

What Does the Brain Tell Us about Usable Security?

Anthony Vance

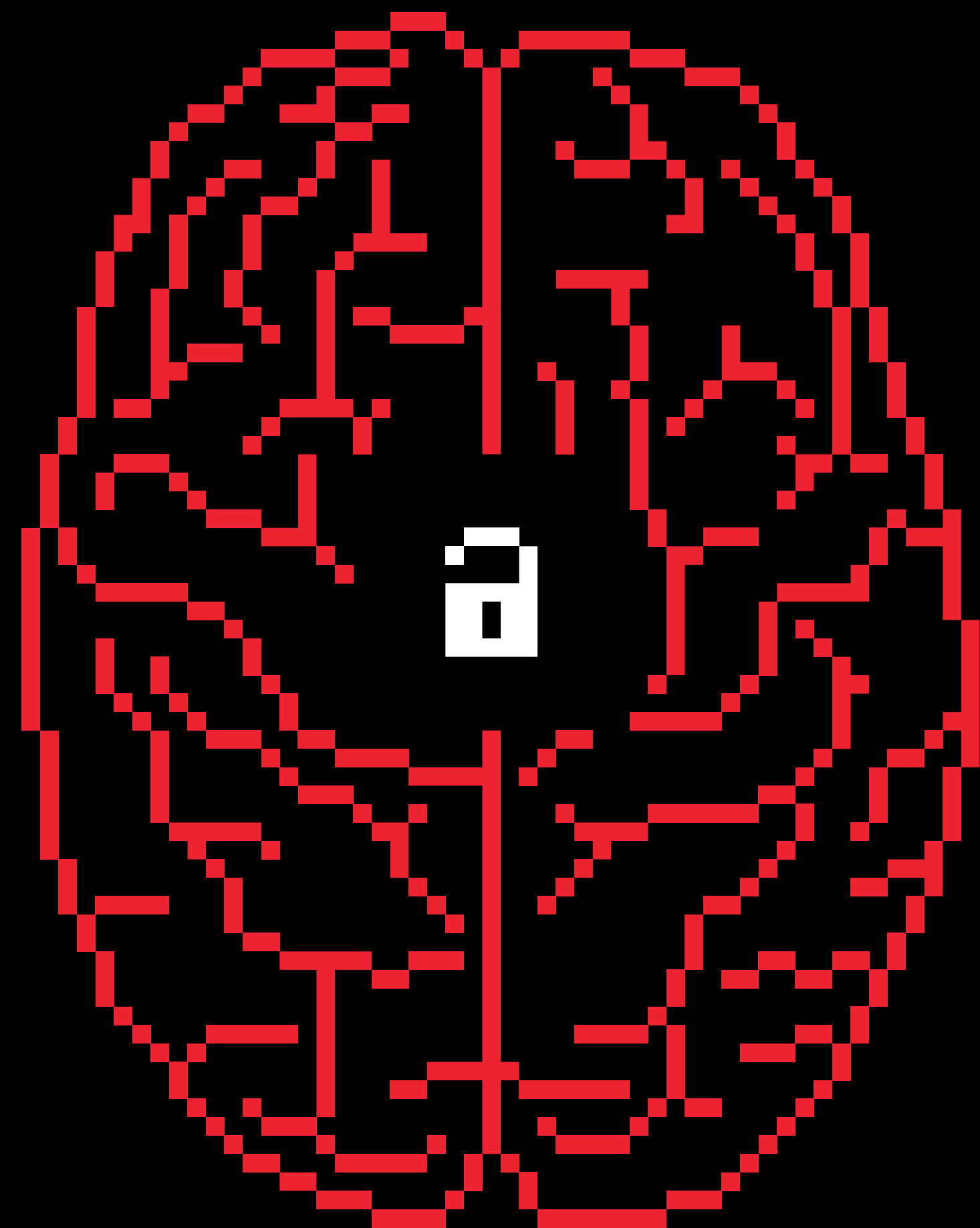
Brigham Young University

Given a choice between dancing pigs and security, users will pick dancing pigs every time.

— Felton and McGraw (1999)

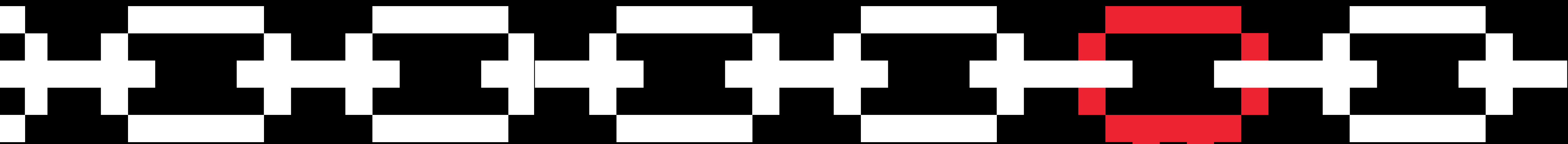
“clicky lusers”

BYU



LAB

Neurosecurity



1. Dual-task Interference
2. Habituation
3. Generalization



1 Lakh Registered

Search

Categories ▾

Channels ▾

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 1,354,413 Searchers

 87,512 Downloads

 3,587,697 Views

Most Recent



Wonderful Earth Nature Film

In the Atacama Desert, no flowers bloom, no insects buzz, and no rain ever falls. This is the driest place on Earth. There was once water here, evidence is

1. Dual-task Interference





Text Message (37/160) abc E
To: 252-332-2222
Hey, I'm going to be a little late...

Send

Menu

Microsoft AutoUpdate

The following updates are available for your Microsoft software.

Install	Name	Type	Released	Size
<input checked="" type="checkbox"/>	Microsoft AutoUpdate 3.8.16111001	Recommended	11/10/16	3.1 MB

For detailed information about this update, please visit the following Web site:

<https://go.microsoft.com/fwlink/?LinkID=831159>

Cancel

Install

How bad is this problem?





Baseline
(resting)



Memory
task

Baseline
(resting)

4382359

1. 43881358

2. 43882369

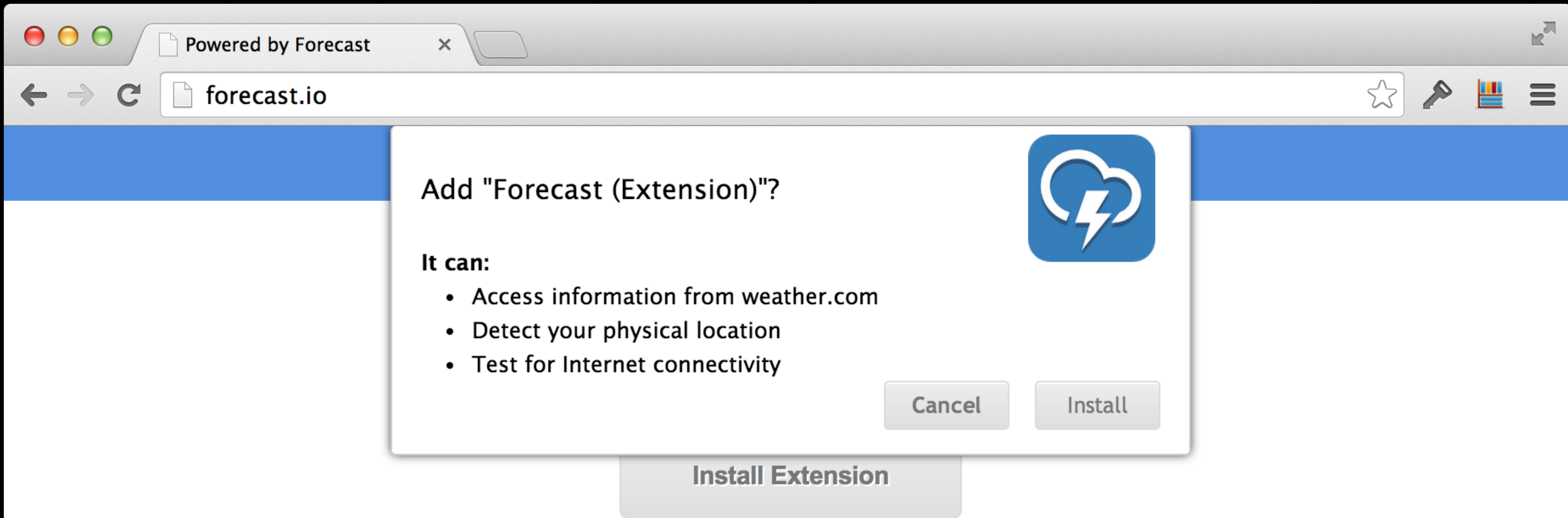
3. 43882359

4. 43883359

Security
task

Memory
task

Baseline
(resting)



Since [launching](#) Forecast, we've had thousands of developers sign up for our [Weather API](#). Our goal is to provide dead-simple access to powerful weather data, and we actually use the API ourselves in [Forecast](#) and [Dark Sky](#).

Here are some of the other great things powered by Forecast:

Check for understanding

Assessment failed. Please review the error messages and press the button on the bottom of the page to try again

Permissions

Manage your apps, extensions, and themes

Manipulate settings that specify whether websites can use features such as cookies, JavaScript, and plug-ins

Manipulate privacy-related settings ***You selected this one. Correct: this is a risky permission.***

Access all text spoken using synthesized speech

Access data you copy and paste ***You selected this one. Correct: this is a risky permission.***

Access the list of your signed-in devices ***You selected this one, but this is not a risky permission!***

Test for Internet connectivity

Access all data on your computer and the websites you visit

You didn't select this one, but this is a risky permission!

Access your data on {list of websites}

Access your tabs and browsing activity

Read and modify your browsing history ***You didn't select this one, but this is a risky permission!***

Access your data on all websites ***You selected this one. Correct: this is a risky permission.***

High DTI

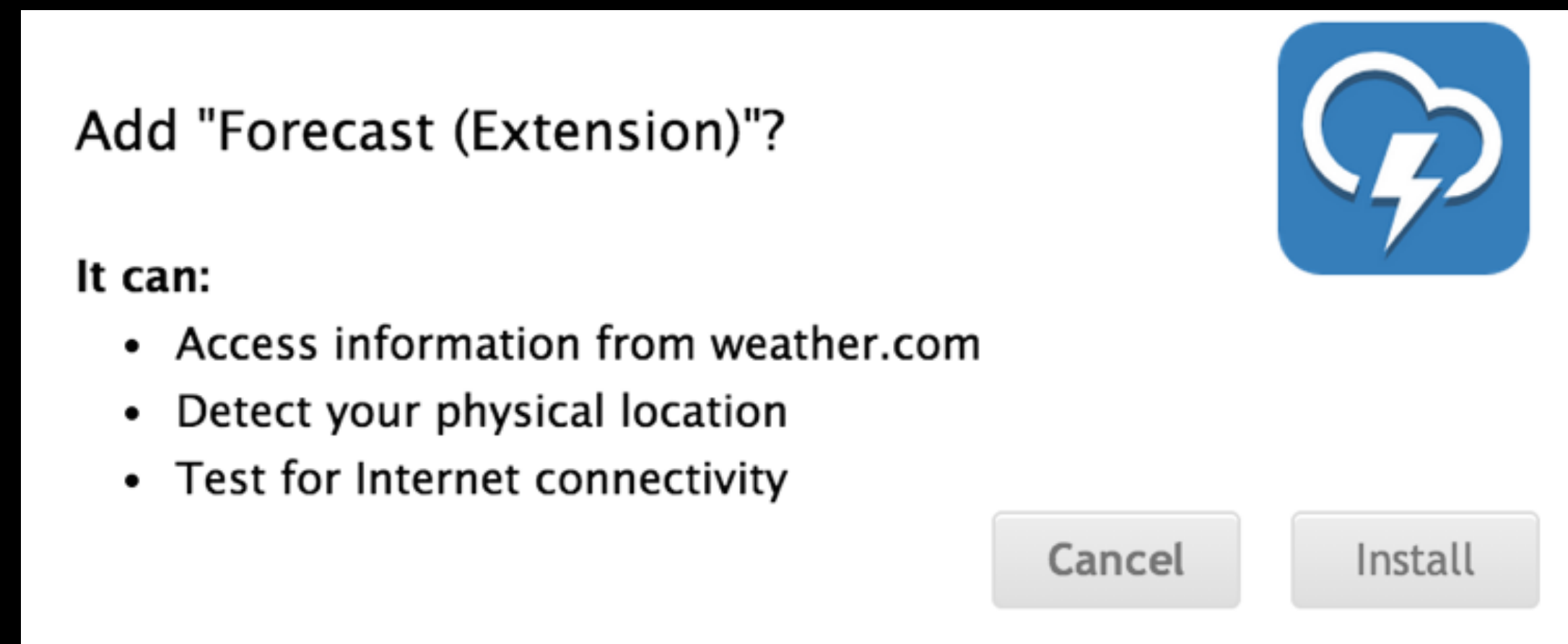
Security
task

Memory
task

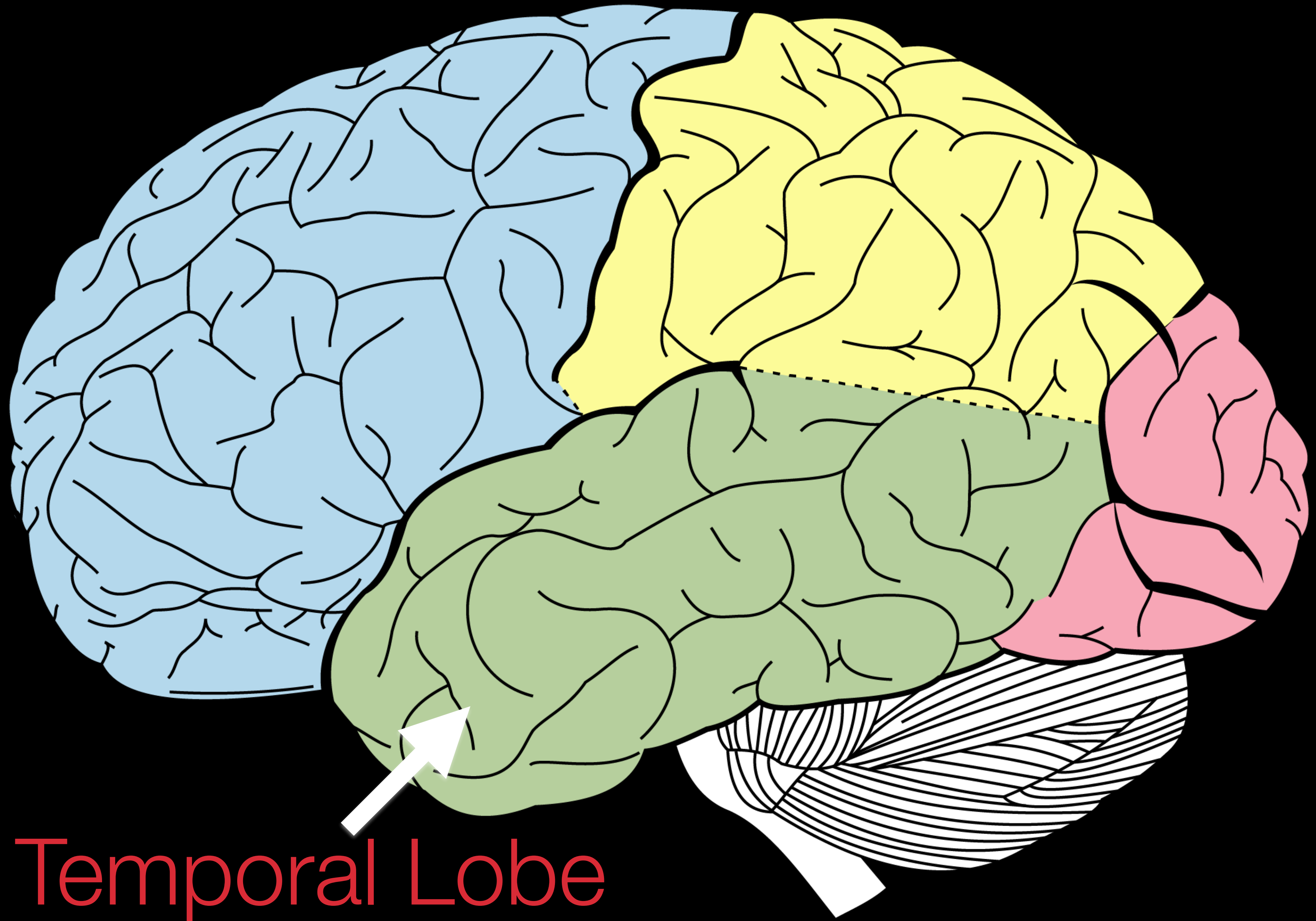
Baseline
(resting)

1. Memorize code

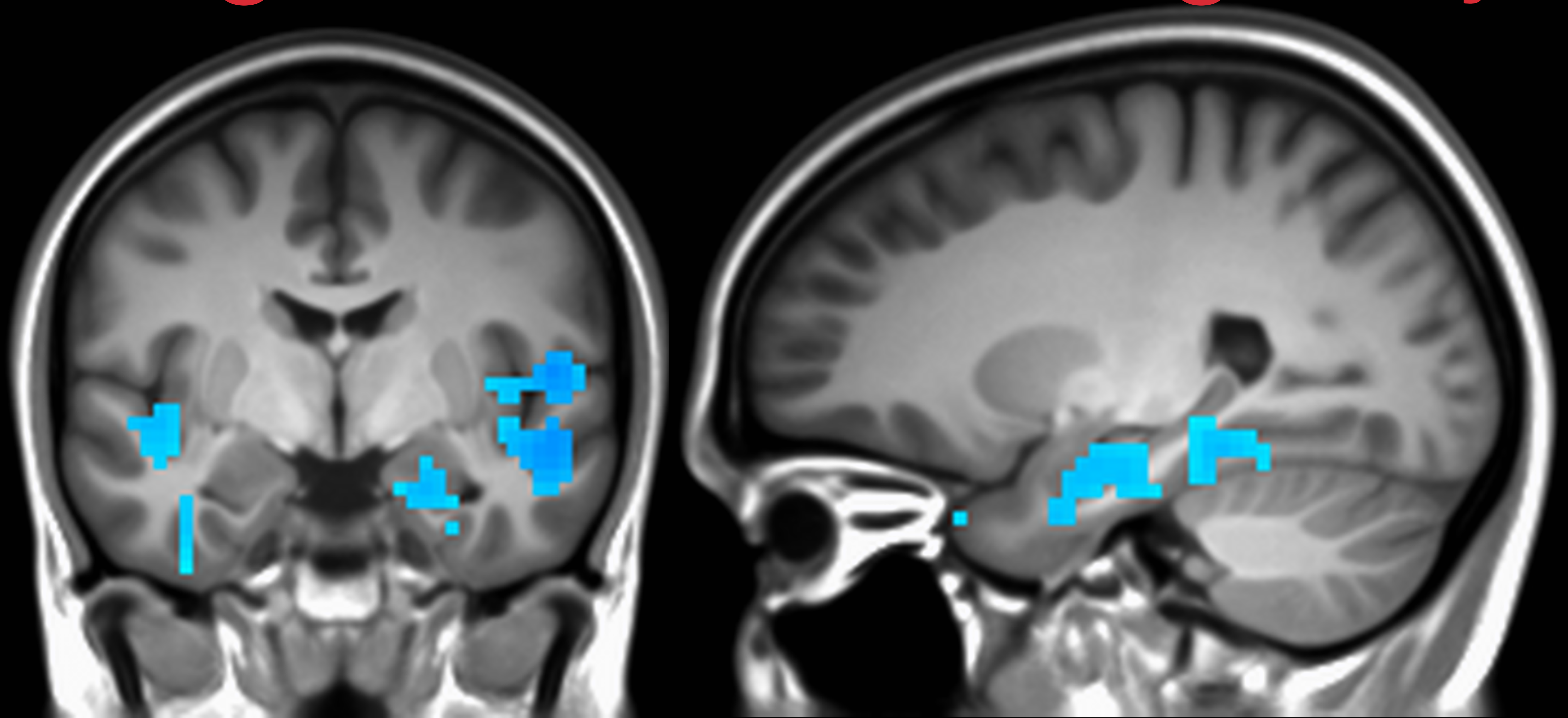
2.



