The Middle Way: Finding the Balance Between Mindfulness and Mind Wandering

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Covid: A time for reflection

- Opportunity to think about our lives
- But also
  - Easy to become distracted by worries

Relevance of Mind Wandering

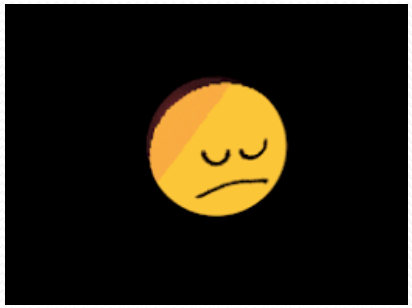
- What is mind-wandering?
  - Mental departures from the here in now in which individuals attention is directed away from the task at hand
    - Driving
    - Reading
- Experience sampling estimates suggest that approximately 25% of waking hours is spent mind-wandering
- Potentially extremely costly
  - Source of distraction
- But may also have value
  - Creative daydreaming

Questions of this talk

- To what degree is mind-wandering a problem?
- To what degree is mindfulness a solution?
- Are there situations when mind wandering may be helpful?
- Can we find ways to foster the good kind of mind wandering?

Costs of Mind Wandering

- Mood



Mind-wandering lowers mood:

Killingsworth and Gilbert, 2012 (Science, 2011)

BREVIA

A Wandering Mind Is an Unhappy Mind

Matthew A. Killingsworth* and Daniel T. Gilbert

Unlike other animals, human beings spend a lot of time thinking about what is not going on around them, contemplating events that happened in the past, might happen in the future, or will never happen at all. Indeed, "stimulus-independent thought" or "mind wandering" appears to be the brain's default mode of operation (*1*–*3*). Although this ability is a remarkable evolutionary achievement that allows people to learn, reason, and plan, it may have an emotional cost. Many philosophical and religious traditions teach that happiness is to be found by living in the moment, and practitioners are trained to resist mind wandering and "to be here now." These traditions suggest that a wandering mind is an unhappy mind. Are they right?

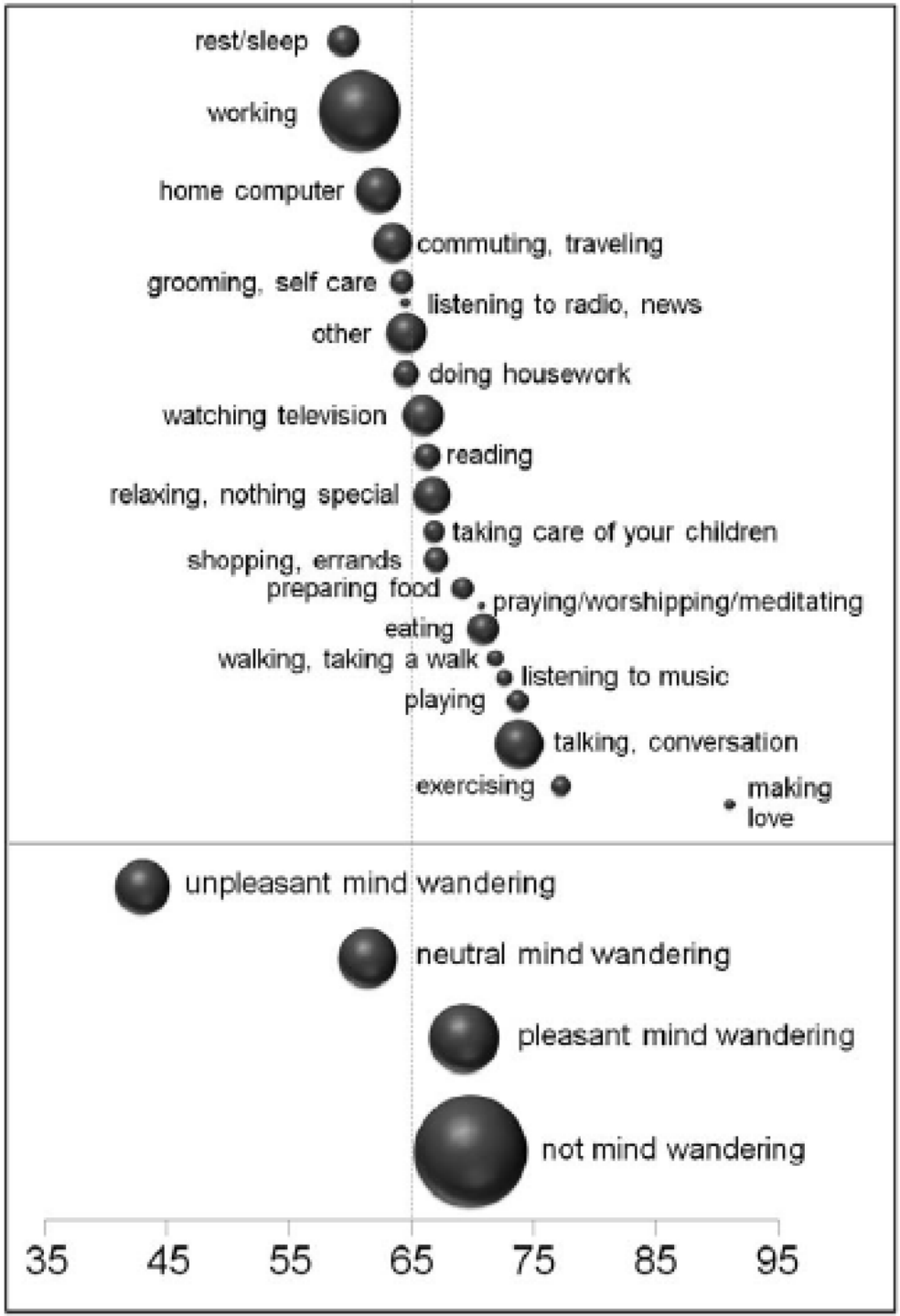
Laboratory experiments have revealed a great deal about the cognitive and neural bases of mind wandering (*3*–*7*), but little about its emotional consequences in everyday life. The most reliable method for investigating real-world emotion is experience sampling, which involves contacting people as they engage in their everyday activities and asking them to report their thoughts, feelings, and actions at that moment. Unfortunately, collecting more of 22 activities adapted from the day reconstruction method (*10*, *11*), and a mind-wandering question ("Are you thinking about something other than what you're currently doing?") answered with one of four options: no; yes, something pleasant; yes, something neutral; or yes, something unpleasant. Our analyses revealed three facts.

First, people's minds wandered frequently, regardless of what they were doing. Mind wandering occurred in 46.9% of the samples and in at least 30% of the samples taken during every activity except making love. The frequency of mind wandering in our real-world sample was considerably higher than is typically seen in laboratory experiments. Surprisingly, the nature of people's activities had only a modest impact on whether their minds wandered and had almost no impact on the pleasantness of the topics to which their minds wandered (*12*).

Second, multilevel regression revealed that people were less happy when their minds were wandering than when they were not [slope (b) = –8.79, $P < 0.001$], and this was true during all activities, including the least enjoyable. Although people's minds were more likely to wander to pleasant topics (42.5% of samples) than to unpleasant topics (26.5% of samples) or neutral topics (31% of samples), people were no happier when thinking about pleasant topics than about their current activity (b = –0.52, not significant) and were considerably unhappier when thinking about neutral topics (b = –7.2, $P < 0.001$) or unpleasant topics (b = –23.9, $P < 0.001$) than about their current activity (Fig. 1, bottom). Although negative moods are known to cause mind wandering (*13*), time-lag analyses strongly suggested that mind wandering in our sample was generally the cause, and not merely the consequence, of unhappiness (*12*).

