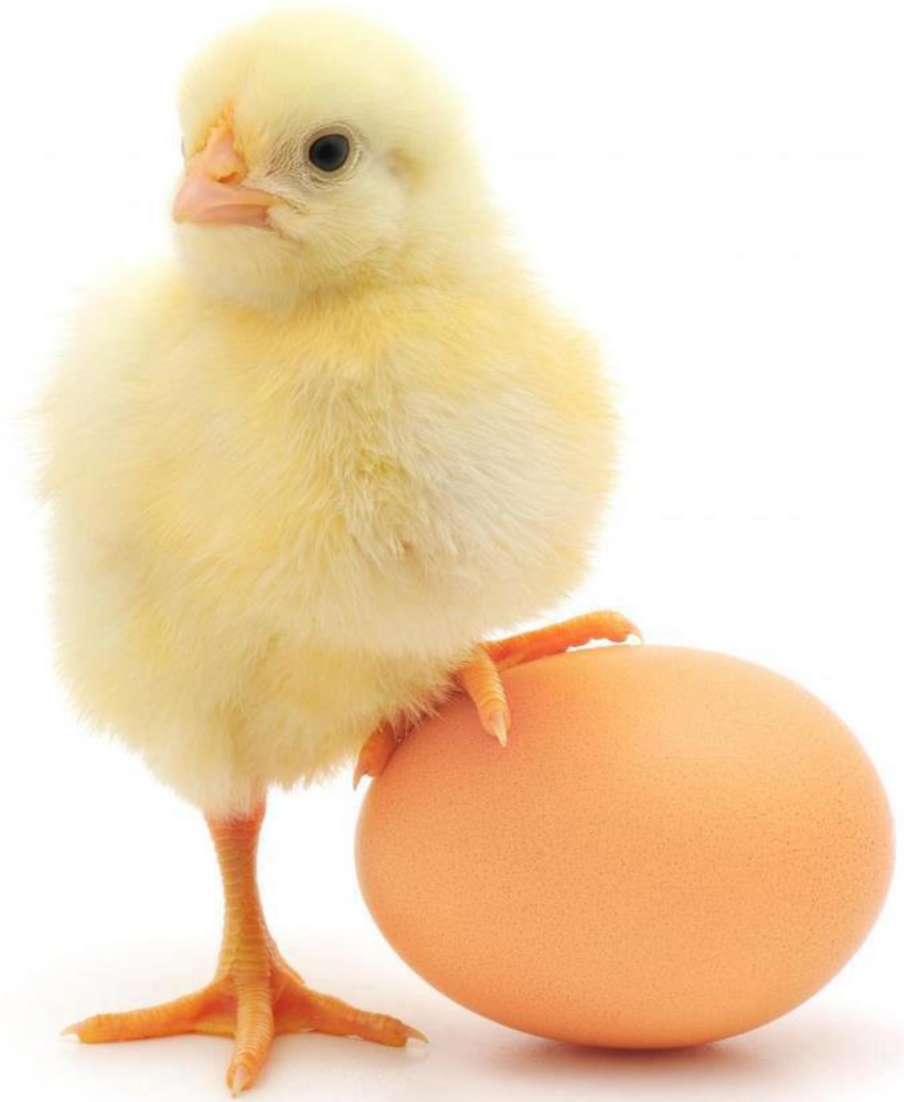
Vulnerabilities for gambling disorder?