3. Recall code



High DTI vs. Warning Only

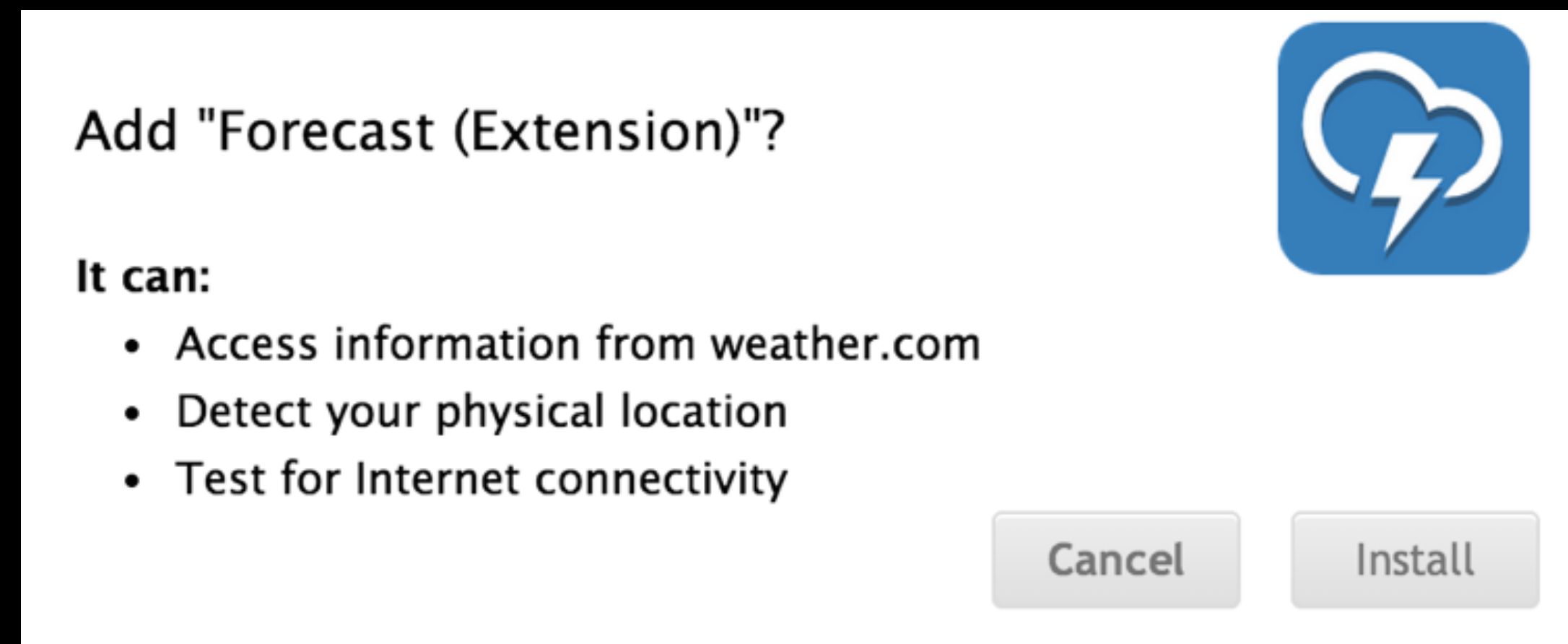


Security Task Performance

Treatment	Warning Disregard
High-DTI	22.9%
Warning-Only	7.4%

1. Memorize code

2.

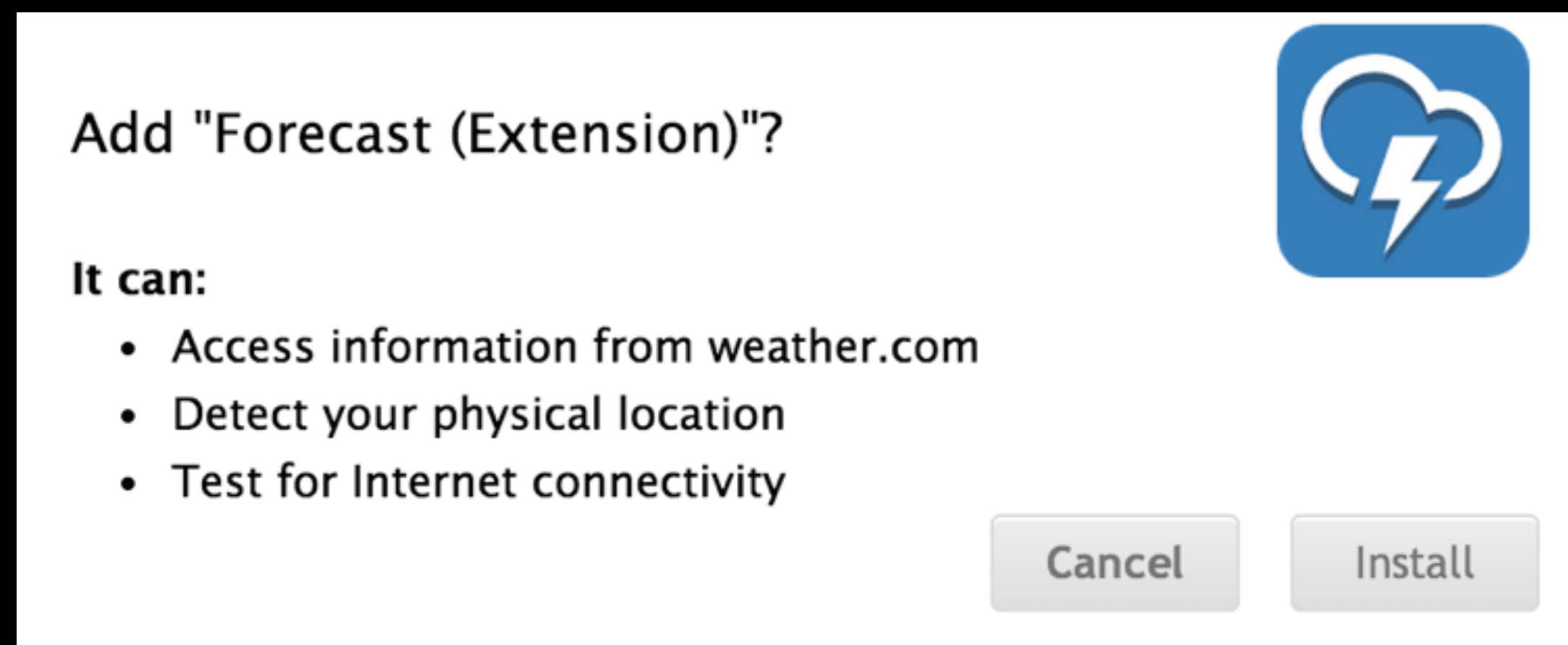


3. Recall code

1. Memorize code

2. Recall code

3.



Security Task Performance

Treatment	Warning Disregard
High-DTI	22.9%
Low-DTI	8.8%
Warning-Only	7.4%



chrome



Security error



atom-airsoft.fi/wp-content/plugins/jetpack/Westpac/west/




Phishing attack ahead

Attackers on **atom-airsoft.fi** might try to trick you to steal your information (for example, passwords, messages, or credit cards).



Automatically report details of possible security incidents to Google. [Privacy policy](#)

[Details](#)

[Back to safety](#)

 Chrome has detected unusual behavior


Is Chrome crashing, showing unusual startup pages, toolbars, or unexpected ads you can't get rid of, or otherwise changing your browsing experience? You may be able to fix the problem by running the Chrome Cleanup Tool.




[Google Search](#) [I'm Feeling Lucky](#)



 Chrome has detected unusual behavior

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 **Run Chrome Cleanup Tool**

Dismiss





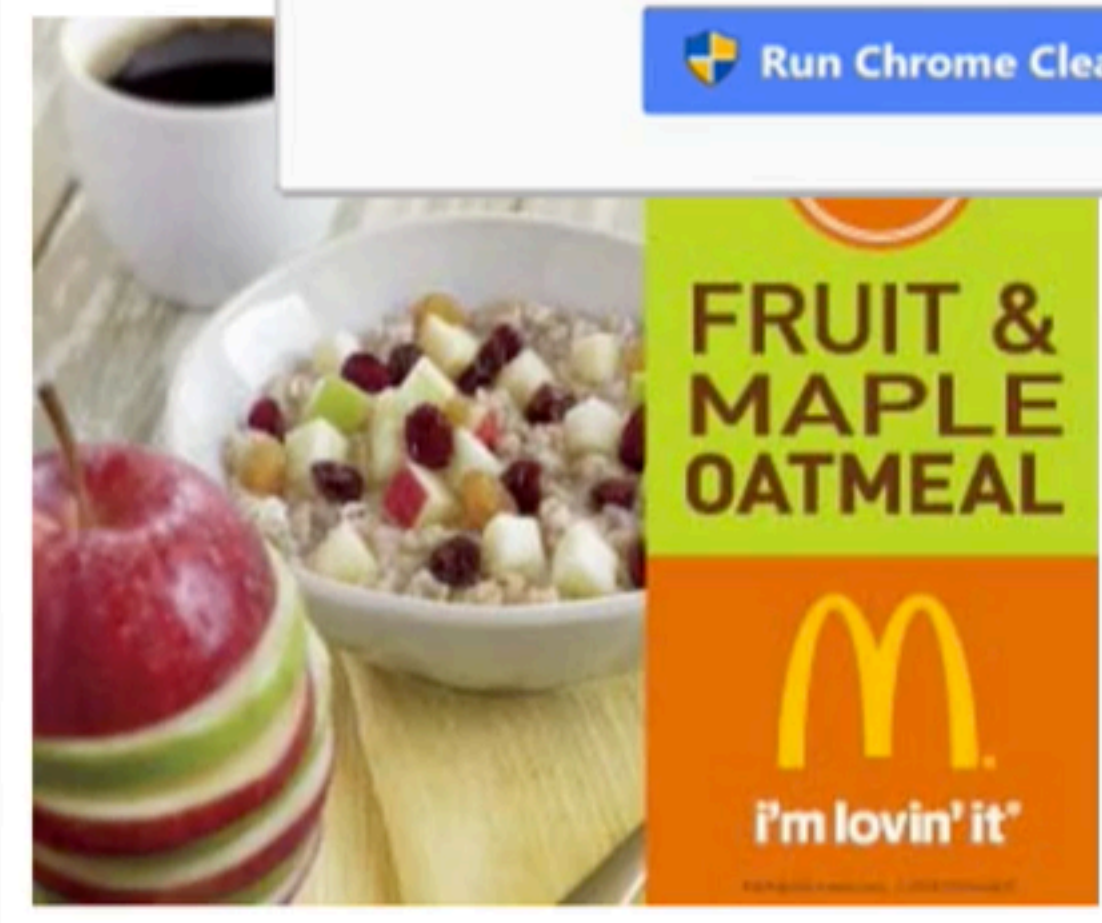
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[Run Chrome Cleanup Tool](#) [Dismiss](#)



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Wonderful Earth Nature Film

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Low-DTI times

After a video

On loading of a page

Waiting for web-based task
to complete

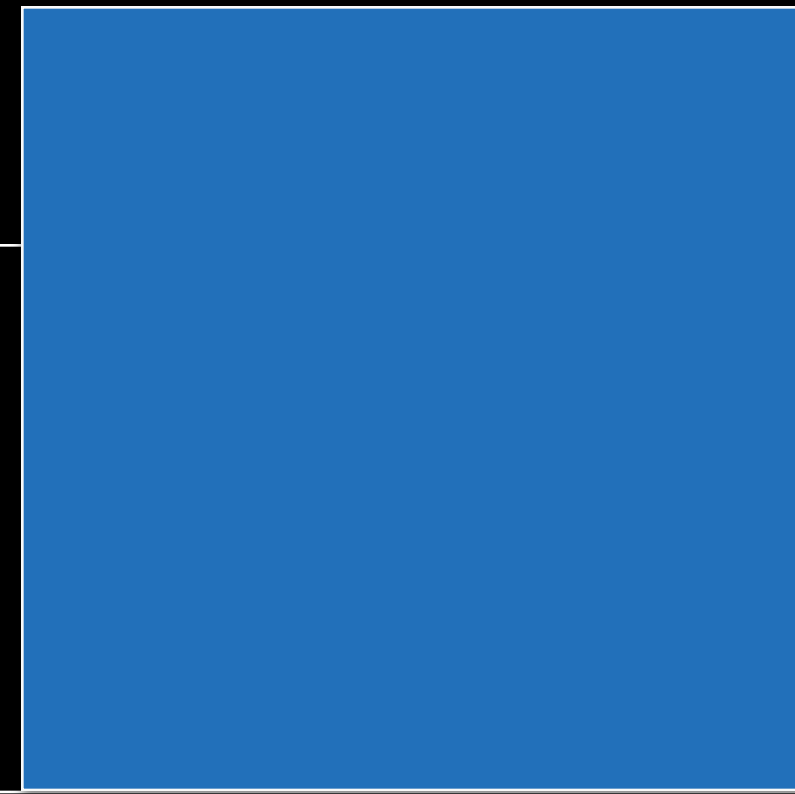
Percentage of Disregard Ranking		
Code	Condition	Disregarded
Low-DTI Conditions		
LowDTI-5	Low-DTI: Waiting for page load	22%
LowDTI-4	Low-DTI: While processing	24%
LowDTI-2	Low-DTI: After video	44%
LowDTI-1	Low-DTI: On first page load	45%
LowDTI-3	Low-DTI: Switching domains	46%
	Average	36%
High-DTI Conditions		
HighDTI-4	High-DTI: On the way to close window	74%
HighDTI-2	High-DTI: While typing	78%
HighDTI-1	High-DTI: During video	79%
HighDTI-3	High-DTI: While transferring information	87%
	Average	80%

Security Message Disregard

100%
75%
50%
25%
0%

Low-DTI

High-DTI



Take-aways

1. The brain isn't good at handling interruptions.

2. Timing a security message to display at a low-DTI results in marked improvement.

2. Habituation





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<https://go.microsoft.com/fwlink/?LinkID=831159>

Cancel

Install

How bad is this problem?

Internet Explorer Security

A website wants to open web content using this program on your computer

This program does not have a valid digital signature that verifies its publisher. This program will open outside of Protected mode, putting your computer at risk. You should only run programs from publishers you trust.

Desktop Defender 2010

Spyware Warning

Your online guard helps to stop unauthorized changes to your computer.

Don't allow

PuTTY Security Alert

The server's host key is not cached in the registry. There have no guarantee that the server is the host you think it is. The server's rsa2 key fingerprint is: ssh-rsa 2048 72:5b:51:06:04:79:99:b2:3a: If you trust this host, hit Yes to add the key to the cache and carry on connecting. If you do not trust this host, hit Cancel to abort the connection.

Warning - Security

The application's digital signature cannot be verified. Do you want to run the application?

Name: oracle.forms.webutil.common.RegisterWebUtil

Publisher: UNKNOWN

From: https://hawkinb.sju.edu

Always trust content from this publisher

OK Cancel << Details

Windows Security

Your credentials did not work

The credentials that were used to connect to 172.27.0.28 did not work. Please enter new credentials.

DEV\administrator

Use another account

Remember my credentials

The logon attempt failed

OK Cancel

Add "Forecast (Extension)"?

It can:

- Access all data on your computer and the websites you visit
- Access your data on all websites
- Detect your physical location

Cancel Install

Microsoft Windows

Windows detected a hard disk problem

Back up your files immediately to prevent information loss, and then contact the computer manufacturer to determine if you need to repair or replace the disk.

Start the backup process

Ask me again later

If the disk fails before the next warning, you could lose all of the programs and documents on the disk.

Show details Cancel

Security Warning

Warning: You are installing software that contains unsigned content. The authenticity or validity of this software cannot be established. Do you want to continue with the installation?

OK Cancel

Microsoft Security Essentials Alert

Potential threat details

Microsoft Security Essentials detected potential threats that might compromise your privacy or damage your computer. Your access to these items may be suspended until you take an action. Click 'Show details' to learn more. [What do the alert levels mean?](#)

Detected items	Alert level	Recommendation	Status
DDoS:Win32/AFtp	Severe	Remove	Active

Show details >> Clean computer Apply actions Close

Opening mpam-fe.exe

You have chosen to open:

mpam-fe.exe

which is: Binary File (80.9 MB)

from: http://definitionupdates.micr...

Would you like to save this file?

Warning - Security

The application's digital signature cannot be verified. Do you want to run the application?

Name: oracle.forms.webutil.common.RegisterWebUtil

Publisher: UNKNOWN

From: https://hawkinb.sju.edu

Always trust content from this publisher

Run Cancel

Open File - Security Warning

Do you want to run this file?

Name: ...ack

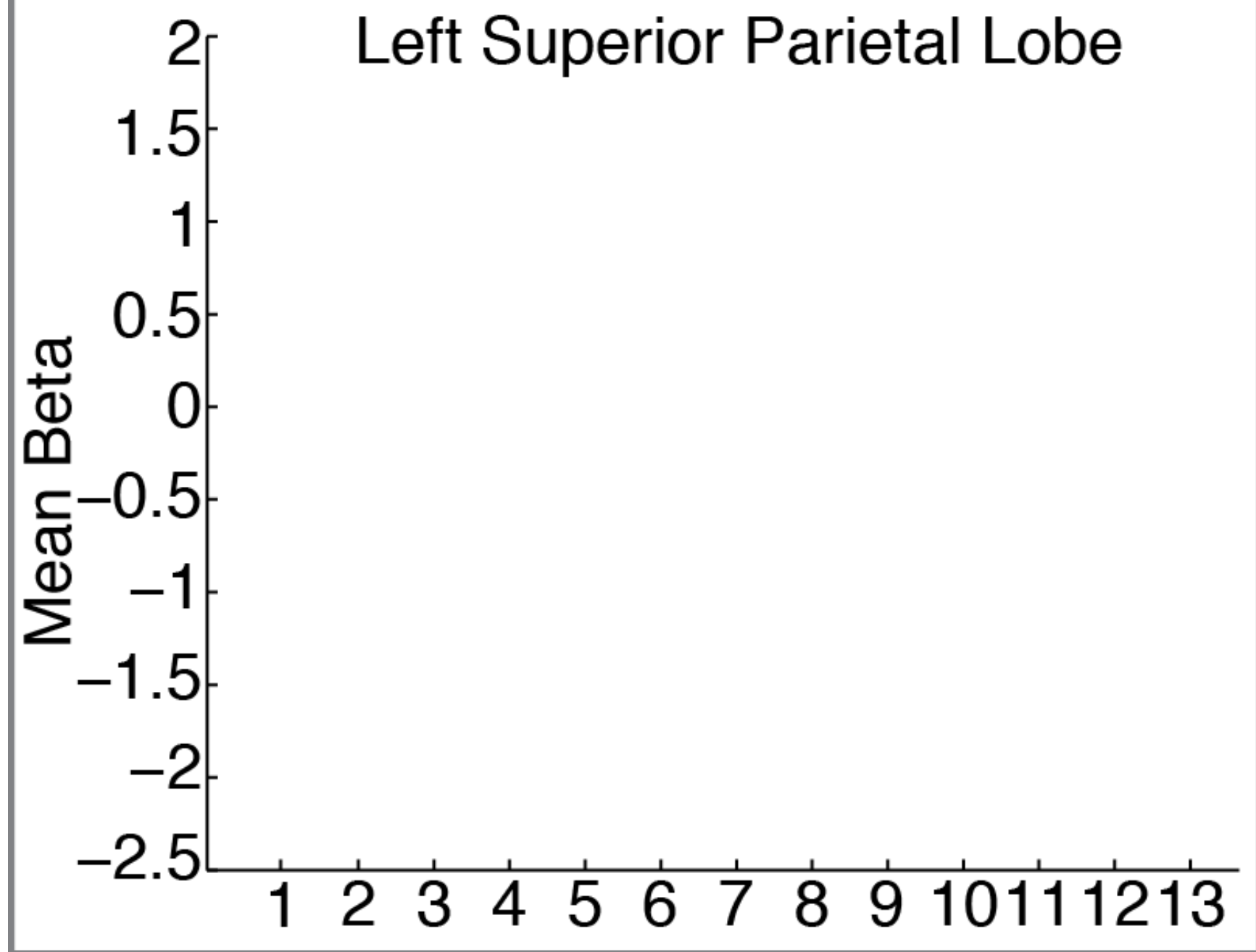
Publisher: Softt...

Type: Appli...

