

# THE EVOLUTION OF INFOGRAPHICS IN PSYCHOLOGY:

*From Theoretical Diagrams to  
Data-Driven Visualizations*

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PSYC6135  
April 10<sup>th</sup>, 2025

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## 01. Evolution of Psychological Infographics

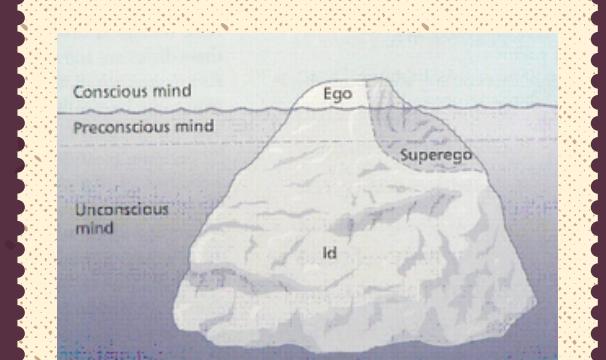
- i. Early Theoretical/Conceptual Diagrams
- ii. Empirical Graphs
- iii. Cognitive & Information Processing Models
- iv. Modern Data Visualizations

*\*Key figures, theories, and methods in visualizing psychological concepts*

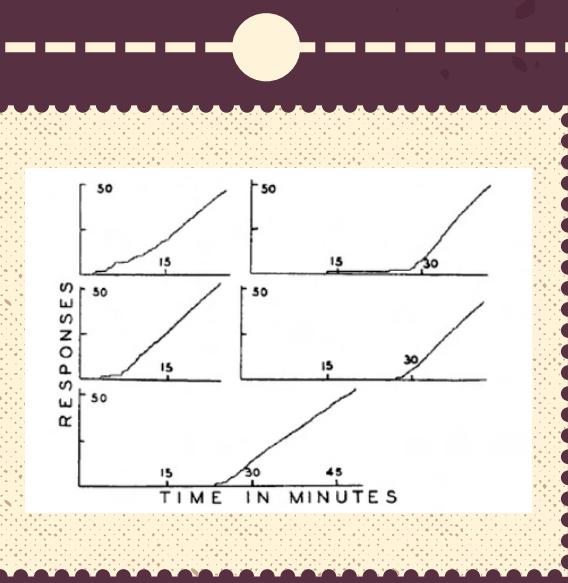
## 02. Future Directions in Psychological Data Visualization

