Multitasking:
Why Your Brain Can’t Do It and What You Should Do About It.

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MULTITASKING?

Our human solution to cheating time!

Performing multiple tasks simultaneously...or so we think!

Effective multitasking is a MYTH!

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Reality: Your brain has a very limited capacity for multiple simultaneous thoughts.

When you "multitask" you are actually switching between the tasks, at great cost!

Today’s Main Take-Home Message:

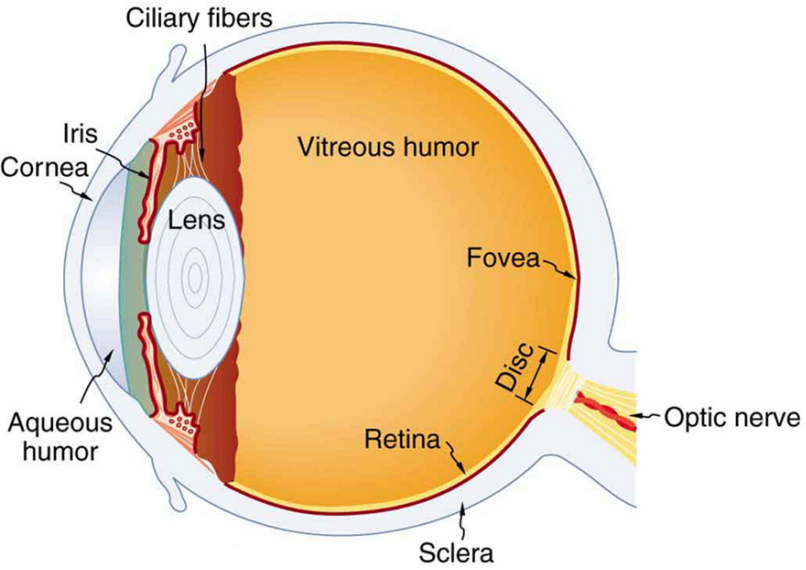
Don’t use your cell phone when you drive.

Regardless of how good you think you are at it, you are not.

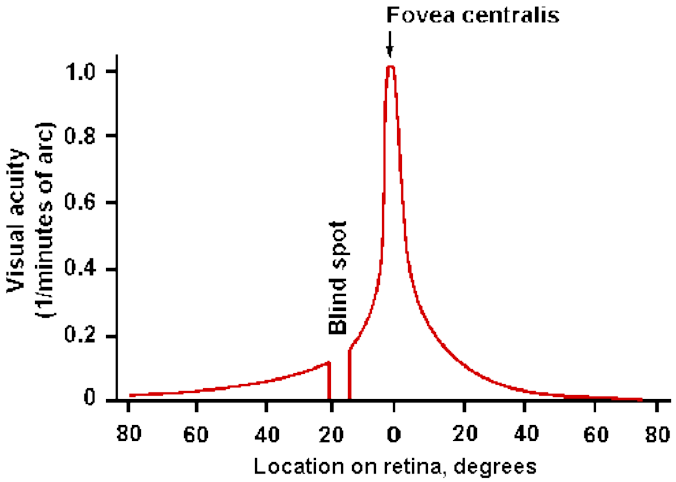
Distracted driving accounts up to 50% of accidents.

The Myth of Multitasking: You are sipping at the outside world through a straw.

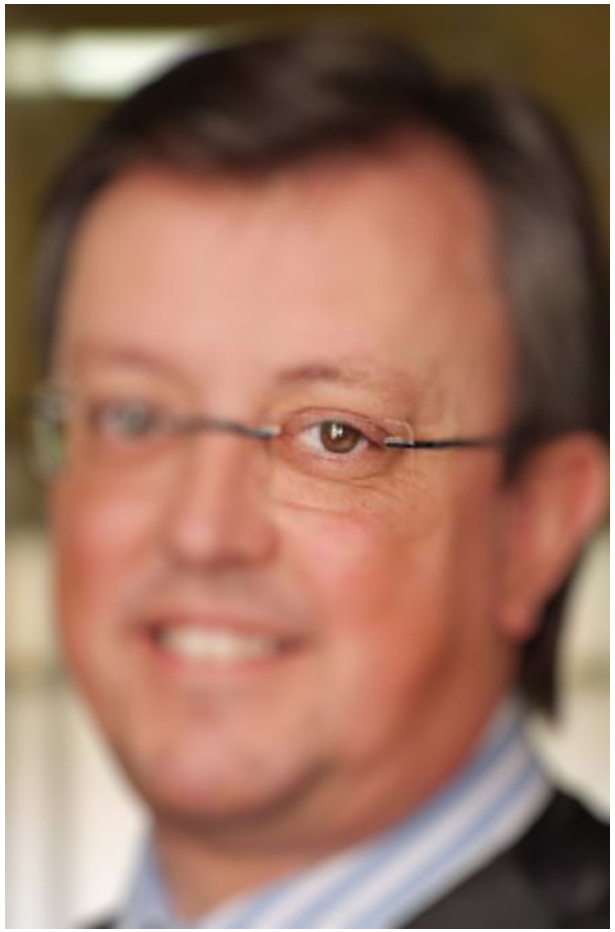
1. You only see clearly at the very center of vision



Light receptors in your eye are much denser at your center of vision (the fovea)