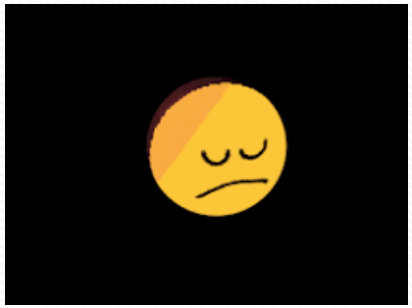
Third, what people were thinking was a better predictor of their happiness than was what they were doing. The nature of people's activities explained 4.6% of the within-person variance in happiness and 3.2% of the between-person variance in happiness, but mind wandering explained 10.8% of within-person variance in happiness and 17.7% of between-person variance in happiness. The variance explained by mind wandering was largely independent of the variance explained by the nature of activities, suggesting that the two were independent influences on happiness.

In conclusion, a human mind is a wandering mind, and a wandering mind is an unhappy mind. The ability to think about what is not happening is a cognitive achievement that comes at an emotional cost.


rest/sleep
working
home computer
commuting, traveling
grooming, self care
listening to radio, news
other
doing housework
watching television
reading
relaxing, nothing special
taking care of your children
shopping, errands
preparing food
praying/worshipping/meditating
eating
walking, taking a walk
listening to music
playing
talking, conversation
exercising
making love
unpleasant mind wandering
neutral mind wandering
pleasant mind wandering
not mind wandering
35
45
55
65
75
85
95

Costs of Mind Wandering

- Mood
- Accidents



Mind wandering leads to auto accidents

BMJ

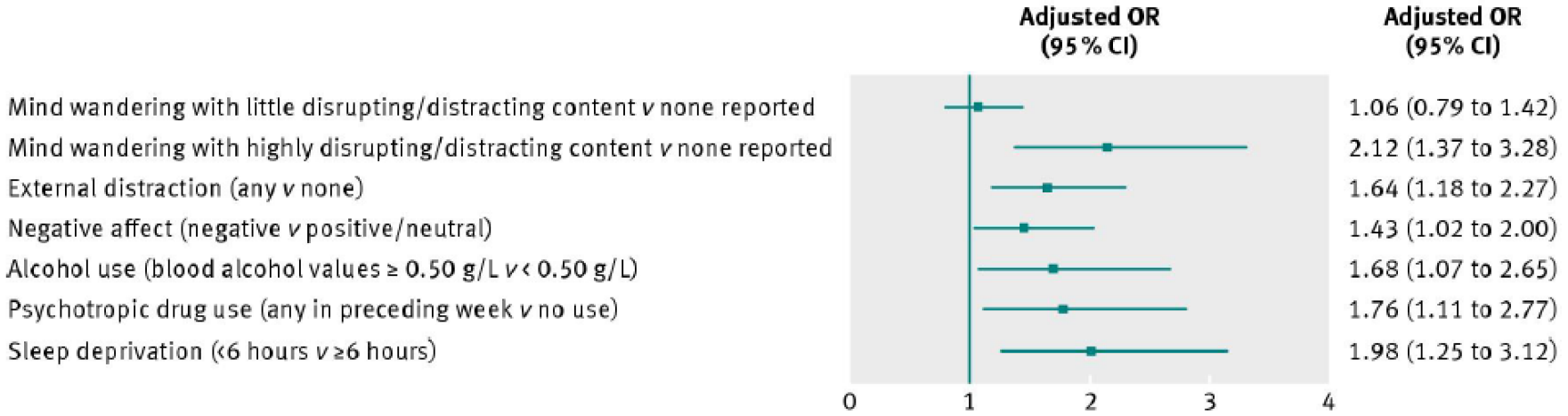
BMJ 2012;345:e8105 doi: 10.1136/bmj.e8105 (Published 13 December 2012)

RESEARCH

CHRISTMAS 2012: RESEARCH

Mind wandering and driving: responsibility case-control study

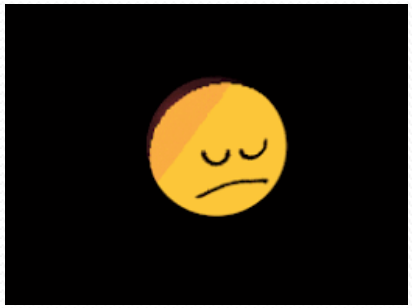
Cédric Galéra *doctor in child psychiatry and epidemiology*[1 2 3], Ludivine Orriols *researcher*[1 2], Katia M'Bailara *associate professor in psychology*[4], Magali Laborey *researcher*[1 2], Benjamin Contrand *statistician*[1 2], Régis Ribéreau-Gayon *doctor in emergency medicine*[1 2], Françoise Masson *doctor in emergency medicine*[1 2], Sarah Bakiri *junior researcher*[1 2], Catherine Gabaude *senior researcher*[5], Alexandra Fort *doctor*[5], Bertrand Maury *professor in mathematics*[6], Céline Lemercier *associated professor in cognitive psychology*[7], Maurice Cours *design engineer*[8], Manuel-Pierre Bouvard *professor in child psychiatry and head of department*[3], Emmanuel Lagarde *senior researcher and head of department*[1 2]



Odds ratios for responsibility for road traffic crashes, adjusted for age, sex, season, time of the day, and location

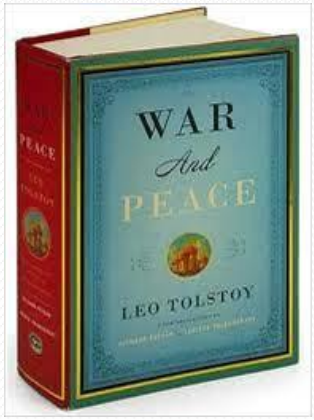
Costs of Mind Wandering

- Mood
- Accidents
- Reading



Self-caught vs probe caught mind wandering

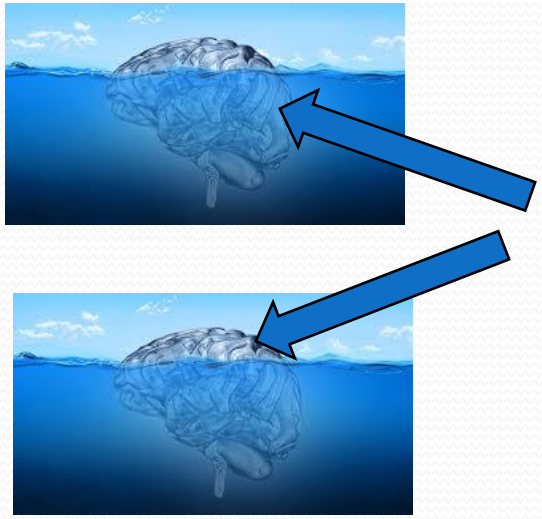
(Schooler et al 2002)



- Read 5 chapters of War and Peace while tracking mind wandering
- Two types of mind wandering measures
  - Self-caught
    - Reported mind wandering every time they noticed it
  - Probe-caught
    - Periodically pinged and asked "just now were you mind wandering"
- Frequency of probe caught mind wandering predictive of reading comprehensions

Three Levels of Consciousness

(Schooler *Trends in Cognitive Science*, 2001)



- Non-conscious-
  - Information that is below the surface of awareness
- Experiential conscious -
  - On going experience
- Meta-conscious/ meta-awareness-
  - Ones explicit understanding of the current contents of experience
    - Self-caught measures mind wandering we meta-awareness
    - Probe-caught- mind wandering without meta-awareness

Effects of alcohol

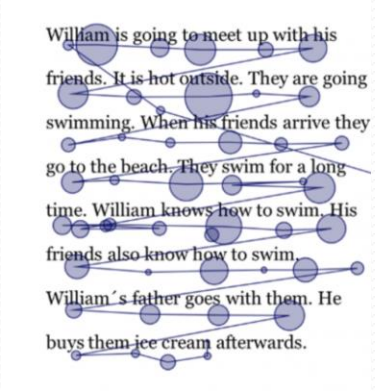
Sayette, Reichle, & Schooler et al, 2012 (Psychological Science)

- Can alcohol impair meta-awareness
- Replicated reading study with alcohol condition
  - Alcohol consumption
    - Increased unaware mind-wandering
      - Doubled the frequency of probe caught mind wandering
    - Reduced meta-awareness
      - Less self-caught mind wandering
- Alcohol packs a one two punch
  - Increases lapses
  - Reduces awareness of them

Eye tracking and Mind Wandering While Reading Reichle, Reineberg, & Schooler (2010)

Psychological Science

- Do gaze durations differ as a function of whether people are on vs. off task while reading?



