



# The Role of Human Factors in Inspection and Operating Errors/Failures in Rail Transit

June 6, 2023  
Minneapolis, MN

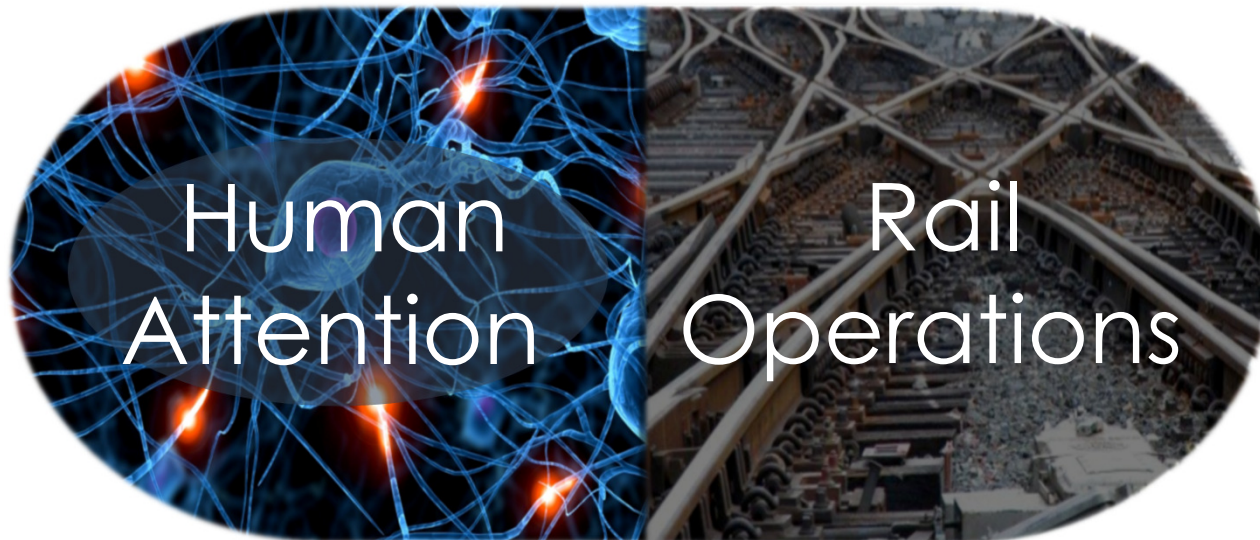


RAIL TRANSIT SEMINAR • JUNE 6



**WRI 2023**

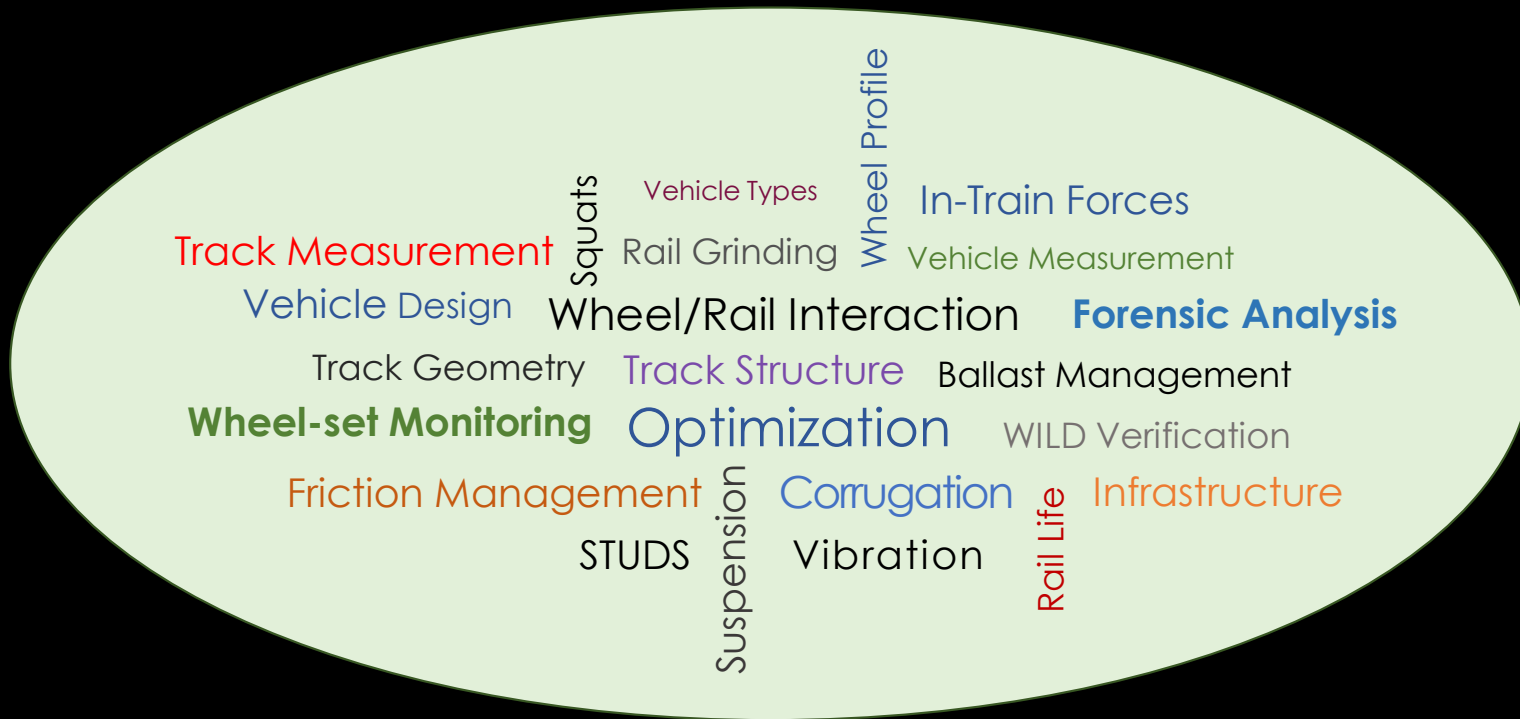
**ATTICUS**  
CONSULTING GROUP LLC



Dr. Daniel Smilek

Randall Jamieson

# Technology vs. Human Attention



The potential for **human error** is omnipresent!



Attention related-errors are **not** well understood!

- Blatant violation
- Complacency
- Lack of training
- Not paying attention



Often, they are the cause of catastrophic accidents!

