Imperial College London

SELF-HARM BEHAVIOUR:
UNDERSTANDING PRESENTATION, MOTIVES AND COGNITIVE MECHANISMS

Martina Di Simplicio

Mood Instability Research team
Division of Psychiatry
Department of Brain Sciences

Learning Objectives

- Understanding the multiple factors that determine complex psychopathological behaviours (e.g. self-harm)
- Understanding how cognitive mechanisms can drive behaviour (e.g. self-harm)
- Gaining a basic understanding of the role of cognitive modalities, in particular mental imagery, in psychopathology and behaviour
- Reflecting on stigma and barriers to accessing support for young people with experiences of self-harm behaviour (lived experience Q&A session / video resources)

Questions in pairs & discussion

Speak to the person sitting next to you for 5 min and answer / discuss these questions to the best of your knowledge:

- Is self-harm a psychiatric disorder?
- Does self-harm always need treatment (physical, pharmacological, psychological)?
- Do young women self-harm more than young men?
- What is the relationship between self-harm and suicide?

SH epidemiology - key points

- Transdiagnostic
- Not a mental health disorder; although Non Suicidal Self-Injury (NSSI) Disorder could be)
- Factors associate with self-harm: SES, social isolation and lack of support, negative life events, childhood emotional, physical or sexual abuse
- Psychological characteristics: entrapment, lack of belonging / perceiving oneself as a burden, black and white thinking, low self-esteem, impulsivity, hopelessness, difficulties in problem-solving, poor emotion regulation skills
- Repetition: hard to predict; more likely in those with depression, substance misuse.
- Impact on functional outcomes
- Gender?
- SH most important risk factor for suicide; Iceberg model of SH/suicide; SH or NSSI?; Shared and distinct factors

Cognitive Mechanisms in Self-harm

Slides and work by Rachel Rodrigues

Nixon et al (2002)

Reasons for Self-harm

Reasons	Percentage of Adolescents (*n*)		
	Total (*n* = 42)	Females (*n* = 36)	Males (*n* = 6)
Cope with feelings of depression	83.3 (35)	86.1 (31)	66.7 (4)
Release unbearable tension	73.8 (31)	77.8 (28)	50.0 (3)
Cope with nervousness/fear	71.4 (30)	75.0 (27)	50.0 (3)
Express frustration	71.4 (30)	75.0 (27)	50.0 (3)
Express anger/revenge	66.7 (28)	69.4 (25)	50.0 (3)
Feel pain in one area when other pain I feel is unbearable	61.9 (26)	66.7 (24)	33.3 (2)
Distraction from unpleasant memories	59.5 (25)	63.9 (23)	33.3 (2)
Punish self for being bad/bad thoughts	50.0 (21)	50.0 (18)	50.0 (3)
Stop suicidal ideation/attempt	47.6 (20)	47.2 (17)	50.0 (3)
Stop feeling alone and empty	42.9 (18)	47.2 (17)	16.7 (1)
Have control in a situation	40.5 (17)	44.4 (16)	16.7 (1)
Stop feeling numb/out of touch	40.5 (17)	41.7 (15)	33.3 (2)
No known reason/just happens	33.3 (14)	33.3 (12)	33.3 (2)
Punish self for feeling good	26.2 (11)	25.0 (9)	33.3 (2)
Other reasons	19.0 (8)	13.9 (5)	50.0 (3)
Change body image/appearance	16.7 (7)	16.7 (6)	16.7 (1)
Get care or attention from others	9.5 (4)	11.1 (4)	00.0 (0)
For excitement	7.1 (3)	5.6 (2)	16.7 (1)
Belong to a group	2.4 (1)	0.0 (0)	16.7 (1)

What we don’t know:

Who will continue self-harming?

Why can’t you just stop?

Urge / Obsession

Addictive

Relapse

Can’t / Don’t want to stop

Coping mechanism

Hiding / Shame

Getting worse / Not enough

Davis et al (2019)

Cognitive mechanisms:

Reinforcing

Nock (2002)
Chapman (2009)
Gardner et al. (2021)
Bryant et al. (2021)

Addictive

Nixon et al. (2002)
Davis et al. (2019)
Riquino et al. (2020)

Impulsive

Lockwood et al. (2017)

Compulsive

Lutz et al. (2021)
Miller et al. (2021)

Addiction model of self-harm behaviour?

Other behaviours?

Binge-purging behaviour:

- Often described as serving similar functions to self-harm, e.g. coping with distress, reducing negative affect (Islam et al., 2015; Warne et al., 2021)

- Often concurrent to self-harm behaviour
- Individuals can describe switching between both

- Young people with both self-harm and disordered eating present with increased risk of young death, as well as greater use of health services (John et al., 2021).