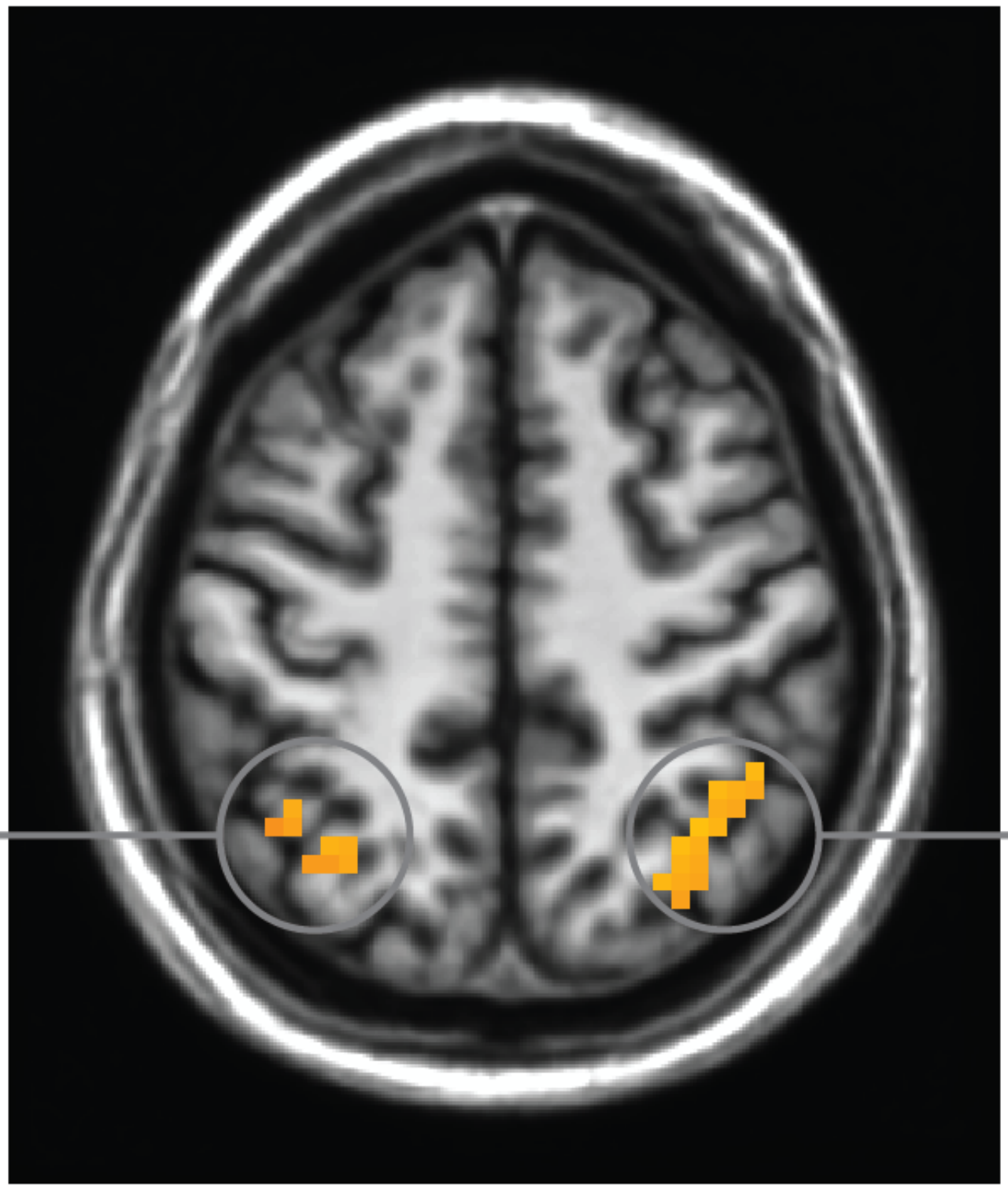
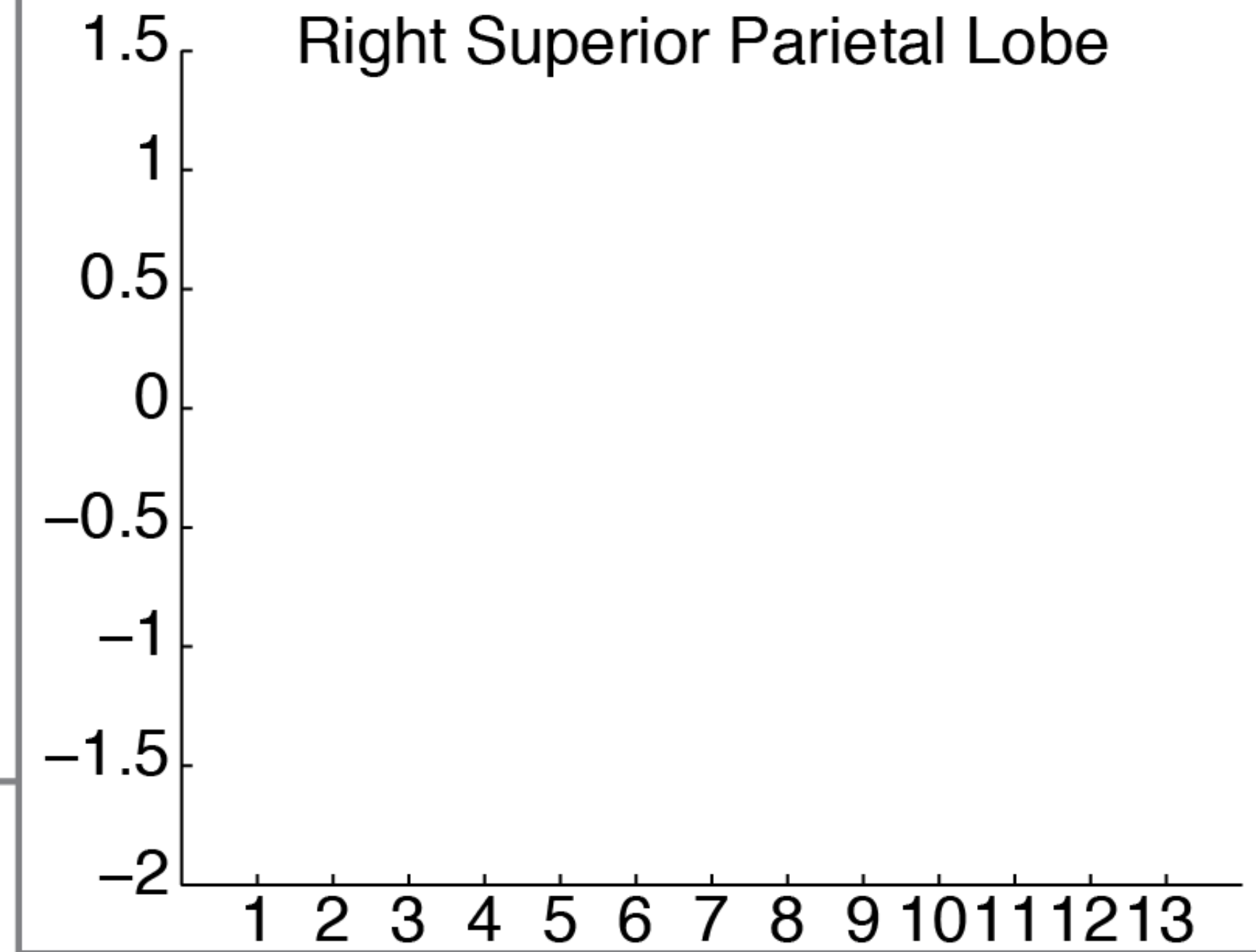
From: C:\Us...

Always ask before opening this file

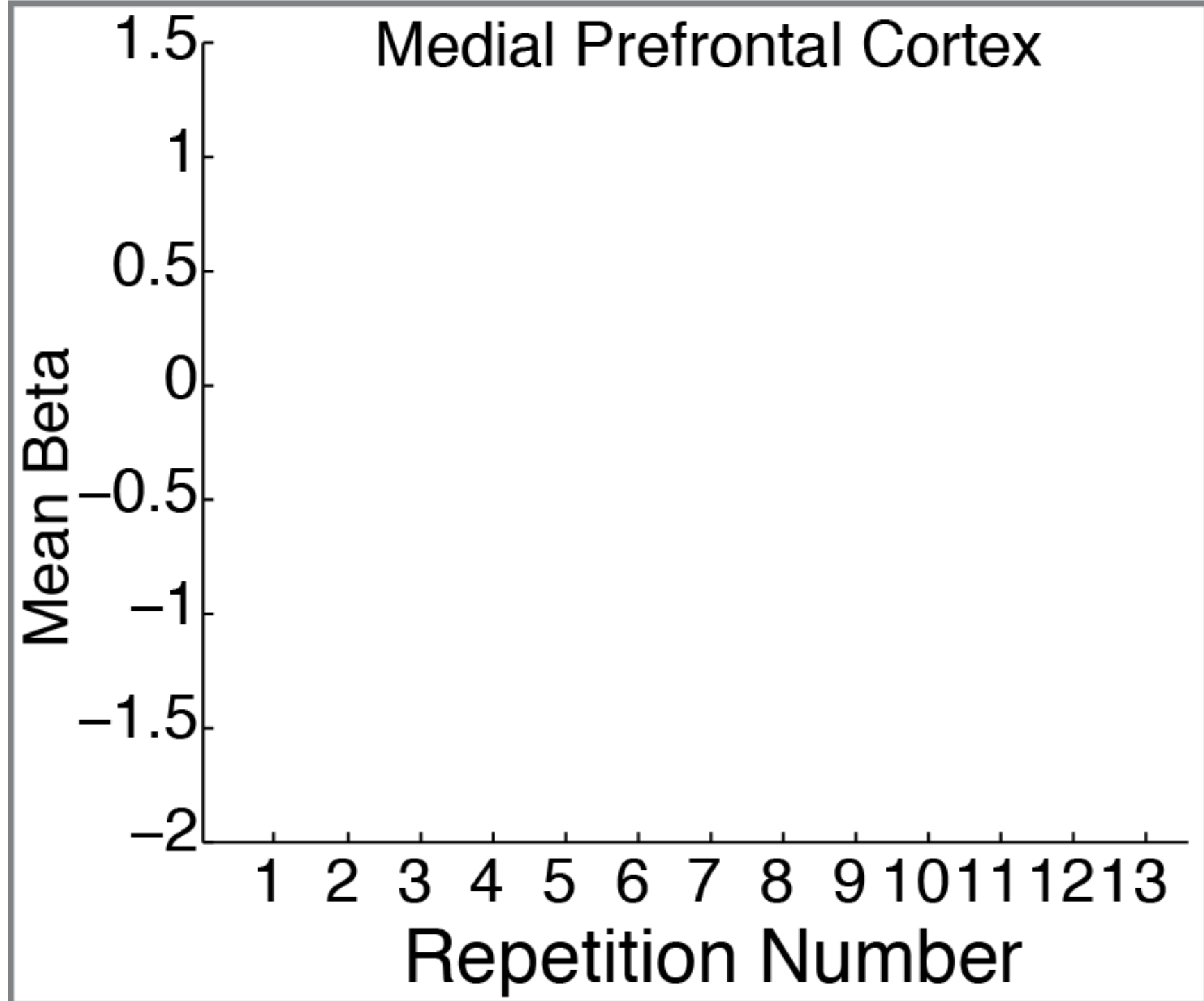
Left Superior Parietal Lobe



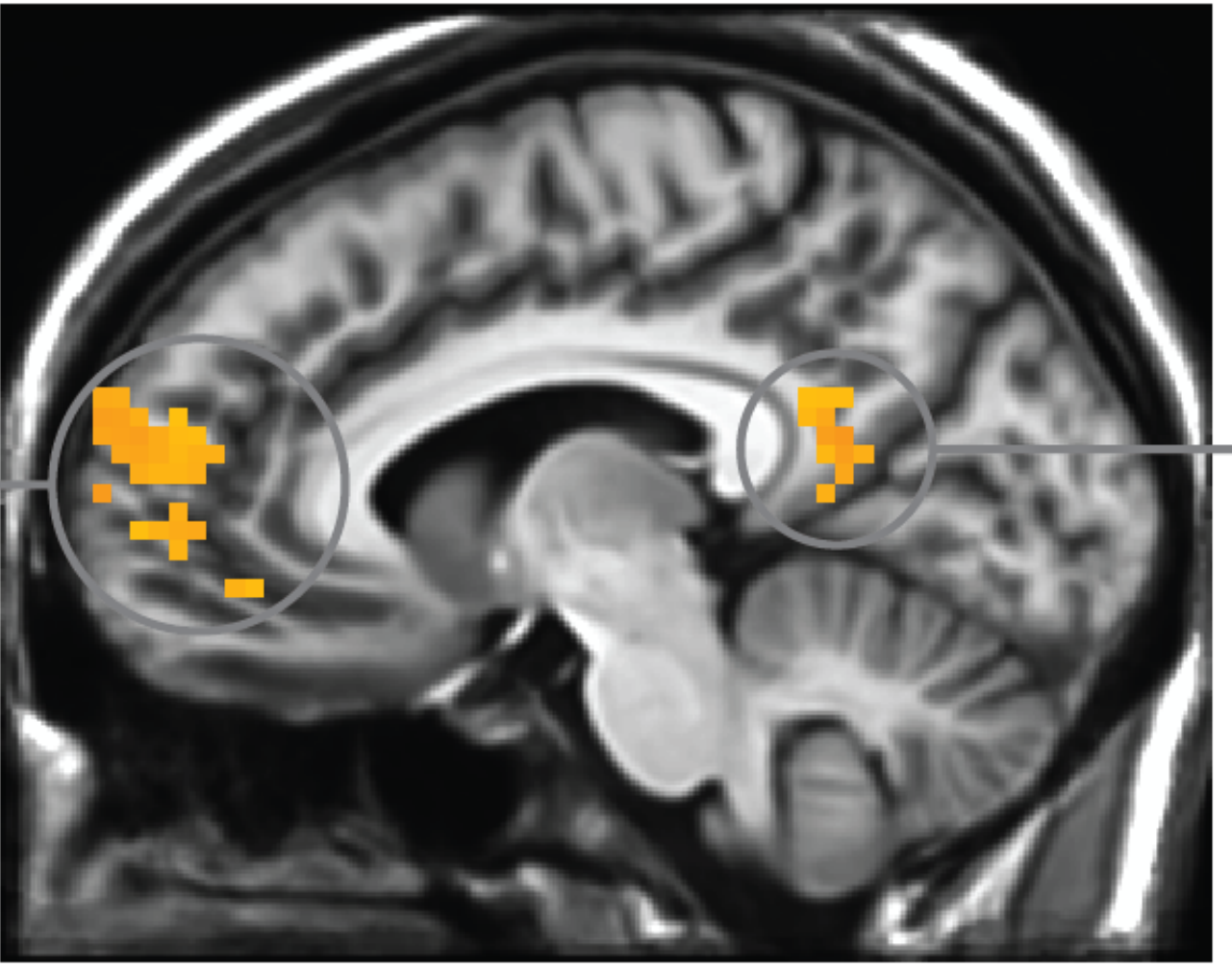
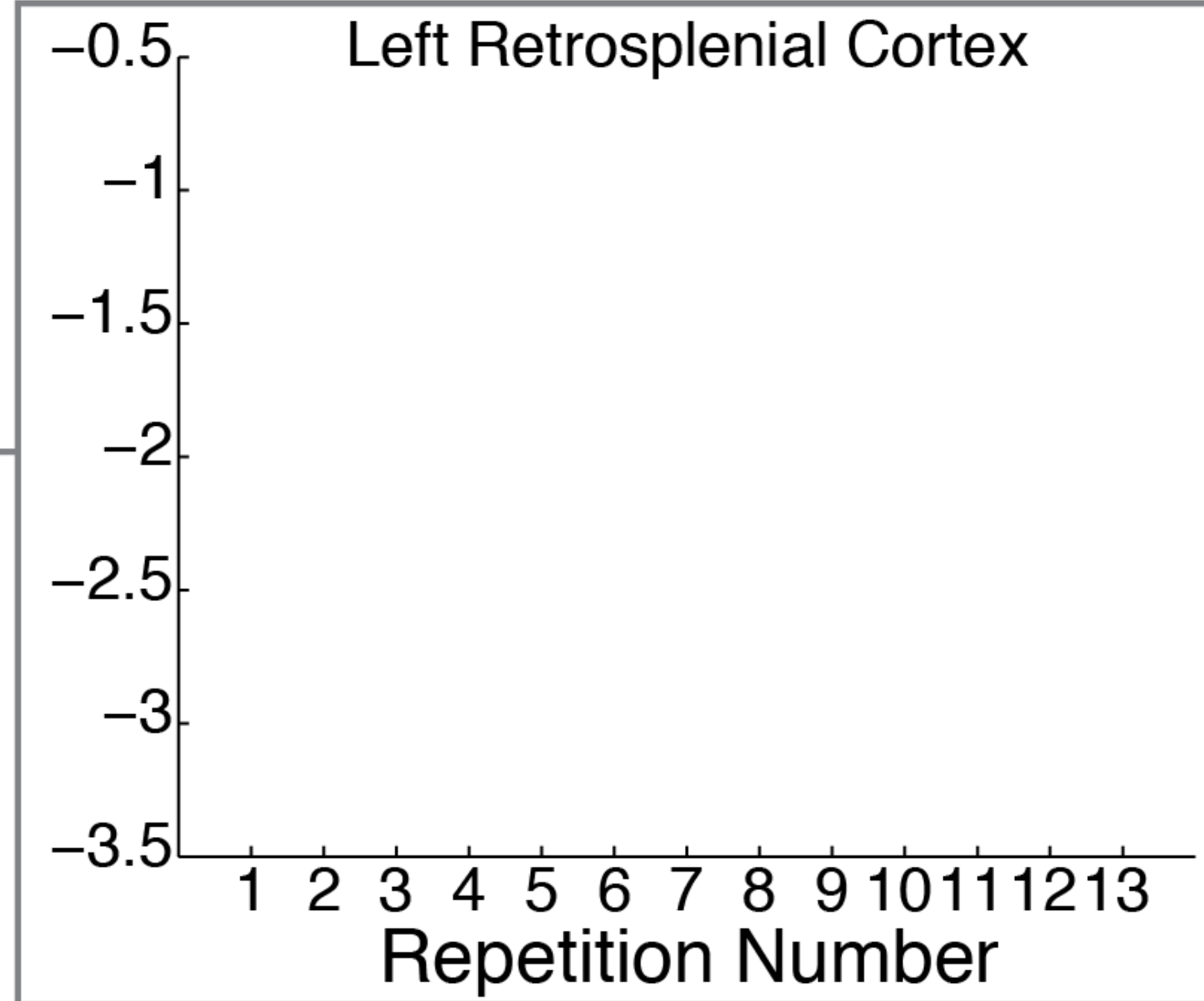
Right Superior Parietal Lobe

