# It All Blurs Together: How the Effects of Habituation Generalize Across System Notifications and Security Warnings

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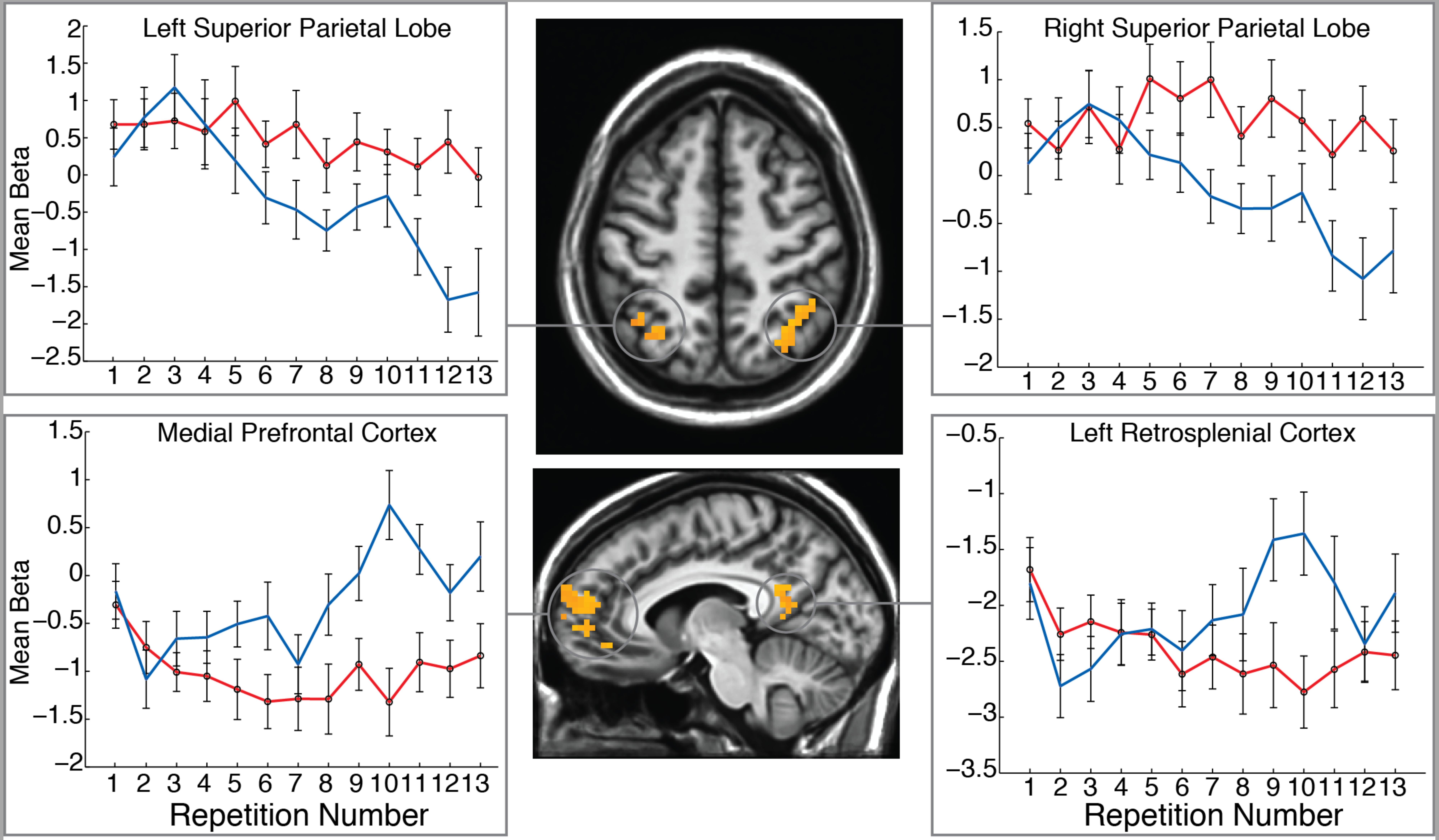
# Habituation


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

# Generalization

# Generalization of habituation

*Psychological Review*
1966, Vol. 73, No. 1, 16–43

# HABITUATION:

## A MODEL PHENOMENON FOR THE STUDY OF NEURONAL SUBSTRATES OF BEHAVIOR [1]

RICHARD F. THOMPSON AND WILLIAM ALDEN SPENCER [2]

*University of Oregon Medical School*

The recent habituation literature is reviewed with emphasis on neurophysiological studies. The hindlimb flexion reflex of the acute spinal cat is used as a model system for analysis of the neuronal mechanisms involved in habituation and sensitization (i.e., dishabituation). Habituation of this response is demonstrated to follow the same 9 parametric relations for stimulus and training variables characteristic of behavioral response habituation in the intact organism. Habituation and sensitization appear to be central neural processes and probably do not involve presynaptic or postsynaptic inhibition. It is suggested that they may result from the interaction of neural processes resembling "polysynaptic low-frequency depression," and "facilitatory afterdischarge." "Membrane desensitization" may play a role in long-lasting habituation.

ments have studied "below-zero" habituation as such (Humphrey, 1933; Prosser & Hunter, 1936; Wendt, 1931), the observations may be viewed as an extension of the relationship between number of stimulus presentations and degree of habituation. Zero response level is of course to some degree dependent upon the particular response measures used.

7. *Habituation of response to a given stimulus exhibits stimulus generalization to other stimuli.*

Coombs (1938) demonstrated generalization of GSR habituation to different types of auditory stimulation, and Porter (1938) demonstrated cross-modal generalization of the habituated GSR for light and tone stimuli. Mowrer (1934) showed some generalization of postrotatory nystagmus habituation in the pigeon. In a recent study, Crampton and Schwam (1961) reported generalization of optic nystagmus habituation

of distinguishing between habituation and "fatigue."

9. *Upon repeated application of the dishabituatory stimulus, the amount of dishabituation produced habituates (this might be called habituation of dishabituation).*