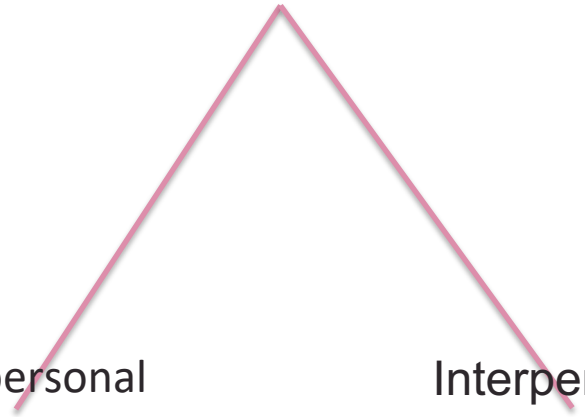



Overview

1. Intro
2. **Reinforcing**
3. Addictive
4. Impulsive & Compulsive
5. Summary

Nock's Four Function Model

Negative Reinforcement



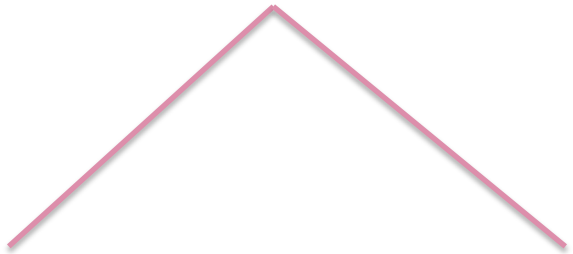
Intrapersonal

Reduce negative emotions

Interpersonal

Remove self from situations

Positive Reinforcement



Intrapersonal

Increase positive emotions

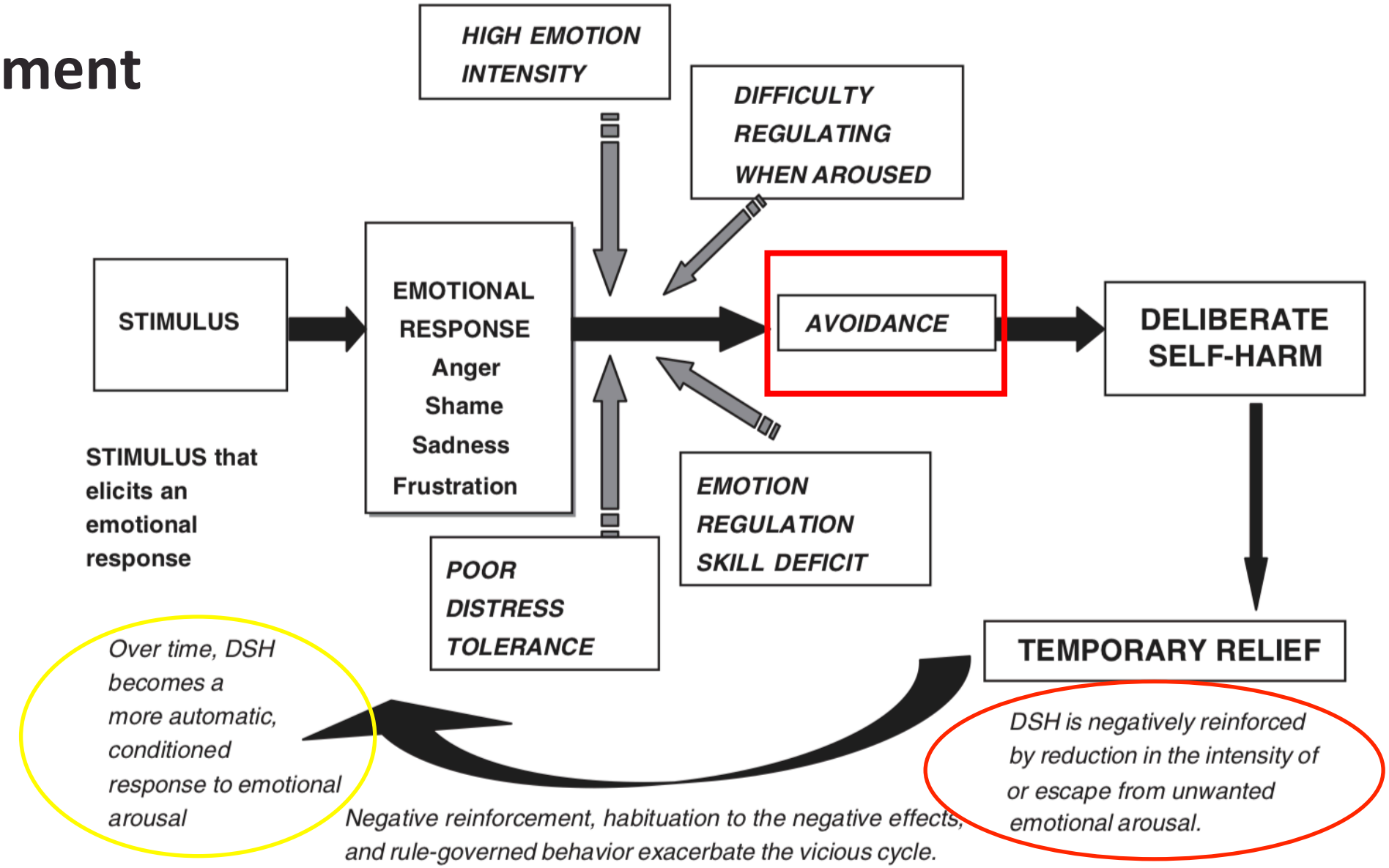
Interpersonal

Gain support or communicate

- SITBI scale to measure negative / positive reinforcement drivers (Nock, 2009; Gardner et al., 2021)
- Automatic positive and negative reinforcement can occur independently and simultaneously (Franklin et al., 2013)

- Positive reinforcement less characterised, including the relationship with reward processing

Negative reinforcement example



Chapman, Gratz & Brown (2006)

Overview

1. Intro
2. Reinforcing
3. **Addictive**
4. Impulsive & Compulsive
5. Summary

Themes Found in Online Forums

Relapse

Urge / Obsession

Coping mechanism

Can’t / Don’t want to stop

Getting worse / Not enough

Hiding / Shame

Davis et al (2019)

Systematic review of reward processing abnormalities in SH behaviour

- **Cue reactivity**:
  - attention bias for SH cues relative to neutral cues (Riquino et al., 2020)
  - greater OFC activation while viewing self-harm images compared to HCs (Plen[illegible]2012; Hooley et al., 2020)

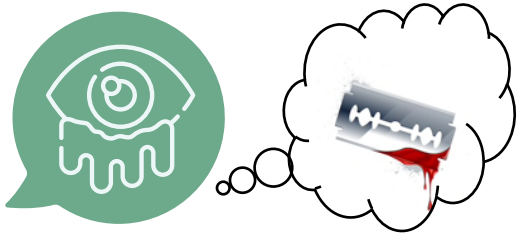
- **Reward anticipation and consumption**:
  - both greater (Poon et al., 2018; Vega et al., 2018) and low[illegible]et al., 2021) neural response in reward regions during monetary gain compared with control
  - lower activation in the putamen, amygdala and C[illegible] HCs during monetary anticipation (Sauder et al., 2016)

Not controlled for depression

- **Reward-based learning** in individuals with SH:
  - more perseverative errors in a Probabilistic Reversal Learning Task than controls (Lutz et al., 2021), especially adolescents with repetitive NSSI (4+ episodes a year)
  - driven by depression? (Zhang et al., 2022)

Rodrigues, Waheed, Amaralingam, Yavuz, Thana, Lingford-Hughes & Di Simplicio, in preparation
https://www.crd.york.ac.uk/prospero/display_record.php?ID=CRD42019132053

Attention Bias to Self-harm Cues



Motivation

Attention bias

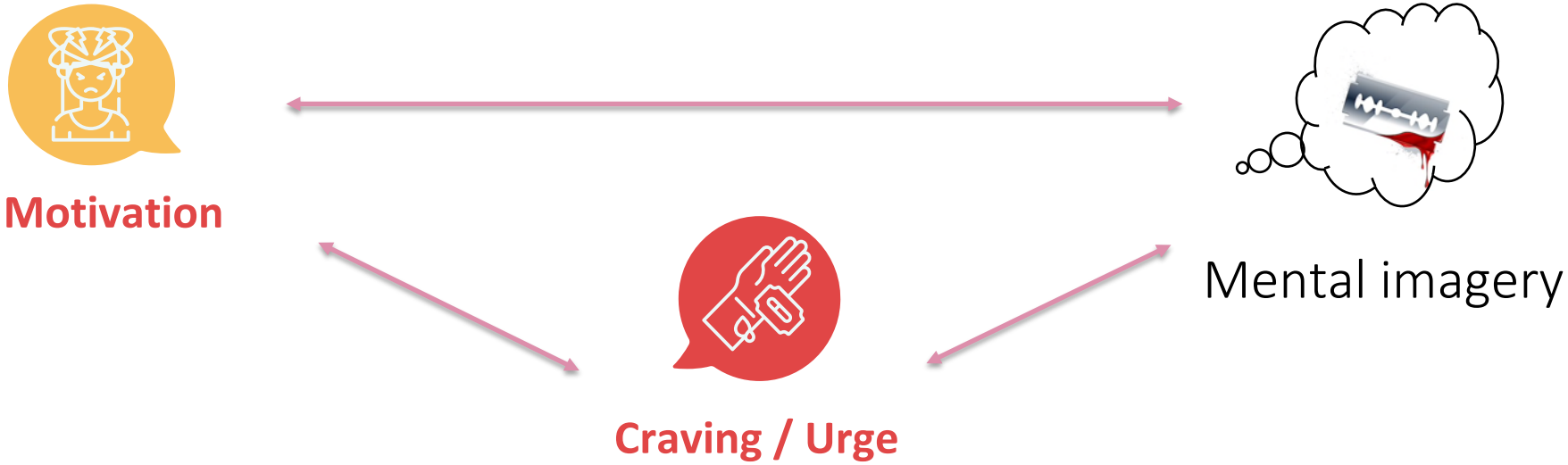
Craving / Urge

Review of attention bias in addiction (Field & Cox, 2008)

Motivational imagery

Imagery and craving

- Evidence from addiction studies (cocaine: Kilts et al., 2001; cigarettes: Hersland et al., 2007; Heishman et al., 2010; alcohol: Connor et al., 2014)



Self-harm imagery

- Imagery commonly associated with self-harm
  - Intrusive imagery prior to SH
  - Reported by 91% university students who self-harmed (Hasking et al., 2017)
  - 1/3 of general population sample completing online survey on imagery (Wesslau et al., 2015)
  - Vivid, compelling, real-like
  - Can also be dynamic (played out like a movie)
  - 1st person perspective

SH formulation

1. Contributing factors

Mother drinking; left home age 15

2. Triggers

Argument with sister on the phone

3. Emotions

Angry, sad, out of control

4. Cognitions

It's all my fault;
I have to do it (SH)

5. SH behaviour description

Cutting on forearm

6. Function

To get back in control
To feel better
To punish myself

7. Maintenance factors

Felt guilty
Feeling better didn't last

Funded by NHS National Institute for Health Research

Imaginator trial, Di Simplicio et al., 2020

Imagery and SH

1. Contributing factors

Mother drinking; left home age 15

2. Triggers

Argument with sister on the phone

Motivational amplifier

3. Emotions

Relief
Peace
Control

4. Cognitions

I have to do it;
I can't wait to be alone to do it

5. SH behaviour description

Cutting on forearm

Funded by NHS National Institute for Health Research

Imaginator trial, Di Simplicio et al., 2020

Motivational role of imagery in SH

Can mental images of SH influence engaging in SH behaviour?