# A Common Root Cause of Human Errors



Failure of human attention!



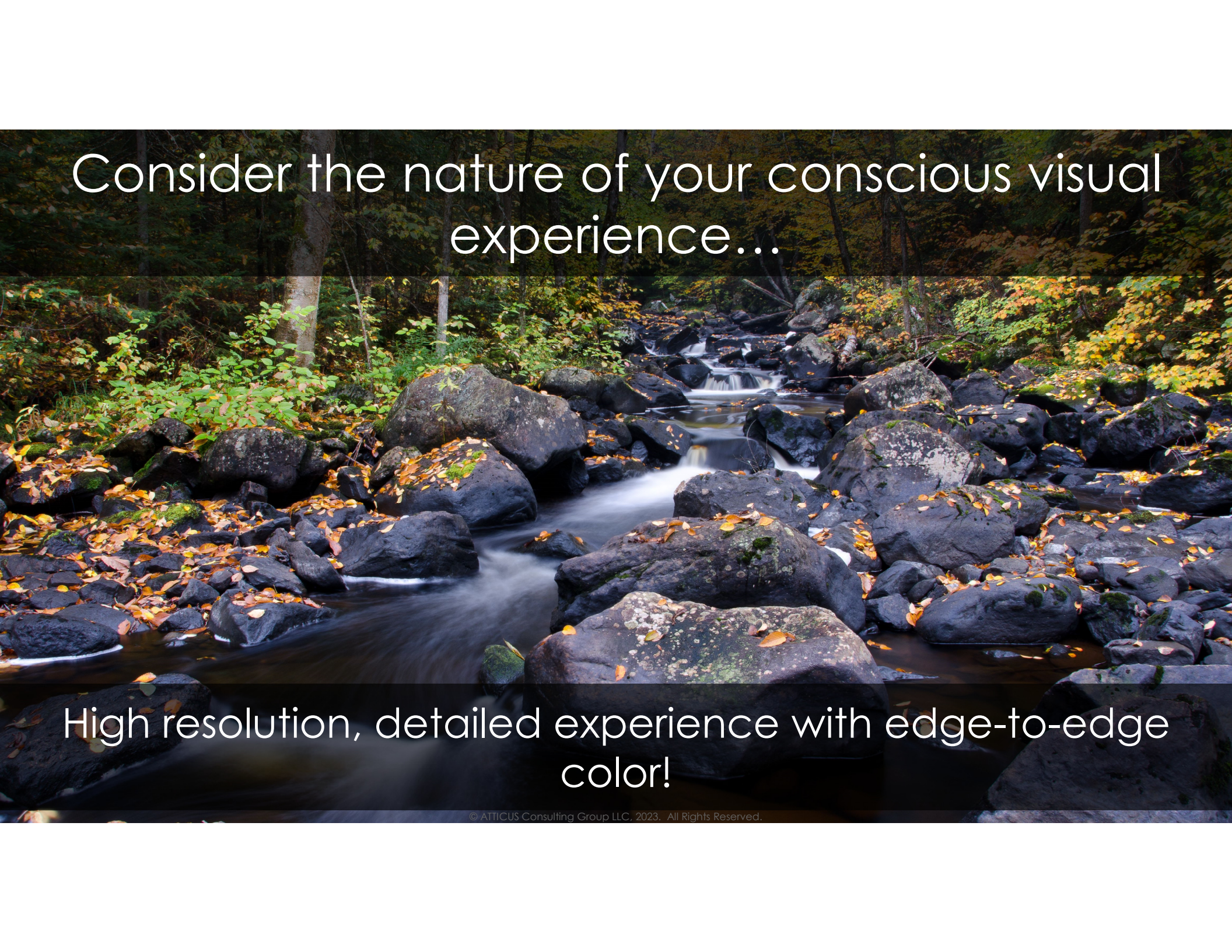
# Attention-Related Factors That Cause Human Error



# Attention-Related Factors That Cause Human Error





A scenic photograph of a rocky stream flowing through a forest. The water is blurred, suggesting a long exposure, and flows over numerous dark, mossy rocks. The surrounding forest is lush with green and yellow autumn foliage. The scene is captured in a wide-angle shot, emphasizing the natural beauty and detail of the environment.

