What Does the Brain Tell Us about Usable Security?

Anthony Vance
University of Hawai‘i at Mānoa
Brigham Young University

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

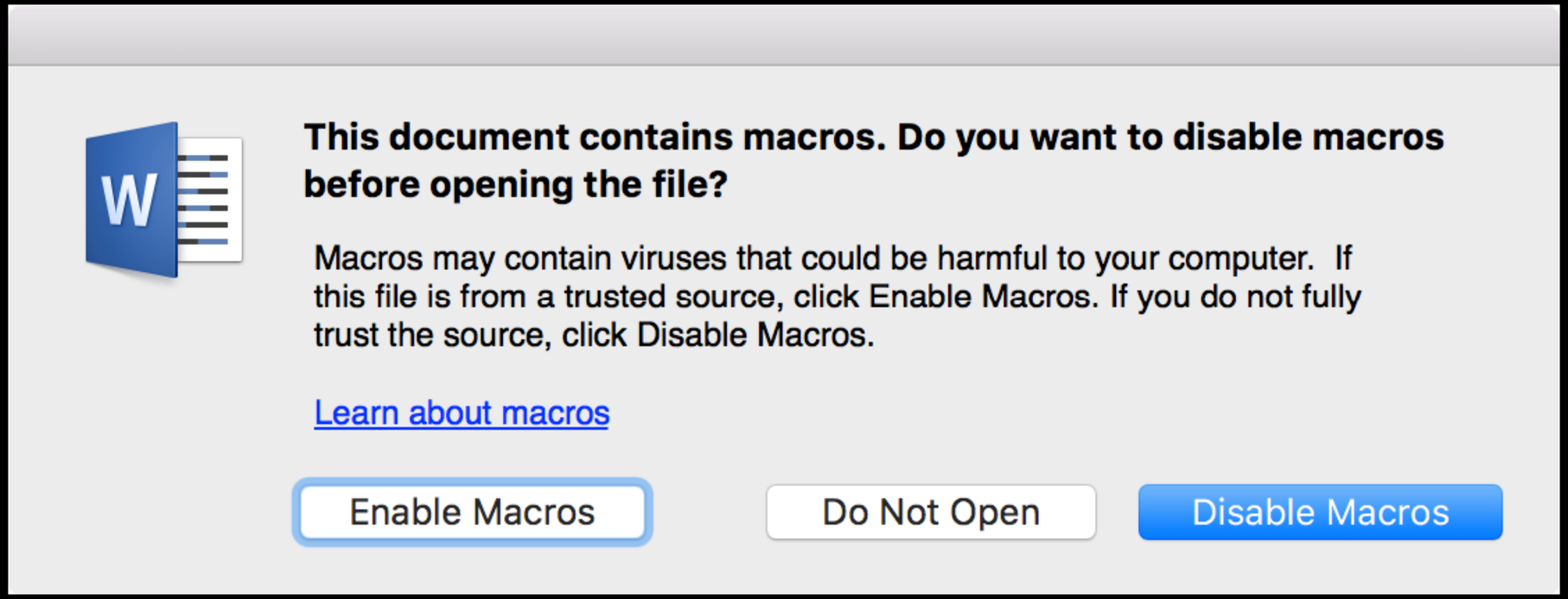
—Felton and McGraw (1999)

The Ukrainian Power Grid Was Hacked Again

Written by
KIM ZETTER
CONTRIBUTOR

January 10, 2017 // 10:07 AM EST

An investigation into a power outage that left customers in Ukraine without electricity for an hour last month has concluded that the cause was indeed a cyberattack, sources tell Motherboard. This would be the second such known hack of a Ukrainian power facility following a massive December 2015 power outage affecting about 230,000 people, which was later blamed on the Russian government.


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
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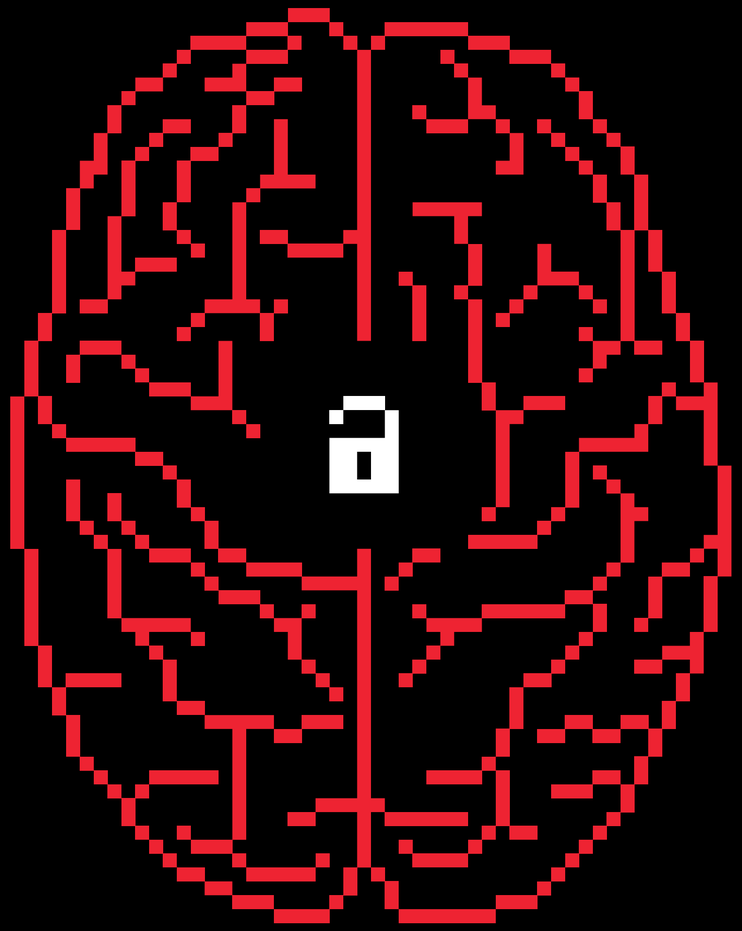
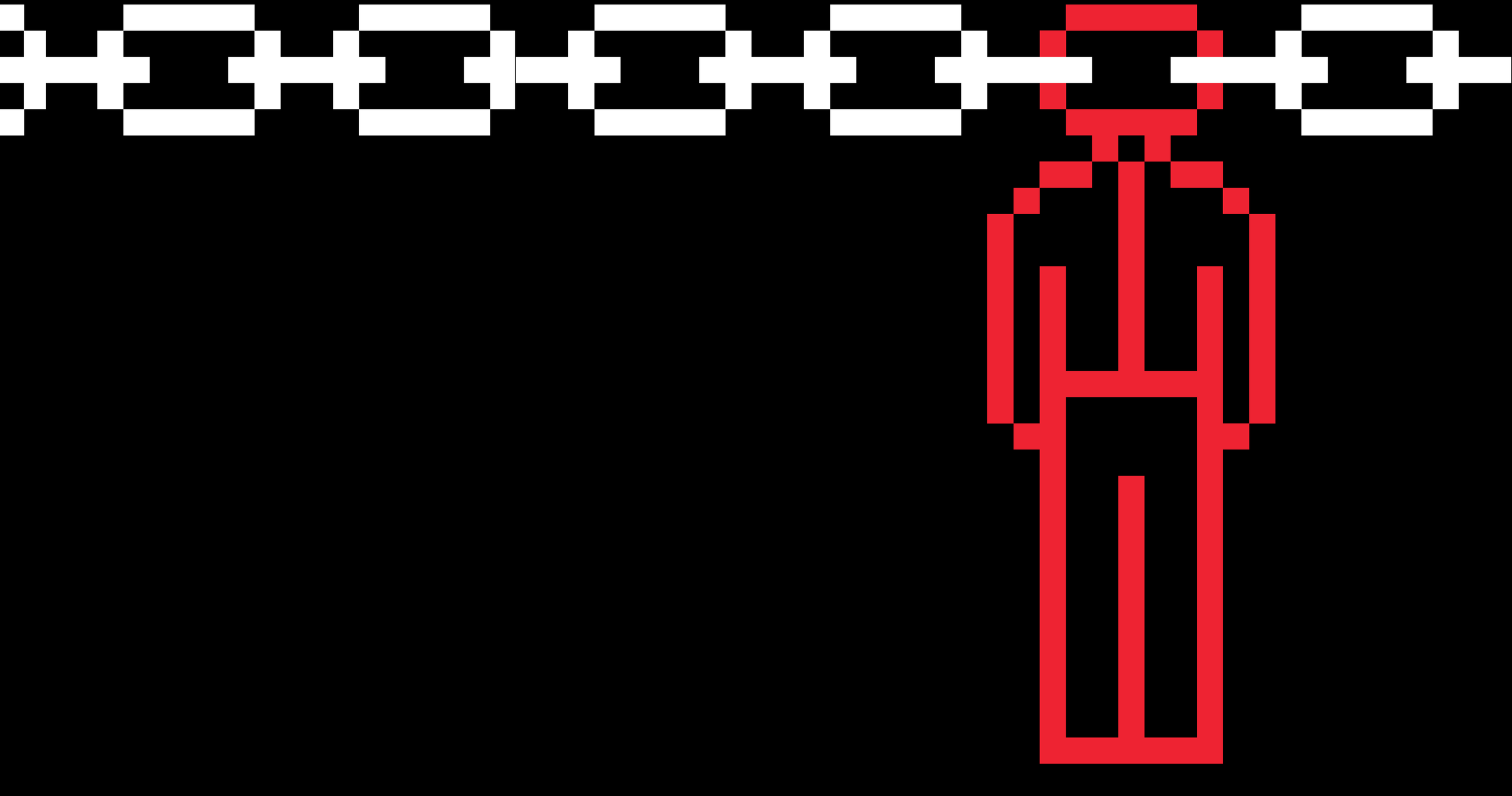
Disable Macros

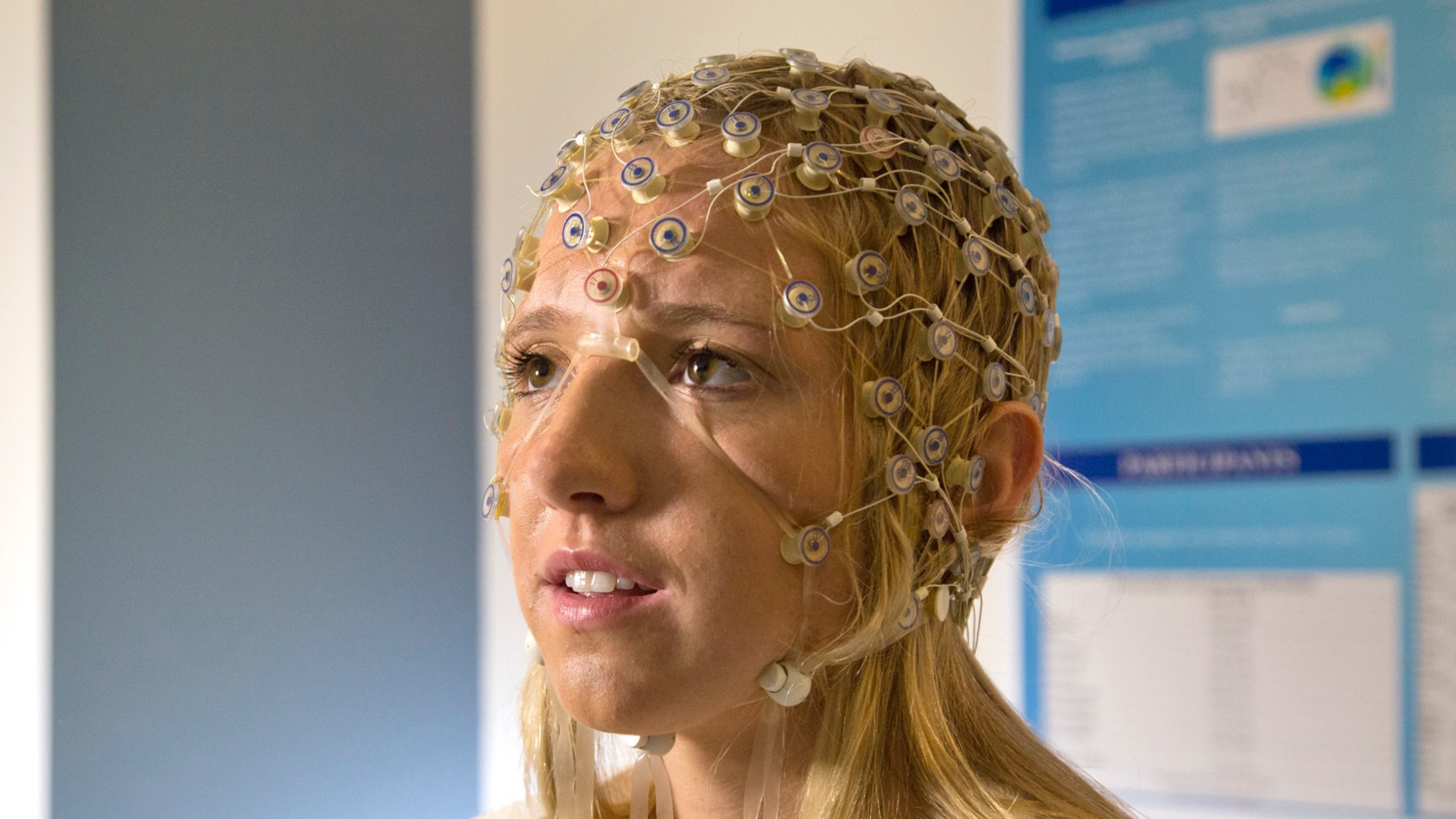
“clicky lusers”