Most studies of dishabituation (see above) have noted its habituation. Lehner (1941) has done the most careful parametric studies, showing that habituation of dishabituation follows a negative exponential course for the startle response in the rat and the abdominal reflex in man. More recently, Hagbarth and Kugelberg (1958) and Hagbarth and Finer (1963) verified and extended Lehner's findings for the abdominal and leg flexion reflexes in humans. Crampton and Schwam (1961) have shown that dishabituation of postrotatory nystagmus in the cat by auditory or cutaneous stimuli habituates in a similar fashion.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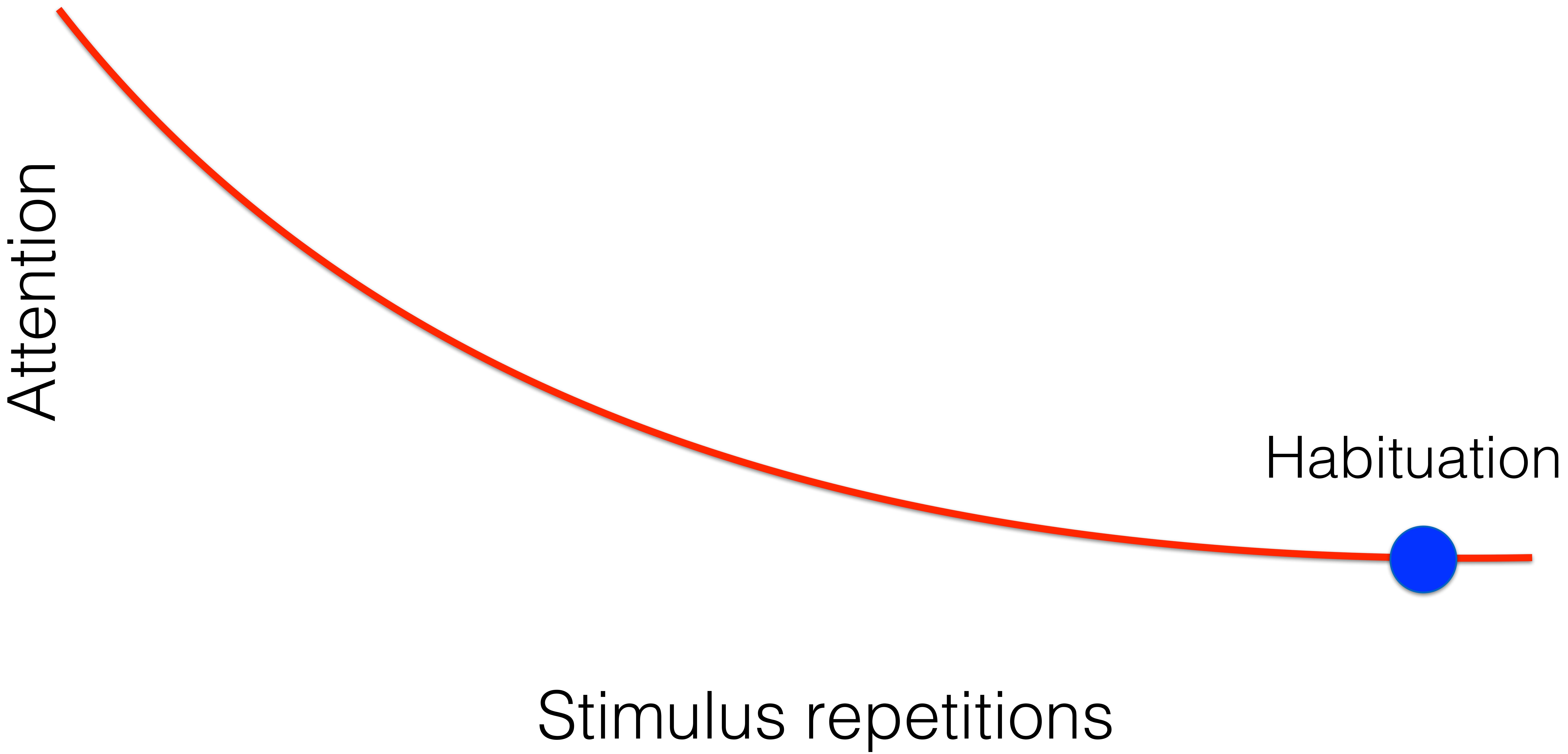
Stimulus repetitions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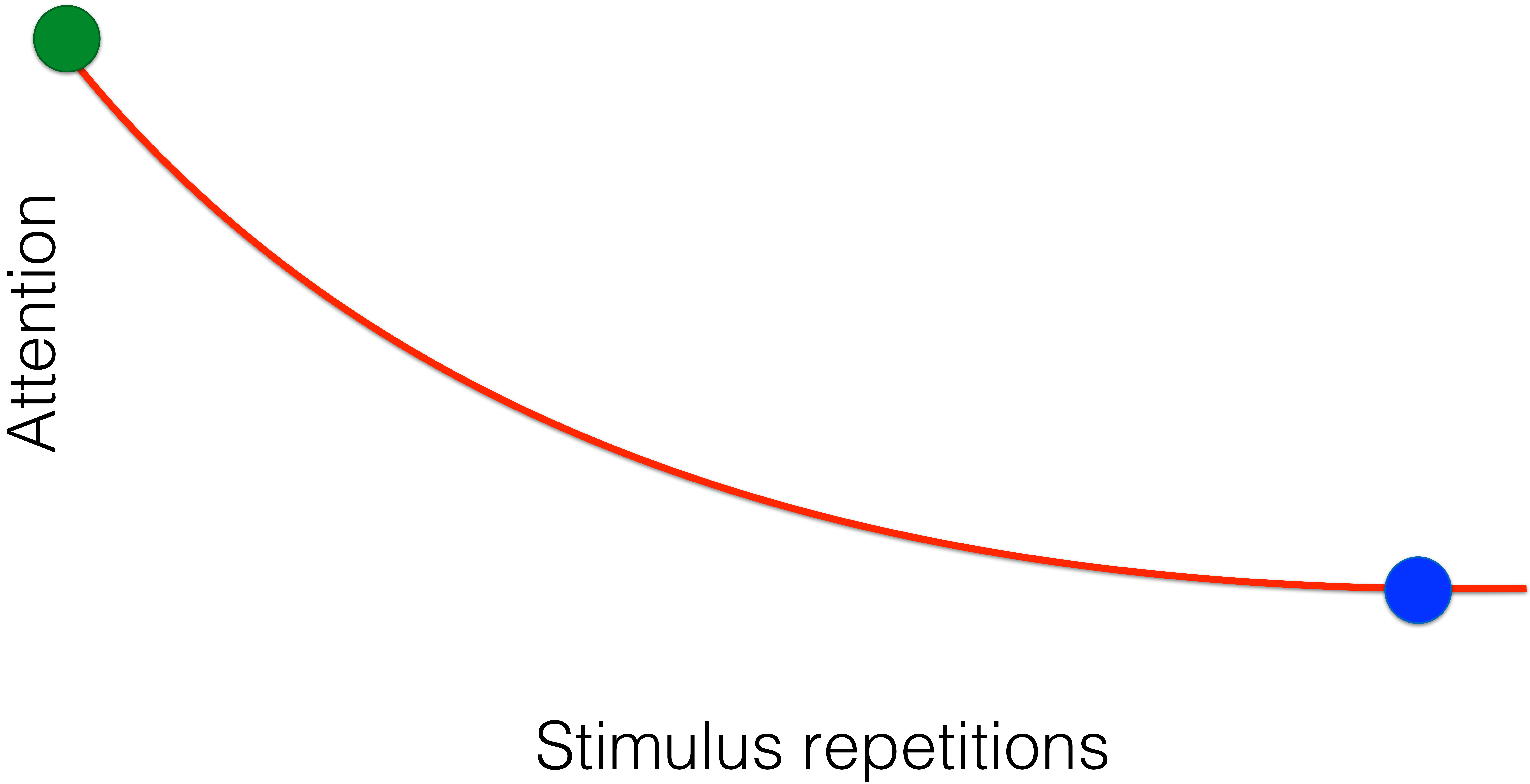
Habituation
Stimulus repetitions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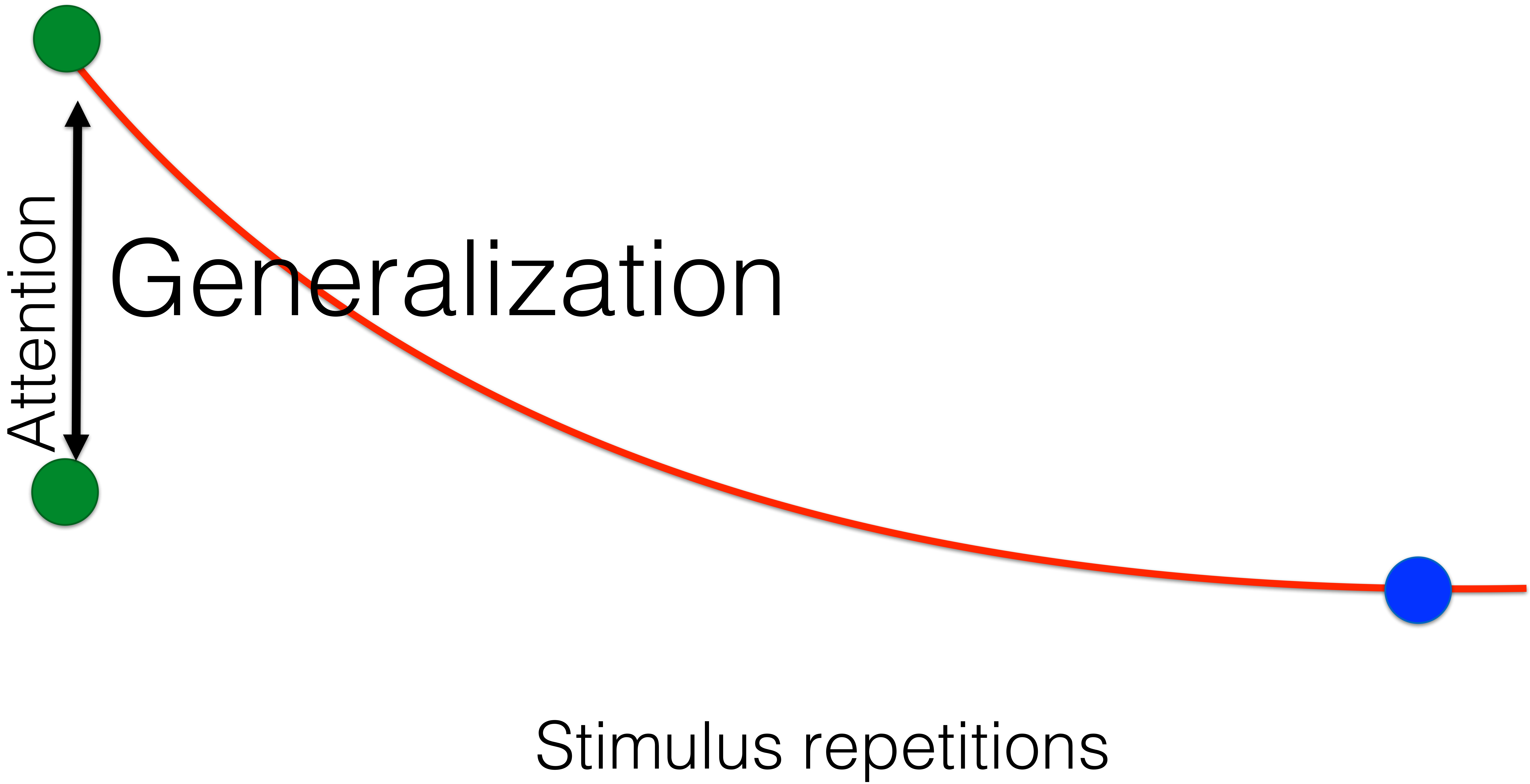