Consider the nature of your conscious visual experience...

High resolution, detailed experience with edge-to-edge color!

Put up your hand when you find the change.



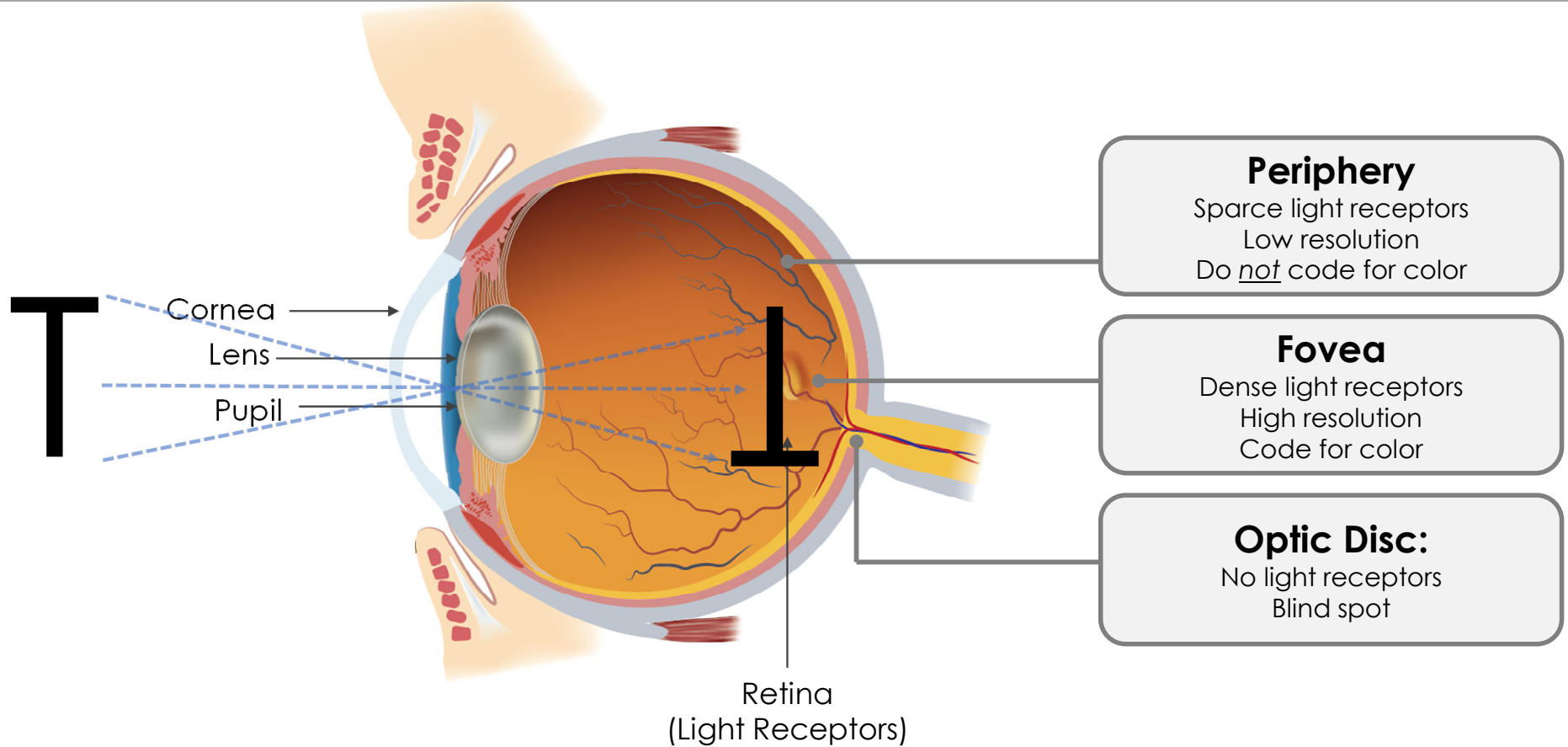
Here is another one!