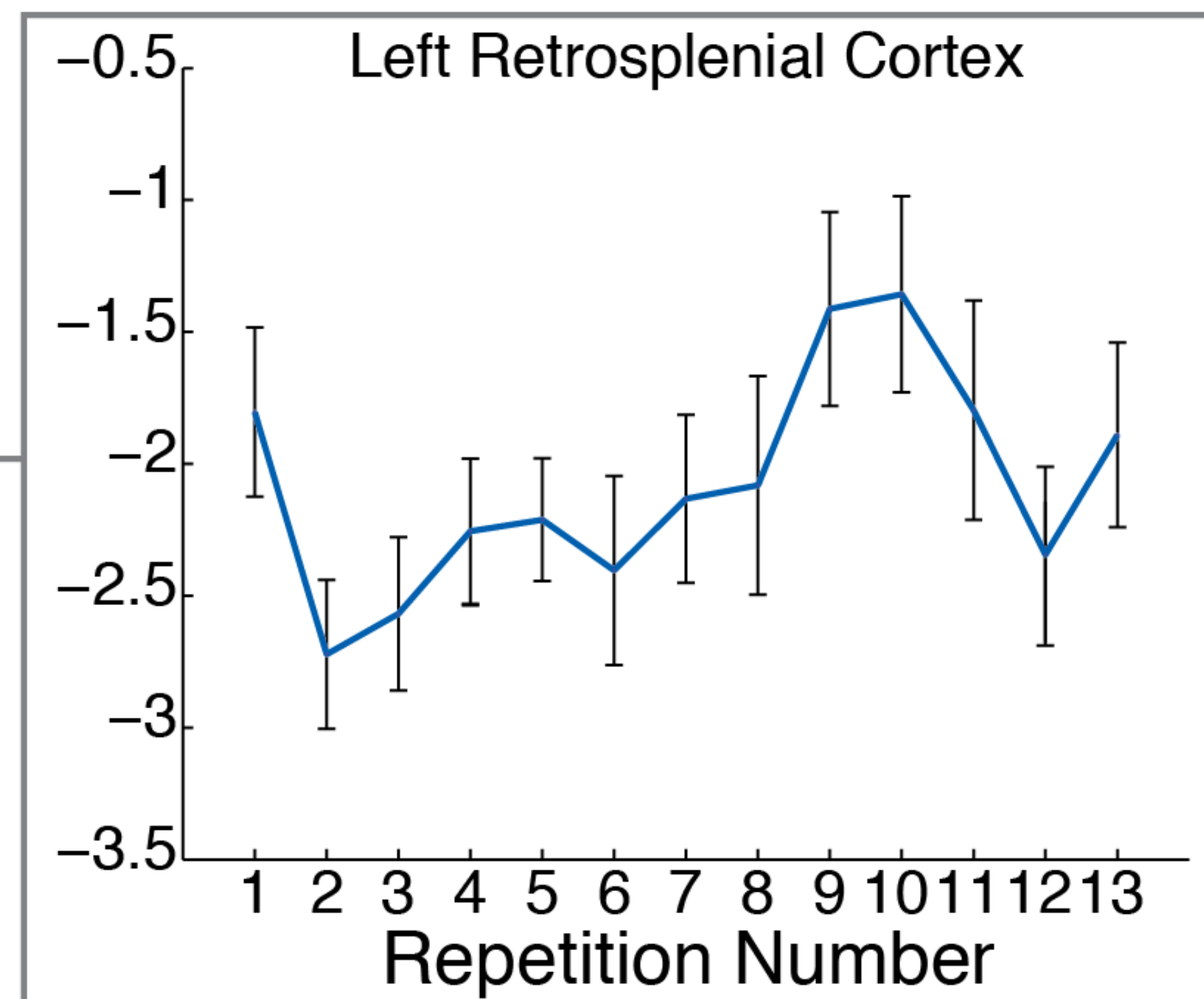
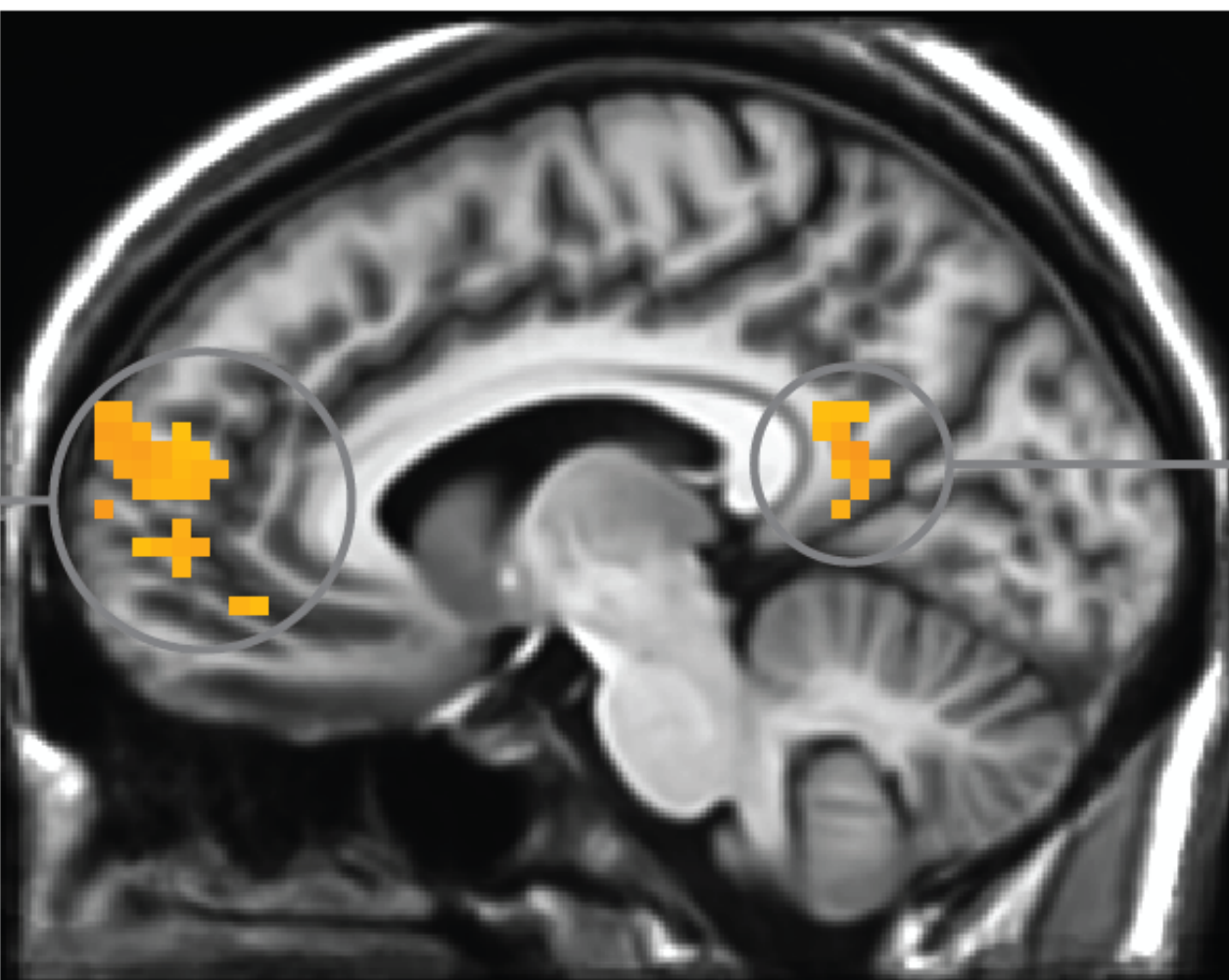
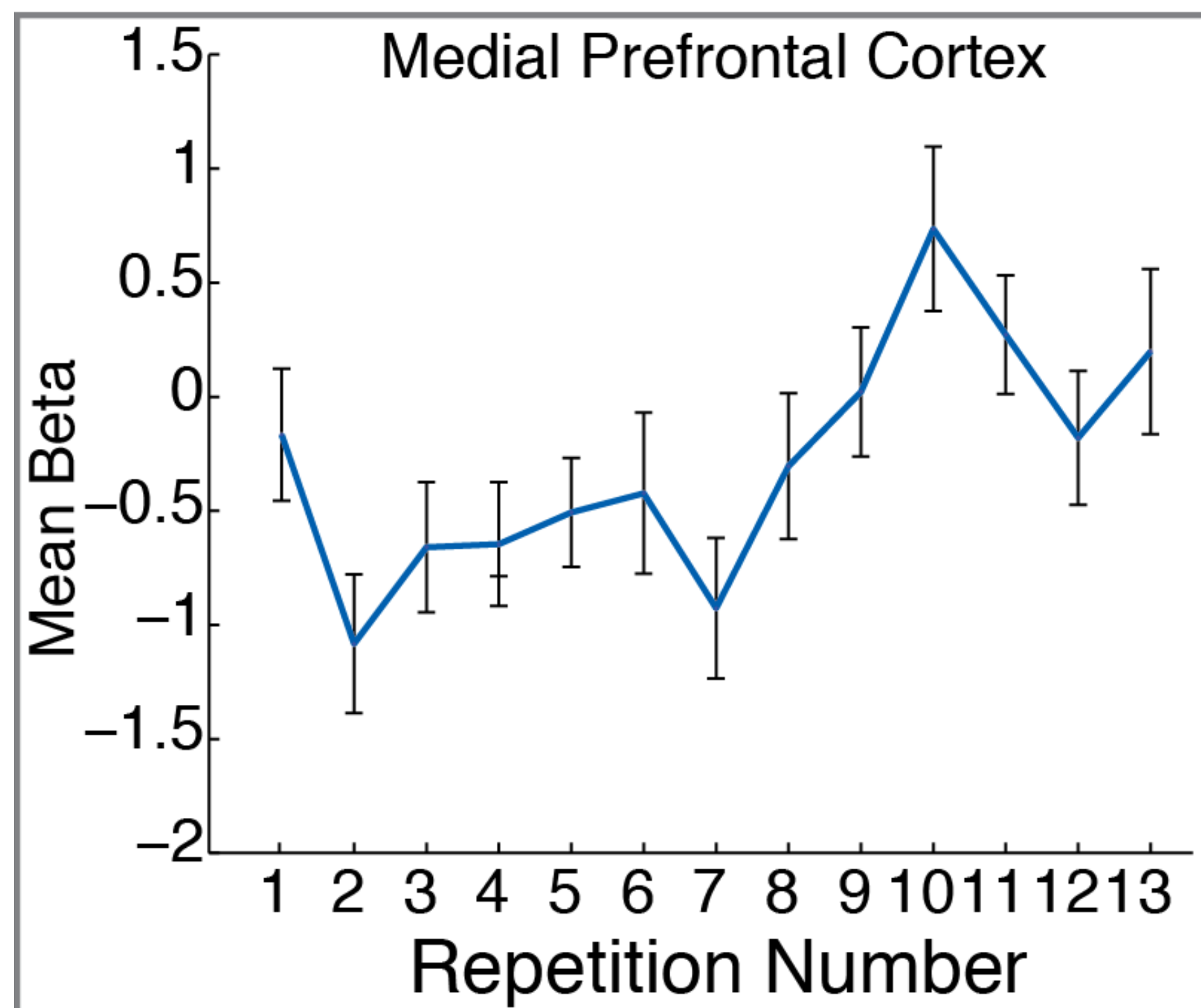
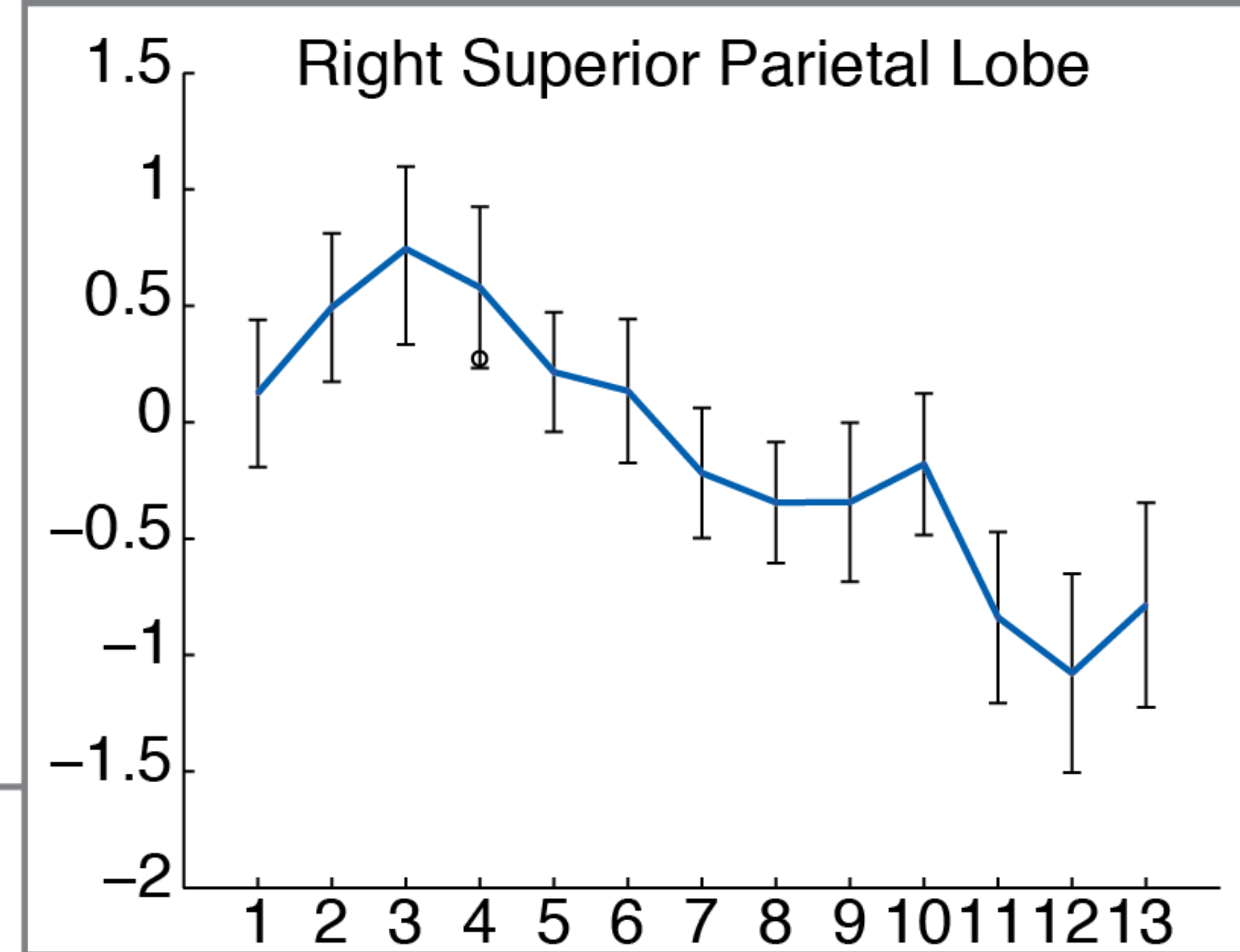
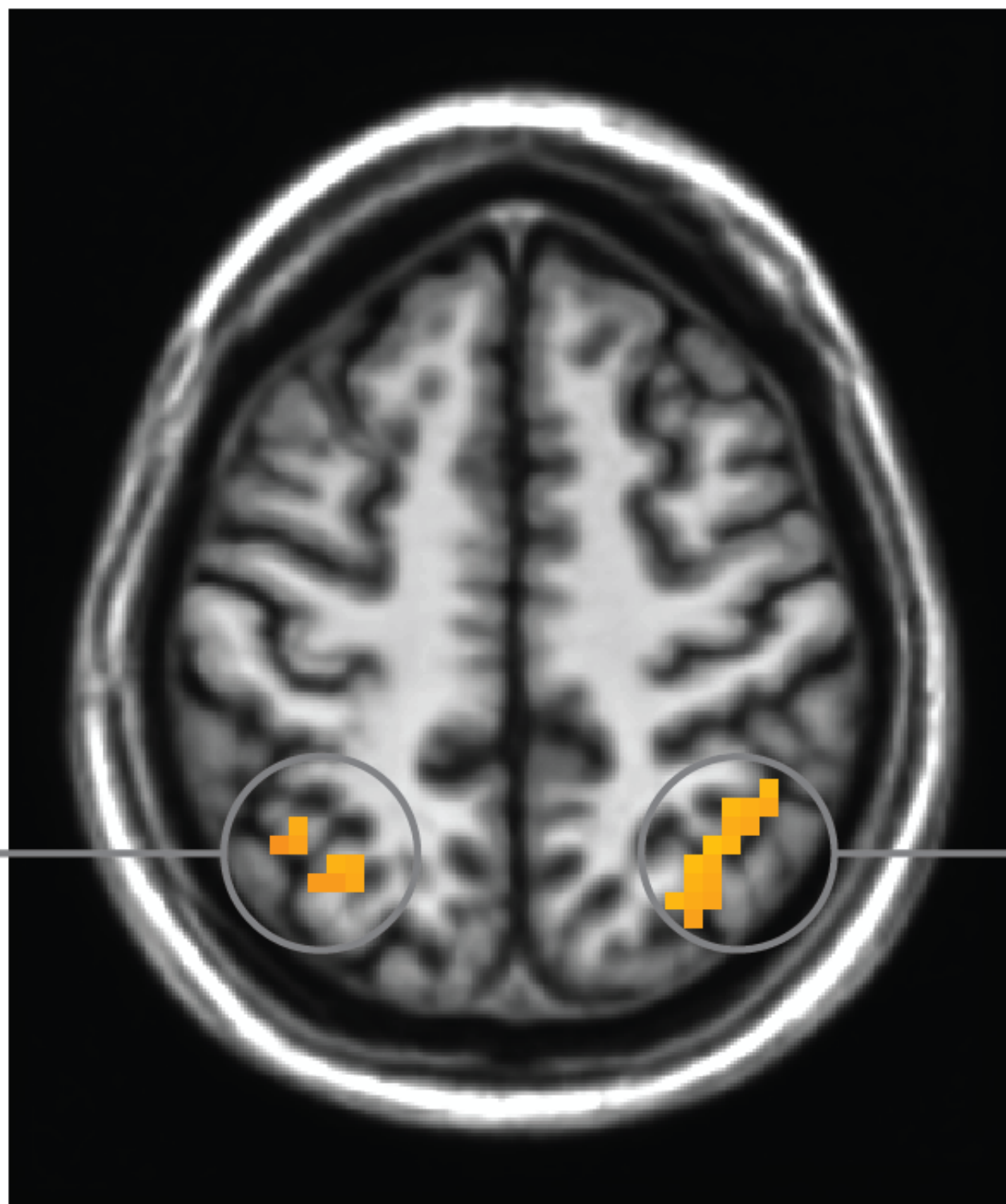
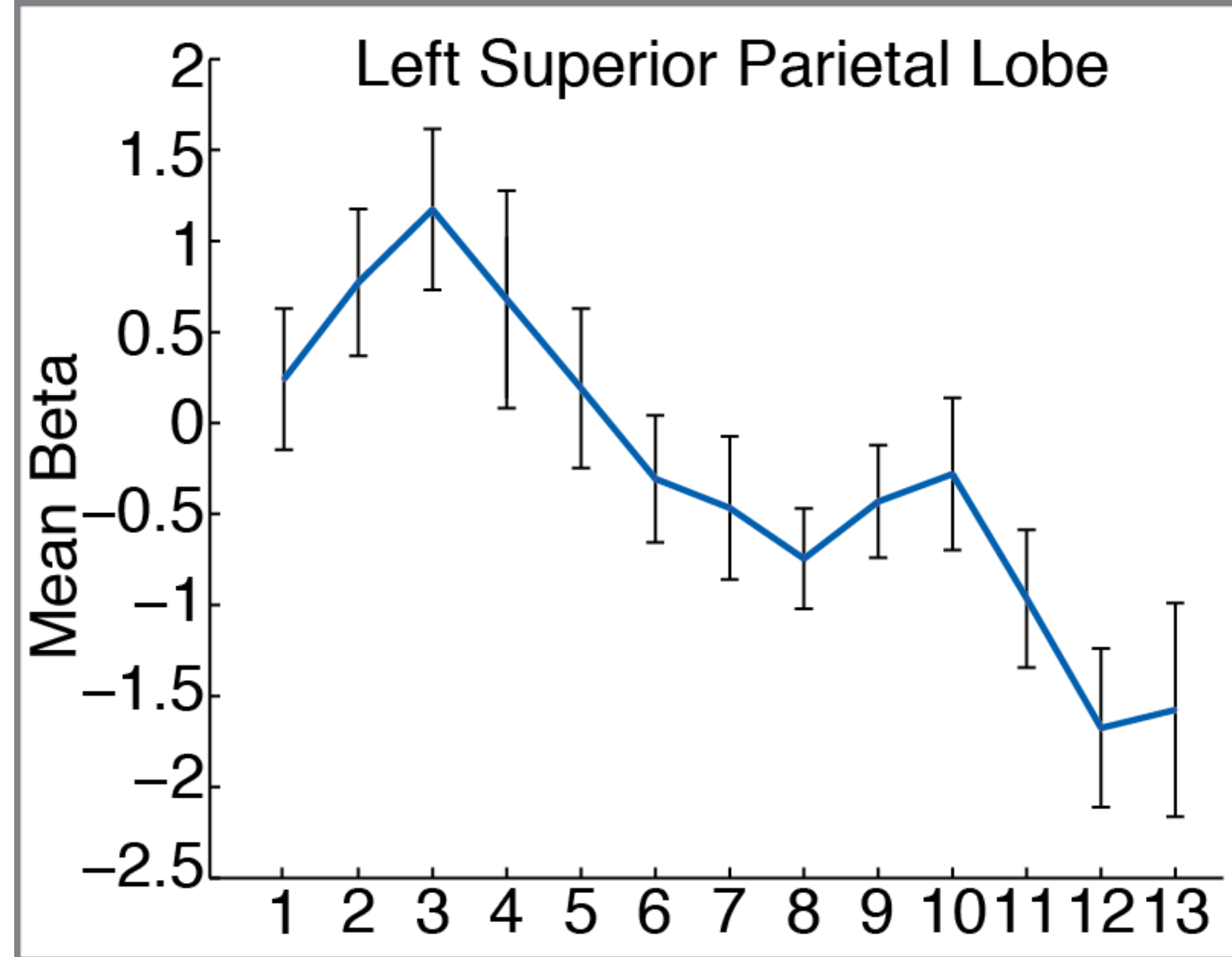



Medial Prefrontal Cortex



Left Retrosplenial Cortex







Add "Forecast (Extension)"? 

It can:

- Access all data on your computer and the websites you visit
- Access your data on all websites
- Detect your physical location


Cancel Install

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Warning! Add "Forecast (Extension)"? 

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Cancel Install

Add "Forecast (Extension)"? 

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Cancel Install

Animations

Add "Swackett (Extension)"?



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Cancel

Install

Add "Swackett (Extension)"?



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Cancel

Install

Add "Swackett (Extension)"?