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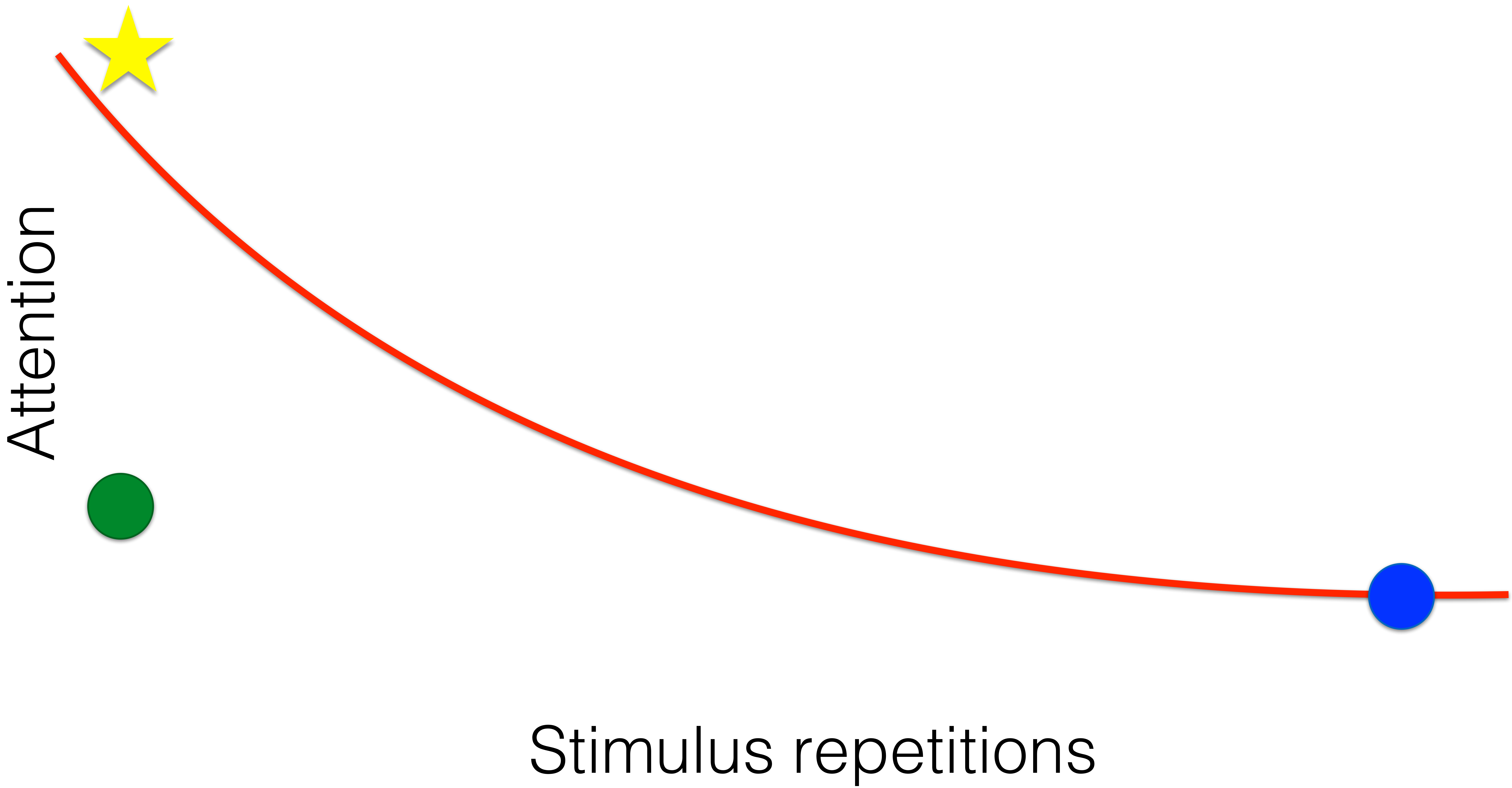
Generalization
Stimulus repetitions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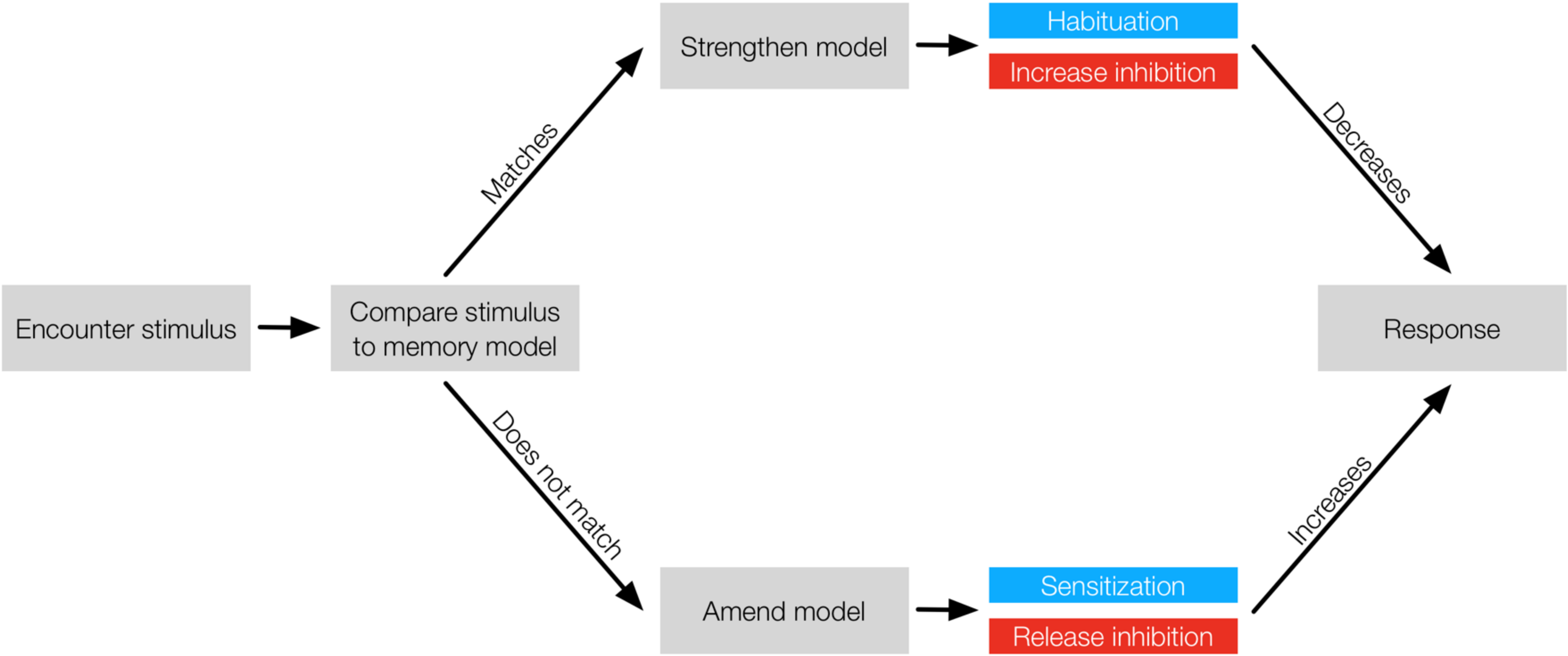
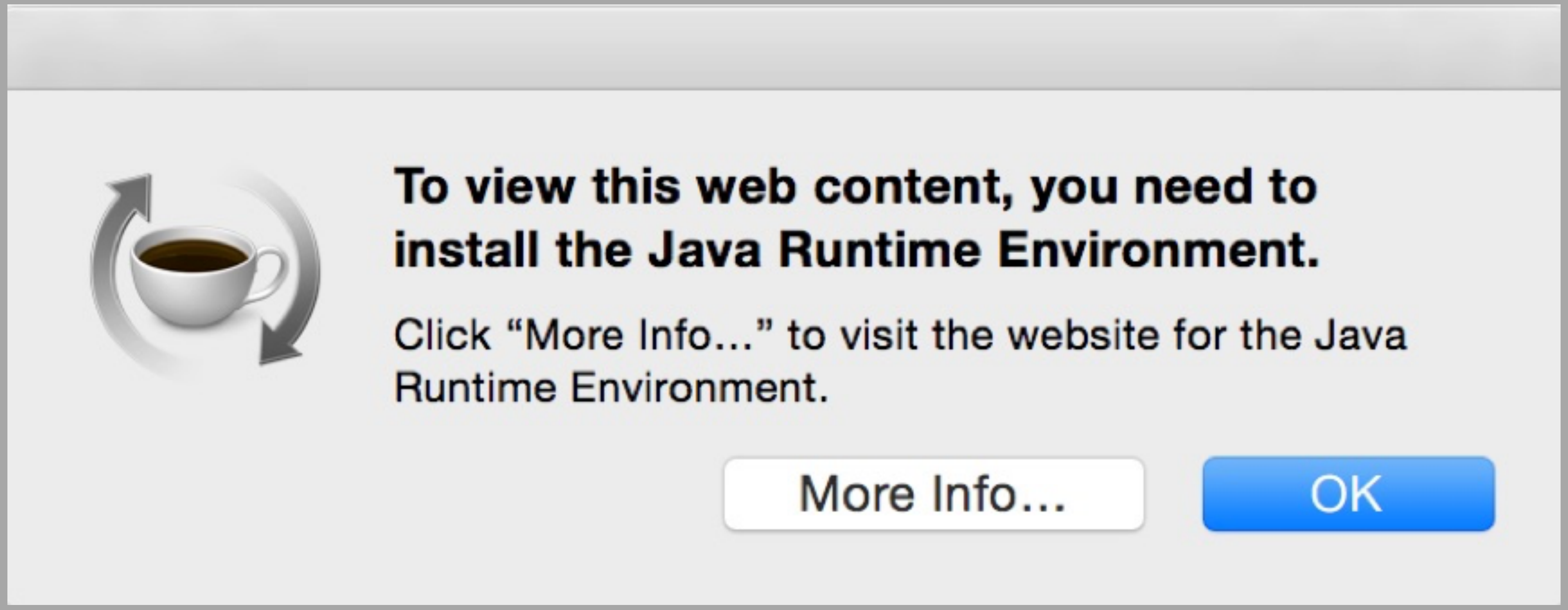