# TIMELINE

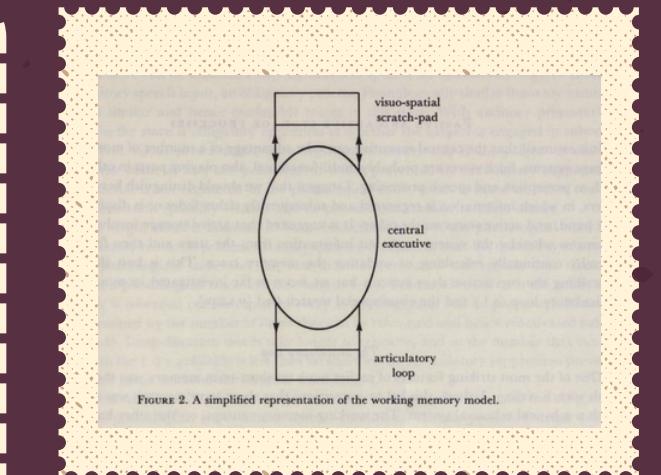
Early 1800s



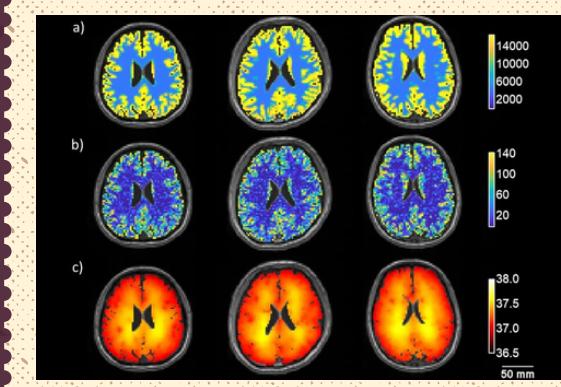
Early Conceptual & Theoretical Diagrams



Empirical Graphs



Cognitive & Information Processing Models

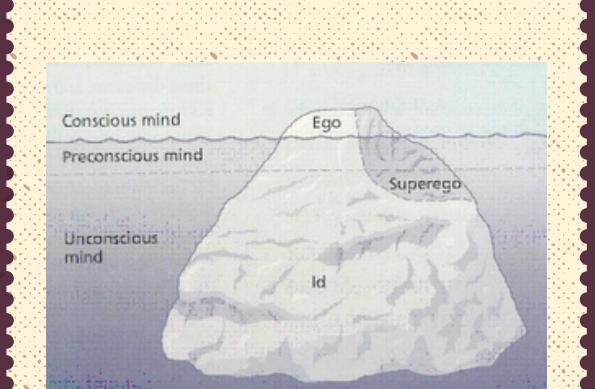


Modern Big Data Visualization

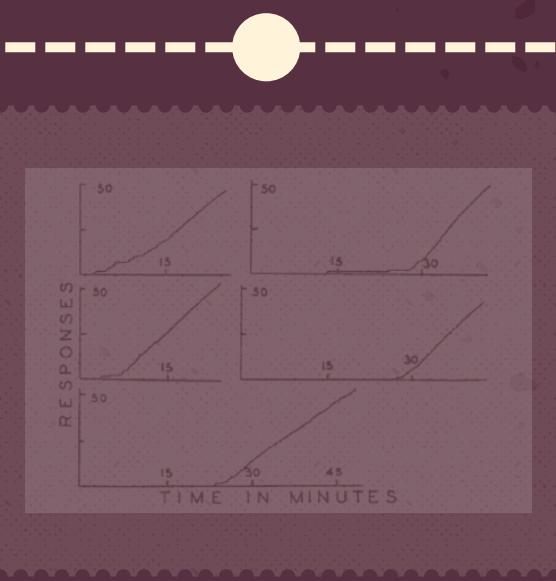
Present

# TIMELINE

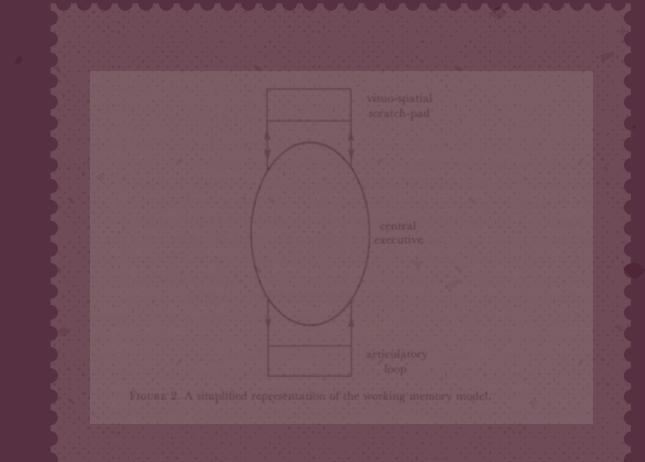
Early 1800s



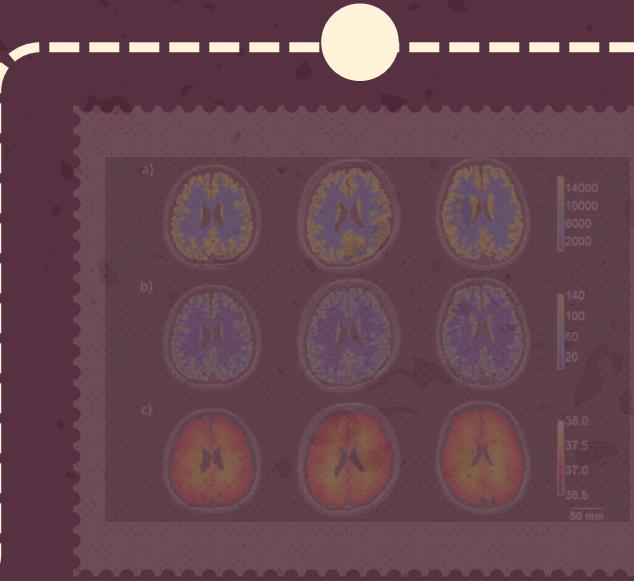
Early Conceptual & Theoretical Diagrams



Empirical Graphs



Cognitive & Information Processing Models

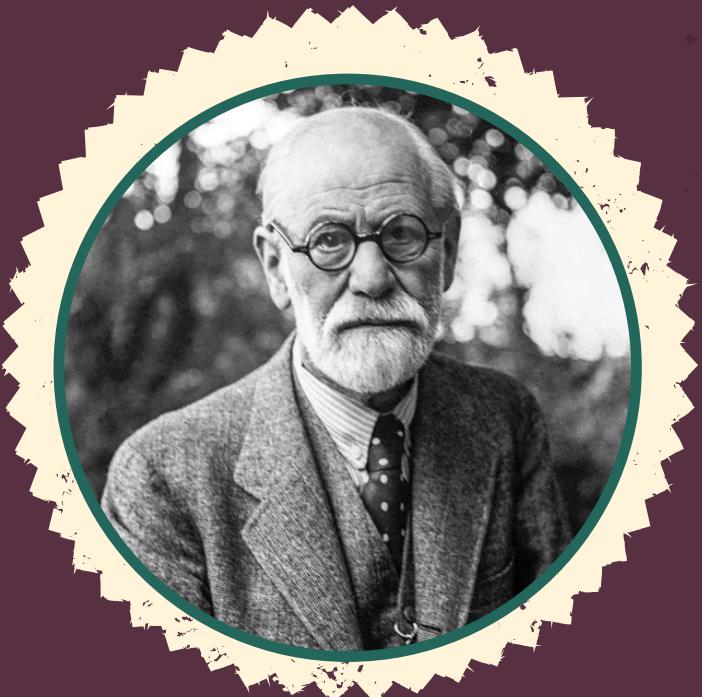


Modern Big Data Visualization

Present

# EARLY CONCEPTUAL & THEORETICAL DIAGRAMS

## *Key Figures*

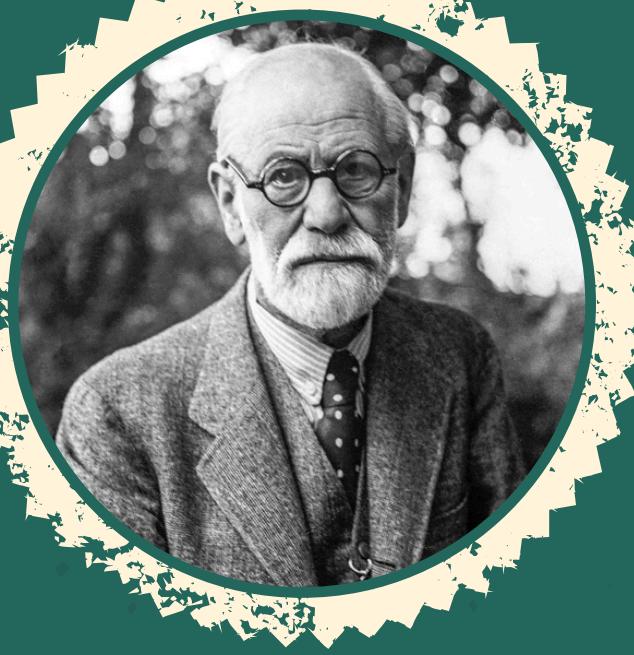


Sigmund Freud



Franz Joseph Gall





# Sigmund Freud's Topographical & Iceberg Model (?)

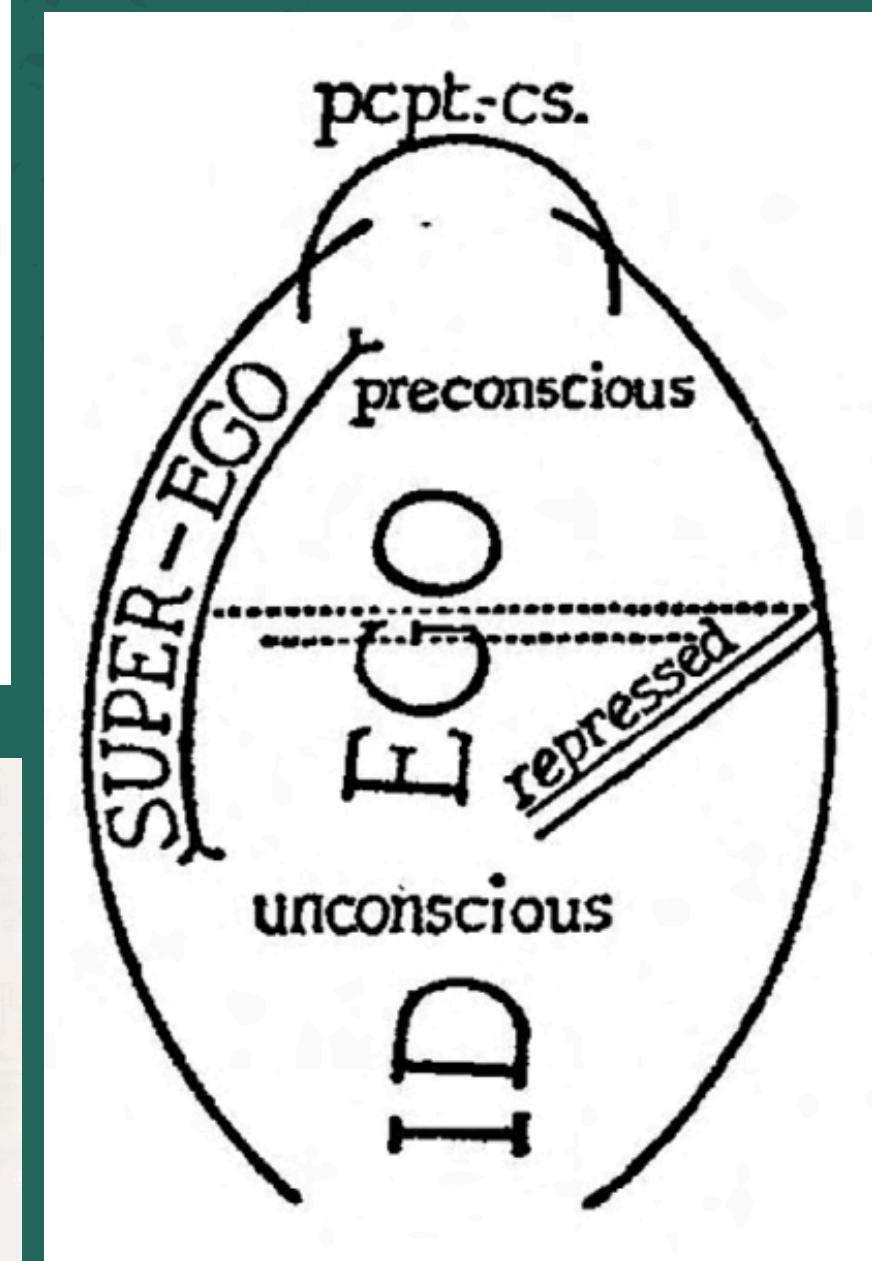
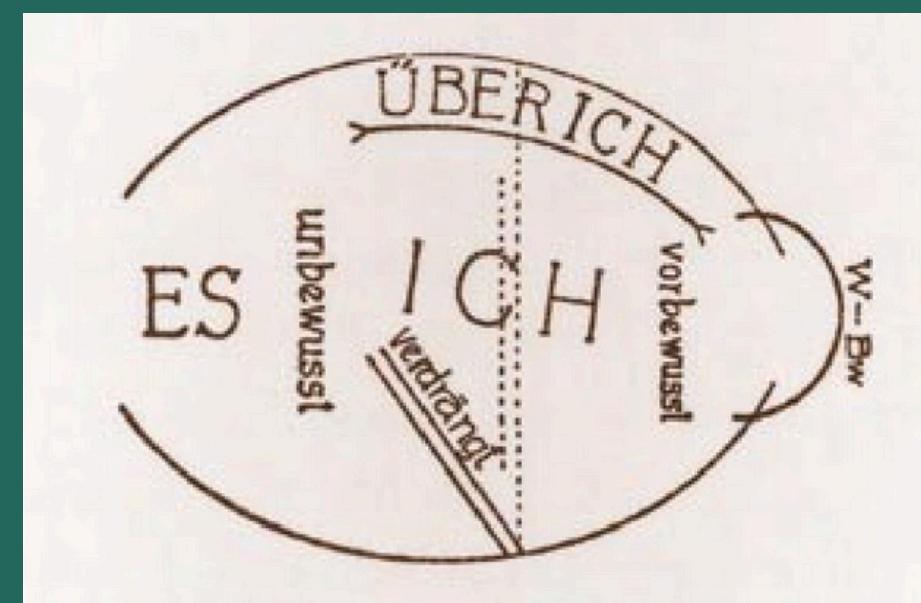
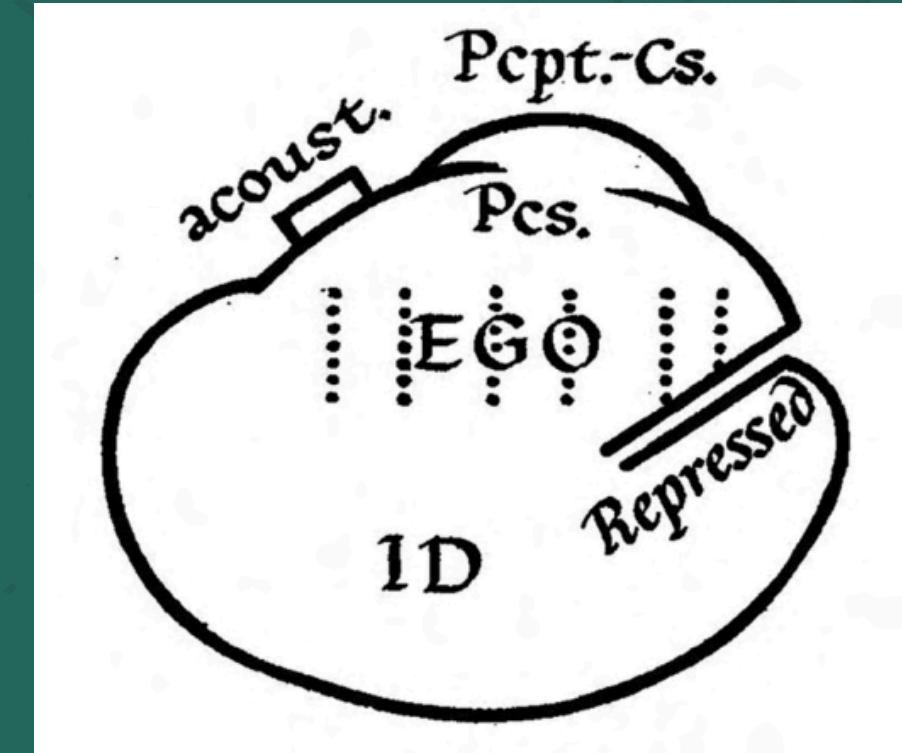
1890-1920s

**Map of human consciousness** (conscious, preconscious, and unconscious), emphasizing that most mental activity occurs beneath conscious awareness

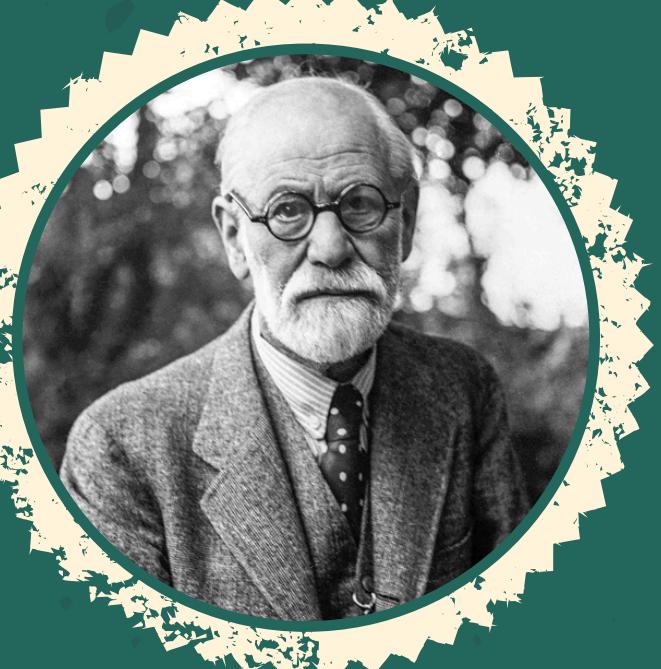
**Key Insight:** The unconscious mind—driven by hidden desires and repressed thoughts—plays a major role in shaping behavior, while the id, ego, and superego regulate internal conflicts

**Importance:** Laid foundation for psychoanalysis, dream analysis, personality theory, and therapeutic techniques. Made an abstract theory of mind visually intuitive.

(Freud, 1923, 1964)

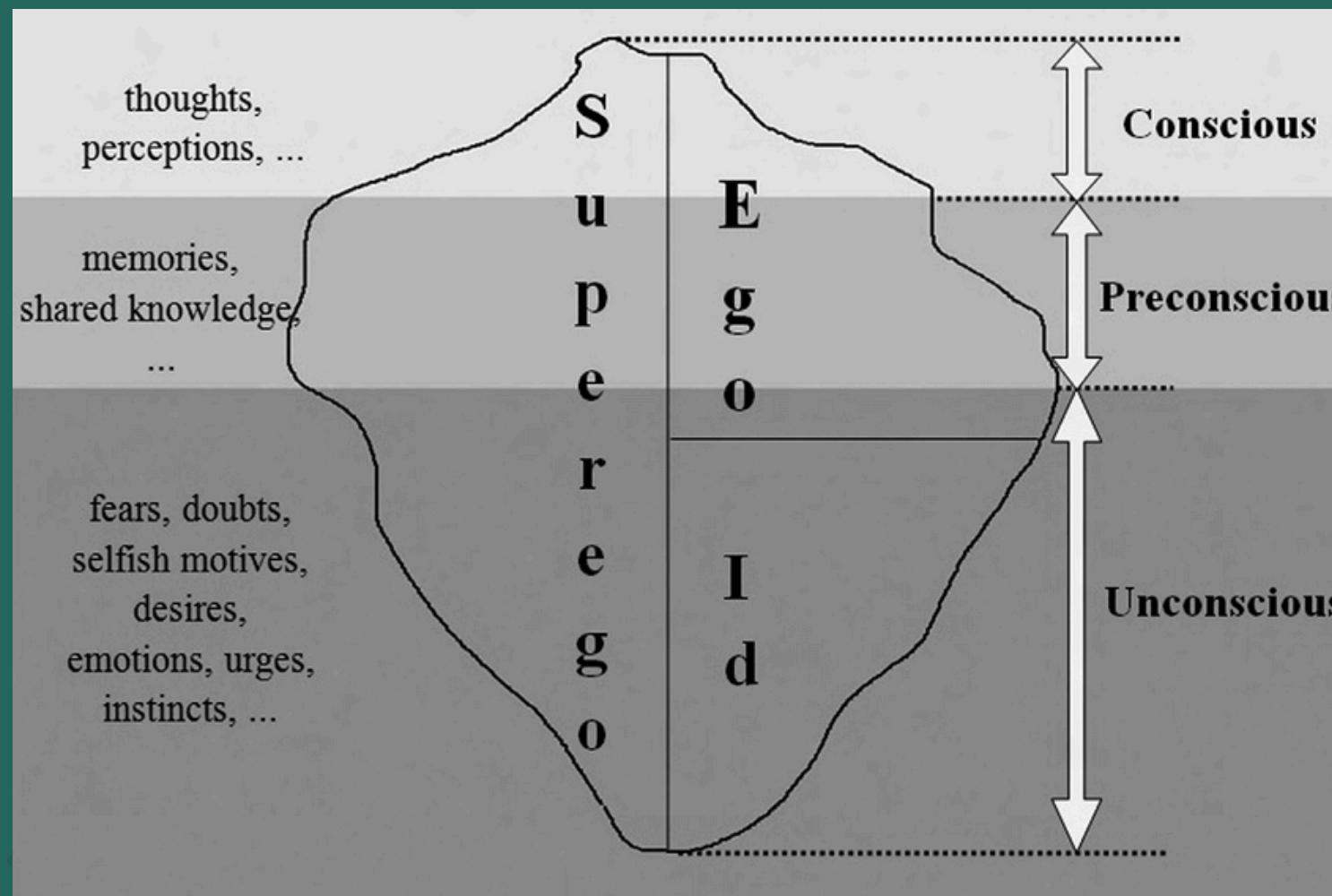


(D'onogue, 2007; Gamwell & Solms, 2006)

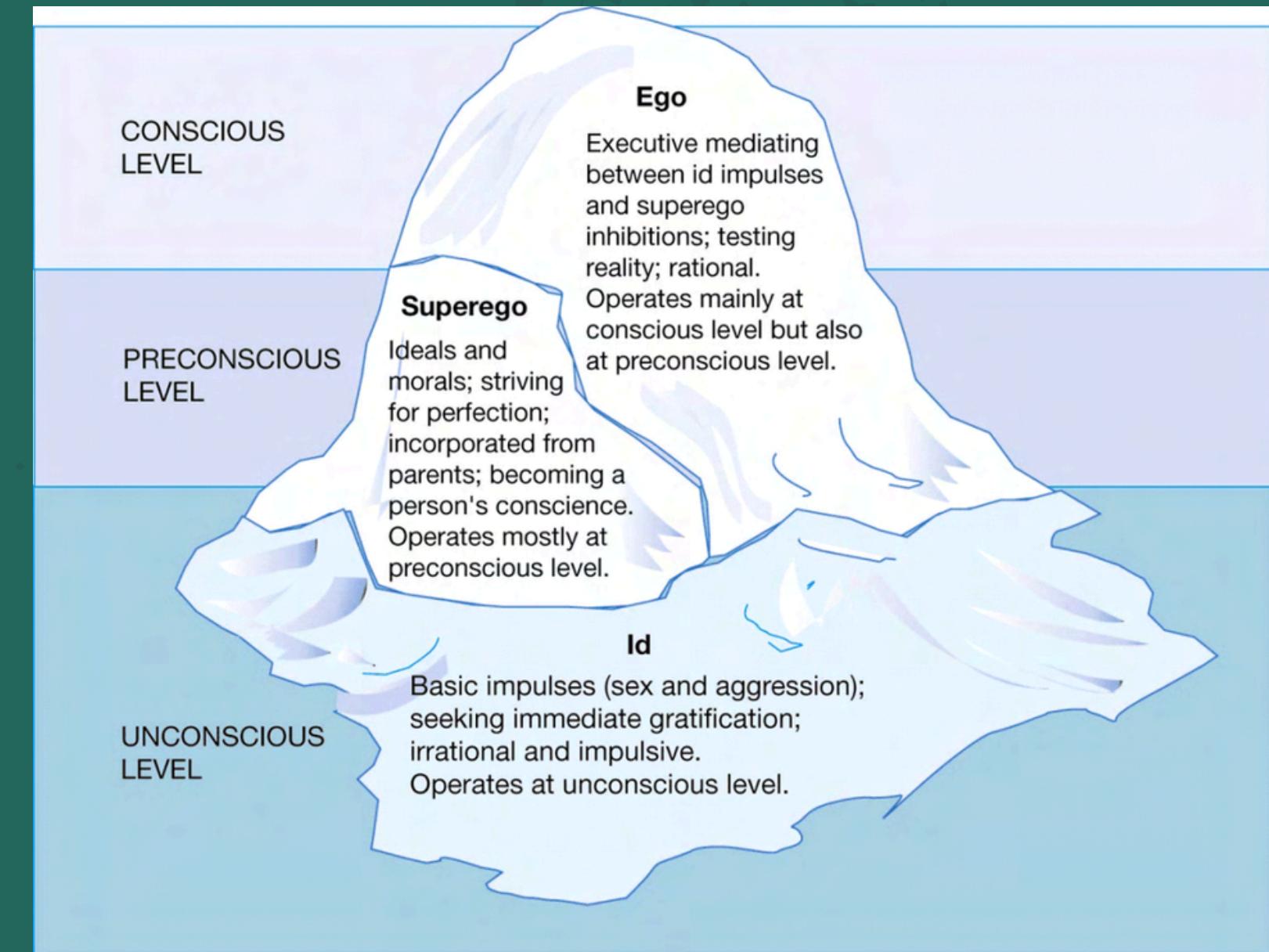


# Sigmund Freud's Topographical & Iceberg Model (?)

1985-1920s



(Banerjee & Pal, 2015)



