THE EVOLUTION OF INFOGRAPHICS IN PSYCHOLOGY:

From Theoretical Diagrams to Data-Driven Visualizations

Marlee Salisbury

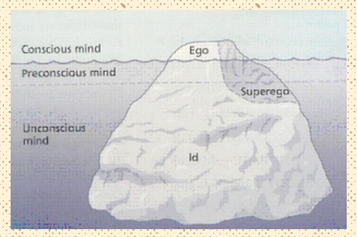
PSYC6135

April 10th, 2025

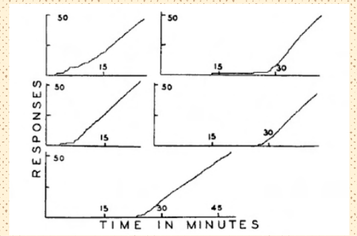
Contents

TIMELINE

Early 1800s



Early Conceptual & Theoretical Diagrams



Empirical Graphs

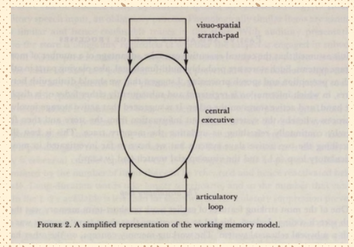
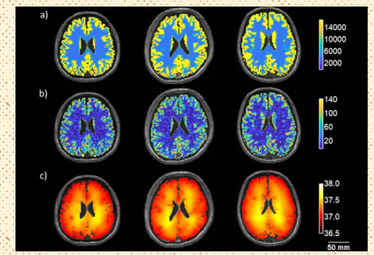


FIGURE 2. A simplified representation of the working memory model.

Cognitive & Information Processing Models

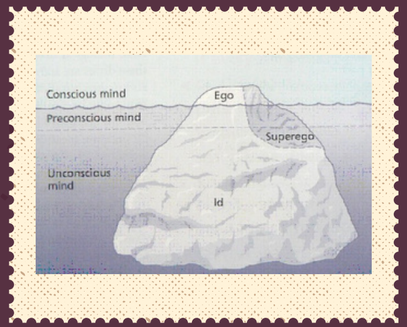


Modern Big Data Visualization

Present

TIMELINE

Early 1800s



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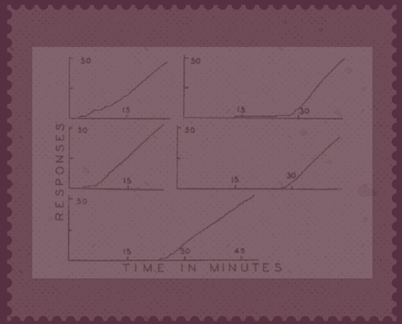

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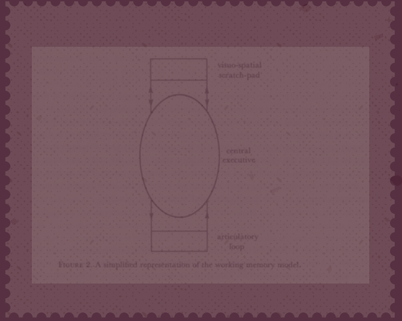
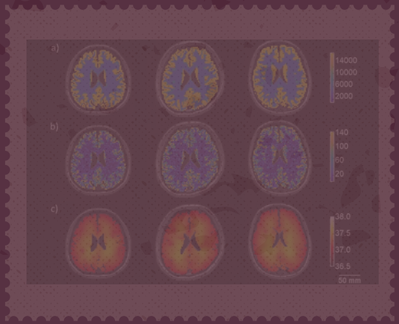


Cognitive & Information Processing Models

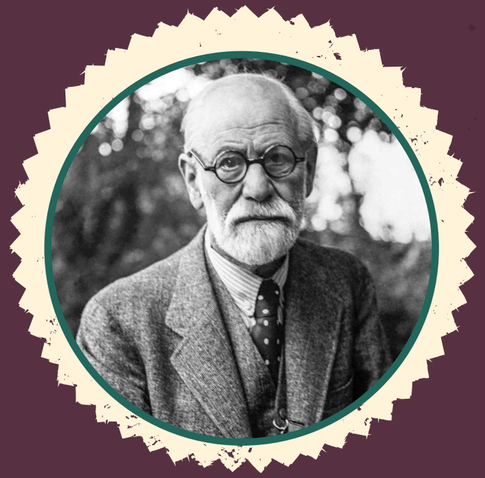


Modern Big Data Visualization

Present

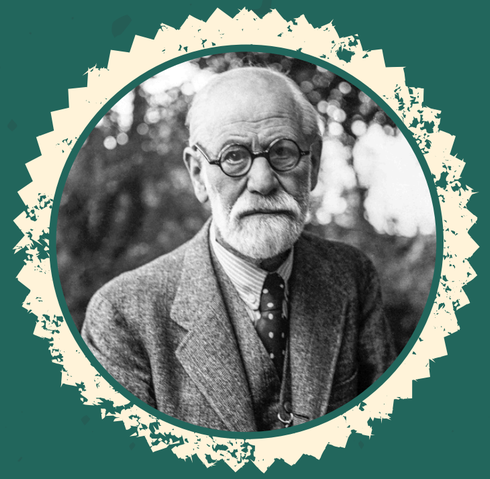
EARLY CONCEPTUAL & THEORETICAL DIAGRAMS

Key Figures



Sigmund Freud

Franz Joseph Gall



Sigmund Freud's Topographical & Iceberg Model (?)

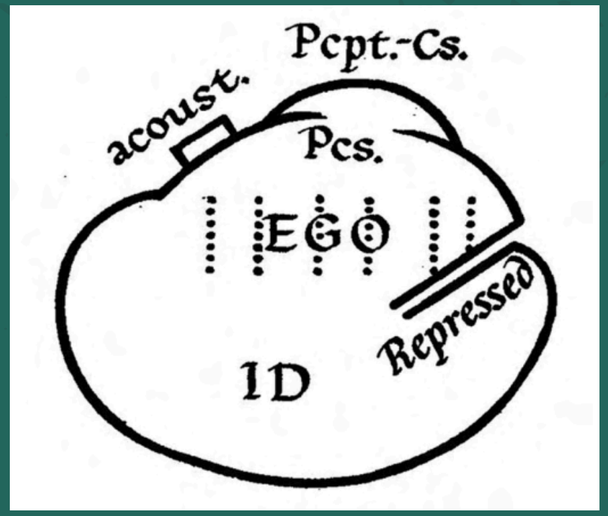
1890–1920s

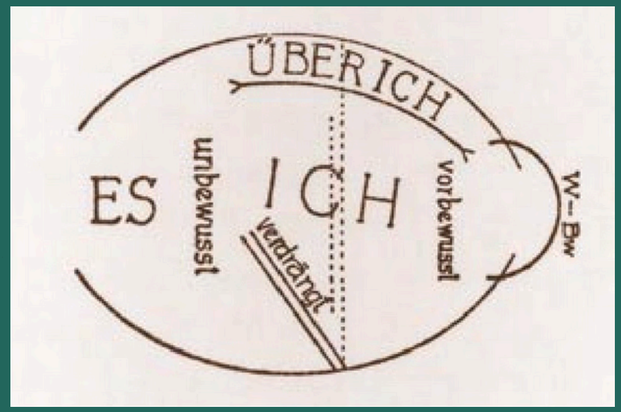
Map of human consciousness (conscious, preconscious, and unconscious), emphasizing that most mental activity occurs beneath conscious awareness

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

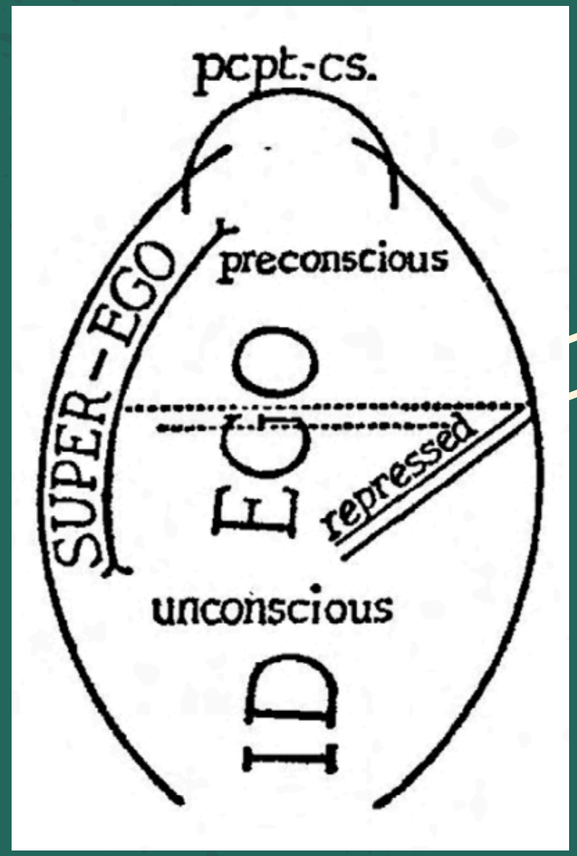
Importance: Laid foundation for psychoanalysis, dream analysis, personality theory, and therapeutic techniques. Made an abstract theory of mind visually intuitive.

