Perception: Bottom-Up and Top-Down

Perception is the mental process of organizing sensory input into meaningful patterns. We take in **1 to 10 million bits** of information a second and compare it with what we already know. Perceptual systems turn outside energy into neural messages, then **select, analyze and condense** it into patterns.

⬆ Bottom-up processing



- Starts with **sensory details**, builds up to the whole
- **Inductive reasoning:** specific observations → general rule
- A **7-year-old** learning to read sounds out each word
- Piecing together a language you barely know

⬇ Top-down processing



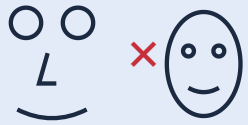
- Starts with **knowledge and expectations**, fills in details
- **Deductive reasoning:** general idea → tested on specifics
- Reading scrambled words with ease
- Fills gaps and finds patterns

TRY IT: TOP-DOWN AT WORK

"Aoccdrnig to rscheearch, it deosn't mttaer in waht oredr the ltteers in a wrod are..."

Your experience as a reader fills in the words. A beginning reader can't.

They work together: prosopagnosia



After a stroke, John sees eyes, nose and mouth (**bottom-up works**) but cannot put them together into a face he recognizes (**top-down is damaged**). **Prosopagnosia** = face blindness.

WHAT SHAPES WHAT WE PERCEIVE

Schema

A mental framework for organizing and interpreting information.

- **Piaget:** a child calls all women "mommy" and all men "daddy" until new schemas form for aunts, uncles and neighbors
- **Culture:** direct eye contact is respectful in some cultures, rude in others
- New info that fits a schema is **easier to remember**; info that doesn't may be dismissed or misremembered

Perceptual set

A top-down readiness to perceive one thing and not another: **expectation shapes experience**.

- An art lover notices patterns and colors others miss
- "Hear the beat, it's gone too far" is misheard as "Hear the beat of my guitar"

Context, expectations and culture

- Told a concert is in a **bad neighborhood**, you read people's glances as threatening
- Persian, Turkish and Zapotec speakers hear pitch as **thin or thick**, not high or low
- Culture tells us what to notice, what is funny or offensive, and shapes stereotypes

Name _____

Gestalt and Attention

Gestalt psychology

Gestalt = German for **pattern** or **whole**. The brain integrates pieces into meaningful wholes: the whole is more than the sum of its parts.



Figure and ground

The **figure** is what you focus on; the **ground** is the background you ignore. A vase, or two faces? This **ambiguous (reversible) figure** flips back and forth.

Hold up a finger: focus on it and it is the figure. Focus on the wall behind and the finger becomes ground.

Grouping: organizing stimuli into patterns



Proximity

Near things belong together: three pairs, not six lines



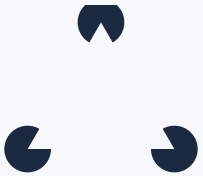
Similarity

Alike things belong together: columns of triangles and circles



Closure

We fill gaps to see a whole triangle



Illusory figure

Seeing a shape that isn't there. The brain draws a white triangle from the gaps in three circles. Remove the circles and the triangle disappears.

Attention

Sensation and perception working together, shaped by expectations (inside) and stimuli (outside). The brain attends to **one complex thing at a time**: walking and chewing gum is fine; reading while the TV is on is slower and less accurate.

Effect	What happens
Selective attention	Focusing on one stimulus while filtering out the rest (your breathing, the watch on your wrist)
Cocktail party effect	Your own **name** cuts through a noisy room. Years of answering to it have **primed** you to notice it
Inattentional blindness	Missing something in plain sight because attention is elsewhere: the **gorilla** walking through the basketball video; a magician's sweeping hand
Change blindness	A kind of inattentional blindness: missing a **change**, because you didn't store what was there before. On *Brain Games*, a clerk ducks behind the desk and a different person stands up

Stroop effect: try it

Say the **ink color** of each word, not the word:

RED BLUE GREEN BLUE RED GREEN

You slow down because **reading is automatic** and the word fights the ink color.

Inattentional vs change blindness

Inattentional: you miss something **new** appearing. **Change:** you miss that something is **different** from a moment ago; it requires memory of before.