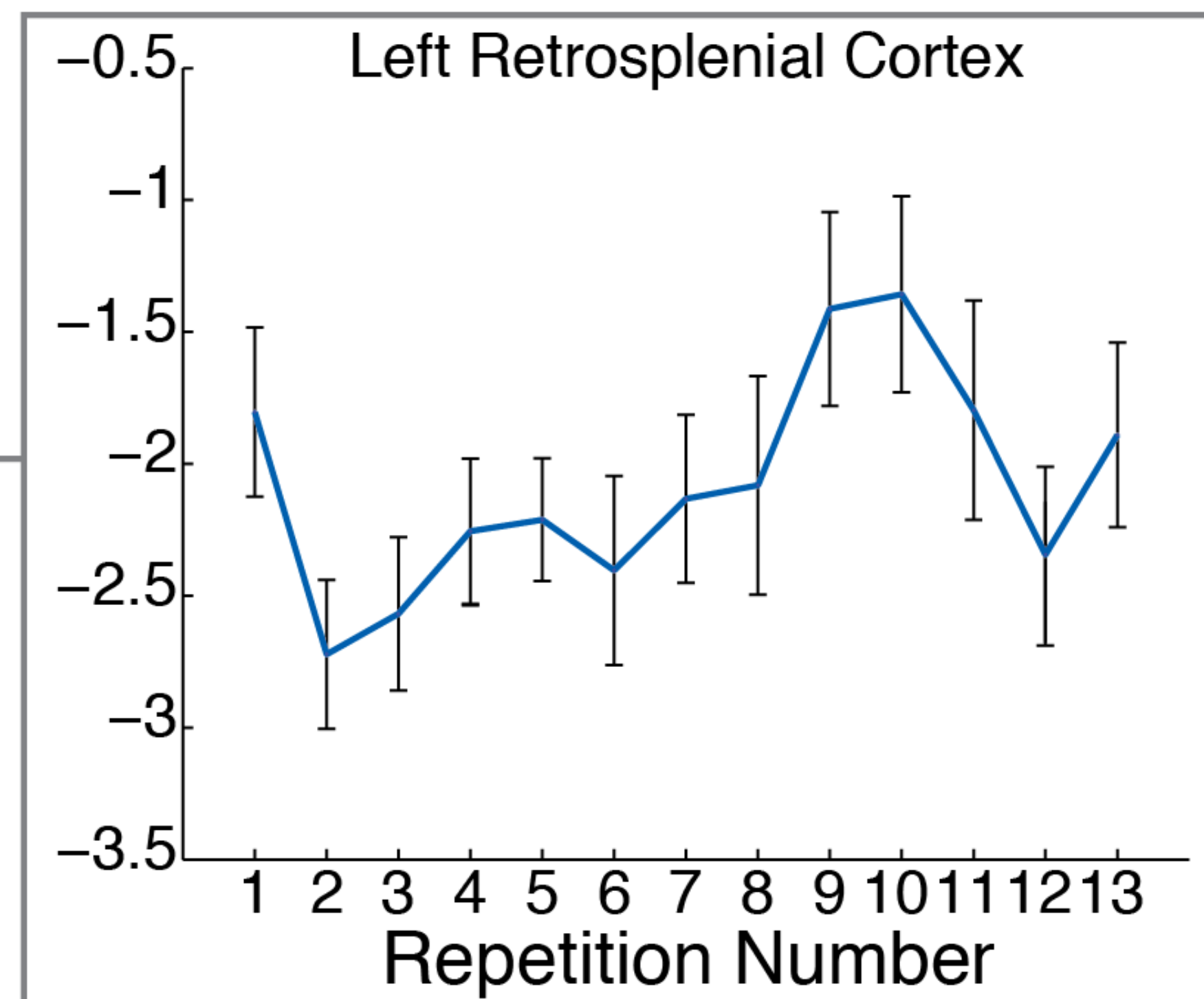
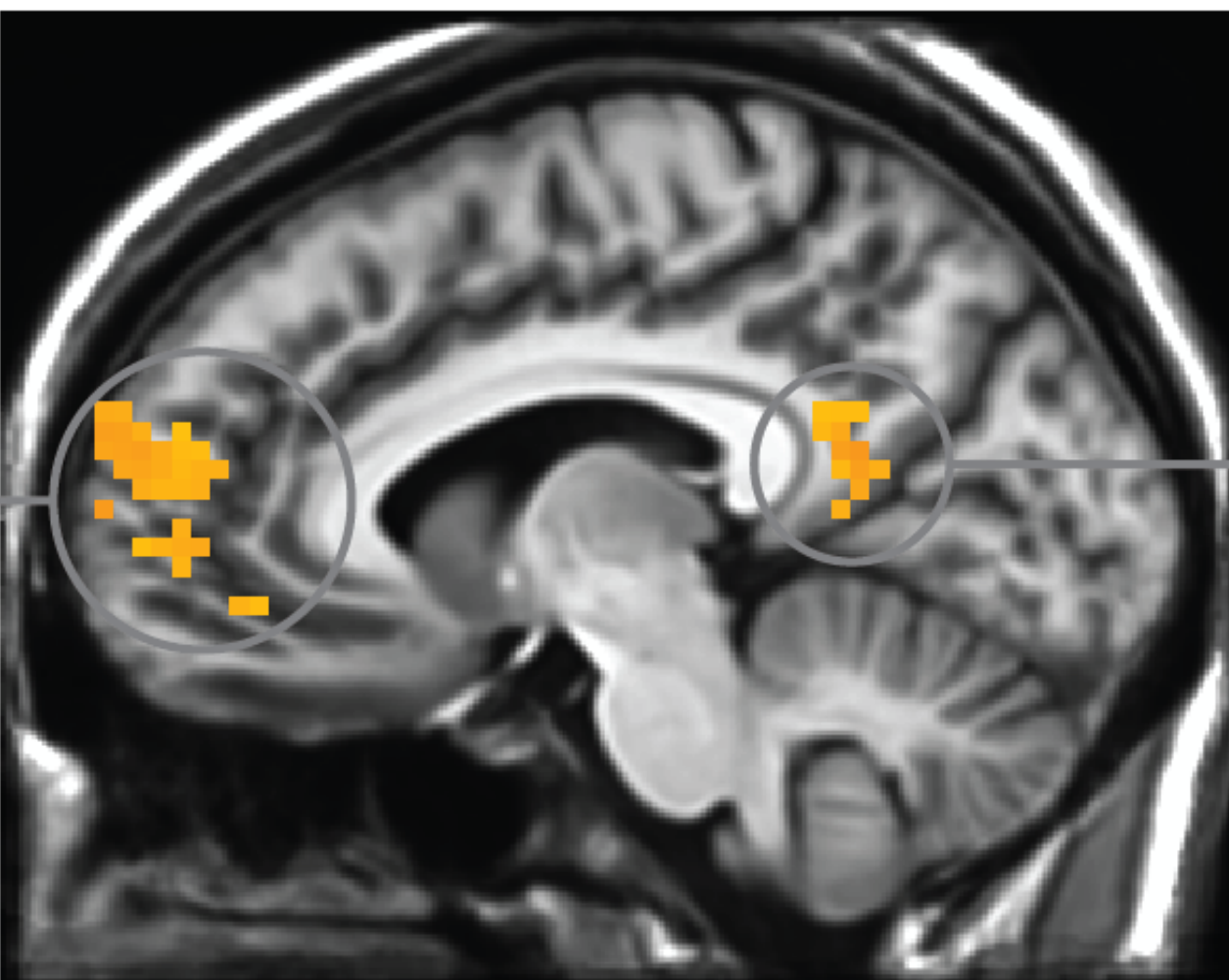
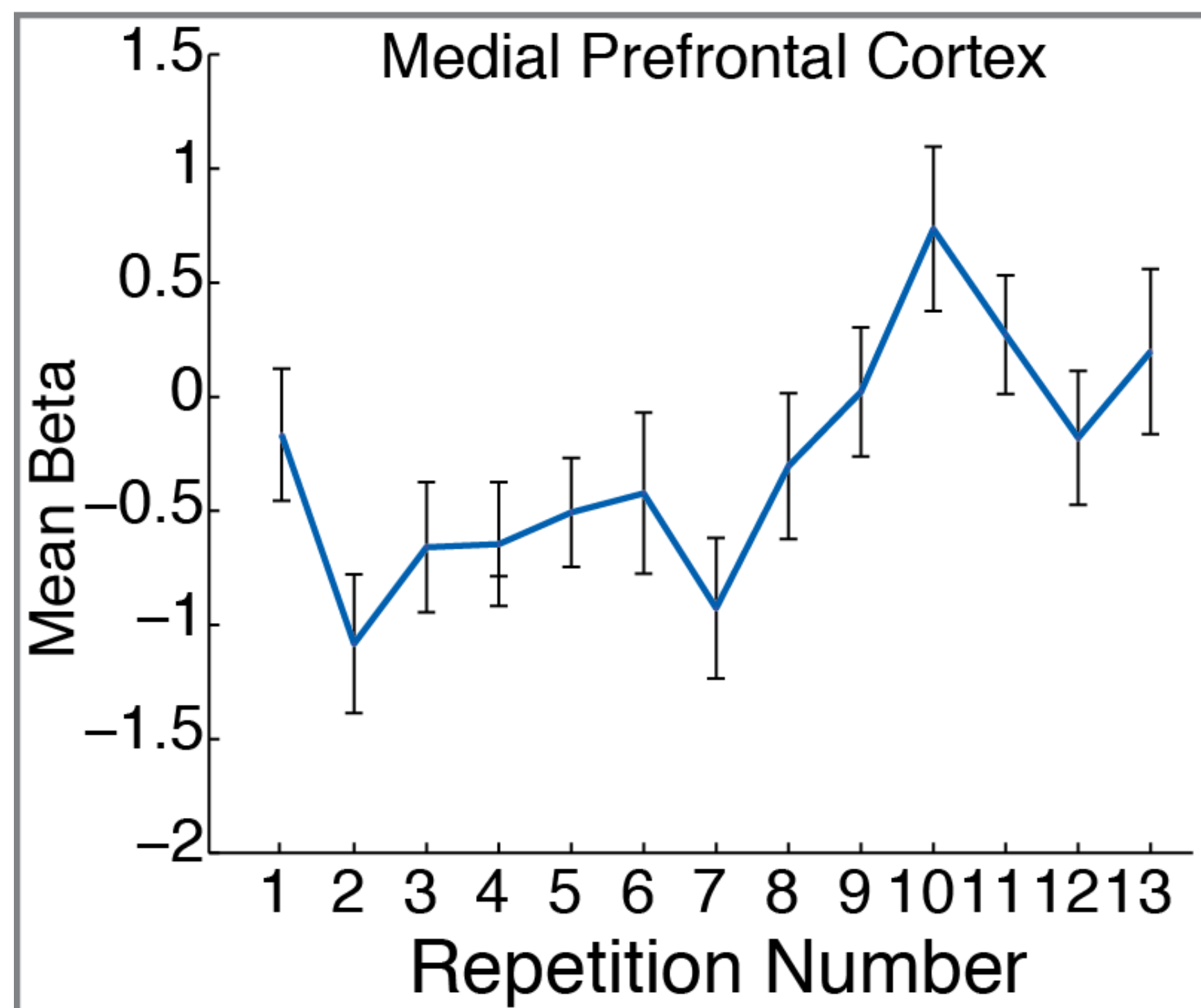
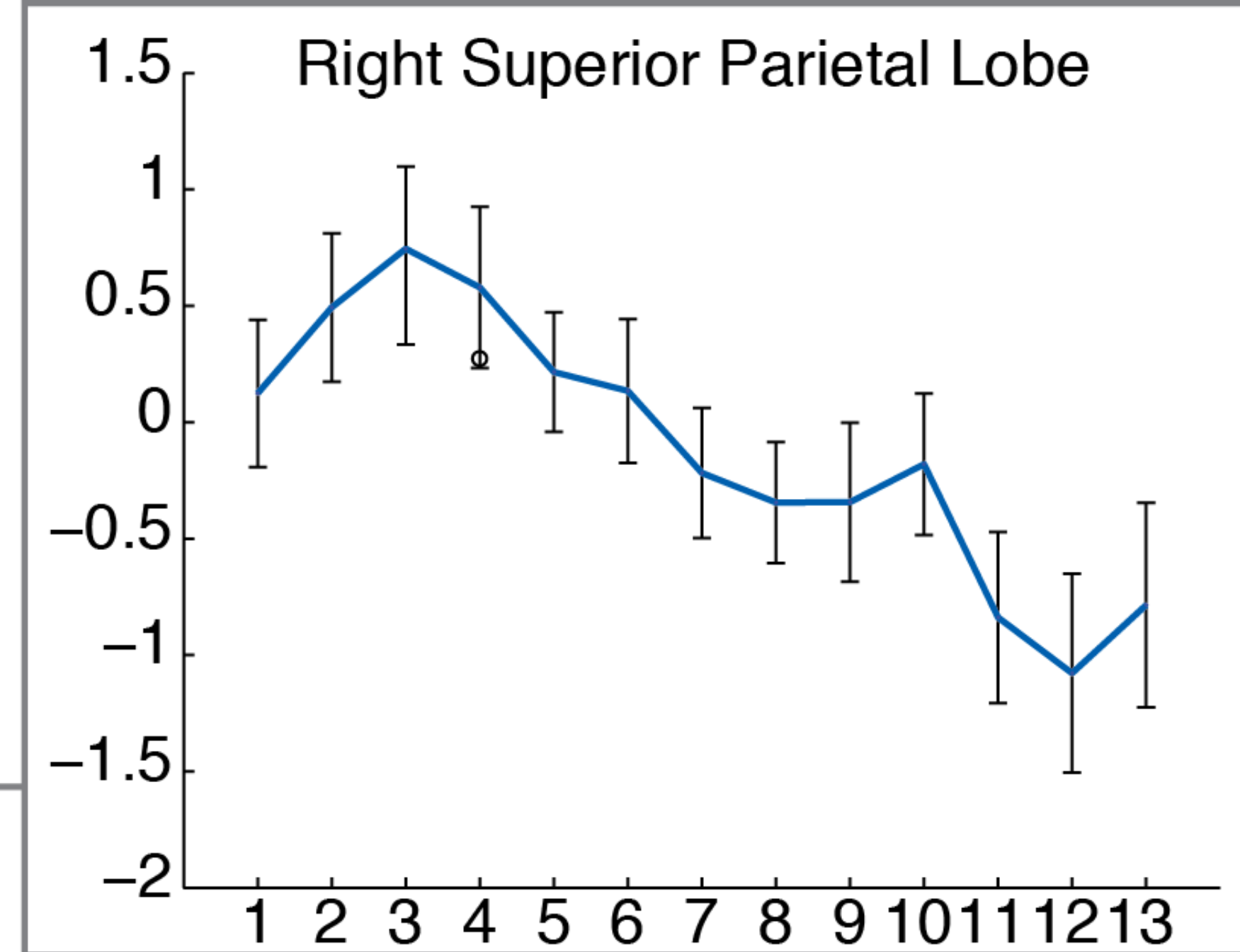
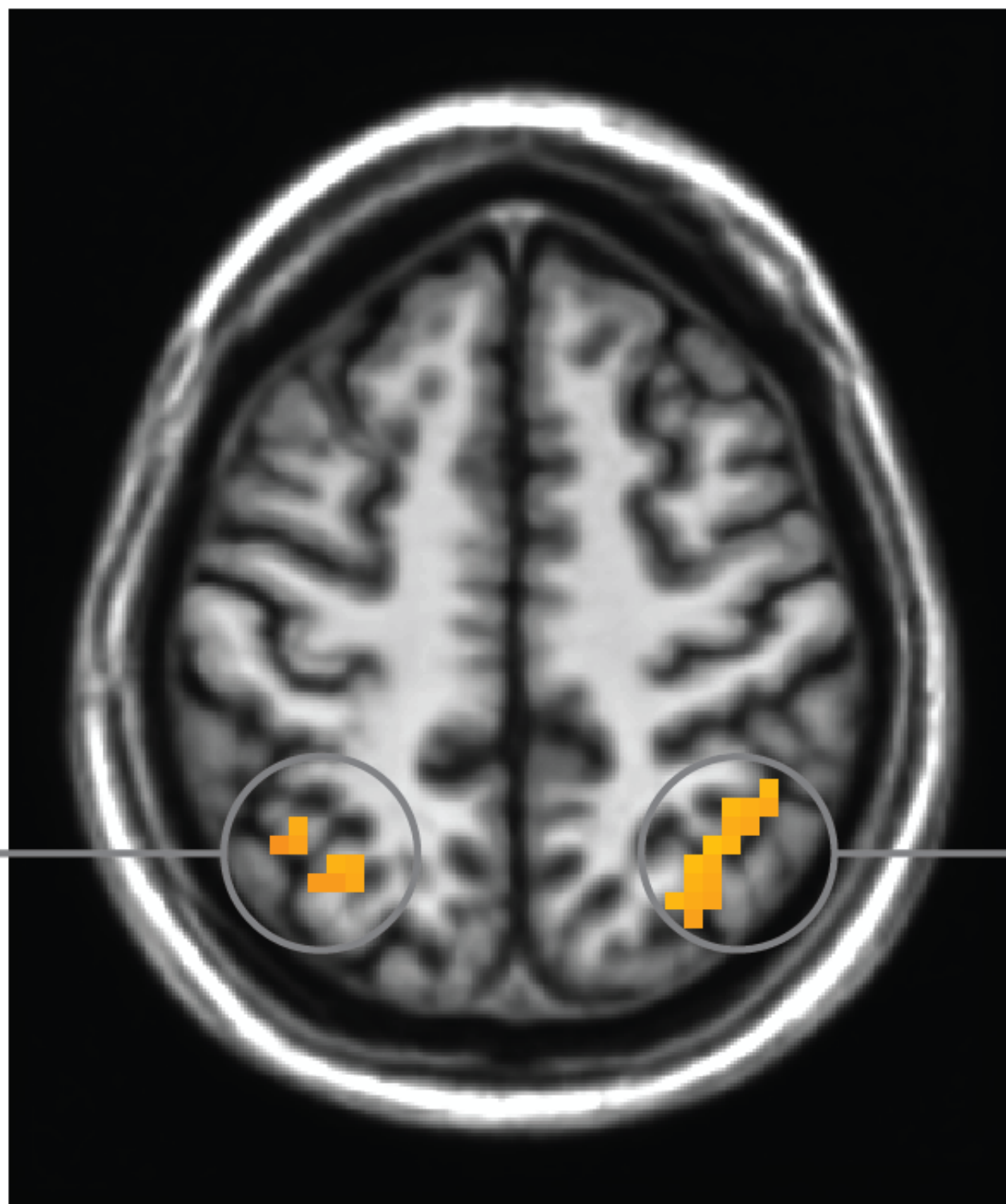
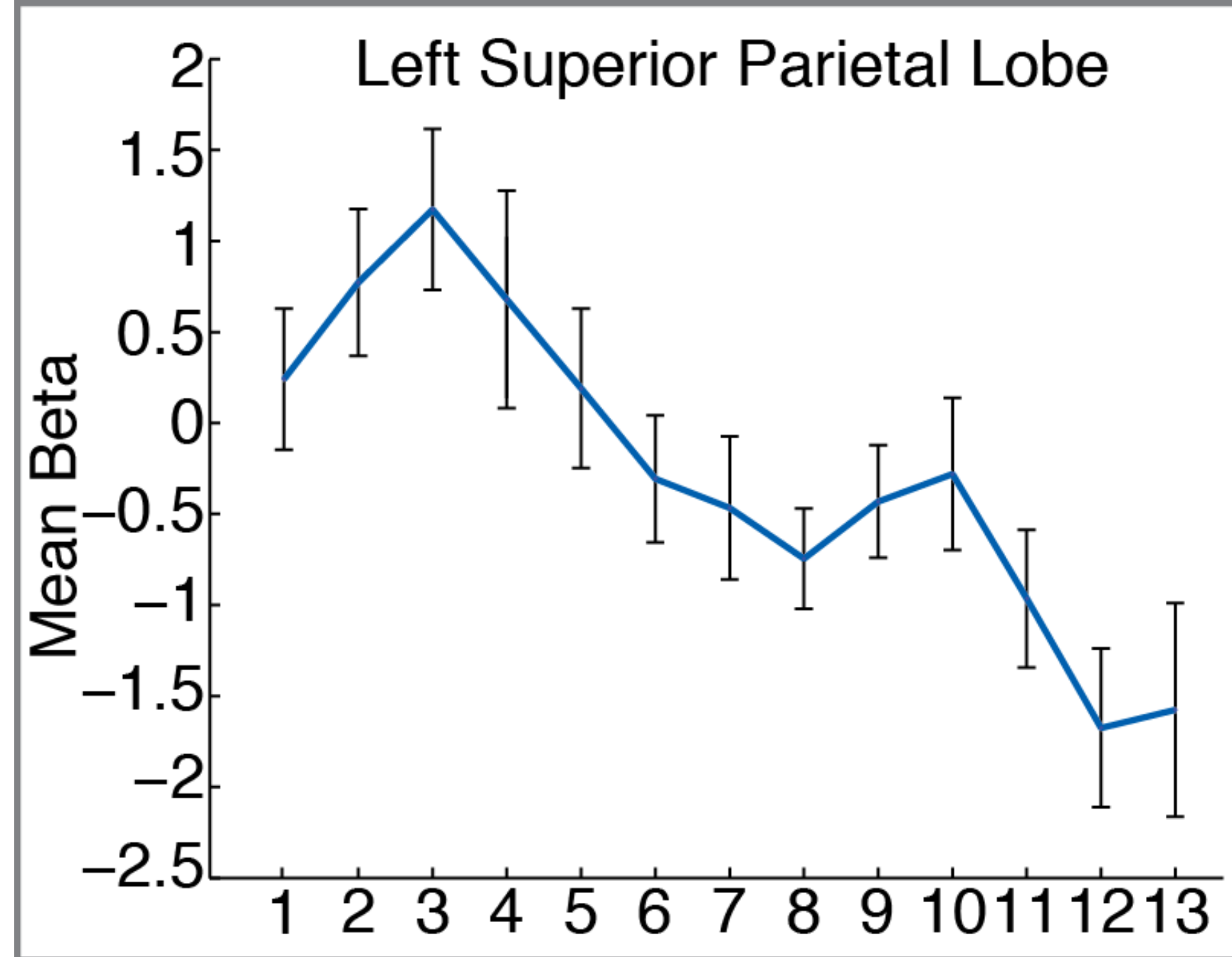