(Kaufmann, 2021)

See: *Where Did Freud's Iceberg Metaphor of Mind Come From?* by Christopher Green (2019)



# Franz Joseph Gall's Phrenology Map

# 1800 - 1940s

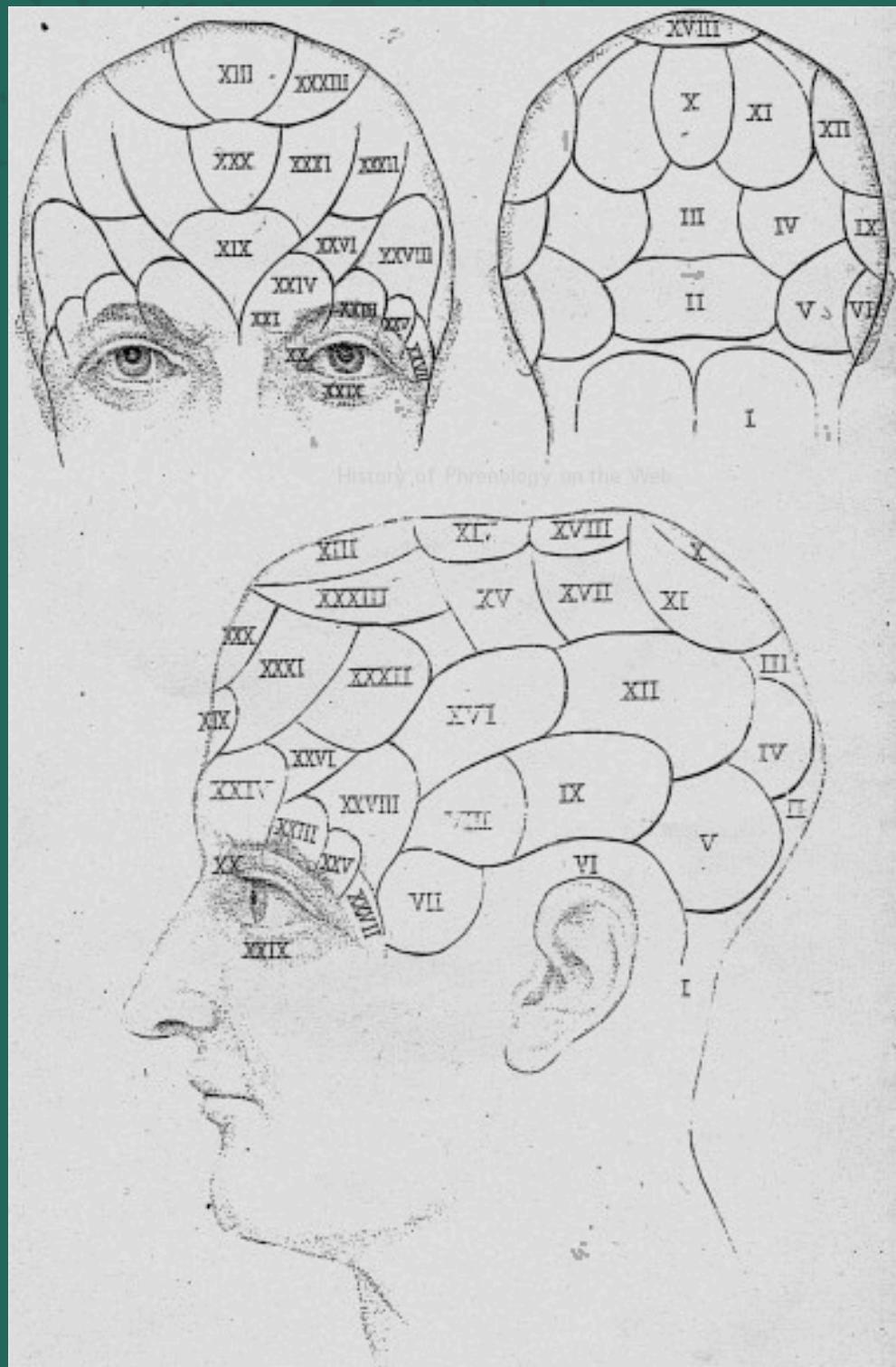
Different brain regions control specific personality traits, emotions, and abilities, which could be determined by feeling the bumps on a person's skull.

**Key Insight:** Mental faculties were localized in specific brain areas, laying the groundwork for later neuroscientific studies on brain function

**Importance:** One of the earliest attempts to visually represent the brain's organization, marking a shift toward graphical depictions of psychological concepts. These maps inspired later brain mapping, including modern fMRI brain activation maps and cognitive function diagrams.

(Simpson, 2005)

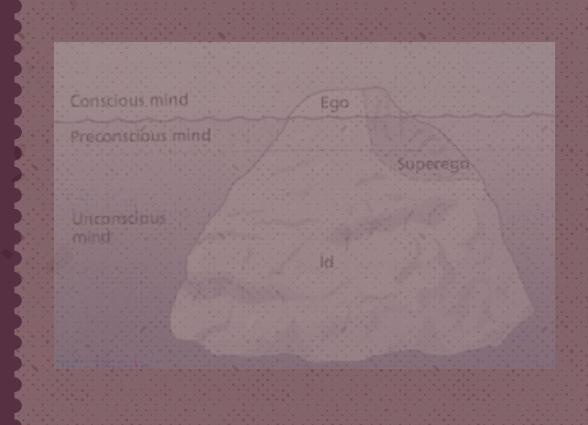
**See: "The History of Phrenology on the Web" by John van Wyhe (<https://www.historyofphrenology.org.uk/>)**



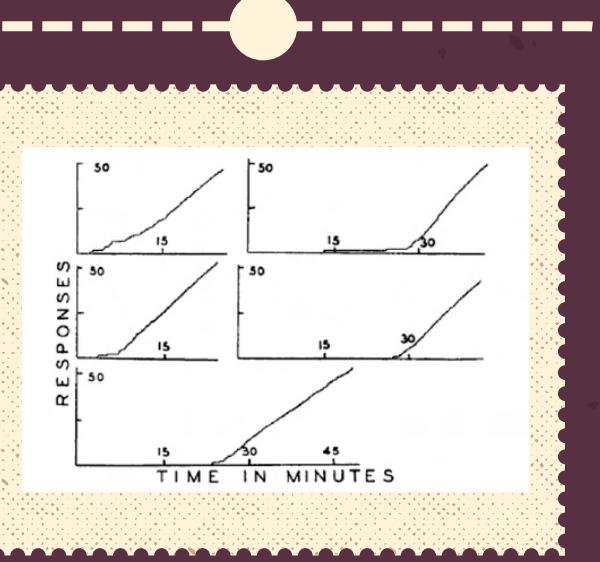
(Gall and Spurzheim, 1815)

# TIMELINE

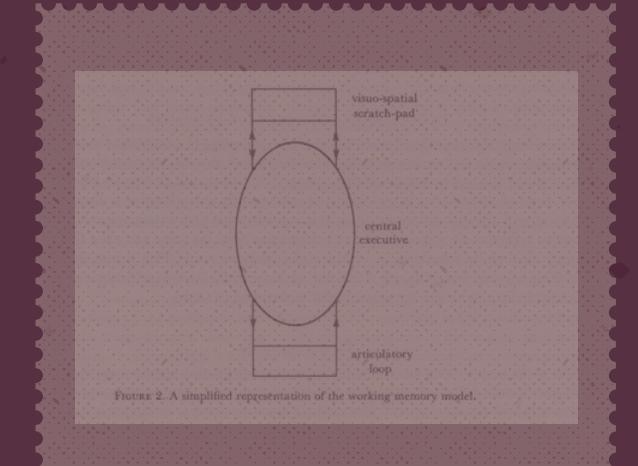
Early 1800s



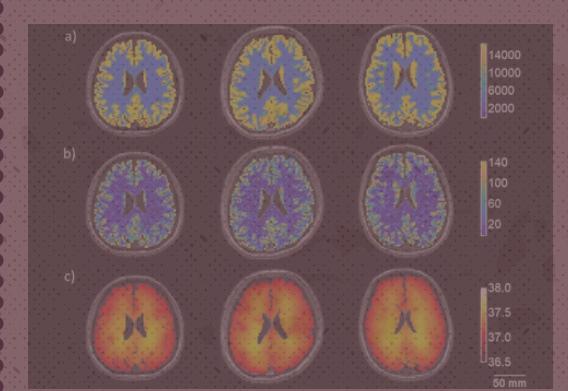
Early Conceptual & Theoretical Diagrams



Empirical Graphs



Cognitive & Information Processing Models



Modern Big Data Visualization

Present

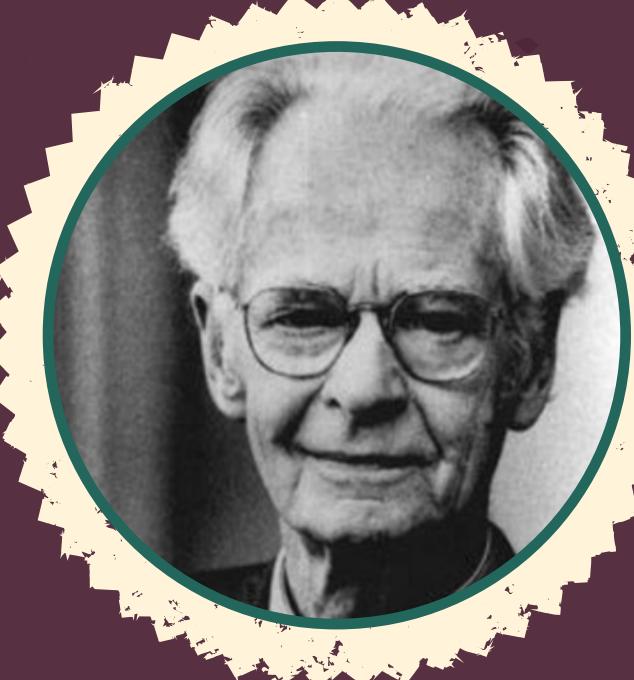


# THE RISE OF EMPIRICAL GRAPHS

*Key Figures*



Herman Ebbinghaus



B.F. Skinner





# Herman Ebbinghaus' Forgetting Curve

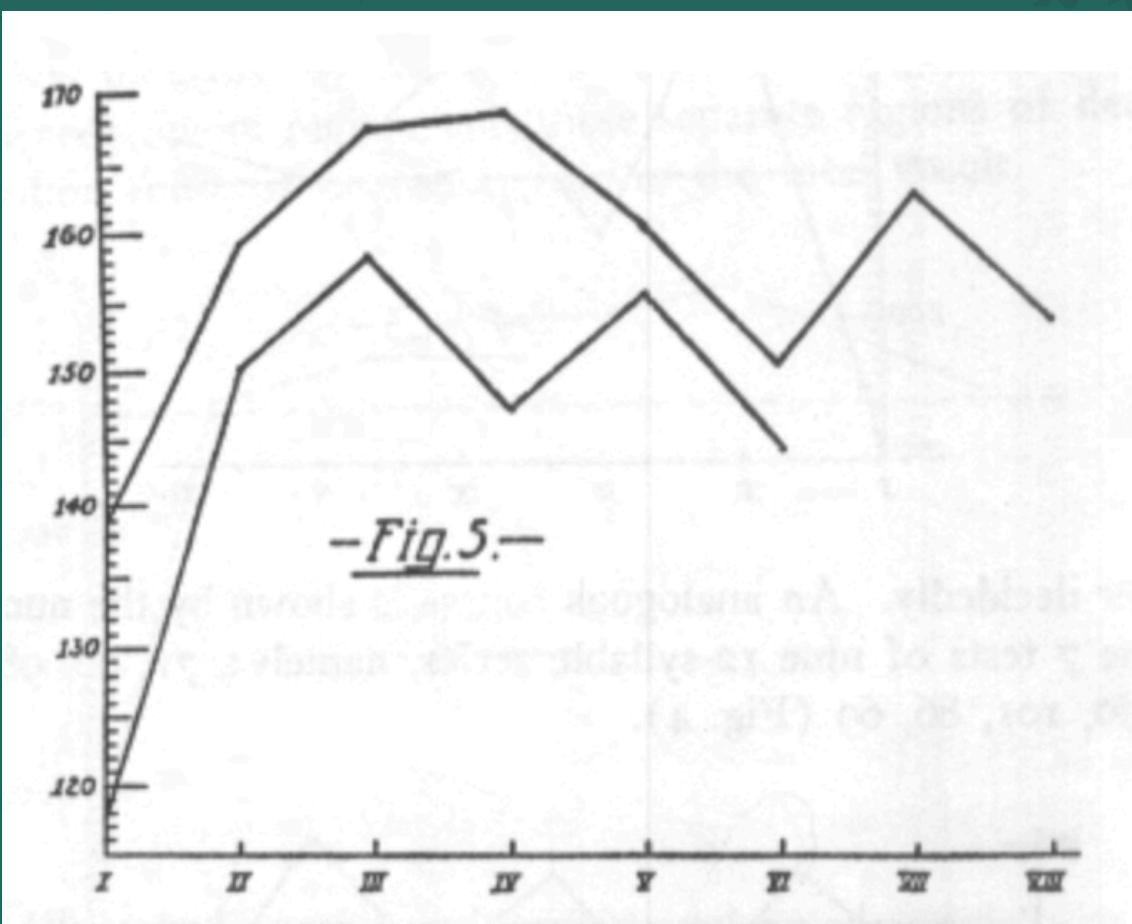
1885-1920s

Graph of memory retention over time

**Key Insight:** Memory declines rapidly but stabilizes with repetition

**Importance:** One of the first quantitative psychological data visualizations. His use of graphs, time-series data, and empirical repetition represented a major shift toward data-driven cognitive psychology.