# Change Blindness

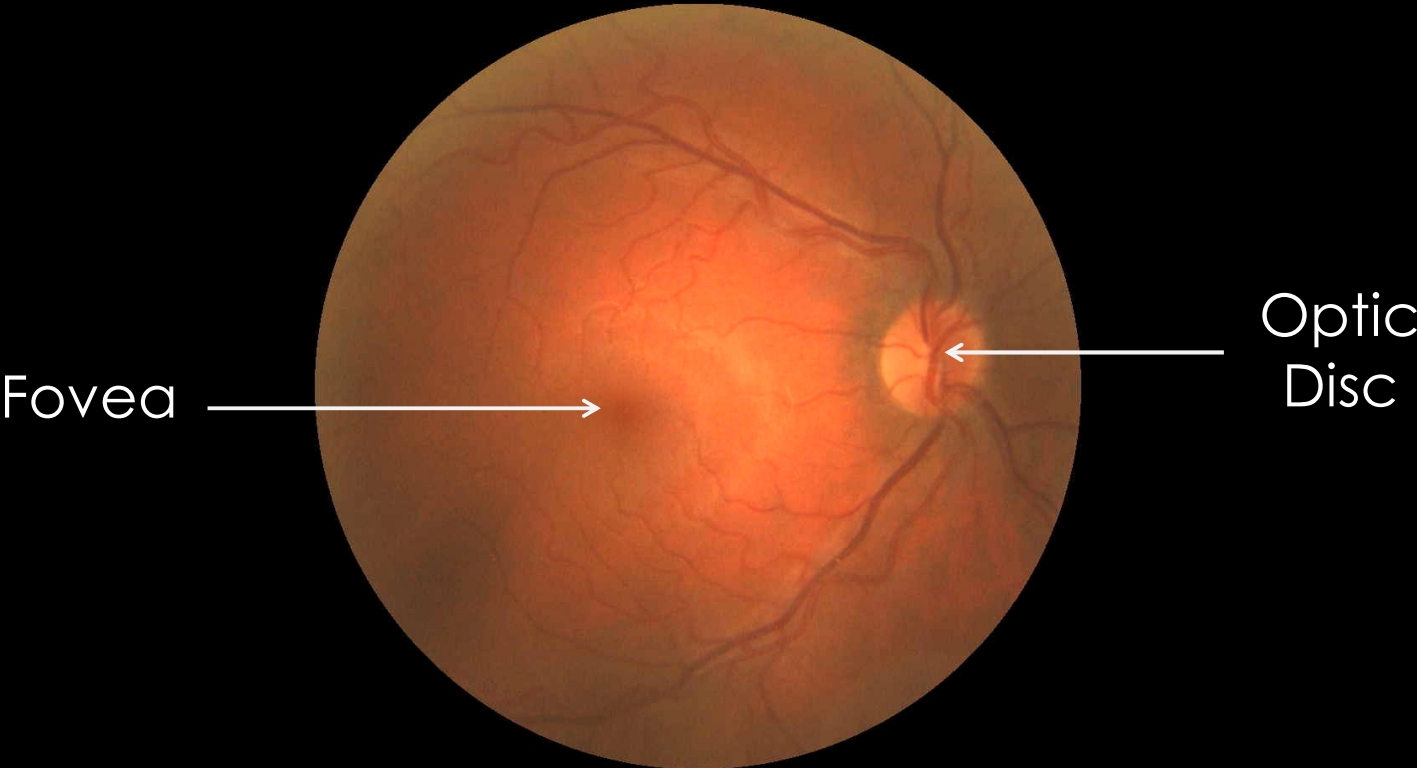
# The Grand Illusion of Perception

# The Eye





# The Retina



This is a very interesting presentation. I am enjoying this presentation very much and I hope it never ends. I am really paying attention to all of the information presented and I hope to share it with my coworkers. This whole conference is amazing and I'm definitely coming back next year!

This is a very interesting presentation, I am enjoying this presentation very much and I hope it never ends. I am really paying attention to all of the information presented and I hope to share it with my coworkers. This whole conference is amazing and I'm definitely coming back next year!

Fixations



Saccades





0:16:05.88 (00049740)



So, why do we miss the change in the  
change-blindness demonstration?





The 'Grand Illusion of Perception'  
might lead us to be overconfident  
in our perception.

