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.

“clicky lusers”
1. Dual-task Interference
2. Habituation
3. Generalization
1. Dual-task Interference
Microsoft AutoUpdate

The following updates are available for your Microsoft software.

<table>
<thead>
<tr>
<th>Install</th>
<th>Name</th>
<th>Type</th>
<th>Released</th>
<th>Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>☑</td>
<td>Microsoft AutoUpdate 3.8.1611001</td>
<td>Recommended</td>
<td>11/10/16</td>
<td>3.1 MB</td>
</tr>
</tbody>
</table>

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

https://go.microsoft.com/fwlink/?LinkId=831159

[Install] [Cancel]
How bad is this problem?
Baseline (resting)
Memory task

Baseline (resting)
1. 4381358
2. 4382369
3. 4382359
4. 4383359
Add "Forecast (Extension)"

It can:
- Access information from weather.com
- Detect your physical location
- Test for Internet connectivity

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

Memory task

Security task

Baseline (resting)
1. Memorize code

2. 

3. Recall code
Temporal Lobe
High DTI vs. Warning Only
## Security Task Performance

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Warning Disregard</th>
</tr>
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<tr>
<td>High-DTI</td>
<td>22.9%</td>
</tr>
<tr>
<td>Warning-Only</td>
<td>7.4%</td>
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</tbody>
</table>
1. Memorize code

2. Add "Forecast (Extension)"

   It can:
   - Access information from weather.com
   - Detect your physical location
   - Test for Internet connectivity

3. Recall code
1. Memorize code
2. Recall code

Add "Forecast (Extension)"?

It can:
- Access information from weather.com
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[Cancel] [Install]
## Security Task Performance

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<tr>
<td>High-DTI</td>
<td>22.9%</td>
</tr>
<tr>
<td>Low-DTI</td>
<td>8.8%</td>
</tr>
<tr>
<td>Warning-Only-Only</td>
<td>7.4%</td>
</tr>
</tbody>
</table>
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.

Run Chrome Cleanup Tool  Dismiss
Low-DTI times
After a video
On loading of a page
Waiting for web-based task to complete
<table>
<thead>
<tr>
<th>Code</th>
<th>Condition</th>
<th>Disregarded</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Low-DTI Conditions</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LowDTI-5</td>
<td>Low-DTI: Waiting for page load</td>
<td>22%</td>
</tr>
<tr>
<td>LowDTI-4</td>
<td>Low-DTI: While processing</td>
<td>24%</td>
</tr>
<tr>
<td>LowDTI-2</td>
<td>Low-DTI: After video</td>
<td>44%</td>
</tr>
<tr>
<td>LowDTI-1</td>
<td>Low-DTI: On first page load</td>
<td>45%</td>
</tr>
<tr>
<td>LowDTI-3</td>
<td>Low-DTI: Switching domains</td>
<td>46%</td>
</tr>
<tr>
<td><strong>Average</strong></td>
<td><strong>36%</strong></td>
<td></td>
</tr>
</tbody>
</table>

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<tr>
<td><strong>High-DTI Conditions</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HighDTI-4</td>
<td>High-DTI: On the way to close window</td>
<td>74%</td>
</tr>
<tr>
<td>HighDTI-2</td>
<td>High-DTI: While typing</td>
<td>78%</td>
</tr>
<tr>
<td>HighDTI-1</td>
<td>High-DTI: During video</td>
<td>79%</td>
</tr>
<tr>
<td>HighDTI-3</td>
<td>High-DTI: While transferring information</td>
<td>87%</td>
</tr>
<tr>
<td><strong>Average</strong></td>
<td><strong>80%</strong></td>
<td></td>
</tr>
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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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How bad is this problem?
Warning - Security

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

Name:
Publisher: UNKNOWN
From: https://hawkinb.siju.edu

You have chosen to open:
mpam-fe.exe
which is: Binary File (80.9 MB)
From: http://definitionupdates.microsoft.com

Would you like to save this file?

Always trust content from this publisher:

Run Cancel
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

[Buttons: Cancel, Install]
Add "Swackett (Extension)"?

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[Cancel] [Install]
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[Cancel]  [Install]
Add "Forecast (Extension)"

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[Cancel] [Install]
Right Ventral Visual Pathway

- Beta Values:
  - Static Warnings: Blue Line
  - Polymorphic Warnings: Red Line

- Reps: Rep1, Rep2, Rep3, Rep4
- Days: Day1, Day2, Day3, Day4, Day5

Graph showing the comparison of static and polymorphic warnings over five days with four repetitions each day.
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
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
• Charge purchases to your credit card
• Delete your photos
• Record microphone audio any time
• Sell your web-browsing data
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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- 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...
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