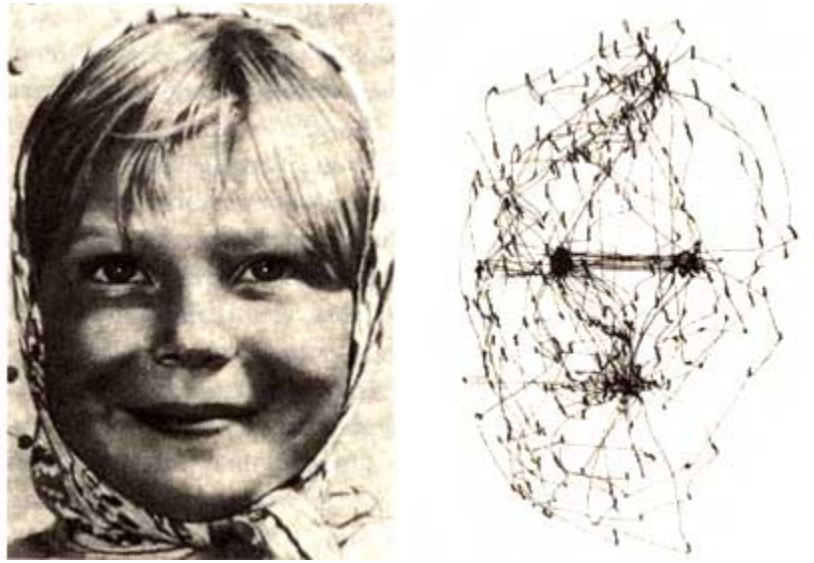
As a result, you only see a small portion of the world in clarity at any given moment.

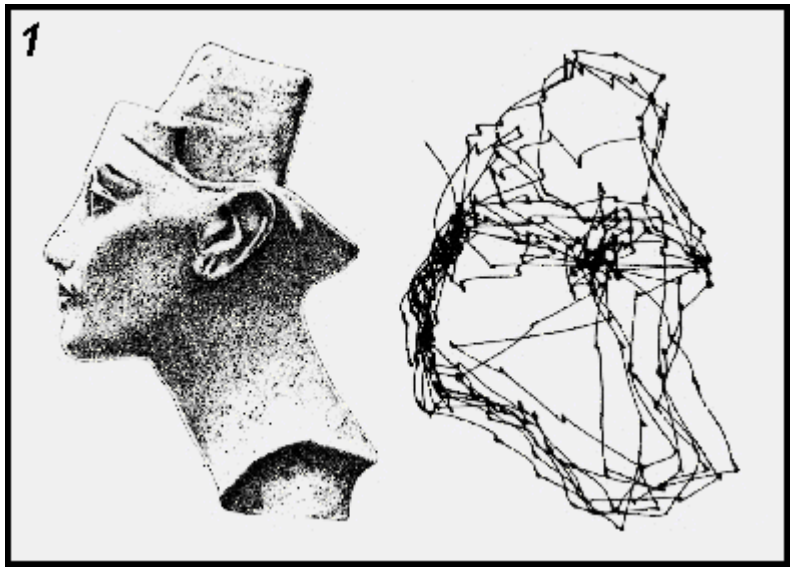


The Myth of Multitasking: You are sipping at the outside world through a straw.

1. You only see clearly at the very center of vision

Your eyes are constantly darting around (~4/sec), taking in small pieces of high clarity.





Your brain pieces together these brief snapshots into an *illusion* of a visual scene in which you clearly perceive everything simultaneously.

The Myth of Multitasking: You are sipping at the outside world through a straw.

Your brain gives you the illusion that you see more than you do because fills in blanks with *predictions*: "If nothing was there a fraction of a second ago, there is nothing there now."

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The problem is that things can change quickly in a fraction of a second.

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But the problem is even worse:

Your brain has a limited capacity for simultaneous thought.

It can only take in a few sips at a time!

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Each sip has a very limited bandwidth

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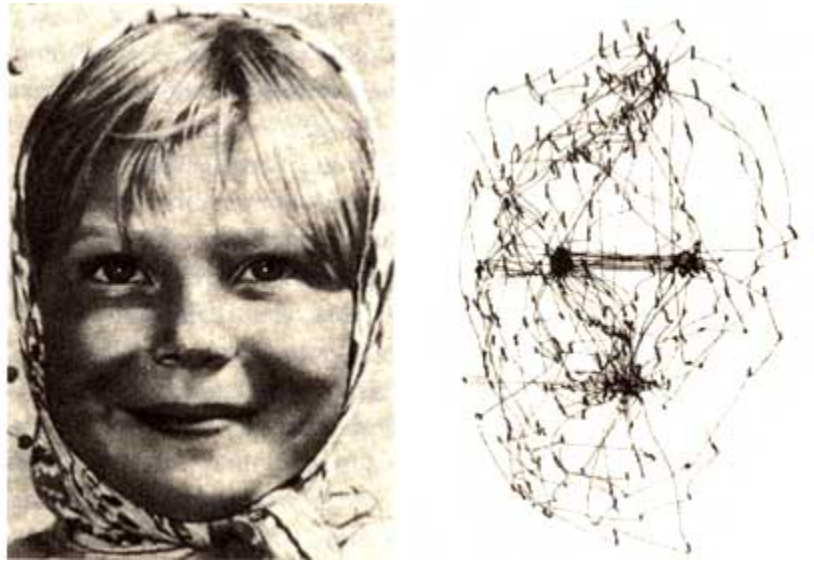