# Attention-Related Factors

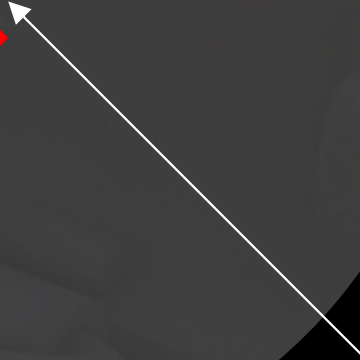


Looking  $\neq$  Seeing



# Covert Attention

Covert  
Attention



Missing Bolt

Fixation



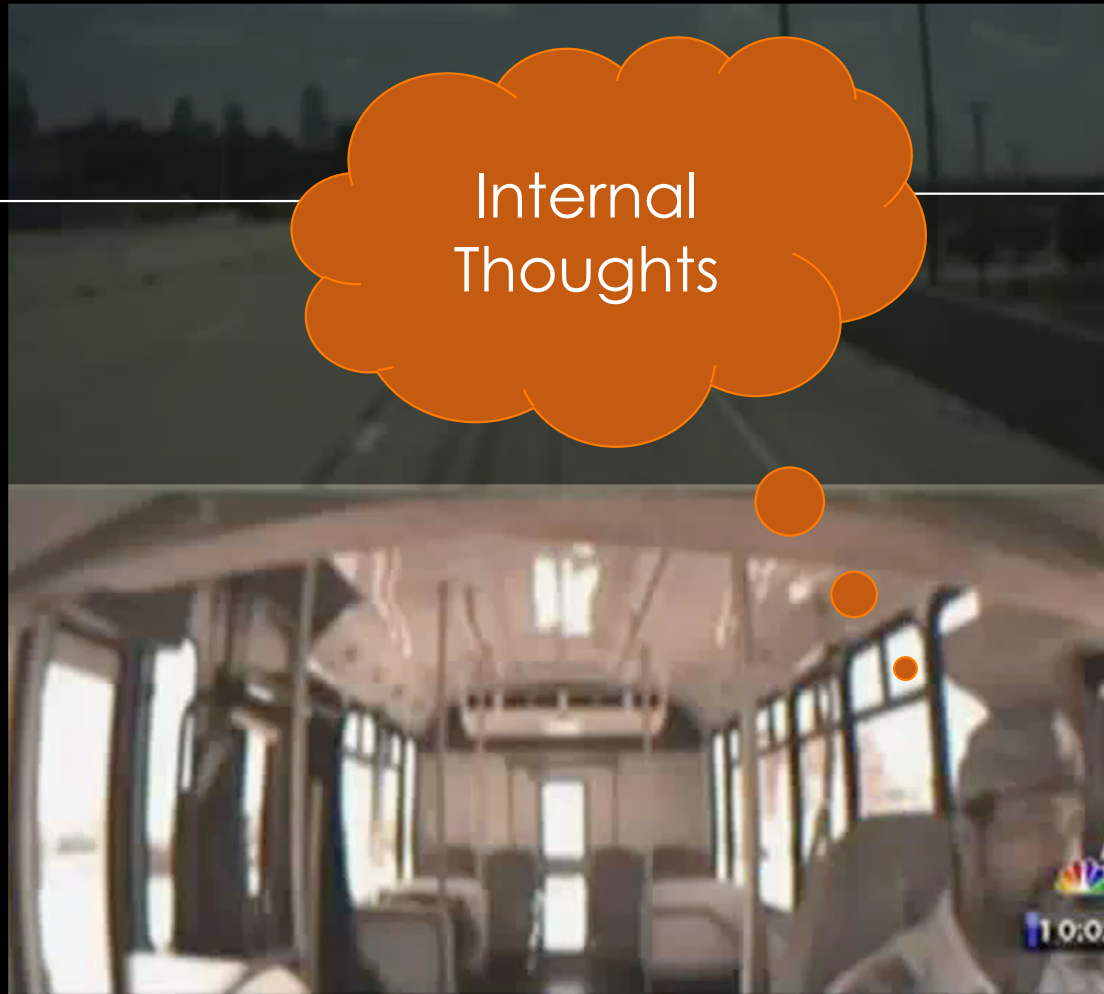
Inattention blindness  
occurs when an item is fixated, but **not**  
attended.



<http://www.nbcdfw.com/traffic/stories/DART-Driver-Fired-After-Crash-on-Tollway-161947975.html>



Covert  
Attention



Fixation

When your attention is turned **inwards**  
to your thoughts, you can become  
**functionally blind.**