Neurosecurity



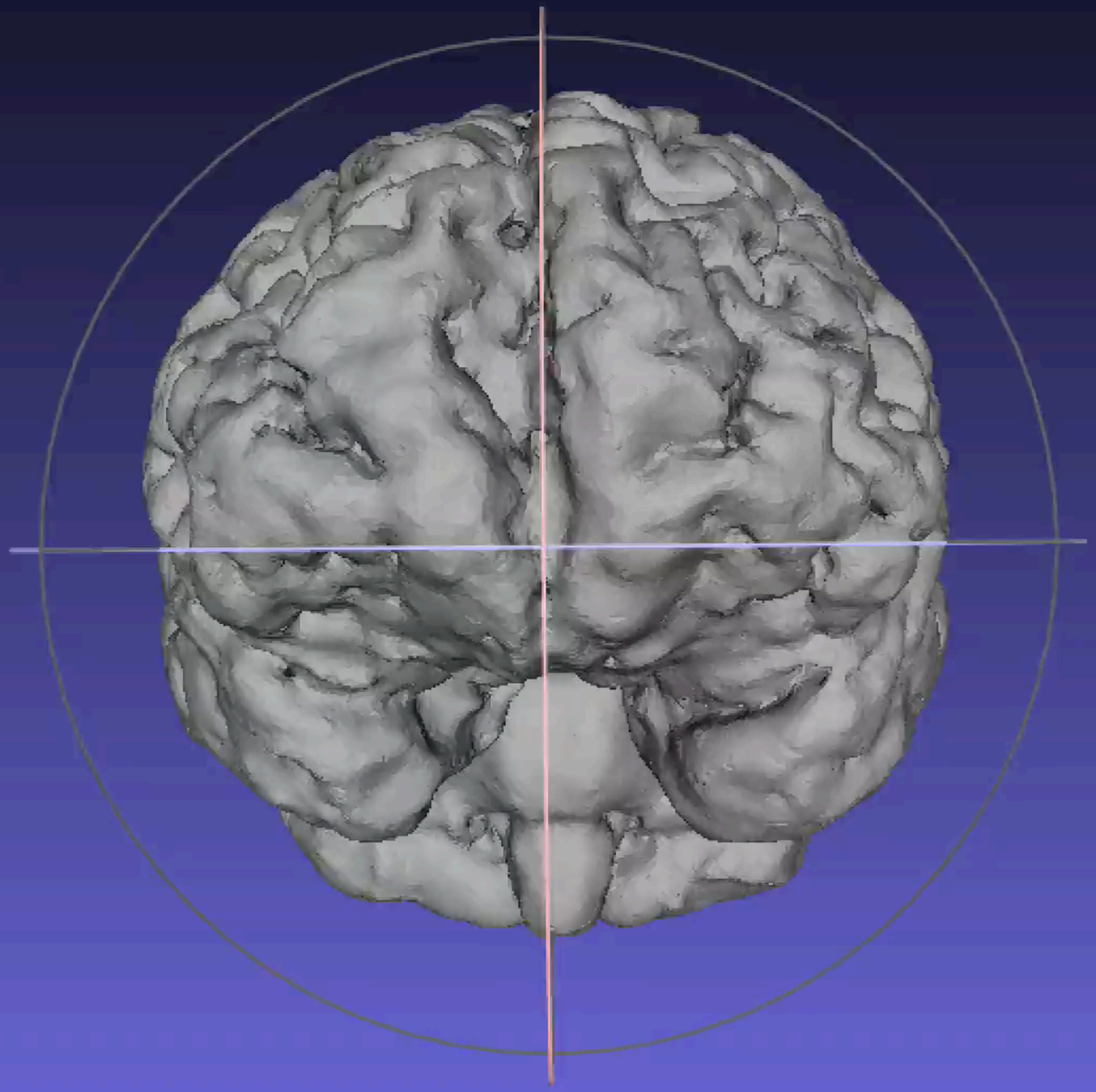
Neural methods



fMRI

1T

3T
SIEMENS

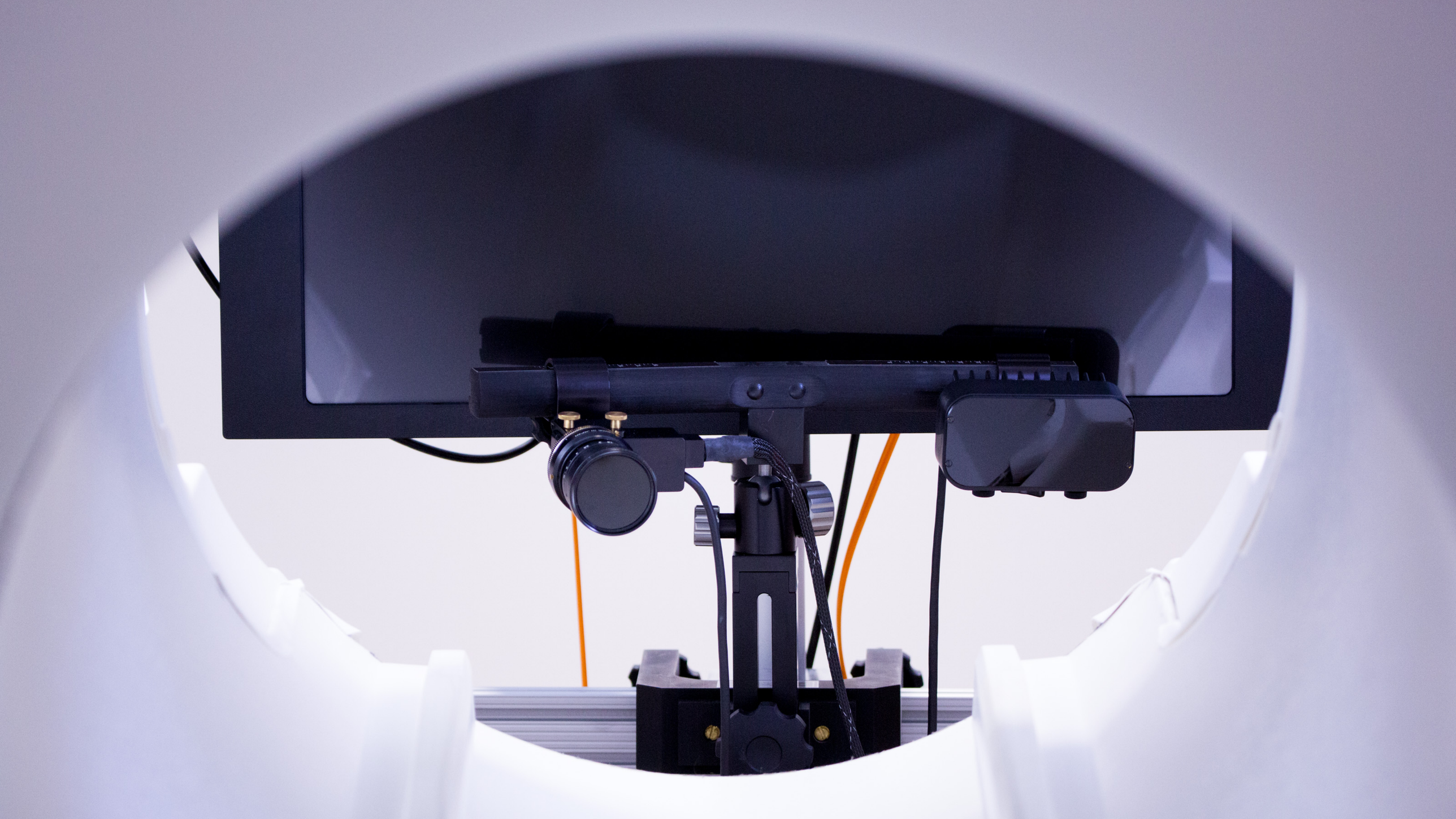


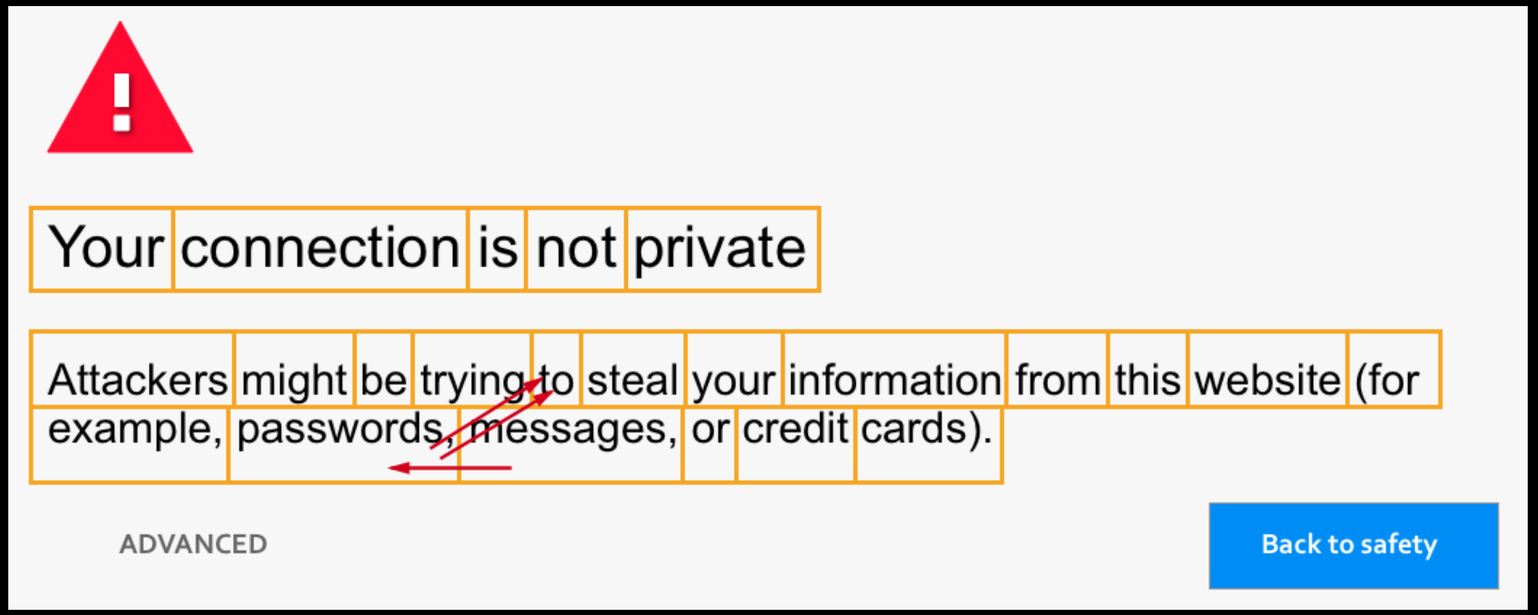
Physiological methods

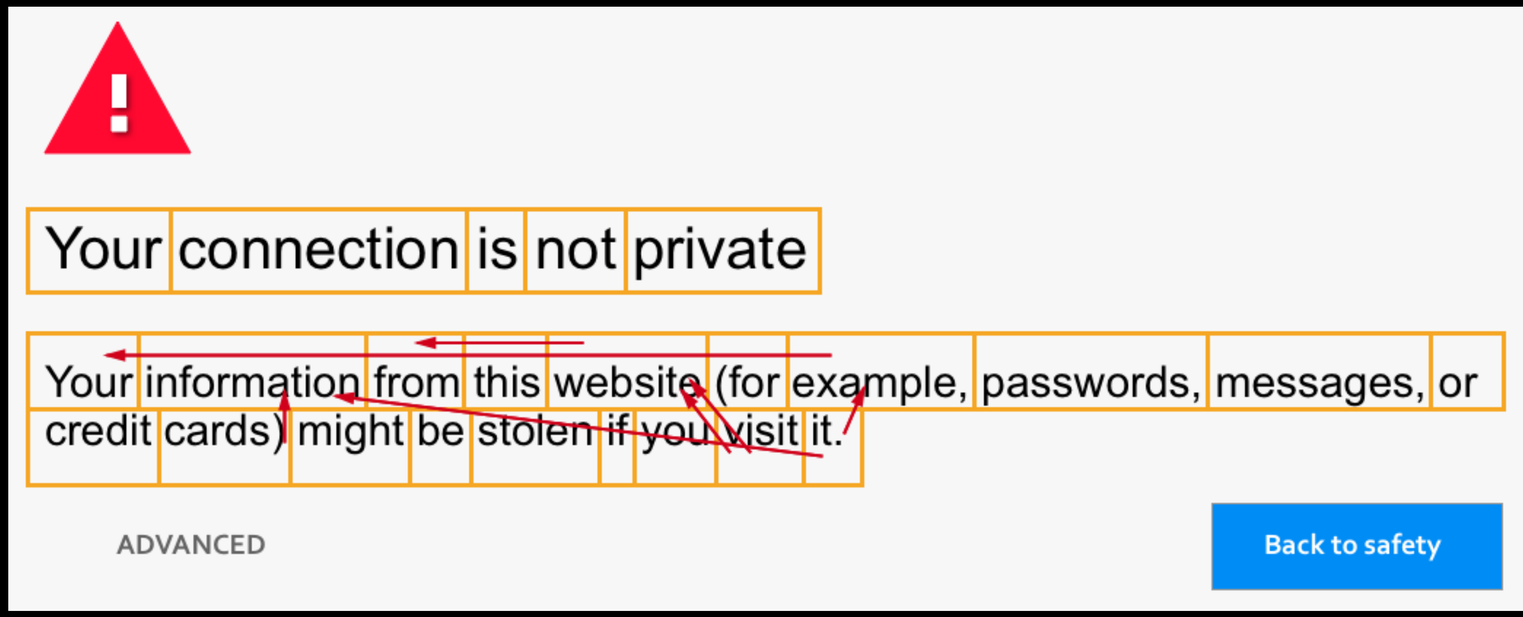
A "?
It
• ur computer and the websites you visit
• A ll websites
• De cation
Cancel
Install

tab
caps lock
shift
fn
control
alt
option
command

Neural and physiological methods simultaneously




Your connection is not private
Attackers might be trying to steal your information from this website (for example, passwords, messages, or credit cards).
ADVANCED
Back to safety


Your connection is not private
Your information from this website (for example, passwords, messages, or credit cards) might be stolen if you visit it.
ADVANCED
Back to safety

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

Vloader

www.vloader.net/

Sign Up | Login | Feedback

V loader

1 Lakh Registered

Search

Categories | Channels | More

1,354,413 Searchers

87,512 Downloads

3,587,697 Views

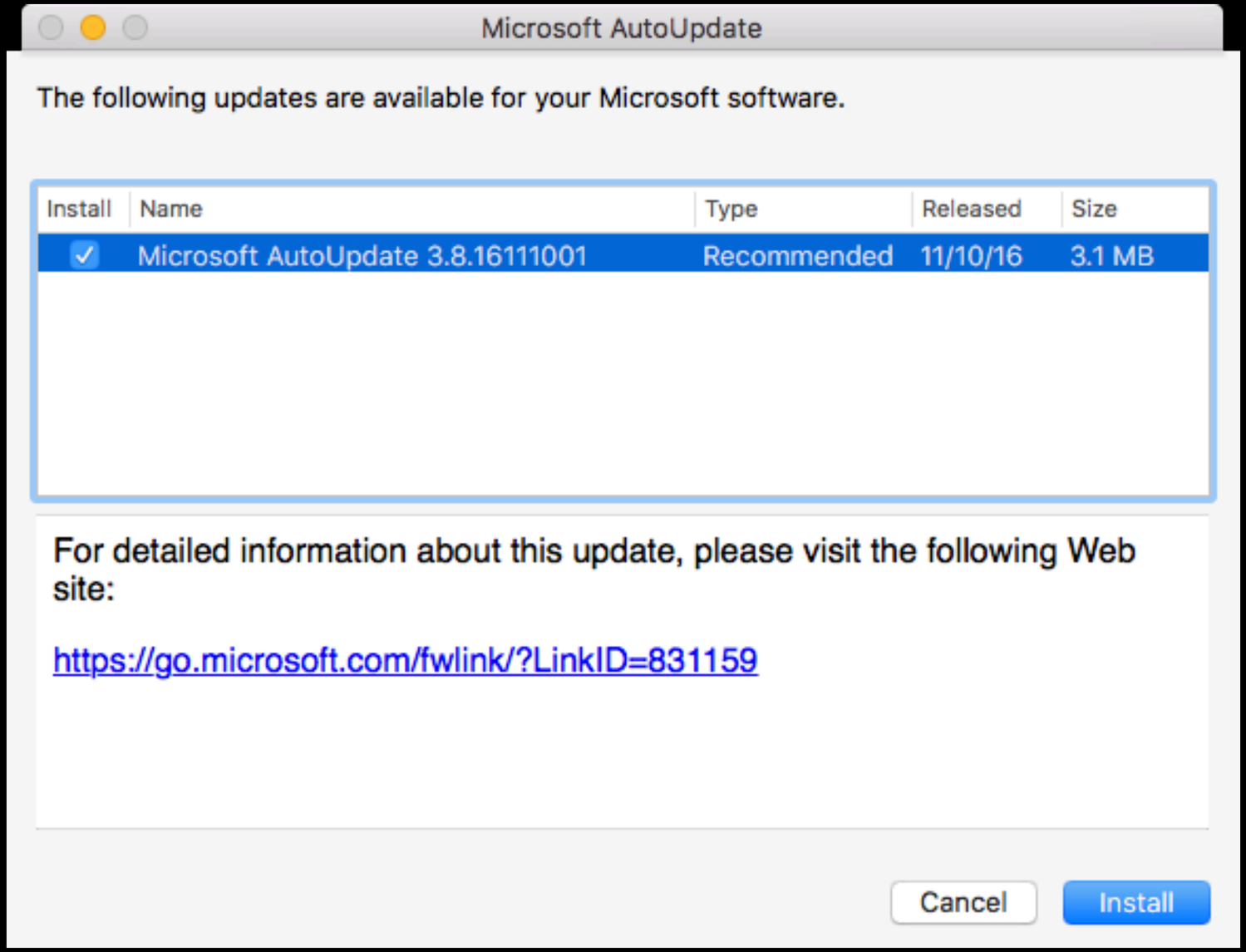
Most Recent

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

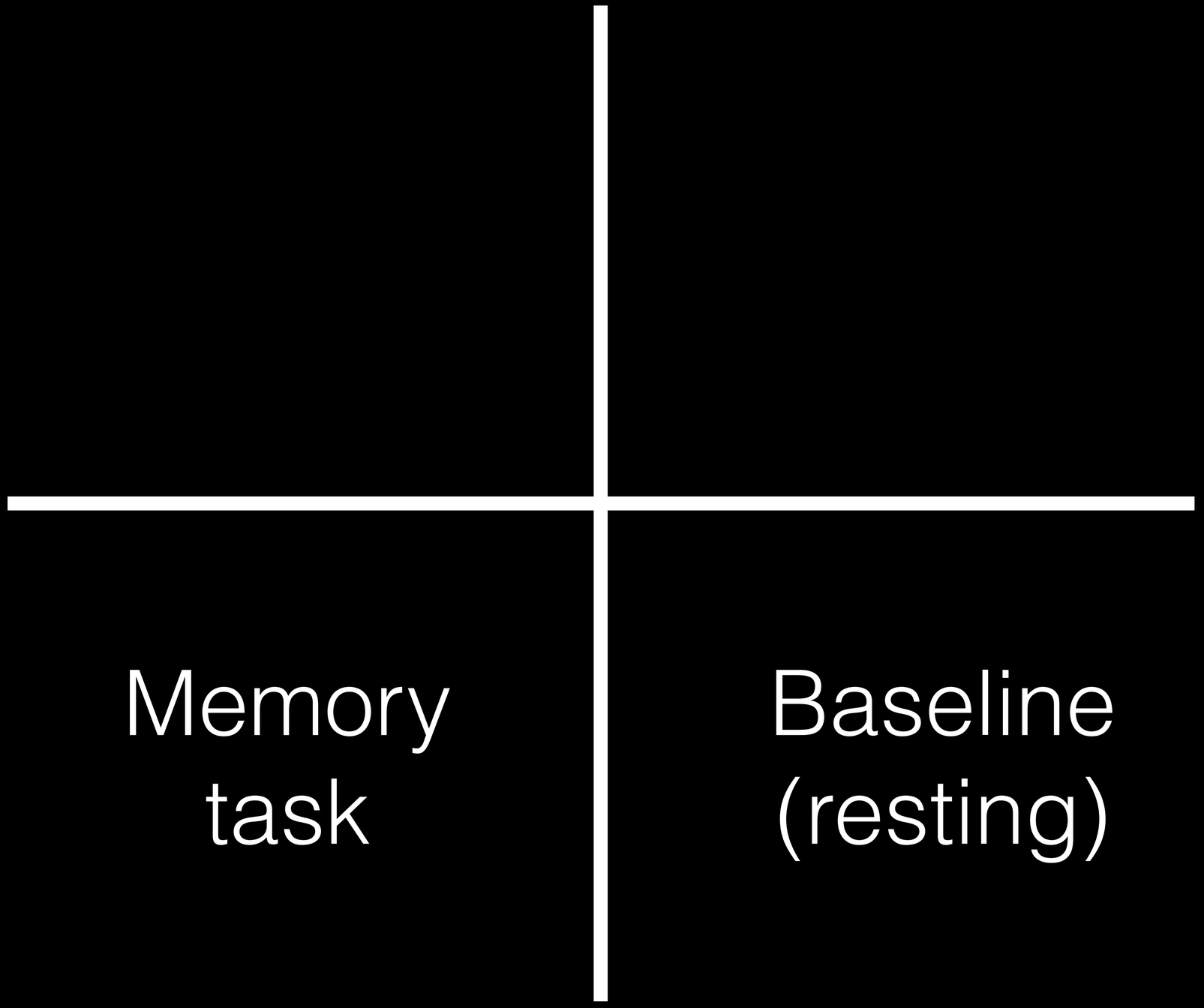
Text Message (37/160)
To:
252-332-2222
Hey, I'm going to be a little late...
Send
Menu


Microsoft AutoUpdate
The following updates are available for your Microsoft software.
Install
Name
Type
Released
Size
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?

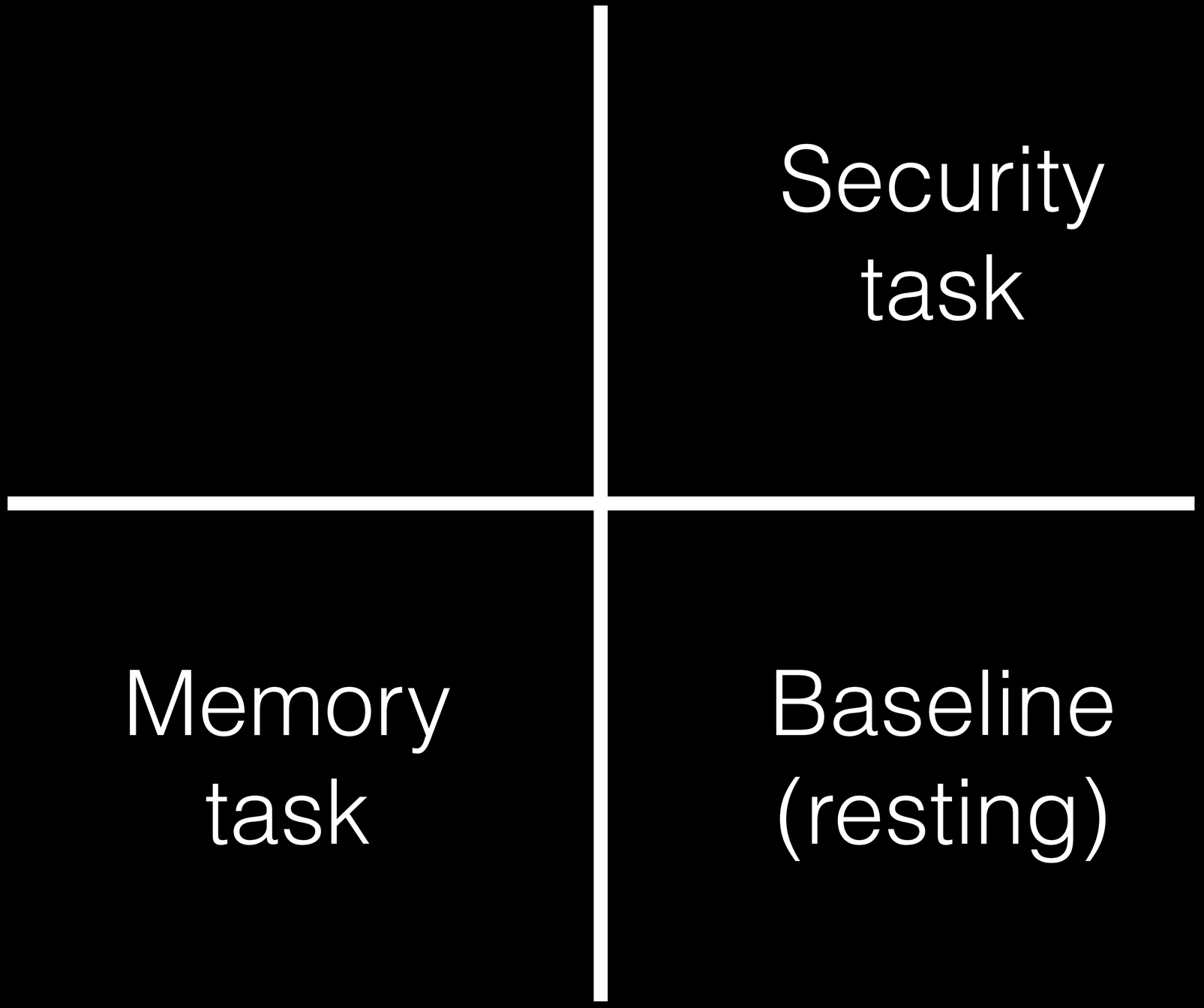
SIEMENS

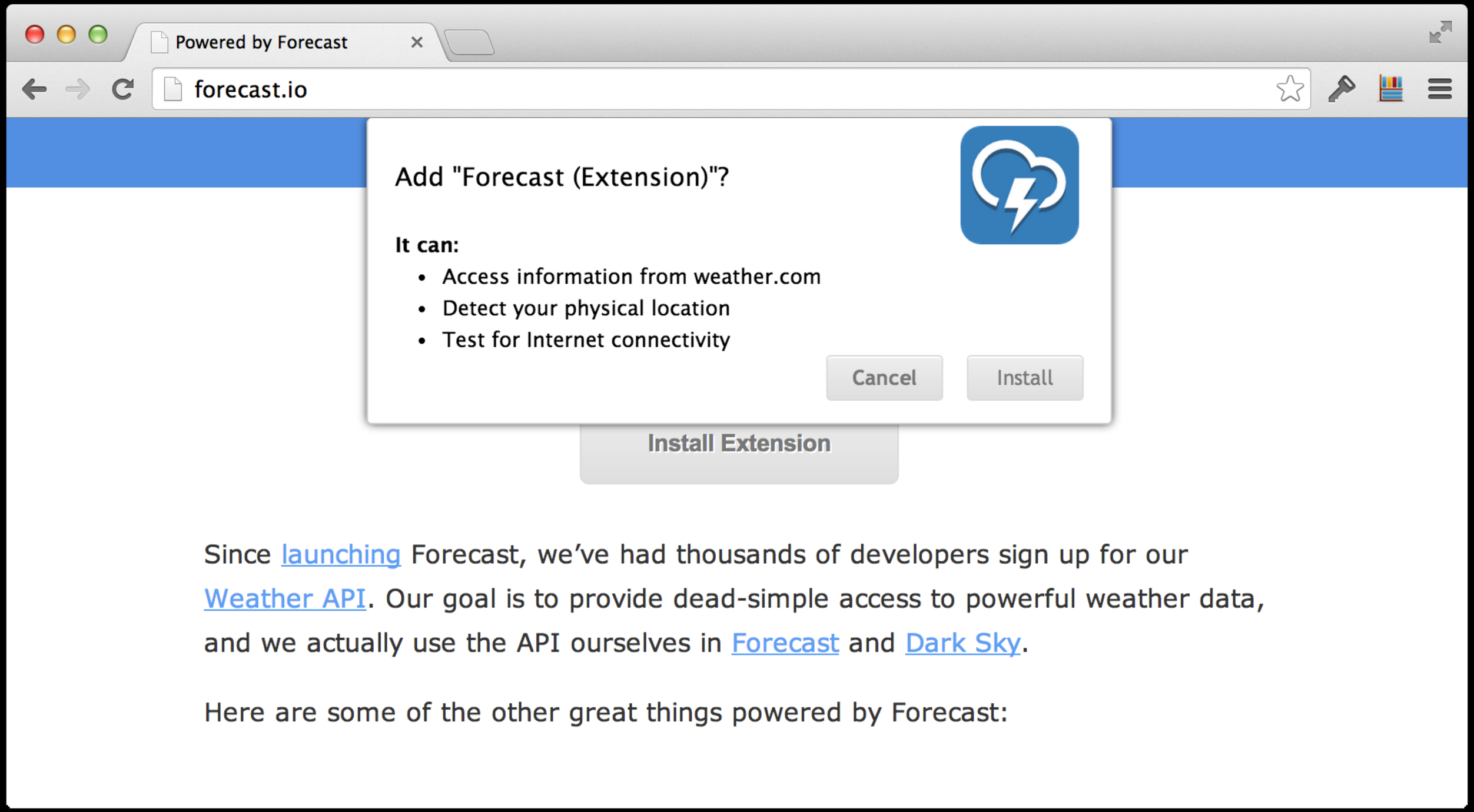
Baseline
(resting)