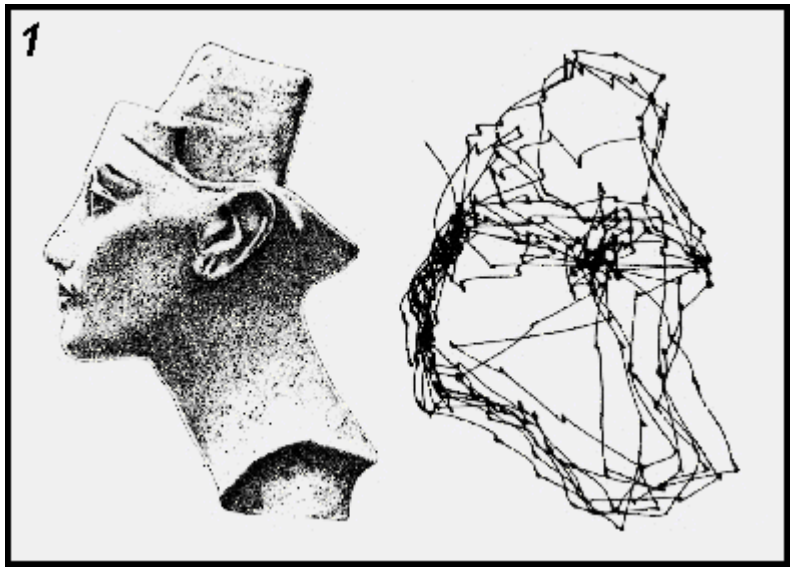

Your brain can only perceive and process about 3-4 things simultaneously

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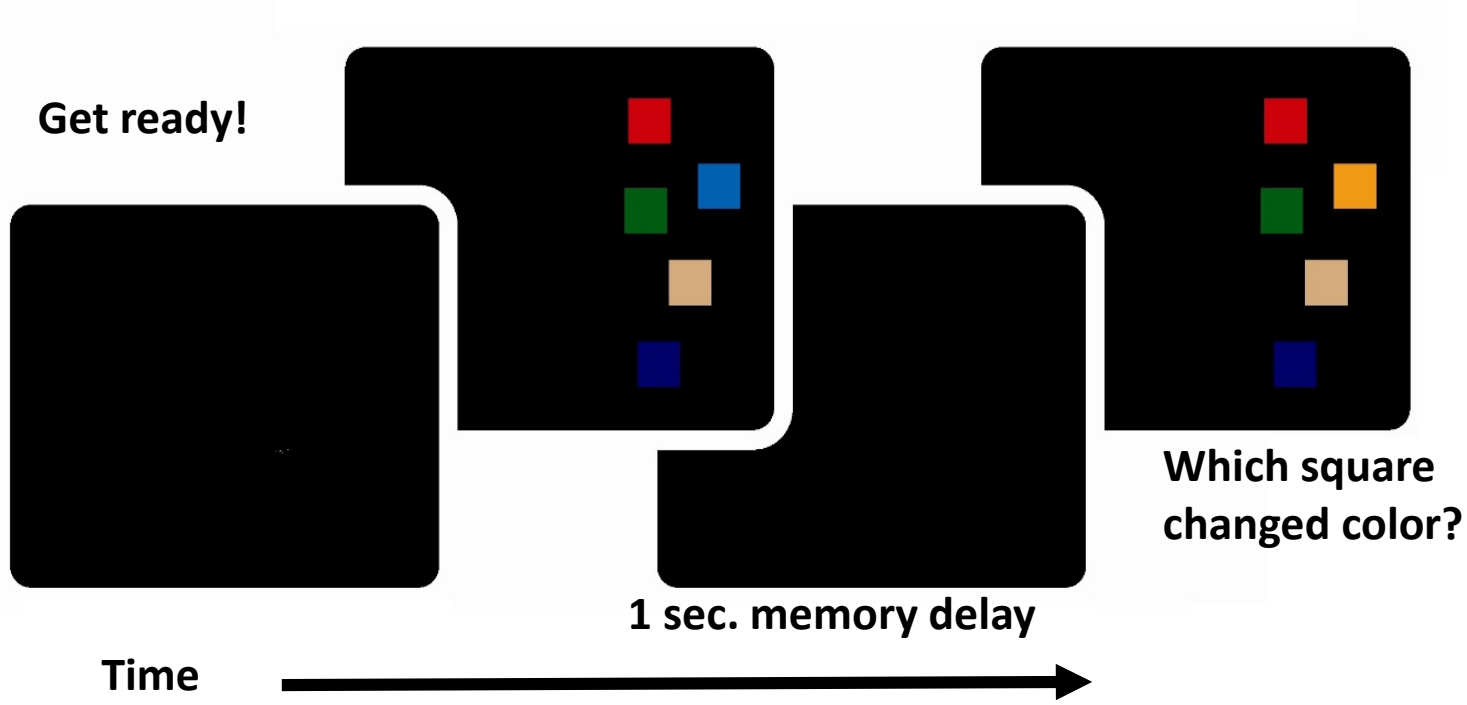
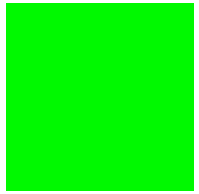
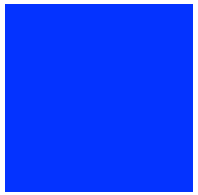
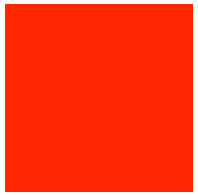
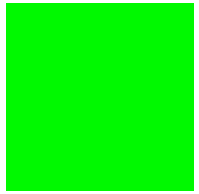
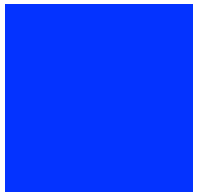
The average adult human can, at best, think only 3-4 things simultaneously.
This is called cognitive capacity.

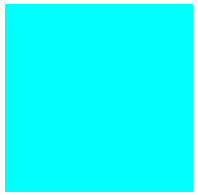
A test of cognitive capacity:
How many colored squares can you hold in mind?