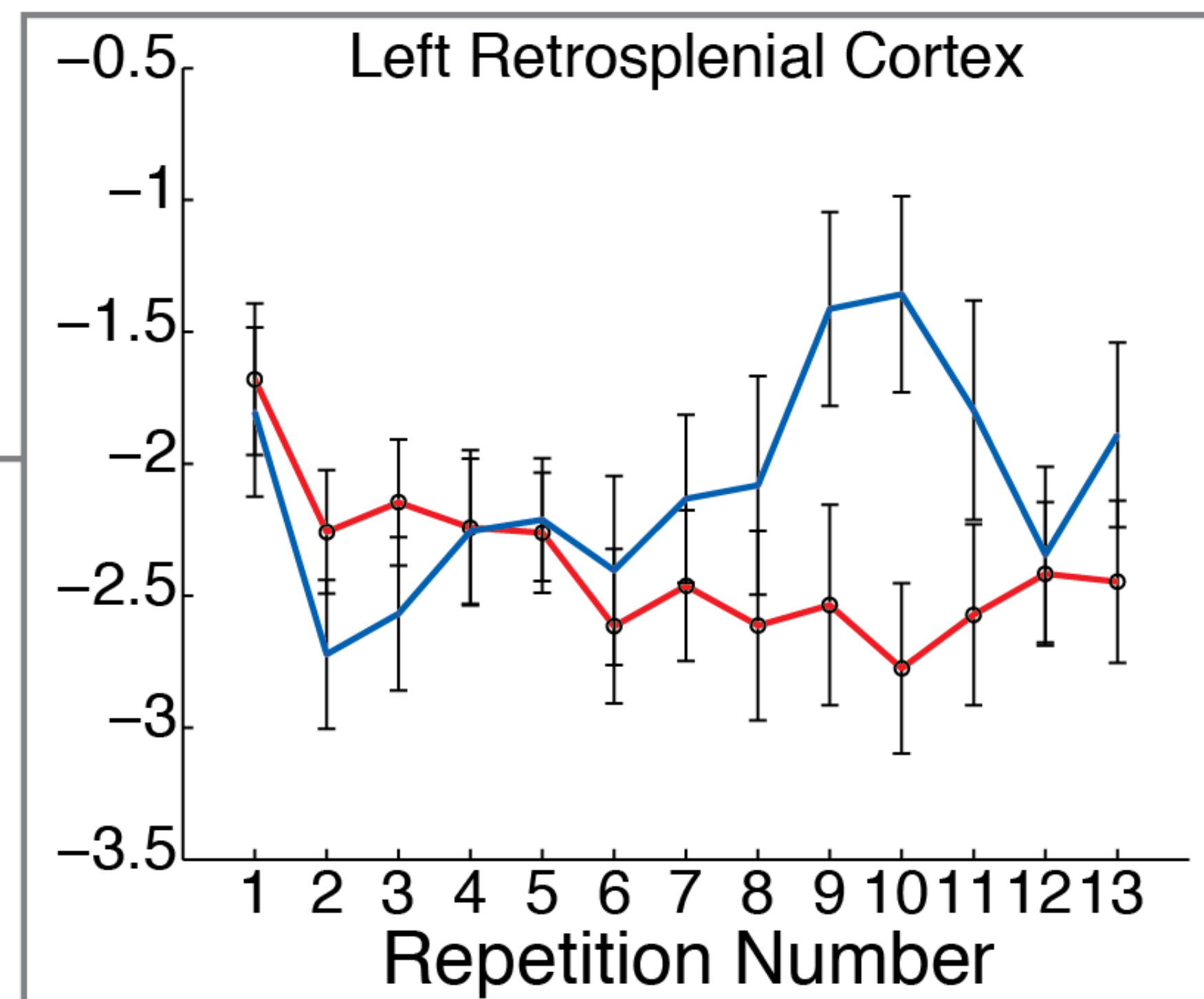
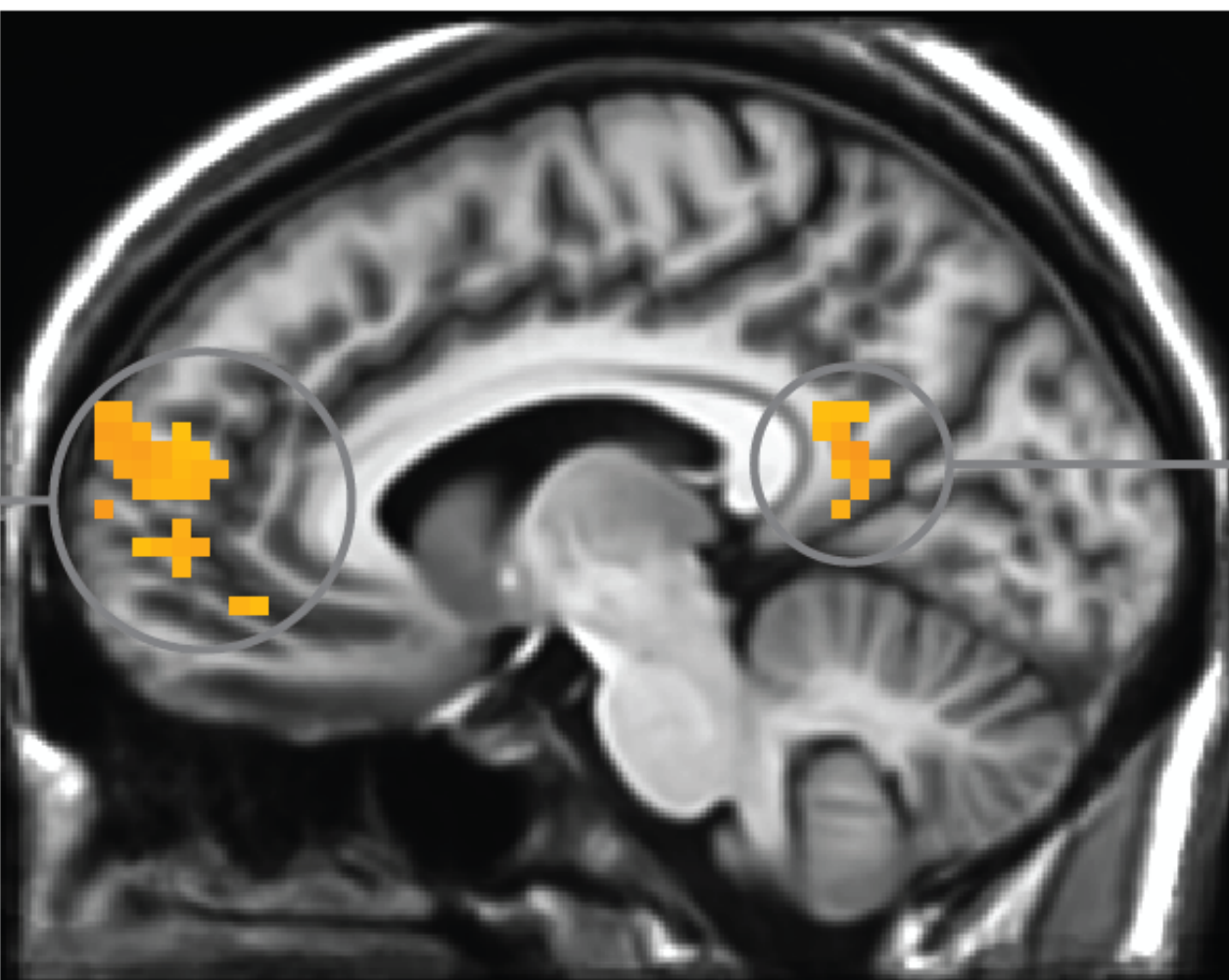
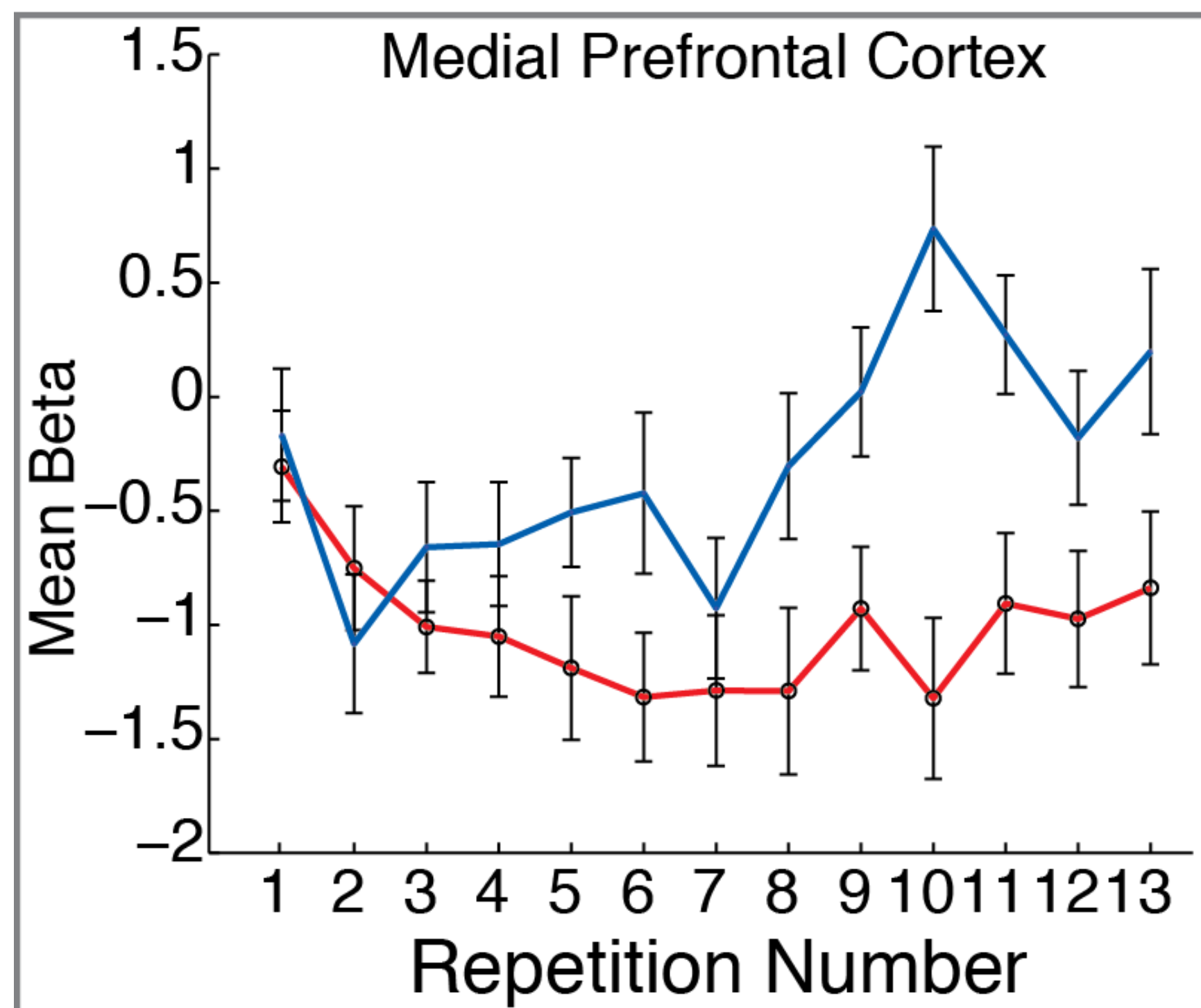
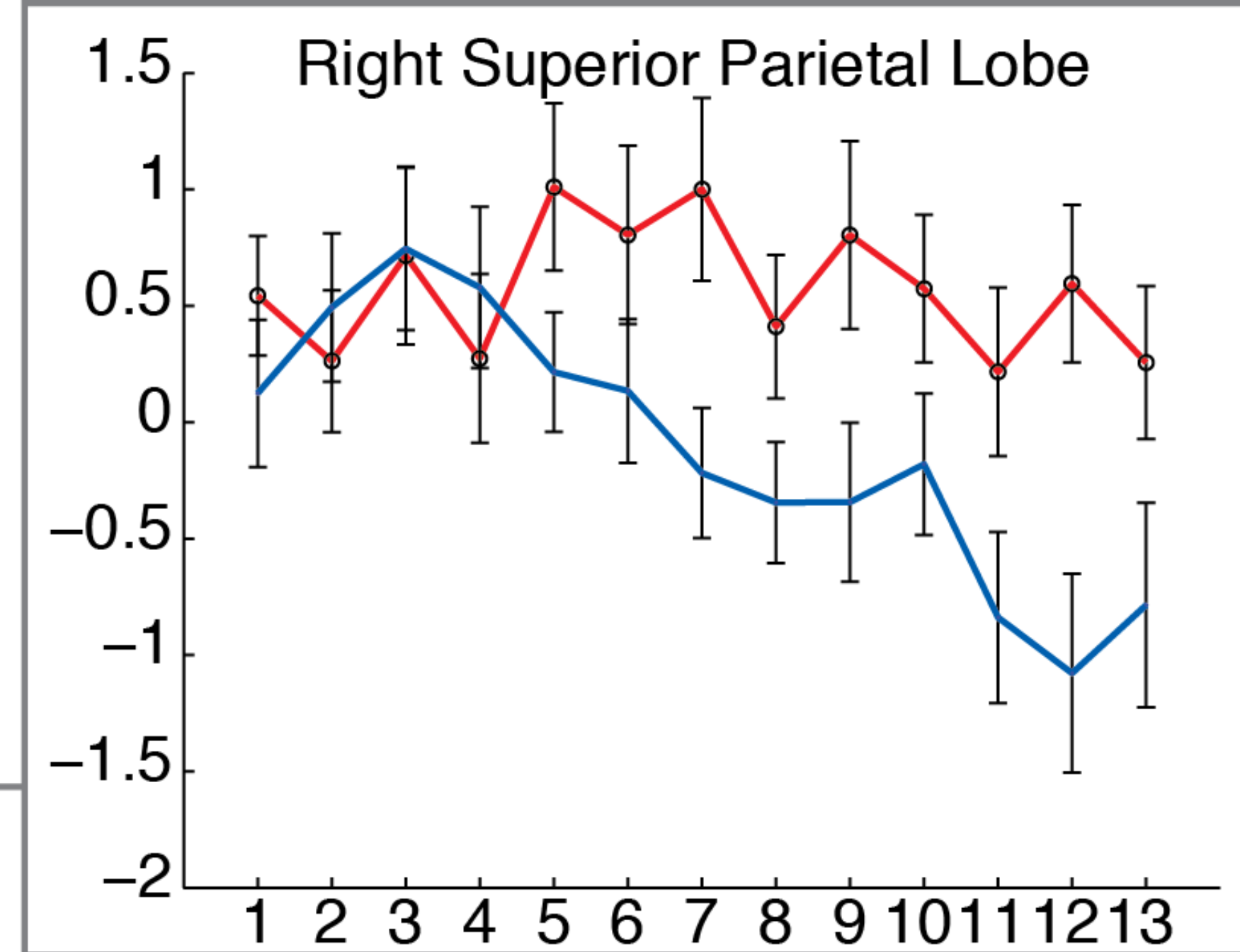
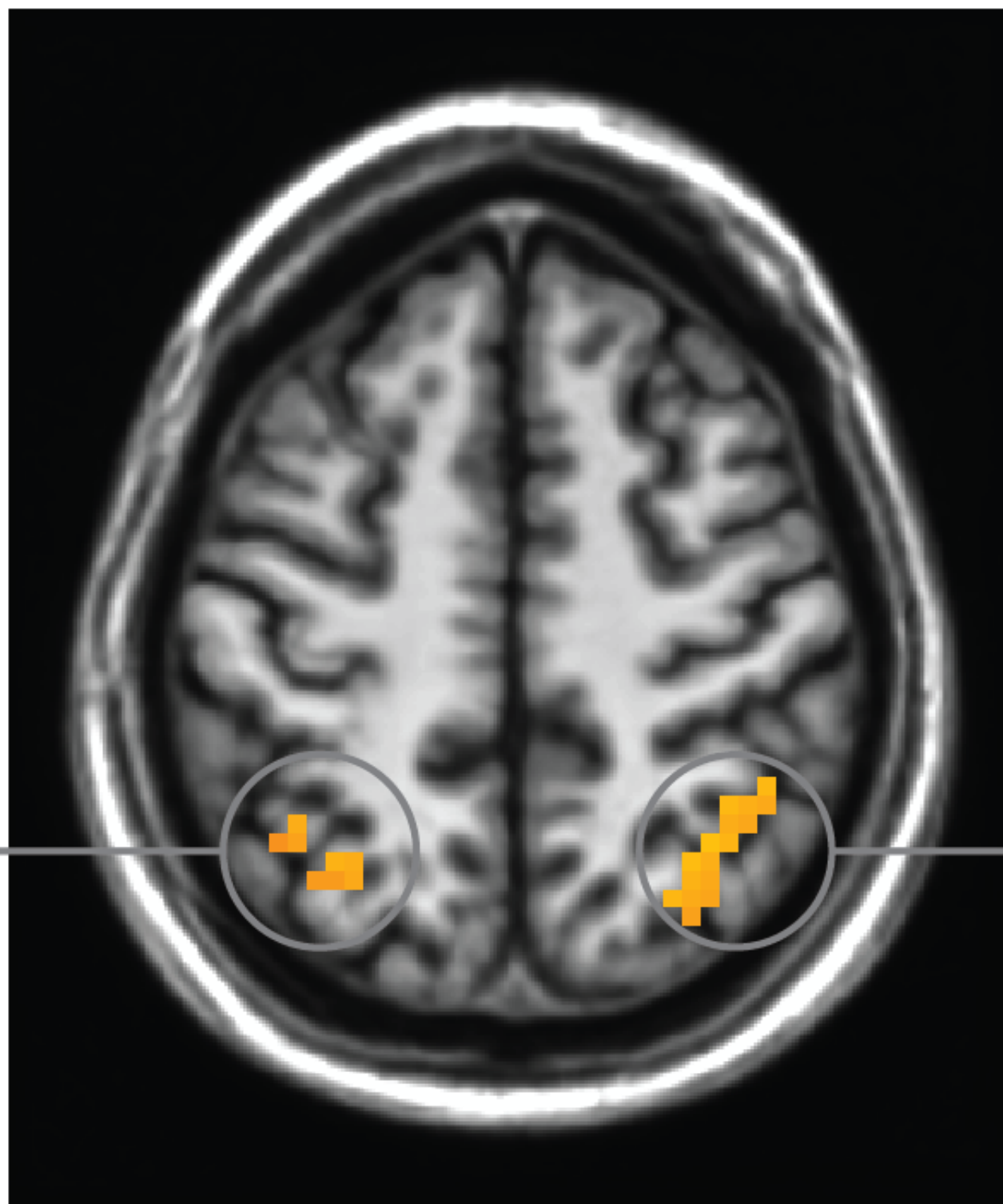
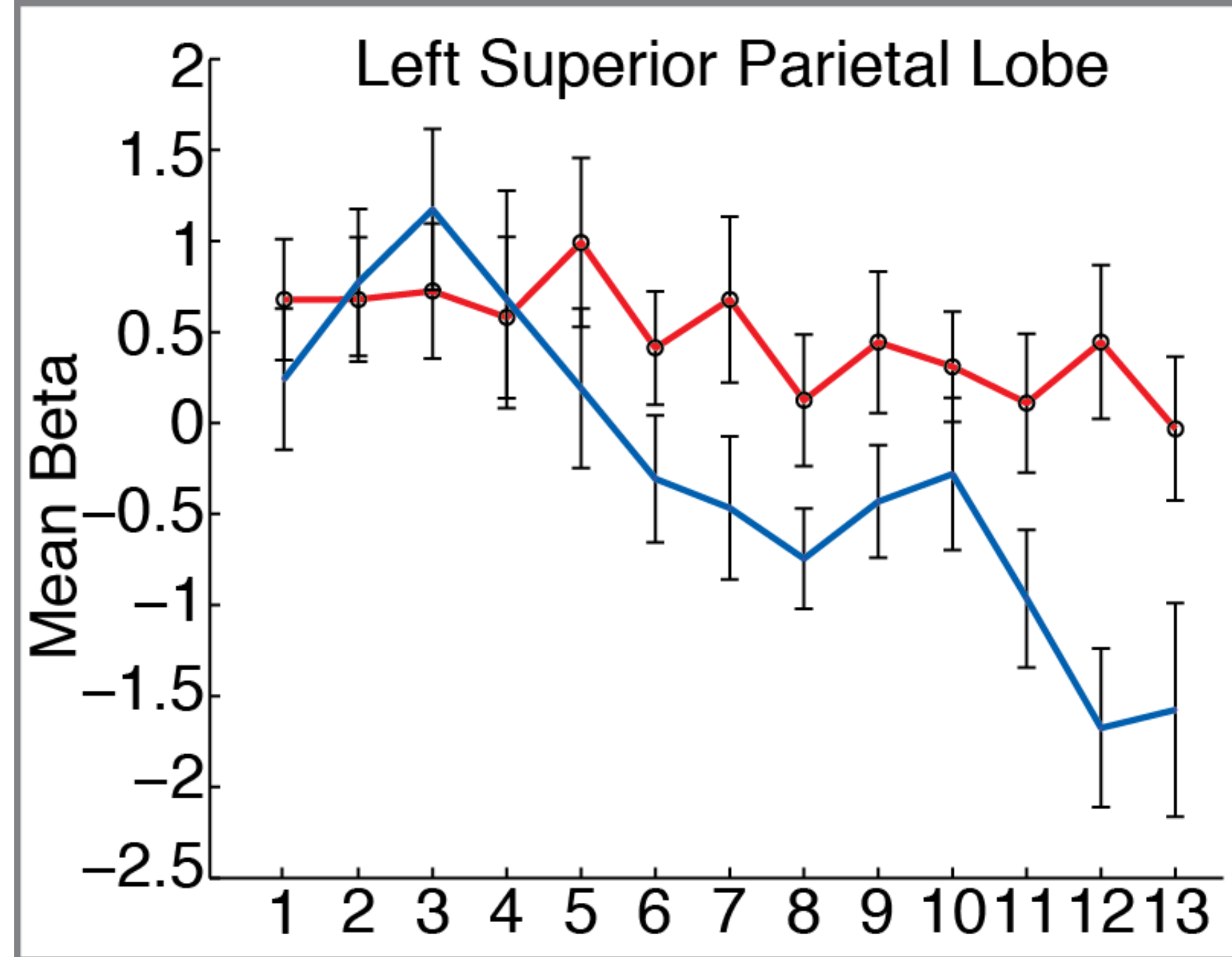
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Cancel