Name _____

Depth, Constancy and Motion

Depth perception



Seeing in 3D and judging distance. **Visual cliff** (Gibson and Walk, 1960): babies 6 to 14 months old balked at the glass over the drop-off and their heart rates rose: depth perception is present by the time they crawl.

Binocular cues: need both eyes (bi- = two)



Retinal disparity

Each eye sees a slightly different image. Bigger difference = closer.



Convergence

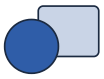
Eyes turn inward for near objects. Finger to nose: lots. Distant mountains: almost none.

Monocular cues: one eye is enough



Linear perspective

Parallel lines meet in the distance



Interposition

What blocks something is closer



Relative size

Smaller of two similar things is farther



Relative clarity

Blurry looks farther



Texture gradient

Fine detail near, smooth far

Perceptual constancy

Seeing objects as unchanging despite changes in viewpoint and light.

Color	Your shirt stays red walking into shade
Size	A person walking away doesn't shrink, though the retinal image does
Shape	A door is still a rectangle when open; a monitor seen from the side
Lightness	A white rose looks white in sun and clouds: it reflects the same **proportion** of light



Apparent movement

Seeing motion when nothing moves. We process up to **10 to 12 images a second** as separate pictures; faster, and they blend.

Stroboscopic movement: a series of still frames shown fast. Film: 24 frames a second; Blu-ray: 60.

Phi phenomenon: lights blink on and off in sequence and seem to move, like a theater marquee.



Müller-Lyer illusion



The lines are **equal**. Most people see B as longer. People in some cultures in Africa and Australia, who grew up with round dwellings and few right-angled corners, don't: **experience shapes perception**.

Name _____

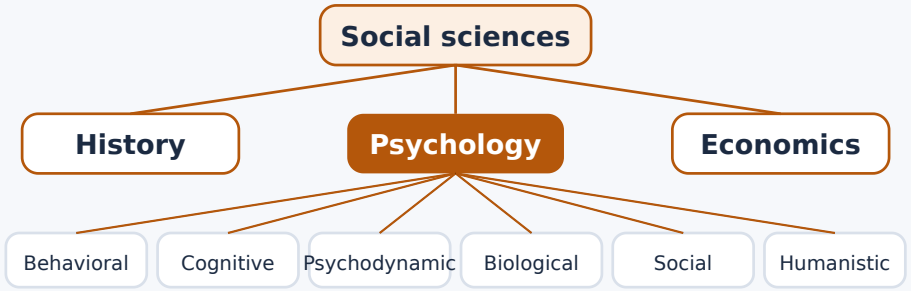
Concepts, Schemas and Executive Functions

Metacognition: thinking about thinking

Active control and awareness of your own thinking: the steps you take, your biases, how you learn. You use it when you **quiz yourself**, review a choice, or change how you study.

Concepts form hierarchies

Concept: a mental grouping of similar things. "Chair" covers high chairs, recliners, dentist chairs and desk chairs.



Prototype



The **best example** of a concept, used to sort new things fast. A **robin** is the prototype bird; a German shepherd might be your prototype dog. Shaped by culture, background and language.

Critical thinking

Going beyond facts to judge them. Jane Halonen: "the propensity and skills to engage in activity with **reflective skepticism** focused on deciding what to believe or do." A "**prove it to me**" attitude: judge by evidence, not anecdotes or emotion. Question everyone, including yourself.

Schemas: forming and changing

A schema is a set of connected ideas that simplifies the world. Schemas act as **mental filters**, letting some information in and blocking the rest, which shapes what you remember.

Assimilation



Fit new info into the schema you have. The schema doesn't change. "A zebra is a horse with stripes." A child calls the ocean a lake.

Accommodation



Change the schema to fit new info. "A zebra is its own animal." The child learns ocean and lake are different. A new job means new norms.

Executive functions

Processes that manage thoughts and actions toward a goal, run by the **prefrontal cortex**.

Adapt to new situations · **Plan and organize** · **Prioritize tasks** · **Solve problems** · **Control impulses** · **Regulate emotions**

Example: planning a study schedule around practice and work; rewriting a thesis when new evidence turns up. Practice and strategies improve them.

Name _____

Problem Solving, Heuristics and Biases

🧩 Trial and error

Try solutions until one works. Good when there are **few options** (the last 4 puzzle pieces); hopeless when there are endless ones (a spacecraft's re-entry speed).