Memory
task
Baseline
(resting)

4382359

1. 4381358
2. 4382369
3. 4382359
4. 4383359


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

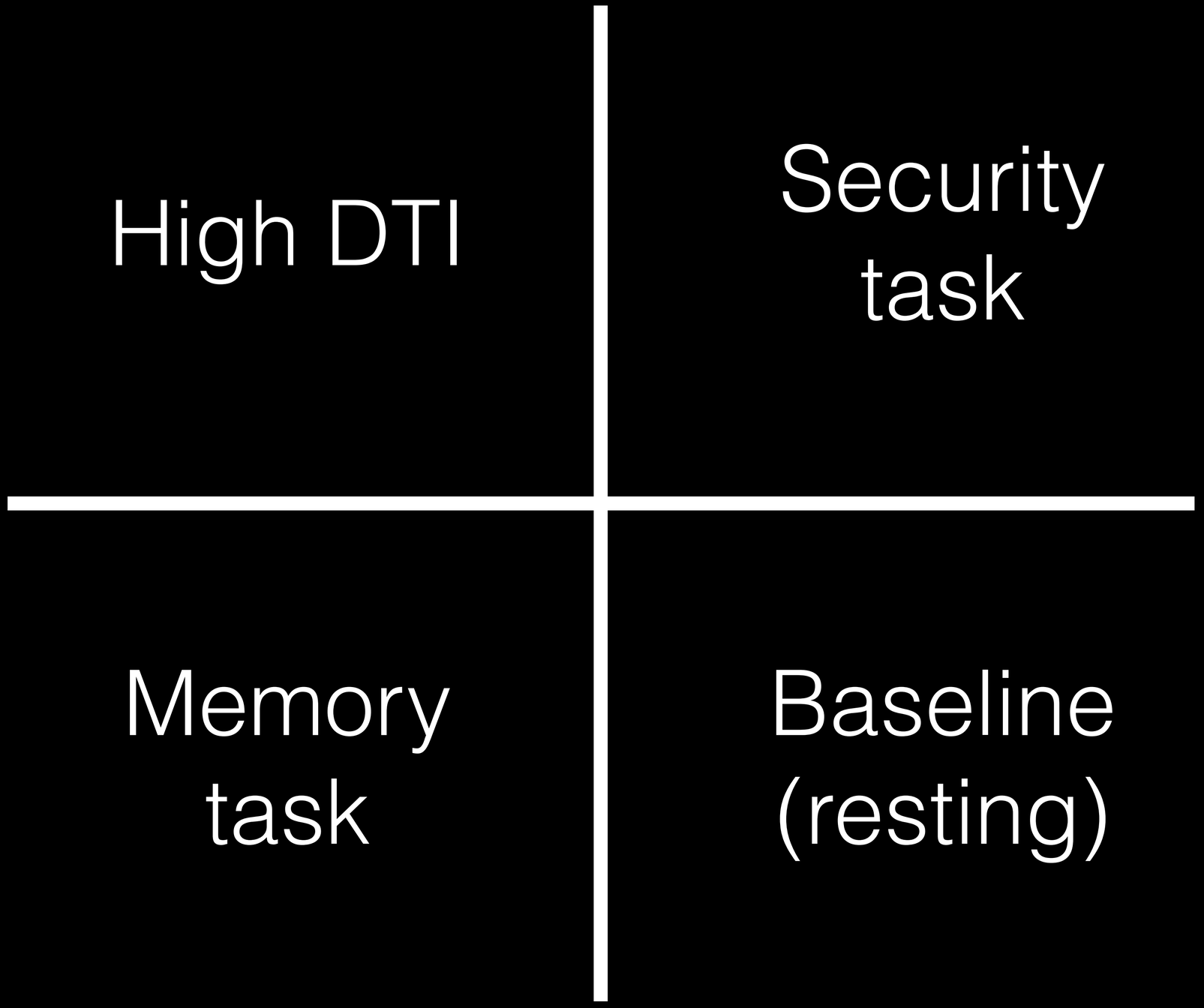
Access all data on your computer and the websites you visit
You didn't select this one, but this is a risky permission!

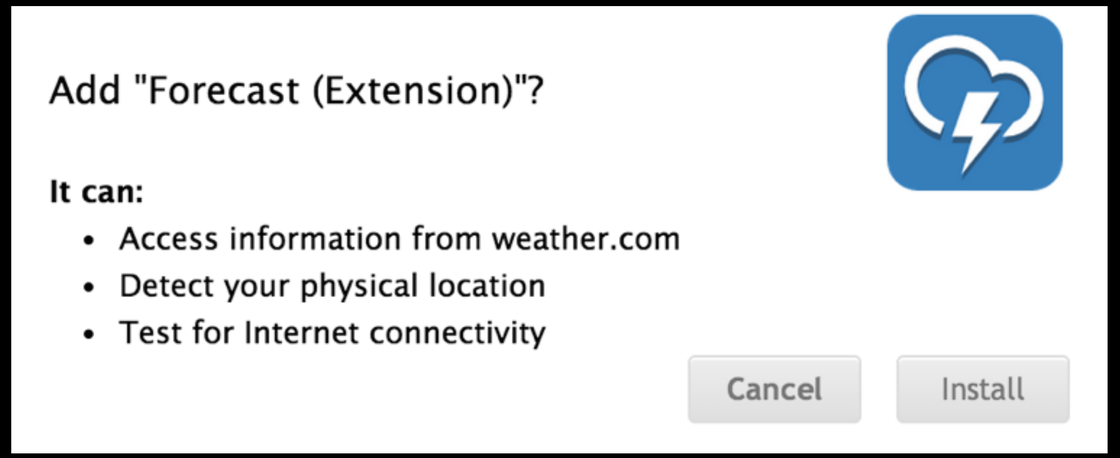
Access your data on {list of websites}

Access your tabs and browsing activity

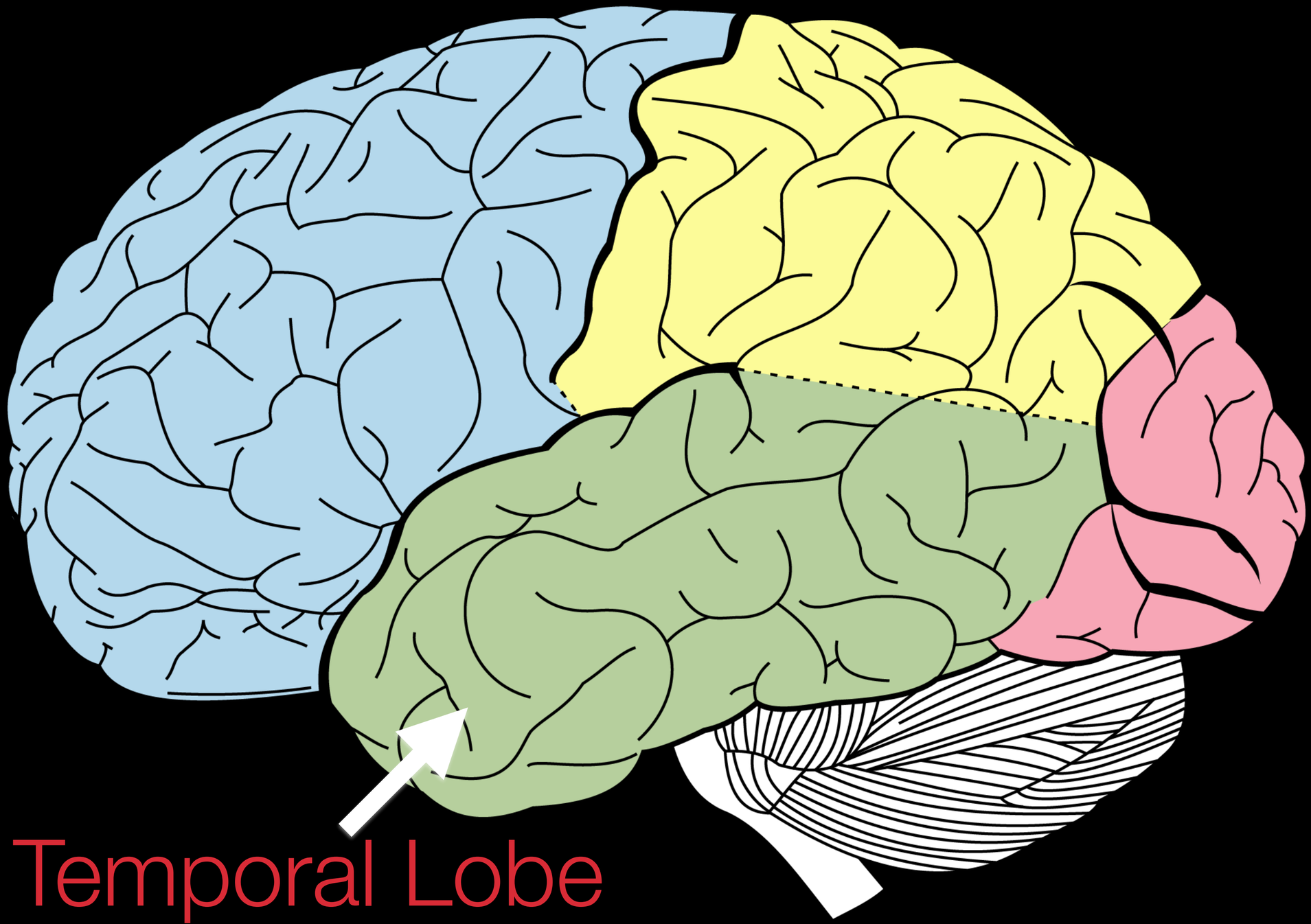
Read and modify your browsing history ***You didn't select this one, but this is a risky permission!***

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

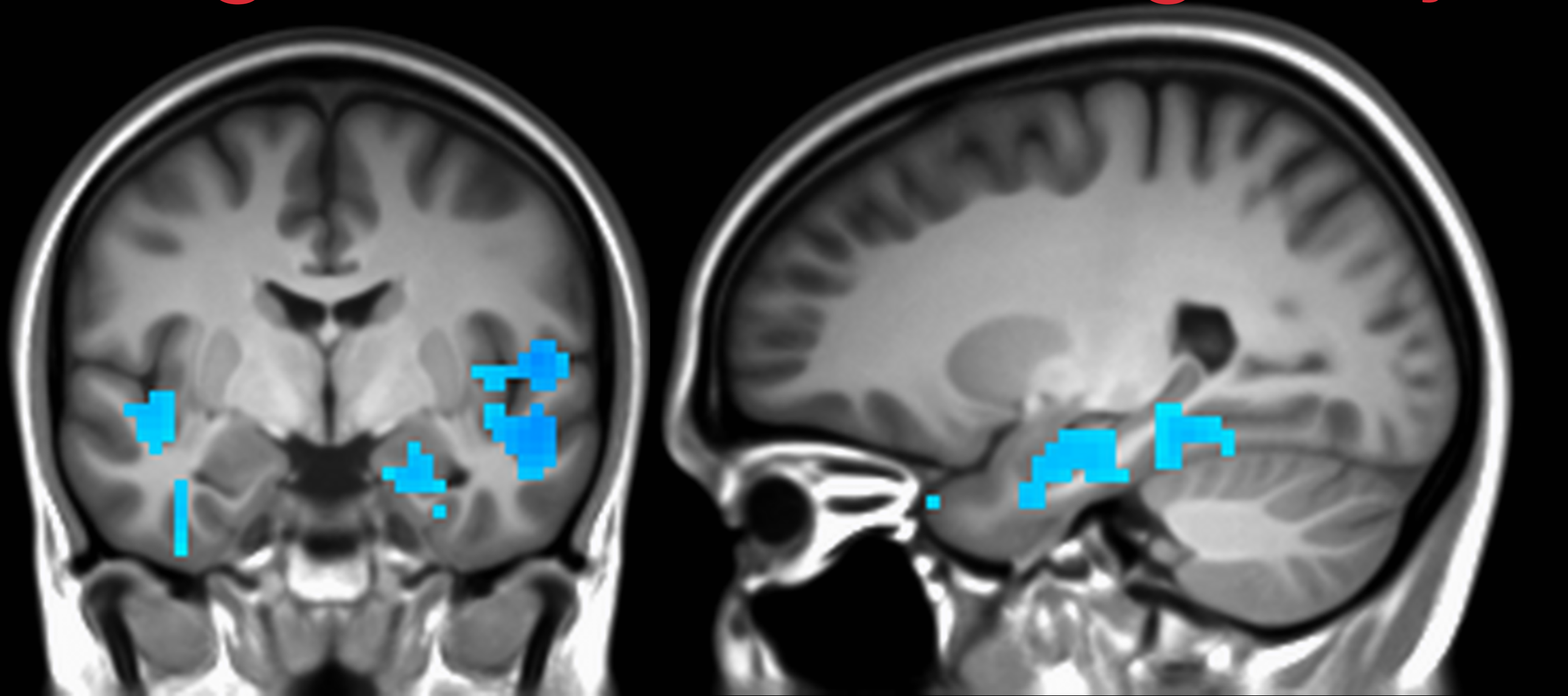

High DTI
Security task
Memory task
Baseline (resting)

1. Memorize code
2. 

3. Recall code

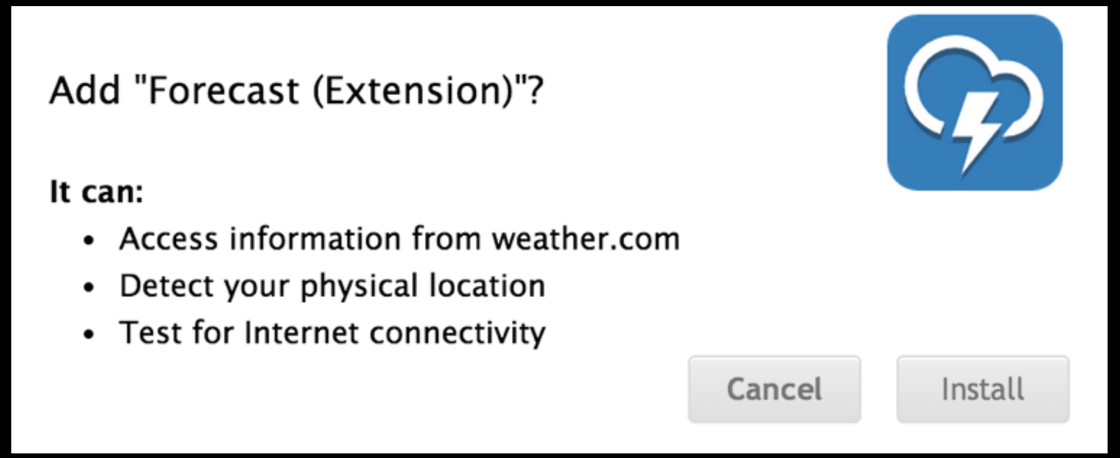

Temporal Lobe

High DTI vs. Warning Only



Security Task Performance

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

1. Memorize code
2. 

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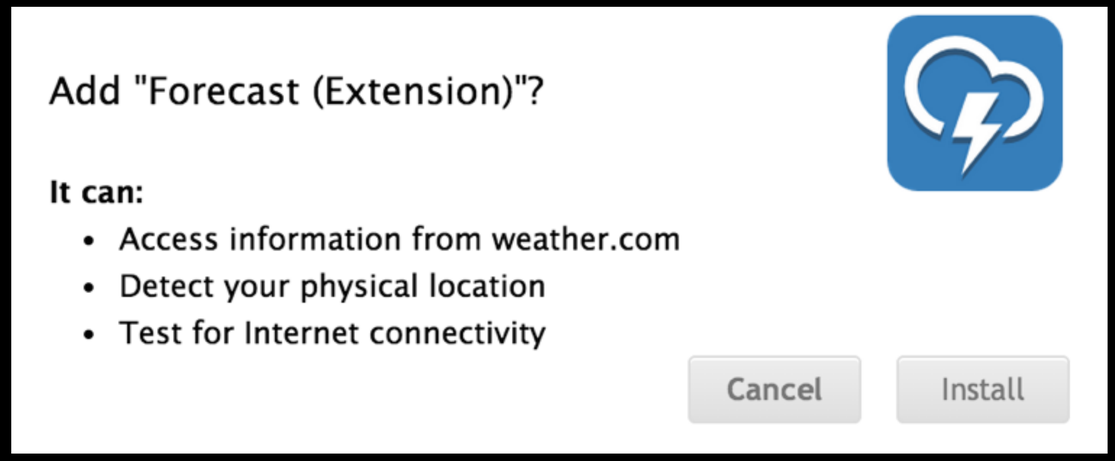
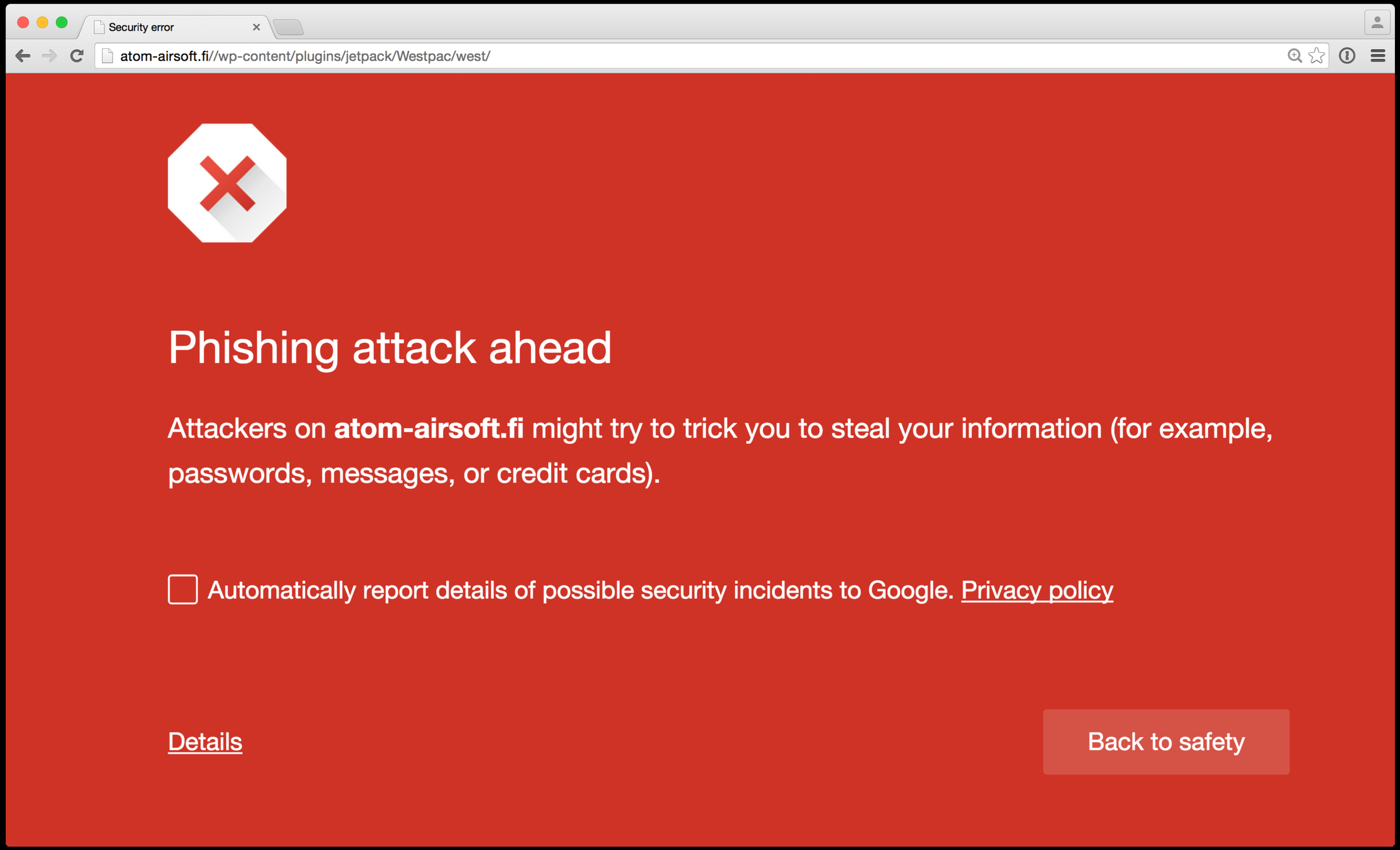
3. 