- Increased impulsivity
  - UPPS-P



- Increased Risky decision-making
  - Cambridge gambling task

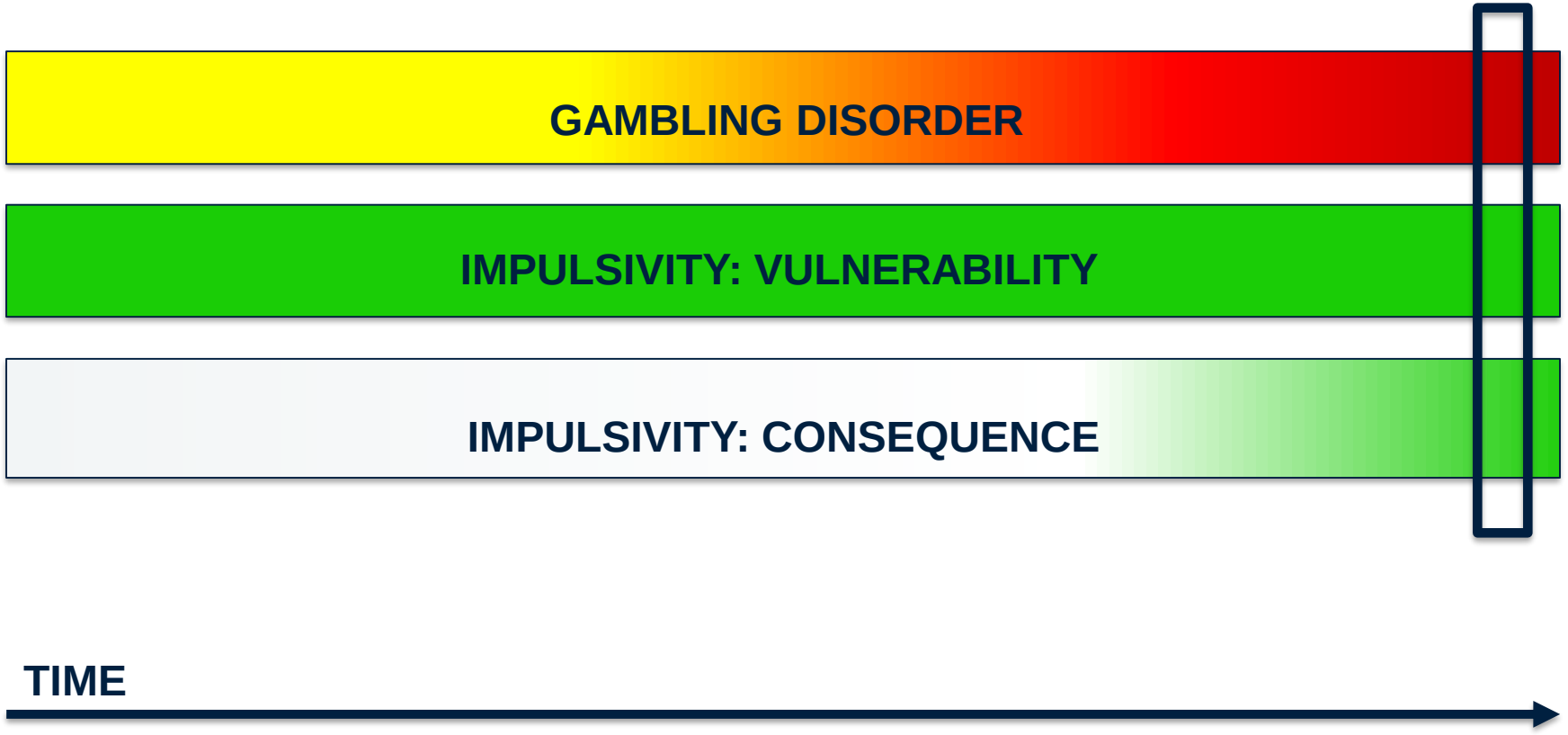
- Reduced neural response to wins
  - fMRI of a slot machine simulation