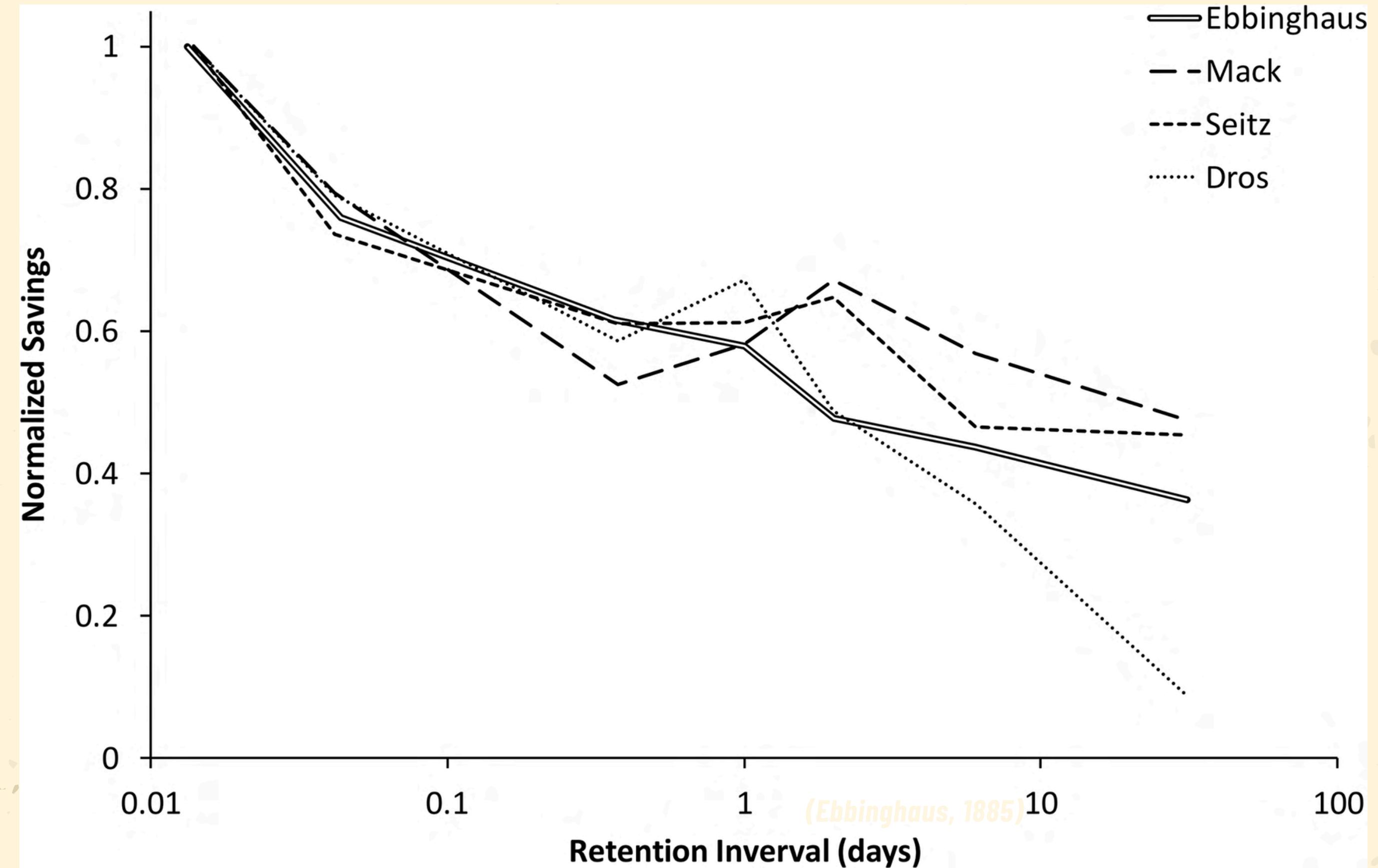
(Murdock, 1885)



(Ebbinghaus, 1885)

See: "Classics in the History of Psychology" by Christopher Green ([psychclassics.yorku.ca](http://psychclassics.yorku.ca))

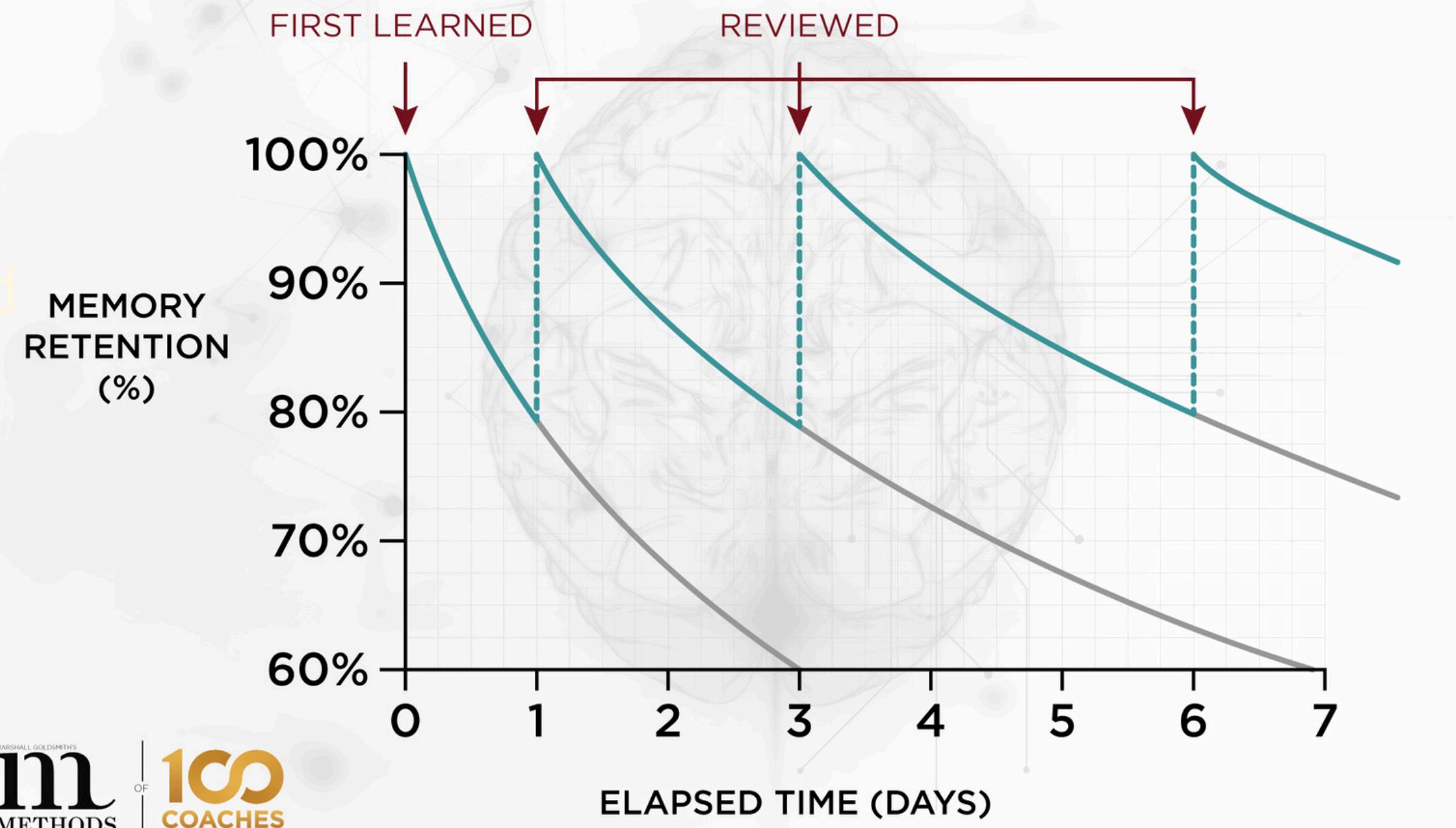
$x = 8$	$x = 16$	$x = 24$
$y =$	$y =$	$y =$
1171	998	1018
1070	795	853
1204	936	854
1180	1124	908
1246	1168	1004
1113	1160	1068
1283	1189	979
1141	1186	966
1127	1164	1076
1139	1059	1038
$m = 1167$		
$w_m = \pm 14$		
$x = 32$	$x = 42$	$x = 53$
$y =$	$y =$	$y =$
736	708	615
764	579	579
863	734	601
850	660	561
892	738	618
868	713	582
913	649	572
858	634	516
914	788	550
975	763	660
$m = 863$		
$w_m = \pm 15$		
$x = 64$		
$y =$		
530		
483		
499		
464		
412		
419		
417		
397		
391		
524		
454		
+ 11		



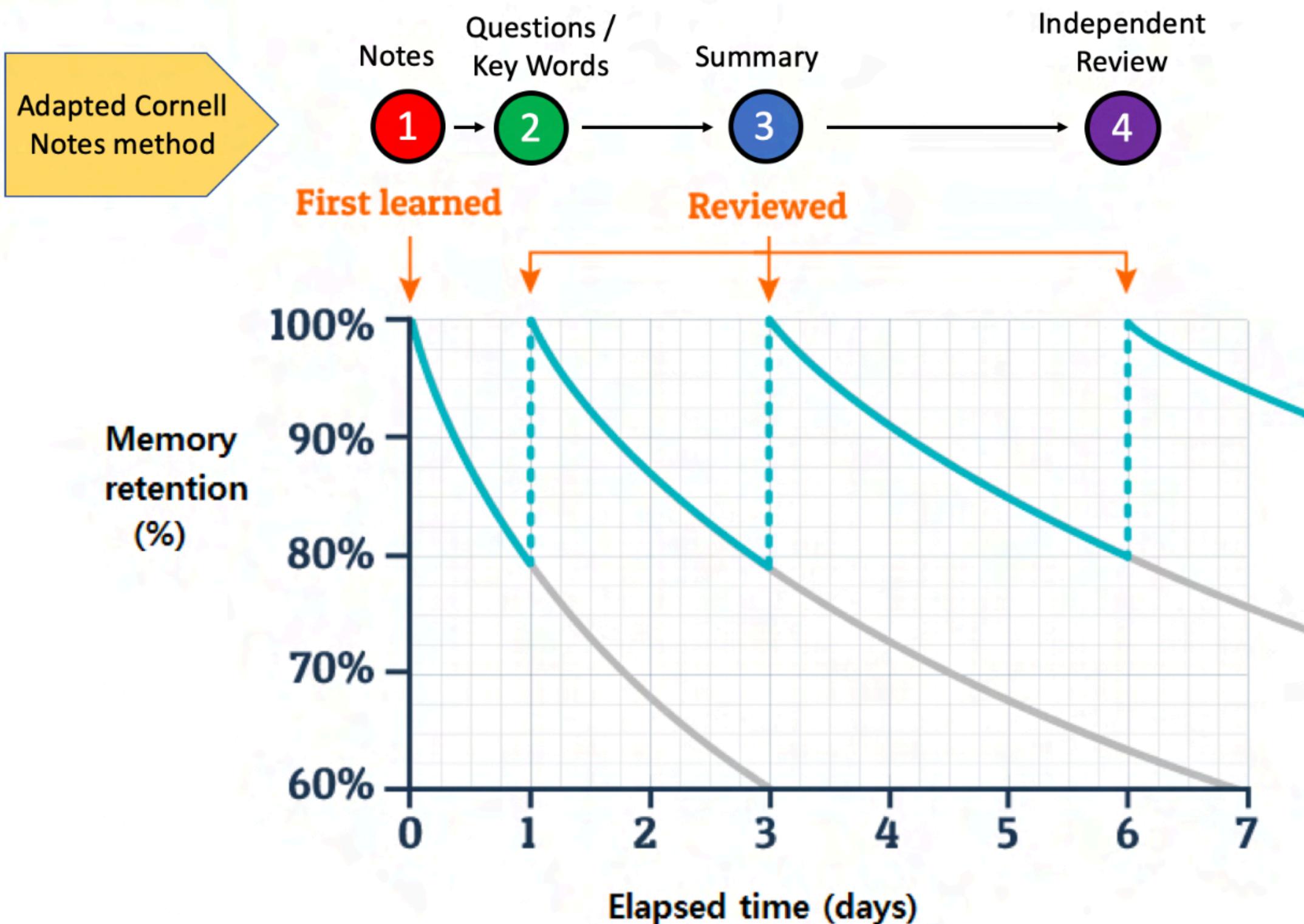
(Ebbinghaus, 1885)

(Murre & Dros, 2015)

## EBBINGHAUS FORGETTING CURVE



## The Power of Review



(Chun & Heo, 2018)



# B.F. Skinner's Behaviour Graphs

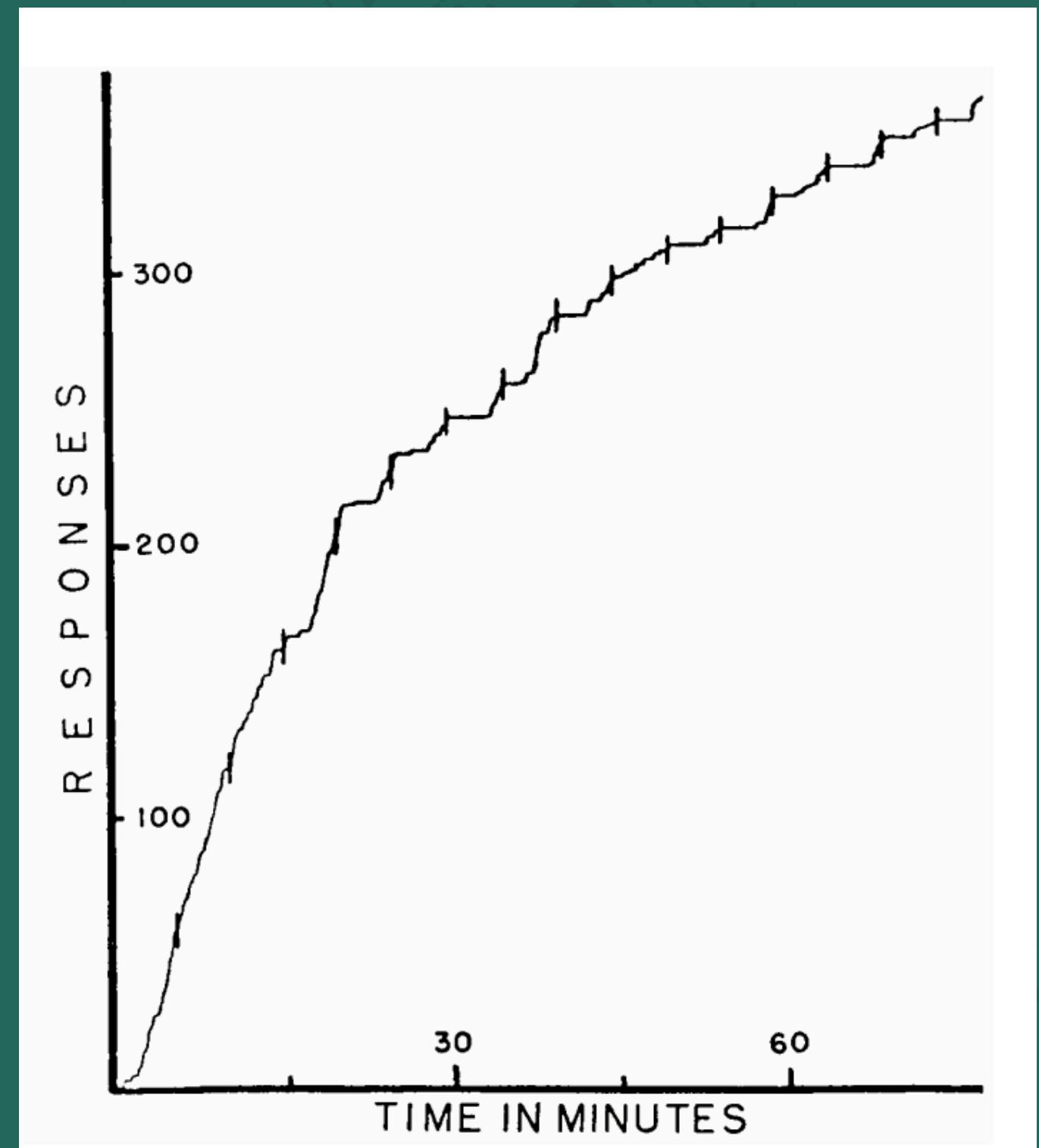
1938

**Cumulative response graphs** from operant conditioning studies showing how often an organism responds over time under different reinforcement schedules. (e.g., fixed vs. variable rewards)

**Key Insight:** Behavior is shaped by its consequences, and different reinforcement schedules produce distinct, predictable patterns of behavior.