- Images associate with SH enactment *(Baker & Lewis, 2013)*
- Images of SH more present in those who attempted SH/suicide than those who only thought about it *(Wetherall et al., 2018)*
- Small daily diary study of individuals with NSSID, more SH episodes reported in days with SH imagery *(Cloos et al., 2019)*
- Distressing imagery = not acting on it vs. comforting imagery = acting on it *(McEvoy et al., 2017)*

Investigating Motivational Abnormalities Guiding Self-Harm Behaviour in Young People

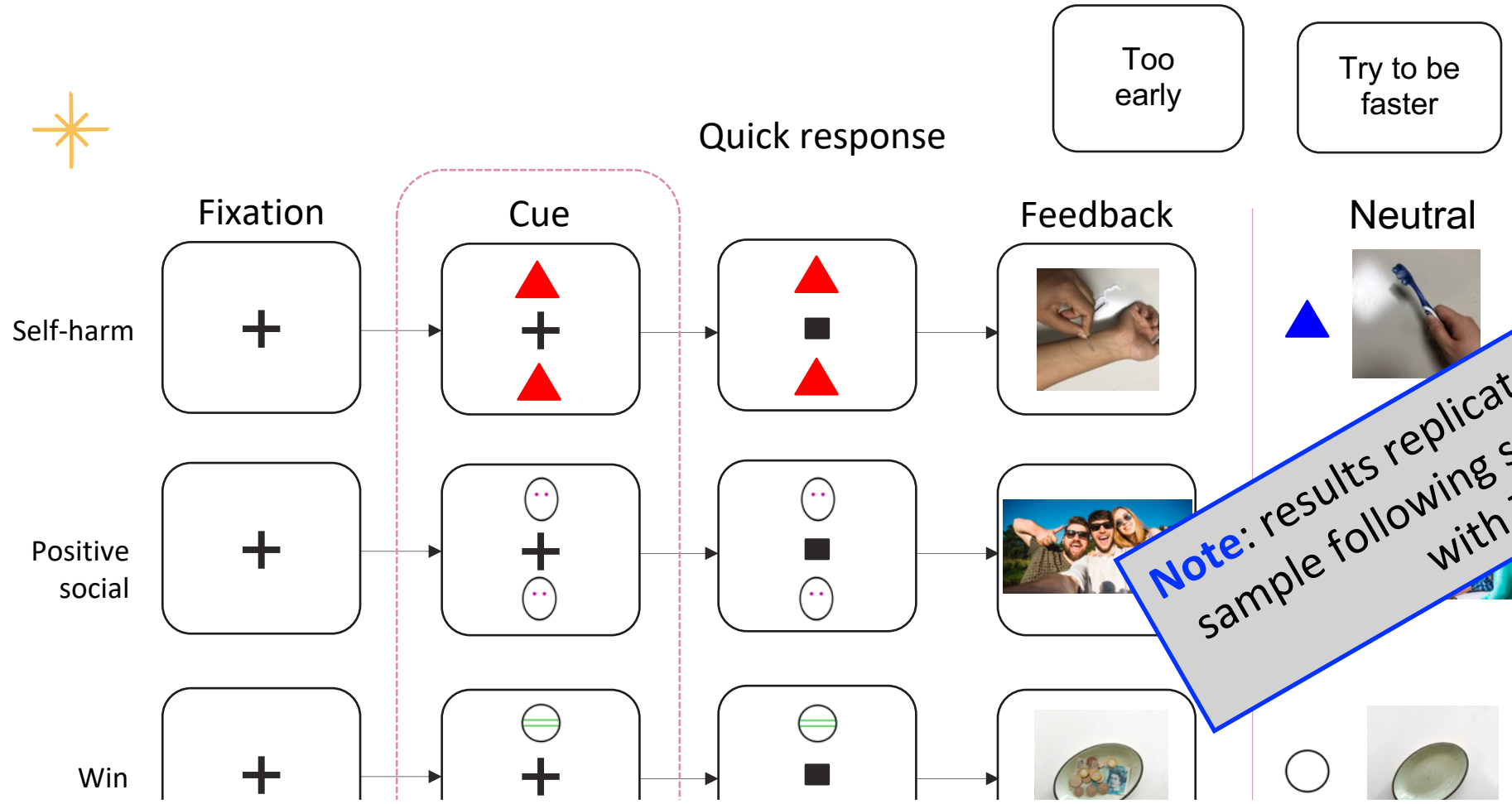
https://www.imaginestudy.org/

Compared to controls, do young people with experiences of SH behaviour present with biases in:

1. anticipation of SH cues (incentive value) and / other monetary / social rewards?
2. attention towards SH cues?
3. general reinforcement learning processes?

Exploratory: are SH characteristics (including mental imagery) associated with motivational processes abnormalities?

Incentive Delay Task

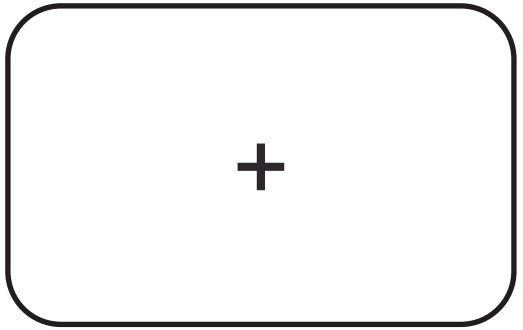


Note: results replicated in separate sample following stress induction with TSST

No btw group differences in RTs or accuracy.
No evidence of incentive sensitisation / reward anticipation biases in YP with SH.