- Prediction-
  - If people are not processing meaning, gaze duration should be less affected by word frequency and clause endings when off task relative to on

Predictors of gaze durations during on task reading

Table 2. Significant Results of Multiple Regression Analyses of Dependent Measures During Normal Reading

Interval and dependent measure	Constant (b_0)	Predictor variable: Inverse of word length (b_1)	Predictor variable: Natural logarithm of word frequency (b_2)	Predictor variable: Clause-/sentence-final word (b_3)
2.5 s				
First-fixation duration	211	—	—	—
Gaze duration	287	−5.99*	−2.04*	—
Total viewing time	322	−70.11**	−3.13**	—
5 s				
First-fixation duration	202	—	0.93*	—
Gaze duration	296	−59.89***	−2.21**	—
Total viewing time	349	−83.87***	−4.08***	—
10 s				
First-fixation duration	204	23.13***	—	−7.75*
Gaze duration	297	−42.66***	−2.92***	—
Total viewing time	385	−101.86***	−5.31***	—

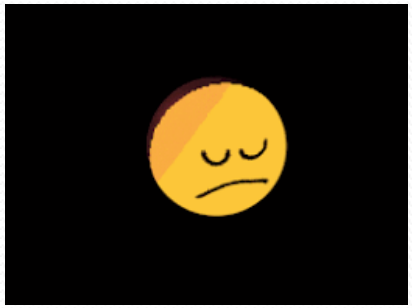
Predictors of gaze durations during mind wandering

Table 4. Significant Results of Multiple Regression Analyses of Dependent Measures During Probe-Caught Zone Outs

Interval and dependent measure	Constant (b_0)	Predictor variable: Inverse of word length (b_1)	Predictor variable: Natural logarithm of word frequency (b_2)	Predictor variable: Clause-/sentence-final word (b_3)
2.5 s				
First-fixation duration	209	—	—	—
Gaze duration	238	—	—	—
Total viewing time	251	—	—	—
5 s				
First-fixation duration	201	—	—	—
Gaze duration	289	−111.92**	—	—
Total viewing time	323	−131.85**	—	—
10 s				
First-fixation duration	222	—	—	—
Gaze duration	329	−78.39*	−3.95*	—
Total viewing time	390	−219.21***	—	—
30 s				

Costs of Mind Wandering

- Mood
- Accidents
- Reading



Questions

- To what degree is mind-wandering a problem?
  - Can impair performance in many domains
- To what degree is mindfulness a solution?

Mind Wandering: An Age Old Problem

- Let the wise guard their thoughts, which are difficult to perceive, extremely subtle, and wander at will..”
  - Buddha (583-463 BCE)

The age old solution: practice of mindful focus on the breath

- Daoist breath meditation technique.
  - When one breathes in and out, one's concentration causes the generative force to rise….Count from one to ten and then from ten to one hundred breaths with the heart (mind) following the counting to prevent it from wandering outside. When the heart and breathing are in unison, this is called locking up the monkey heart and tying up the running horse of intellect.

Mindfulness Research Publications by Year, 1980 - 2013

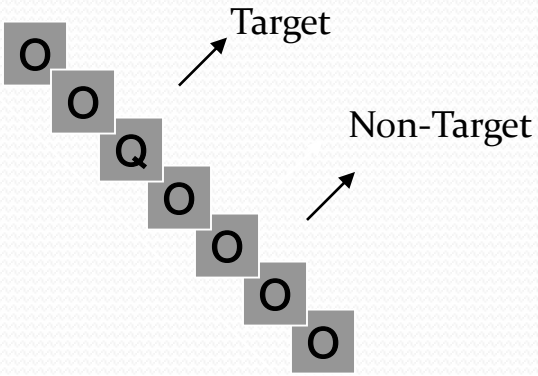
Source: D.S. Black (2014)

Are mindfulness & mind-wandering opposing constructs? Mrazek et al, 2012, *Emotion*

METHOD: Examine relationships between Mindful Attention & Awareness Scale (MAAS) & several converging markers of mind-wandering:

- A questionnaire commonly used when studying mind-wandering *(IPI)*
- Mind-wandering during 10-minute meditation *(TUT in Meditation)*
- Two behavioral markers of inattention associated with mind-wandering

Sustained Attention to Response Task



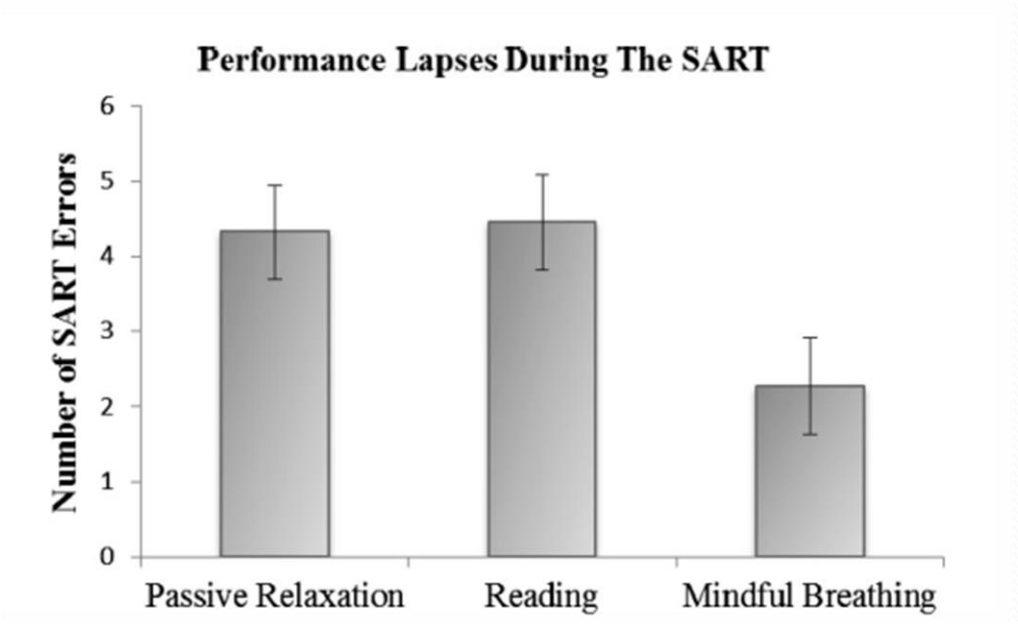
	MAAS	RT Variability	SART errors	TUT
1. Mindfulness (MAAS)	-			
2. SART RT Variability	-.188*	-		
3. SART errors	-.234*	.449***	-	
4. TUT in Meditation	-.220*	.252**	.088	-
5. Daydreaming (IPI)	-.237**	.216*	.060	.258**

Can Brief Mindfulness Exercises Reduce Mind-Wandering?