Encounter stimulus
Compare stimulus to memory model
Matches
Strengthen model
Habituation
Increase inhibition
Decreases
Does not match
Amend model
Sensitization
Release inhibition
Increases
Response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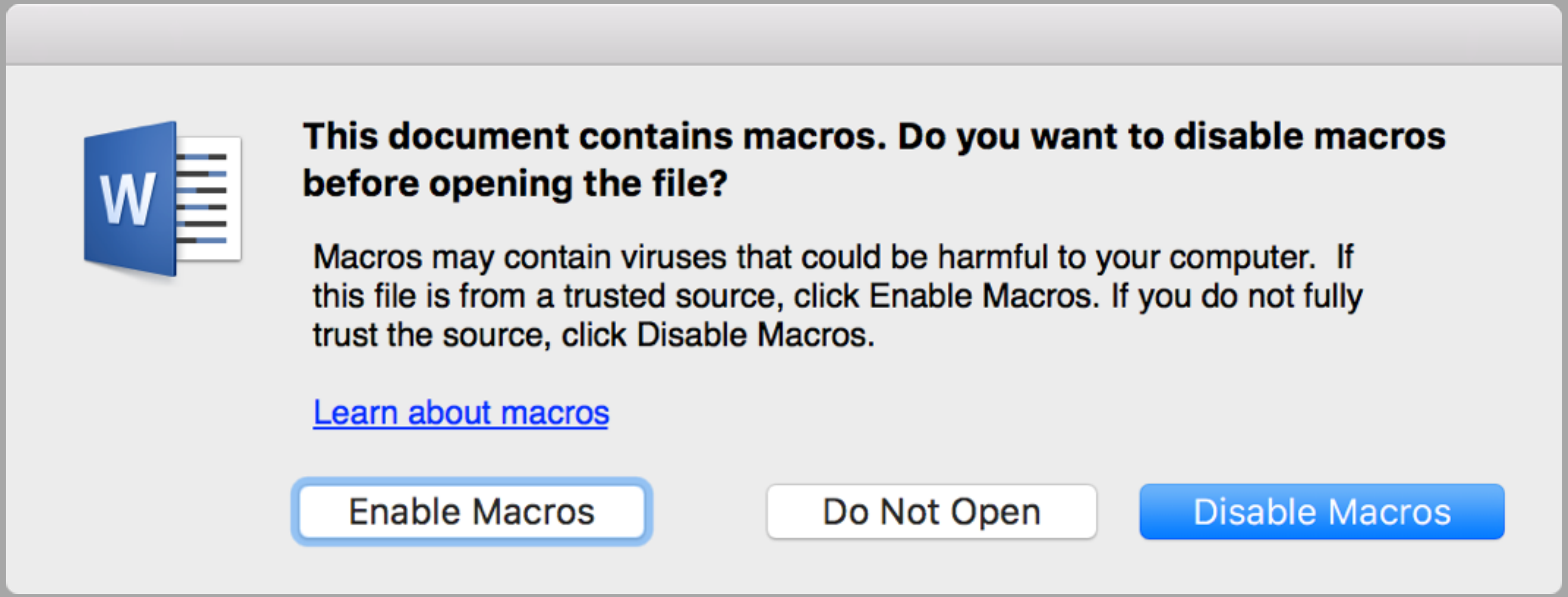
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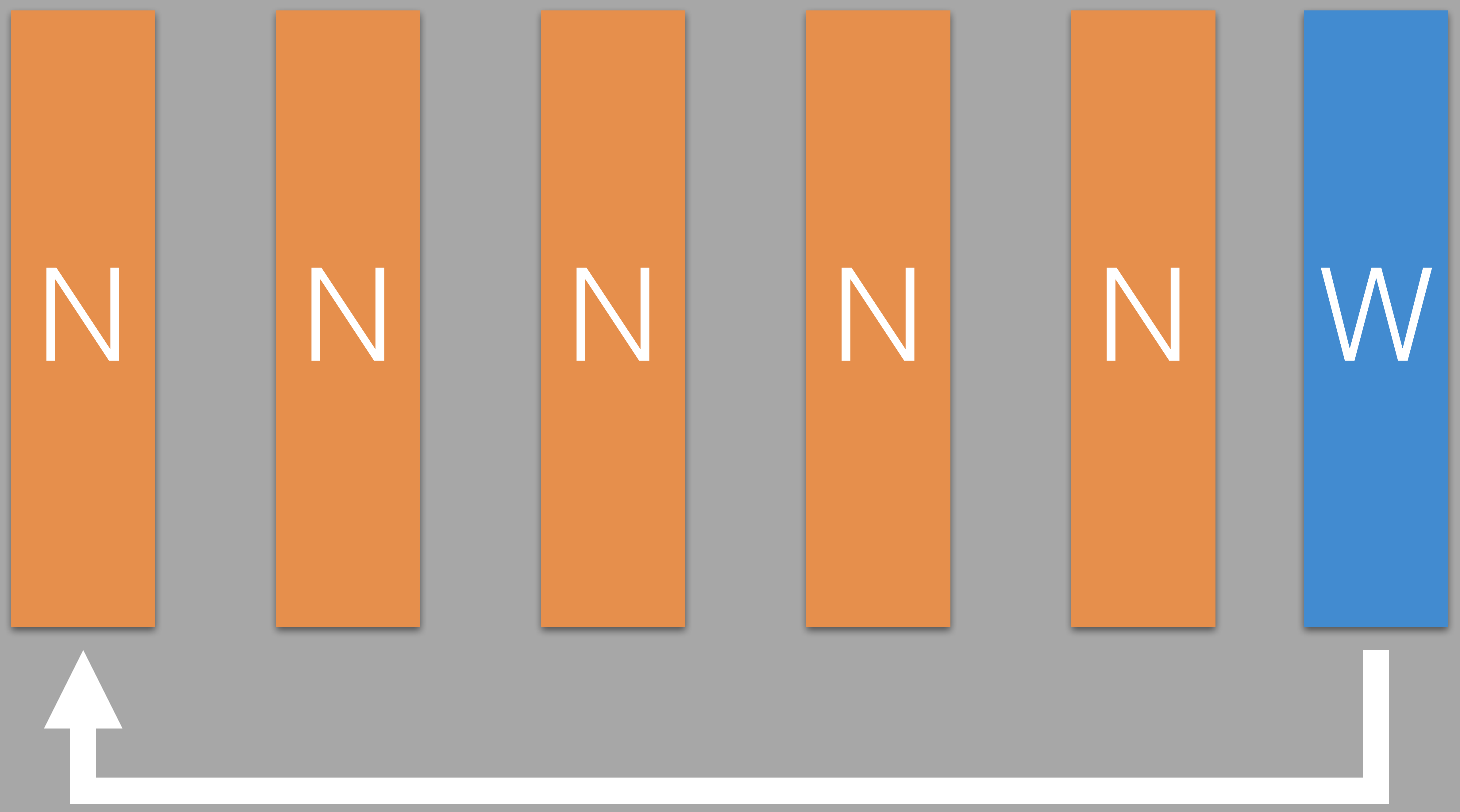
RQ1. How does habituation to notifications generalize to novel security warnings?