**Importance:** Among the first real-time behavior visualizations, shifting psychology toward measurable and observable behavior. Led to modern behaviour tracking.

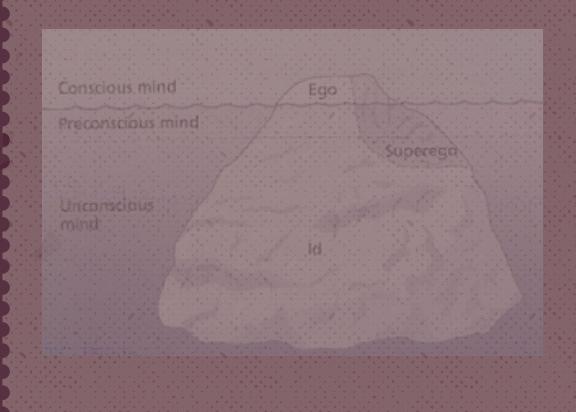
(Best, Smith, & Stubbs, 2001; Kubina et al., 2015)



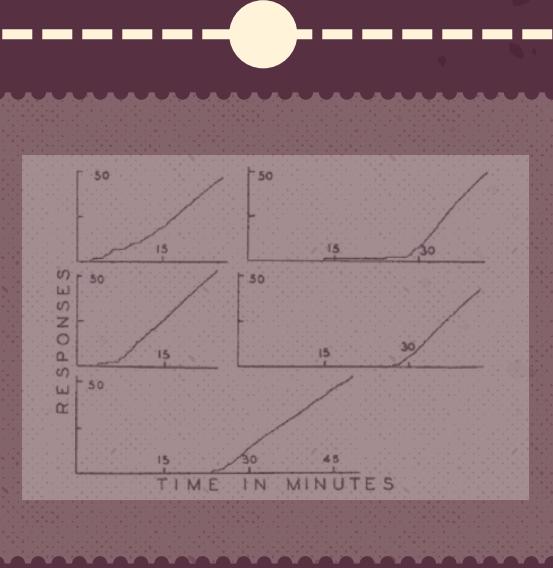
(Skinner, 1938)

# TIMELINE

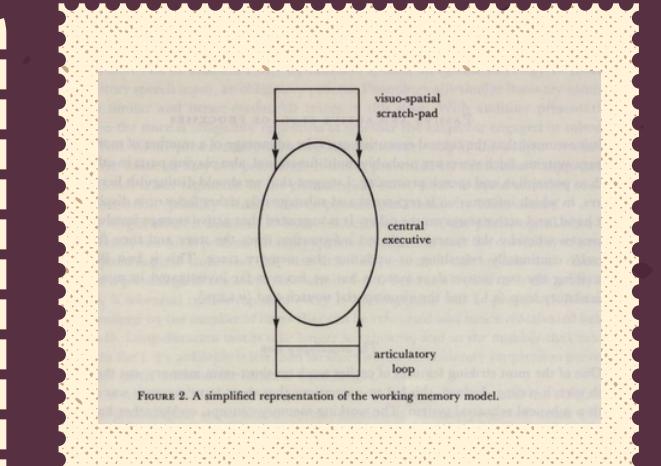
Early 1800s



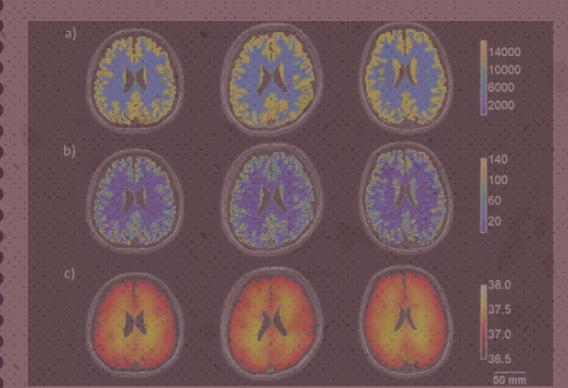
Early Conceptual & Theoretical Diagrams



Empirical Graphs



Cognitive & Information Processing Models



Modern Big Data Visualization

Present

# COGNITIVE PSYCHOLOGY & INFORMATION PROCESSING MODELS

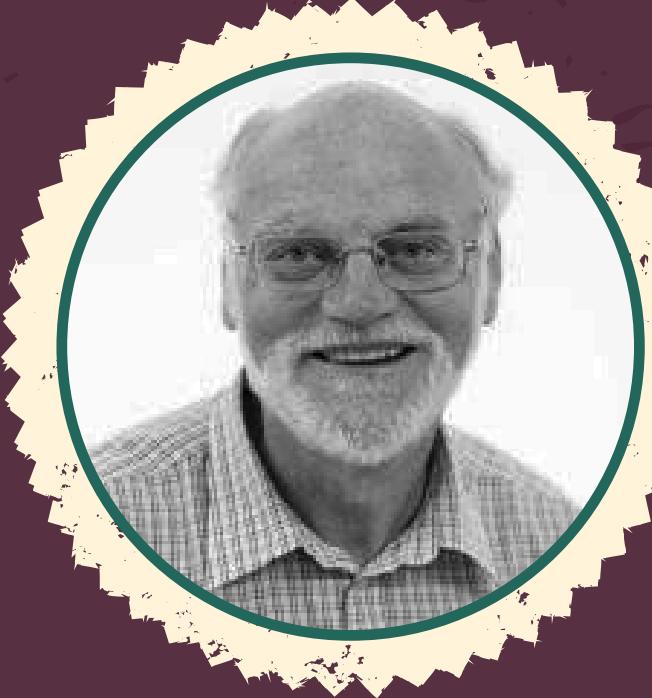
*Key Figures*



George Armitage Miller



Alan Baddeley



Graham Hitch





# Miller's Memory Capacity Graph

1956

*"The magical number seven, plus or minus two"*

**Key Insight:** Human short-term memory has a finite capacity, which affects how we process, store, and recall information—especially in tasks involving attention, learning, and decision-making

**Importance:** Cornerstone of cognitive psychology (memory & information processing) and paved way for more data-driven visualizations in cognitive science (e.g., models of WM)

(Miller, 2003)

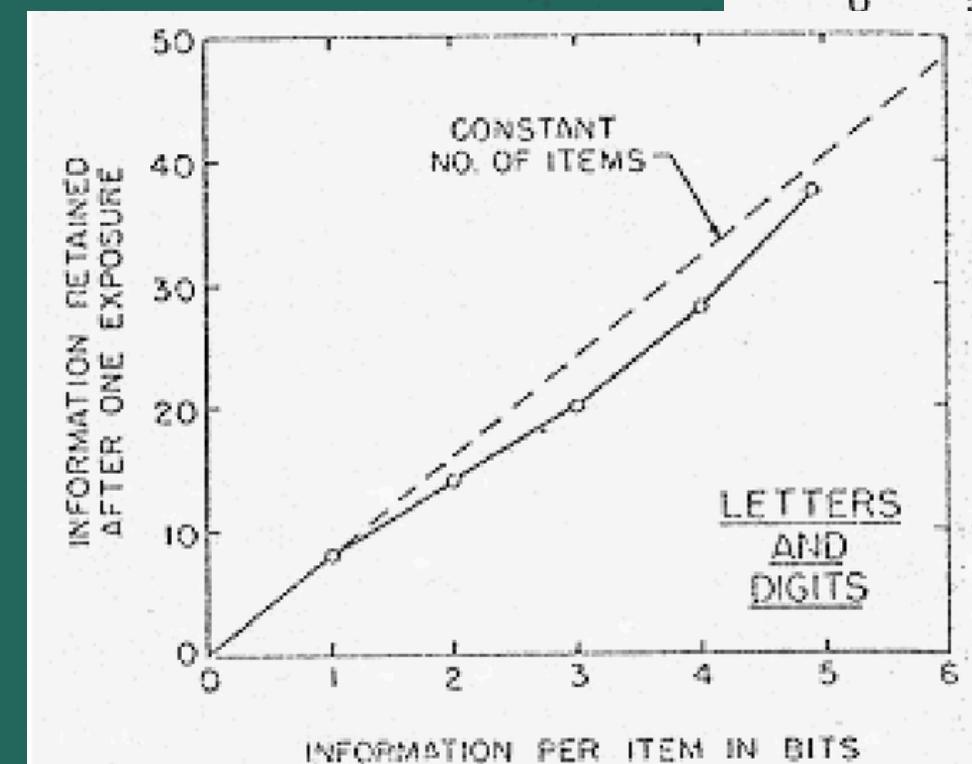
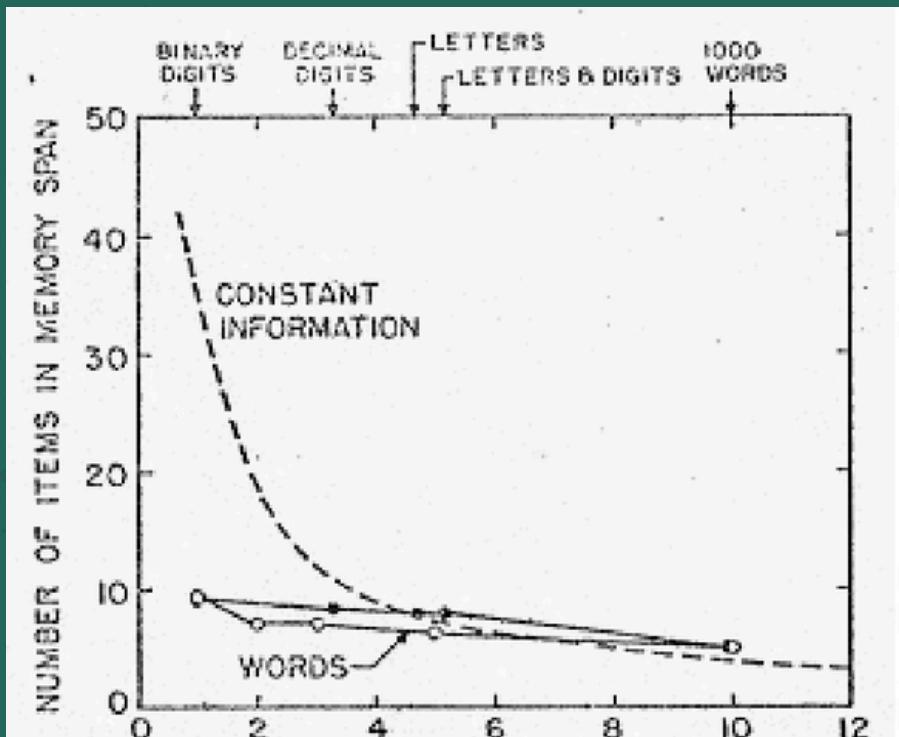


FIG. 8. Data from Pollack (16) on the amount of information retained after one presentation plotted as a function of the amount of information per item in the test materials.



Data from Hayes (10) on the span of memory plotted as a function of information per item in bits.

(Miller, 1956)

# The Magical Number Seven, Plus or Minus Two: Some Limits on our Capacity for Processing Information

1956 [1]

George A. Miller (1956)  
*Harvard University*

First published in *Psychological Review*, 63, 81-97.

My problem is that I have been persecuted by an integer. For seven years this number has followed me around, has intruded in my most private data, and has assaulted me from the pages of our most public journals. This number assumes a variety of disguises, being sometimes a little larger and sometimes a little smaller than usual, but never changing so much as to be unrecognizable. The persistence with which this number plagues me is far more than a random accident. There is, to quote a famous senator, a design behind it, some pattern governing its appearances. Either there really is something unusual about the number or else I am suffering from delusions of persecution.