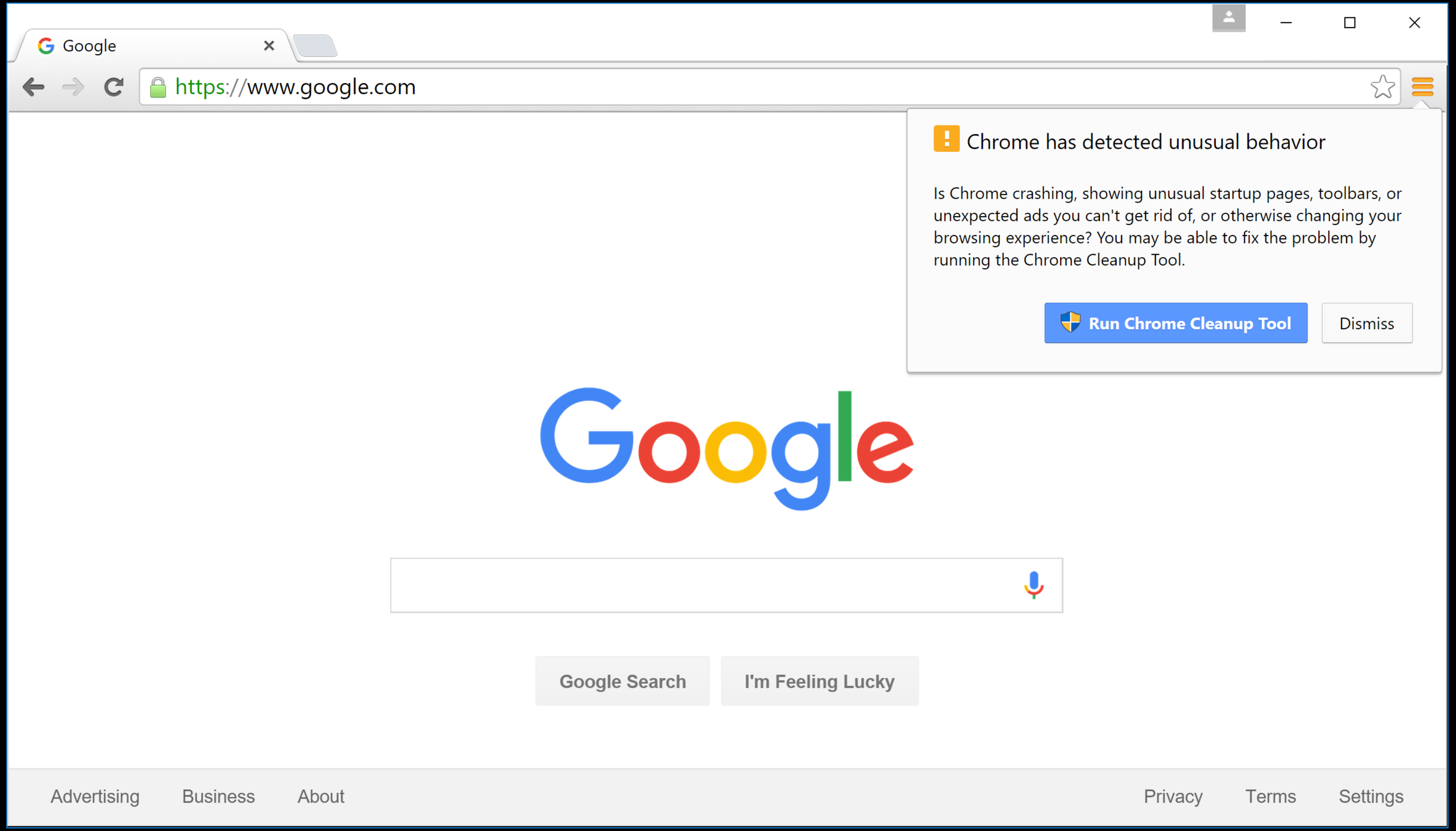
Security Task Performance

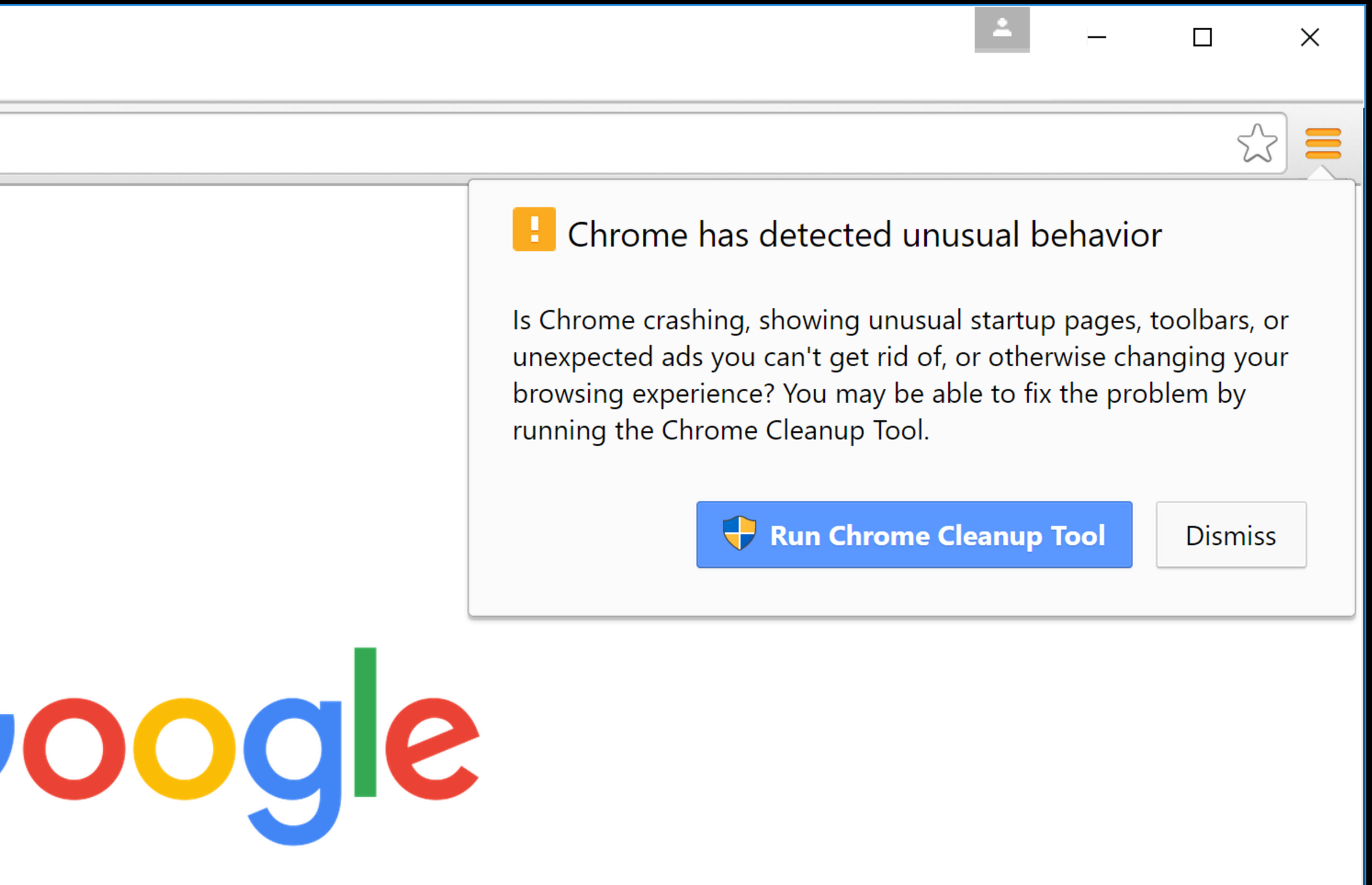
Treatment	Warning Disregard
High-DTI	22.9%
Low-DTI	8.8%
Warning-Only	7.4%

Google

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


Google
https://www.google.com
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.
Run Chrome Cleanup Tool
Dismiss
Google
Google Search
I'm Feeling Lucky
Advertising
Business
About
Privacy
Terms
Settings


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.
Run Chrome Cleanup Tool
Dismiss
oogle

Vloader

www.vloader.net/

Vloader

1 Lakh Registered

Search

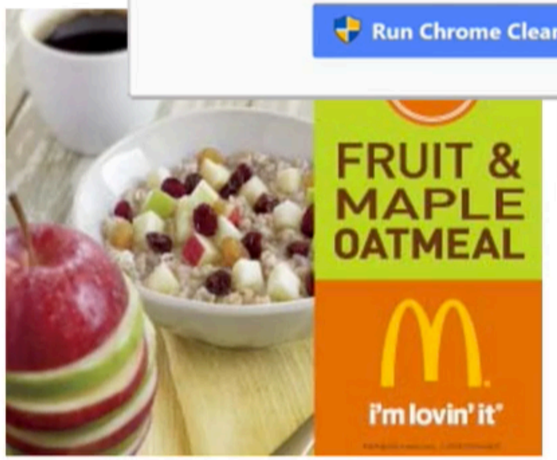
Cat

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.

Run Chrome Cleanup Tool

Dismiss



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

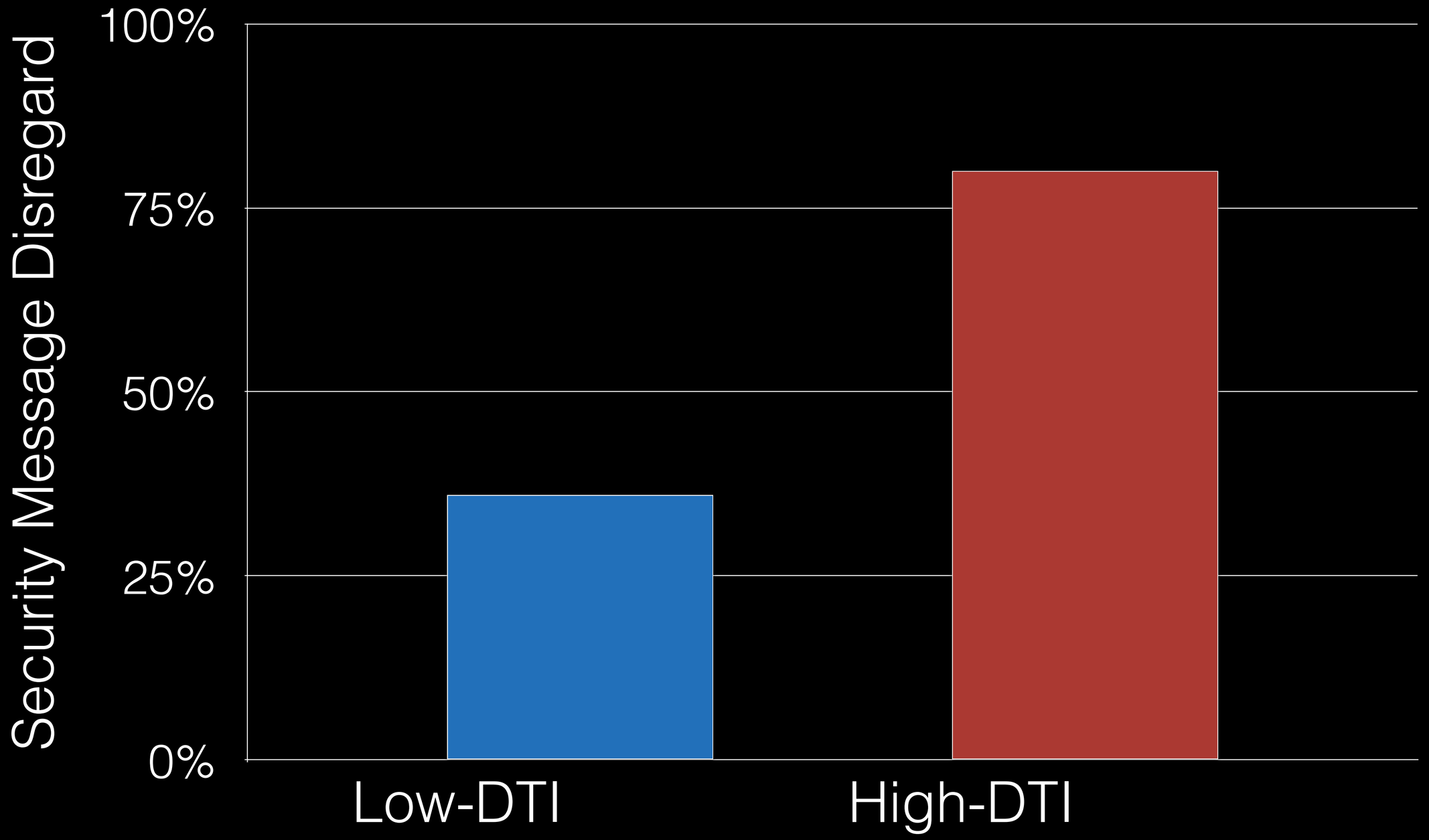
Low-DTI times

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%**

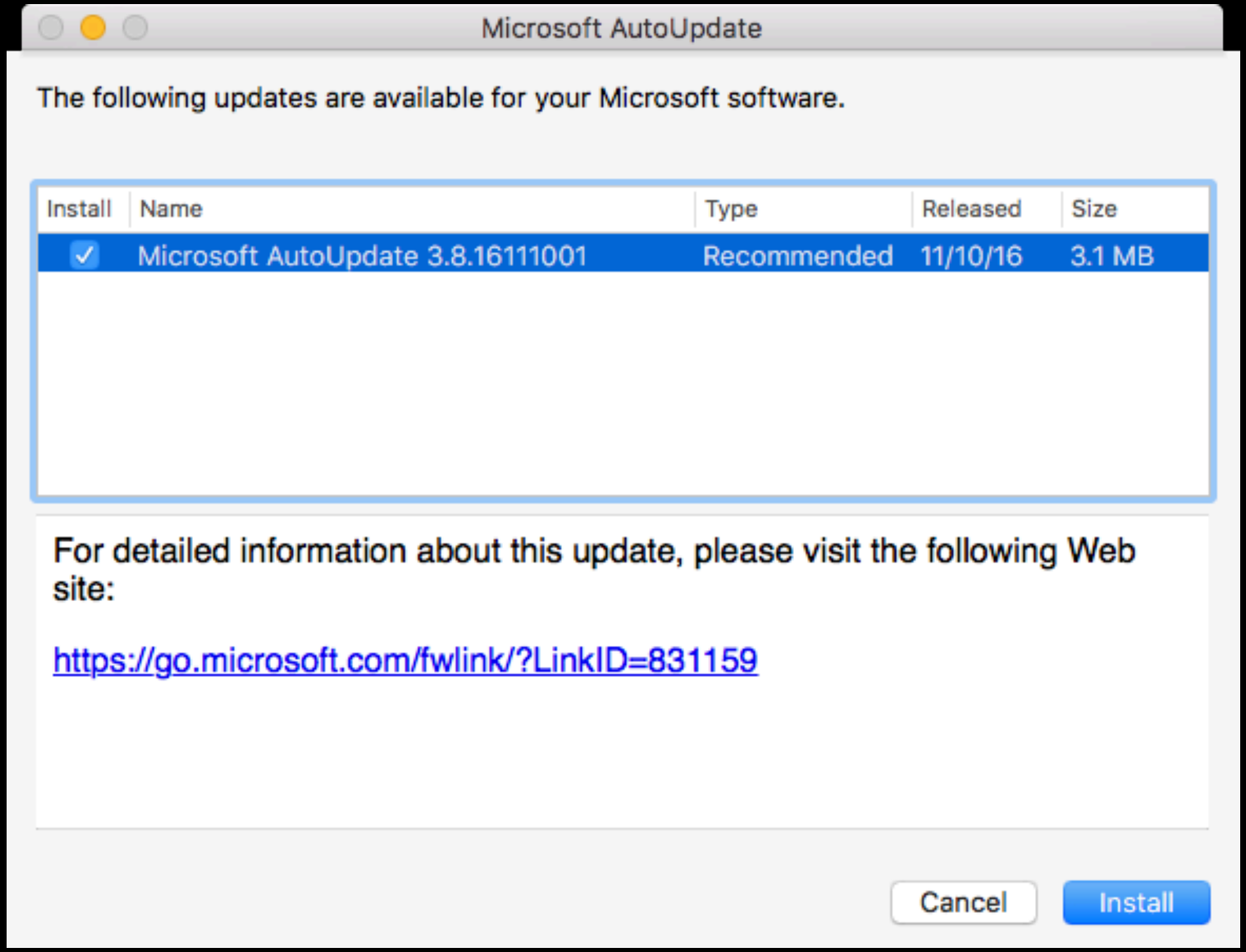

Security Message Disregard
100%
75%
50%
25%
0%
Low-DTI
High-DTI

Take-aways

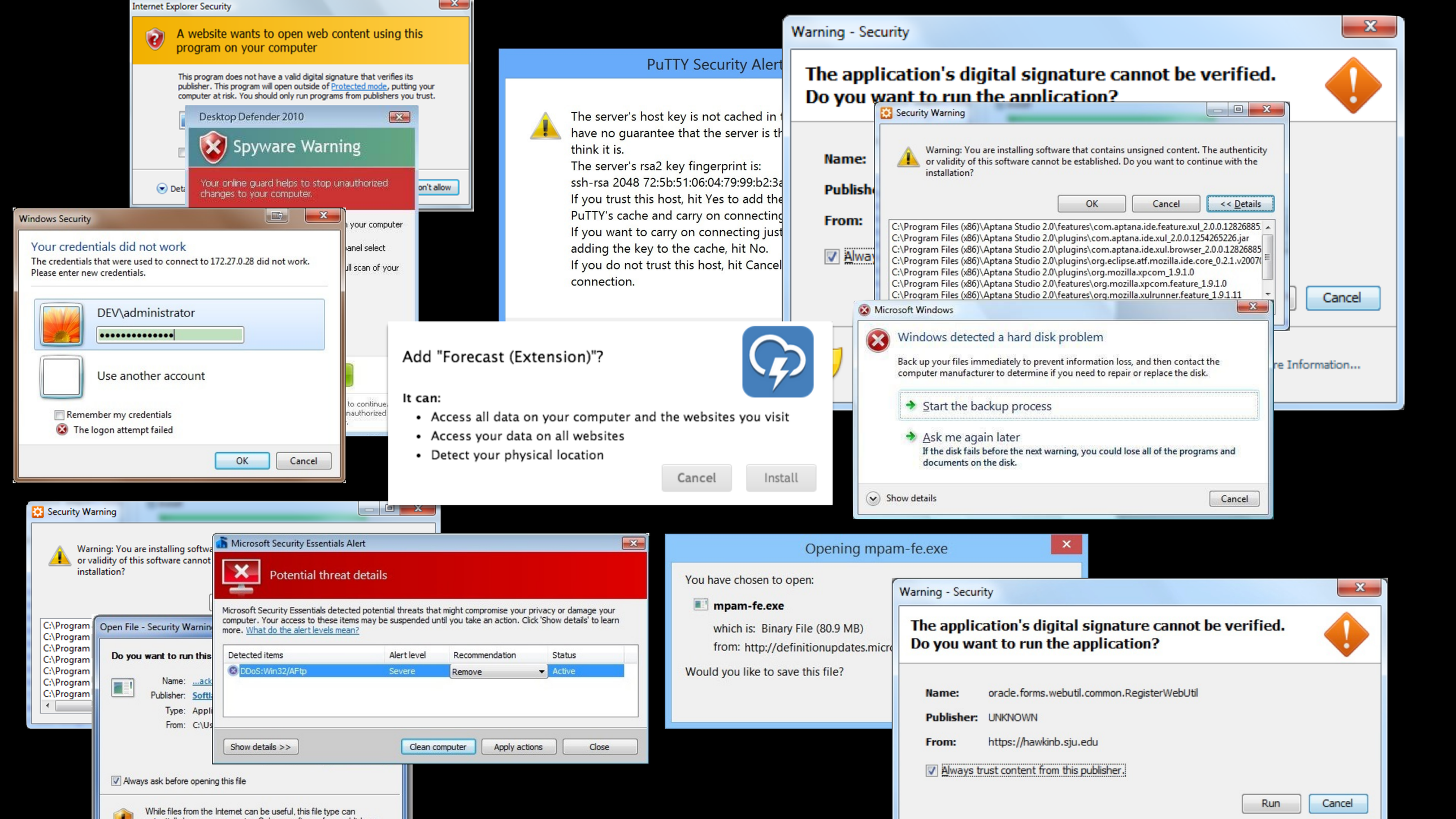
1. The brain isn’t good at handling interruptions.