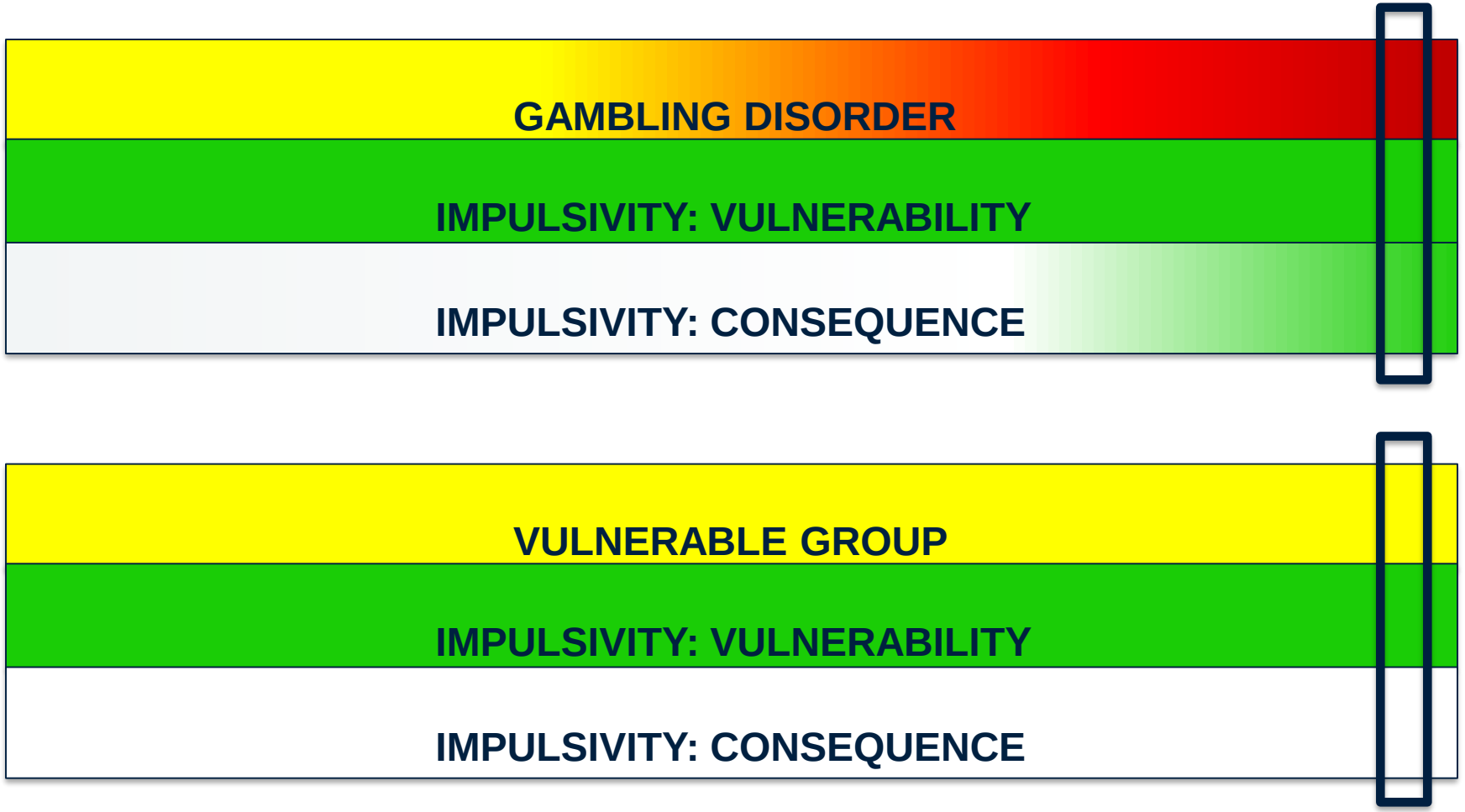
Why is this an important question?

- Characterize the development of gambling disorder
- Identify risk-factors for the development of gambling disorder – help prevention
- May inform research on ‘machine design features’ to identify those features that may be harmful to vulnerable populations

Cross-sectional studies



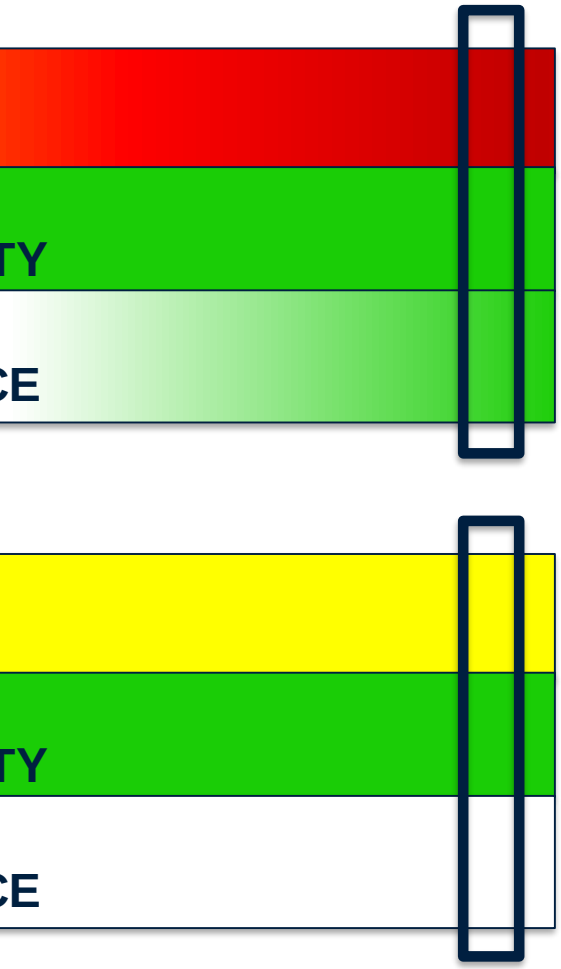
An alternative design



A vulnerable group?