Prior to a 10-minute SART task, participants were randomly assigned to either:

Mindful Breathing
Passive Rest
Reading

Minimized demand characteristics and expectancy effects by treating all conditions as experimental



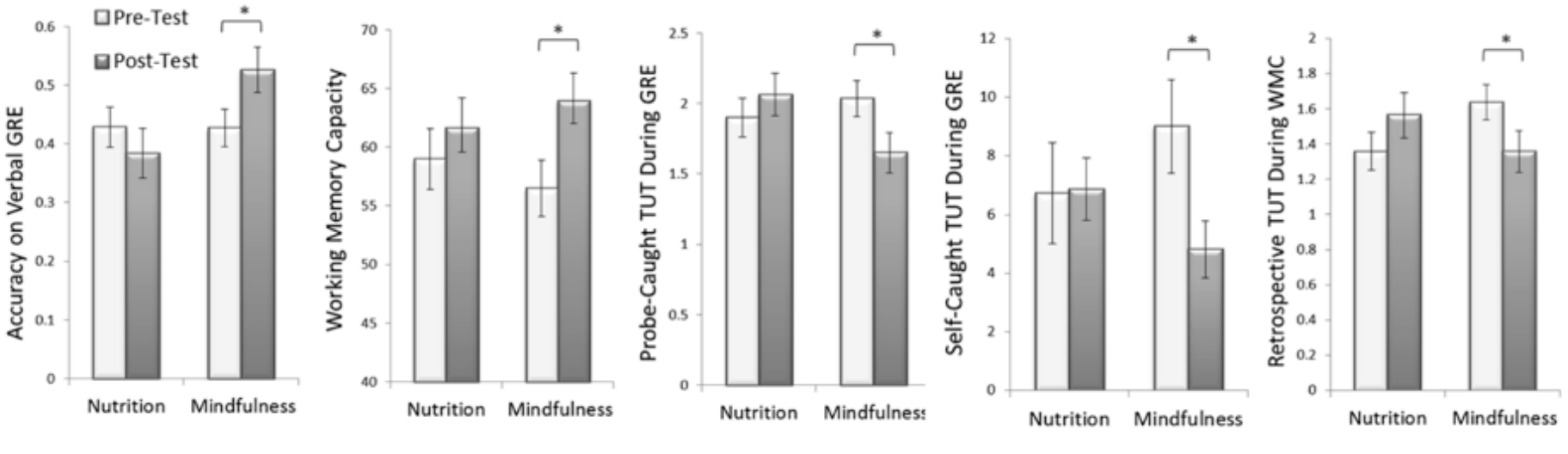
Can Mindfulness Training Reduce Mind Wandering?

Mrazek, Franklin, Phillips, Baird, Schooler (2013) *Psychological Science*

- undergraduates were randomly assigned to either a two week mindfulness (N=26) or nutrition (N=22) class

- Within a week before and after classes, participants completed
  - Working memory task
    - Mind Wandering assessed retrospectively
  - a 20-minute verbal reasoning section from the GRE
    - Mind Wandering assessed by probe caught and self caught measures

Effect of Mindfulness Training



The Plasticity Initiative

- Goal: Three iterative studies to examine how much can someone improve their life through six-weeks of intensive and multi-faceted training.

- Intervention: Mindfulness-based health & wellness training called the Summer Intensive Transformation (SIT) program
  - 5.5 hours a day, 5 days a week for 6 weeks: including

Meditation

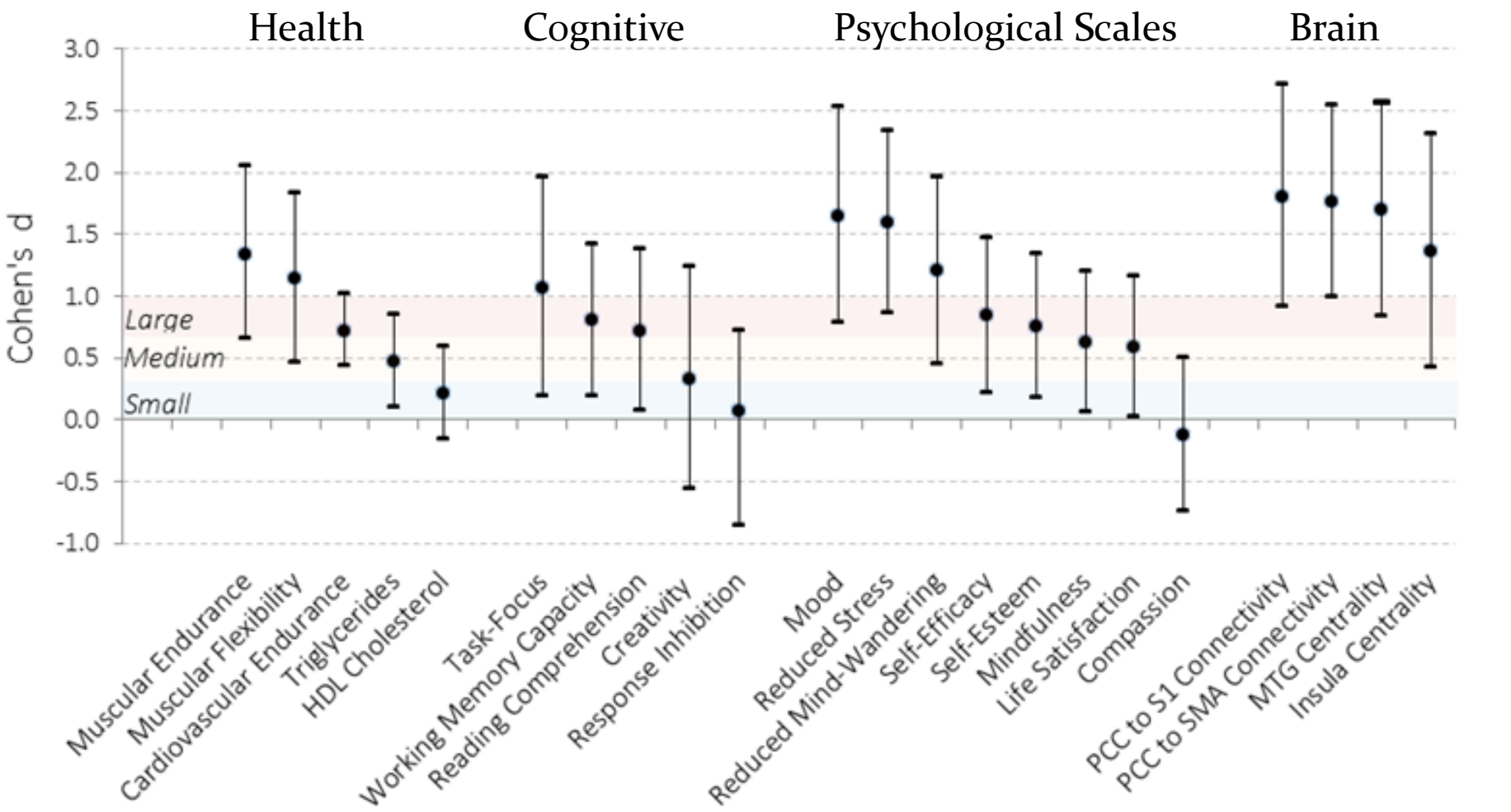
Yoga

Exercise

Instruction

Mrazek et al., 2016; Mooneyham et al., 2017a; Mooneyham et al., 2017b

Effect Sizes from SIT 1.0



Note: Improvements in the intervention condition relative to the waitlist control. Error bars denote 95% CIs. Shaded sections demarcate traditional effect size estimates.

SIT 1.0 Testimonials

- “This was the best thing I’ve ever experienced.”
- “I came in as a skeptic, and I certainly didn’t think I would change my life in six weeks. But I learned to take control of my mind, and it has made me happier, stronger, healthier, and more focused.”
- “This program gave me the tools to achieve things I’ve only dreamed about. It is truly one of a kind.”
- “I can’t even put into words how grateful I am to have been a part of this program. It’s taught me how to make the most of this one life. I will never forget this experience.”

THE MINDFUL EDUCATION INITIATIVE

CMHP
Center for Mindfulness and Human Potential

UCSB

A digital high school mindfulness course that is grounded in science, truly scalable, and designed for youth.

1 RIGOROUS SCIENCE

- Designed using best practices from educational psychology
- Grounded in principles of effective behavior change
- Systematically refined through empirical research

2 TRULY SCALABLE

- Digital, contagious, marketable
- Personalized through a responsive online learning platform
- Easily integrated into classrooms
- Eliminates need for expensive teachers or teacher training

3 TAILORED TO YOUTH

- Designed for high school students from the ground up
- Iteratively refined through the integration of students' language, questions, values, and aspirations

Custom digital platform

We're building a custom digital learning platform that can deliver an ideal user experience.