# Attention-Related Factors





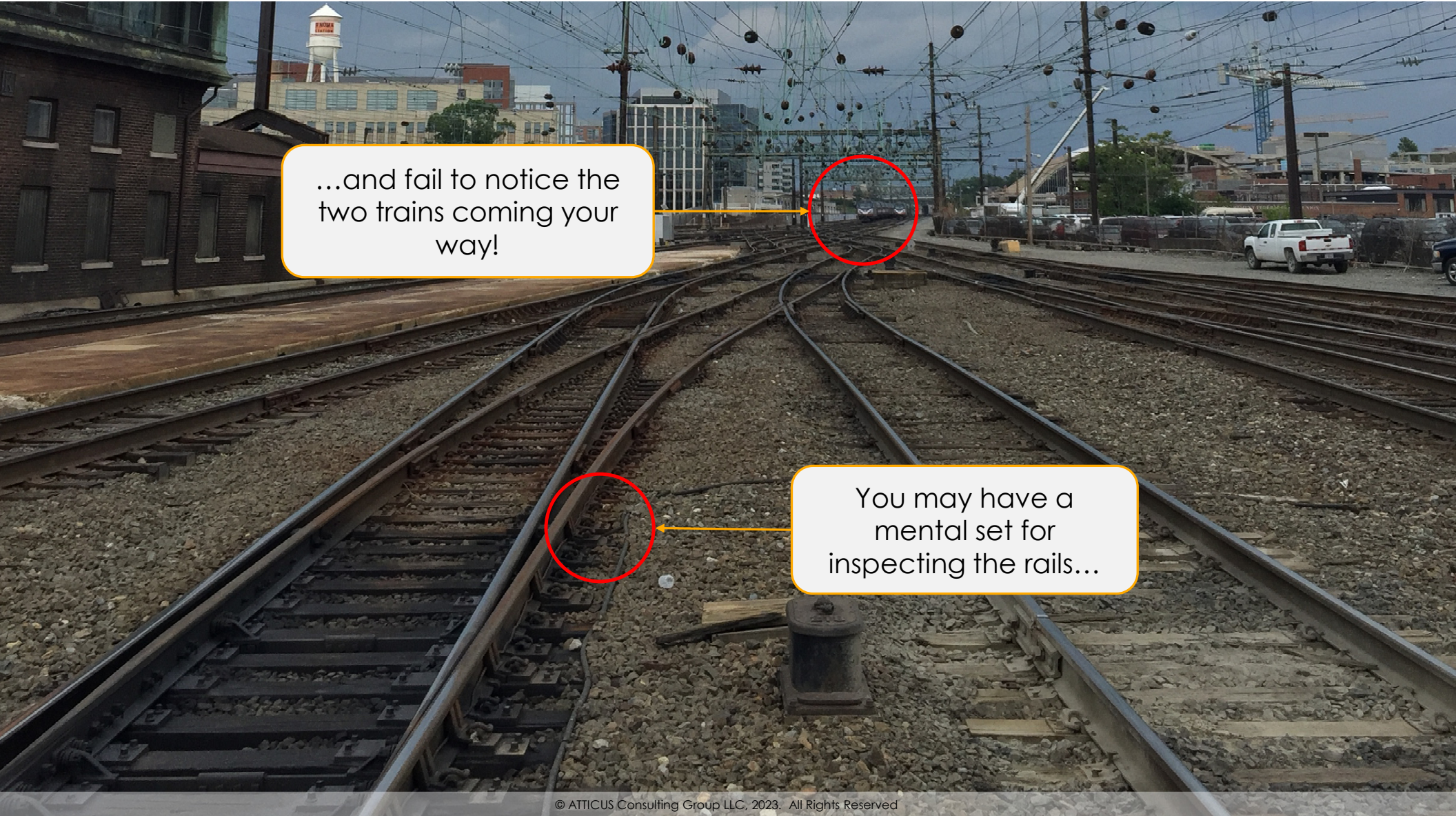
Describe the **people** in the scene



Describe the **location** of the scene



● Eye Fixation



...and fail to notice the two trains coming your way!

You may have a mental set for inspecting the rails...

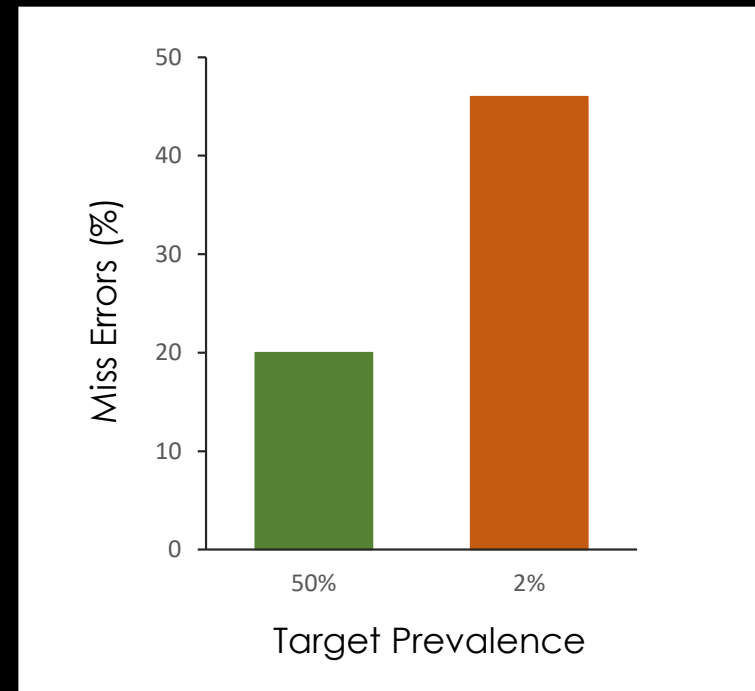
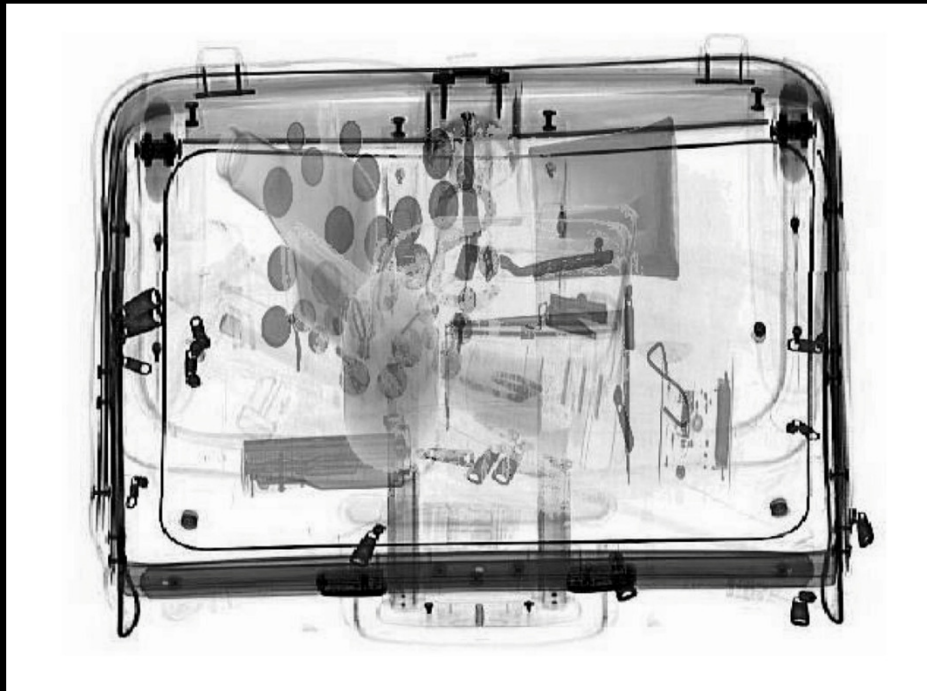
Visual perception is influenced by your  
mental set, expectations, and prior  
knowledge.