RQ2. How warnings be designed to be resistant to generalization?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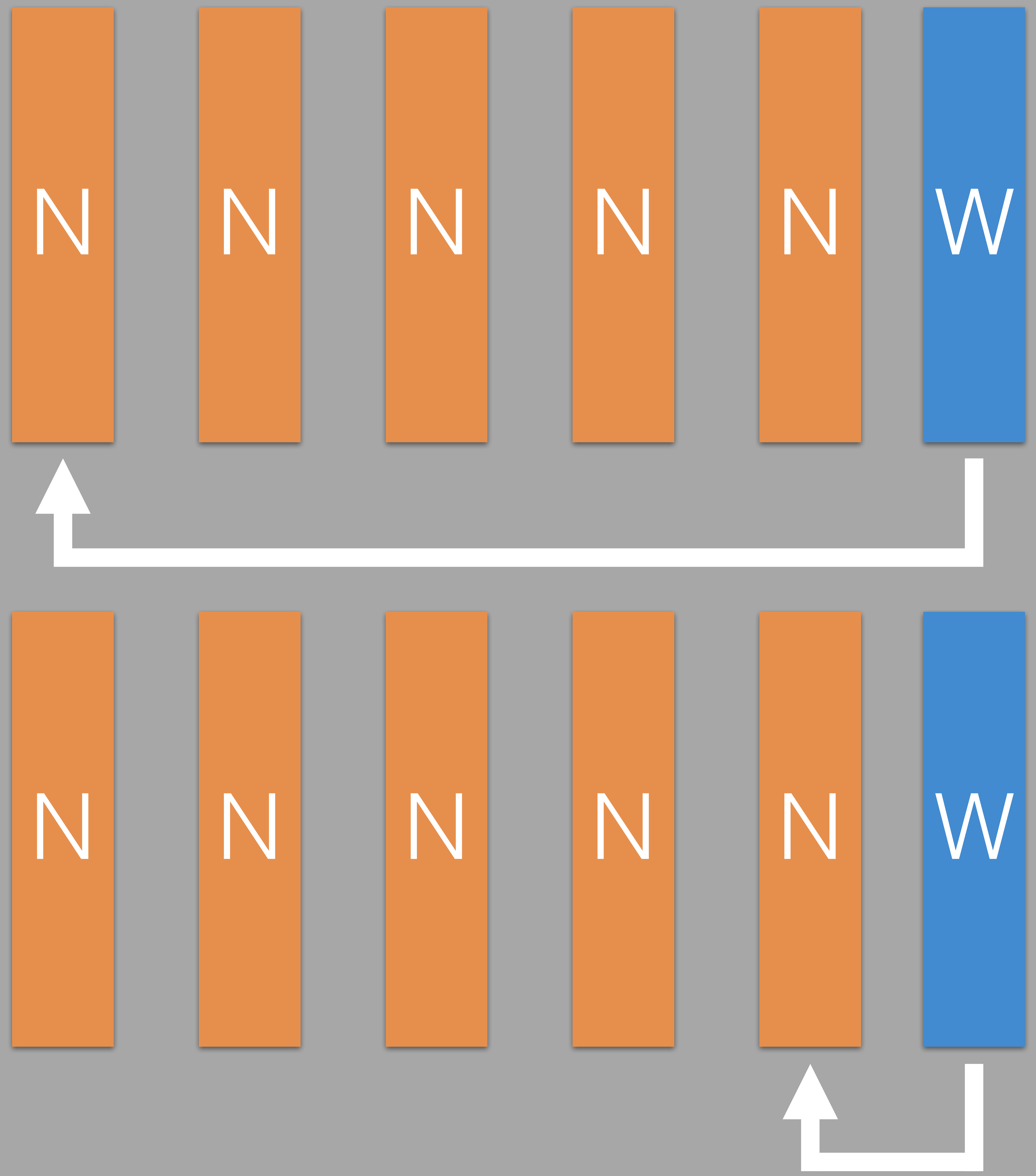
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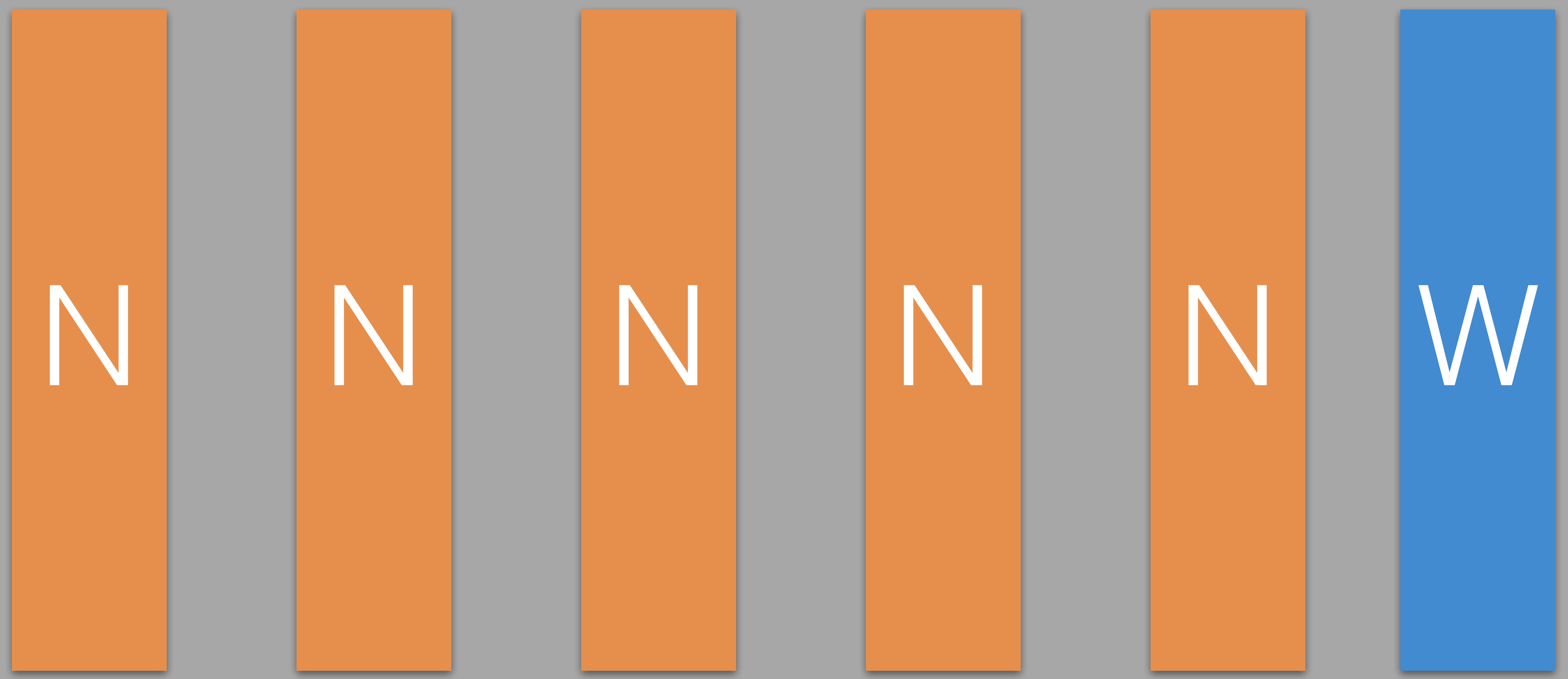
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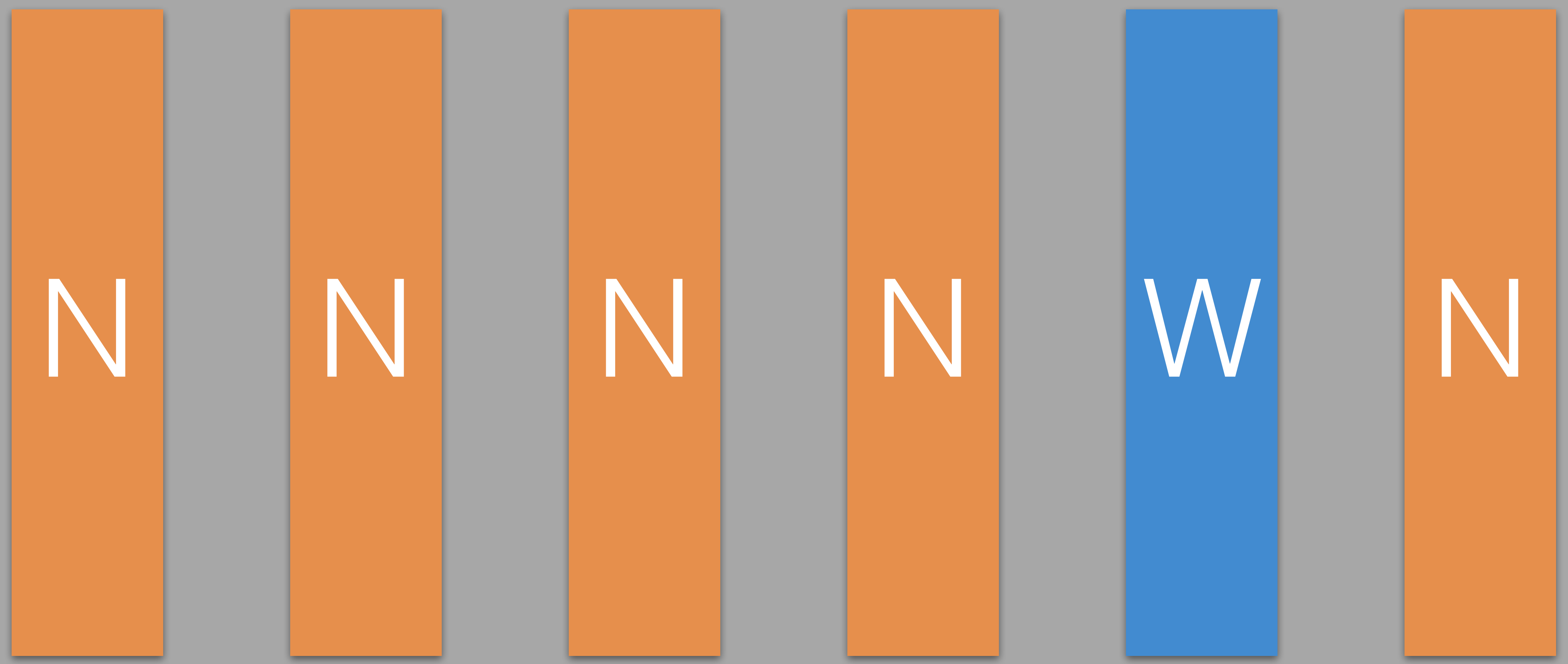