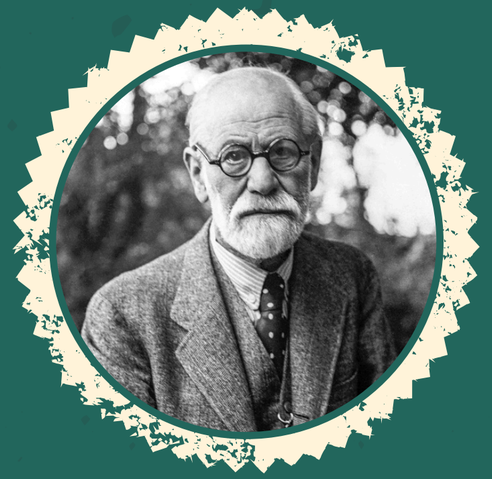
(D'onogue, 2007; Gamwell & Solms, 2006)





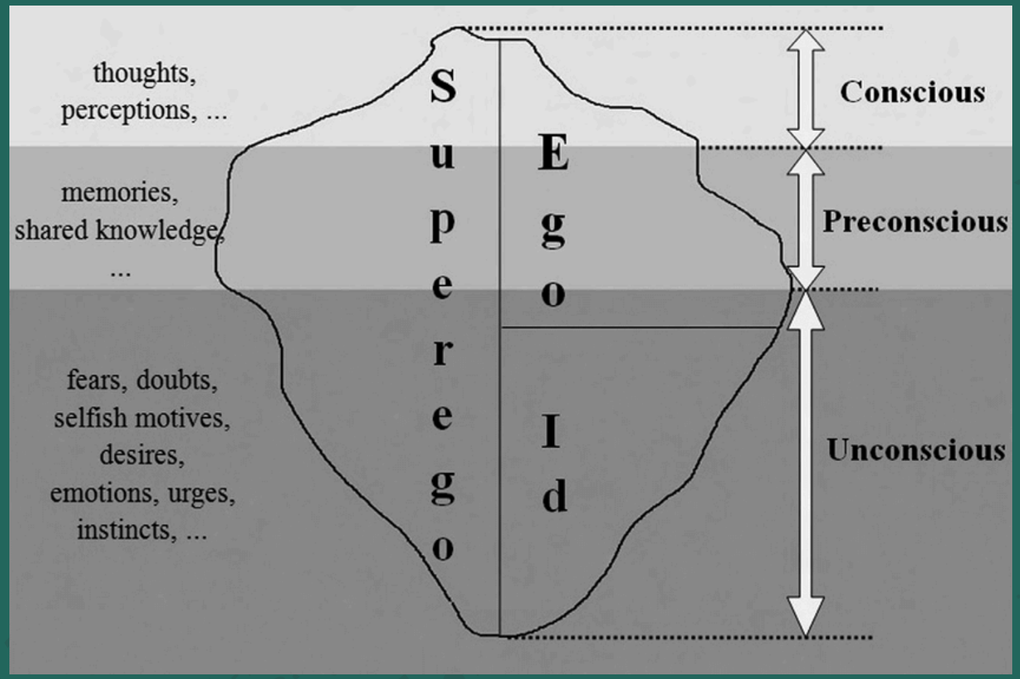
(Freud, 1923, 1964)



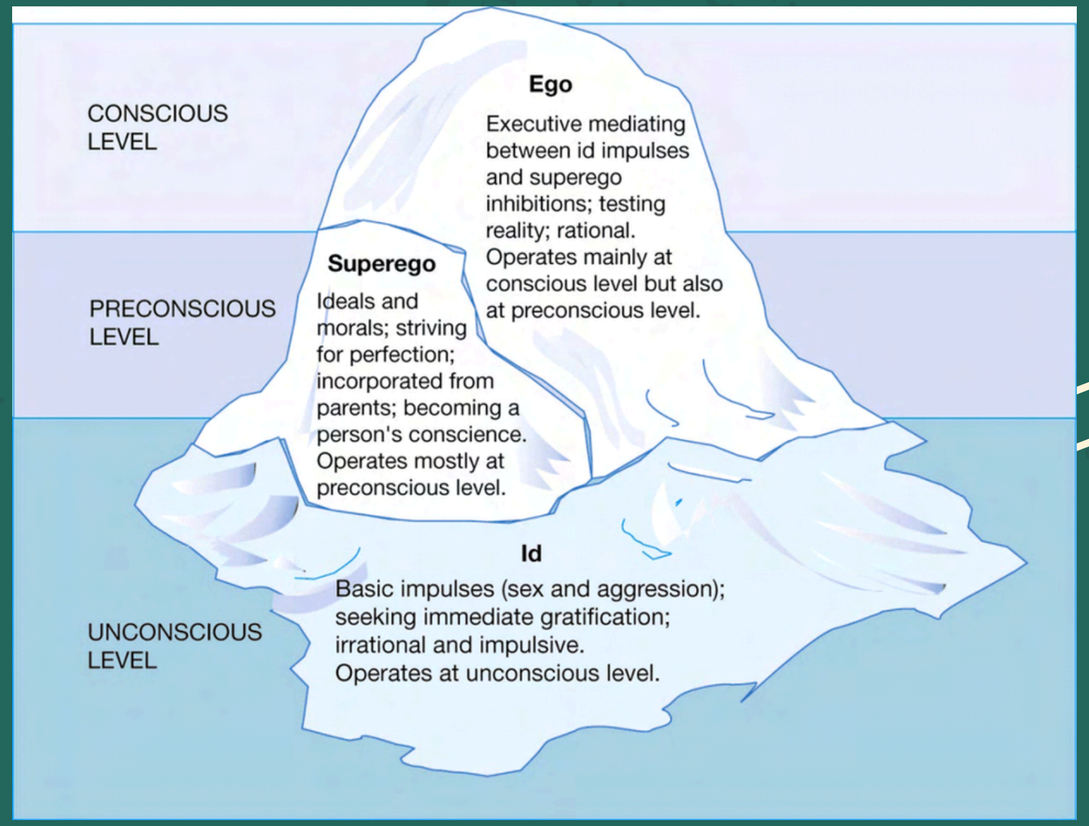


Sigmund Freud's Topographical & Iceberg Model (?)

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

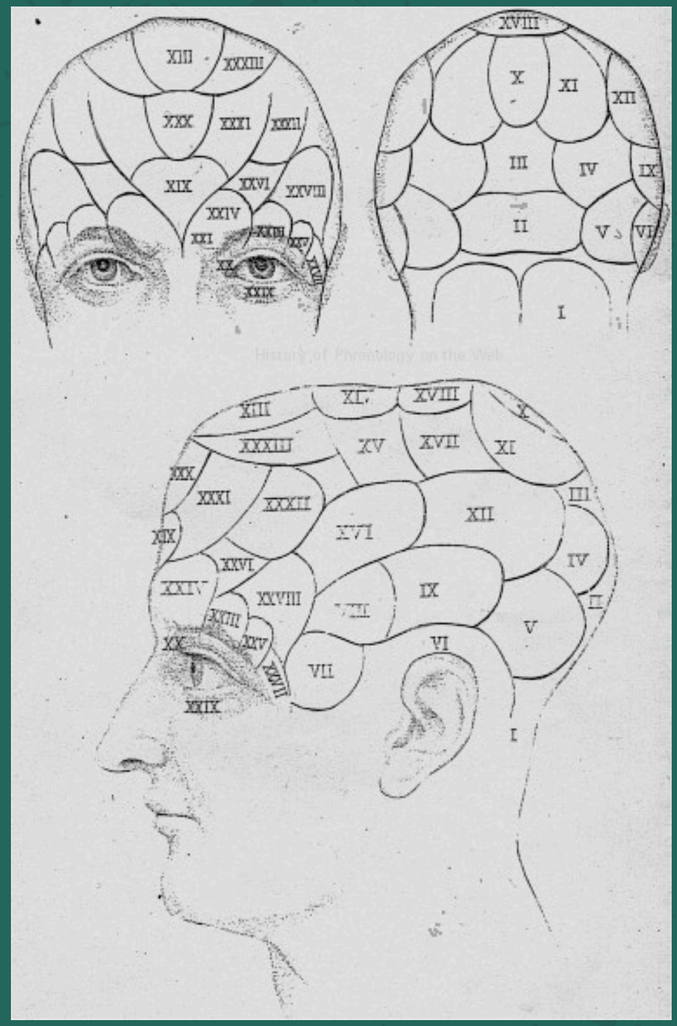
Different brain regions control specific personality traits, emotions, and abilities, which could be determined by feeling the bumps on a person's skull.