- Gambling disorder has a genetic component
  - Heritability = 50-60% (Lobo and Kennedy – 2009)
- First degree relatives of those with gambling disorder are at a higher risk of developing a gambling problem
  - 8.3% vs. 0.7% (Mann et al. – 2017)

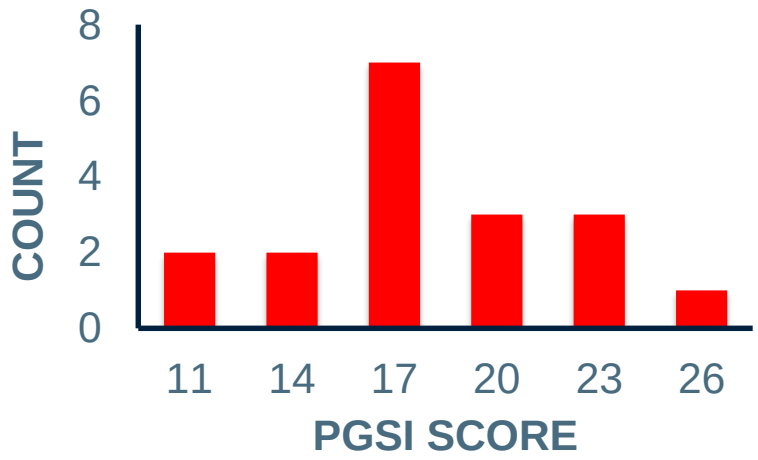
Our question



- Do unaffected siblings show the same neurocognitive profile as patients with gambling disorder?

Gambling disorder participants

- CNWL Problem Gambling Clinic
  - Central London location
  - Within month of starting treatment
- Met DSM 5 criteria for gambling disorder
- Scored 8 or higher on the Problem Gambling Severity Index
- All male
- Mean age = 28.5 years



Sibling participants

- No current or past gambling problem
- Had a brother or sister with a current gambling problem
  - Confirmed by telephone (PGSI of 8+)

Study design

18 patients with gambling disorder

VS.

17 matched controls

Matched:	**Gamblers scored higher:**
Age, Alcohol use Smoking status, IQ	Beck depression inventory Beck anxiety inventory

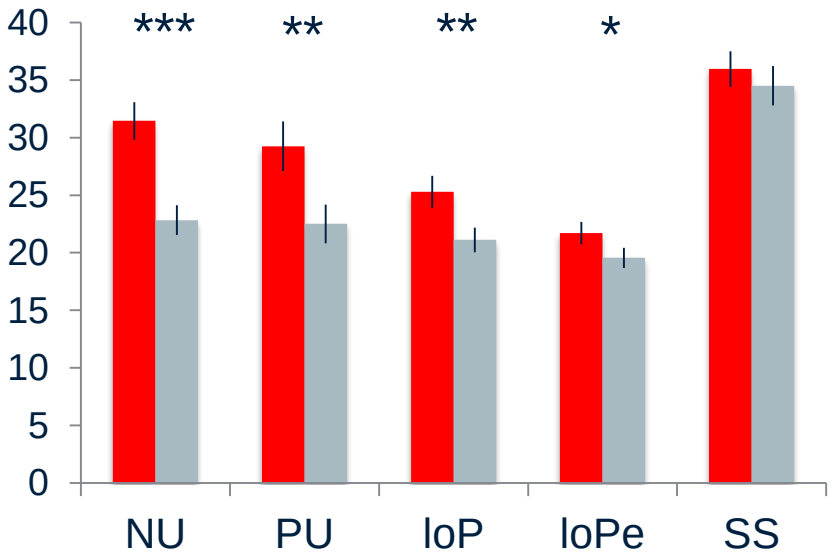
15 unaffected siblings

VS.