📋 Algorithm

Step-by-step procedure. **Guaranteed correct** if followed, but slow. A lasagna recipe; adding 1 to 100 one number at a time.

⚡ Heuristic

A **rule of thumb**: fast, uses less data, **can be wrong**. Picking the restaurant with the fullest parking lot; skipping a job ad with typos.

Representativeness heuristic

Judging by how well something **matches your prototype**, while ignoring how common it is.

- Shy, tidy **Steve**: librarian or farmer? People say librarian, but farmers far outnumber librarians
- Glasses and loves to read: teacher (3.1 million) or biker (6 million)?
- **Susan** the activist: "feminist banker" feels likelier than "banker," but it can't be: it's a smaller group

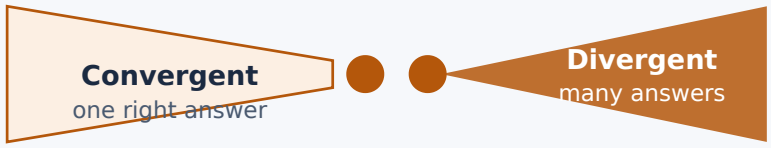
Availability heuristic

Judging how likely something is by **how easily examples come to mind**.

- Plane crashes make the news, so flying feels riskier than driving
- Words starting with K come to mind faster, but K is **2 to 3 times** more common as the third letter (bake, make)

Creativity

Novel, valuable ideas. Needs **expertise**, imaginative thinking, an adventurous personality, **intrinsic motivation** and a creative environment (Pixar's cereal bar and flexible hours).



"How many uses for a brick?" is divergent: the creative kind. A multiple-choice question is convergent.

Bias or trap	What it is	Example
Confirmation bias	Seeking evidence that agrees with you; ignoring what doesn't	Ignoring every red flag about someone you're in love with
Mental set	Sticking with a method that worked before	Using the long jug formula 2(A) − B = C when 2 + 2 works
Functional fixedness	Seeing an object only for its usual use	Not thinking to slip a door latch with a credit card
Priming	An earlier cue unconsciously shapes a later response	Grandma's perfume brings back memories
Framing	The wording of a choice changes the decision	"97% safe" vs "3% chance the chute fails"
Gambler's fallacy	Thinking a random outcome is "**due**"	Expecting tails after five heads in a row
Sunk-cost fallacy	Continuing because of what you've already spent	Funding refilled ink cartridges after printers reject them

Decisions and intuition

Every problem needs a decision, but not every decision is a problem (what to wear vs where to go to college). **Intuition** lets experience work through the unconscious mind when time or information is short. Unused skills fade: you once knew your times tables.

Remember the pairs

Mental set = stuck on a **method**. **Functional fixedness** = stuck on an **object's use**. **Priming** = an earlier cue. **Framing** = the wording itself.

Name _____

Memory: Systems and Types

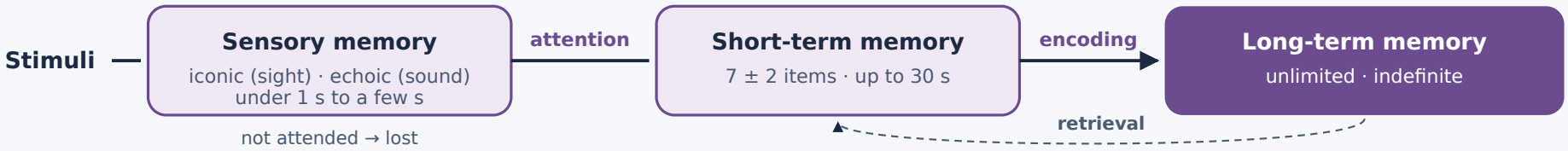
1 · Encoding → Getting information in, in a usable form