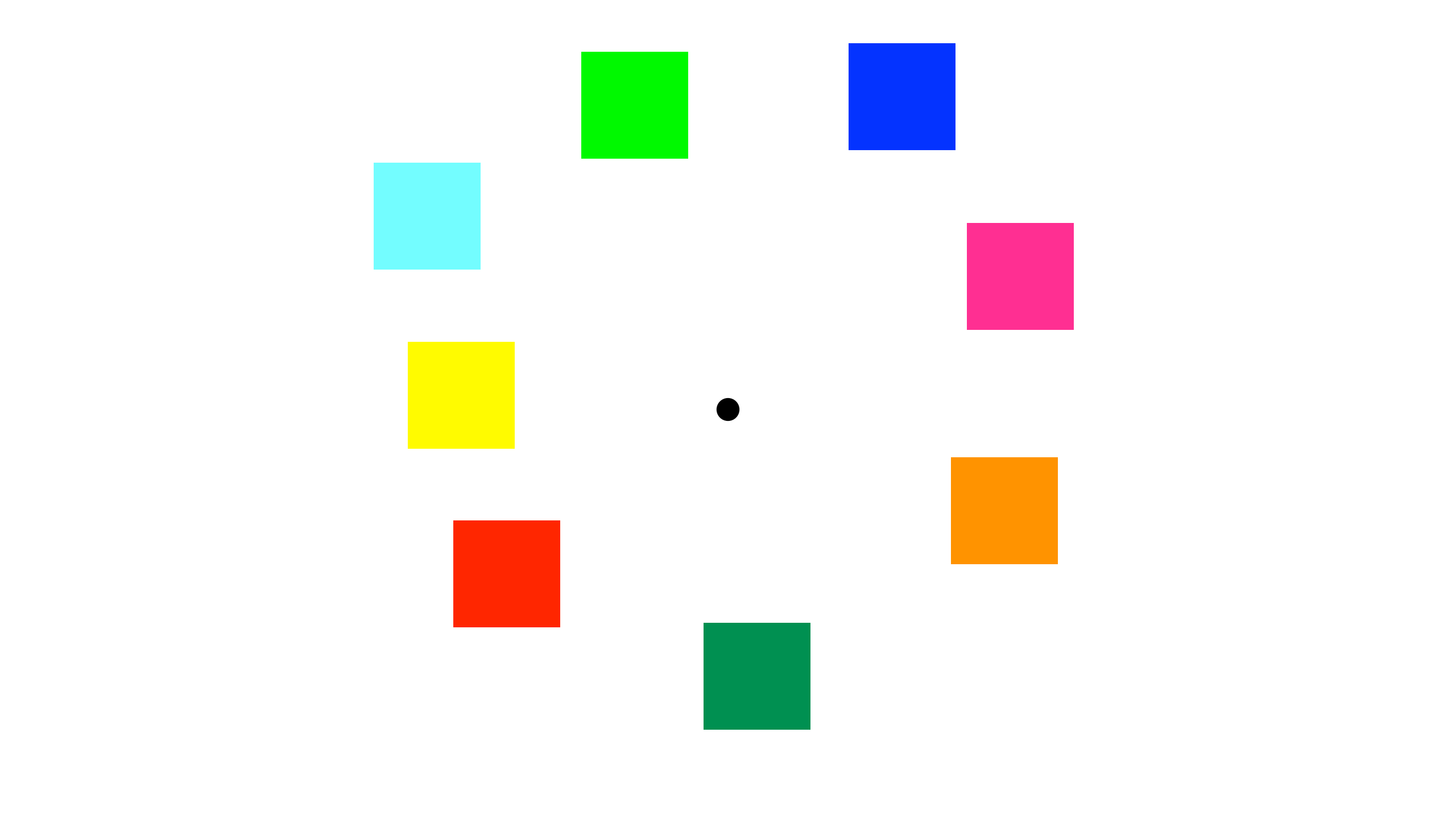


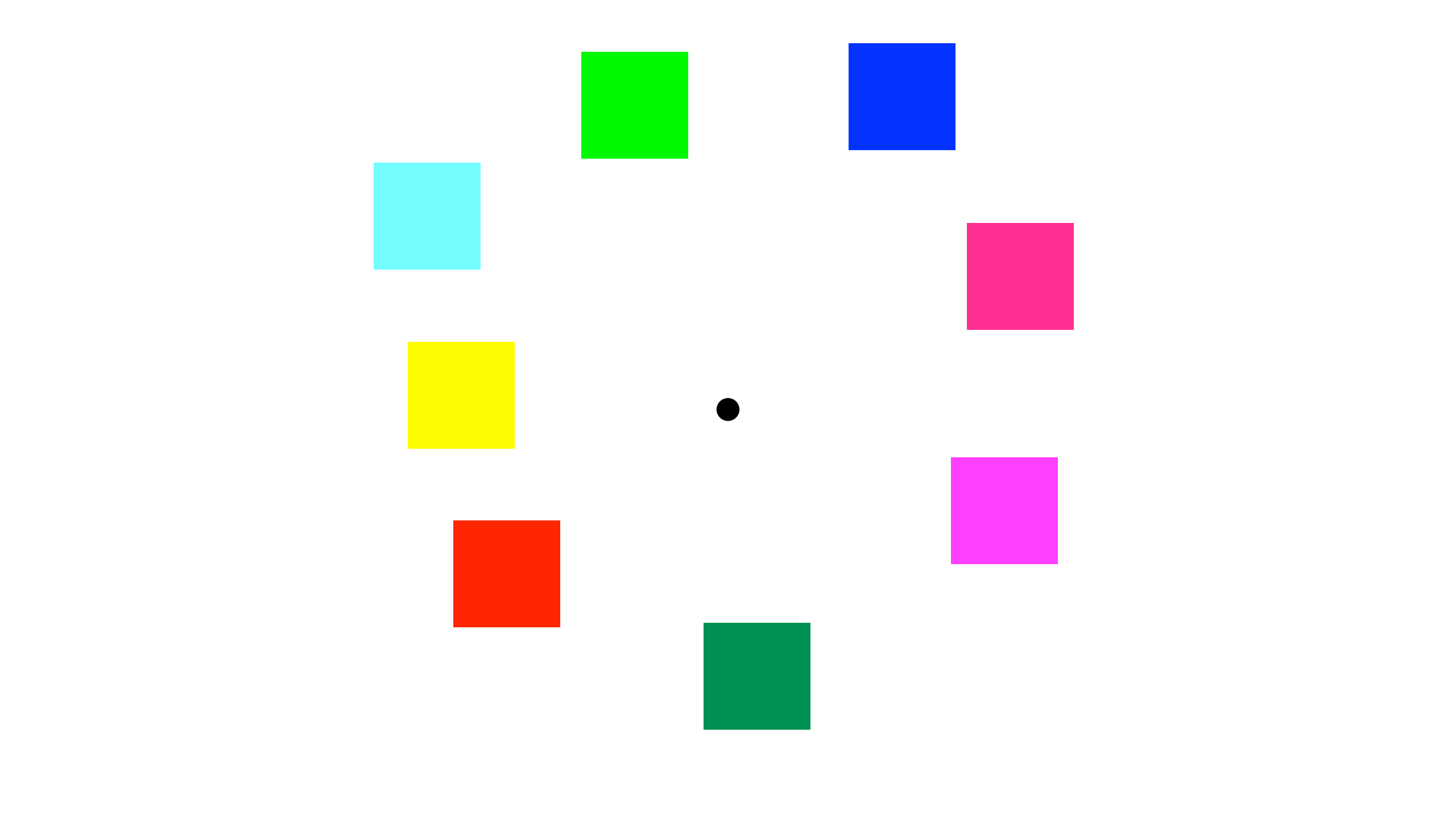





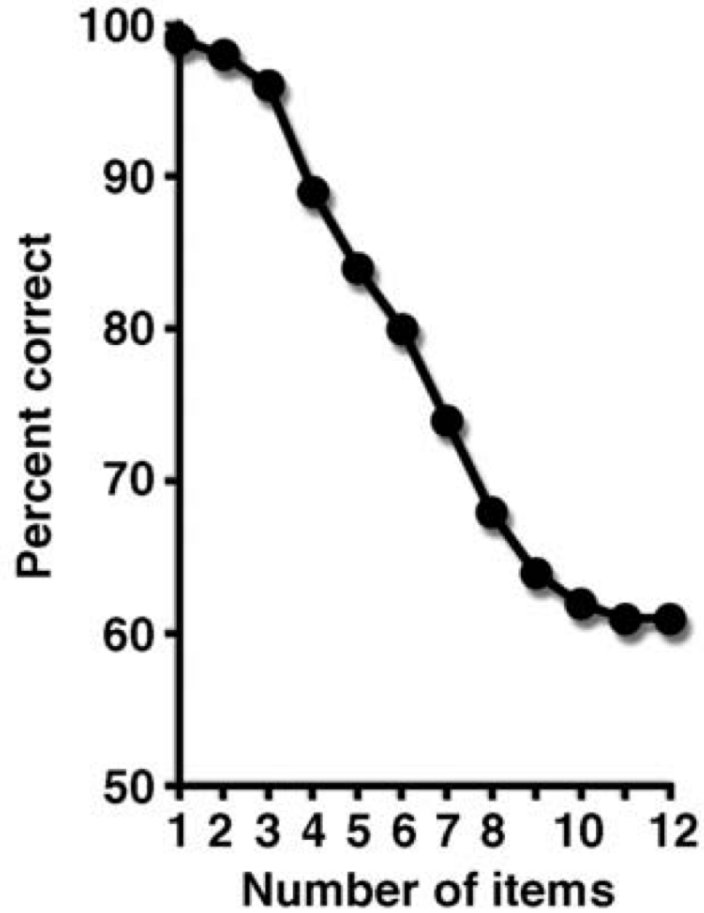









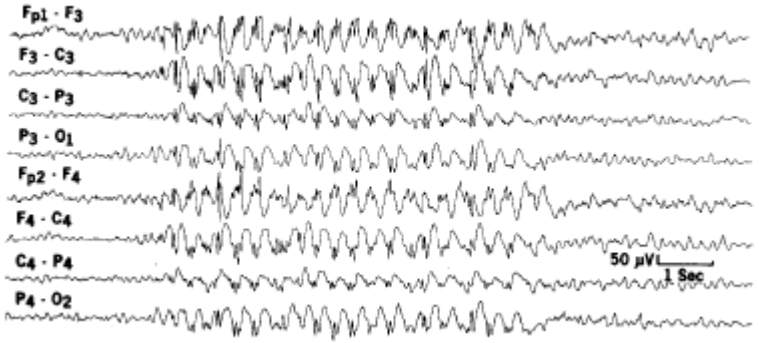
Human performance decreases with load



Fukuda, Awh, and Vogel, 2010

A Bit of Science: Why Can You Only Hold a Few Things in Mind?

Brain waves: coordinated oscillations of the activity of millions of neurons.
Oscillations from 1/sec to >100/sec.