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)

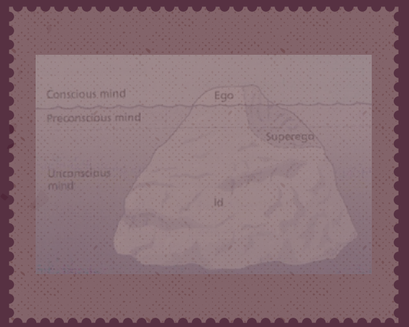
***See: "The History of Phrenology on the Web" by John van Wyhe* (https://www.historyofphrenology.org.uk/)**



(Gall and Spurzheim, 1815)

TIMELINE

Early 1800s



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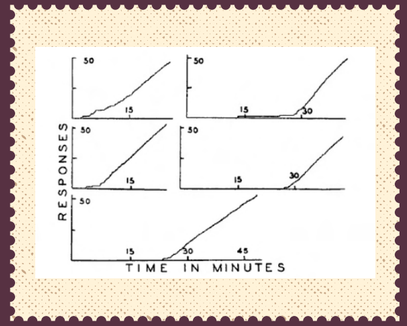
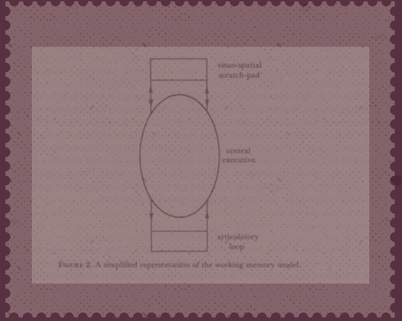
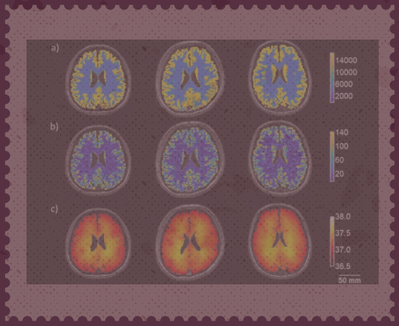


Empirical Graphs



Cognitive & Information Processing Models



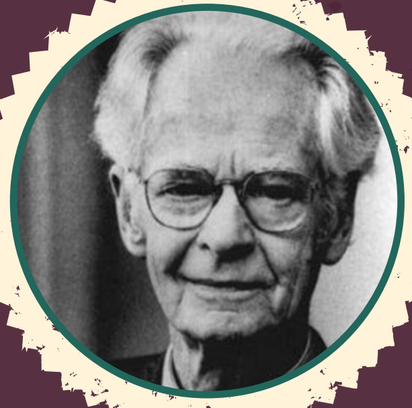
Modern Big Data Visualization

Present

THE RISE OF EMPIRICAL GRAPHS

Key Figures

Herman Ebbinghaus



B.F. Skinner

Herman Ebbinghaus' Forgetting Curve

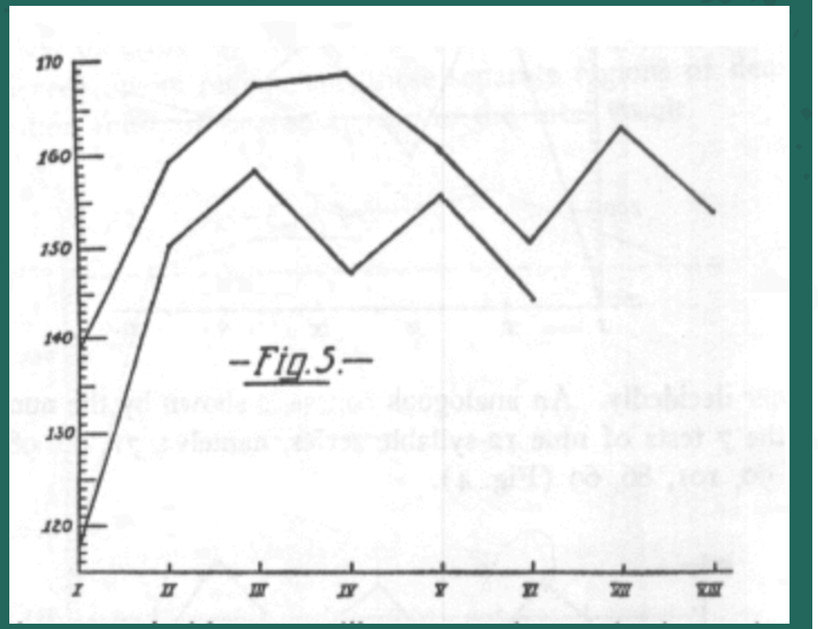
1885–1920s

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)



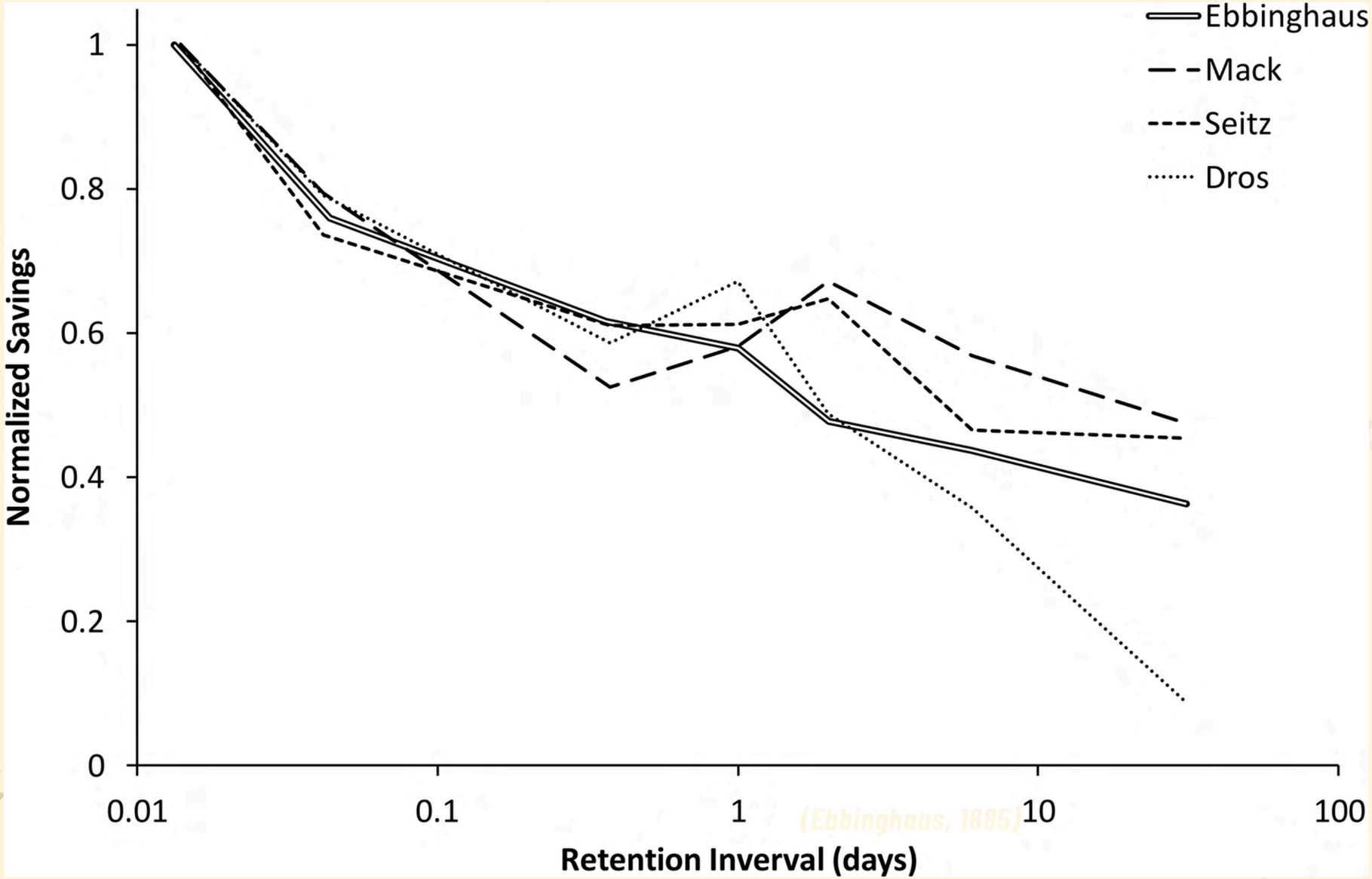
-Fig. 5.-

(Ebbinghaus, 1885)

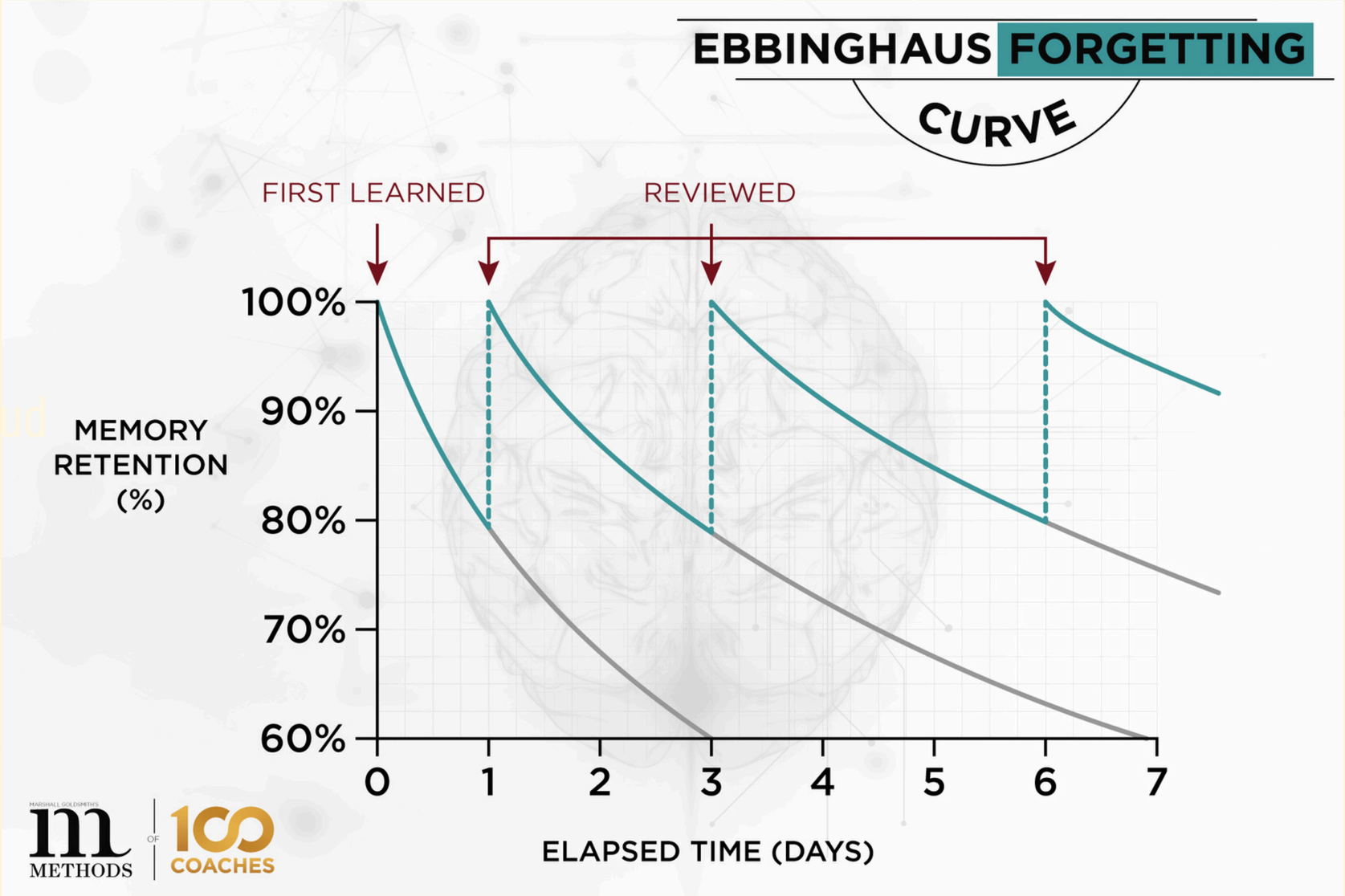
$x = 8$	$x = 16$	$x = 24$
$y =$	$y =$	$y =$
1171	998	1013
1070	795	853
1204	936	854
1180	1124	908
1246	1168	1004
1113	1160	1068
1283	1189	979
1141	1186	966
1127	1164	1076
1139	1059	1033
$m =$ 1167	1078	975
$w_m =$ ± 14	± 28	± 17