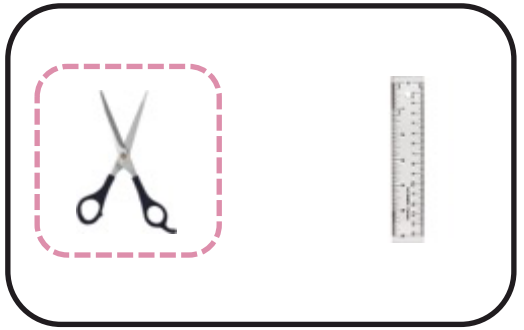
Dot Probe Task

Fixation



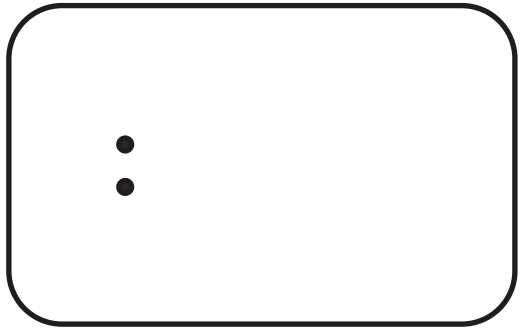
0.5s

self-harm + neutral cues



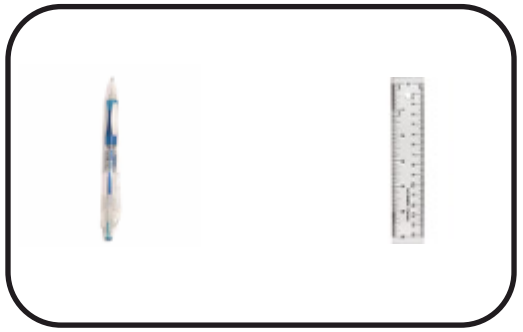
0.2s or 2s

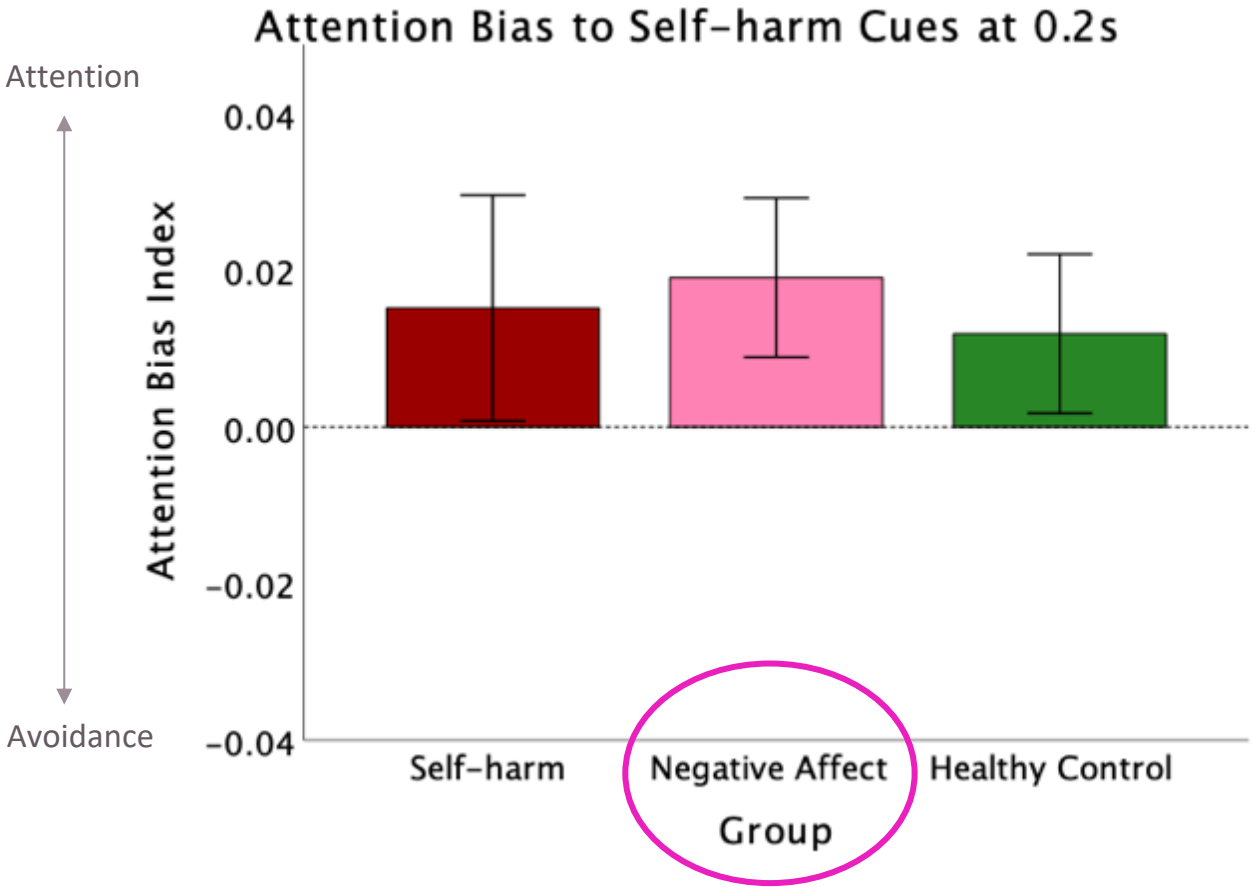
Dot probe

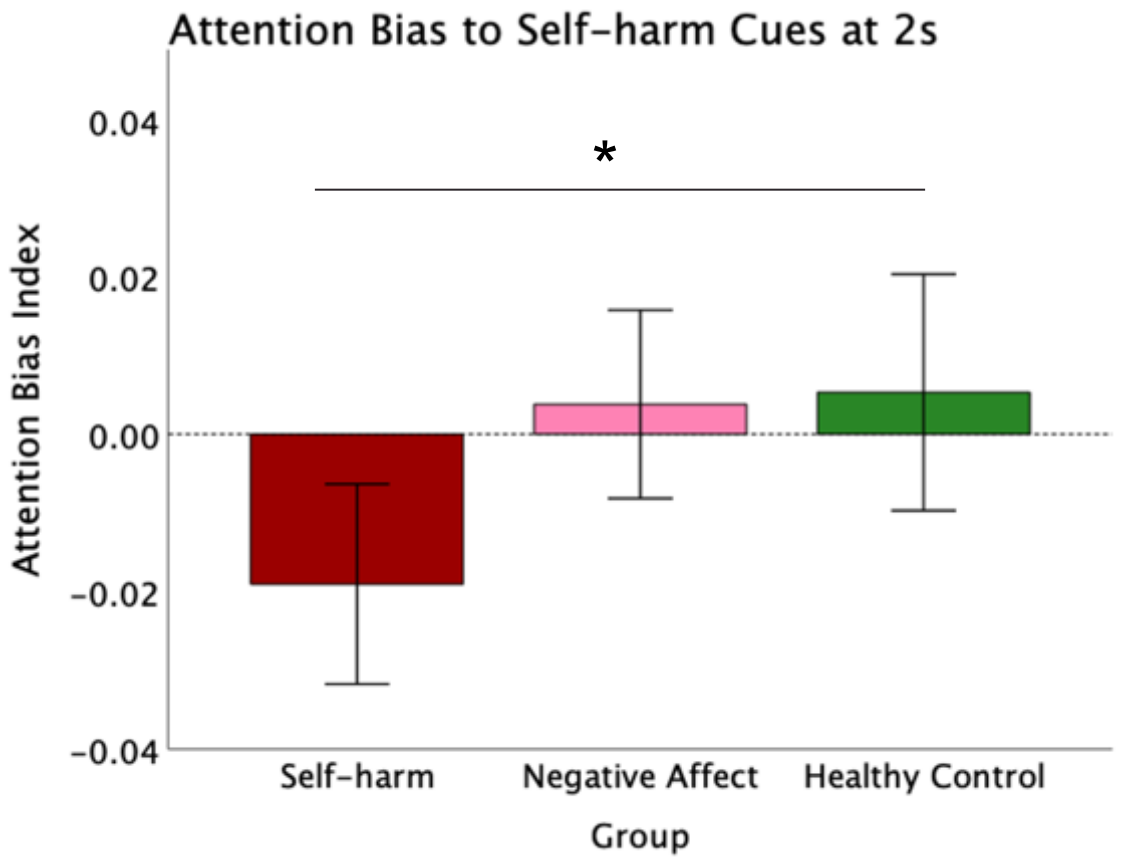


response

neutral + neutral cues



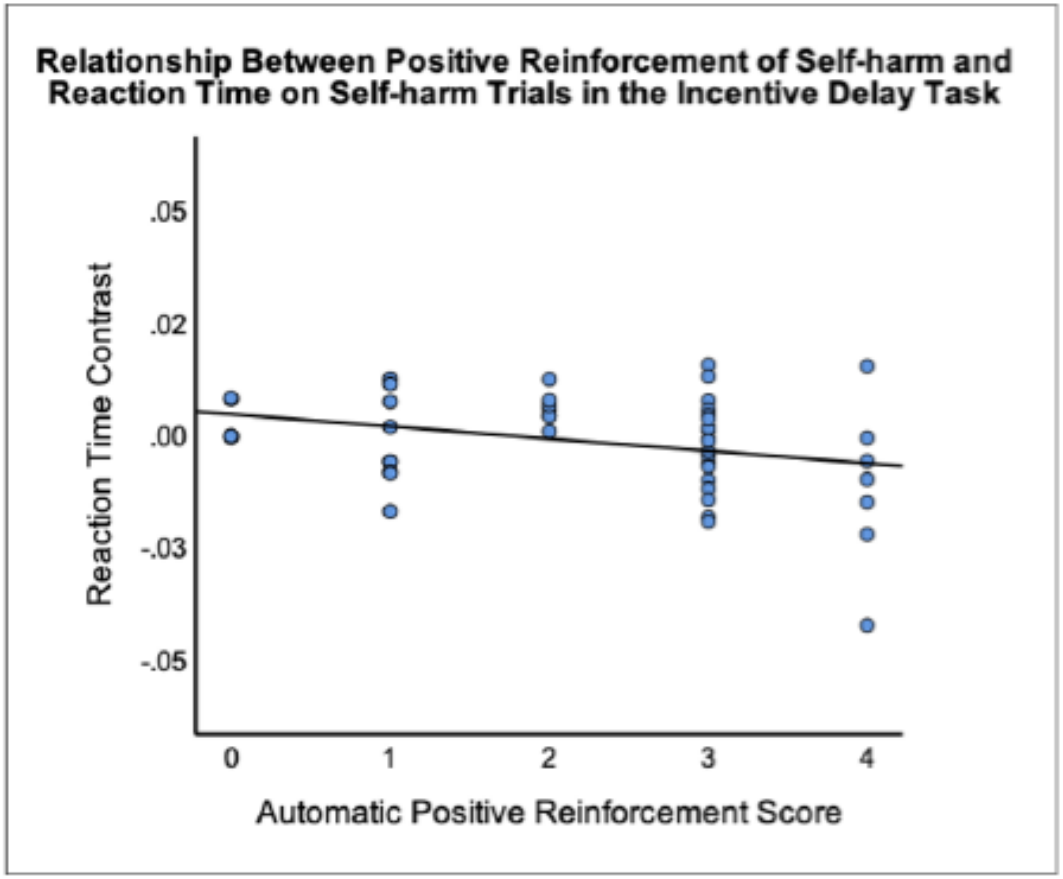


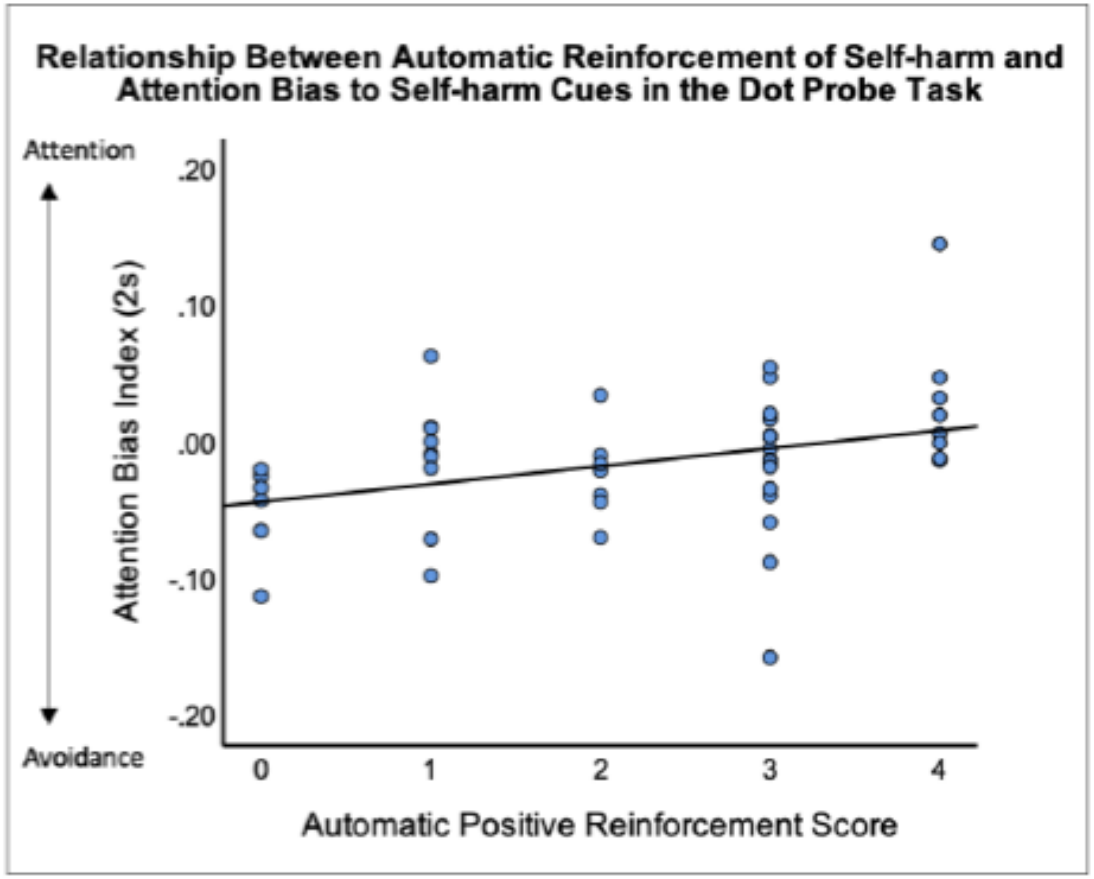


Attentional avoidance to substances cues has ben associated with recovery in addiction

Rodrigues, Mehesz, Lingford-Hughes & Di Simplicio (JAD, 2023)

Exploring associations with SH characteristics

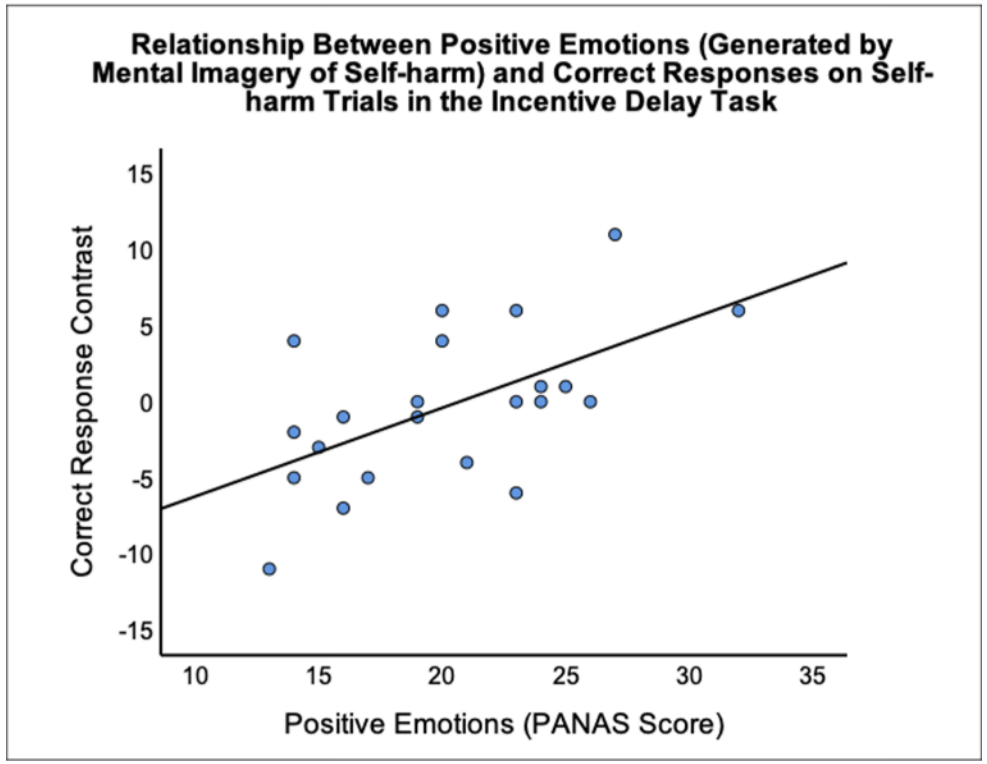




Individuals who endorse positive reinforcement as a driver of SH may present with incentive sensitisation of SH cues?

Yavuz, Rodrigues, Pascual, Lingford-Hughes & Di Simplicio (in prep)

Exploring associations with SH characteristics



Medium correlation with **SH mental imagery ratings**:

>>> those experiencing stronger positive emotions after SH mental imagery more accurate responses in SH vs neutral trials

Rodrigues, Yavuz, Pascual, Lingford-Hughes & Di Simplicio (in preparation)

Summary

- Self-harm is a reinforcing behaviour
- Most people described it as a way to regulate emotions; some people experience it as “addictive”
- Reward mechanisms (cues incentivisation and attention biases) might be involved, but only in a sub-group of those who self-harm
- What is the role of avoidance of self-harm cues?
- More research needed to understand the role of self-harm mental imagery
- Similar mechanism could be extended to other dysregulated behaviours such as binging and purging?