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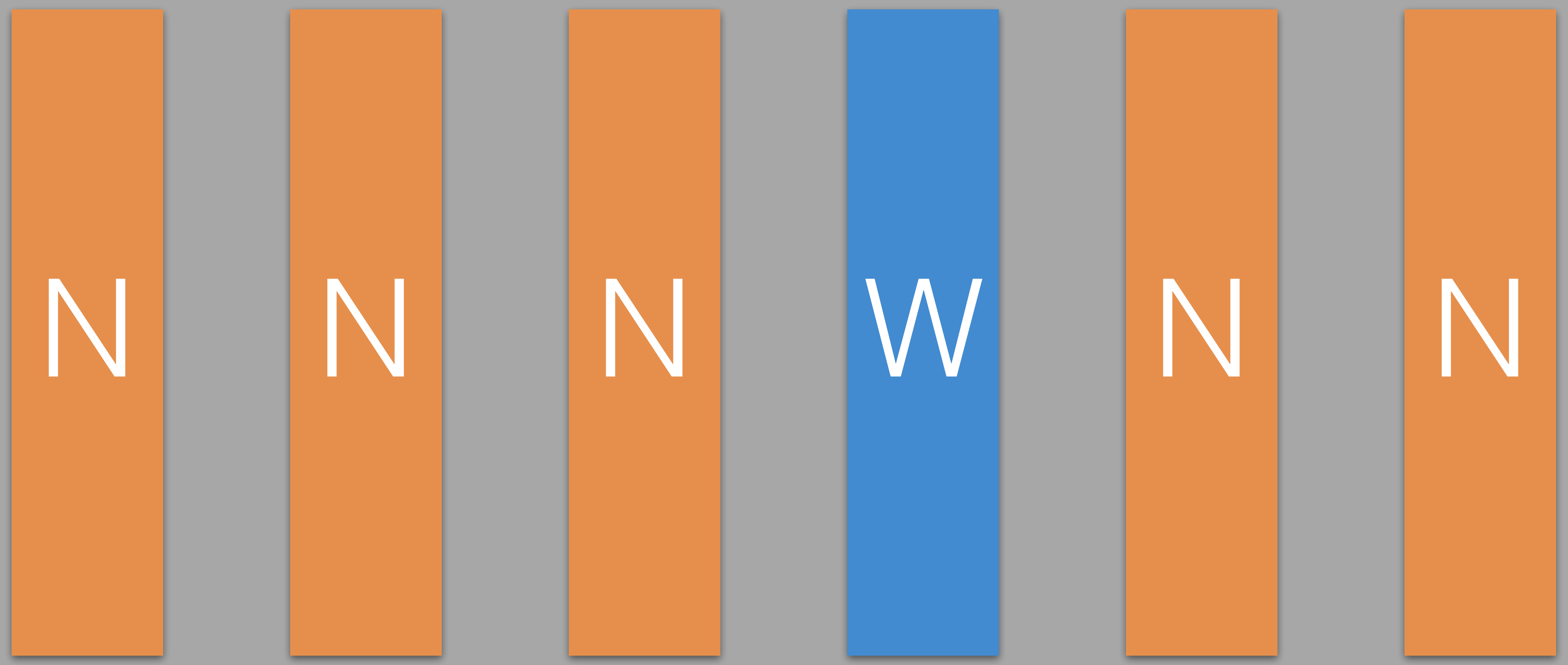
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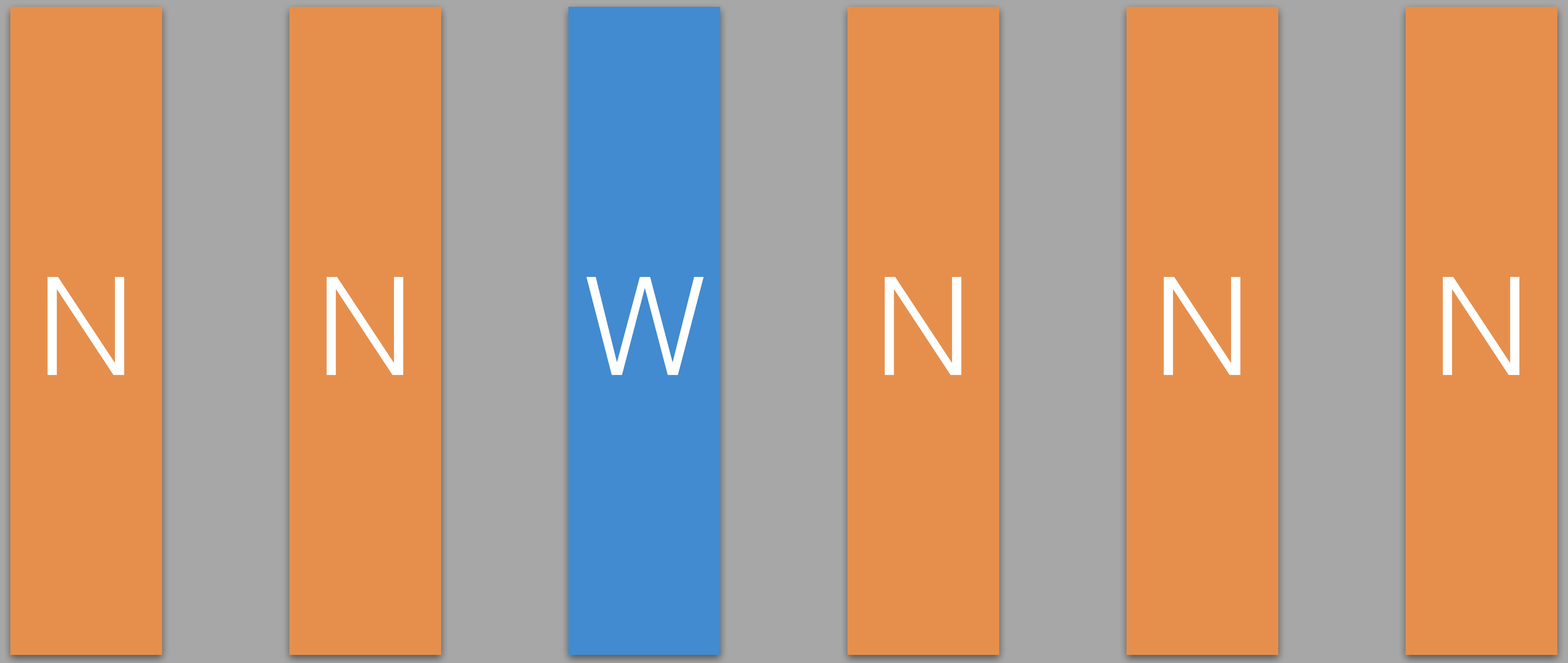
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# Ecological validity