# Attention-Related Factors





# Target Prevalence

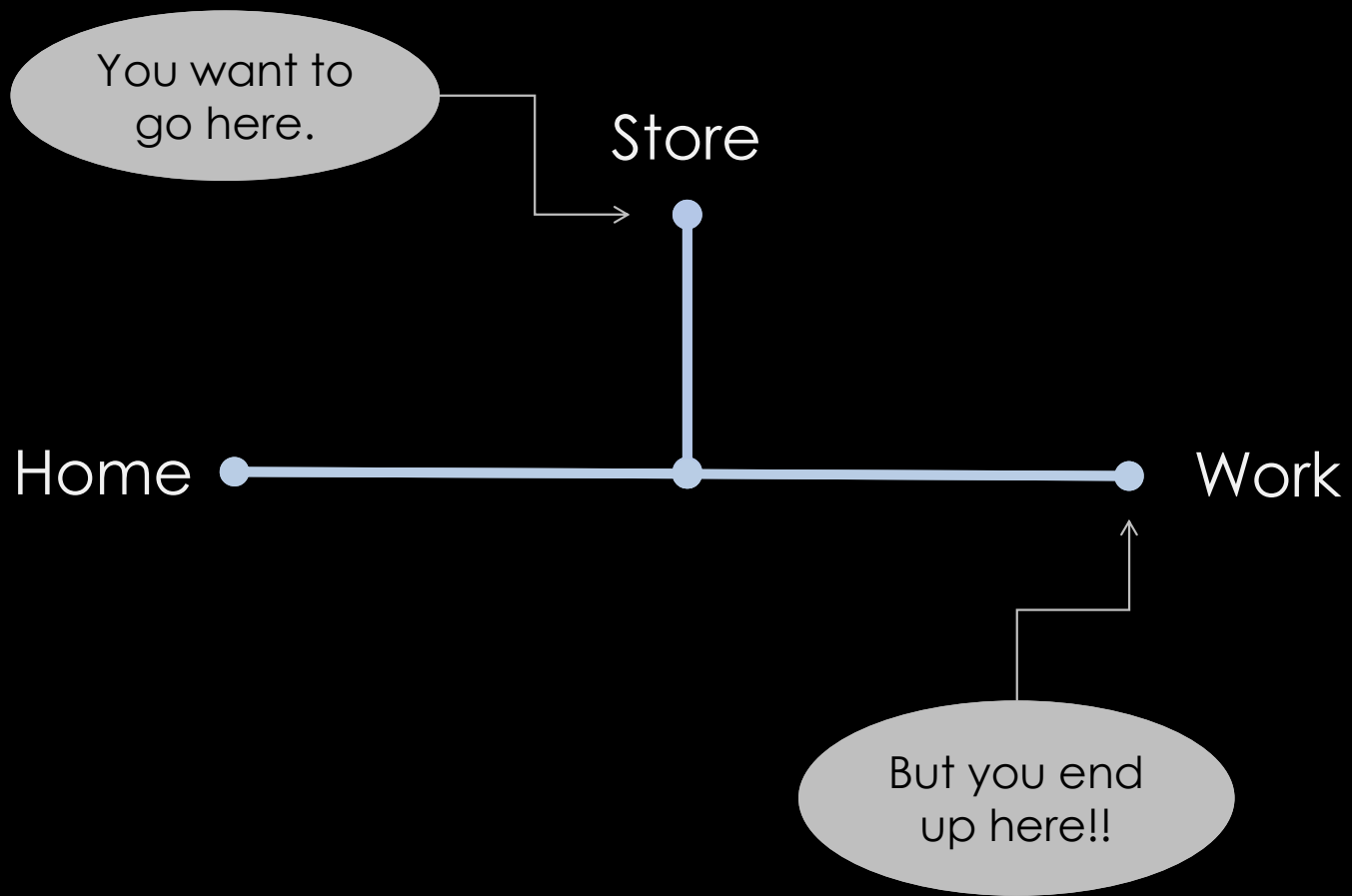


Wolfe, J. M., Horowitz, T. S., Van Wert, M. J., Kenner, N. M., Place, S. S., & Kibbi, N. (2007). Low target prevalence is a stubborn source of errors in visual search tasks. *Journal of Experimental Psychology: General*, 136(4), 623. (Fig 1).

