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

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

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) to measure attentional sign-tracking and its persistence following reversal of stimulus-reward contingencies to measure of cognitive inflexibility. Questionnaires assessed trait compulsivity (CHI-T) and impulsivity (S-UPPS-P) and compulsivity-related problems (BATCAP; see Table 1) for drinking and obsessive compulsive behaviours.

RESULTS

**Attentional sign-tracking** was associated with lack of premeditation, $\beta = 18.2, p = .025$ and greater trait compulsivity, $\beta = 2.4, p < .001$. Cognitive inflexibility was associated with negative urgency (distress-driven impulsivity), $\beta = 14.1, p = .020$

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

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.

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.

Table 1. Brief Assessment Tool for Compulsivity-Associated Problems (BATCAP)1

<table>
<thead>
<tr>
<th>Item</th>
<th>Question</th>
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<tbody>
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<td>How much distress did these behaviors cause you?</td>
</tr>
<tr>
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<td>f)</td>
<td>At its most severe point (in the past week), what was the strength of your urge/craving to perform these behaviors?</td>
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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.

![Figure 1](https://example.com/figure1.png)

***Figure 1.*** Sequence of trial events in the visual search task (training). Participants respond to the target (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.

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.

![Figure 2](https://example.com/figure2.png)

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

![Figure 3](https://example.com/figure3.png)

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**References**