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.
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:b2:3
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
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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 information from weather.com
Detect your physical location
Test for Internet connectivity
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 softwa
or validity of this software cannot
installation?
Open File - Security Warning
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.microsoft.com
Would you like to save this file?
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**Table 1 The Proposed Opportunities for IS Research**

(1) Localize the various brain areas associated with IS constructs (neural correlates of IS constructs) and link them to the cognitive neuroscience literature to map IS constructs into specific brain areas, learn about the functionality of these brain areas, and better understand the nature and dimensionality of IS constructs.

(2) Capture hidden (automatic or unconscious) mental processes (e.g., habits, ethics, deep emotions) that are difficult or even impossible to measure with existing measurement methods and tools.

(3) Complement existing sources of data with brain imaging data that can provide objective responses that are not subject to measurement biases (e.g., subjectivity bias, social desirability bias, common method bias).

(4) Identify antecedents of IS constructs by examining how brain areas are

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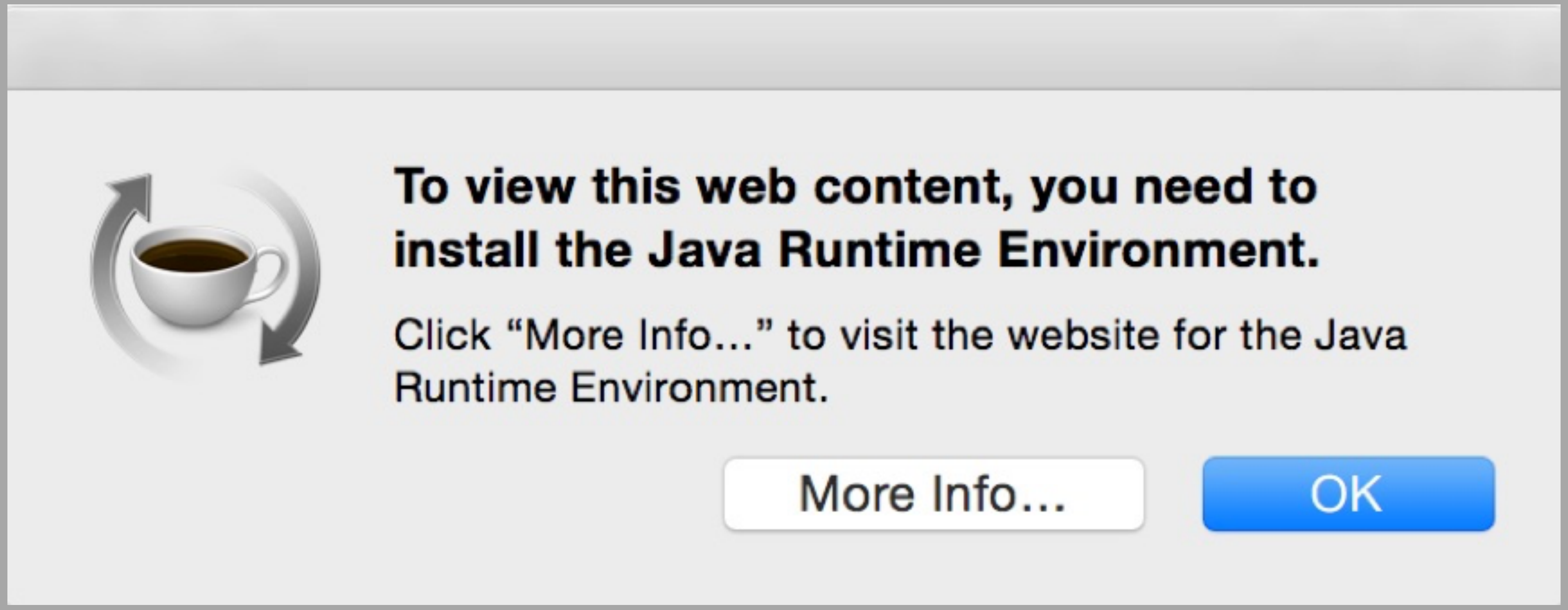
# Behavioral experiment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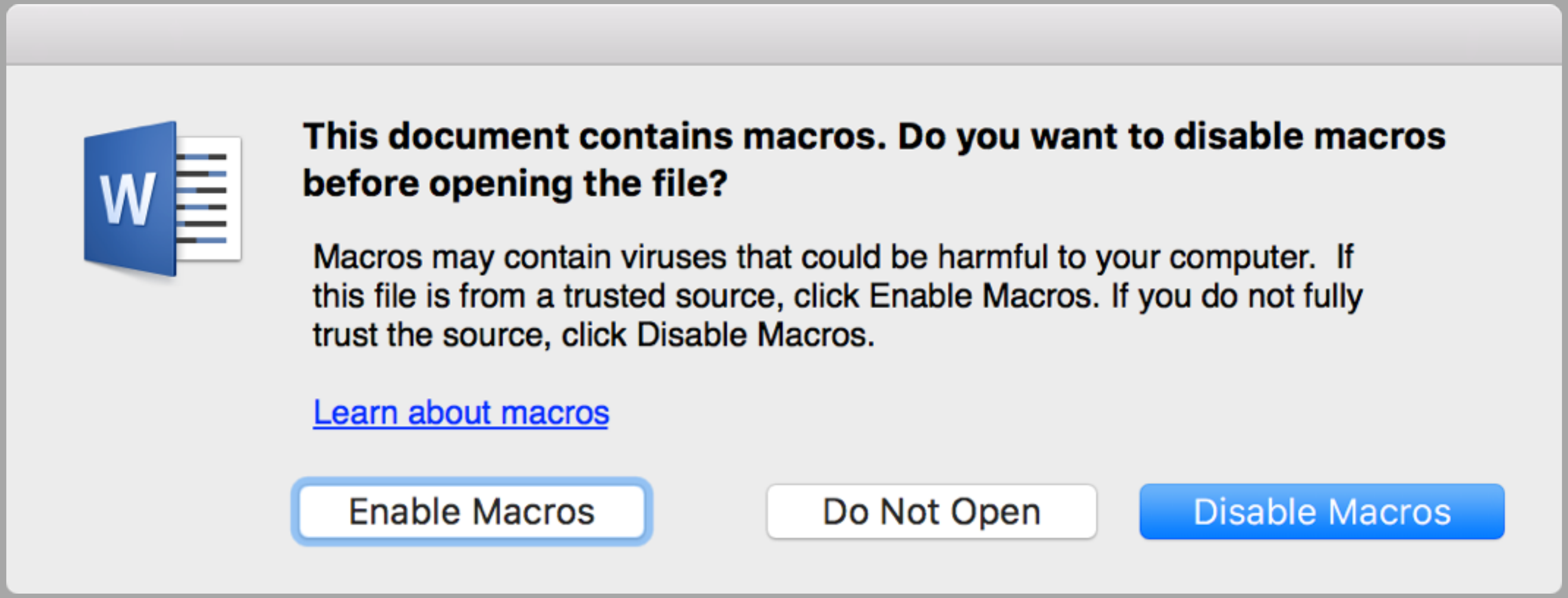
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