EEG recordings of brain waves

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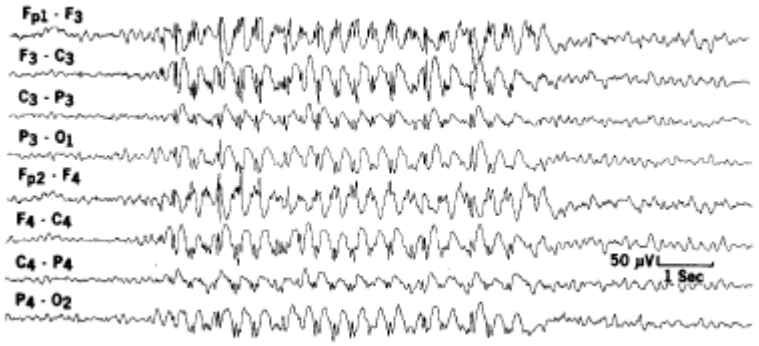

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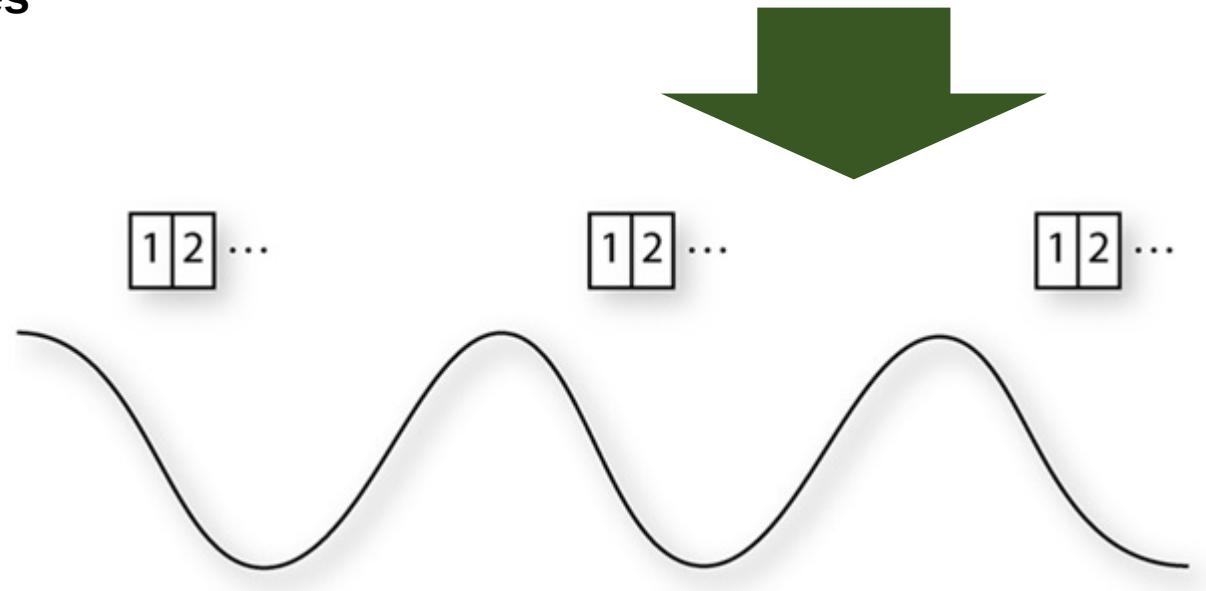
Brain wave may keep multiple thoughts from interfering with one another by "juggling" the thoughts (oscillating them out of phase of one another) – Siegel, Warden, and Miller (2009)



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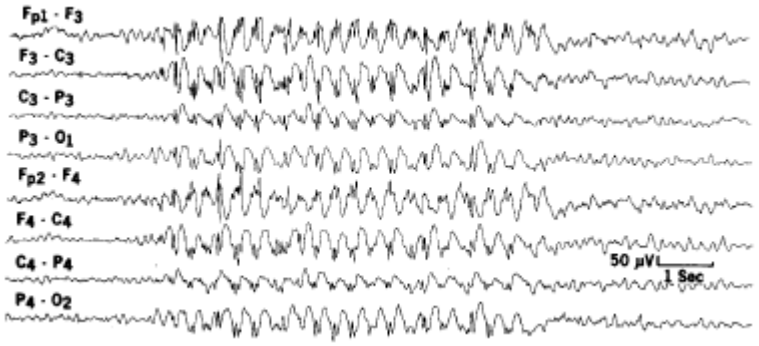

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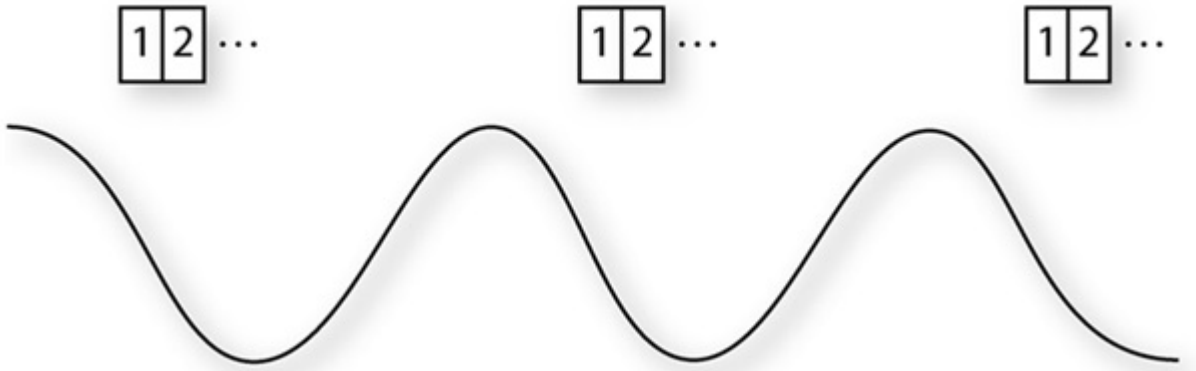
The cost is limited capacity for thought: Only a few thoughts can fit in each brain wave (i.e., only a few balls can be juggled at a time).