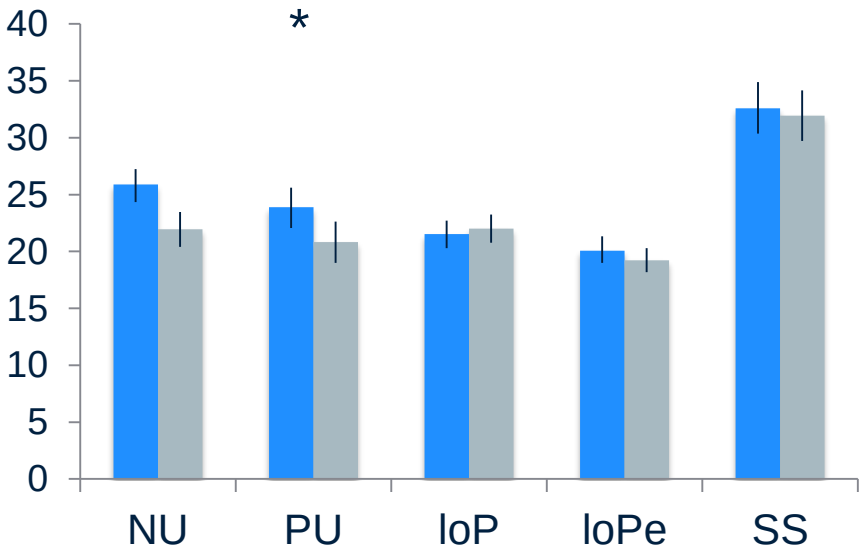
16 matched controls

Impulsivity: UPPS-P

GAMBLERS vs. **CONTROLS**



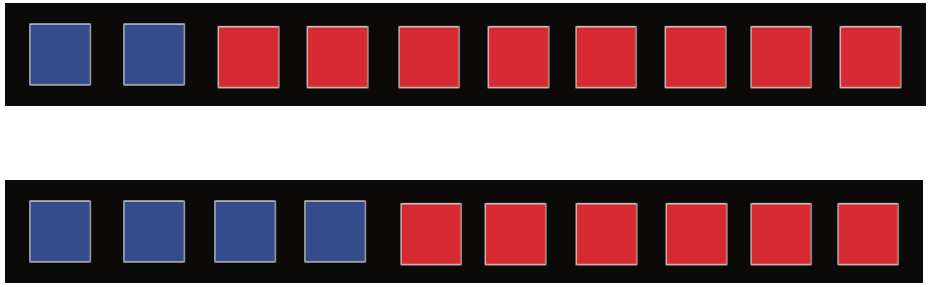
SIBLINGS vs. **CONTROLS**



NU = Negative urgency
PU = Positive urgency
loP = Lack of premeditation
loPe = Lack of perseverance
SS = Sensation seeking

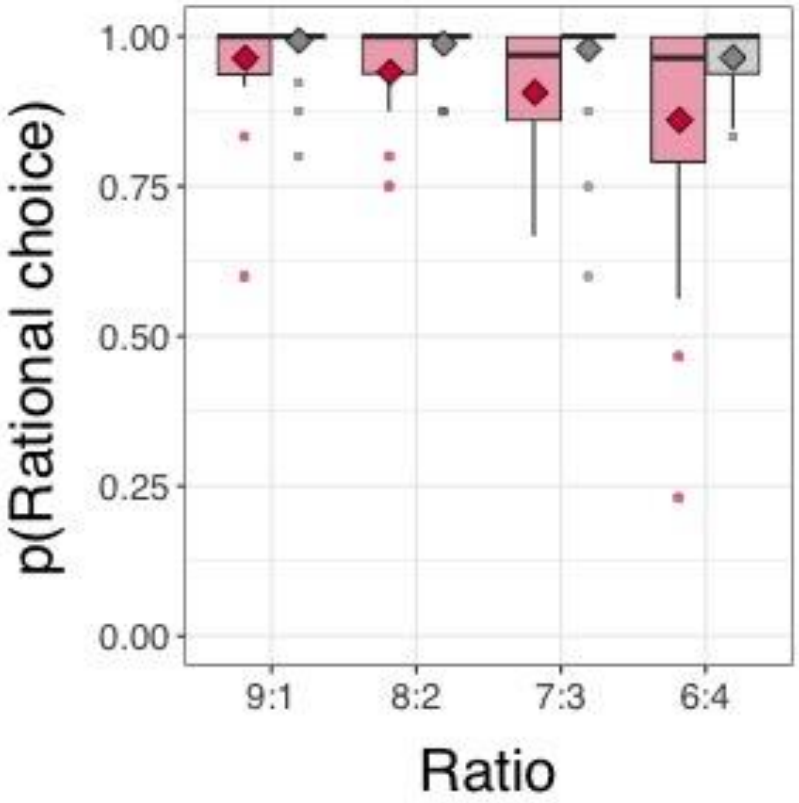
Cambridge gambling task

- Cambridge Gambling Task
  - *Which* box (red or blue) hides the yellow token?
  - *How much* would you like to bet?