Impulsivity & Compulsivity Constructs

Impulsivity

‘The tendency to act prematurely, without foresight, despite adverse consequences’

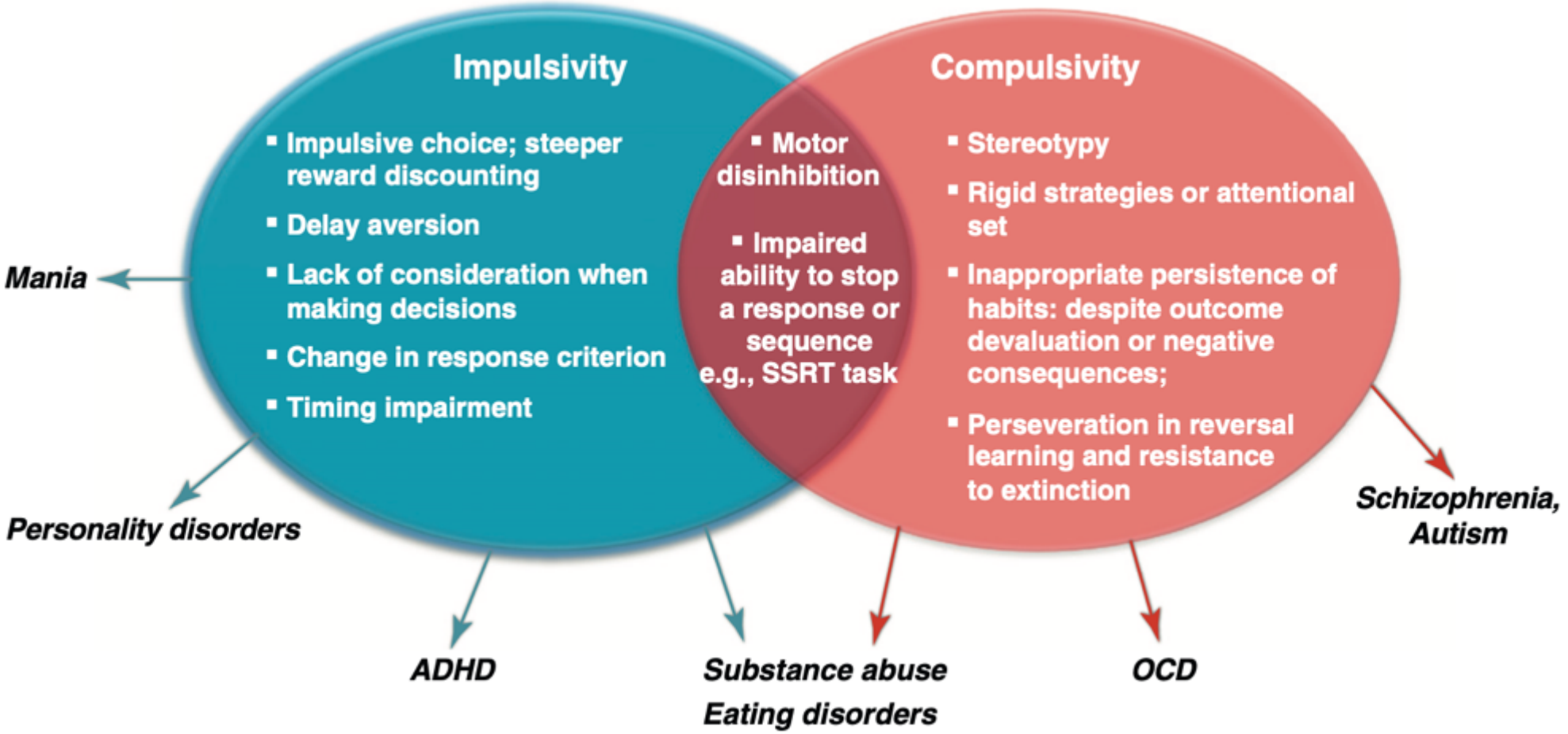
Compulsivity

‘[Where] actions are persistently repeated, despite adverse consequences.’

Robbins et al (2012)

Robbins et al (2012)

Impulsivity & Compulsivity Constructs



Self-harm

Eur Child Adolesc Psychiatry (2017) 26:387–402
DOI 10.1007/s00787-016-0915-5

REVIEW

Impulsivity and self-harm in adolescence: a systematic review

Joanna Lockwood[1,2] · David Daley[1,2] · Ellen Townsend[3] · Kapil Sayal[1,2]

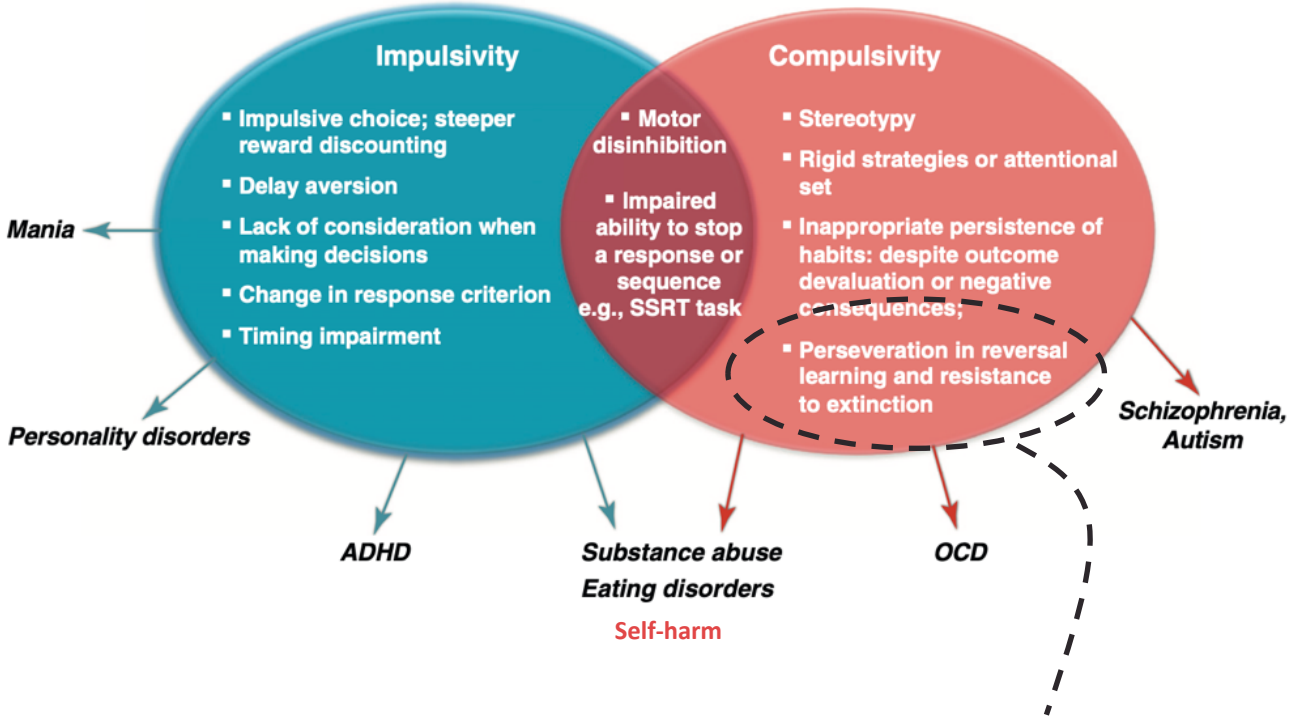
Initiation of self-harm

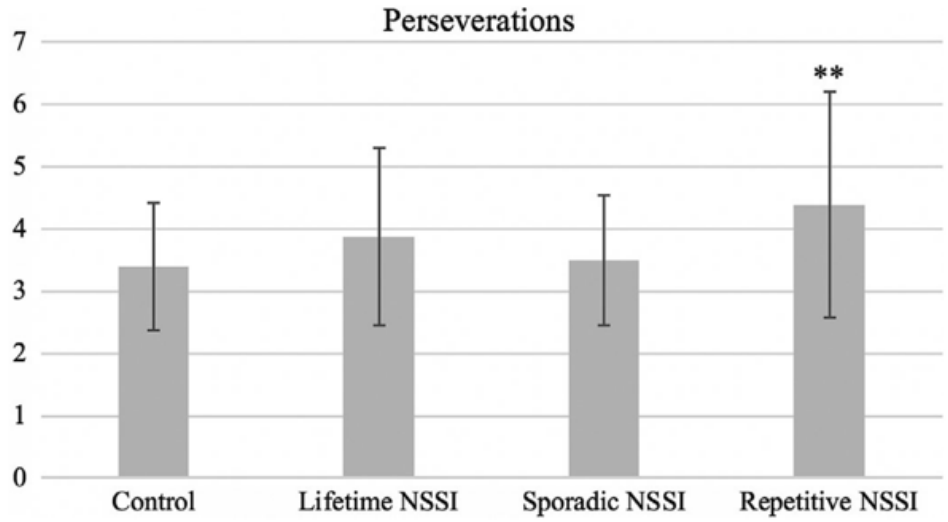
Mood based impulsivity (negative urgency, reacting rashly to negative affect)

Maintenance of self-harm

Cognitive facets of impulsivity (lack of planning and forethought)