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The problem: Attention to one thing means much less attention (perception) of other things.

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Don’t believe me? Let’s take a test!

FRIGHTENING STUDIES

Using a driving simulator, David Strayer and co showed that we're WAAAAY more impaired than we think when driving while on a cell phone call!

- **Eyetracking shows phoning drivers fail to notice HALF the items falling on retina!!!**
- **More than twice as likely to miss a traffic signal**
- **React substantially slower to info they did detect**

Cell phone use while driving induces a form of inattentional blindness

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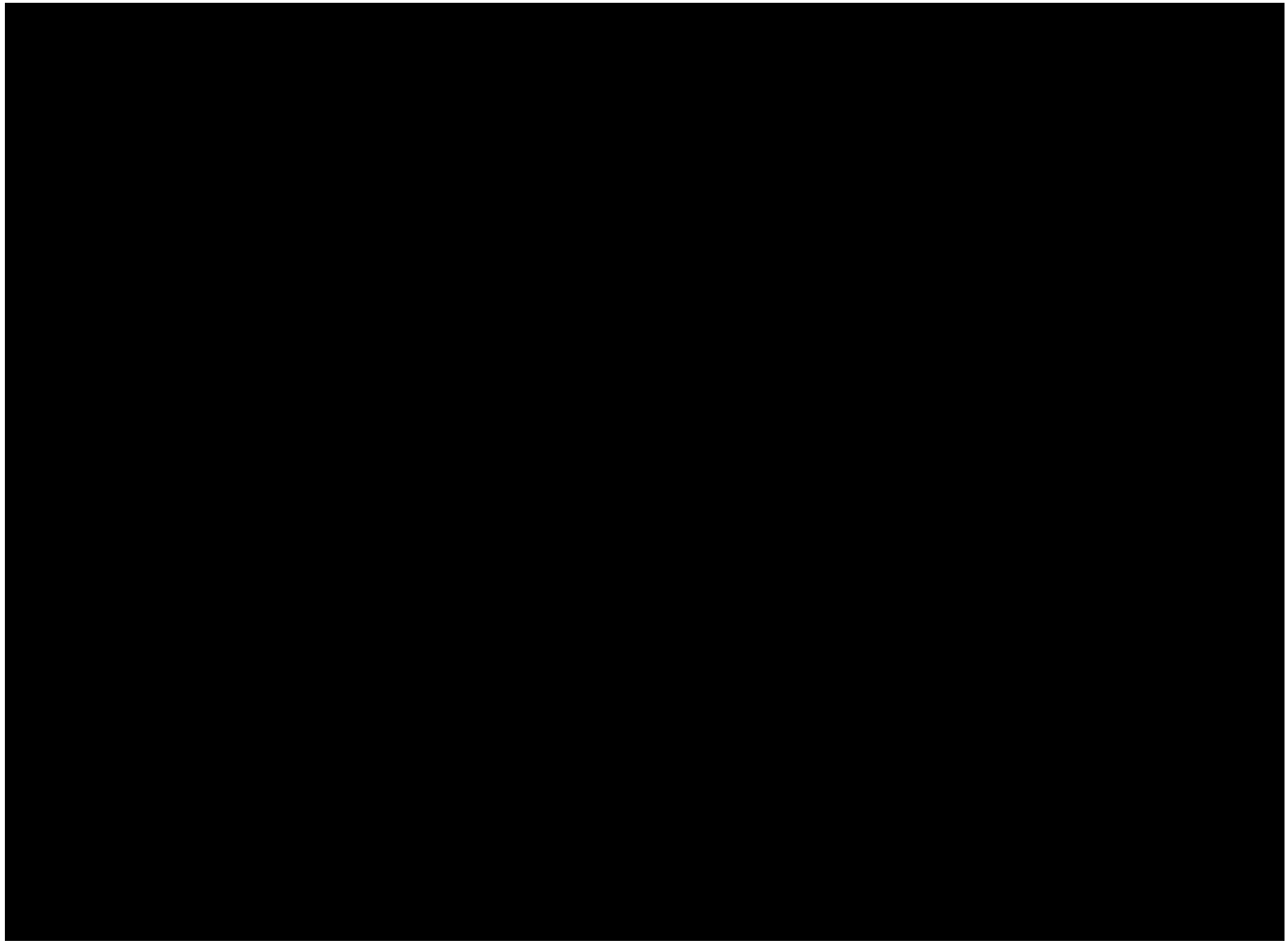

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A: There's ZERO difference in distractibility between handheld and hands-free!!!

Does Practice Make Perfect?

Q: Can you get better at multitasking if you keep at it?

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A passenger helps (or least doesn't hurt) this coordination.

Passenger adjusts conversation timing depending on driving demands

Passenger also acts as 2nd source of coordination…

...and attention

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Chronic vs. light cell phone drivers.

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Driving simulation tests found no difference in distractibility!

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People who report being “well-practiced” at using cell phones when driving miss as many things as people who rarely do it.

Are Some People Better At Multitasking?