$x = 32$	$x = 42$	$x = 53$	$x = 64$
$y =$	$y =$	$y =$	$y =$
736	708	615	530
764	579	579	483
863	734	601	499
850	660	561	464
892	738	618	412
868	713	582	419
913	649	572	417
858	634	516	397
914	788	550	391
975	763	660	524
$m =$ 863	697	585	454
$w_m =$ ± 15	± 14	± 9	+ 11

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

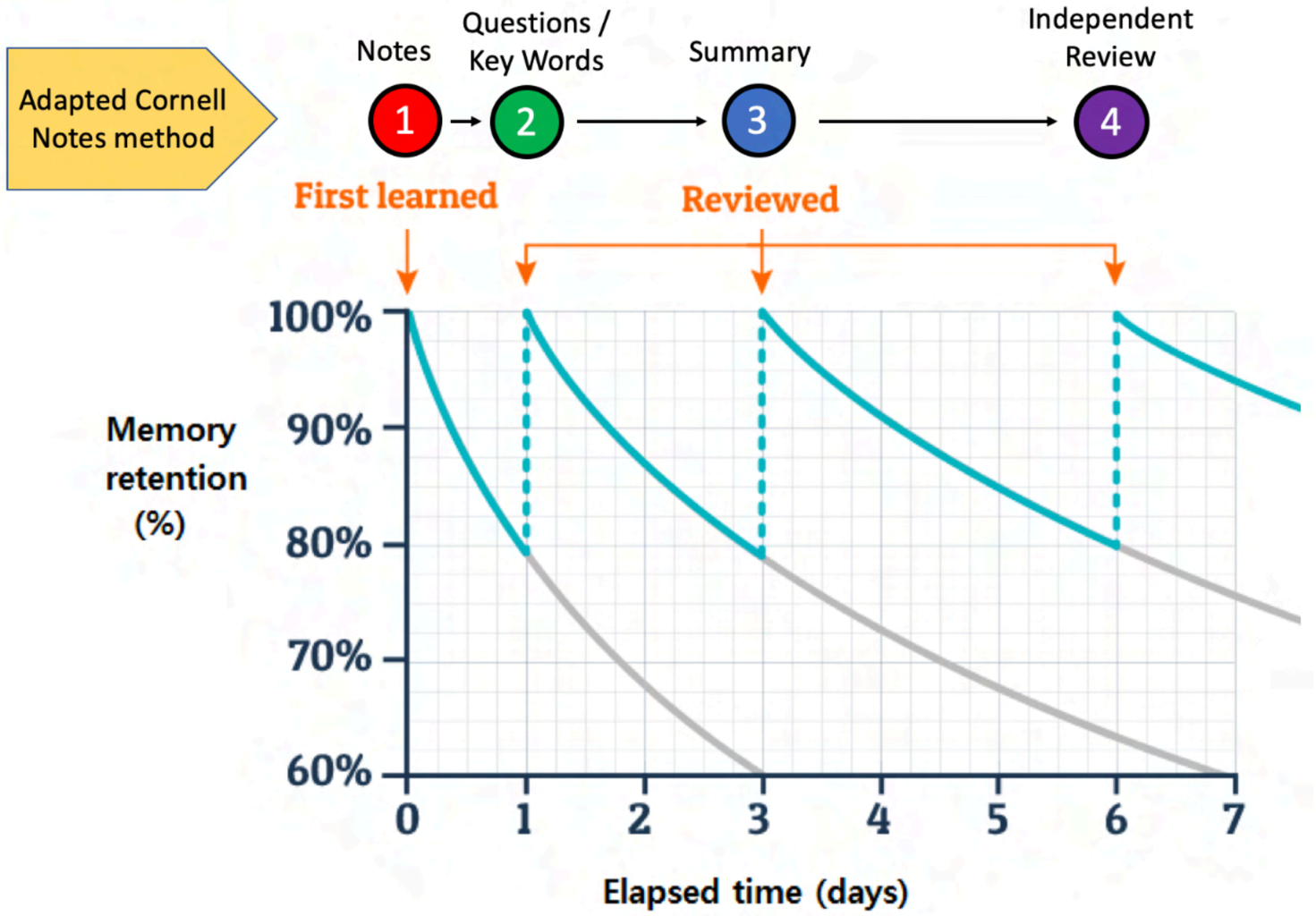


(Murre & Dros, 2015)

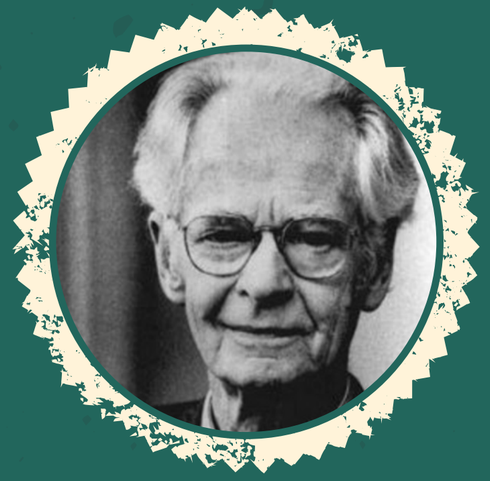


(Methods, 2022)

The Power of Review



(Chun & Heo, 2018)



B.F. Skinner's Behaviour Graphs

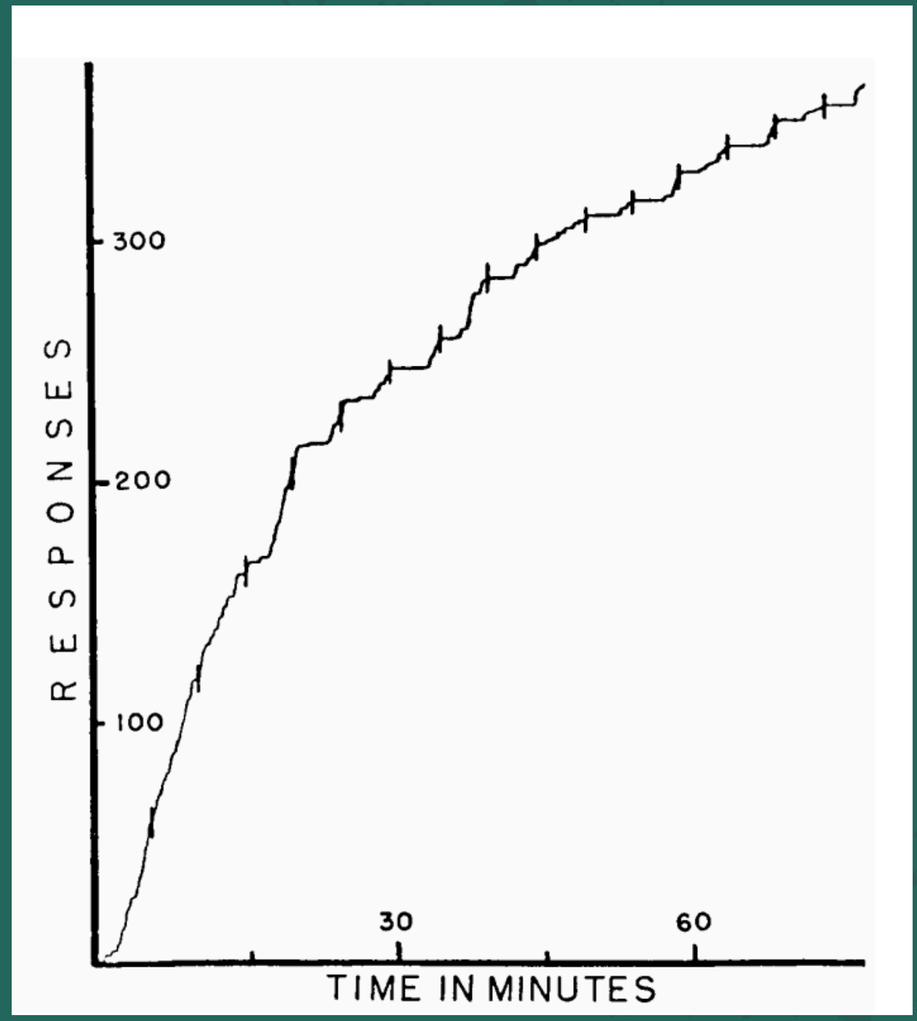
1938

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.