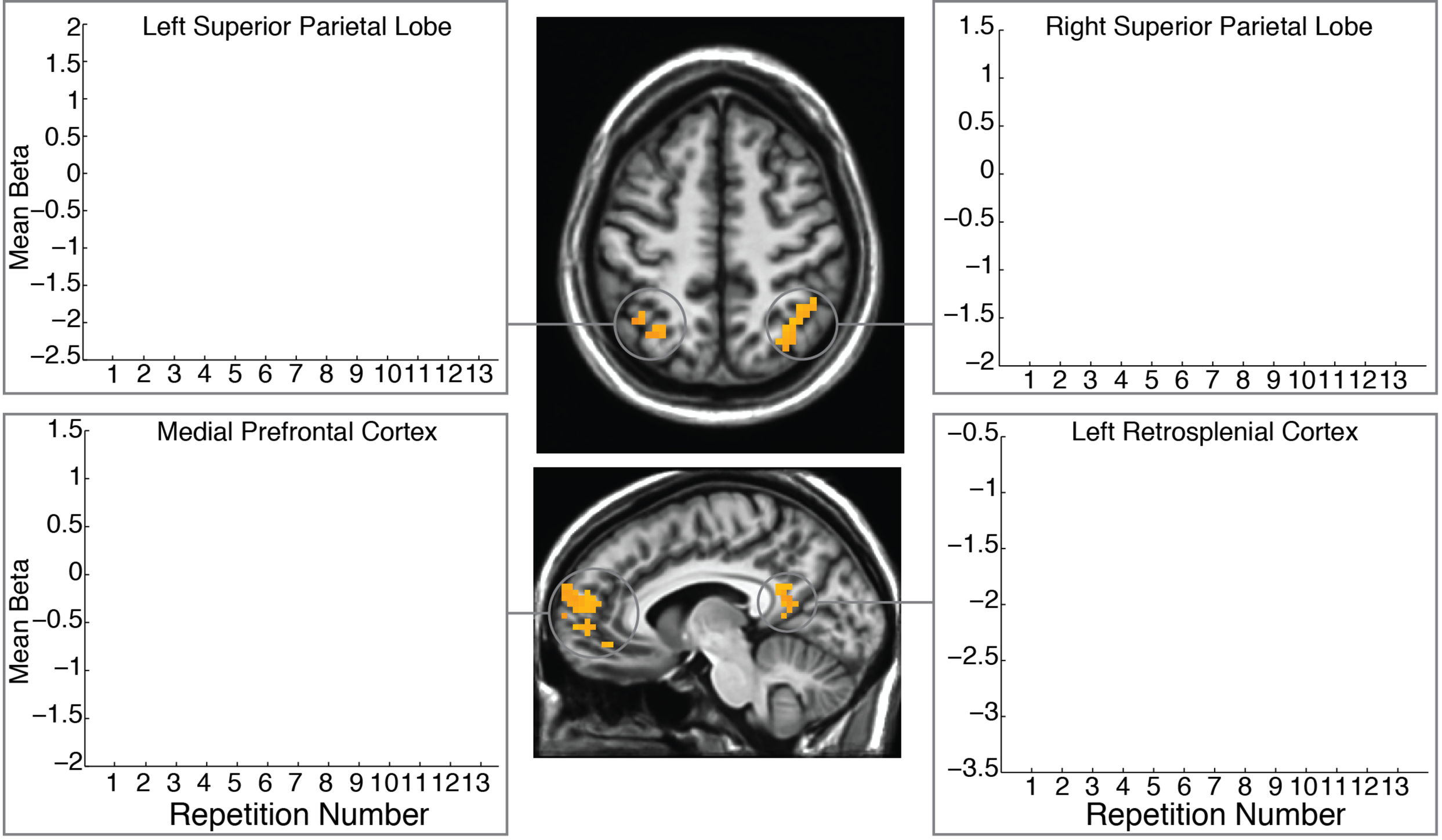
2. Timing a security message to display at a low-DTI results in marked improvement.

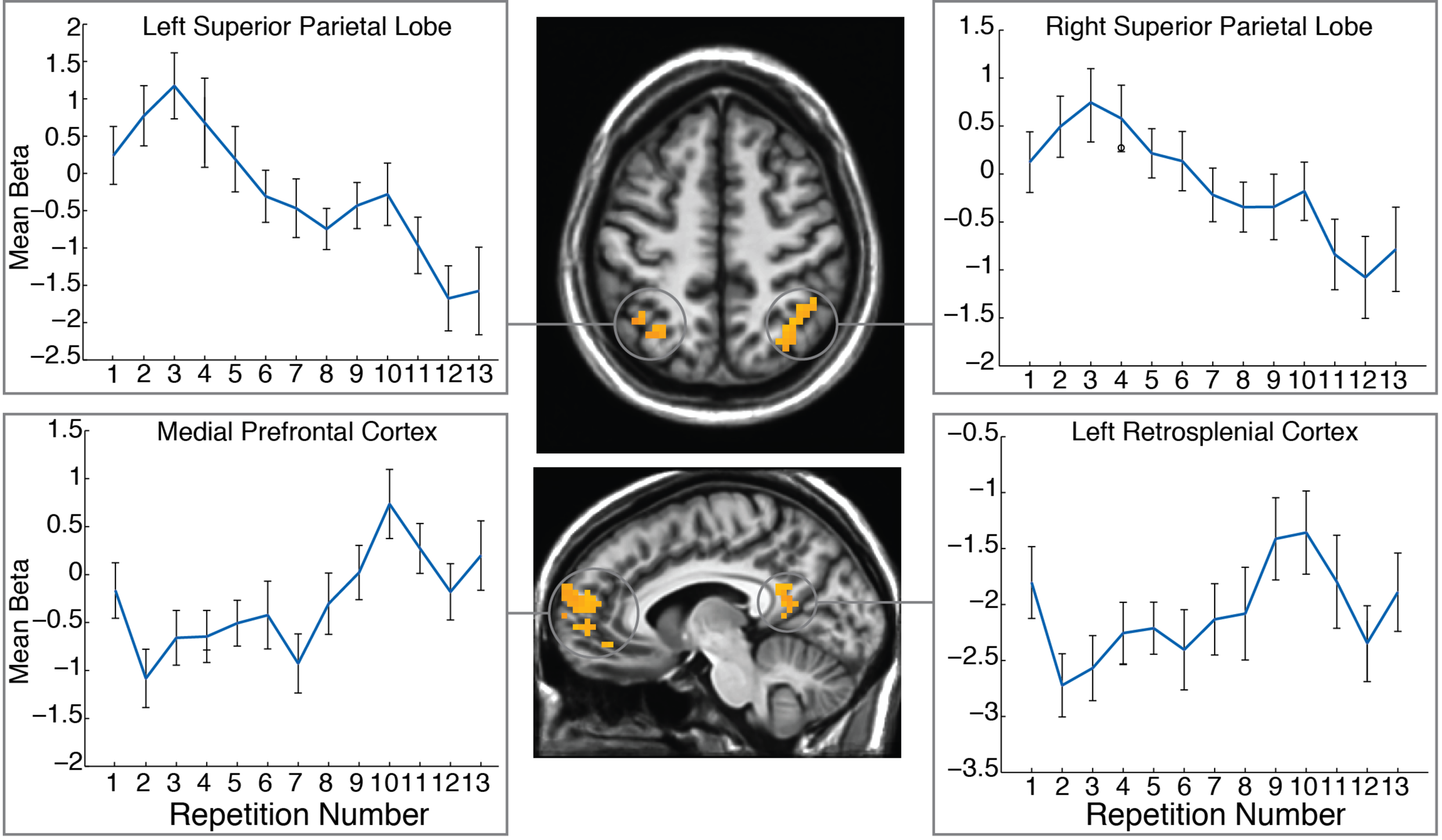
2. Habituation


Microsoft AutoUpdate
The following updates are available for your Microsoft software.
Install
Name
Type
Released
Size
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?


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.
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
PuTTY Security Alert
The server's host key is not cached in
have no guarantee that the server is th
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
PuTTY's cache and carry on connecting
If you want to carry on connecting just
adding the key to the cache, hit No.
If you do not trust this host, hit Cancel
connection.
Warning - Security
The application's digital signature cannot be verified.
Do you want to run the application?
Name:
Publish
From:
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
<< Details
C:\Program Files (x86)\Aptana Studio 2.0\features\com.aptana.ide.feature.xul_2.0.0.12826885
C:\Program Files (x86)\Aptana Studio 2.0\plugins\com.aptana.ide.xul_2.0.0.1254265226.jar
C:\Program Files (x86)\Aptana Studio 2.0\plugins\com.aptana.ide.xul.browser_2.0.0.12826885
C:\Program Files (x86)\Aptana Studio 2.0\plugins\org.eclipse.atf.mozilla.ide.core_0.2.1.v2007
C:\Program Files (x86)\Aptana Studio 2.0\plugins\org.mozilla.xpcom_1.9.1.0
C:\Program Files (x86)\Aptana Studio 2.0\features\org.mozilla.xpcom.feature_1.9.1.0
C:\Program Files (x86)\Aptana Studio 2.0\features\org.mozilla.xulrunner.feature_1.9.1.11
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
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
Security Warning
Warning: You are installing softwa
or validity of this software cannot
installation?
Open File - Security Warnin
Do you want to run this
Name:
Publisher:
Type:
From:
Always ask before opening this file
While files from the Internet can be useful, this file type can
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

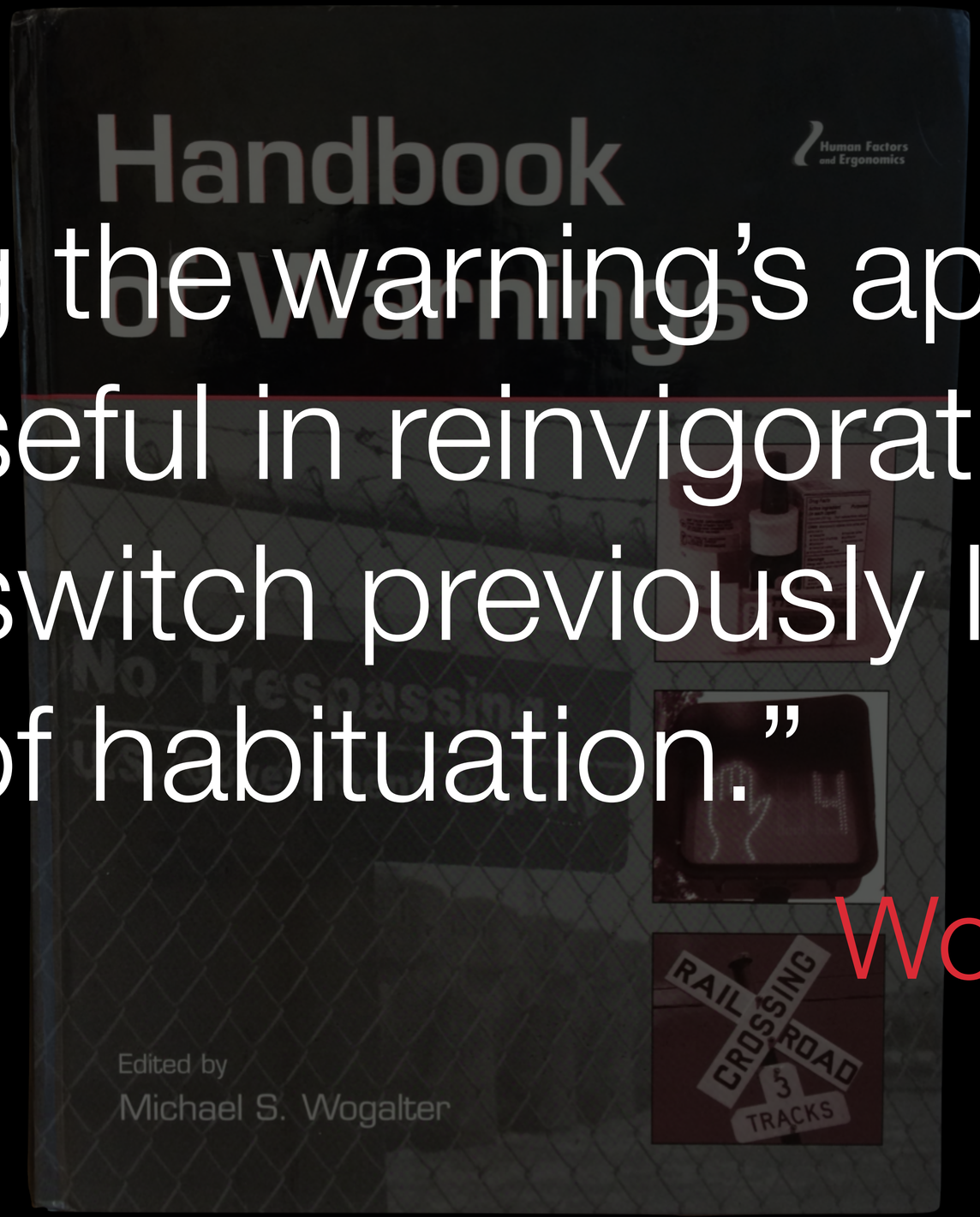

Left Superior Parietal Lobe
Mean Beta
2
1.5
1
0.5
0
−0.5
−1
−1.5
−2
−2.5
1 2 3 4 5 6 7 8 9 10 11 12 13
Right Superior Parietal Lobe
1.5
1
0.5
0
−0.5
−1
−1.5
−2
1 2 3 4 5 6 7 8 9 10 11 12 13
Medial Prefrontal Cortex
Mean Beta
1.5
1
0.5
0
−0.5
−1
−1.5
−2
1 2 3 4 5 6 7 8 9 10 11 12 13
Repetition Number
Left Retrosplenial Cortex
−0.5
−1
−1.5
−2
−2.5
−3
−3.5
1 2 3 4 5 6 7 8 9 10 11 12 13
Repetition Number


Left Superior Parietal Lobe
Mean Beta
Right Superior Parietal Lobe
Medial Prefrontal Cortex
Mean Beta
Repetition Number
Left Retrosplenial Cortex
Repetition Number

Handbook of Warnings

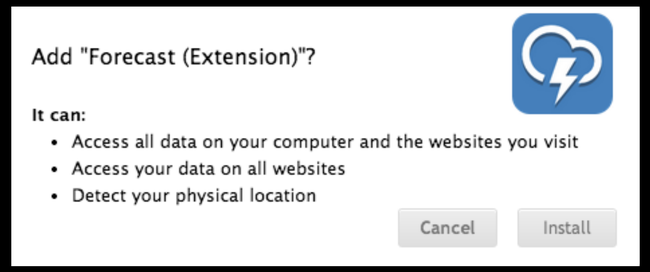
Human Factors and Ergonomics

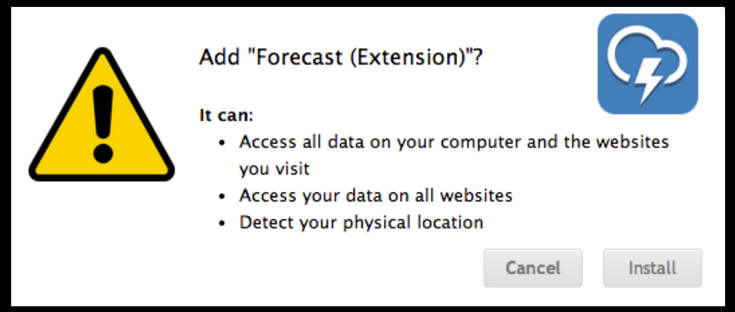
Edited by
Michael S. Wogalter



"Changing the warning's appearance may be useful in reinvigorating attention switch previously lost because of habituation."