2 · Storage → Keeping and rehearsing it

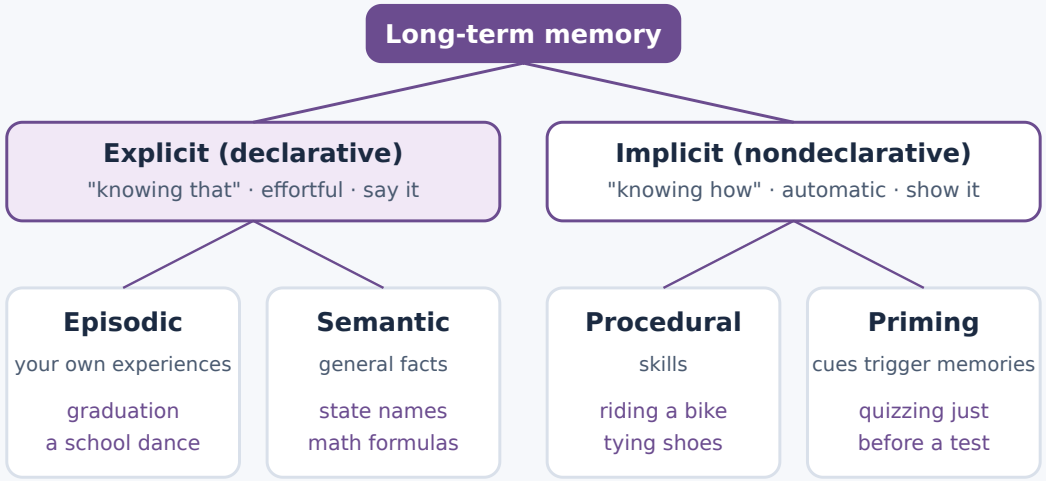
3 · Retrieval → Getting it back out

Parallel processing: the brain handles many inputs at once: words on the page, sounds in the house, the smell of a freshly bathed dog.

The multi-store model (Atkinson and Shiffrin)



Kinds of long-term memory



WHICH KIND IS IT?

Knowing Paris is the capital of France	**Semantic**	Typing without looking at the keys	**Procedural**
Remembering your 16th birthday party	**Episodic**	Remembering to call Grandma tonight	**Prospective**

Prospective memory

"Memory of the future": remembering to do something later. Turning in a paper online, taking out the trash, submitting college applications before the deadline.

Long-term potentiation (LTP)

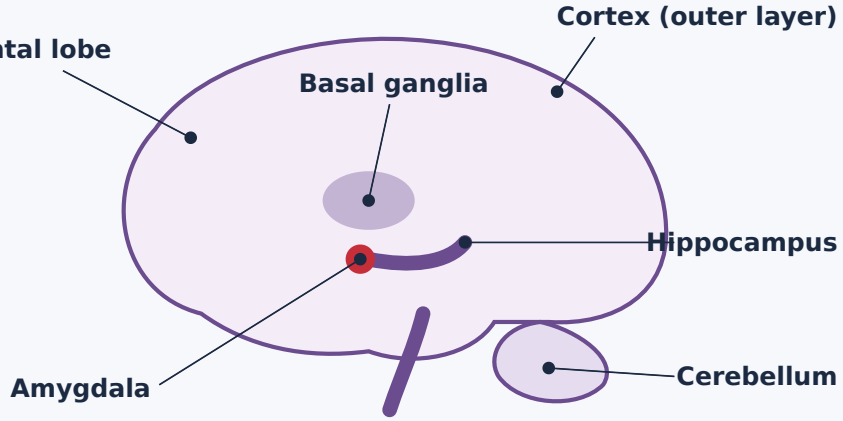
Repeated use **strengthens synapses**, so neurons signal more easily: the likely biological basis of learning. Practicing a tennis serve, or linking new terms to old ones, physically changes the brain.

Automatic vs effortful

Automatic processing needs no awareness for well-learned acts: at the free-throw line, the muscles fire on their own while you watch the hoop. **Effortful processing** needs attention and practice: new vocabulary.

Name _____

Memory in the Brain, Working Memory and Depth of Processing



Schematic side view, front at left; not to scale

Structure	Role in memory
Hippocampus	Moves new **explicit** memories from short-term into long-term storage
Cerebellum	**Procedural** (implicit) memories; balance and fine motor skill
Basal ganglia	Procedural memory and **habits**; rats running a maze for the thousandth time
Amygdala	**Emotional** memories
Cerebral cortex	Long-term storage, in pieces: an apple's shape, color and smell sit in different areas
Frontal lobe	Working memory; explicit (declarative, episodic) memory

Memory hooks

Hippocampus: hippos on **campus** send new facts off to college (long-term storage). **Cerebellum** = little brain for **skills**. **Amygdala** = the **emotion** stamp.