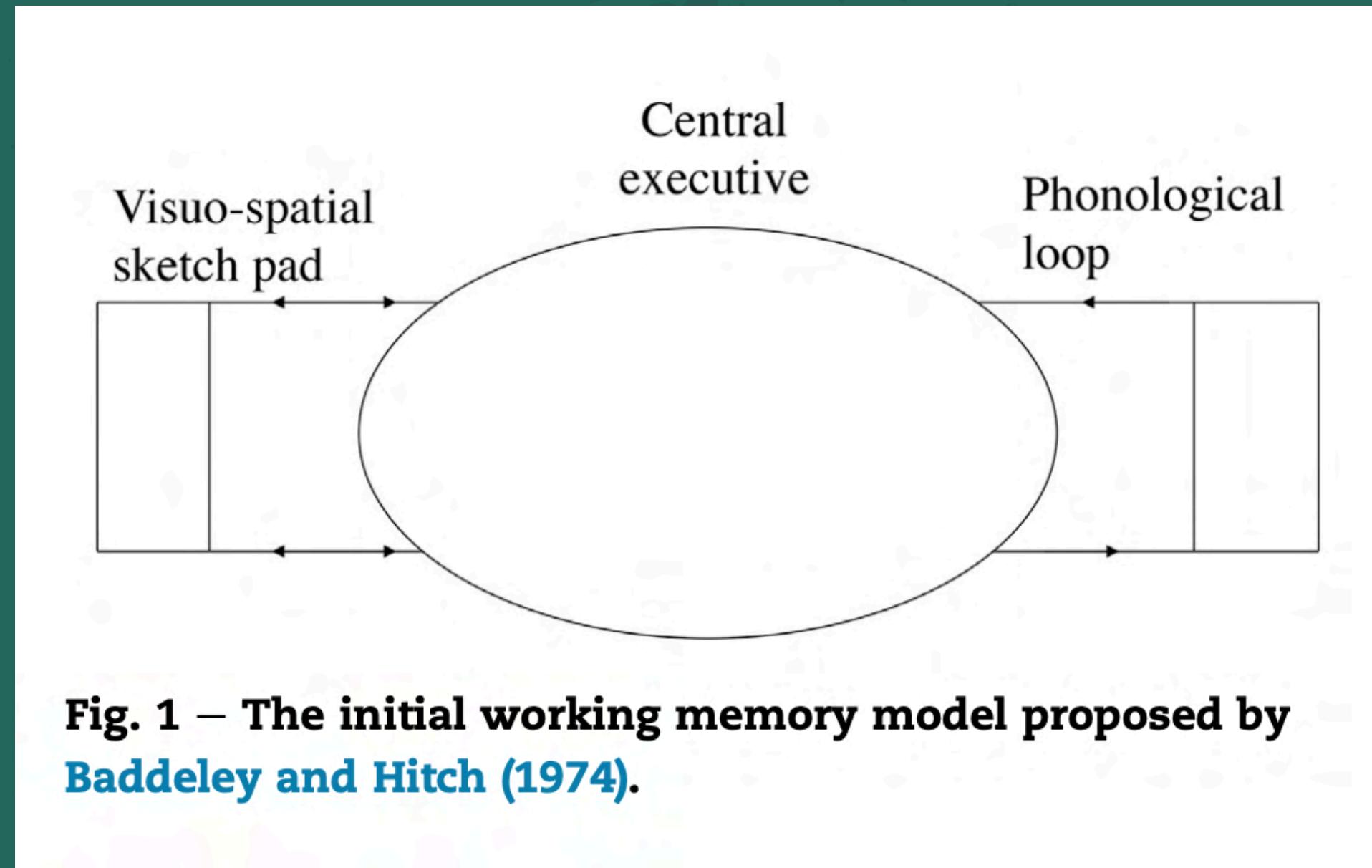
# Baddeley & Hitch's Working Memory Model

1974



**Key Insight:** Working memory is a set of **specialized, interacting components**, allowing us to simultaneously process verbal and visual-spatial information

**Importance:** Foundational theory in cognitive psychology and helped make complex cognitive functions visually accessible

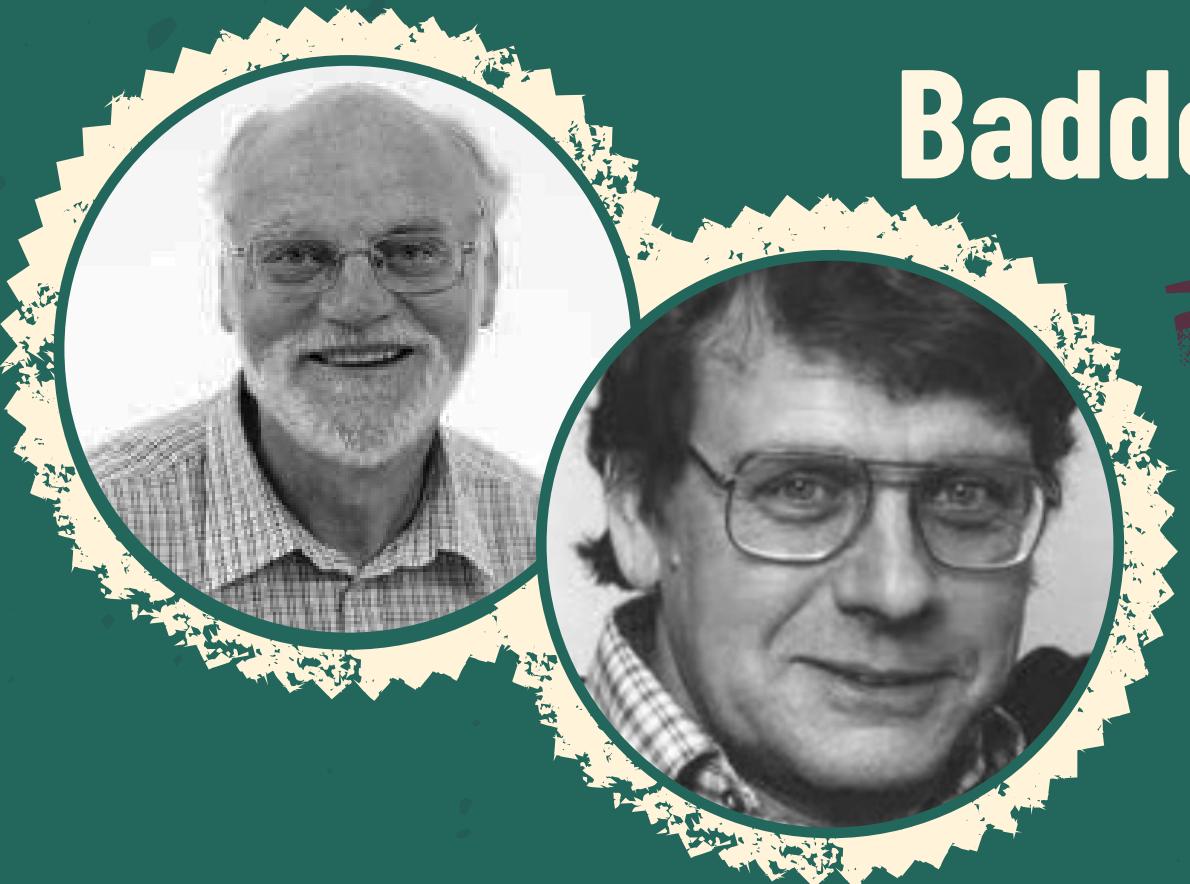


**Fig. 1 – The initial working memory model proposed by Baddeley and Hitch (1974).**

(Baddeley & Hitch, 2019)

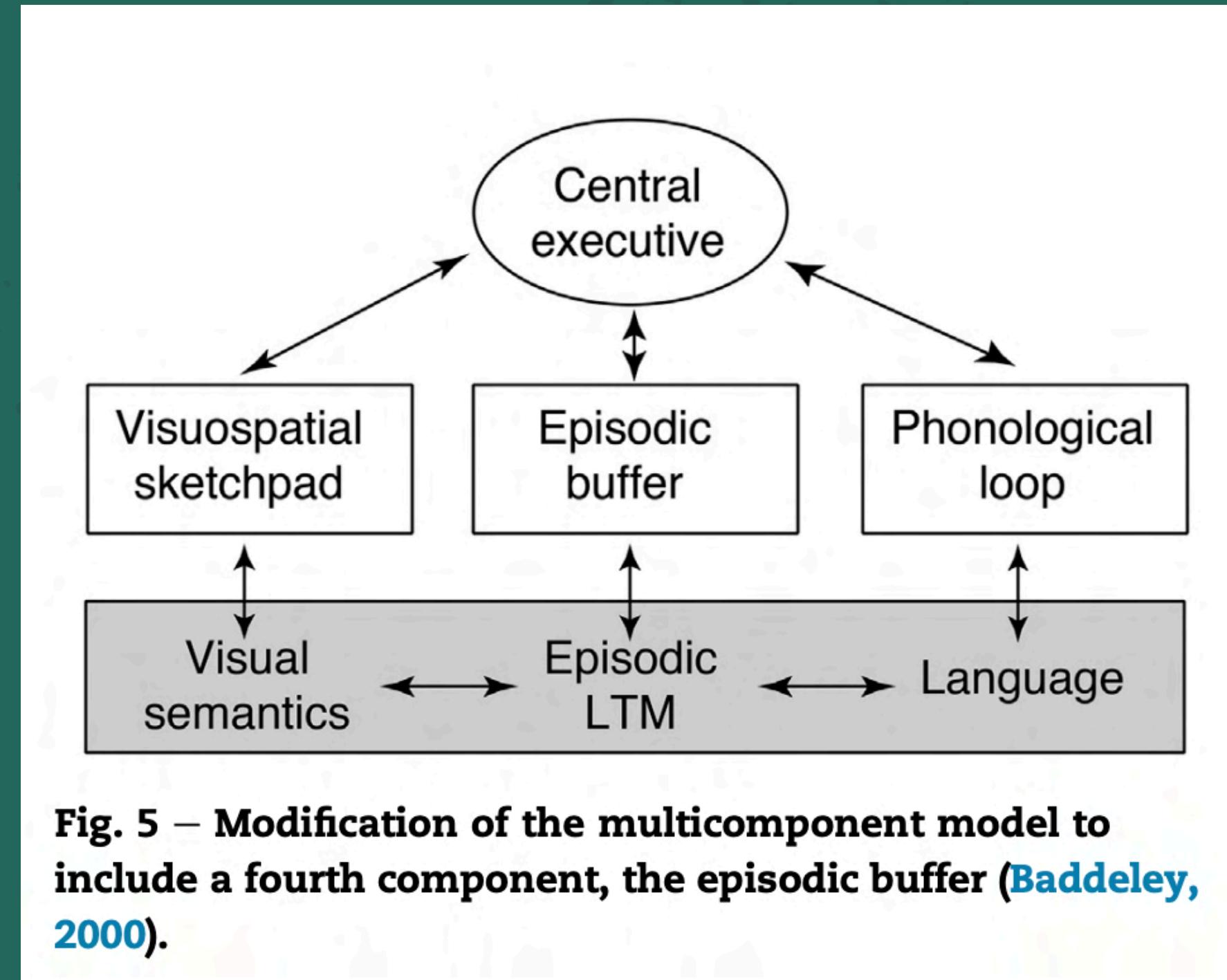
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1974



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**Fig. 5 – Modification of the multicomponent model to include a fourth component, the episodic buffer (Baddeley, 2000).**

(Baddeley & Hitch, 2019)

# Baddeley & Hitch's Working Memory Model

1974



**Key Insight:** Working memory is a set of **specialized, interacting components**, allowing us to simultaneously process verbal and visual-spatial information

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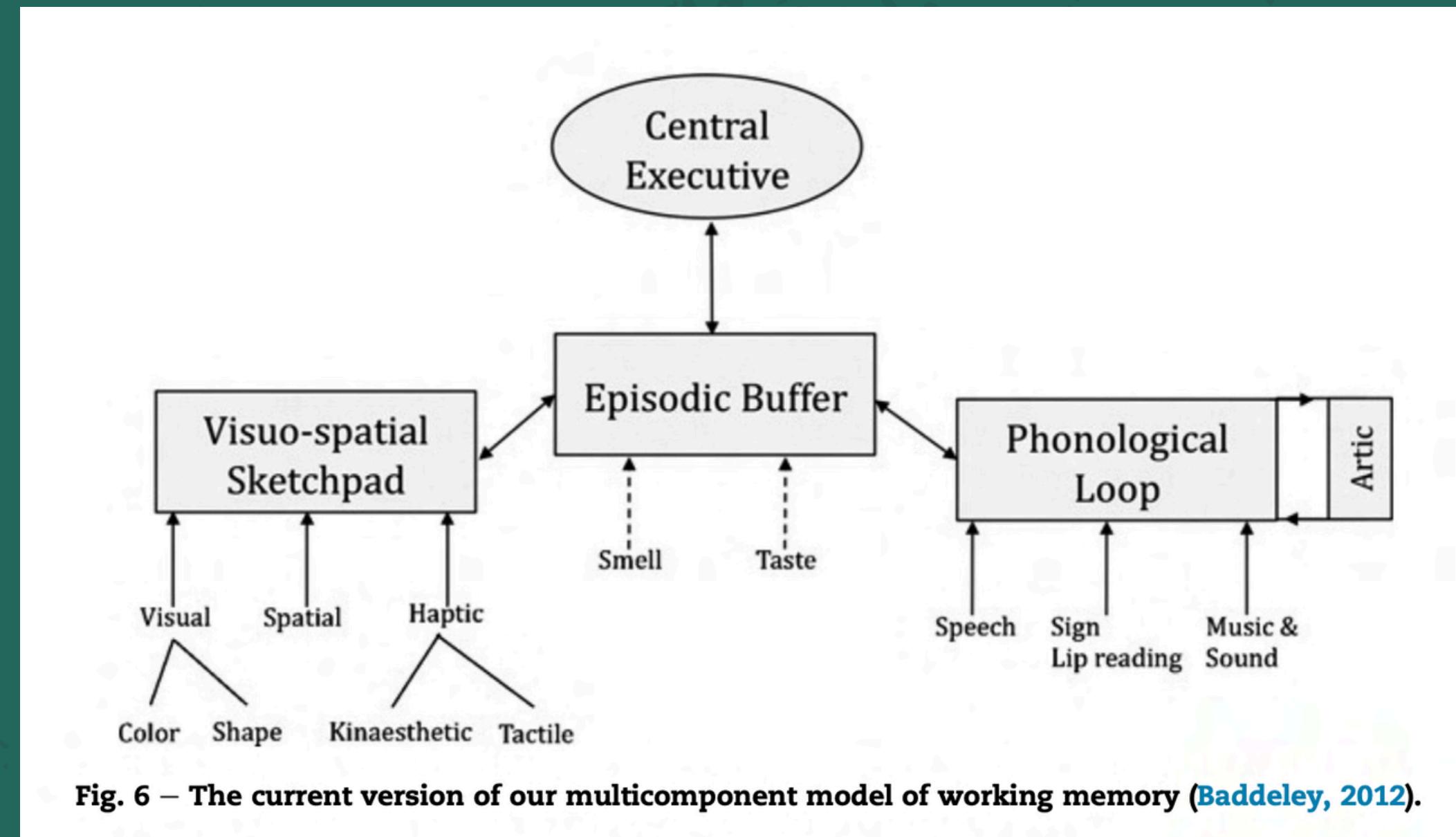
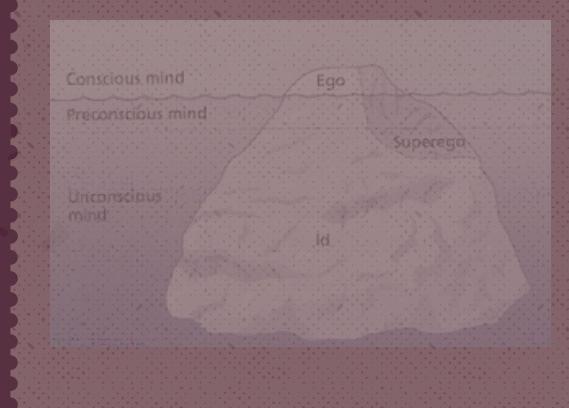


Fig. 6 – The current version of our multicomponent model of working memory (Baddeley, 2012).

