The tendency to be attracted to reward cues ('sign-tracking') is related to more problematic compulsive behaviours, but only among individuals who are cognitively inflexible

Cognitive inflexibility moderates the association between reward-related attentional capture and compulsivity-related problems transdiagnostically

Lucy Albertella[1], Samuel Chamberlain[2], Mike Le Pelley[3], Fred Westbrook[3], Jon Grant[4], Leonardo Fontenelle[1], & Murat Yücel[1]

1. Monash University, Australia; 2. University of Cambridge, UK; 3. UNSW Sydney, Australia; 4. University of Chicago, USA

INTRODUCTION

Impulsivity and compulsivity may be understood as dimensional constructs that relate to distinct patterns of behavior. Impulsivity refers to the tendency to act without thinking. By contrast, compulsivity is the tendency to engage in repetitive, habitual behaviors despite adverse consequences. These constructs may interact to enhance risk, as supported by studies using self-report measures of impulsivity and compulsivity. No study to date has examined whether this interaction also exists at a neurocognitive level.

The current study had the following aims:

1. To examine whether two cognitive risk markers, i.e., reward-related attentional capture ('***attentional sign-tracking***') and cognitive ***inflexibility***, are associated with impulsive and/or compulsive personality traits

2. To examine whether ***attentional sign-tracking*** and ***inflexibility*** interact to predict severity of compulsivity-related problems across different behavioural domains, i.e., drinking and obsessive compulsive behaviours

METHODS

Participants were 173 adults (42% female; mean age = 34.5 years, S.D = 8.4) recruited via AMT. They completed an online visual search task (see Figure 1)[1,2] to measure attentional sign-tracking and its persistence following reversal of stimulus-reward contingencies to measure of cognitive inflexibility[3]. Questionnaires assessed trait compulsivity (CHI-T)[4,] impulsivity dimensions (S-UPPS-P)[5,] and compulsivity-related problems (BATCAP[1]; see Table 1) for drinking and obsessive-compulsive behaviours.

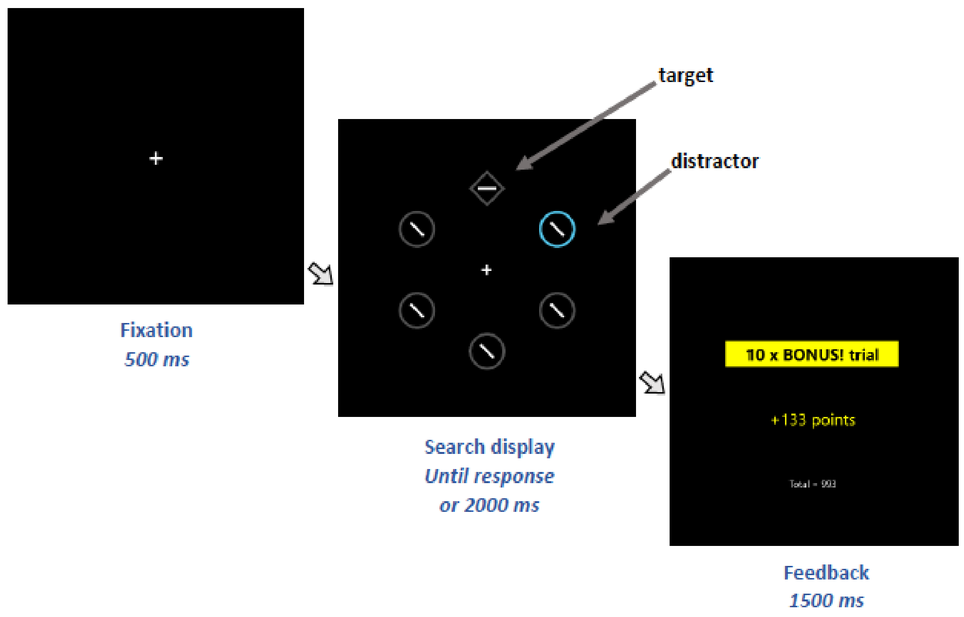

Figure 1. Sequence of trial events in the visual search task (training). Participants respond to the line (horizontal or vertical) in the diamond (target). Fast, correct responses to the target receive high reward in the presence of a high value distractor (e.g., blue circle) and low reward in the presence of a low value distractor (e.g., orange circle) or no coloured circles. **Slower response times (to target) on high value distractor trials than low value distractor trials demonstrate attentional sign-tracking.**

In the reversal phase, the stimulus-colour conditions are reversed**. Slower response times (to target) on *previously-high* distractor trials minus *previously-low* distractor trials demonstrate inflexibility,** i.e., an inability to adapt attentional biases to changing circumstances.

Table 1. Brief Assessment Tool for Compulsivity-Associated Problems (BATCAP)[1]
Items adapted from FOCI[6], YBOCS[7], and Penn Alcohol Craving Scale[8]
"For the next questions, [*insert behaviour of interest here, with examples*] will be referred to as 'these behaviours'.

In the past week:…"

a) On average, how much time was occupied by these behaviors?
b) How much distress did these behaviors cause you?
c) How hard was it for you to control these behaviors?
d) How much did these behaviors interfere with work/school, social, or family life?
e) How anxious would you become if prevented from these behaviors?
f) At its most severe point (in the past week), what was the strength of your strongest urge/craving to perform these behaviors?

A series of linear and negative binomial regressions were run for Aims 1 and 2, respectively. Significant interactions (Aim 2) were followed up using correlation analyses among flexible and inflexible groups separately.

RESULTS

Attentional sign-tracking was associated with lack of premeditation, β =18.2, p = .025 and greater trait compulsivity, β = 2.4, p < .001.