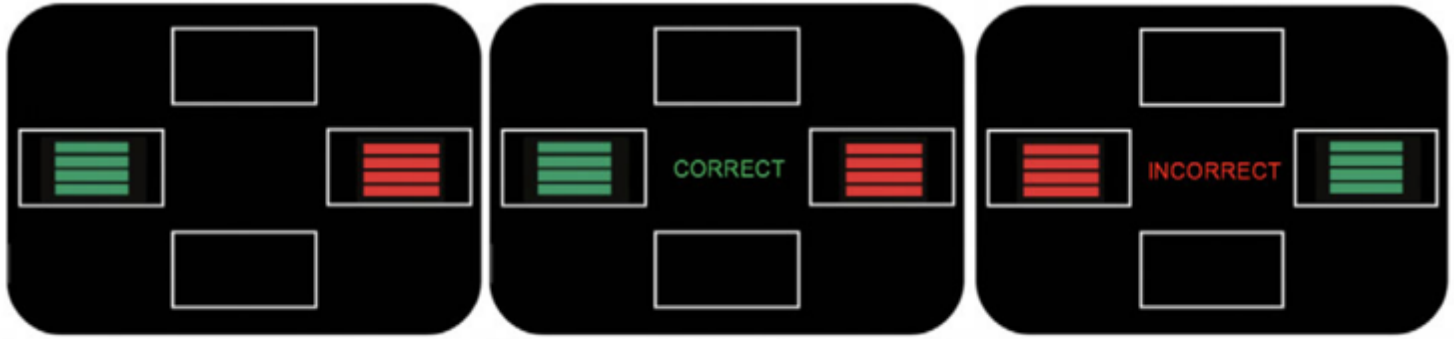
Compulsivity (Cognitive Inflexibility)



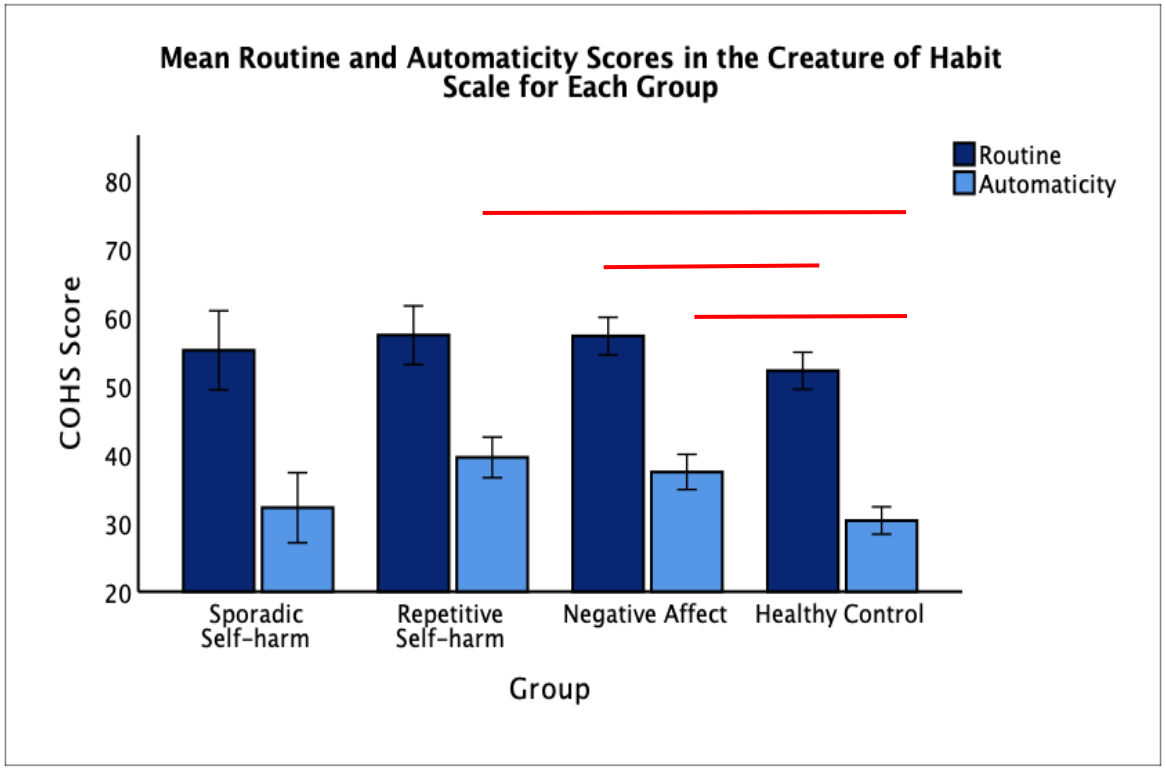


Lutz et al (2021)

Probabilistic Reversal Learning Task



Compulsivity (Cognitive Inflexibility)



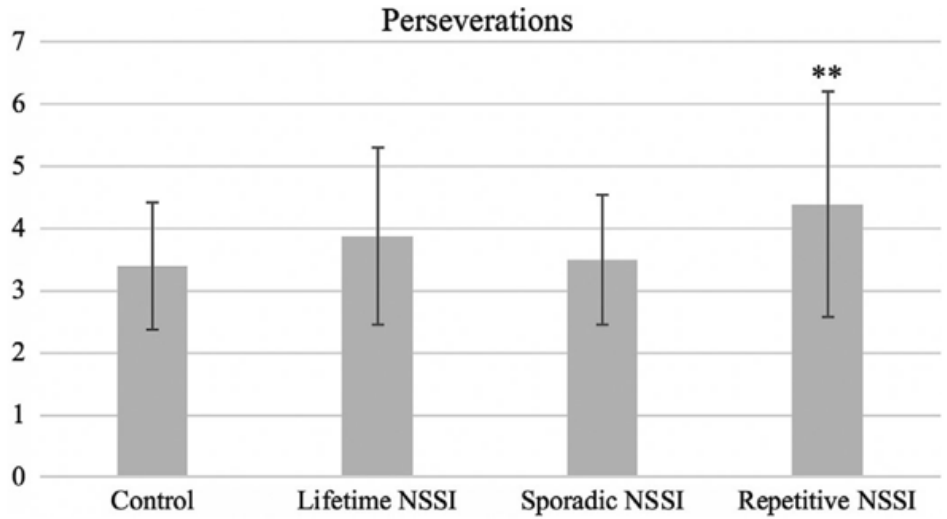
Creature of Habit Scale (COHS; Ersche et al., 2017) measures two components of habitual responding:

- Routine: tendency to engage in routine behaviours (can generalise to habits)

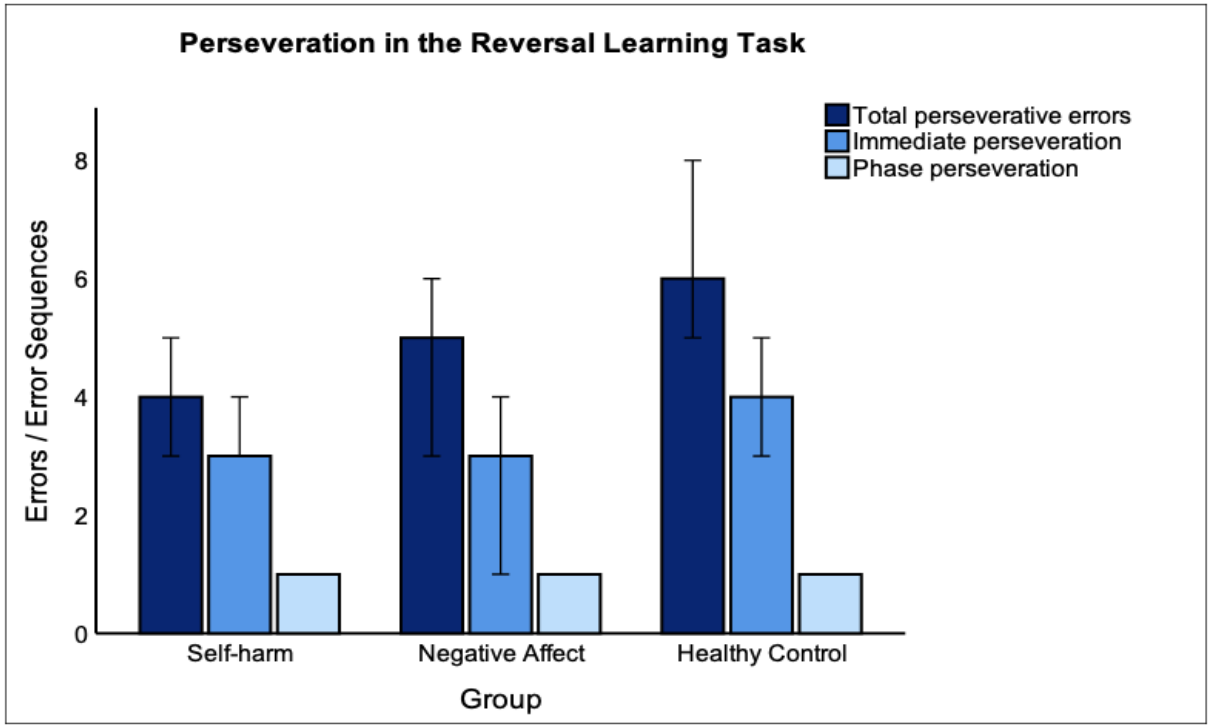
- Automaticity: tendency to engage in automatic actions (unintentional, triggered by environment cues)

Rodrigues, Lingford-Hughes, Kumar & Di Simplicio (unpublished)

Compulsivity (Cognitive Inflexibility)



Lutz et al (2021)



Young people with SH made less perseveration errors compared to the HC group.