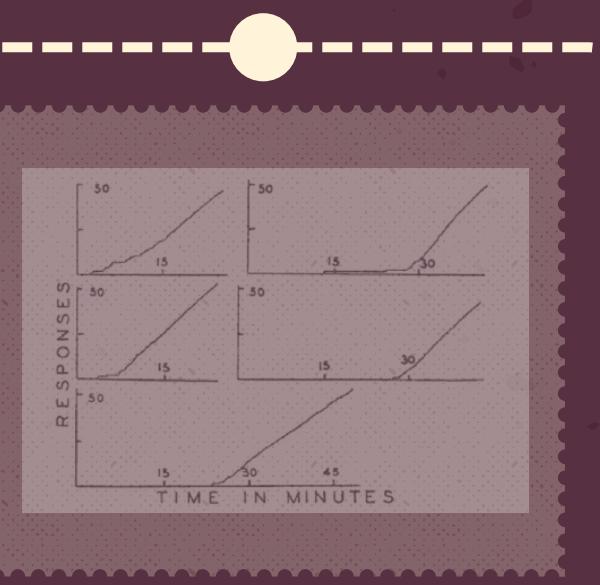
(Baddeley & Hitch, 2019)

# TIMELINE

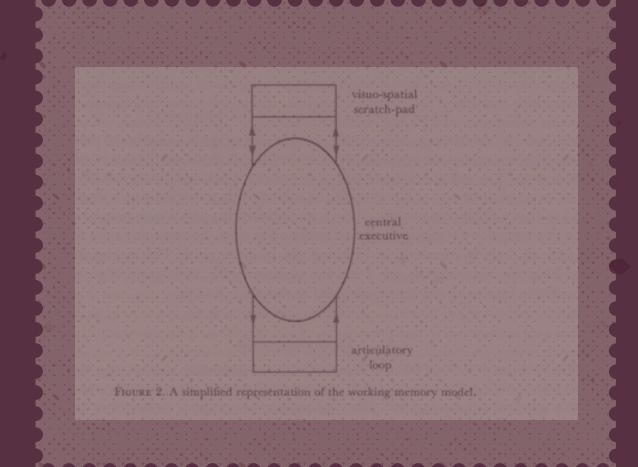
Early 1800s



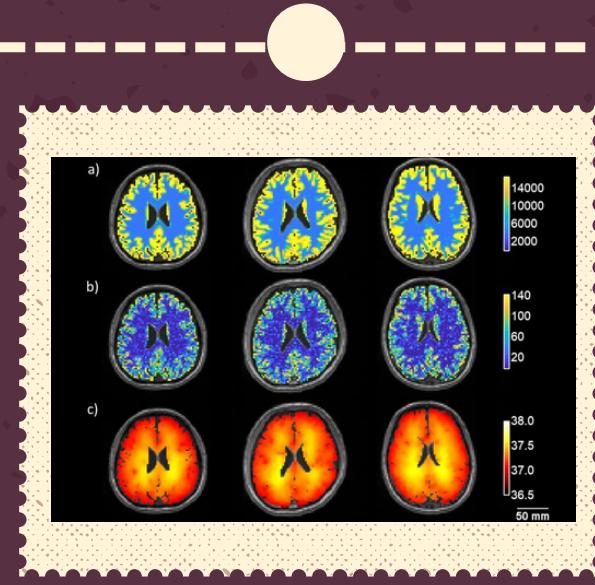
Early Conceptual & Theoretical Diagrams



Empirical Graphs



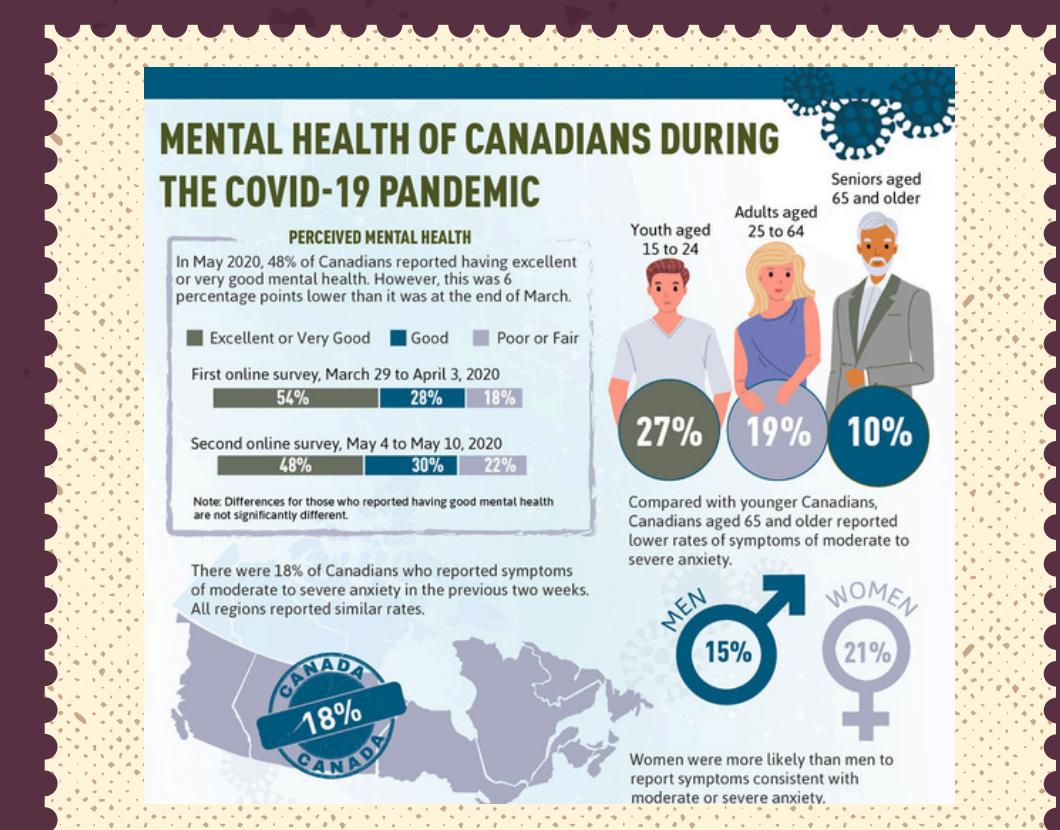
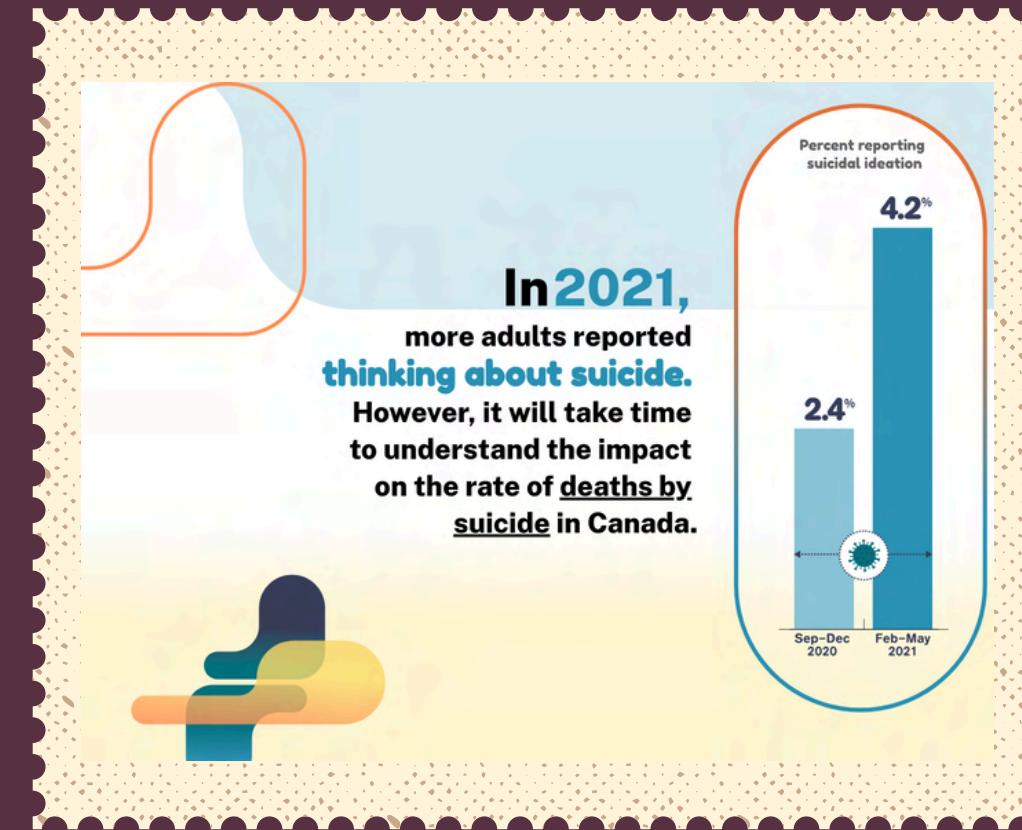
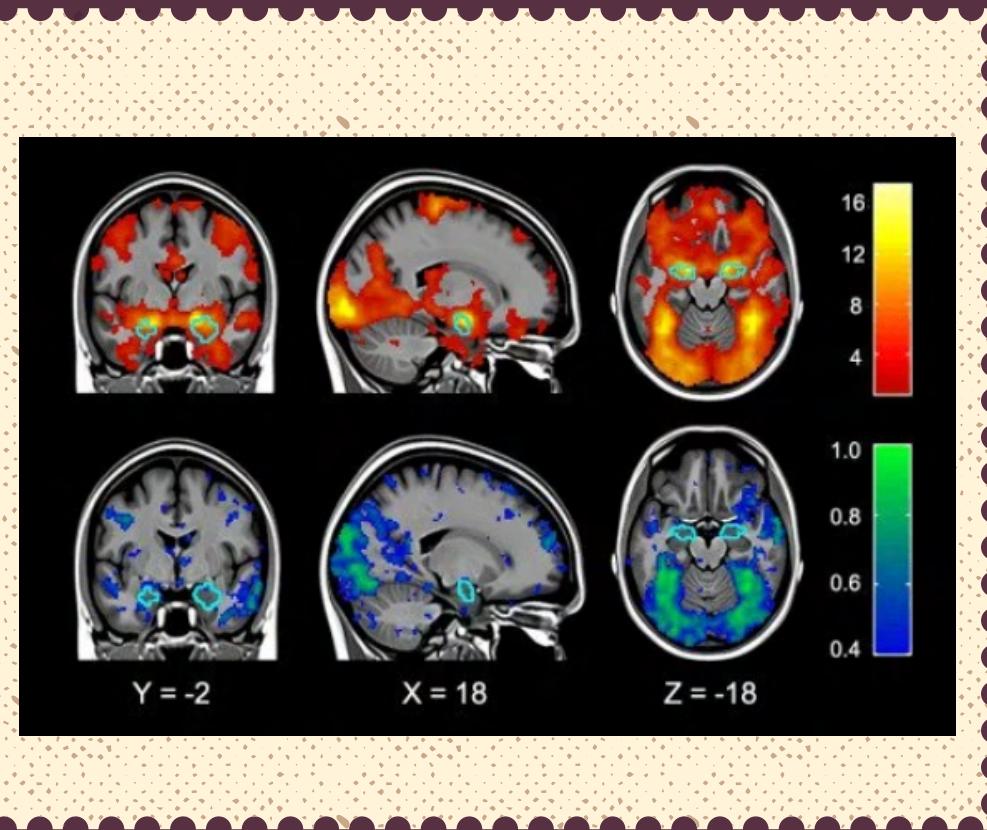
Cognitive & Information Processing Models



Modern Big Data Visualization

Present

# MODERN DATA VISUALIZATIONS IN PSYCHOLOGY



Brain Imaging

Interactive  
Dashboards

Mental Health Awareness  
Infographics

# Brain Imaging (PET, fMRI, EEG)

1970s

## Importance:

- From abstract to anatomical
- From theoretical models to empirical maps
- Data complexity & interactivity
- Statistical mapping

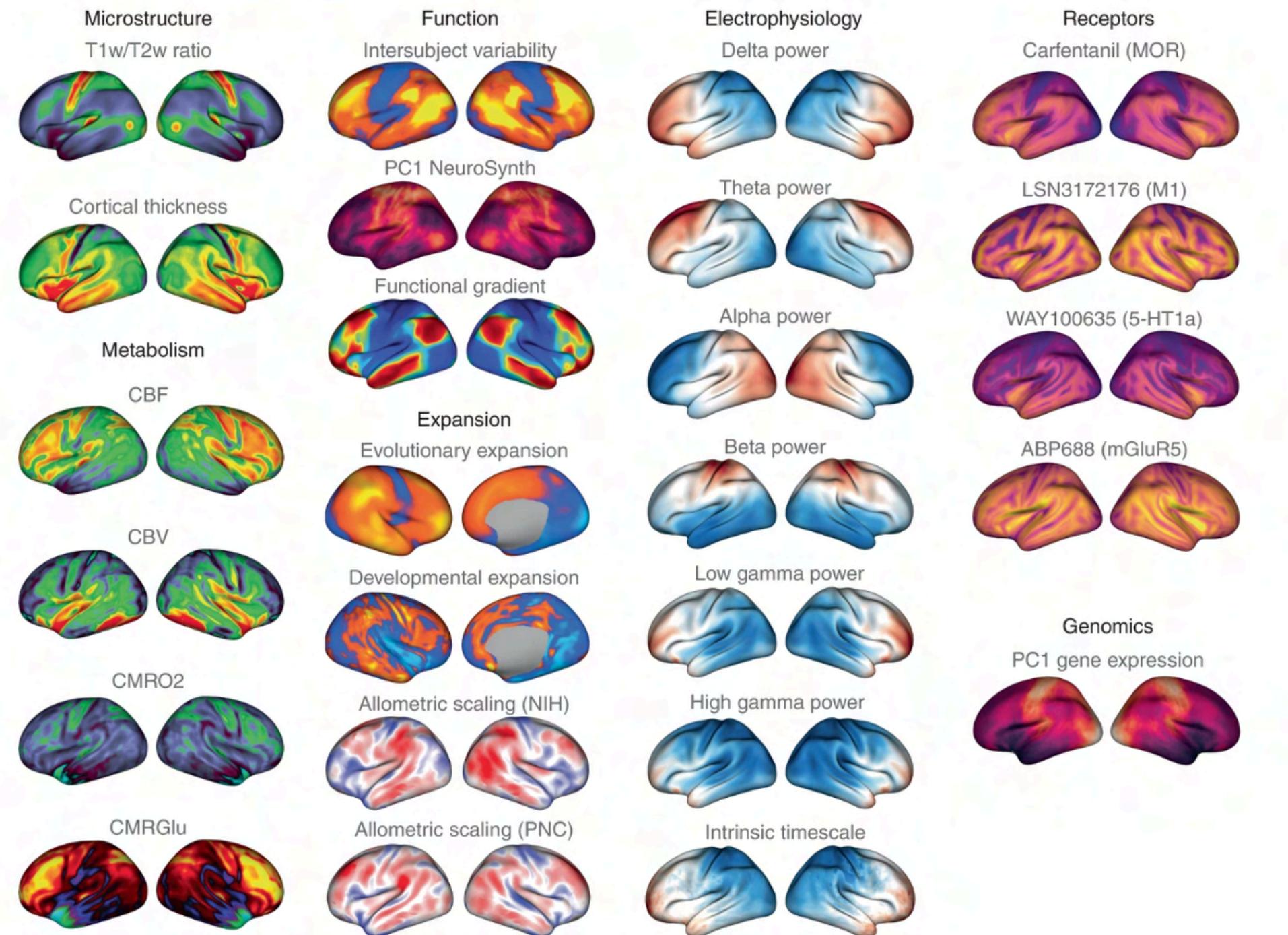
## Data Visualization Tools:

- SPM
- FMRIB Software Library (FSL)
- Connectome Workbench
- **R Packages:** CerebroViz, NeuroimaGene, ggseg, ggseg3d

(Goldstone, Pestilli, & Börner, 2015; Lunn, Shaw, & Winder, 2022)

**Fig. 2: Brain maps from the published literature.**

From: [neuromaps: structural and functional interpretation of brain maps](#)



(Markello et al., 2022)

# Interactive Dashboards

Late 2000s

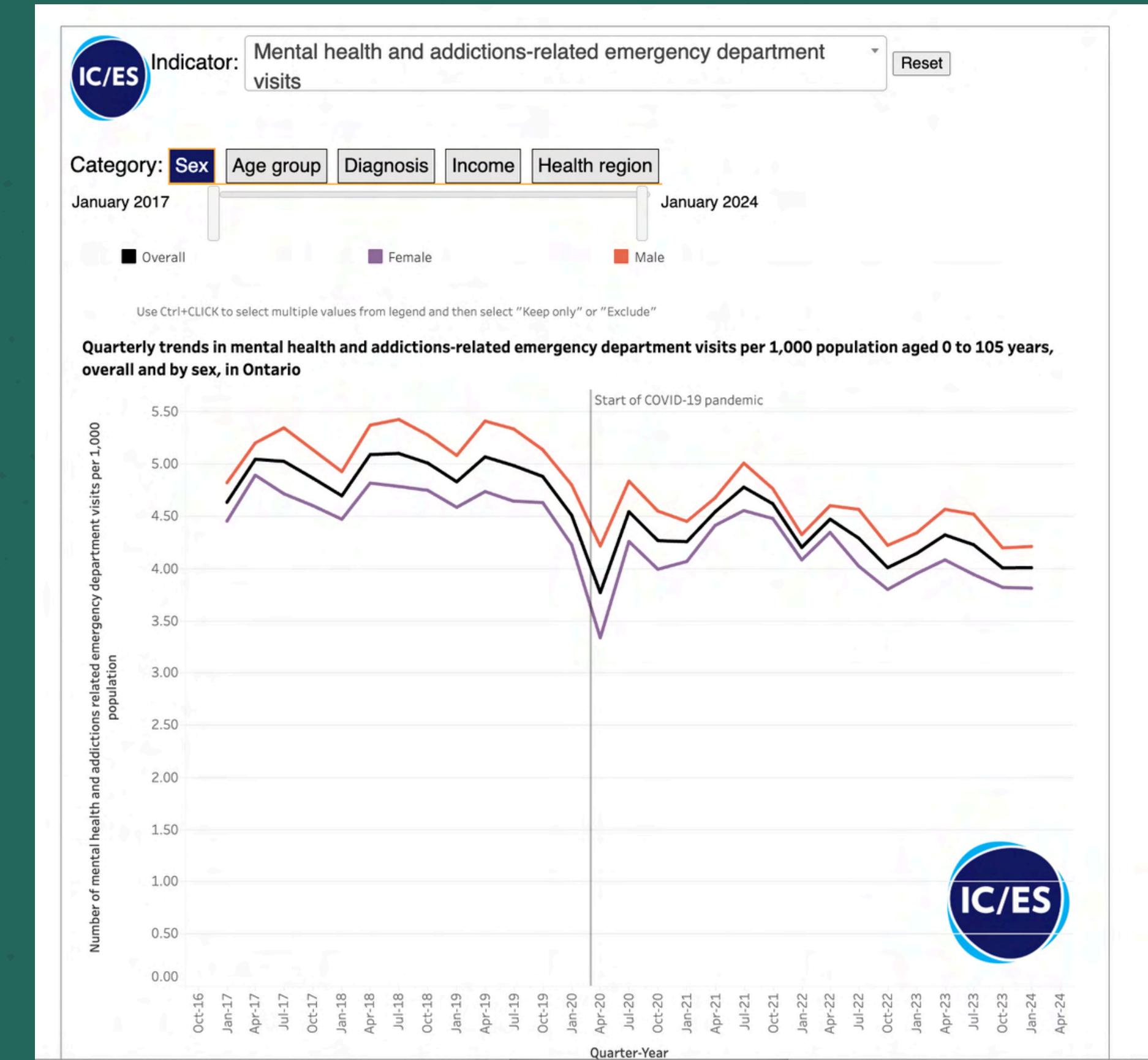
## Importance:

- From static to interactive
- Real time data monitoring
- Improved accessibility & transparency
- Multimodal integration

## Data Visualization Tools:

- R Shiny
- Tableau
- Power BI
- Google Data Studio
- Python Dash

(Ellis & Merdian, 2015; Papas & Whitman, 2011)



(ICES, 2024)

# Mental Health Awareness Infographics

Mid 2010s

## Importance:

- Access to psych knowledge
- Combatting stigma
- Preventative education
- Action & advocacy

## Data Visualization Tools:

- Canva
- Piktochart
- Figma
- Infogram



## Mental Health Referral Insights in Ontario 2023

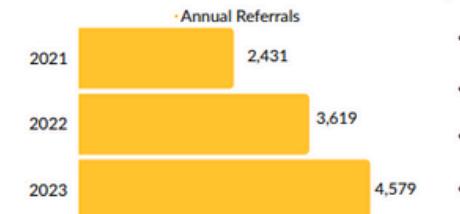
askforhelptoday.ca

Anxiety is the primary issue across all ages

Depression ranks second among adults and teens, while children primarily face challenges related to emotion regulation. Trauma is a significant concern for adults, whereas ADHD is prevalent among teens and children, ranking third. School-related issues hold the fifth position for teens and fourth for children.



Bypassed 10,000 Referrals in October 2023



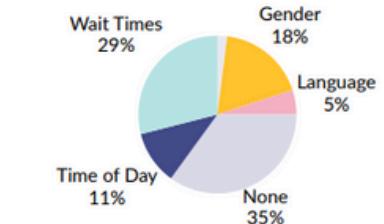
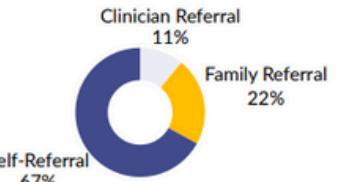
Individual therapy continues to be the most sought-after psychological service. Psychological assessment services, which saw a 224% increase between 2021 and 2023, was second.

Growing demand for psychological services

- Private services on the rise post-COVID due to limited access to public agencies
- 27% more referrals in 2023 compared to 2022 (as of November 30th)
- Largest annual rise seen in children & youth (0-12) from 2021 to 2022
- Seniors (66+) saw the highest increase between 2022 & 2023

## Referral patterns

11% of referrals were sent by physicians, nurse practitioners & other clinicians. Of these, 60% were sent as part of the publicly funded frontline workers program, indicating the public sector will leverage services when they are publicly funded (e.g., OHIP).



## Patient preferences

While 35% of Ontarians had no specific preference with regards to their psychologist, many indicated low wait times & the clinician's gender as most important.



## Regional insights

Higher demand per capita in southern Ontario cities. This may signal greater need, less access to publicly funded services, and/or better access to benefits, among other things.



OPA provides a scalable and integrated centralized intake service that matches patients of all ages with the support they need. Get in touch with us today to discover more.

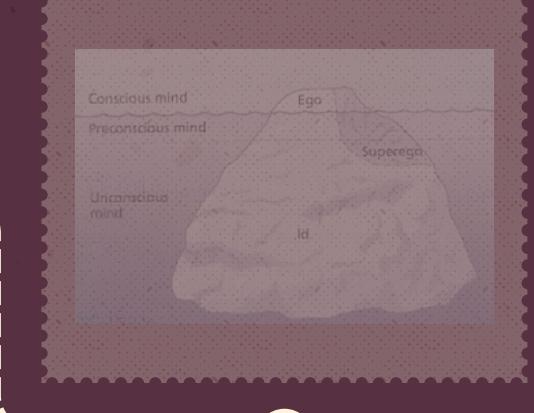
Strata Health

www.askforhelptoday.ca  
Phone: (437) 242 7809  
Email: [askforhelptoday@psych.on.ca](mailto:askforhelptoday@psych.on.ca)

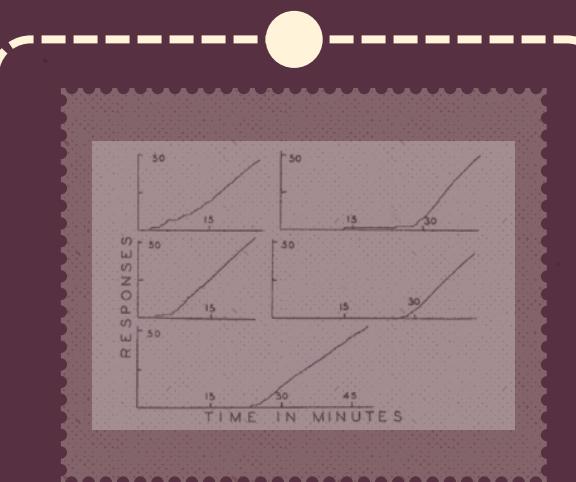
ONTARIO PSYCHOLOGICAL ASSOCIATION

# TIMELINE

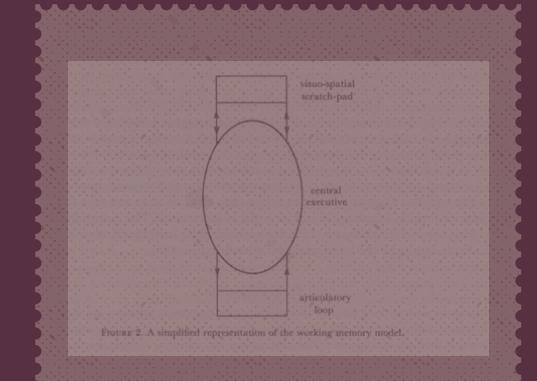
Early 1800s



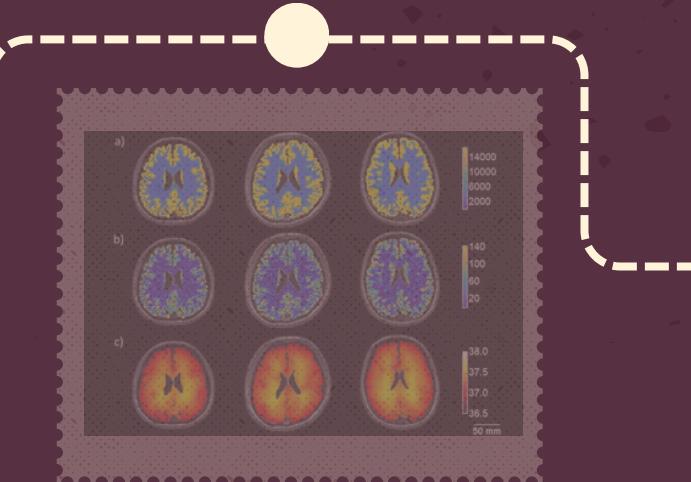
Early Conceptual & Theoretical Diagrams



Empirical Graphs



Cognitive & Information Processing Models



Modern Big Data Visualization



Future Directions in Psychological Data Visualizations

# FUTURE DIRECTIONS IN PSYCHOLOGICAL DATA VISUALIZATIONS

AI-Generated

(e.g., Lin et al., 2023)

Virtual & Augmented  
Reality

(e.g., Olshannikova et al., 2015)

Sonification & Haptics

(e.g., Sawe, Chafe, & Treviño, 2015)

Natural Language  
Processing

(e.g., Lin et al., 2023; Uddin, 2024)

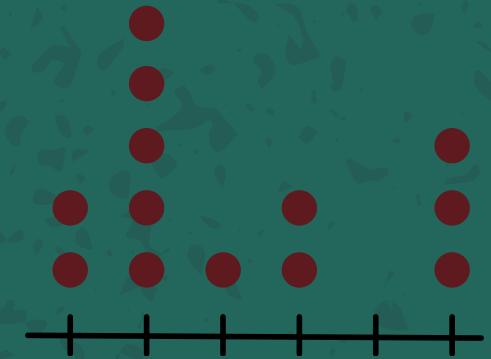
Real-Time  
Biofeedback

(e.g., Gradl et al., 2018)

Thank you!



# Points to Ponder



- 1** What voices, perspectives, theories, or phenomena might be lost (or newly included) as data visualization continues to evolve in psychology?
- 2** How has the shift from hand-drawn models to digital, data-driven visualizations changed how we define, interpret, and trust, psychological “evidence”?
- 3** How has the evolution of psychological visualization changed the audience/consumers of psychological knowledge?