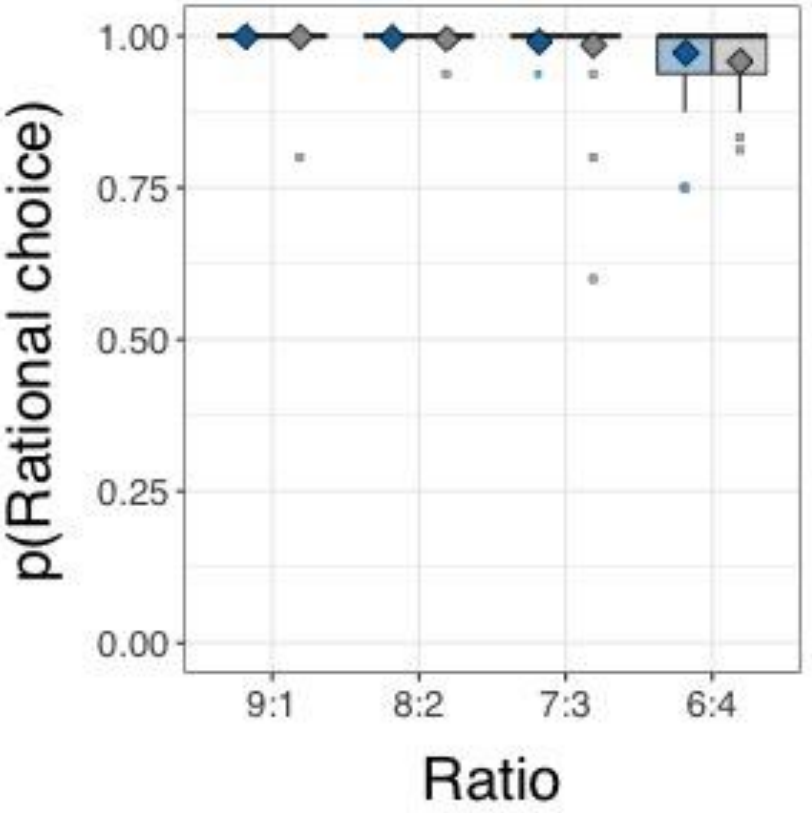


Which colour?

GAMBLERS vs. **CONTROLS**

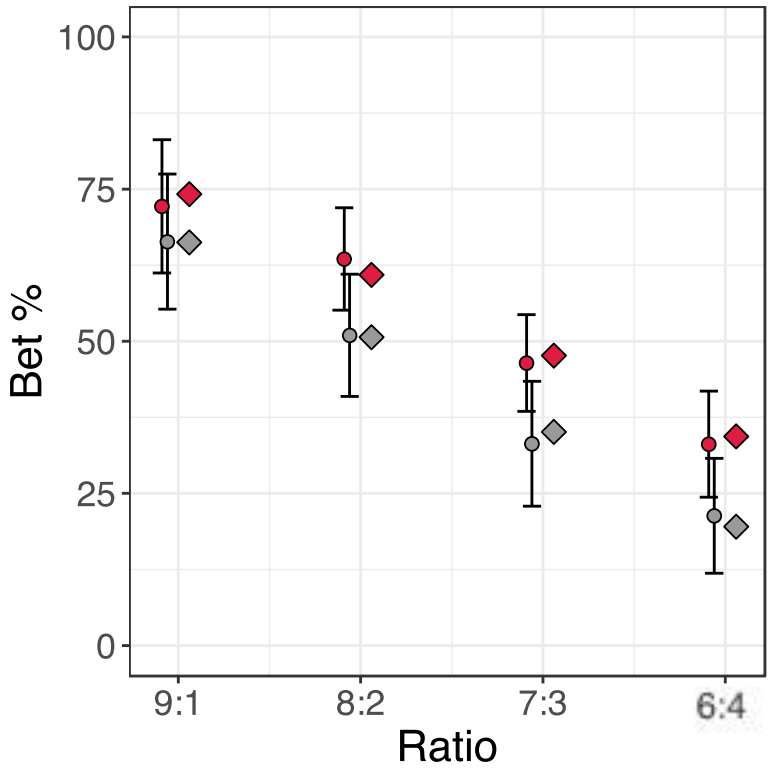


SIBLINGS vs. **CONTROLS**

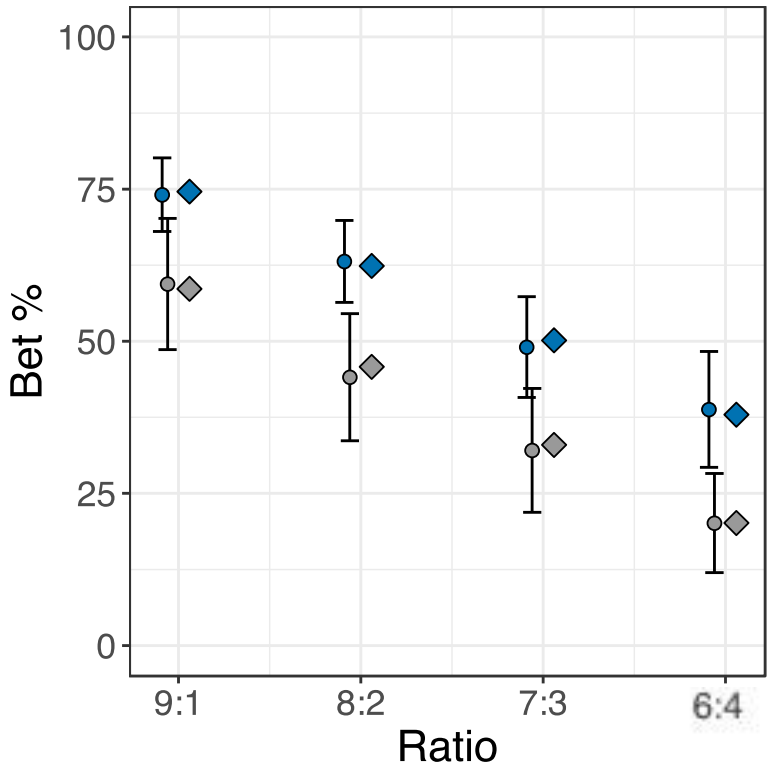


How much?

