# research snapshot

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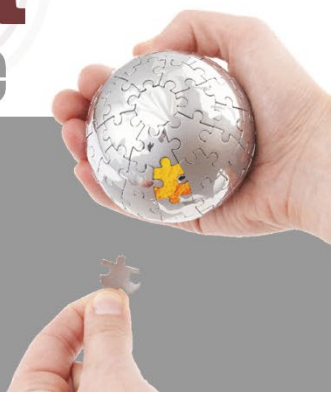
# Neurochemistry related to abilities to inhibit response and not be distracted by irrelevant information in gambling disorder



## What this research is about

Gambling disorder (GD) is the formal term used to describe a problematic relationship with gambling. People with GD have difficulty controlling their gambling even when it causes problems in their personal lives and/or financial situations. People with GD have issues regulating their behaviour and may act impulsively. Impulsivity refers to a tendency to carry out actions without regard for their consequences.

Researchers can use behavioural tasks to study impulsivity in people with GD. One such task is the Stop Signal Task (SST). The SST requires participants to press a button when they see an arrow on a screen (go trials). When the arrow is presented with a sound, they are to refrain from pressing the button (stop trials). In this way, the SST can measure someone's ability to prevent a response that is no longer appropriate (called response inhibition).

The Eriksen Flanker task measures how well someone can perform when there are distracting stimuli present. This is known as distractor interference. It has a similar procedure to the SST, but the arrow is presented with other arrows that are facing in the same direction (called a congruent trial) or in the opposite direction (called an incongruent trial).

There is not a clear answer on how someone with GD performs on these two tasks. The Eriksen Flanker task has not been tested on people with GD. The SST has been tested on people with GD, but results from these studies are not consistent. The aim of this study was to compare how people with and without GD perform on the SST and Eriksen Flanker task. The researchers then examined how performance was related to neurochemical levels in the brain.

## What you need to know

People who have a problematic relationship with gambling have gambling disorder (GD). Research suggests that people with GD have difficulties in regulating their actions. This study aimed to assess how people with GD performed on behavioural tasks. These behavioural tasks measured their response inhibition and their resistance to distractor interference. The researchers also used a brain scanning technique to see if performance on these tasks was related to neurochemical levels in specific regions of the brain. This study found that people with GD were slower during the distractor interference task. Neurochemical levels in the dorsal anterior cingulate cortex area of the brain seemed to be involved in their resistance to distractor interference.

## What the researchers did

The researchers recruited 12 men with GD and 14 men without GD for this study. For the researchers to determine how the men with GD performed on the two tasks, they needed to compare them to a control group. In this study, the control group was the group of 14 men without GD. The participants completed the Eriksen Flanker task and the SST on one day. On a different day, they underwent in vivo Magnetic Resonance Spectroscopy (MRS).

MRS is a neuroimaging technique that gathers data about small regions in the brain called voxels. In this study, the researchers were interested in three voxels that might be affected in people with GD. The three voxels were the dorsal anterior cingulate cortex (dACC), the right dorsolateral prefrontal cortex

(dIPFLC), and the posterior occipital cortex (POC). They also measured the amount of neurochemicals present in these areas. The neurochemicals were γ-aminobutyric acid (GABA+), glutamate-glutamine (Glx), and creatine (Cr). The researchers used ratios of these neurochemicals as their variables of interest (GABA+/Glx, GABA+/Cr, and Glx/Cr).

## What the researchers found

For the Eriksen Flanker task, the researchers found that participants were slower to respond across incongruent and congruent trials compared to the non-GD group. As well, for the GD group, the number of errors for the incongruent trials was positively correlated with the Glx/Cr levels in the dACC region. This means that as people with GD made more errors during the incongruent trials, the Glx/Cr ratio in the dACC region of the brain also increased. This was only seen in the GD group.

For the SST, there were no differences on performance between the GD and non-GD groups. However, for the GD group, the response times for go errors in the SST were positively correlated with GABA+/Cr and the GABA+/Glx ratios. This means that as response times grew longer, the ratios between GABA+ and Cr and between GABA+ and Glx were larger. There was also a positive correlation between the percentage of go errors in the SST and the ratio of Glx/Cr in the dACC region. All these relationships were only observed in the GD group.

In summary, the researchers found that people with GD did not show impairment when tested with the SST. However, the researchers demonstrated that people with GD show impairments in distractor interference as measured by the Eriksen Flanker task. There were also differences in the neurochemistry of people with GD compared to those without GD. This was observed mostly in the dACC region of the brain.

## How you can use this research

This research can inform future studies on people with GD. More research on the Eriksen Flanker task in people with GD is required. Further, more research is required on potential impairments of the dACC in people with GD.

## About the researchers

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## Citation

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## About Gambling Research Exchange (GREO)

Gambling Research Exchange (GREO) has partnered with the Knowledge Mobilization Unit at York University to produce Research Snapshots. GREO is an independent knowledge translation and exchange organization that aims to eliminate harm from gambling. Our goal is to support evidence-informed decision making in safer gambling policies, standards, and practices. The work we do is intended for researchers, policy makers, gambling regulators and operators, and treatment and prevention service providers.

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