-Optimizes personalized learning

-Seamless integration into schools

-Teachers can track student use

-Works across all devices

High quality video instruction

- Direct-to-camera instruction utilizing best practices from educational psychology
- Excellent production quality
- Meaningful, relatable content
- Professional graphics and animation
- Tightly packaged to maximize engagement and efficiency

Daily focus activities

DailyBeat_31

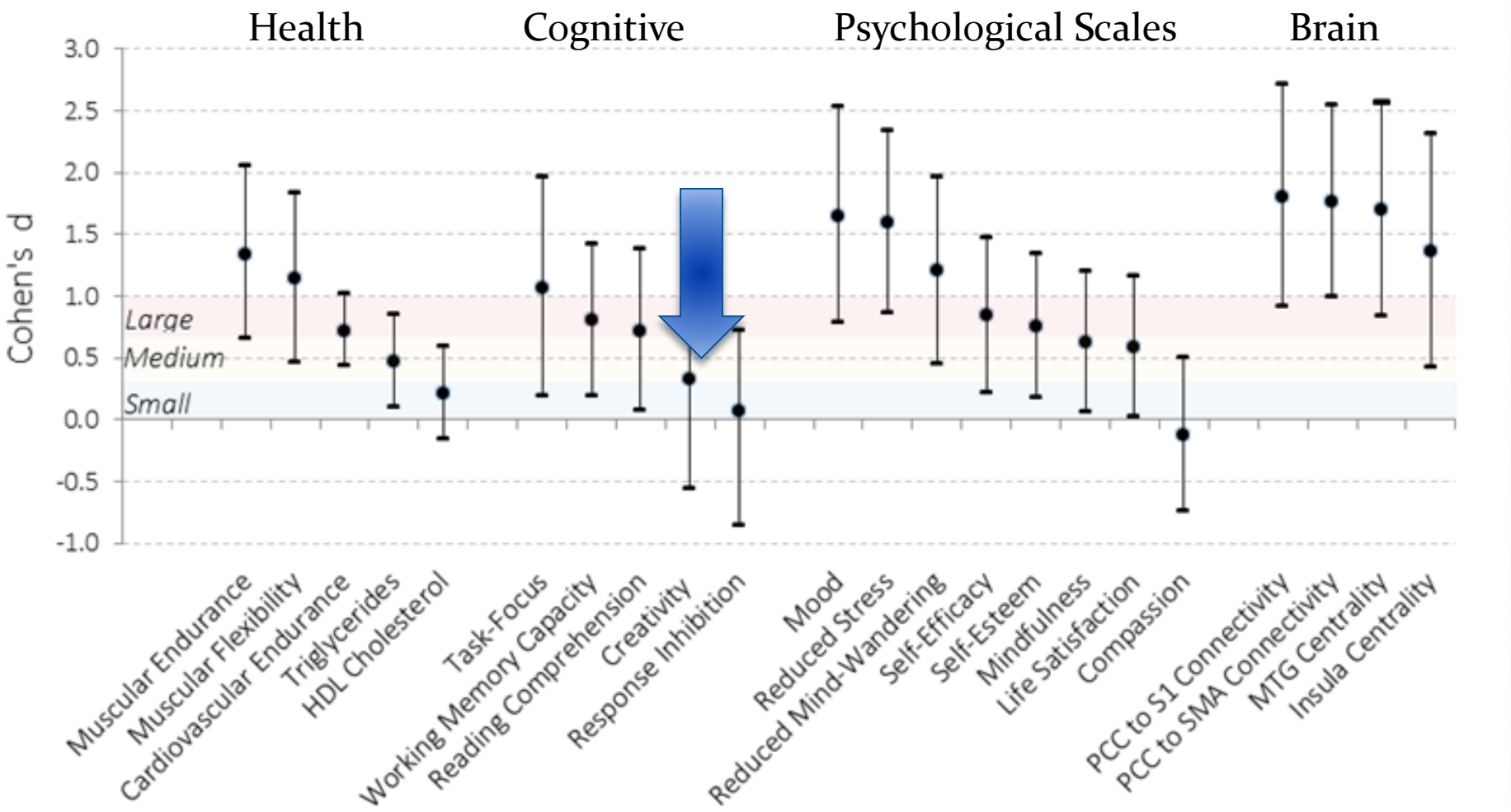
https://vimeo.com/246850077/15ff9cb1e3

Questions

- To what degree is mind-wandering a problem?
  - Can impair performance in many domains
- To what degree is mindfulness a solution?
  - Can be extremely helpful in reducing dysfunctional mind-wandering
- Are there situations when mind wandering may be helpful?

Is there an upside to mind-wandering?

Effect Sizes from SIT 1.0



Note: Improvements in the intervention condition relative to the waitlist control. Error bars denote 95% CIs. Shaded sections demarcate traditional effect size estimates.

Mindfulness facilitates many things but what about creativity?

Alternative routes to creativity

- Remote Associates
  - “board”, “magic”, “death”) → Find common associate

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  - Black

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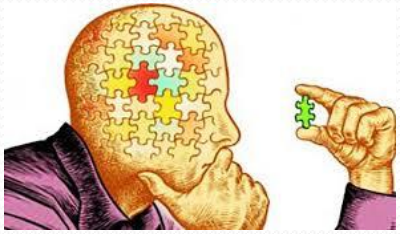

Analytical

Alternative routes to creativity

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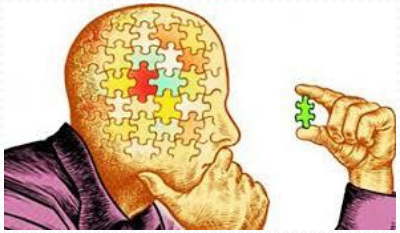


Analytical

Insight

Mindfulness Attention and Awareness Scale Brown & Ryan, (2003)

- I break or spill things because of carelessness, not paying attention, or thinking of something else.

  I find it difficult to stay focused on what's happening in the present.

  I tend to walk quickly to get where I'm going without paying attention to what I experience along the way.

  I tend not to notice feelings of physical tension or discomfort until they really grab my attention.

  I forget a person's name almost as soon as I've been told it for the first time.

  It seems I am "running on automatic," without much awareness of what I'm doing.

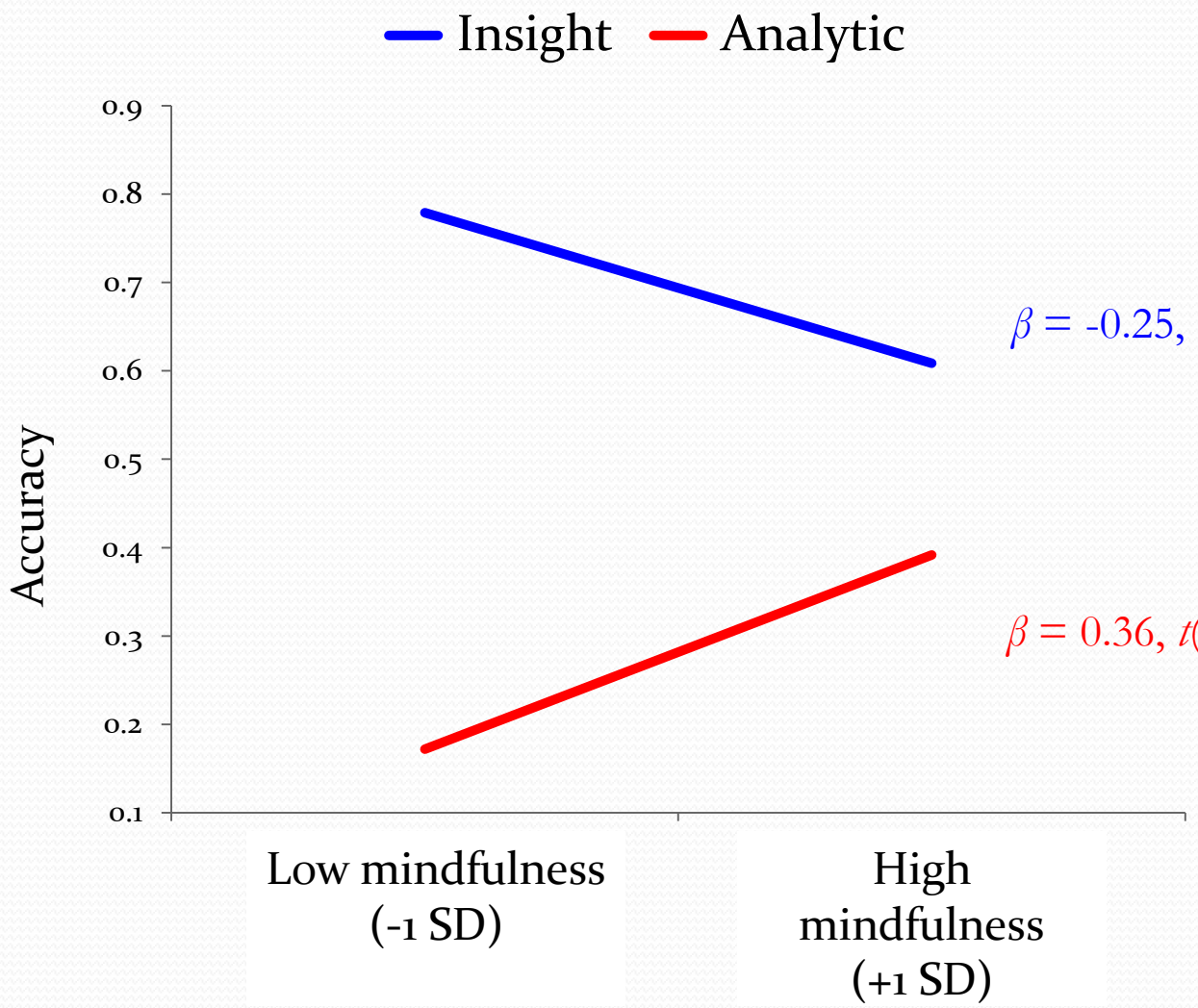
  I rush through activities without being really attentive to them.