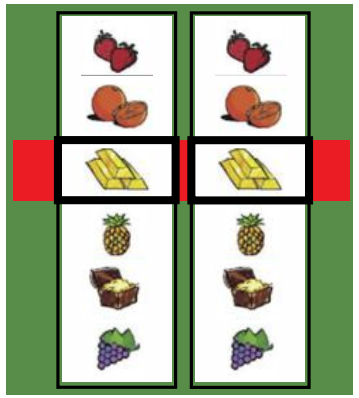
GAMBLERS vs. **CONTROLS**



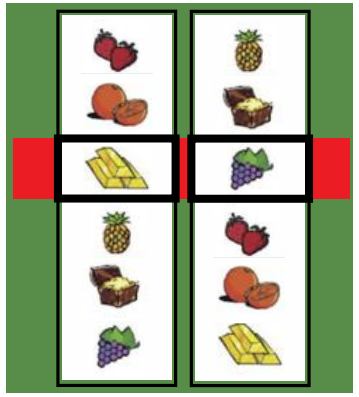
SIBLINGS vs. **CONTROLS**



Neural response to rewards



WIN

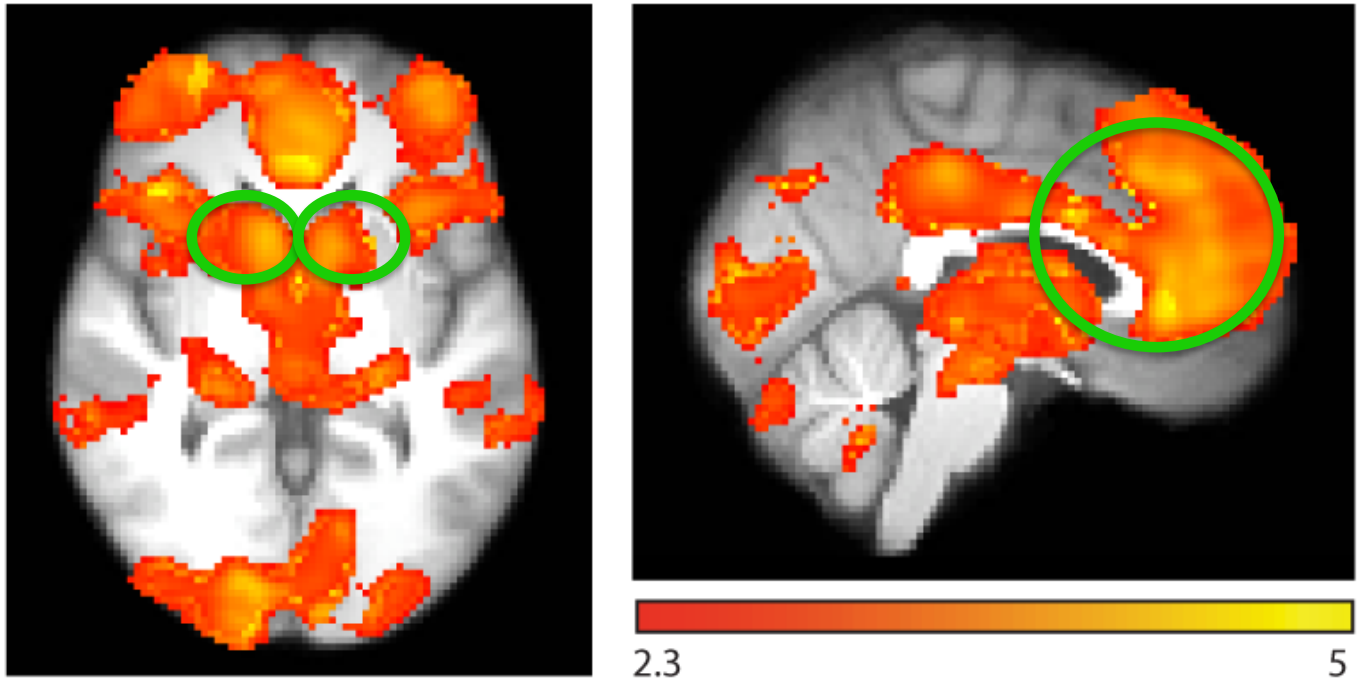


NO WIN

Slot machine task

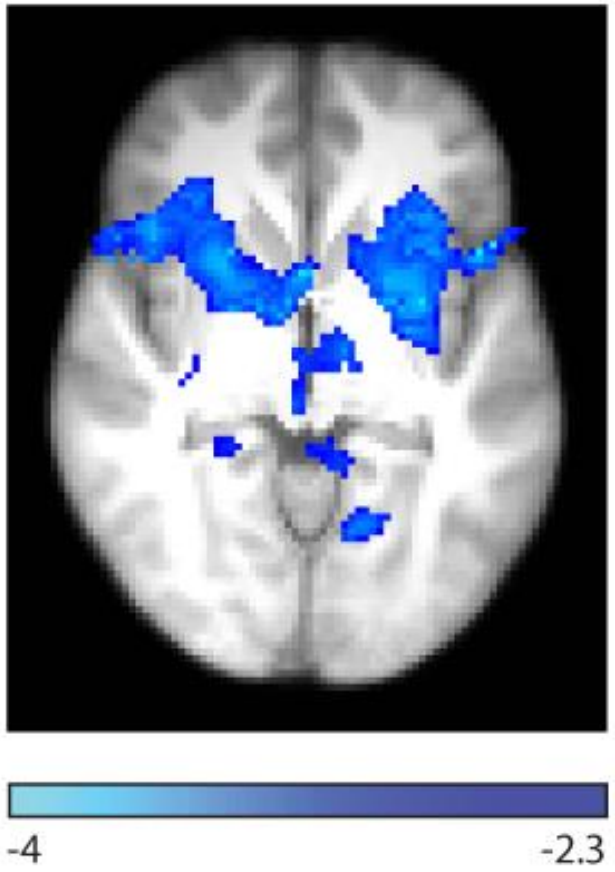
- Functional MRI
- Unpredictable wins in 1/6 of trials
- 5/6 trials do not result in a win

Win related activity



WIN > No WIN in Gamblers

Win related activity



Gamblers: Negative correlation with gambling severity

Results summary

- Impulsivity
  - Increased in **gamblers** and **siblings**
- Cambridge gambling task
  - Bet increased in **gamblers** and **siblings**
  - Rational decision decreased in **gamblers** but **NOT** in **siblings**
- Neural response to wins
  - No group differences in **gamblers** or **siblings**
  - Correlation between PGSI and win response in **gamblers**

Conclusions

- We have identified several differences between patients with gambling disorder and controls that are likely to represent a vulnerability for the development of gambling disorder.