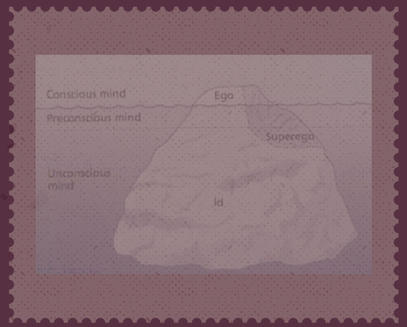
(Best, Smith, & Stubbs, 2001; Kubina et al., 2015)



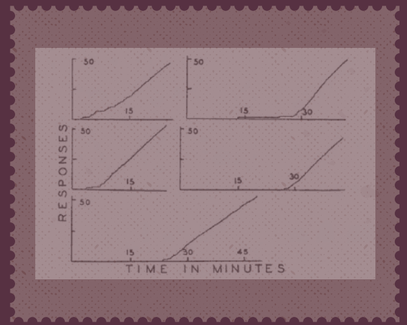
(Skinner, 1938)

TIMELINE

Early 1800s



Early Conceptual & Theoretical Diagrams



Empirical Graphs

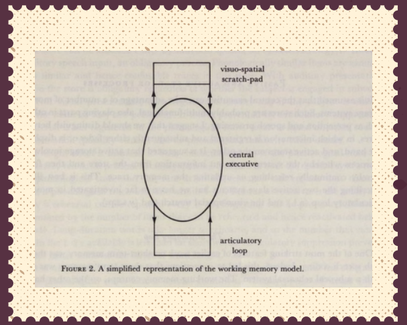
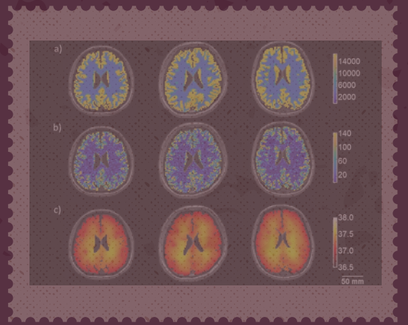


FIGURE 2. A simplified representation of the working memory model.

Cognitive & Information Processing Models



Modern Big Data Visualization

Present

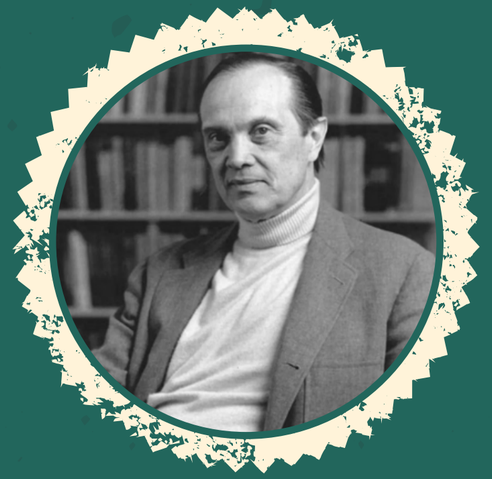
COGNITIVE PSYCHOLOGY & INFORMATION PROCESSING MODELS

Key Figures

George Armitage Miller

Alan Baddeley

Graham Hitch



Miller's Memory Capacity Graph

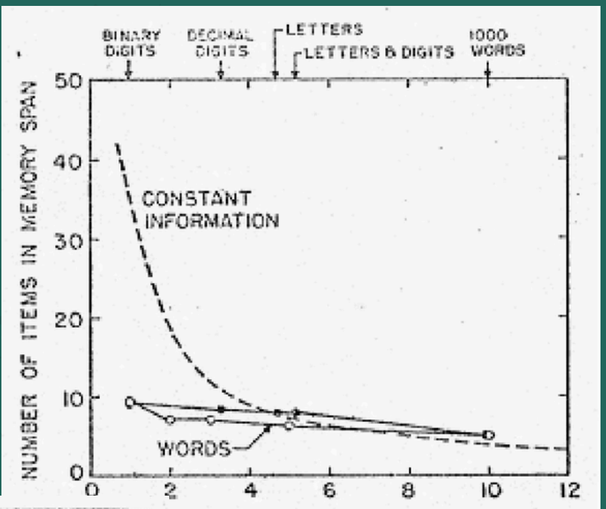
1956

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

Key Insight: Wuman 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)



ata from Hayes (10) on the span
e memory plotted as a function
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s.

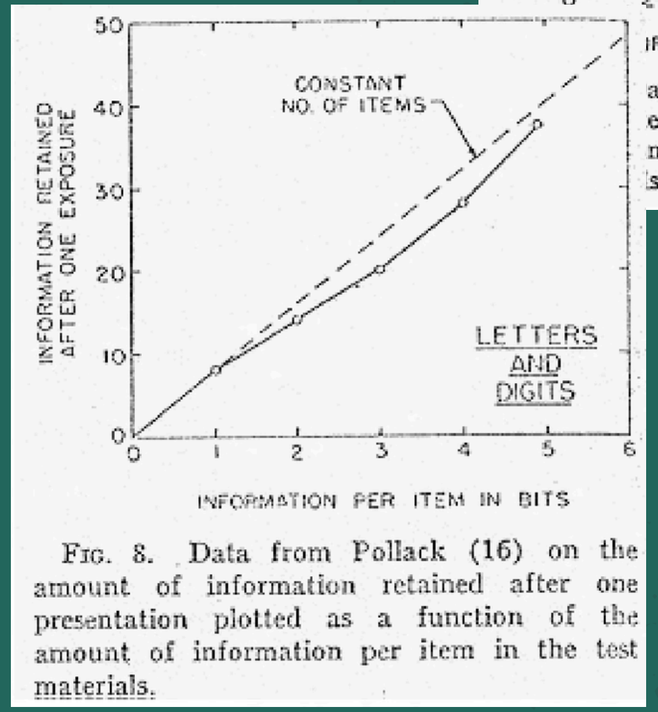


FIG. 8. Data from Pollack (16) on the amount of information retained after one presentation plotted as a function of the amount of information per item in the test materials.

(Miller, 1956)

The Magical Number Seven, Plus or Minus Two: Some Limits on our Capacity for Processing Information[1]

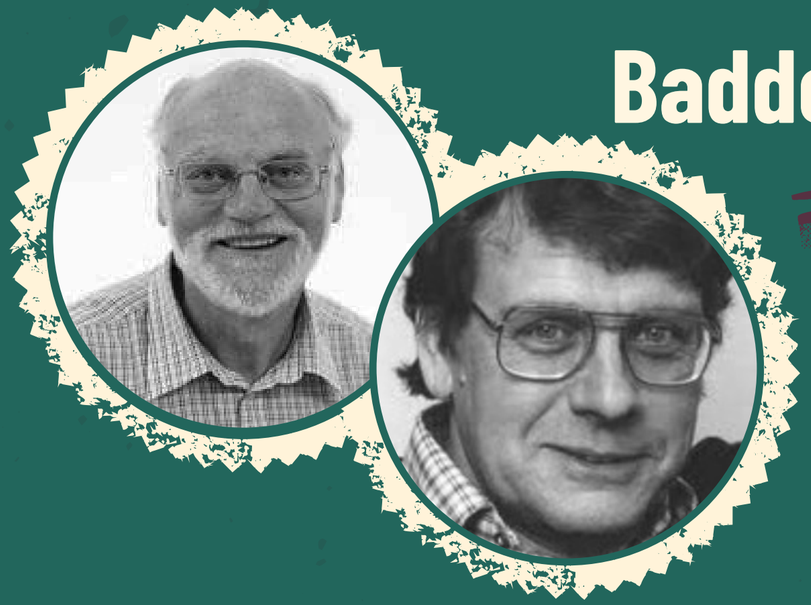
George A. Miller (1956)
Harvard University

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.