  I get so focused on the goal I want to achieve that I lose touch with what I'm doing right now to get there.

  I do jobs or tasks automatically, without being aware of what I'm doing.

  I find myself listening to someone with one ear, doing something else at the same time.

Zedelius & Schooler, 2016



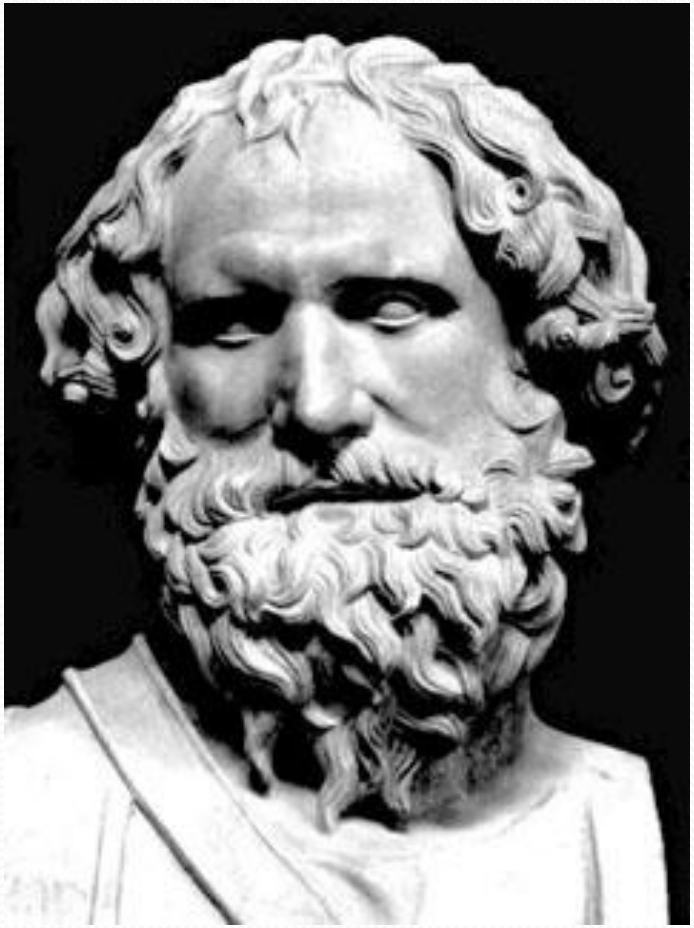
β = -0.25, $t(66)$ = -2.04, p = 0.045

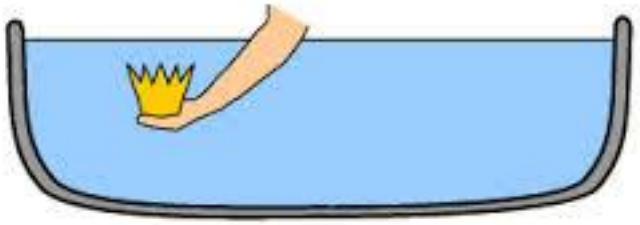
β = 0.36, $t(63)$ = 3.03, p = 0.04

Mind-wandering and Creative Incubation

- Numerous anecdotal examples of mind-wandering and creativity

Archimedes- Volume displacement





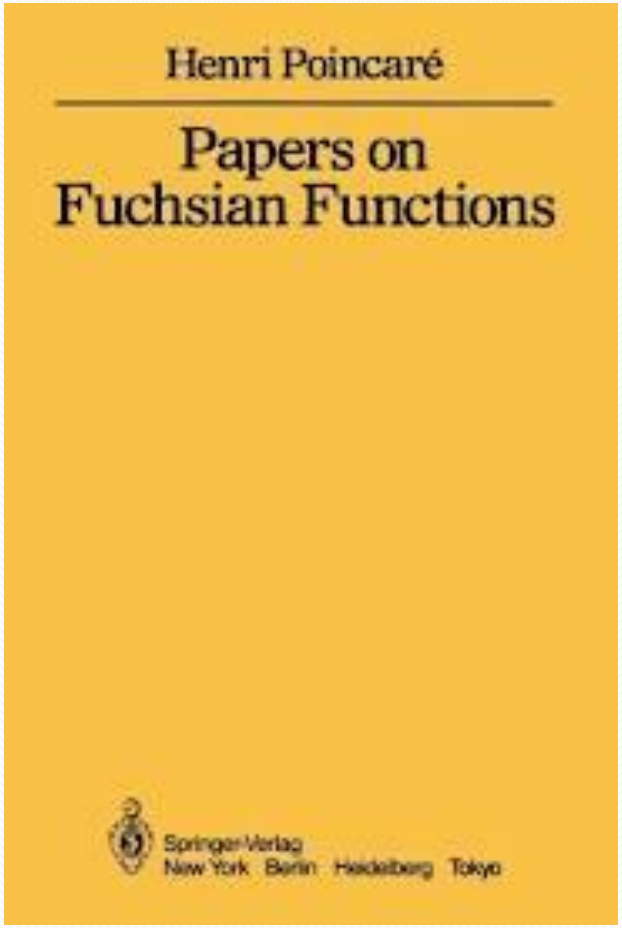
Mass of object − Apparent mass when submerged = Density of water × Volume of object

$$\frac{440 \text{ grams}}{31 \text{ cm}^3} = 14.2 \text{ grams/cm}^3$$

Wait a minute! The density of solid gold is 19.3 gm/cm^3!!


EUREKA!

Poincare and Fuchsian functions



Poincare

- The crucial idea came to him as he was about to get onto a bus, as he relates in *Science and Method* (1908):-
  - *At the moment when I put my foot on the step the idea came to me, without anything in my former thoughts seeming to have paved the way for it, that the transformation that I had used to define the Fuchsian functions were identical with those of non-euclidean geometry.*

Townes' invention of the laser

Townes invention of the laser

- The idea for the laser beam dawned upon the phy Charles Townes, while he was sitting on a park bench in Washington DC, admiring the azaleas. He suddenly realized how light could be configured into a very pure form. This was early in the morning of 26th April, 1951, when he was on his way to a conference.
- Townes wrote, 'There is a tremendous emotional experience (in scientific discovery) which I think is similar to what some people would normally describe as a religious experience, a revelation.'