Install





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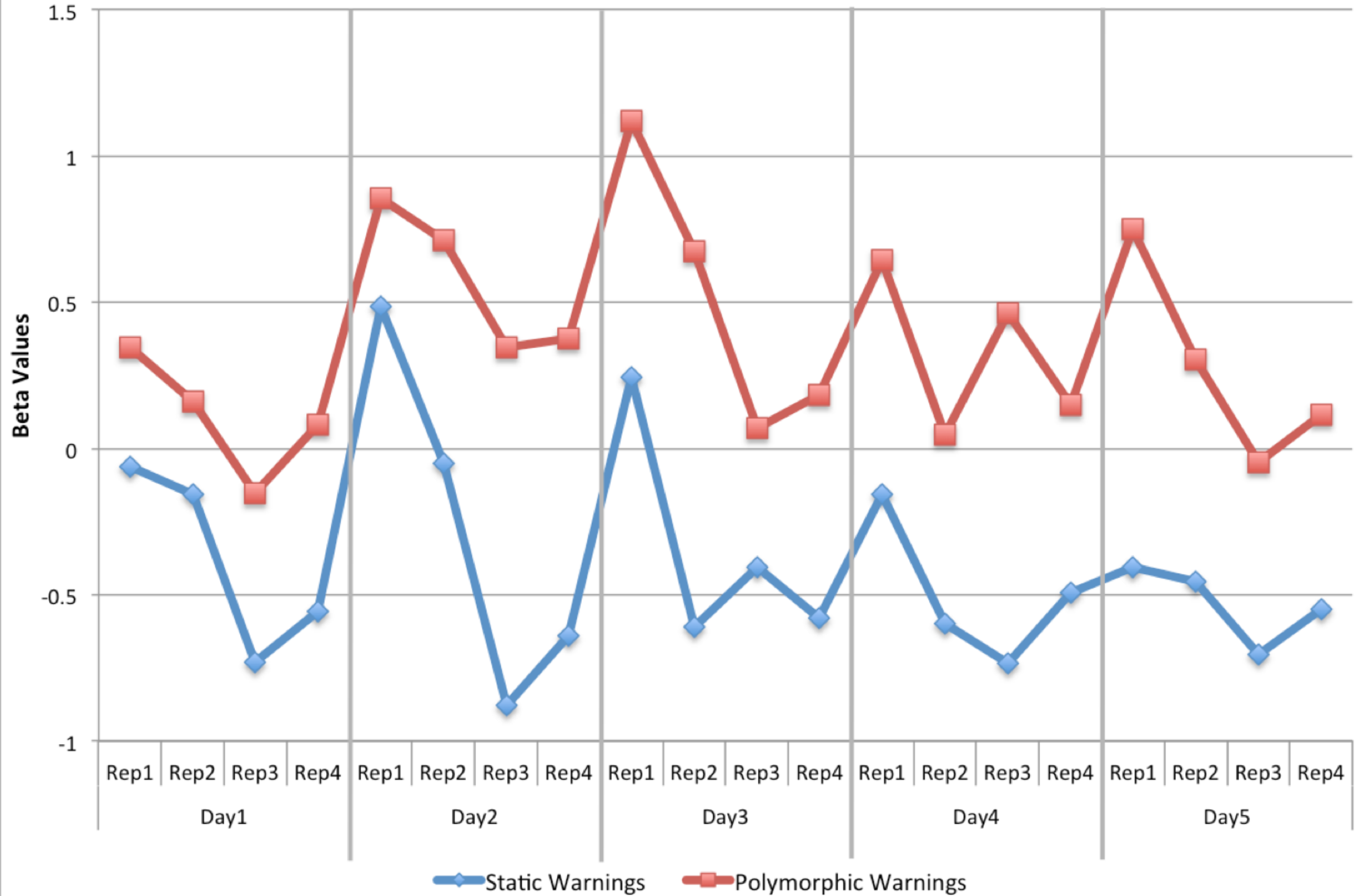


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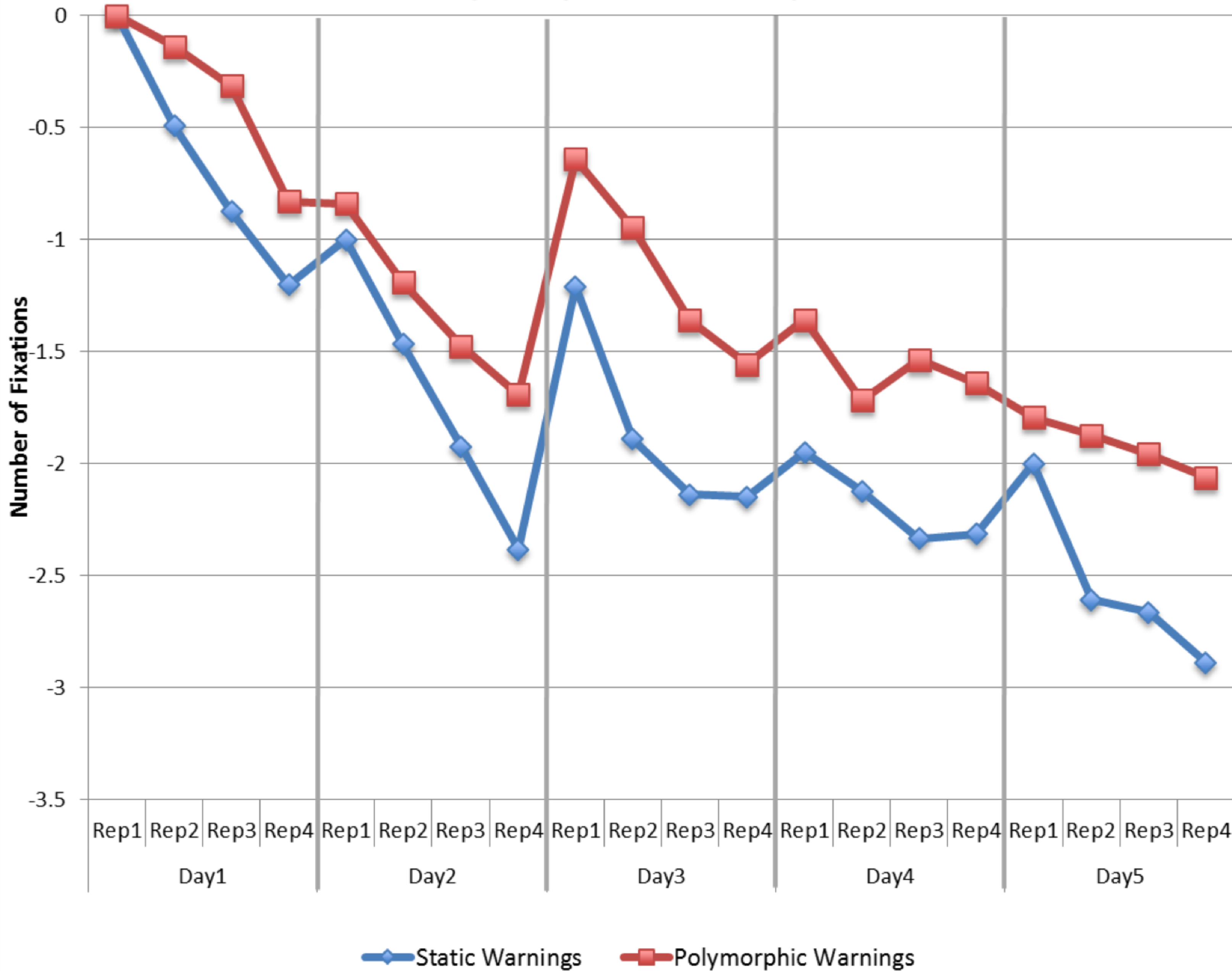
Right Ventral Visual Pathway





Change in Eye Gaze Fixations

(Intercepts Normalized at 0)



Mobile field experiment

Adherence behavior

Download Apps

Today's Category: Health & Fitness



Runkeeper - GPS Track Run Walk

Every one. Every run. Track your pace, measure workout distance, chart weight loss, crush training goals and more with the running app trusted by 45 million users! Runkeeper is the simplest way to improve fitness, whether you're just deciding to get off the couch for a 5k, biking every day, or even deep into marathon training.

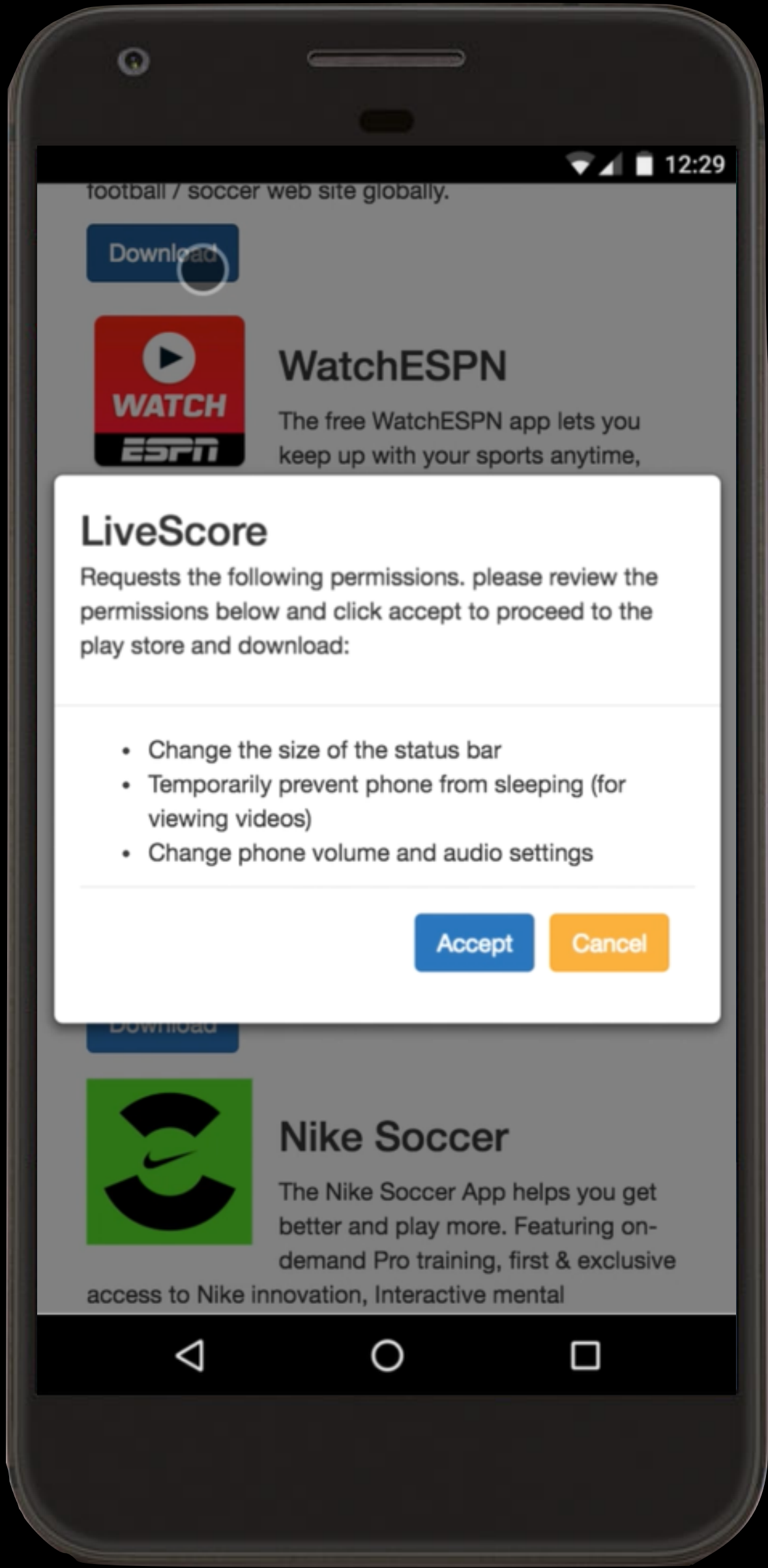
Download



7 Minute Workout

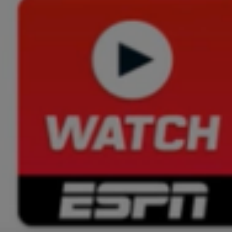
Featured by Google Play! No. 1 in over 19 countries and among the top 5 health apps in over 57. Now supports Google Fit, and comes with the new abs workout. Over 3 million users love 7 minute workout. Scientifically proven to assist weight loss and improve cardiovascular function.

Download



football / soccer web site globally.

Download



WatchESPN

The free WatchESPN app lets you keep up with your sports anytime,

LiveScore

Requests the following permissions. please review the permissions below and click accept to proceed to the play store and download:

- Change the size of the status bar
- Temporarily prevent phone from sleeping (for viewing videos)
- Change phone volume and audio settings

Accept

Cancel

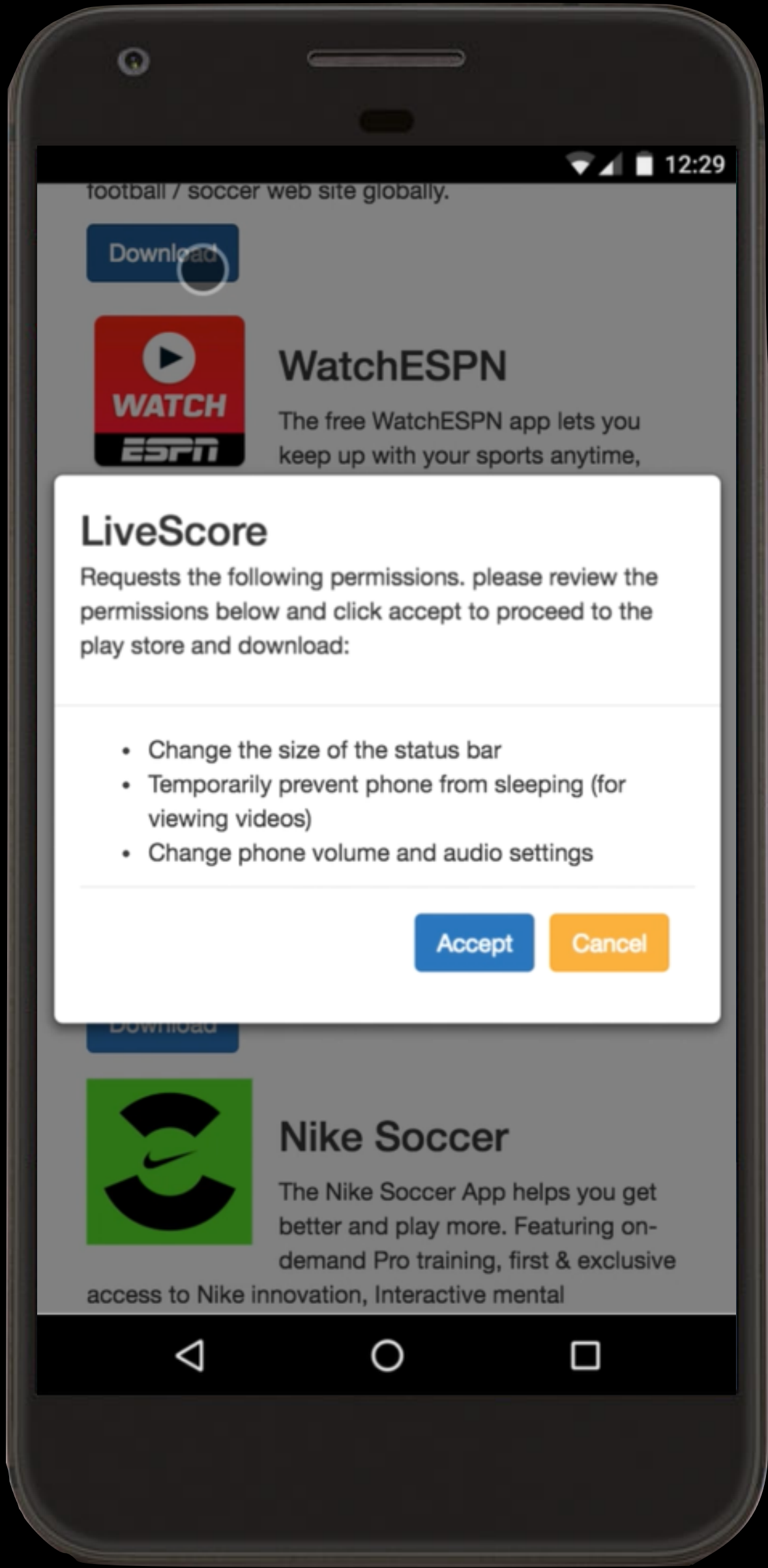
Download



Nike Soccer

The Nike Soccer App helps you get better and play more. Featuring on-demand Pro training, first & exclusive access to Nike innovation, Interactive mental

- Charge purchases to your credit card
- Delete your photos
- Record microphone audio any time
- Sell your web-browsing data



football / soccer web site globally.