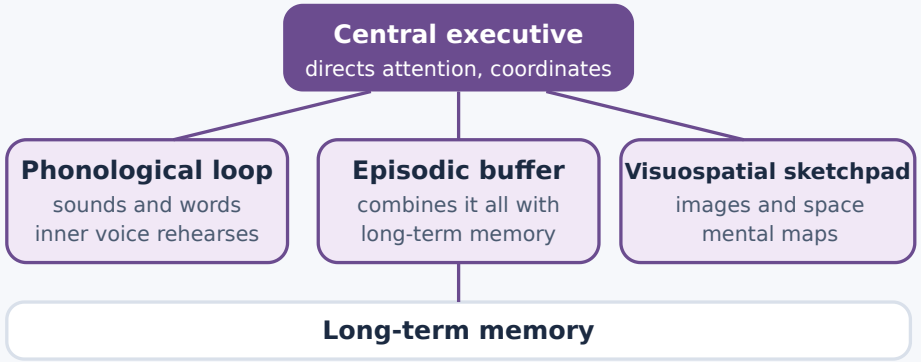
📝 Short-term memory

A **sticky note**: holds a little, briefly (a name you just heard, a phone number). Miller (1956): **7 ± 2** items.

🗂 Working memory

A **desk**: holds information **and works on it**: reasoning, problem solving, following instructions.

Working memory model (Baddeley and Hitch, 1974)



Levels of processing: deeper = remembered better

Structural shallow · What it looks like: the letters' shapes

Phonemic middle · What it sounds like: rhymes, syllables

Semantic deep · What it means; ties to what you know

Self-referent deepest · How it relates to your own life

Making your own examples, and **interleaving** (linking new terms to earlier units), are semantic encoding.

Name _____

Encoding and Mnemonics

Encoding and memory traces

Encoding converts sensory input into a form memory can store. It leaves **memory traces**: stronger synapses, changed neurotransmitter levels and new connections. Traces grow with intense encoding and frequent retrieval, and fade with time.

🧠 **Semantic**
by meaning: deepest, lasts longest

👂 **Acoustic**
by sound

👁 **Visual**
by image: the brain stores pictures well

✋ **Tactile**
by touch

What makes encoding work

Emotion	Emotional events are encoded vividly, but terror can cause errors
Selective attention	No attention, no encoding: it never leaves sensory memory
Rehearsal	**Maintenance** = repeating (shallow, fades). **Elaborative** = linking to what you know (deep, lasts)
Context-dependent memory	Recall is better in the place you learned it

Organize it

Chunking: group items into meaningful units.

17761812186119141941 → **1776** **1812** **1861** **1914** **1941**

Five war years, not twenty digits. An expert football fan chunks a whole play; a beginner follows the ball.

Categories: groups by shared features (all the cognitive biases).
Hierarchies: general to specific (long-term → explicit → episodic).

Mnemonic devices

Structures that make information memorable by linking it to something you already know: an anchor for encoding and retrieval.

Acronyms

HOMES Huron, Ontario, Michigan, Erie, Superior: the Great Lakes

OCEAN Openness, Conscientiousness, Extraversion, Agreeableness, Neuroticism: the Big Five

SAME Sensory = Afferent, Motor = Efferent: neuron types

Method of loci: a walk through your house

1. Kitchen counter **Broccoli**
2. Kitchen table **3 heads of lettuce**
3. Kitchen sink **Strawberries**
4. Front door **Granola bars**
5. Bathroom **Soap**
6. Sofa **Carrots**
7. Television **Kleenex**
8. Bed **Peanut butter**
9. Pillows **Bread**
10. Closet **Almonds**

Picture each item in its place, then walk through the house to recall the list. Aboriginal elders tie knowledge to song, dance, story and place.

