

Practising response inhibition in the everyday environment leads to reduced Stop Signal Reaction Time: An ecological momentary assessment study of the Stop Signal task

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INTRODUCTION:

Response inhibition, or the (in)ability to override a no longer appropriate response is a fundamental construct of impulsivity and executive cognitive functioning. The inability to control behaviour is thought to play a role in impulse control disorders such as substance misuse and Attention Deficit Hyperactivity Disorder¹ (ADHD).

Response inhibition can be measured in the laboratory using computerised tasks such as the Stop Signal Task (SST). The SST requires infrequent inhibition during a forced choice reaction time task, creating a necessary speed accuracy trade off. Test re-test reliabilities of the SST are generally low² suggesting performance can fluctuate over time. Indeed, recent research suggests that inhibition may be responsive to acute internal and environmental cues³, and also demonstrates some degree of plasticity or improvement with training⁴.

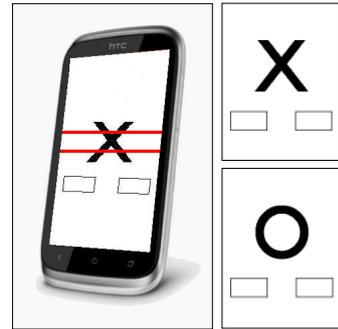
We examined the feasibility and reliability of repeated Stop Signal Task performance administered via a smartphone device.

METHOD:

100 heavy drinking participants (46 male) with a mean age of 35.69 (\pm 9.22) years took part in an Ecological Momentary Assessment study examining *intra-individual fluctuations* in inhibition and alcohol consumption. Ecological Momentary Assessment involves repeated measurements of subjects behaviour in real time, in this case outside of the laboratory.

Participants were loaned a smartphone (Android) with an application 'app' which presented the SST installed. Participants were randomly prompted by text message twice per day (once between 10am – 2pm and once between 2pm – 6 pm) for two weeks, to complete the SST.

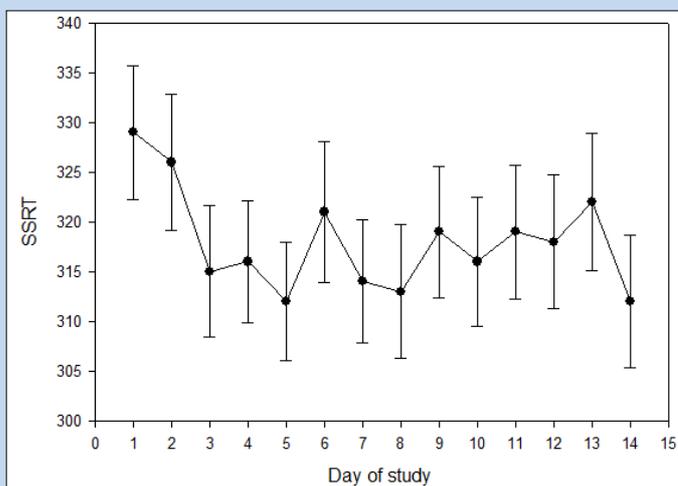
We examined three main indices of Stop signal performance: inhibition errors, 'go' reaction times (GoRTs) and Stop Signal Reaction Time (SSRT) over the two week period.



The stop signal task was approximately 6 minutes long and presented the full 192 trial version.

RESULTS:

Compliance with the task was generally good (~94% of assessments completed per time-point).



Comparisons were made between scores from day one to day fourteen.

There were significant reductions in mean GoRTs ($t = 3.77$, $p < .01$) and also SSRT ($t = 2.32$, $p < .05$, see Figure). Number of inhibition errors increased over time ($t = 4.65$, $p < .01$).

Correlations between indices (indicative of test-retest reliability) were significant although generally poor (SSRT: $r = .36$, Go RTs: $r = .46$, inhibition errors: $r = .52$).

Strong negative correlations between inhibition errors and GoRTs ($r_s \sim .93$) at all time points confirmed a speed accuracy trade off strategy was present.

DISCUSSION:

Practising inhibitory control over a two week period led to significant reductions in SSRT in a group of healthy individuals. These findings support evidence that inhibition is a transient state and can be improved.

The improvement of response inhibition through practise or training should be further investigated as a potential treatment for impulse control disorders.

Smartphone technology may provide new methods of data capture with improved ecological validity and efficiency. Specifically, this data demonstrates the SST (a fairly complex cognitive task) can be reliability translated for administration via a portable device and administered in a variety of settings.

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Mobile Cognition



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