See: "George Miller's Magical Number of Immediate Memory in Retrospect: Observations on the Faltering Progression of Science" by Nelson Cowan (2016)

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

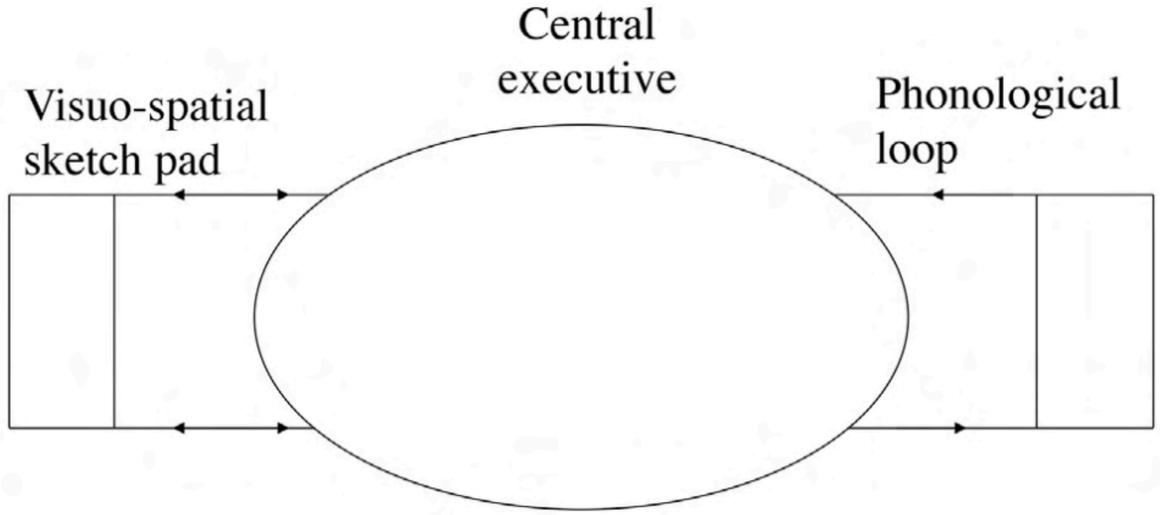
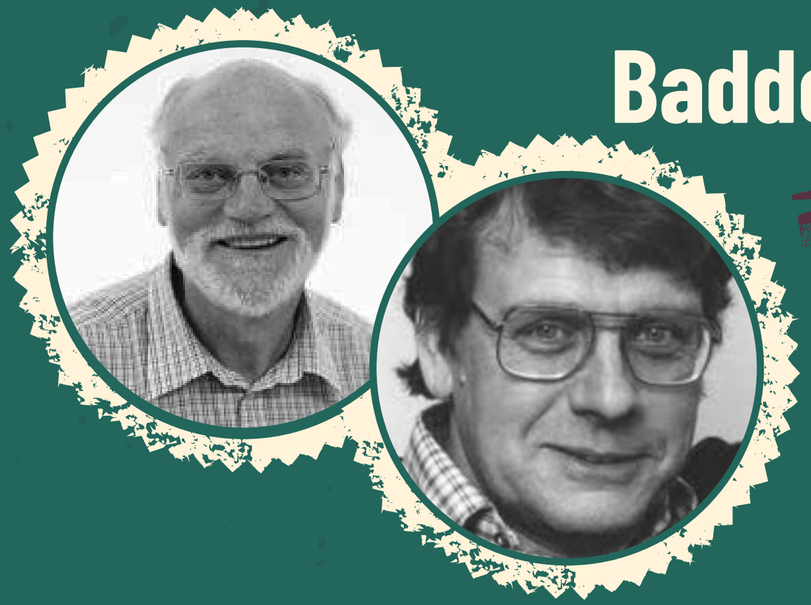


Fig. 1 – The initial working memory model proposed by Baddeley and Hitch (1974).

(Baddeley & Hitch, 2019)

Baddeley & Hitch's Working Memory Model



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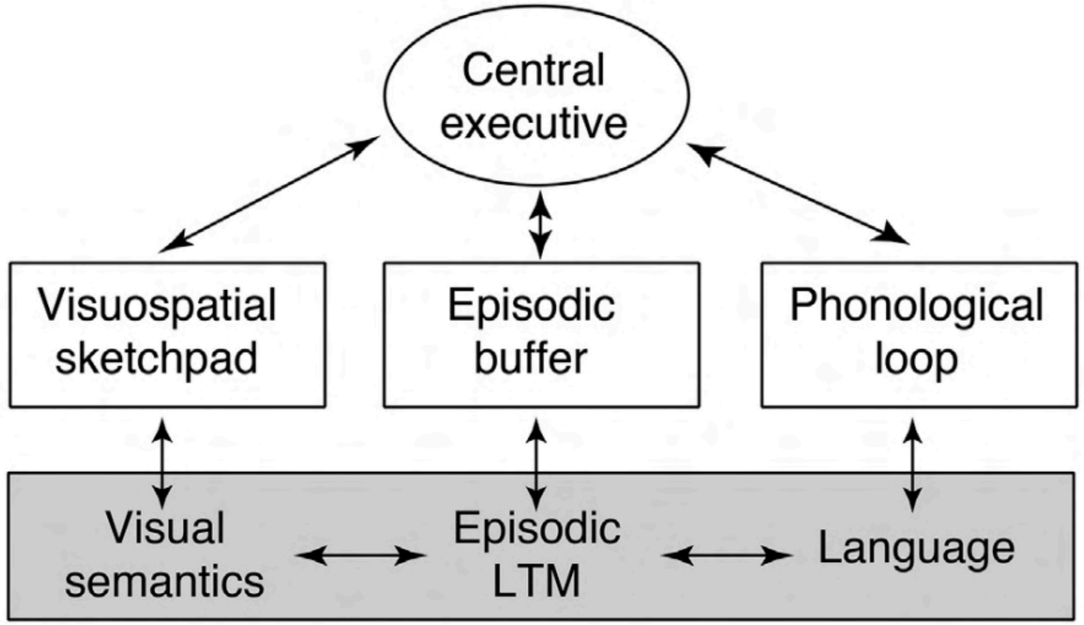
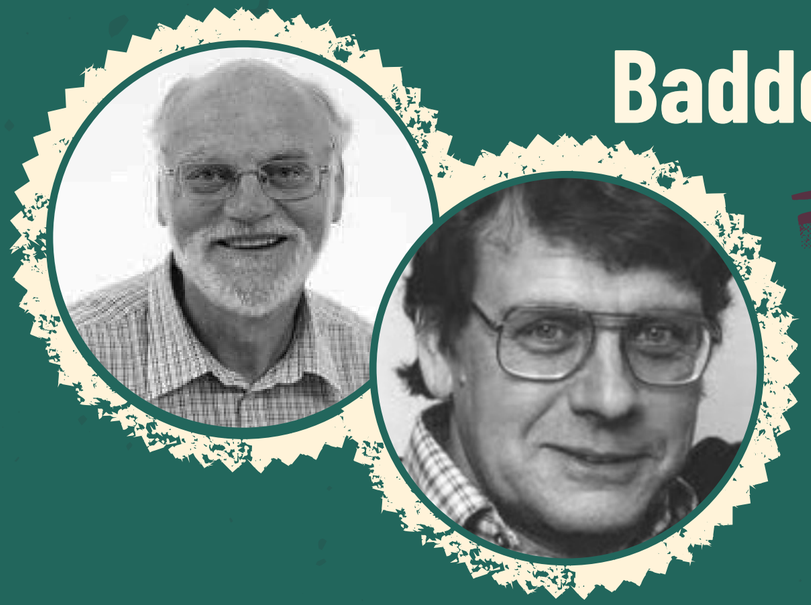


Fig. 5 – Modification of the multicomponent model to include a fourth component, the episodic buffer (Baddeley, 2000).

(Baddeley & Hitch, 2019)

Baddeley & Hitch's Working Memory Model



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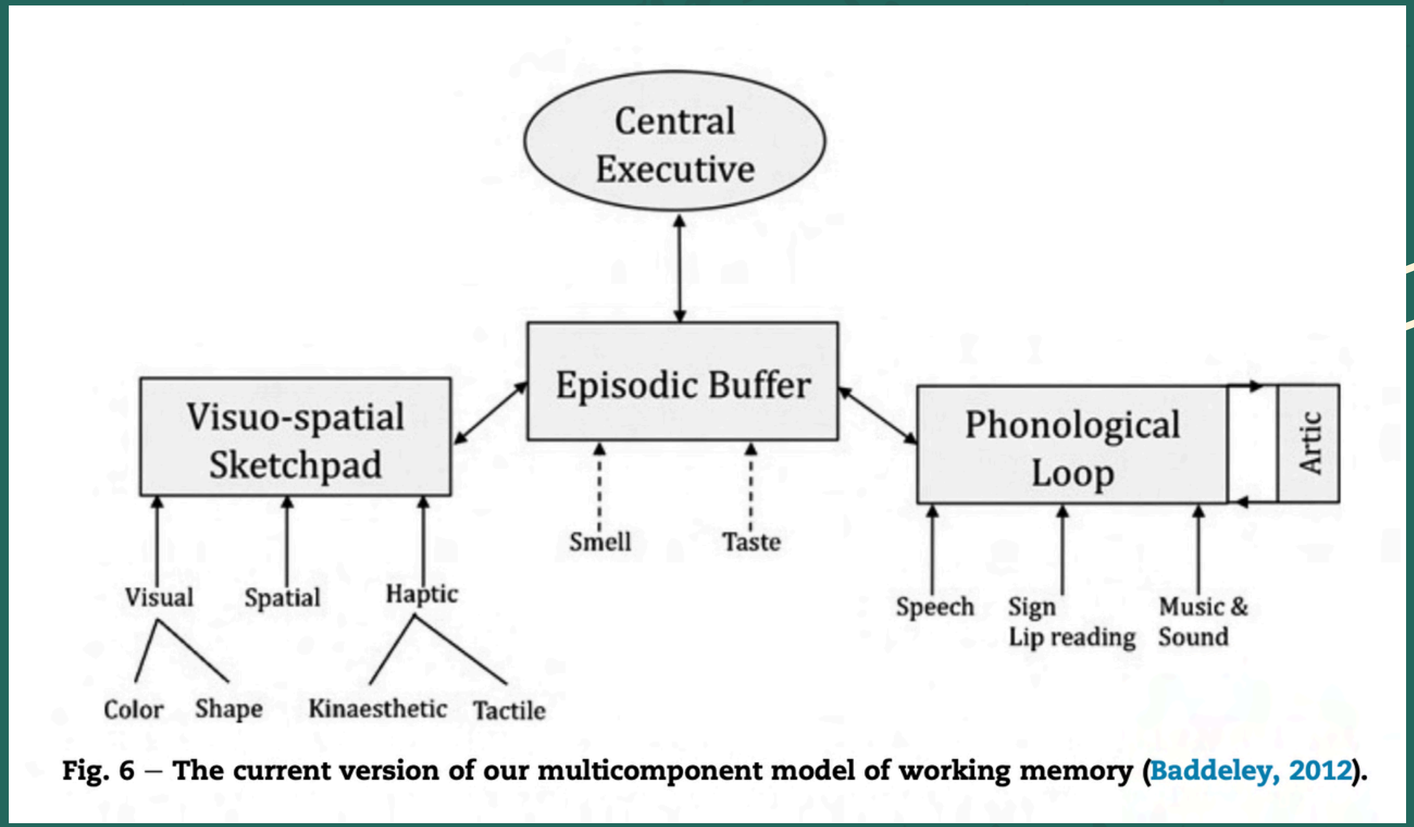
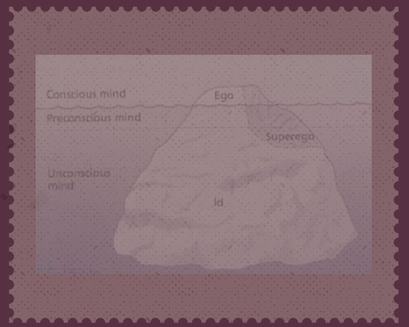