Wogalter 2006


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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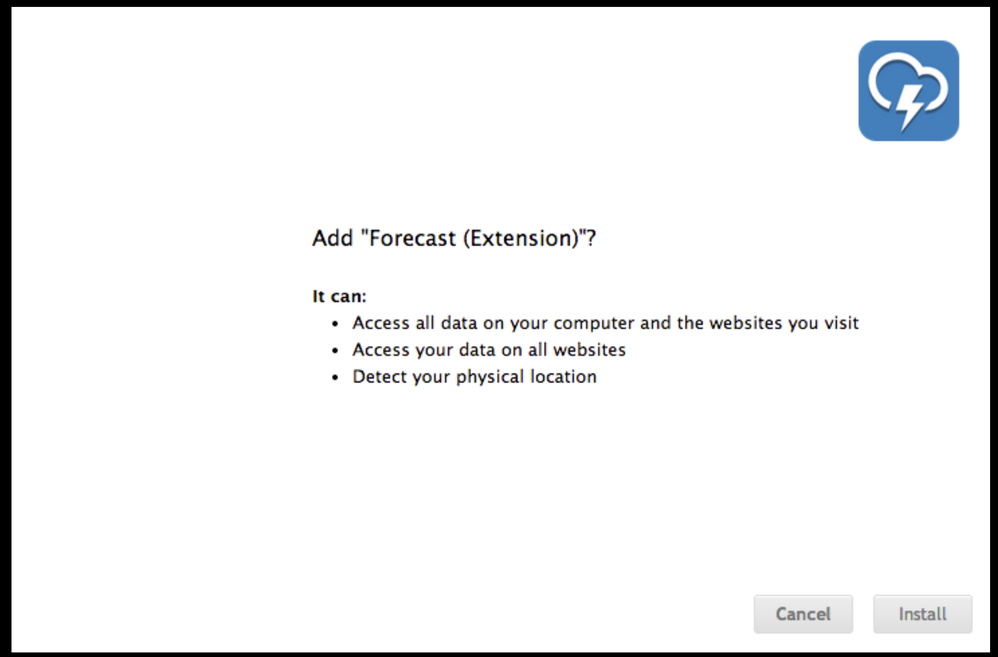
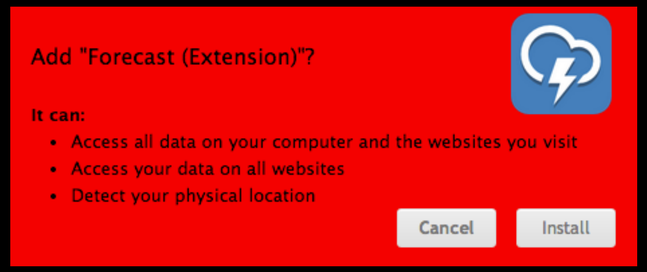
Cancel
Install


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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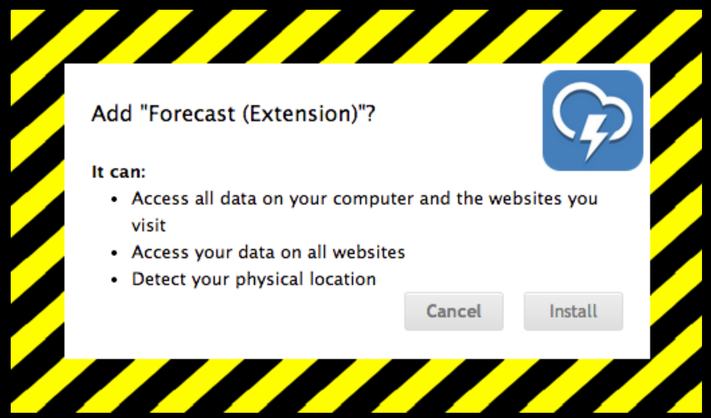
Access your data on all websites
Detect your physical location
Cancel
Install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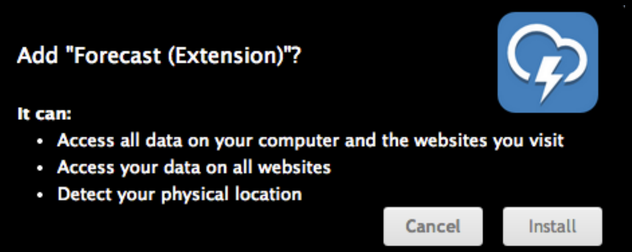
Install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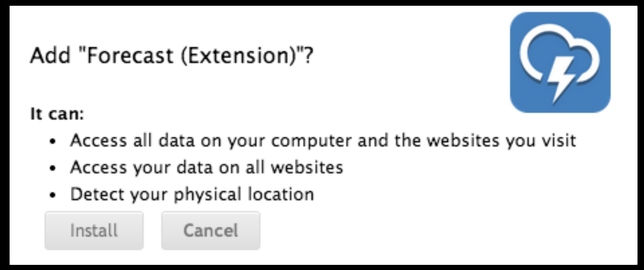
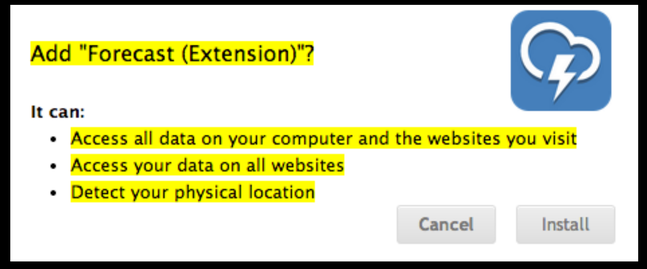
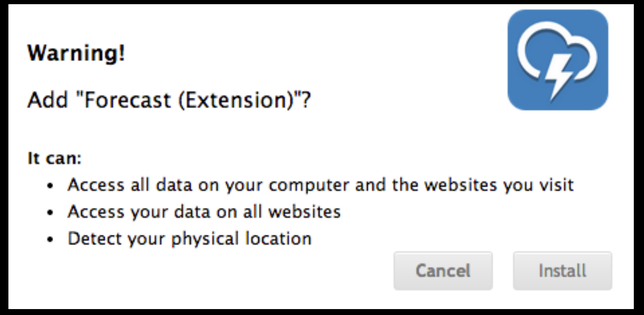
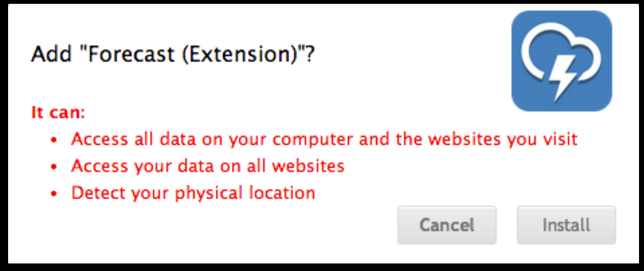
Access your data on all websites
Detect your physical location
Cancel
Install


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
Install
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


Warning!
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


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

Animations

Add "Swackett (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

Add "Swackett (Extension)"?

It can:

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

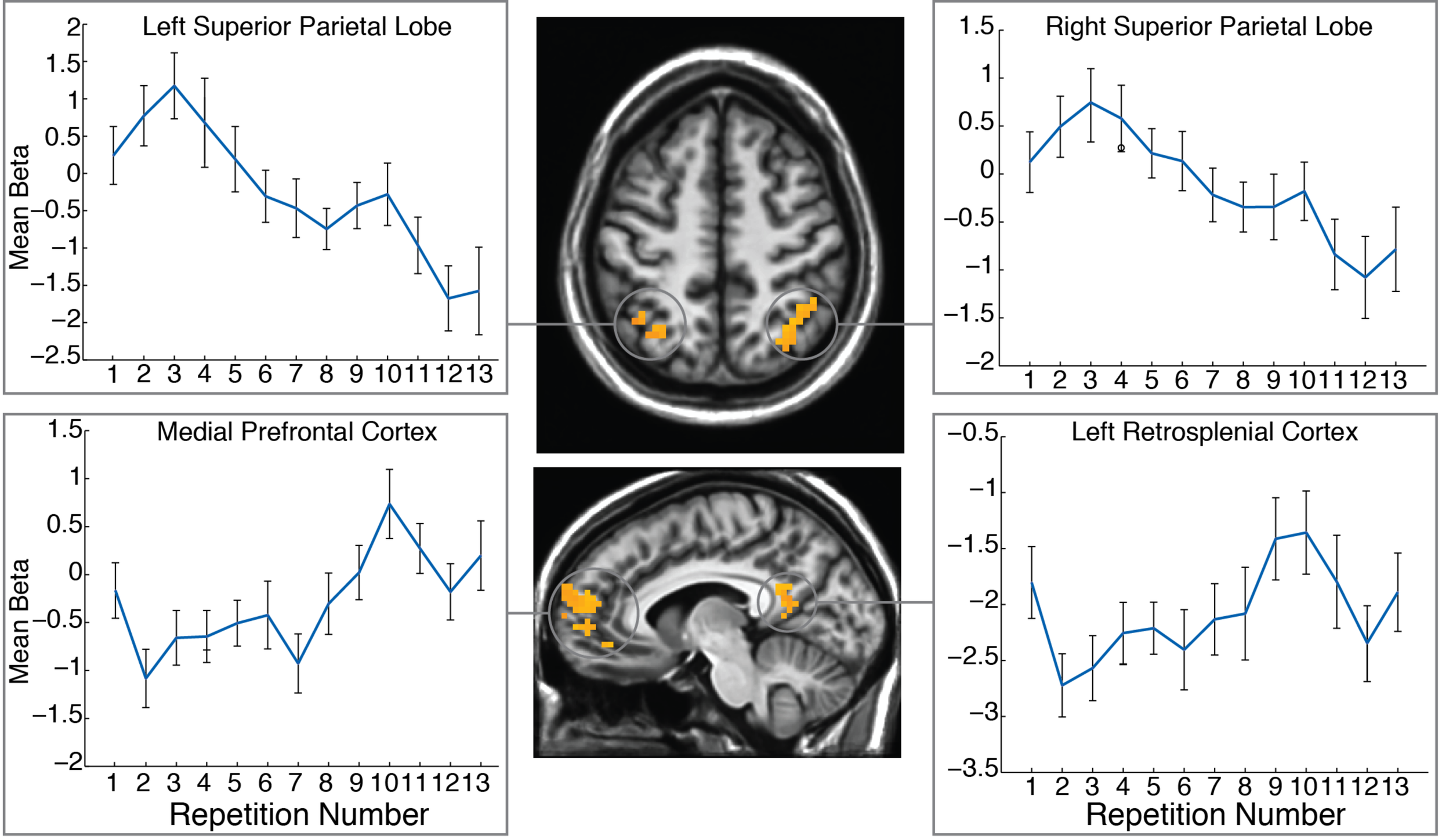
Cancel Install

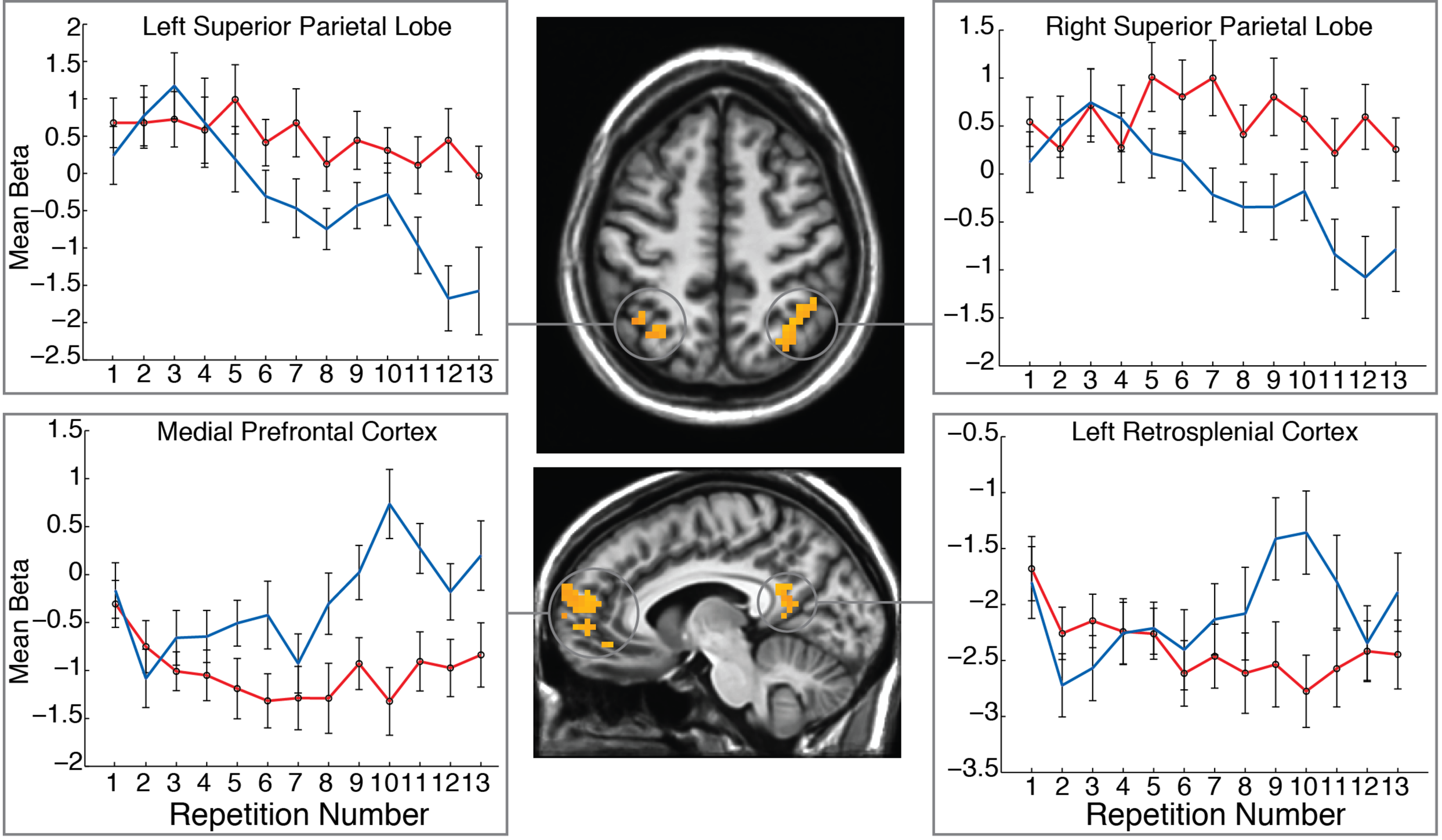
Add "Swackett (Extension)"?

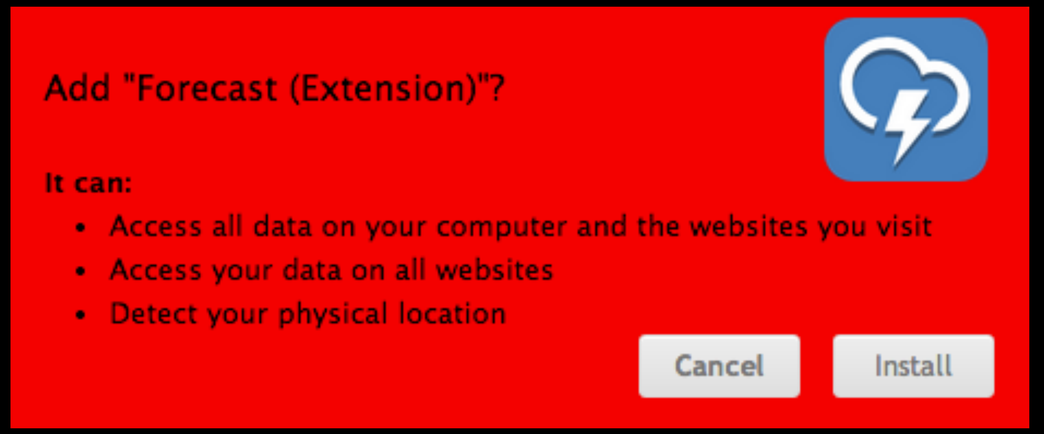
It can:

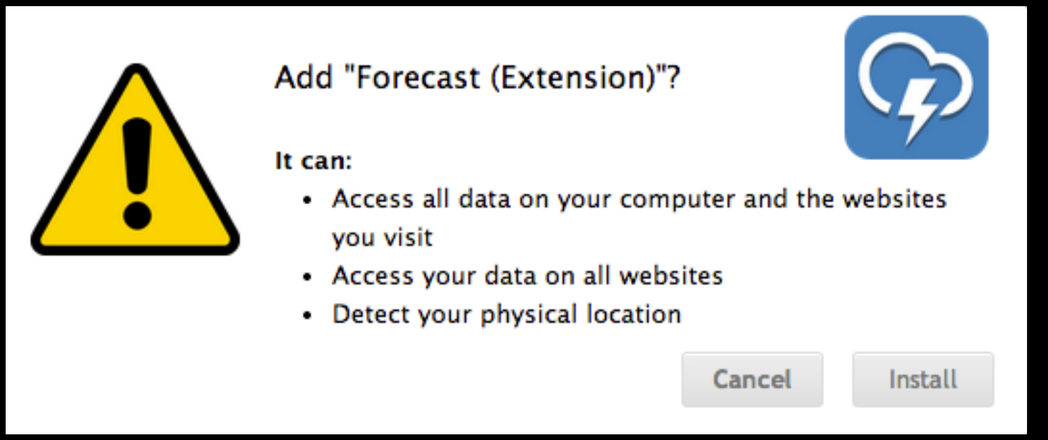
- Access all data on your computer and the websites you visit
- Access your data on all websites
- Detect your physical location

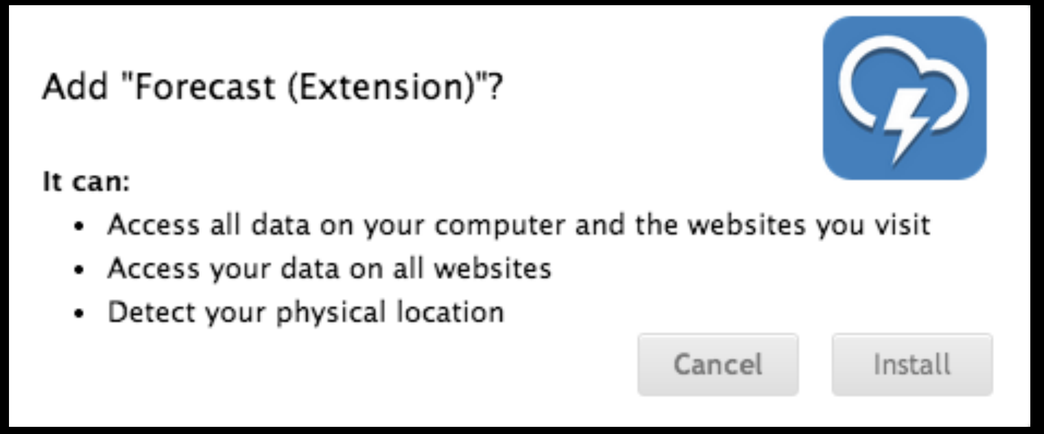
Cancel Install

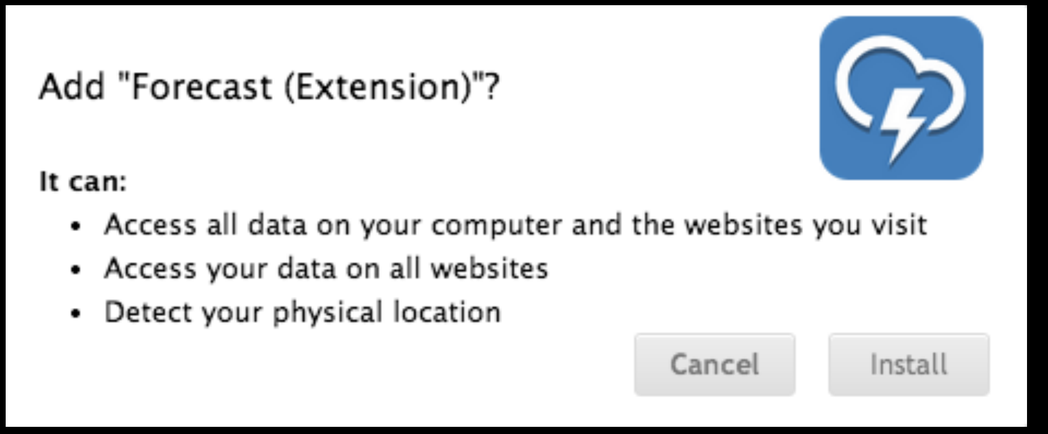

Left Superior Parietal Lobe
Mean Beta
Right Superior Parietal Lobe
Medial Prefrontal Cortex
Mean Beta
Repetition Number
Left Retrosplenial Cortex
Repetition Number