- These differences are related to financial decision making, planning for the future during heightened emotions, and not in how the brain processes the receipt of rewards
- NEXT STEP: looking at decision making in the brain?

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Group characteristics – sibling study

	GD	Controls		Siblings	Controls	
Age, median (range)	28.5 (21 – 51)	30 (20 – 58)	W = 143, **p** = .75	31 (21 – 51)	29 (20 – 58)	W = 111.5, *p* = .87
IQ	111 (83 –134)	121 (78 – 131)	W = 192, **p** = .20	116.13 (2,66)	113.13 (2.59)	$t_{(28.89)}$ = 0.81, *p* = .42
PGSI, median (range)	18 (10 – 25)	0 (0 – 2)	-	0 (0-1)	0 (0)	-
BAI, median (range)	8 (0 – 33)	2 (0 - 17)	W = 71.5, **p < .01**	2 (0 – 25)	1.5 (0 – 9)	W = 98, *p* = .39
BDI -II, median (range)	14.5 (1 – 46)	3 (0-10)	W = 24, ***p* < .001**	2 (0 -23)	0 (0 – 7)	W = 79, *p* = .096
Alcohol use (AUDIT)	6 (1 – 8)	5 (0 – 9)	W = 151, *p* = .96	4.6 (0.59)	4.5 (0.58)	$T_{(28.93)}$ = 0.12, *p* = .91
DAST – N ever used drugs (range of scores)	6 (1 – 2)	6 (1 –5)	-	4 (1)	4 (1 – 5)	-
N smokers	6	7	-	7	3	-
FTND	2.67 (0.99)	3.29 (0.92)	$t_{(10.7)}$ = 0.46, *p* = 0.66	0 (0)	5 (1 – 7)	-
GRCS	89 (41 – 109)	26 (23 – 55)	W = 3, **p < .001**	29 (23 – 69)	24 (23 – 43)	W = 90.5, *p* = .23