Observations from anecdotes

- Major discoveries seem to occur when people have been working on a problem for a while and then take a break.
- Solution occurs while mind-wandering during the break
- Often associated with an aha experience

On-line Real-time Journal Study of Creative Scientists and Writers

(Gable,Hopper, & Schooler, Psych Science, 2019)

- Does mind wandering contribute to the creative ideas of creative professionals?
- Are ideas associated with mind wandering uniquely associated with overcoming impasses?
- Two replications of the same procedure
- Study 1
  - 45 physicists and 53 writers completed a daily creativity journal for two weeks

Spontaneous Task Independent Mindwandering (STIM)

- “doing something unrelated to work (e.g.,paying a bill)” and thinking about something unrelated to the general idea or problem
- 20% of ideas occurred under this classification

Quality of Ideas as Function of Mind Wandering

- No differences in overall creativity, significance etc, but STIM ideas
  - More likely to involve overcoming impasses
    - ideas that involved overcoming an impasse that came during mind wandering 26.%
    - Ideas that involved steady progress that came during mind wandering 14%
  - More likely to involve Aha experiences
    - ideas that involved aha's that came during mind wandering 25%
    - Ideas that did not involve aha's that came during mind wandering 16%

Speculative mechanisms underpinning creative mind wandering

- Curiosity
  - Creative individuals are more likely to mind wander about ideas they are interested in

- Zeigarnick effect-
  - Impasses may increase mind wandering about creative problems which may enable them to be considered in novel contexts.

Curious daydreaming

Zedelius & Schooler, in prep

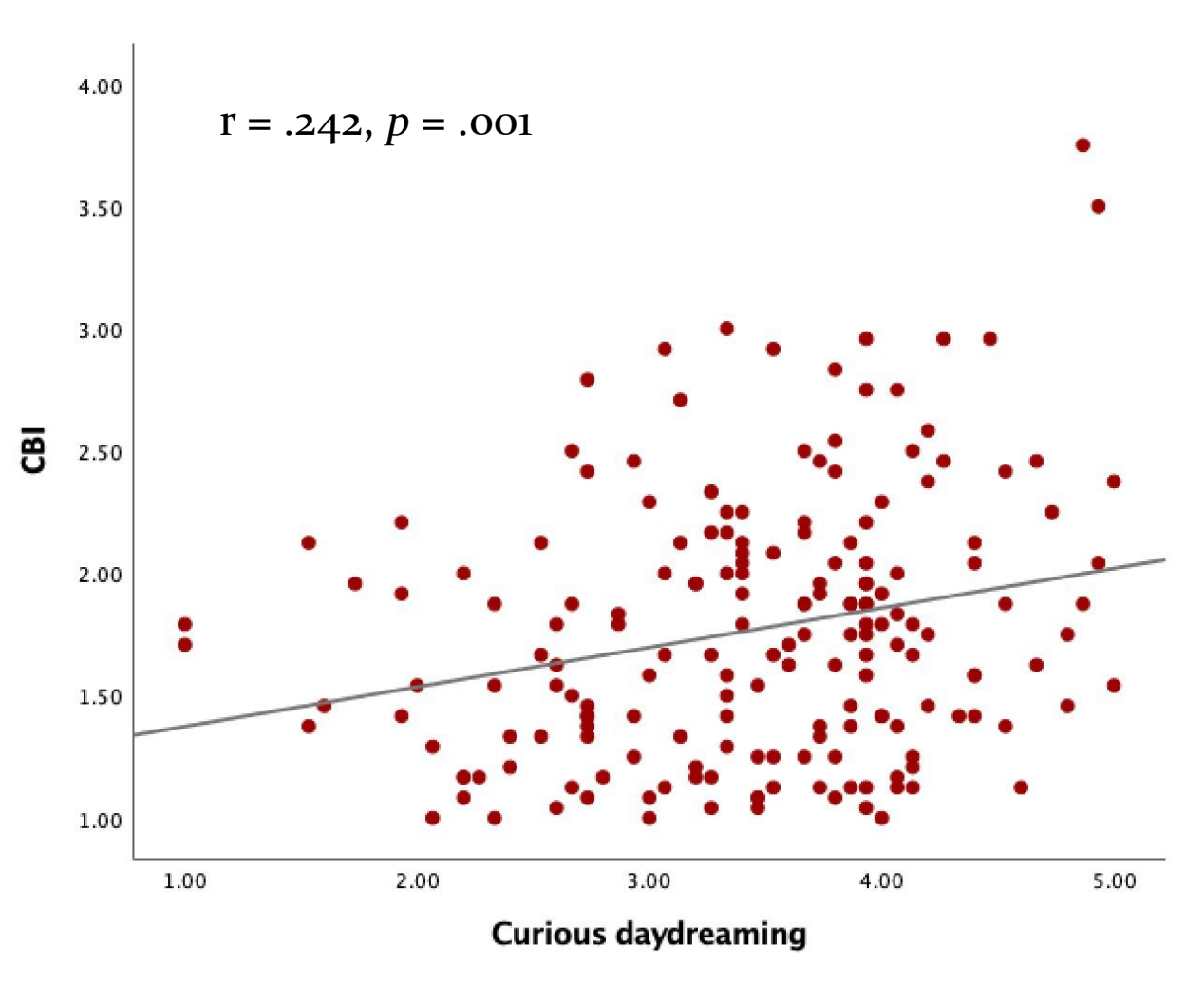
- *"The daydream revolved around an unfinished task or project"*
- *"I daydreamed about an intriguing question that I have yet to find an answer to"*
- *"The daydream led to the solution to a problem or question that had previously stumped me"*