Fig. 6 – The current version of our multicomponent model of working memory (Baddeley, 2012).

(Baddeley & Hitch, 2019)

TIMELINE

Early 1800s



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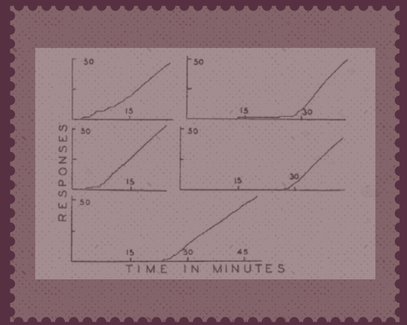
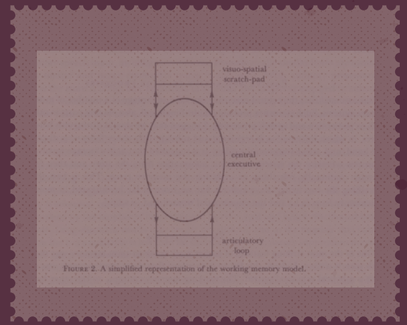


Empirical Graphs



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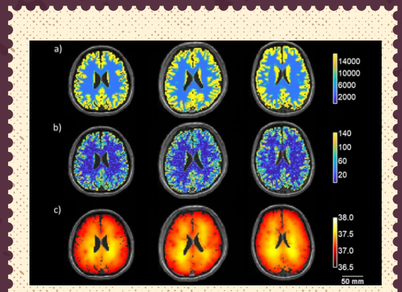
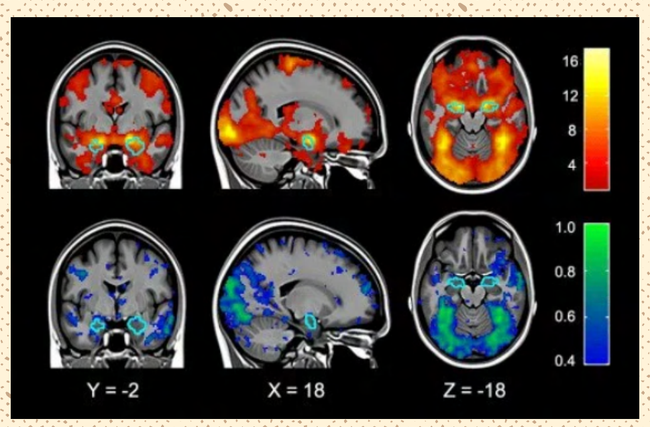


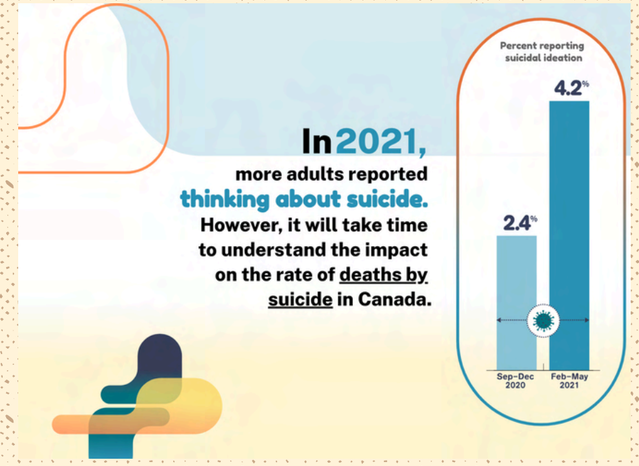
Modern Big Data Visualization

Present

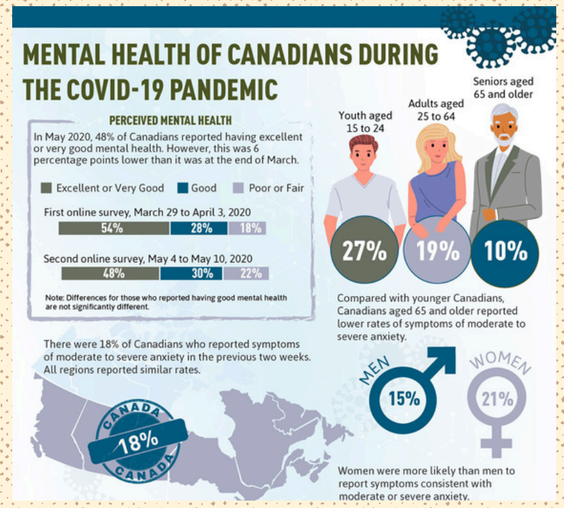
MODERN DATA VISUALIZATIONS IN PSYCHOLOGY



Brain Imaging



Interactive Dashboards



Mental Health Awareness Infographics

Brain Imaging (PET, fMRI, EEG)

1970s

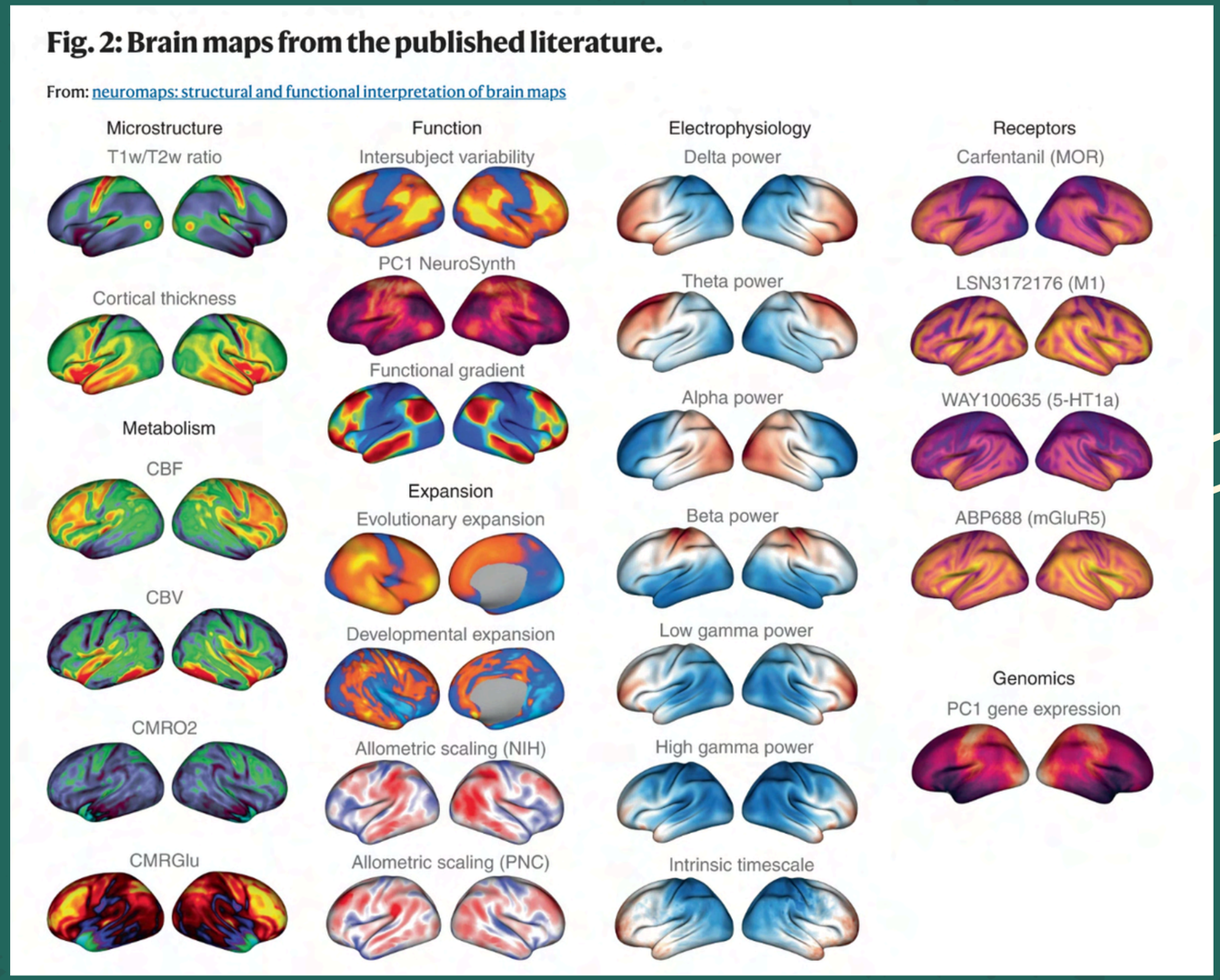
Importance:

- 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)



(Markello et al., 2022)

Interactive Dashboards

Late 2000s

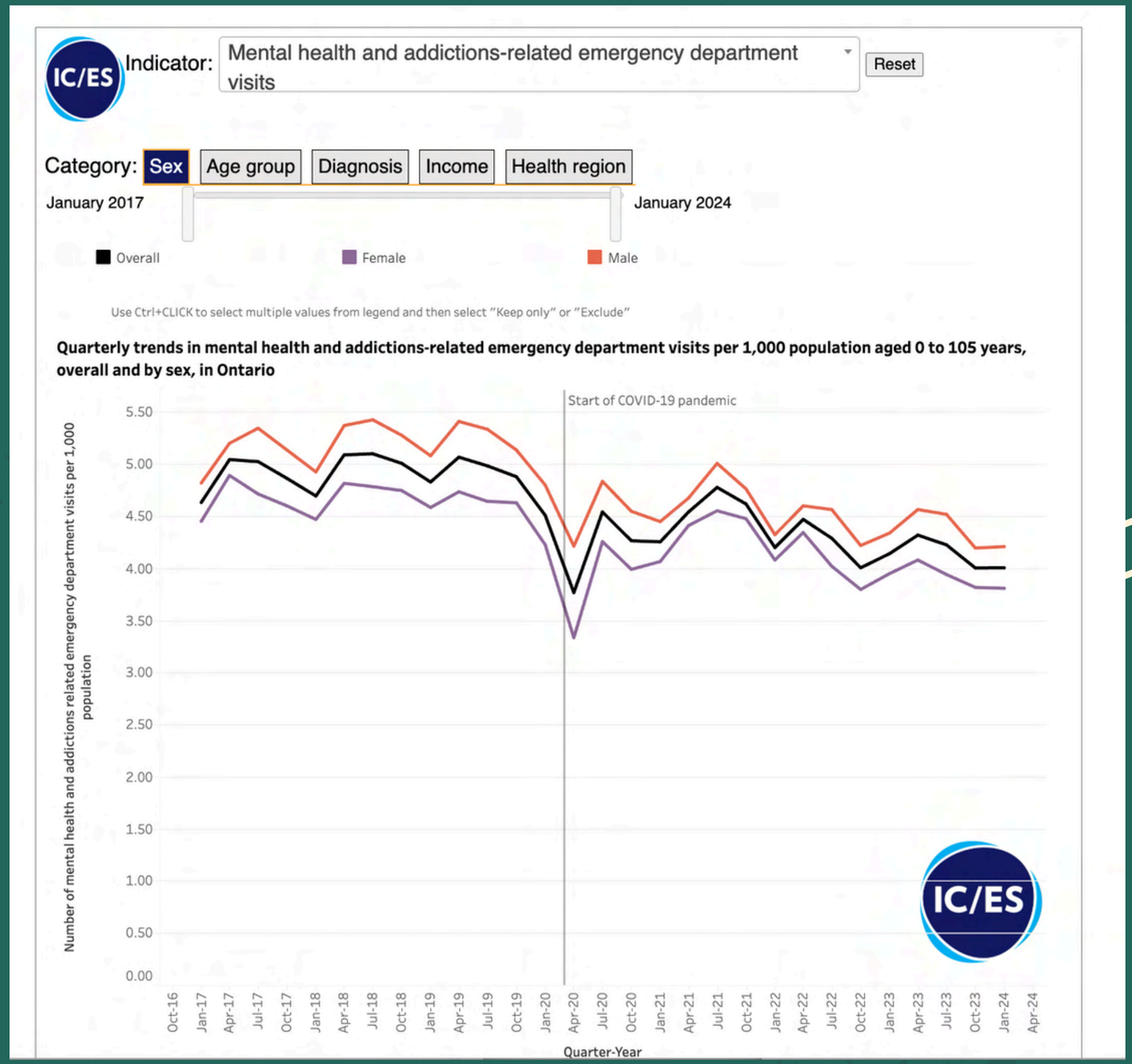
Importance:

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

Data Visualization Tools:

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

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



(ICES, 2024)

Mental Health Awareness Infographics

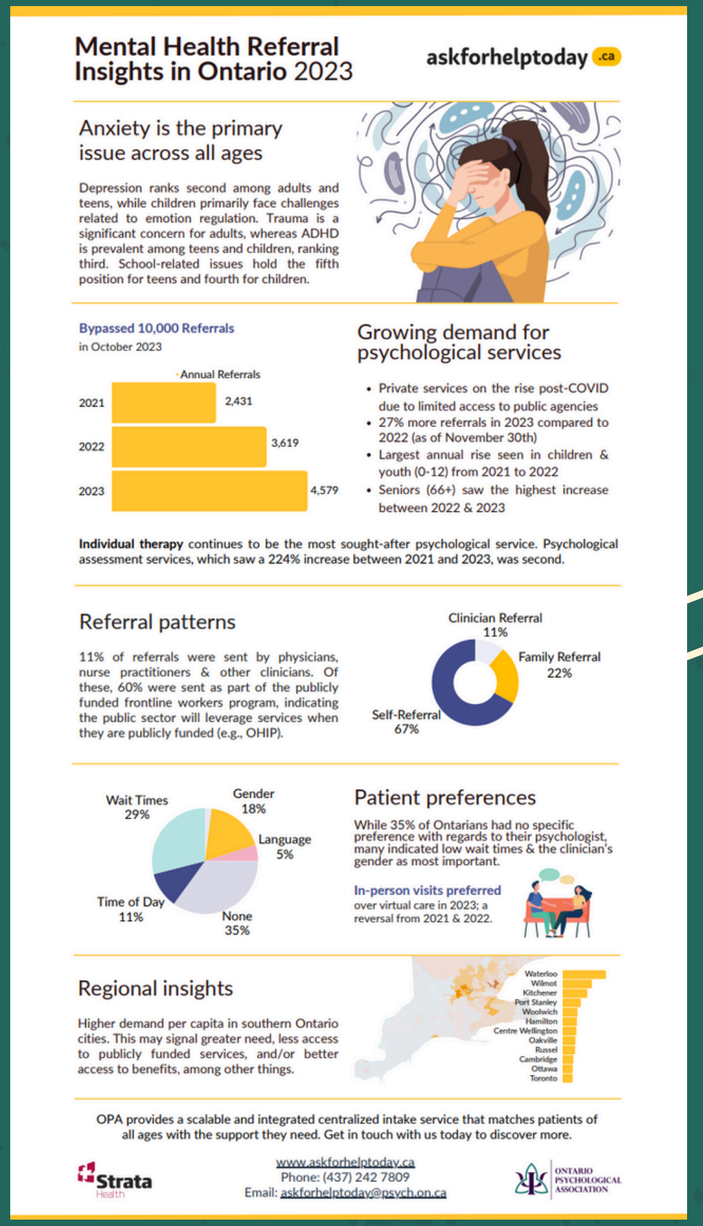
Mid 2010s

Importance:

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

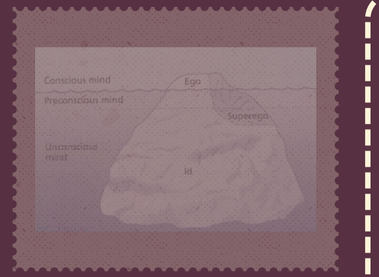
Data Visualization Tools:

- Canva
- Piktochart
- Figma
- Infogram

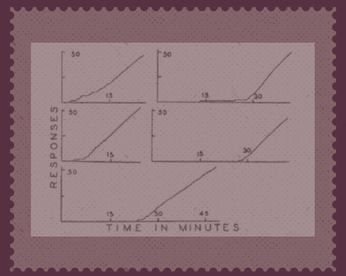


TIMELINE

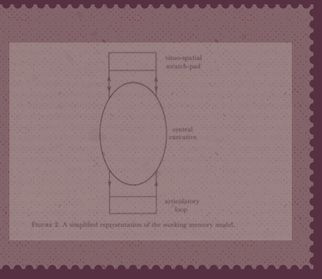
Early 1800s



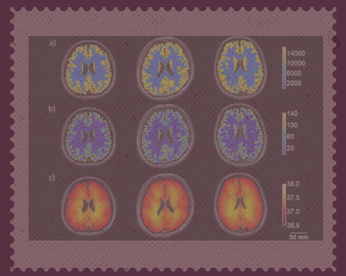
Early Conceptual & Theoretical Diagrams



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

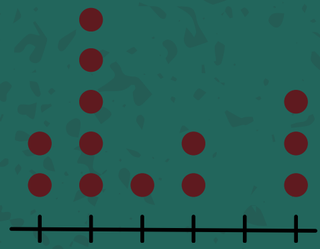
(e.g., Lin et al., 2023; Uddin, 2024)

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?