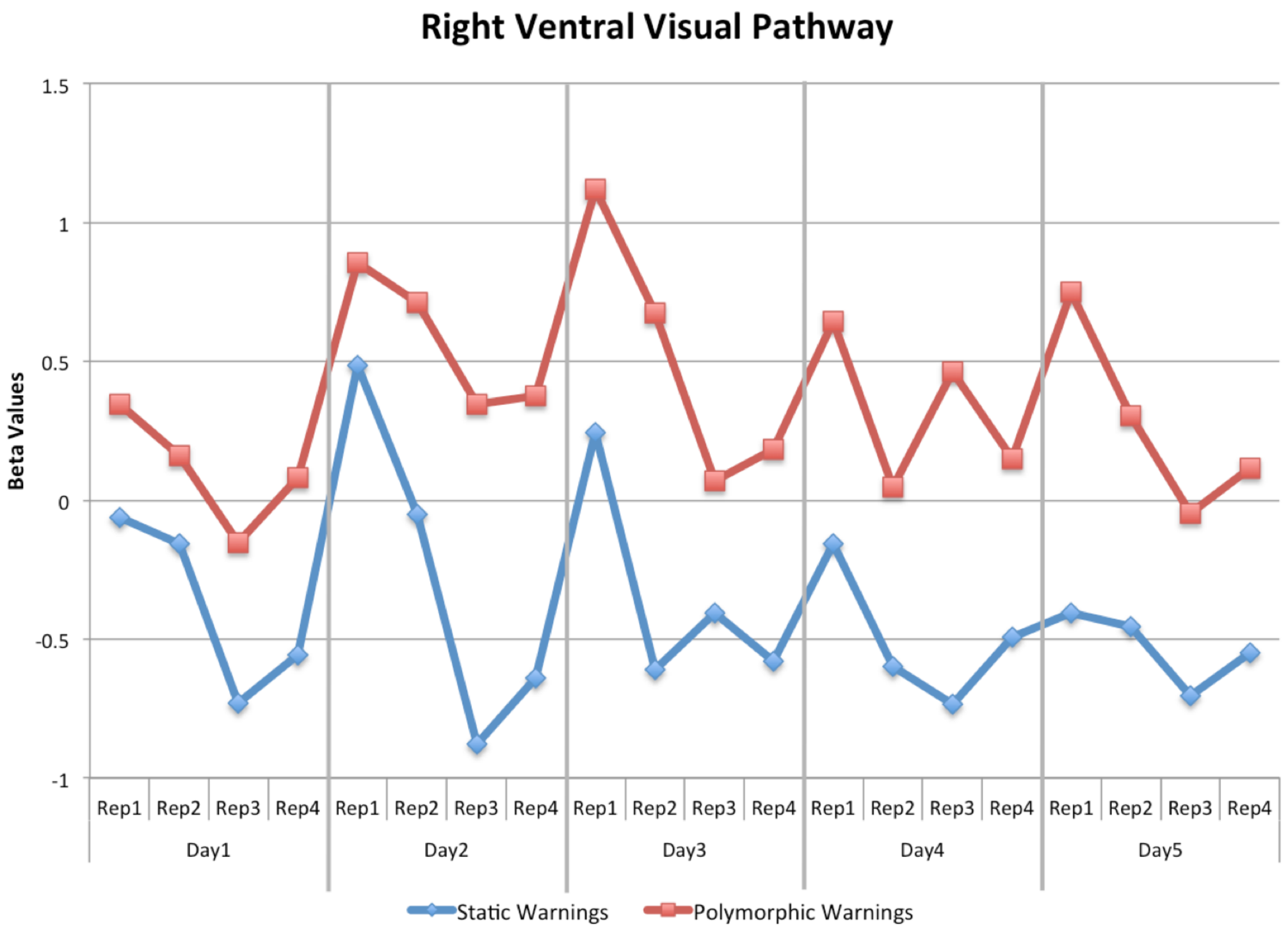

Left Superior Parietal Lobe
Mean Beta
2
1.5
1
0.5
0
−0.5
−1
−1.5
−2
−2.5
1 2 3 4 5 6 7 8 9 10 11 12 13
Right Superior Parietal Lobe
1.5
1
0.5
0
−0.5
−1
−1.5
−2
1 2 3 4 5 6 7 8 9 10 11 12 13
Medial Prefrontal Cortex
Mean Beta
1.5
1
0.5
0
−0.5
−1
−1.5
−2
1 2 3 4 5 6 7 8 9 10 11 12 13
Repetition Number
Left Retrosplenial Cortex
−0.5
−1
−1.5
−2
−2.5
−3
−3.5
1 2 3 4 5 6 7 8 9 10 11 12 13
Repetition Number

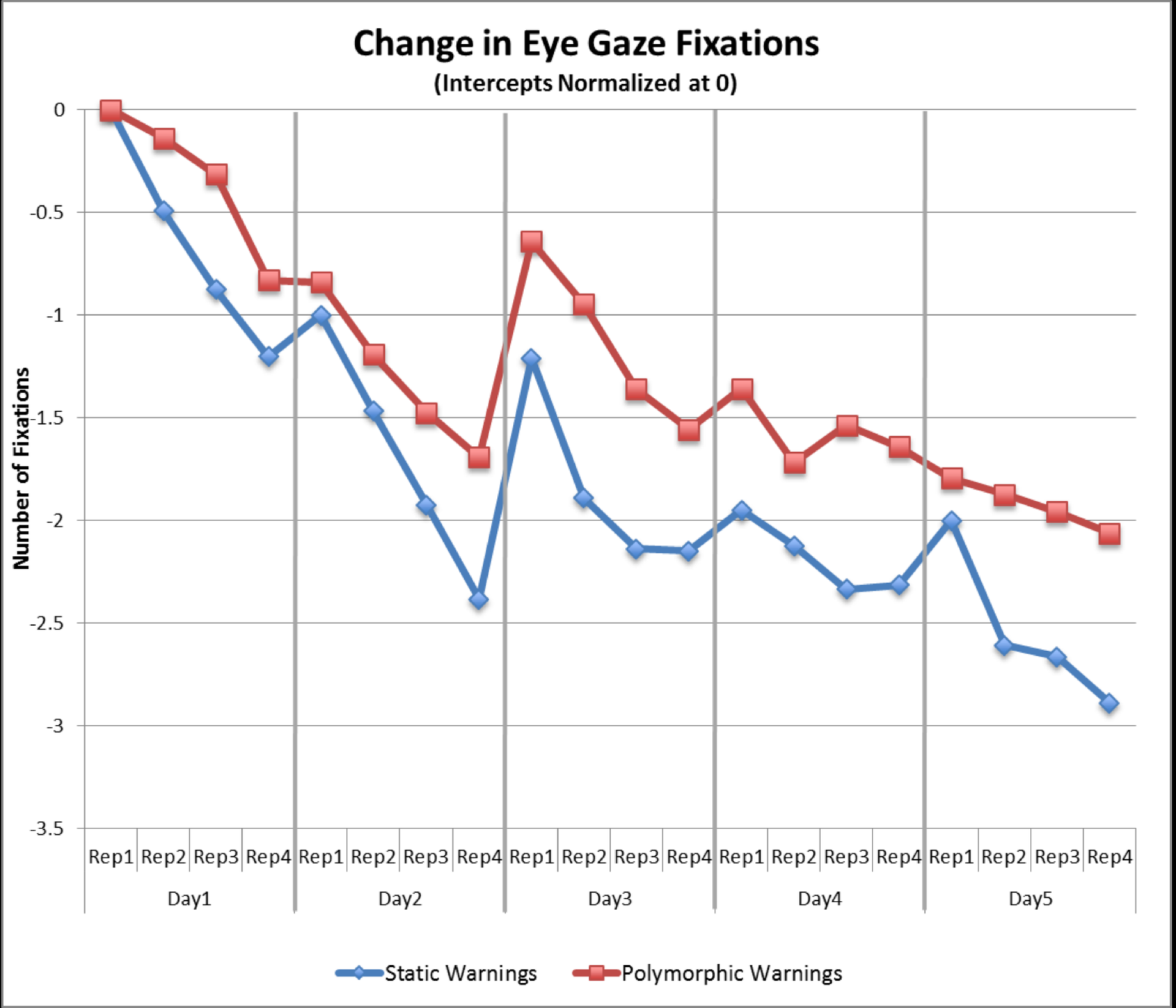

Add "Forecast (Extension)"?
It can:
• Access all data on your computer and the websites you visit
• Access your data on all websites
• Detect your physical location
Cancel
Install


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


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

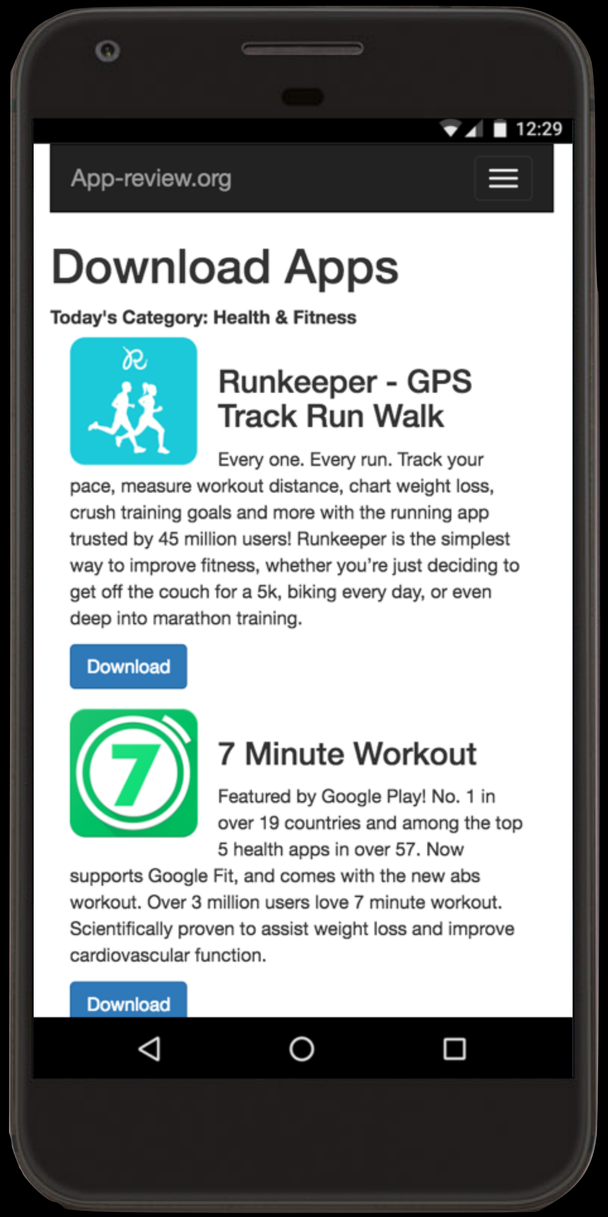

Add "Forecast (Extension)"?
It can:
• Access all data on your computer and the websites you visit
• Access your data on all websites
• Detect your physical location
Cancel
Install


Right Ventral Visual Pathway
Beta Values
1.5
1
0.5
0
-0.5
-1
Rep1
Rep2
Rep3
Rep4
Day1
Day2
Day3
Day4
Day5
Static Warnings
Polymorphic Warnings


Change in Eye Gaze Fixations
(Intercepts Normalized at 0)
Number of Fixations
0
-0.5
-1
-1.5
-2
-2.5
-3
-3.5
Rep1 Rep2 Rep3 Rep4 Rep1 Rep2 Rep3 Rep4 Rep1 Rep2 Rep3 Rep4 Rep1 Rep2 Rep3 Rep4 Rep1 Rep2 Rep3 Rep4
Day1
Day2
Day3
Day4
Day5
Static Warnings
Polymorphic Warnings

Mobile field experiment

Adherence behavior


12:29
App-review.org
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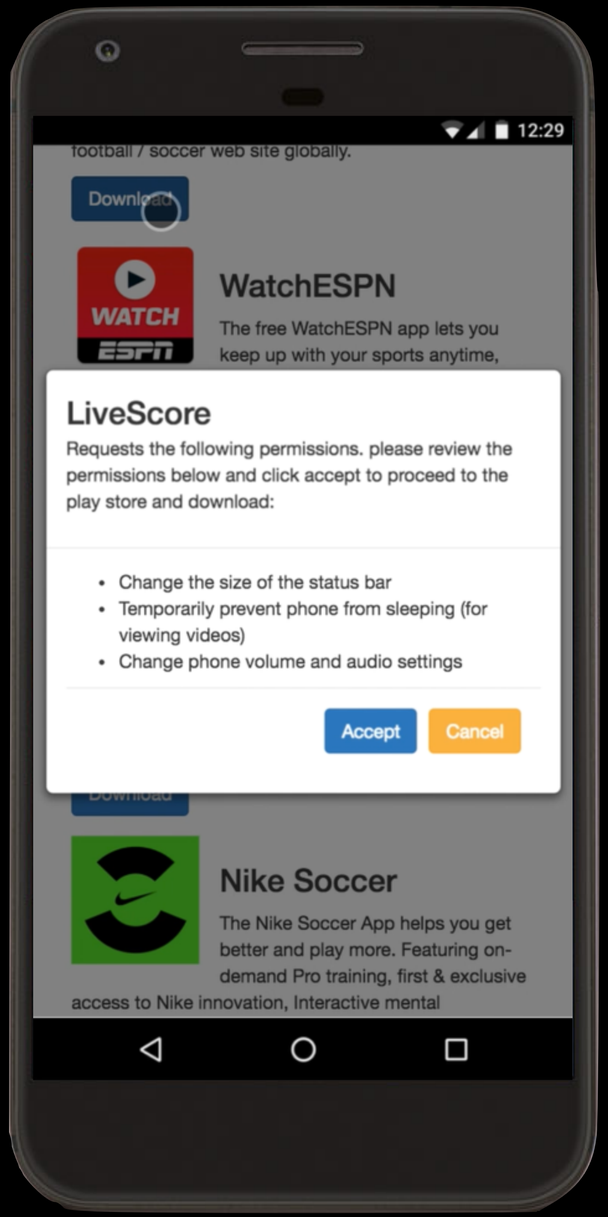
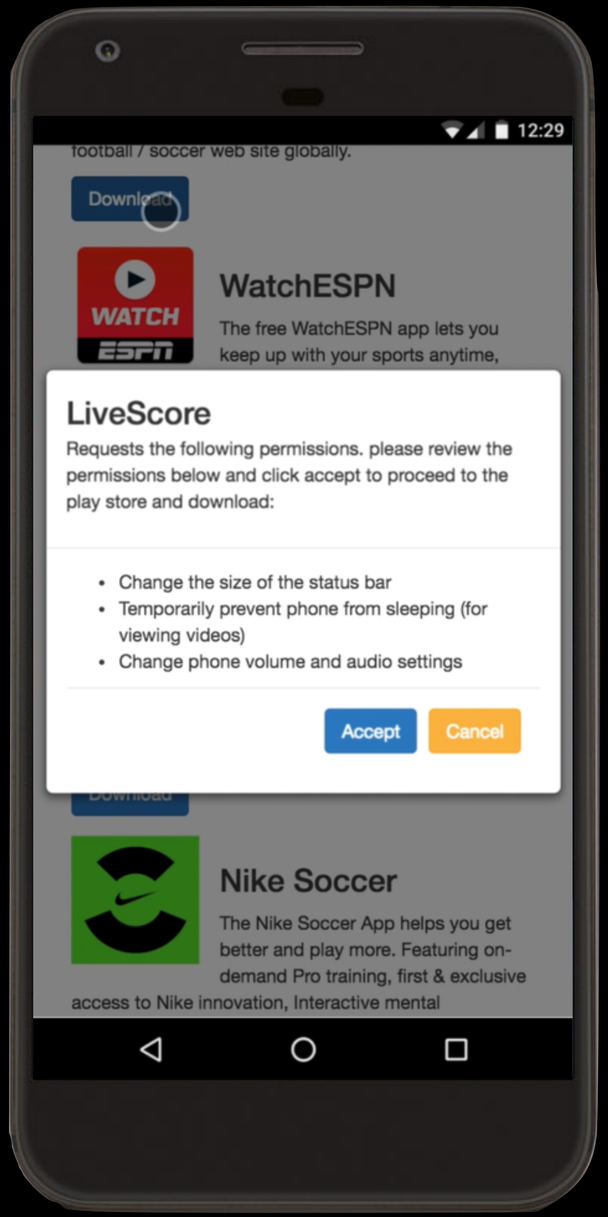
Today's Category: Health & Fitness
Runkeeper - GPS Track Run Walk
Every one. Every run. Track your pace, measure workout distance, chart weight loss, crush training goals and more with the running app trusted by 45 million users! Runkeeper is the simplest way to improve fitness, whether you're just deciding 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


12:29
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
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


12:29
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
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Accept
Cancel
Nike Soccer
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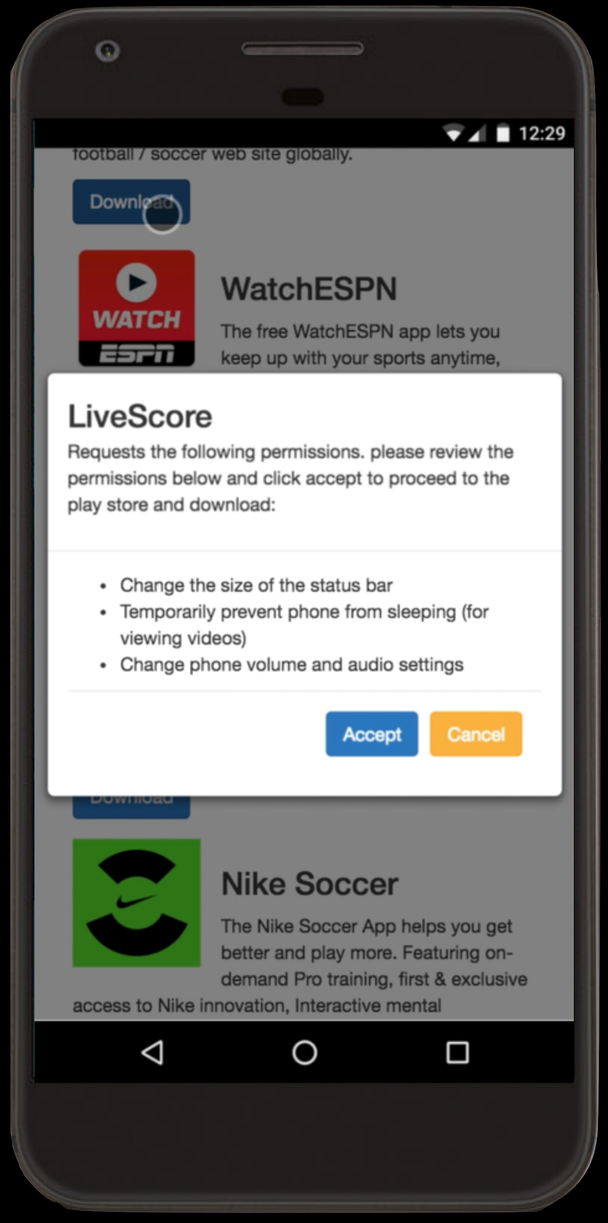
12:29
football / soccer web site globally.
Download
WatchESPN
The free WatchESPN app lets you keep up with your sports anytime,
LiveScore
Requests the following permissions. please review the permissions below and click accept to proceed to the play store and download:
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Cancel
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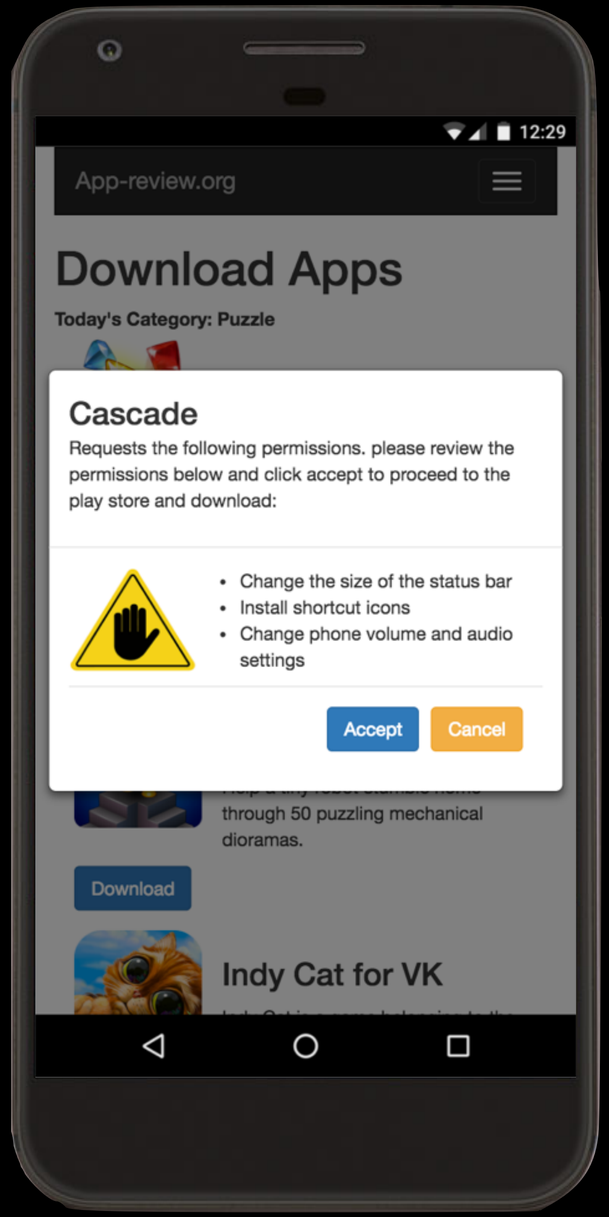
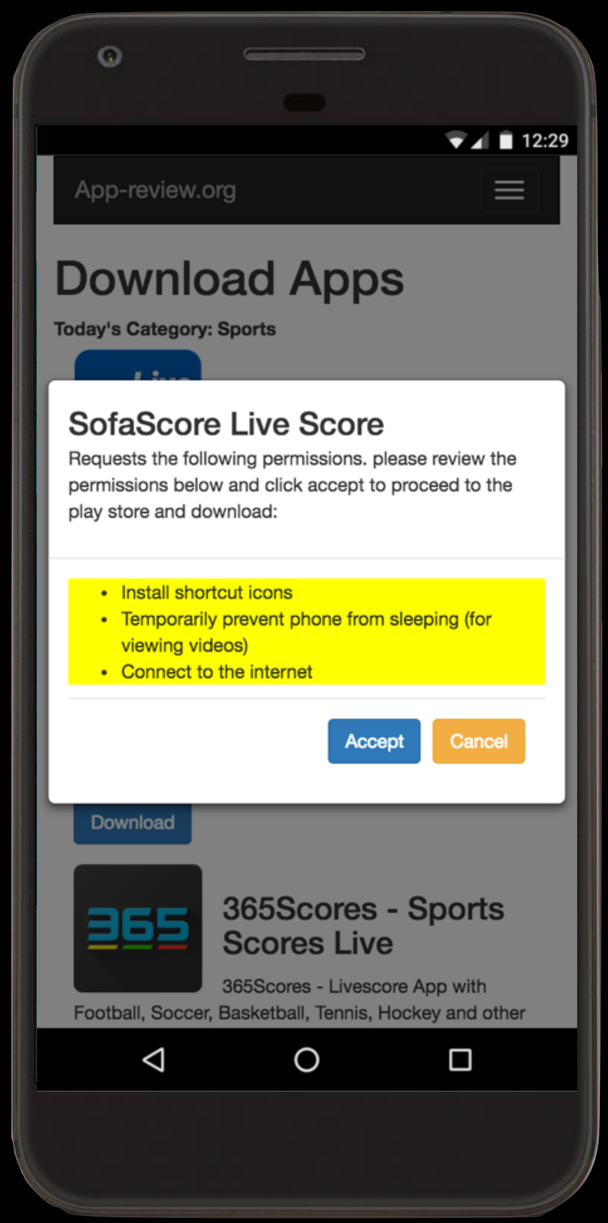
The Nike Soccer App helps you get better and play more. Featuring on-demand Pro training, first & exclusive access to Nike innovation, Interactive mental