Curious daydreaming

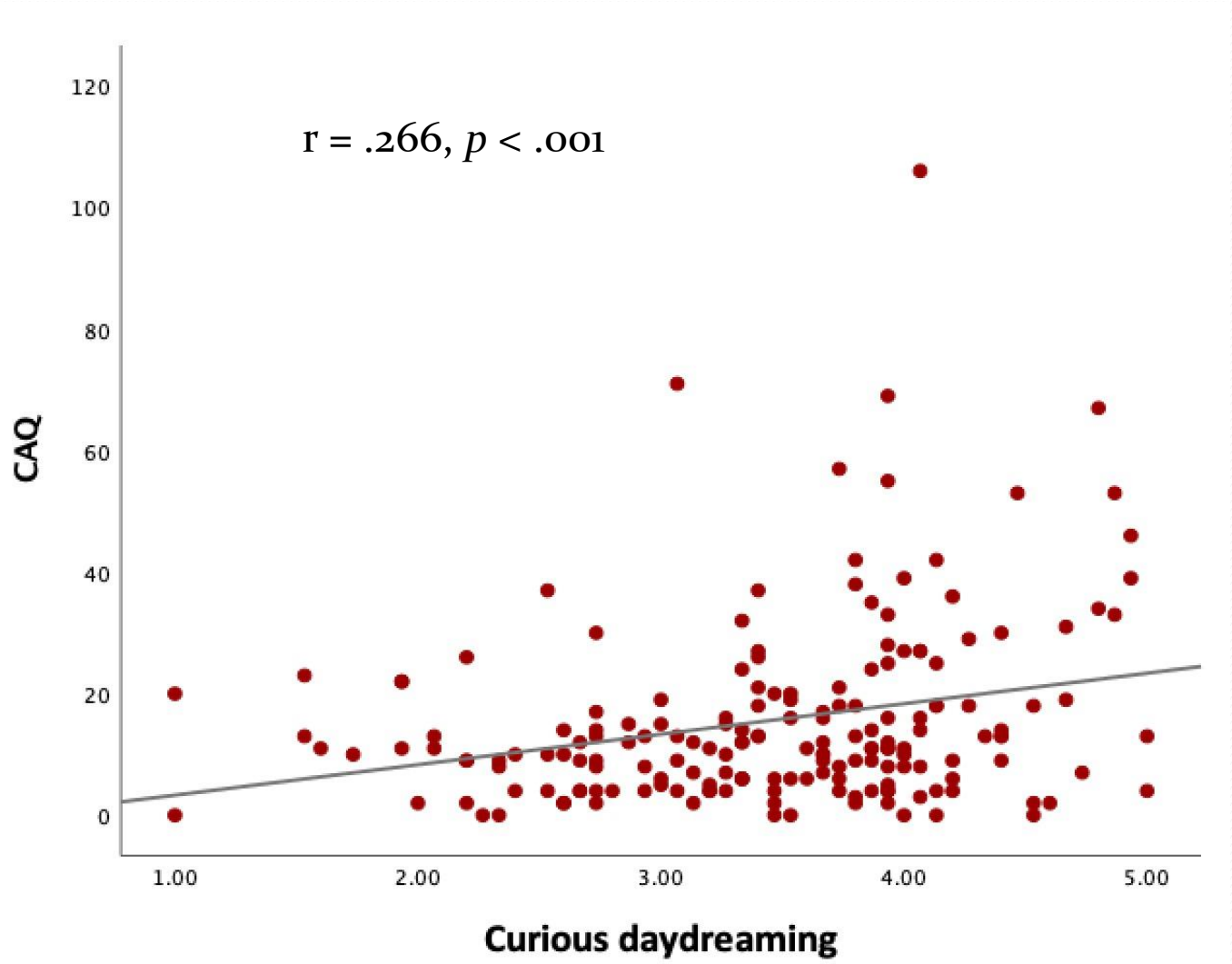
Zedelius & Schooler, in prep

- Creative Behavior Inventory (**CBI**; Dollinger, 2003)
  - Day-to-day creative activities like arts and crafts projects, writing plays, stories, songs or poems, painting, sculpting, making costumes
- Creative Achievement Questionnaire (**CAQ**; Carson et al., 2005)
  - a new self-report measure of creative achievement that assesses achievement across 10 domains of creativity
- Curious daydreaming scale

Creative behavior



Creative achievement



Questions

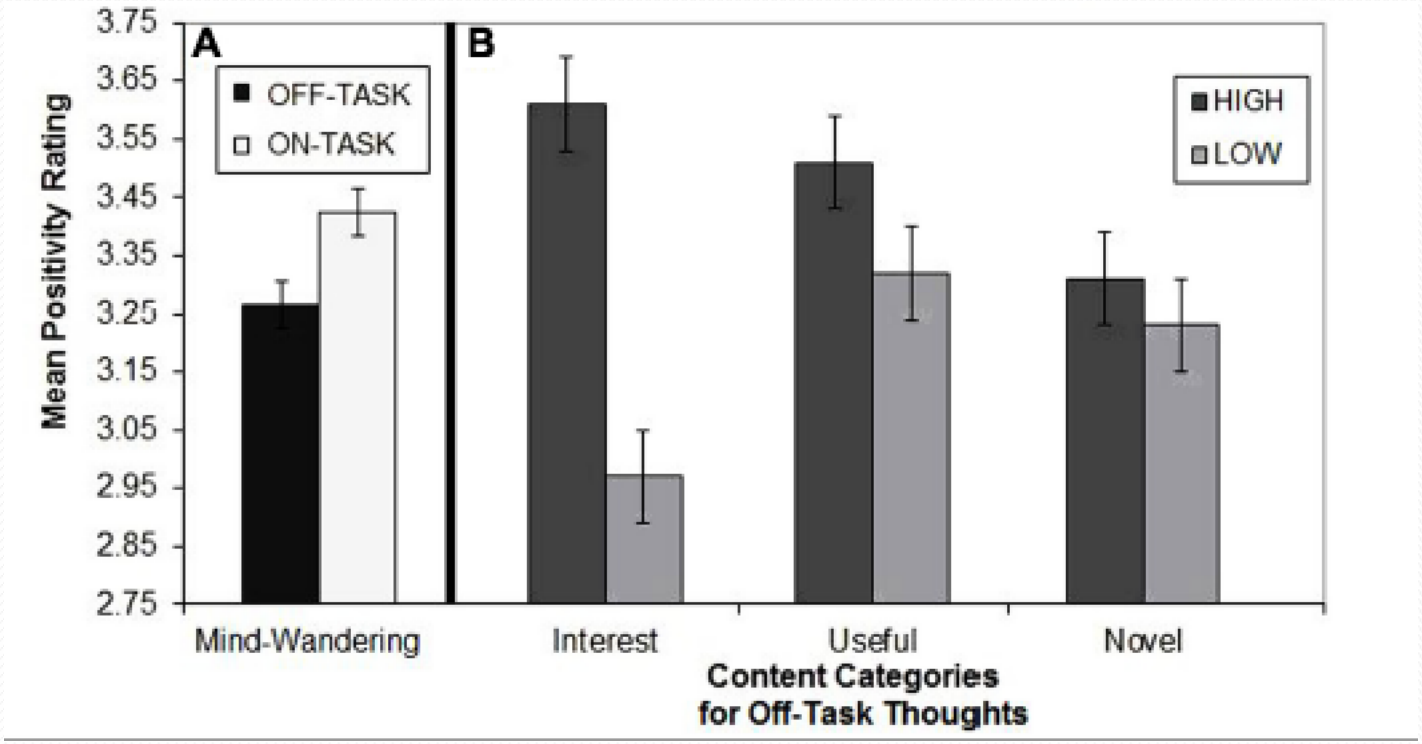
- To what degree is mind-wandering a problem?
  - Can impair performance in many domains
- To what degree is mindfulness a solution?
  - Can be extremely helpful in reducing dysfunctional mind-wandering
- Are there situations when mind wandering may be helpful?
  - Fosters creative insights
  - Particularly when curious mind wandering
- Can we find ways to foster the good kind of mind wandering?

Cultivate Mind Wondering

- Playful mind wandering that promotes creativity
  - Curious
  - Meaningful
  - Bizarre
  - Unsolved puzzles

Mind-wondering also promotes positive mood

(Franklin et al, 2013 *Frontiers in Psychology*)



How can we cultivate the mind – wondering?

Openness to Experience

- Personality dimension involving
  - Being creative and open to new ideas
- Facets
  - Fantasy
    - (e.g., "I have a very active imagination")
  - Aesthetics
    - (e.g., "I am intrigued by patterns I find in art and nature")
  - Feelings
    - (e.g., "I experience a wide range of emotions and feelings")
  - Ideas
    - (e.g., "I often enjoy playing with theories or abstract ideas")
  - Values
    - (e.g., "I consider myself broad-minded and tolerant of other people's lifestyles")
  - Actions
    - (e.g., "I think it's interesting to learn and develop new hobbies")

Impact of Openness to Experience

- Benefits
  - Associated with a host of positive traits
    - Creativity
      - (especially when combined with intelligence)
    - Career advancement
    - Metacognitive awareness
    - Intellectual humility
    - Curiosity
    - Longevity
- Limitations
  - Daydreaming can lead to distraction
  - Can be non-discerning in what one is open to.

Open Mindfulness

- Cultivating Openness to Experience along with Mindfulness
- Gain the benefits of both
  - Creativity of openness + awareness of mindfulness

How can you cultivate open mindfulness?

- Engage in novel experiences every day
  - Listen to new music
  - Try a new recipe
  - Read on a new topic
  - Think about interesting topics
- Meditate

Using Immersive Sound Experiences to Encourage Open Mindfulness

- Foster the growth of **Both** Openness to Experience and Mindfulness
- Encourage Openness to Experience by:
  - Introducing people to novel rewarding experiences
    - Consciousness expanding sound experiences
- Encourage Mindfulness/Meta-awareness by:
  - Focusing on the sounds as the grounding object
  - Gently releasing thoughts when they arise and return to the ground.
- Amanda Gregory.com

Conclusions

- To what degree is mind-wandering a problem?
  - Can impair performance in many domains
- To what degree is mindfulness a solution?
  - Can be extremely helpful in reducing dysfunctional mind-wandering
- Are there situations when mind wandering may be helpful?
  - Fosters creative insights
- Can we find ways to foster the good kind of mind wandering?
  - Promoting
    - Mind wondering- mind wandering about things we are curious about
    - open mindfulness- through trying new experiences, meditating, listening to mind expanding music

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