Uncommon targets are *more* likely  
to be *missed*.

# Attention-Related Factors





# Two Brain Systems that Guide Behavior

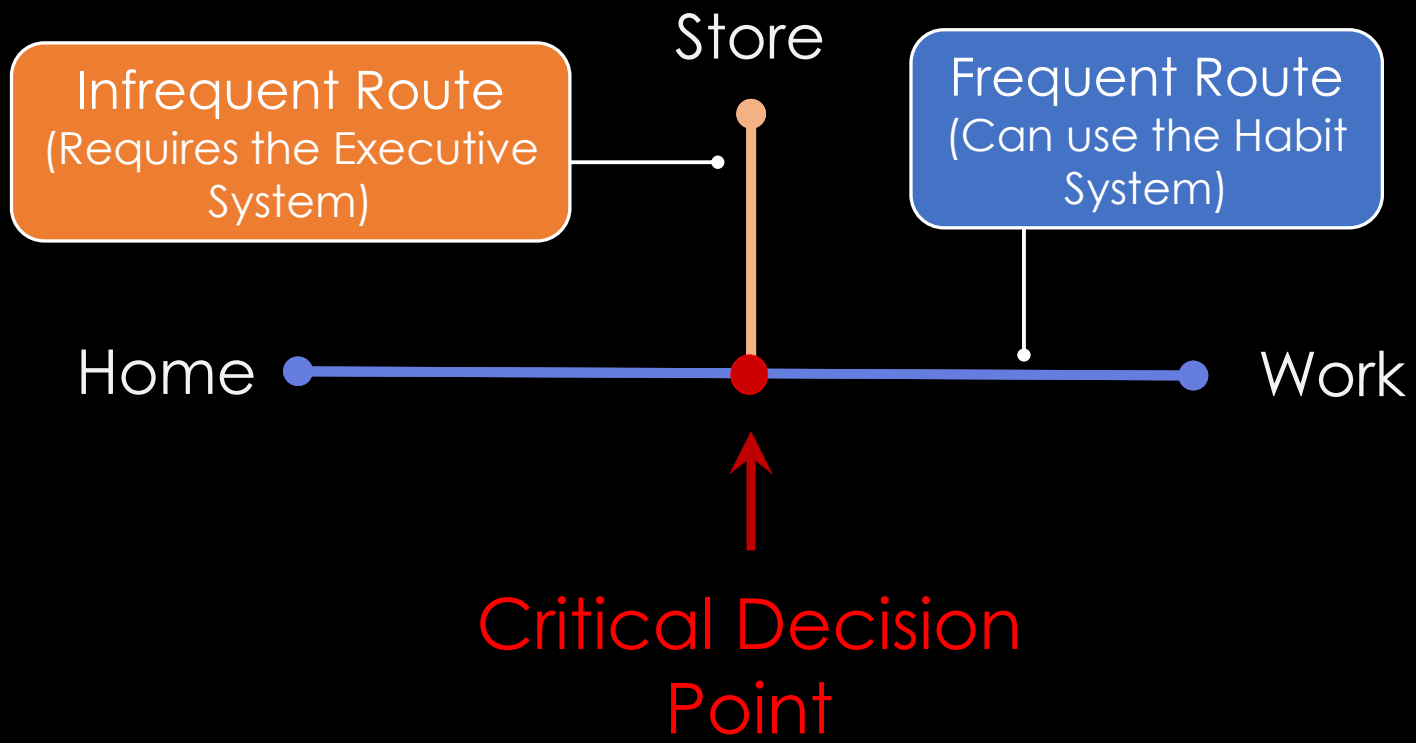
## Executive System

- Intentional
- Conscious
- Limited Capacity
- Novel Situations



## Habit System

- Automatic
- Unconscious
- Unlimited Capacity
- Repeated Situations



In unusual situations, your habit system, if left unchecked, will likely enact the more common, but inappropriate, behavior.

# Attention-Related Factors That Cause Human Error





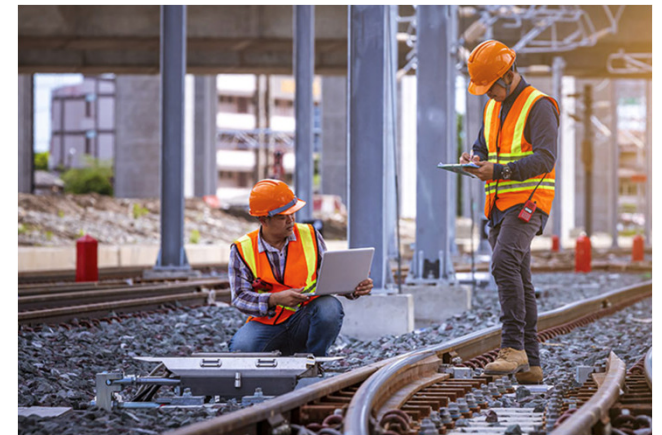
# Attention Strategies Can be Trained!



The Science



Attention Strategies



The Application

Comprehensive Attention Performance Training Program™