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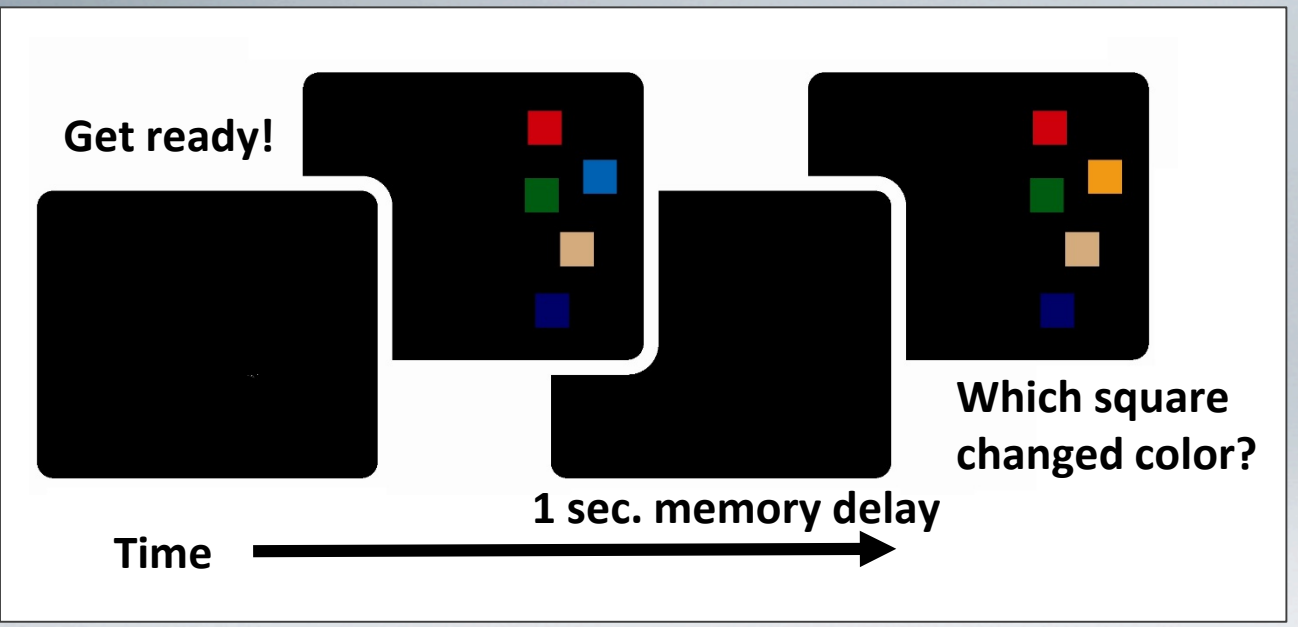
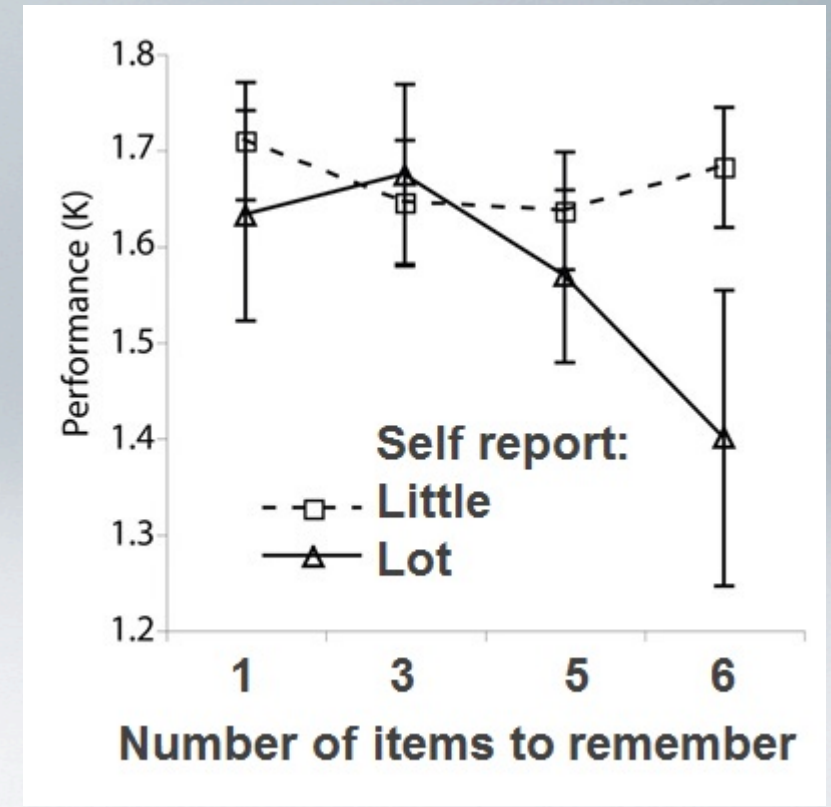
Some people *think* they are, but they are actually *worse*!

Ophir et al (2009) asked 100s of Stanford students, Do you multitask a lot or a little?





Students who multitask a lot actually have a lower, not higher, cognitive capacity.

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People don't multitask more because they are better at it. They multitask more because they are more distractible (can't help themselves) and have an inflated confidence in their abilities to multitask.

Another Cost of Multitasking: Reduced Cognitive Ability

Because of our limited cognitive capacity, we don't really multitask. We rapidly switch between tasks.

This results in "switch costs". We cognitively stumble (slow down, make mistakes) as our brain's reconfigure to the new task.

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- **Loss of productivity. You can spend of good proportion of your day switching instead of doing.**
- **More errors.**
- **Reduced depth-of-thought. Less time spent thinking = less depth.**

Why Do We Like To Multitask?

Our brain finds information *rewarding*. Our brains evolved in an environment where new information was usually important.

Our brain did not evolve to deal with our information-rich modern world.

It is hard to ignore that informational "tap on the shoulder" even though it is often counter-productive in our modern world.

Multitasking: What Should We Do?

Use your “executive brain” – *Plan* to single-task

- **Avoid temptation. Go “off-grid”. Put away your cell phone when you drive. Turn off your email/web access for a while.**

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- **Prioritize. Work on your most important tasks first. Then you won't feel pressure to multitask.**
- **Be self-aware and resist. Recognize that humans have the temptation to multi-task but that it is not effective.**