

# Smartphone and internet-based inhibitory control training for problem drinkers

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## Introduction:

Inhibitory control is the (in)ability to stop, change or delay a response that is no longer appropriate. Inhibition is a fundamental construct of both impulsivity and executive functioning and is thought to play a causal role in problem drinking<sup>1</sup>. Recent evidence suggests that (dis)inhibition is not a stable trait (e.g. it fluctuates within individuals), and may also exhibit some degree of plasticity<sup>2</sup>. Given the potential causal relationship between disinhibition and alcohol use, strengthening inhibitory control may be a feasible target for behavioural interventions<sup>3</sup>. In a series of studies we are examining different methods of inhibitory control training administered via mobile devices and the internet for problem drinkers.

## Smartphone Method:

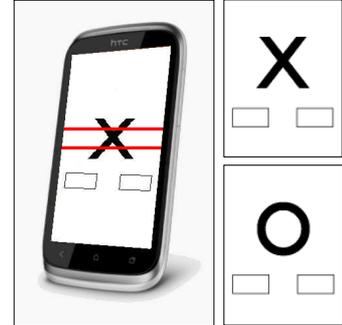
45 heavy drinkers (22 Male) with a mean age of 35.71 ( $\pm$  11.63) took part. We developed an application to administer the Stop Signal Task via a Smartphone. Participants were instructed to access the application twice per day to complete the task and record the amount of alcohol they had consumed. Standard Stop Signal Reaction Time (SSRT) was measured at baseline, one week and two weeks after training for group comparisons.

Participants were randomised to one of three groups following a brief alcohol intervention (Down Your Drink):

Standard – completed a standard Stop Signal Task for each assessment

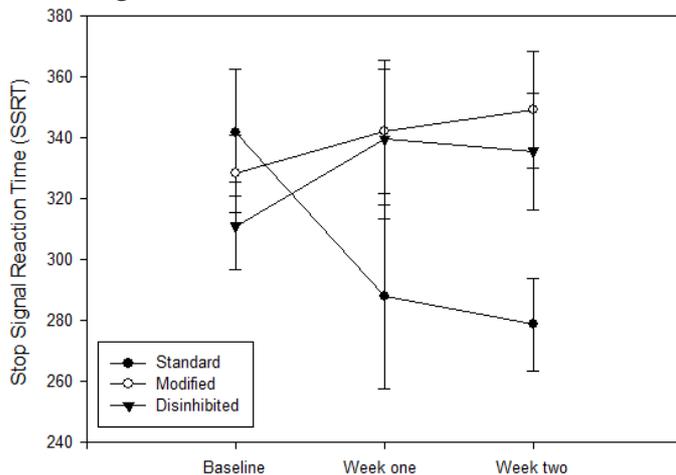
Modified – completed a task which increased in difficulty as performance improved.

Disinhibited – completed a standard reaction time task with no inhibitory component.



Smartphone application was administered using an entry level smartphone which was loaned to participants. The stop signal task was approximately 6 minutes long and presented the full 192 trial version.

Figure 1: SSRTs over time across conditions



## Results

**Compliance:** Compliance with the app was generally good. Participants completed >90% of assessments on average.

**Inhibitory Control (Fig 1):** A 3 (Time: Baseline, Week one, Week two) x 3 (Group: Standard, Modified, Disinhibited) mixed ANOVA was performed on SSRTs. There was no main effect of time ( $F(2,78) = 0.86$ ,  $p > .10$ ) but the hypothesised time x condition interaction was significant ( $F(4, 78) = 2.60$ ,  $p < .05$ ,  $np2 = .12$ ). There were no significant differences in SSRT at baseline or one week assessment between the three groups ( $p > .10$ ). At week two there was a significant difference ( $F(2,41) = 4.62$ ,  $p < .05$ ), with the standard group having quicker SSRTs compared to the modified group ( $t(27) = 2.92$ ,  $p < .01$ ) and also the disinhibited group ( $t(26) = 2.35$ ,  $p < .05$ ). There was no significant difference between the modified and disinhibited groups ( $t(25) = 0.51$ ,  $p > .10$ ).

## Alcohol Consumption:

A 2 (Time: pre-training, post-training) x 3 (Group: Standard, Modified, Disinhibited) mixed ANOVA was performed on units of alcohol consumed. There was a main effect of time ( $F(1,39) = 7.52$ ,  $p < .001$ ) but no significant time x condition interaction ( $F(2,39) = 0.87$ ,  $p > .10$ ). Over the two week study period participants reduced their alcohol consumption by approximately 11 UK units.

## Internet Method

Currently in progress is a phase two RTC contrasting different types of inhibition training (Non-specific, Cue-specific and Go/No-Go training) via the internet. This study will be the first to examine the effects of prolonged inhibitory control training (4 weeks) and whether any effects persist at significant follow-ups.

Trial registration details: ISRCTN55671858.

## Discussion

Our pilot study demonstrated that inhibitory control improves through practise compared to a no practise (disinhibition) condition. However, our modified version did not improve inhibitory control. This suggests that our method of training was ineffective and future studies may wish to focus on simply practising inhibition.

A reduction in alcohol consumption in the pilot study across conditions may suggest non-specific treatment effects, such as self monitoring alcohol consumption or contact with an intervention.

Taken together these studies suggests that using internet and smartphone technology may be low cost, viable new method of data collection and psychological treatment administration which can overcome existing barriers (e.g. geographical location) and target hard to reach groups (problem drinkers)<sup>4</sup>.

## References:

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