No between-group differences when splitting by repetitive and sporadic SH.

Rodrigues, Cohen, Custovic, Hampshire, Kumar and Di Simplicio (in preparation)

Probabilistic Reversal Learning Task: computational model

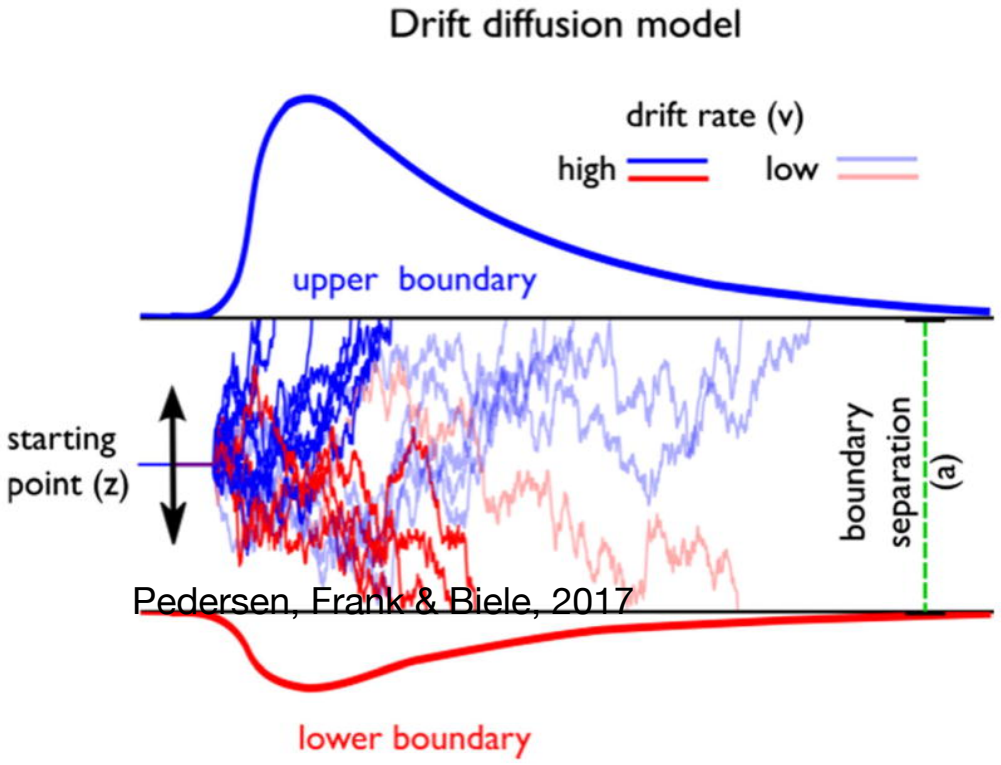
Reinforcement learning + drift diffusion model (RLDDM)

Reinforcement learning parameter:

- Learning rate (alpha)

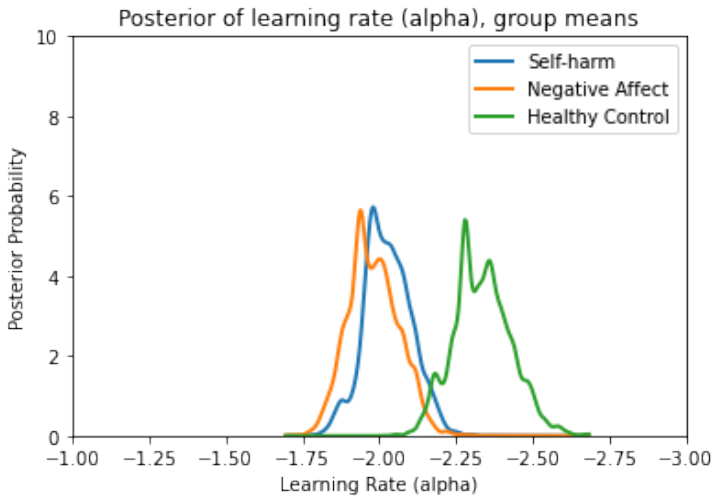
Drift diffusion parameters (decision making characteristics):

- Decision threshold (a)
- Drift rate (v)

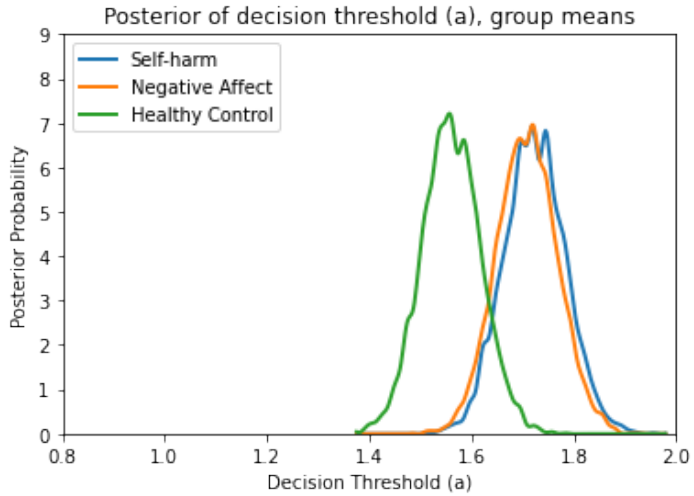


Probabilistic Reversal Learning Task: computational modelling results

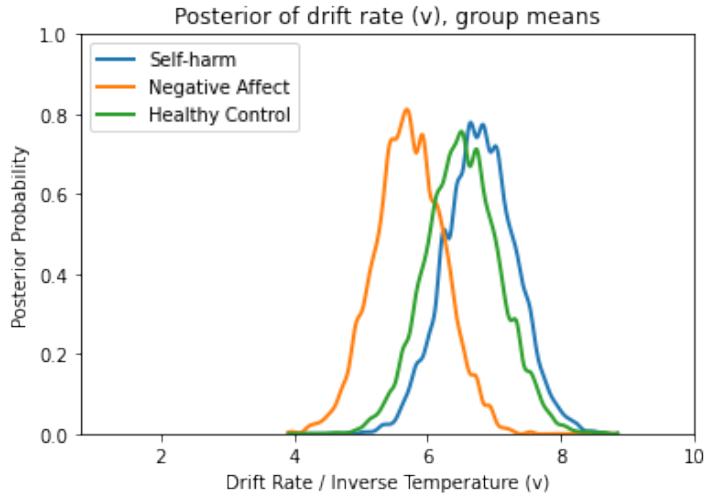
Learning rate



Decision Threshold



Drift Rate



- **SH and NA group had a higher learning rate:** greater value to more recent feedback vs reinforcement history
- **SH and NA group had a higher decision threshold**:
  - similar to anxiety, cautious response style under uncertainty (Dillahunt et al., 2022)
  - avoiding negative feedback? YPRG comment: driven by 'disliking the boos'

Rodrigues, Cohen, Custovic, Hampshire, Kumar and Di Simplicio (in preparation)

Summary

- Role of compulsivity & cognitive flexibility in SH remains to be understood
- Mechanisms underlying decision making (including relationships with impulsivity) appear more nuanced than expected
- What is the relationship between cognitive parameters and clinical parameters?
- What about individual differences?