Cognitive ***inflexibility*** was associated with negative urgency (distress-driven impulsivity), β = 14.1, p = .020

Attentional sign-tracking interacted significantly with cognitive ***inflexibility*** to predict greater compulsive drinking score, χ^2 = 4.5, p = .034, and OCD score, χ^2 = 13.3, p < .001.

Attentional sign-tracking was associated with more compulsive drinking (see Fig 2) and more obsessive compulsive behaviours (see Fig 3) among cognitively ***inflexible*** participants only.

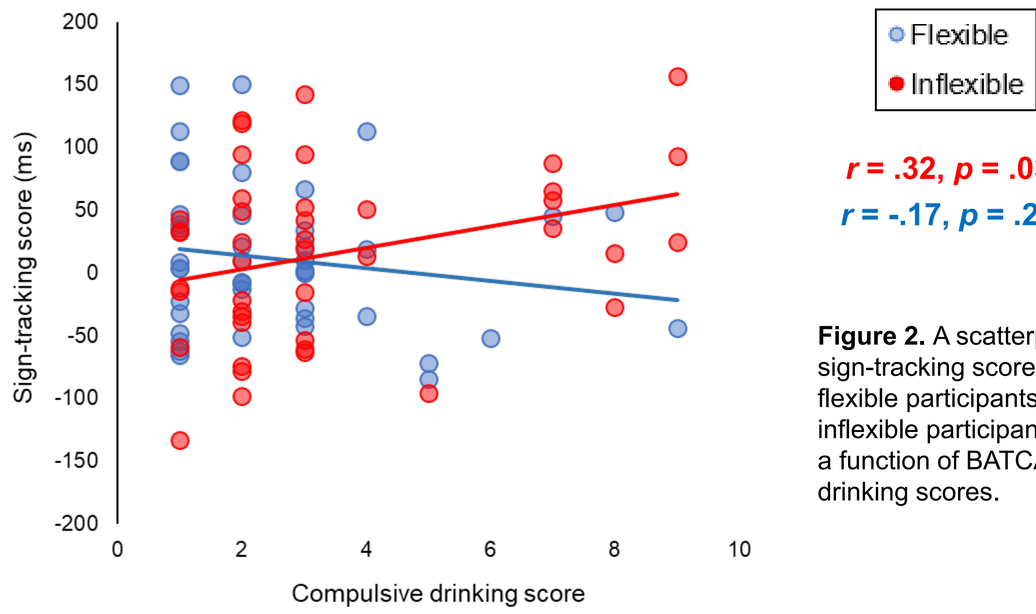

Figure 2. A scatterplot of sign-tracking scores in flexible participants and inflexible participants as a function of BATCAP drinking scores.

Sign-tracking score: Response time (to target) on high-reward distractor trials *minus* response time (to target) on low-reward distractor trials

A greater sign-tracking score indicates greater attentional capture by high reward cues relative to low or no reward cues

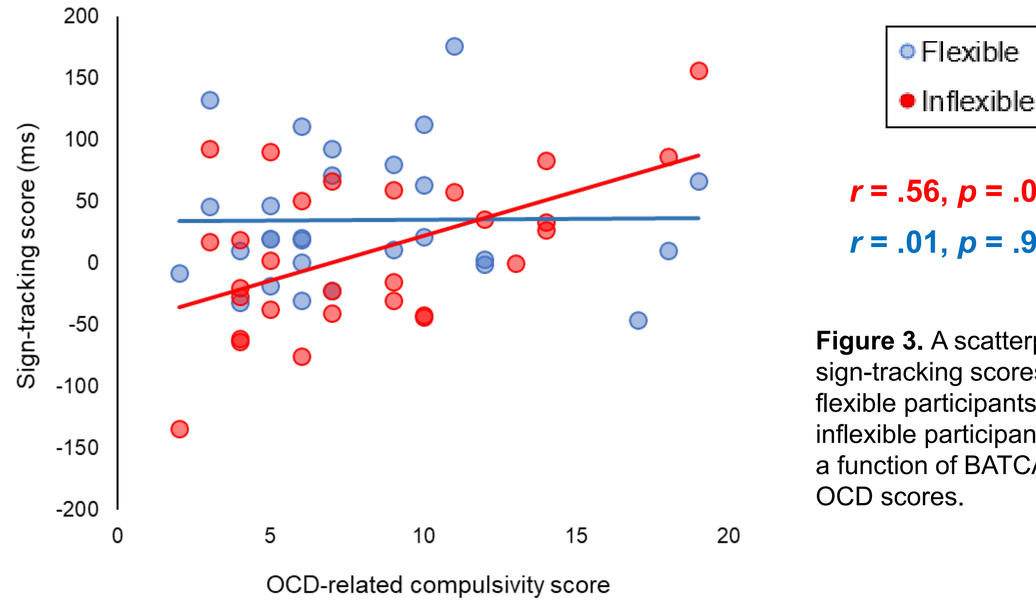

Figure 3. A scatterplot of sign-tracking scores in flexible participants and inflexible participants as a function of BATCAP OCD scores.

CONCLUSIONS

- Attentional sign-tracking was associated with lack of premeditation (acting without thinking) and trait compulsivity
- Inflexibility of attentional sign-tracking was associated with distress-driven impulsivity
- Attentional sign-tracking and its inflexibility interacted to determine more compulsive drinking and more severe obsessive compulsive behaviours
- Cognitive flexibility may be a protective factor

Cognitive flexibility training may be useful in early interventions for compulsive behaviours & distress-driven impulsivity

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The authors declare no conflict of interest

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