12:29
App-review.org
Download Apps
Today's Category: Puzzle
Cascade
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
Install shortcut icons
Change phone volume and audio settings
Accept
Cancel
through 50 puzzling mechanical dioramas.
Download
Indy Cat for VK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Today's Category: Sports
SofaScore Live Score
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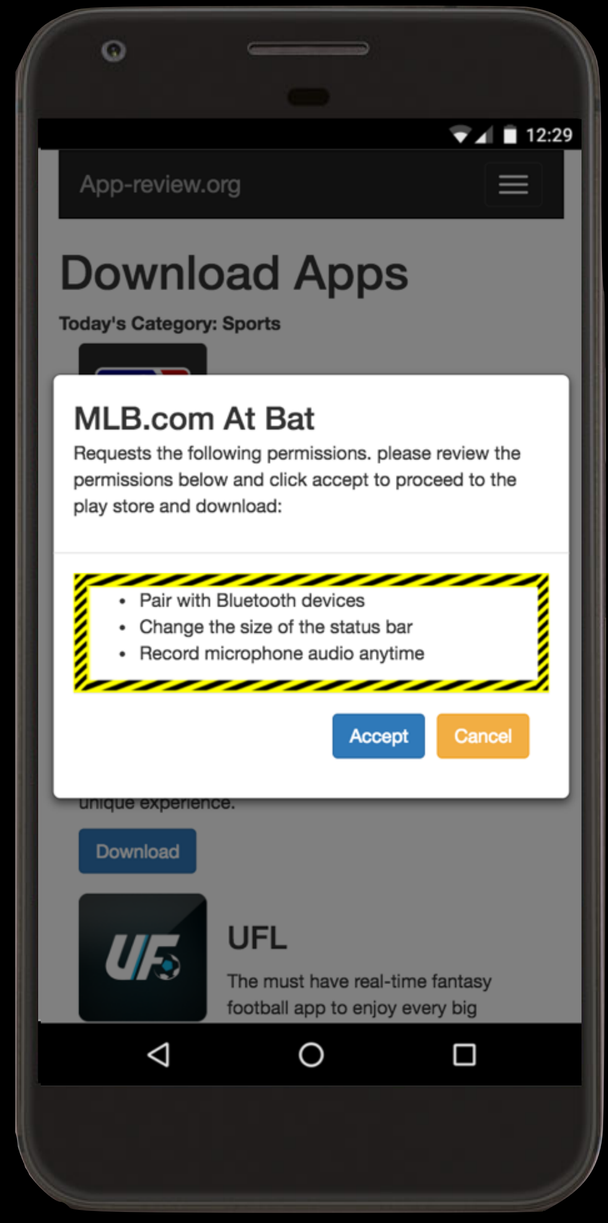
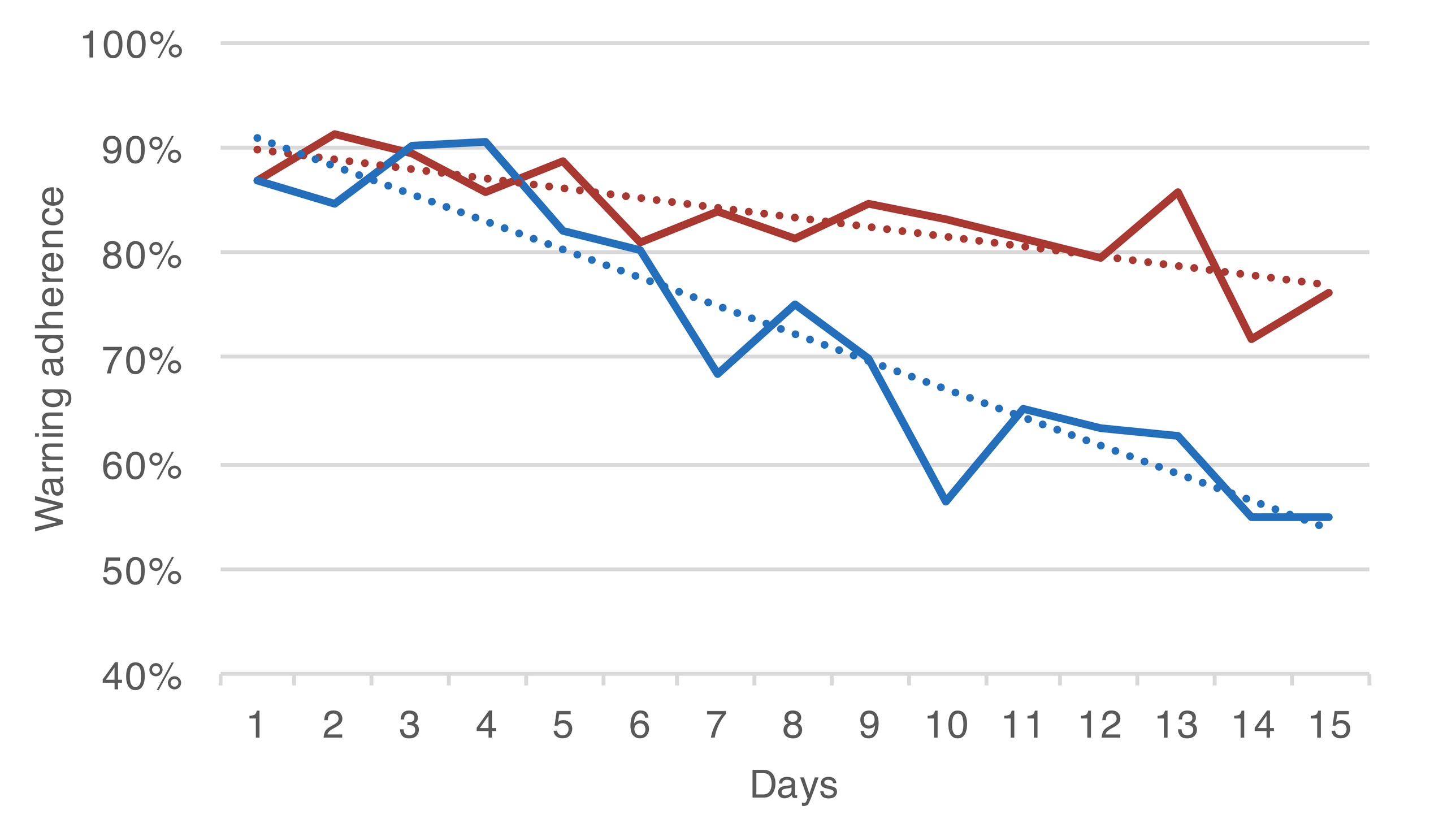
Temporarily prevent phone from sleeping (for viewing videos)
Connect to the internet
Accept
Cancel
Download
365Scores - Sports Scores Live
365Scores - Livescore App with Football, Soccer, Basketball, Tennis, Hockey and other


12:29
App-review.org
Download Apps
Today's Category: Sports
MLB.com At Bat
Requests the following permissions. please review the permissions below and click accept to proceed to the play store and download:
Pair with Bluetooth devices
Change the size of the status bar
Record microphone audio anytime
Accept
Cancel
unique experience.
Download
UFL
The must have real-time fantasy football app to enjoy every big


100%
90%
80%
70%
60%
50%
40%
Warning adherence
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
Days

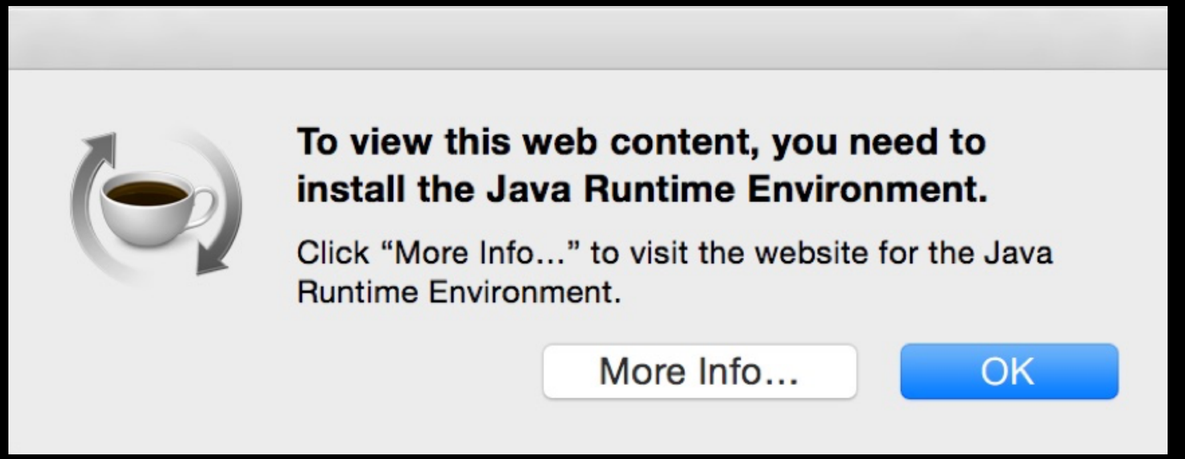
Take-aways

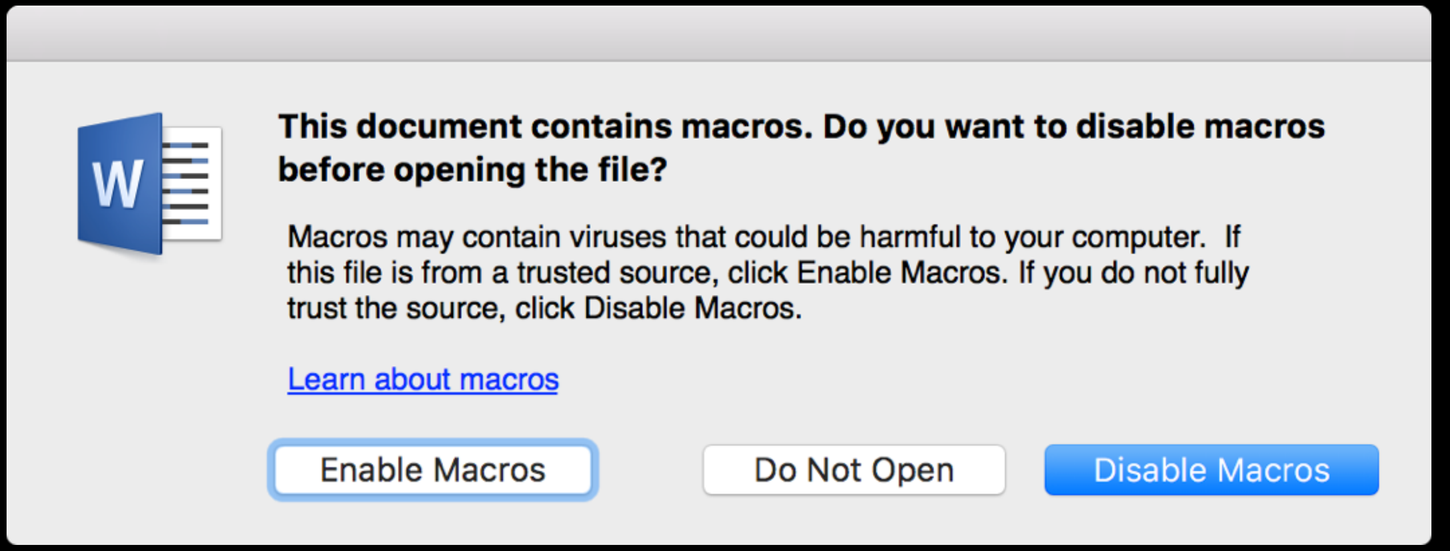
1. The human brain is wired to tune out things it has seen before.

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.
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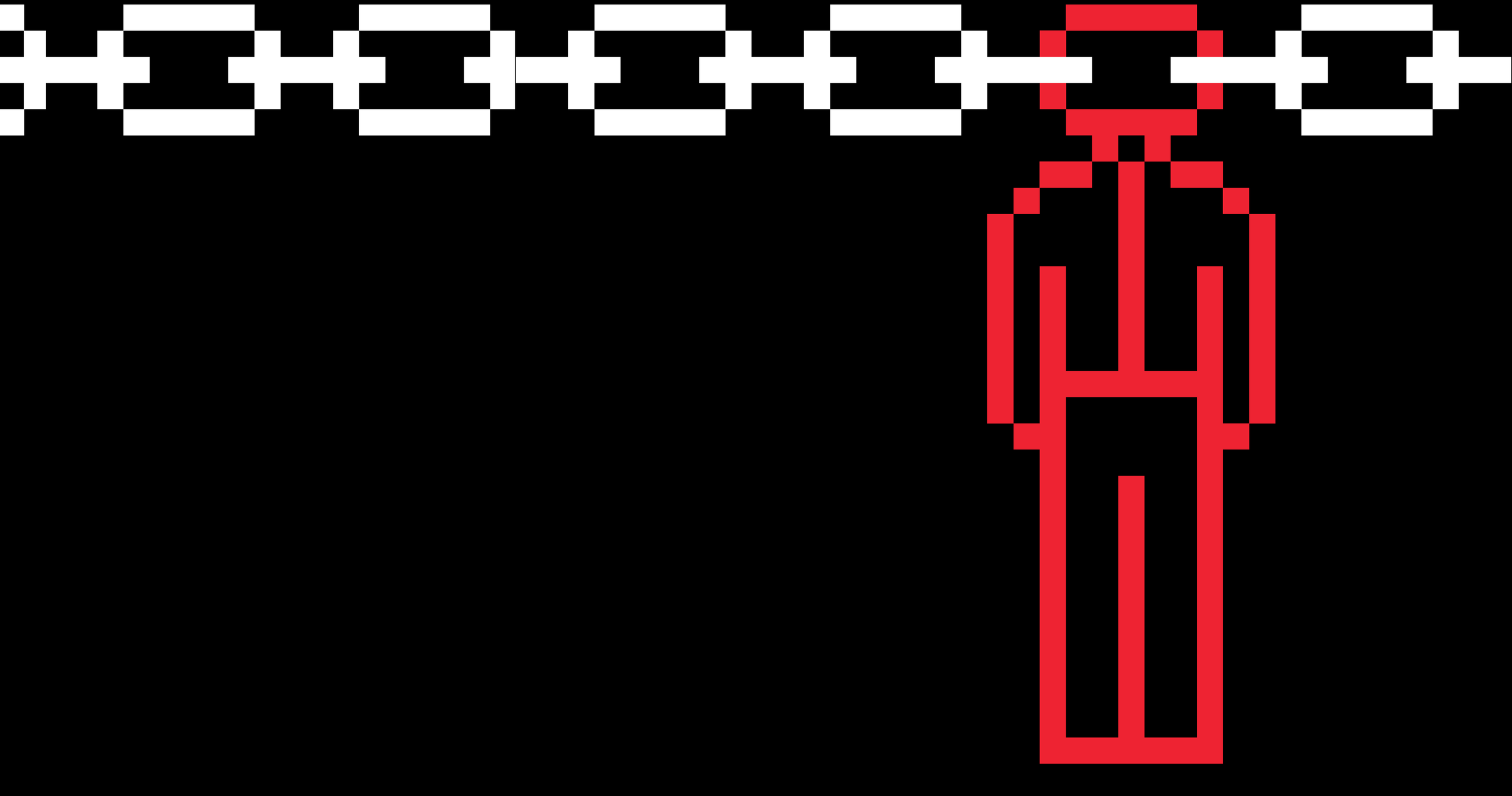
How bad is this problem?

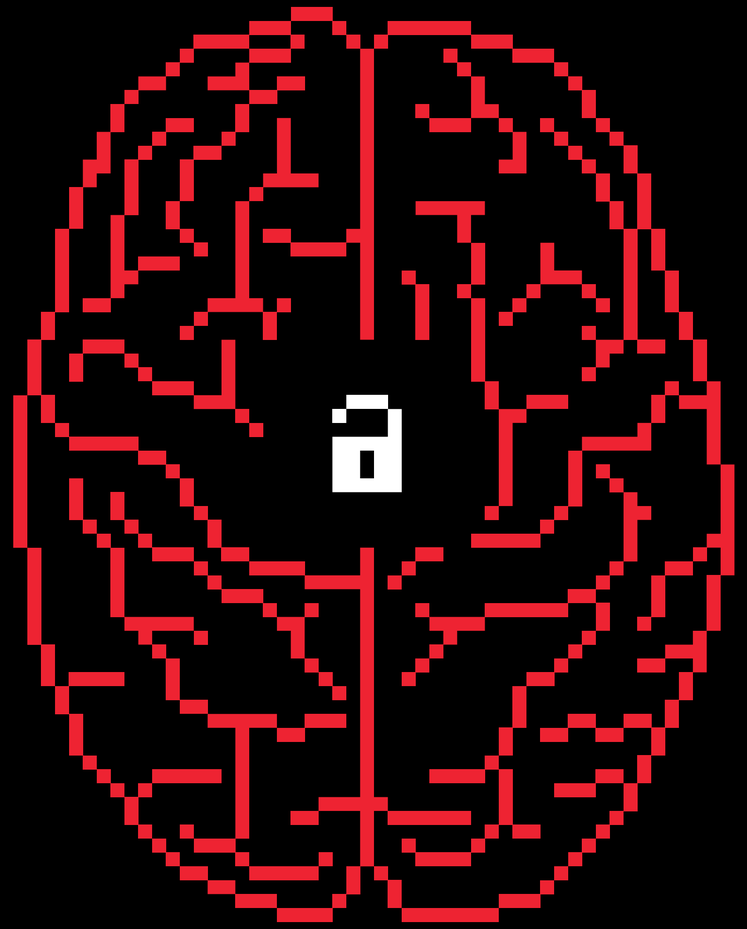
Take-aways

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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