Download



WatchESPN

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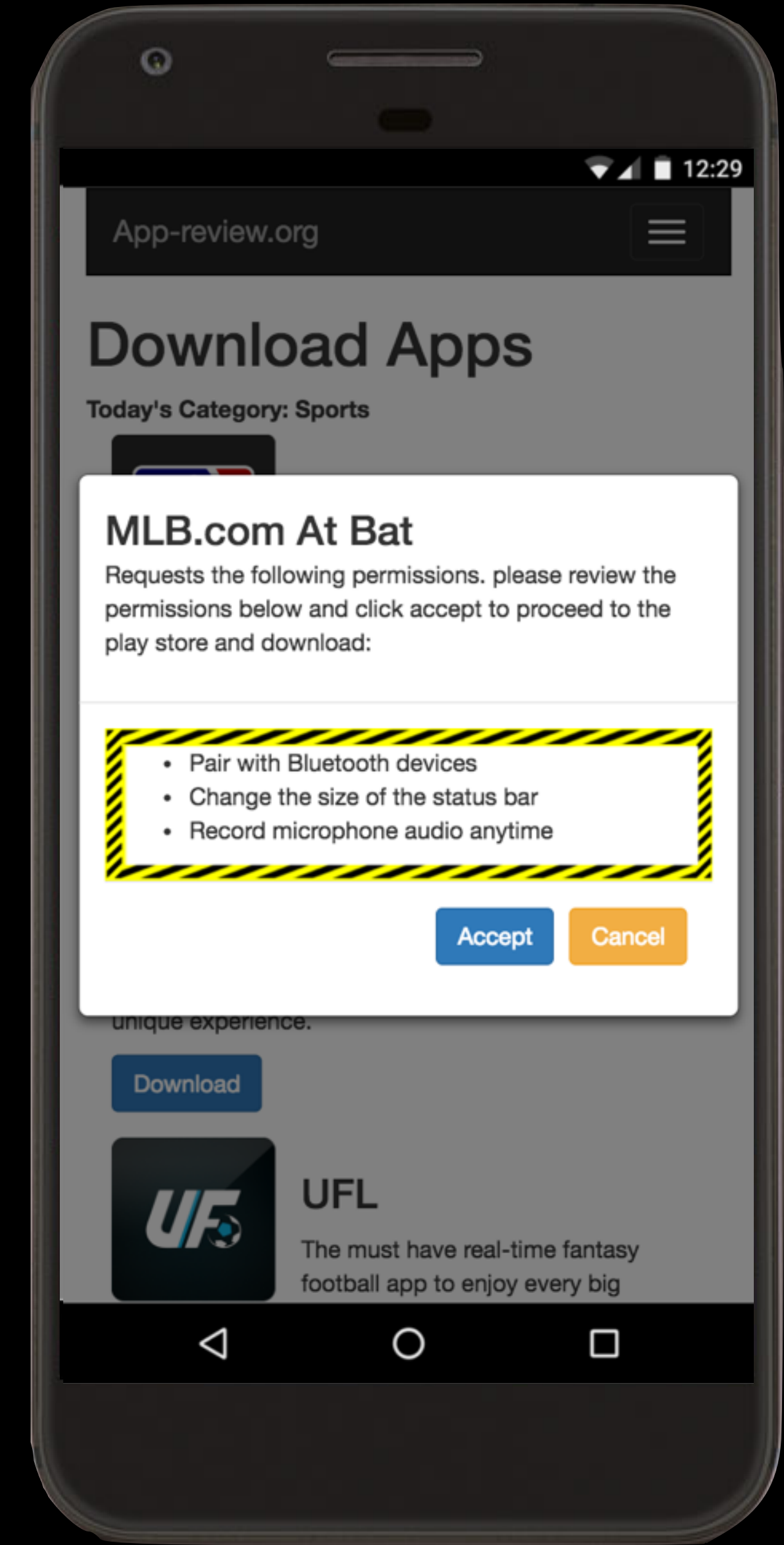
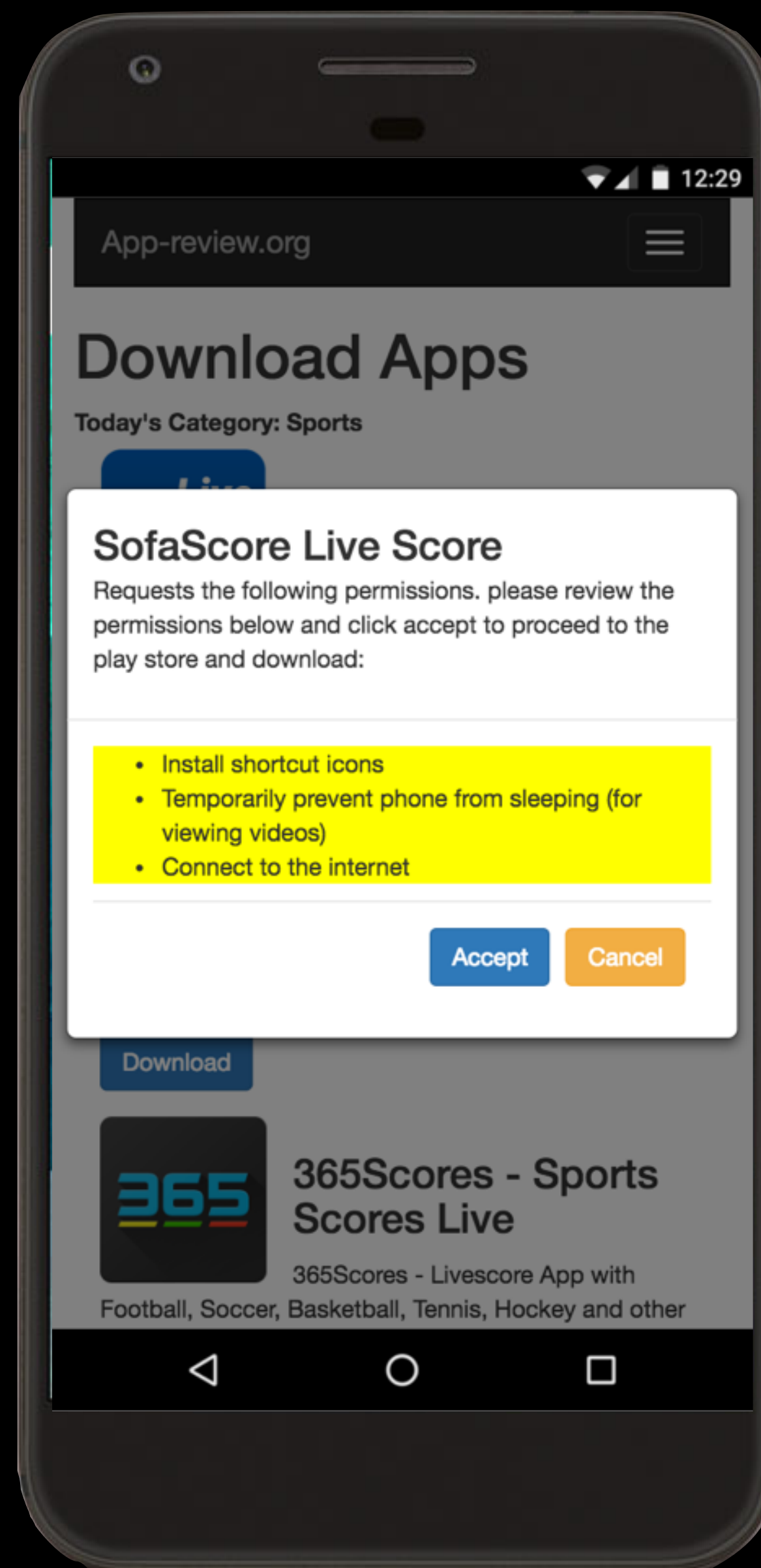
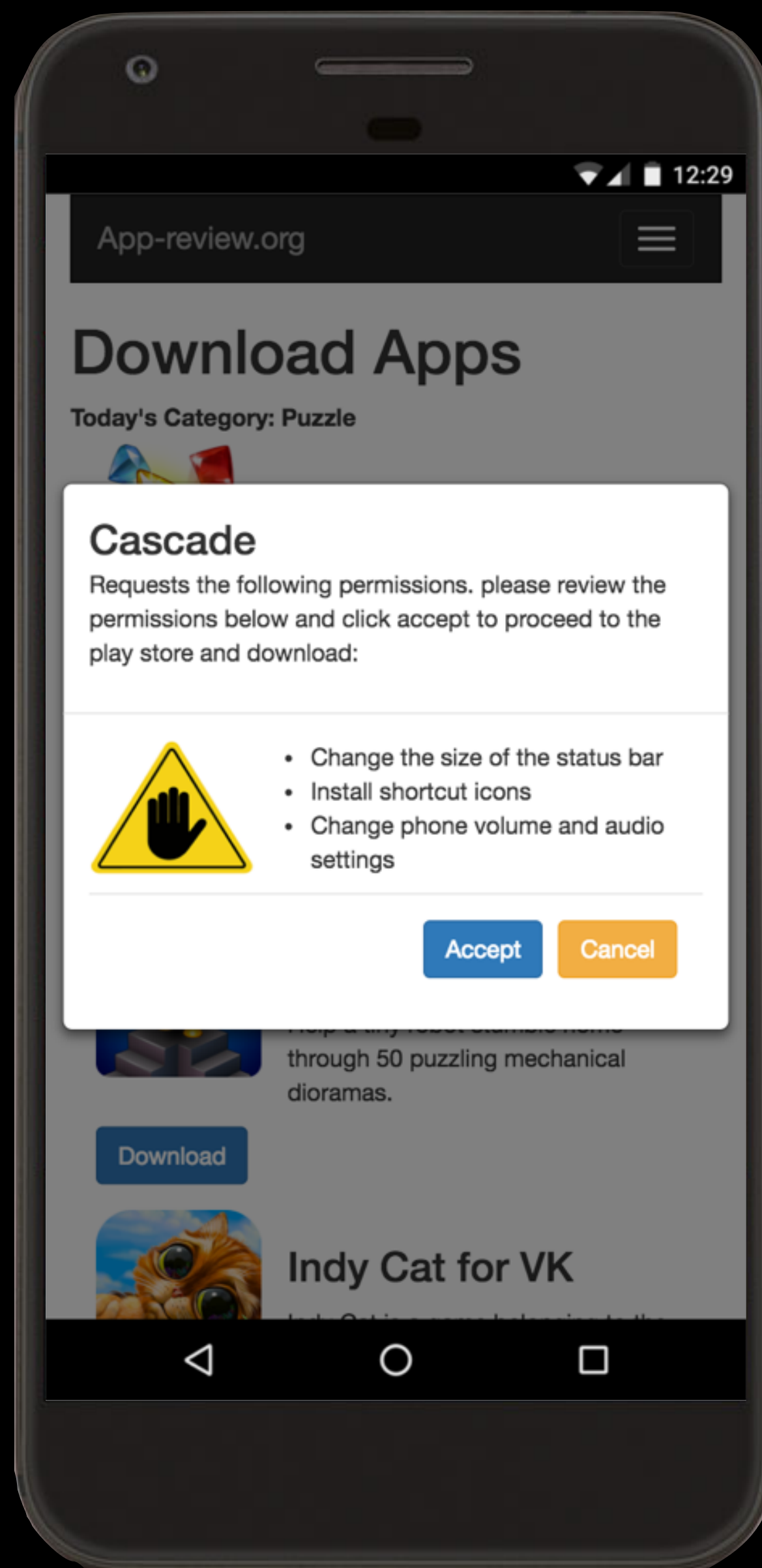
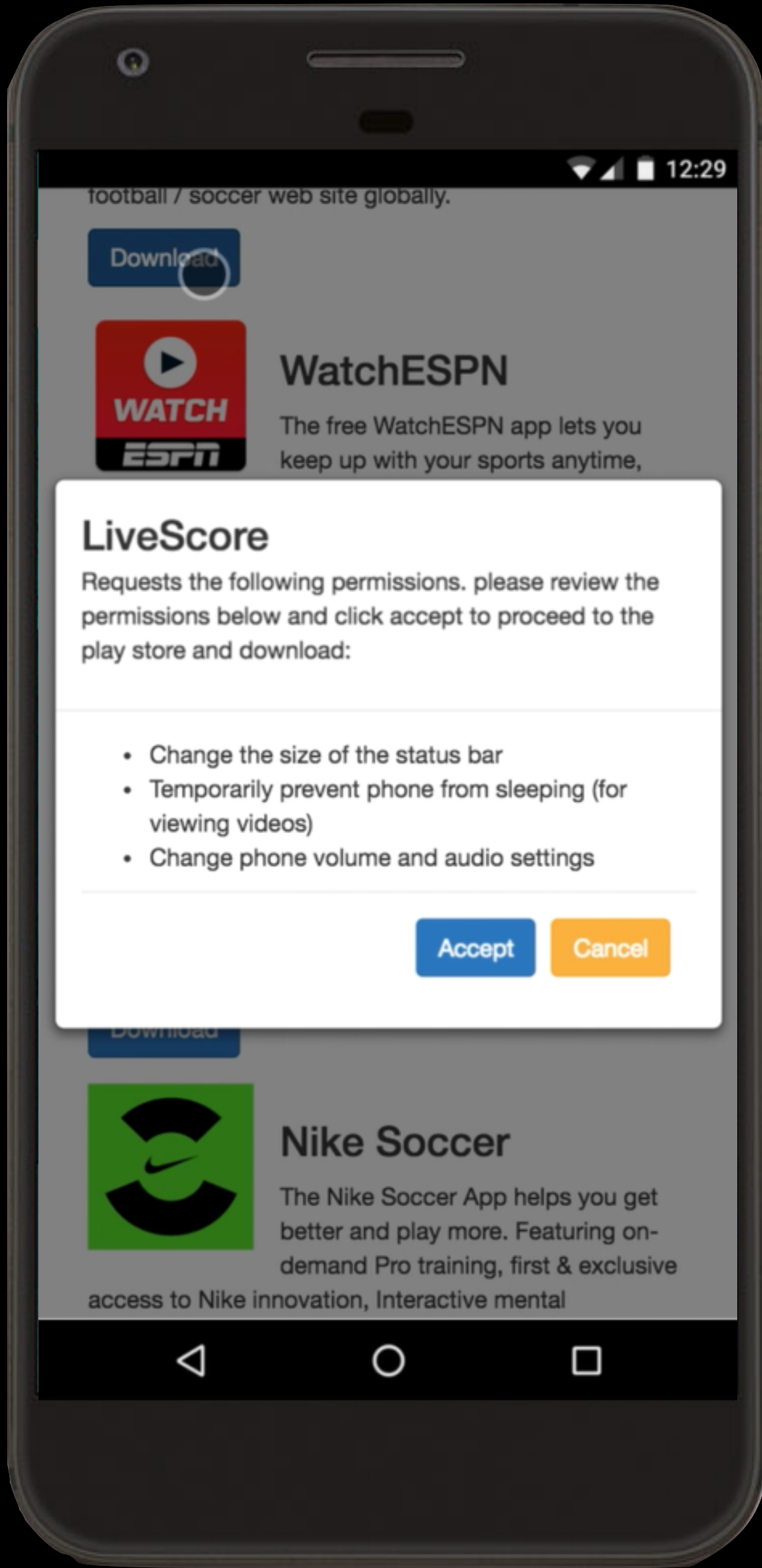
Cancel

Download



Nike Soccer

The Nike Soccer App helps you get better and play more. Featuring on-demand Pro training, first & exclusive access to Nike innovation, Interactive mental

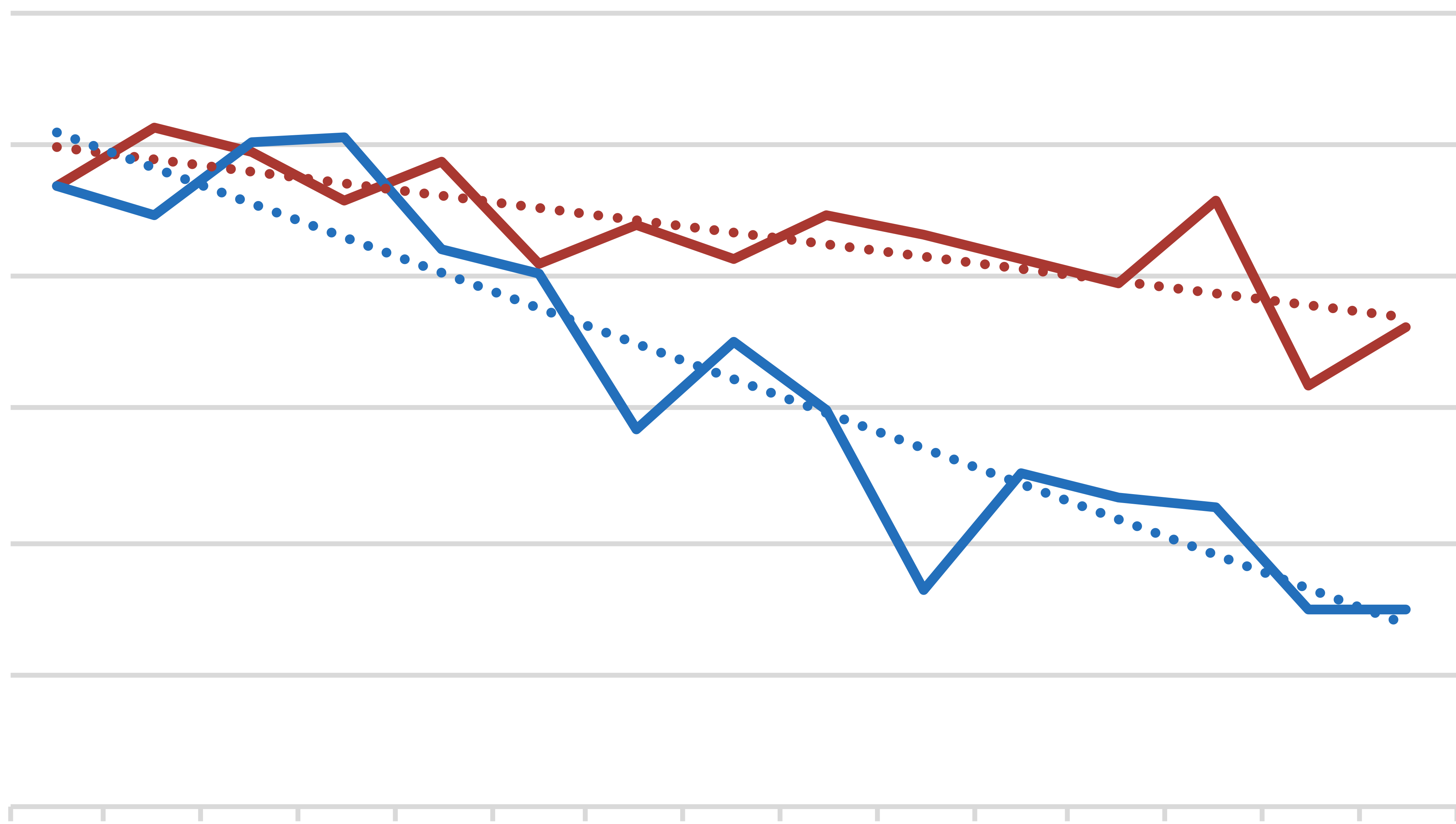


Warning adherence

100%
90%
80%
70%
60%
50%
40%

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

Days



Take-aways

1. The human brain is wired to tune out things it has seen before.

2. Updating the security UI
can reduce habituation.

3. Generalization

Generalization of habituation



To view this web content, you need to install the Java Runtime Environment.

Click "More Info..." to visit the website for the Java Runtime Environment.

More Info...

OK



This document contains macros. Do you want to disable macros before opening the file?

Macros may contain viruses that could be harmful to your computer. If this file is from a trusted source, click Enable Macros. If you do not fully trust the source, click Disable Macros.

[Learn about macros](#)

Enable Macros

Do Not Open

Disable Macros



How bad is this problem?

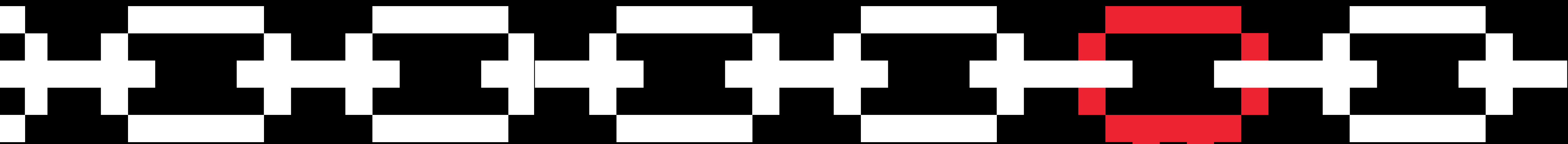
Take-aways

1. Frequent notifications likely contribute to habituation to rare security messages.

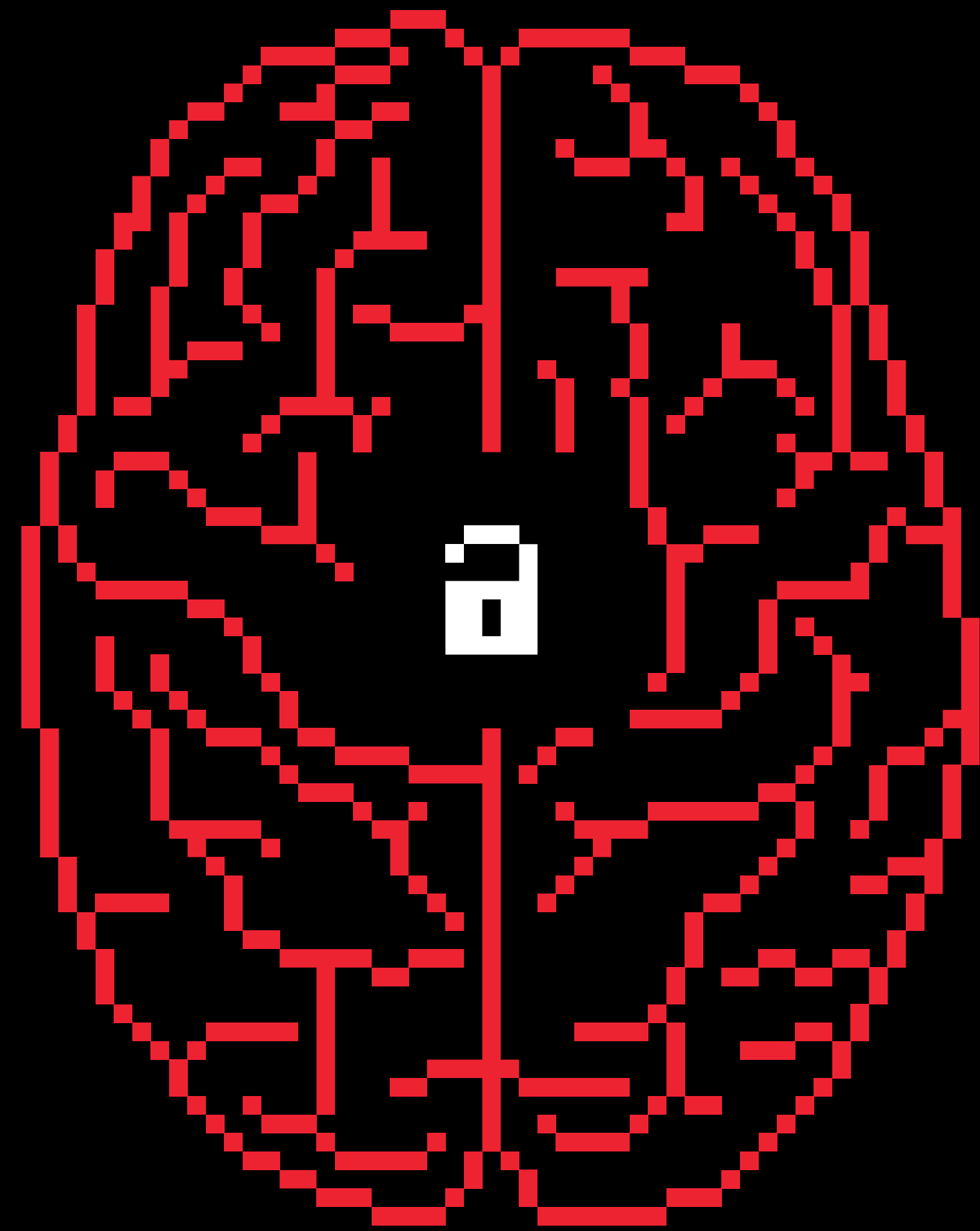
2. Design security
messages to be visually
distinct

1. Dual-task Interference
2. Habituation
3. Generalization





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