Visual imagery and personalization

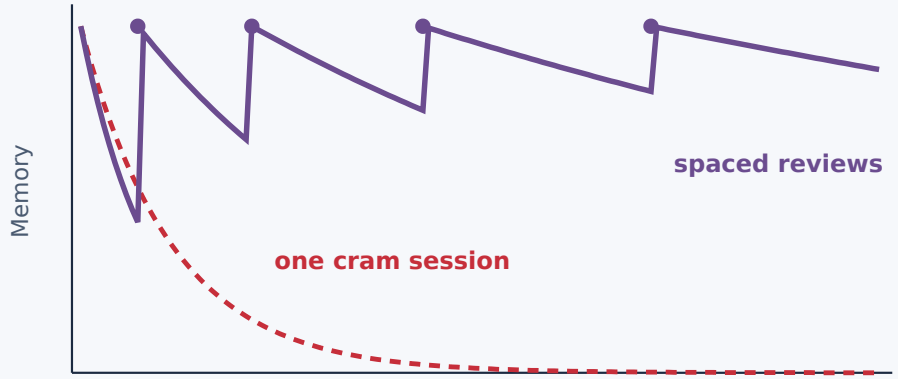
A vivid picture sticks better than an abstract idea; a story built from your own interests sticks best. Picture **hippos on a college campus** to remember that the hippocampus moves memories into long-term storage.

Name _____

Spacing and Serial Position

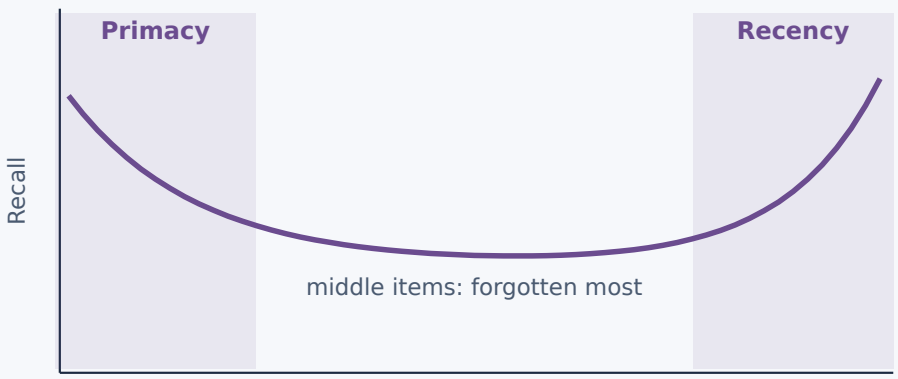
Spacing effect

Information is better remembered when studied over **several spaced sessions** (distributed practice) than all at once (**massed practice**, or cramming).



Serial position effect

In a list, we remember the **first** and **last** items better than the middle. First identified by **Hermann Ebbinghaus** in the late 1800s.



Why spacing works

- New memory traces are weak; each review strengthens them again
- Short sessions beat long ones: **an hour a day** beats several hours once a week
- Each return strengthens the link between cue and memory: **long-term potentiation**
- Small chunks prevent overload
- Lasts for the long run instead of fading right after the test

Try it: read one textbook section, not the whole unit, and spend a few minutes each day quizzing yourself on class notes.

Primacy effect

Remembering the **first** items. They got the most rehearsal and attention, so they made it into **long-term memory**.

Recency effect

Remembering the **last** items. They are still in **short-term memory**, so they are easy to recall right away.

The middle gets lost

Middle items get the least attention and rehearsal, so they are overshadowed by both ends. When you study a list of terms, start your next session in the middle.

Name _____

Storing Memories and Losing Them

System	Capacity	Duration	Holds
Sensory	Large	Under 1 s to a few s	Raw input: iconic (sight) and echoic (sound)
Short-term	7 ± 2 items	15 to 30 s without rehearsal	What you're attending to: a phone number
Working	About 4 chunks	15 to 30 s without rehearsal	Information being used: reasoning, problem solving
Long-term	Virtually unlimited	Minutes to a lifetime	Explicit facts and events; implicit skills and habits

Consolidation

Stabilizing new information and moving it from short-term into long-term memory through synaptic change. It takes time and is helped by **rehearsal** and **sleep**.

Maintenance rehearsal

Repeating three coffee orders until you order. Keeps it in STM; rarely reaches LTM.

Elaborative rehearsal

Connecting meaning: where the hippocampus is, what's near it, hippos on campus. Reaches LTM.

Amnesia: which memories are lost?



Retrograde: memories BEFORE are lost
usually episodic · hippocampus spared
can still make new memories

Anterograde: NEW memories can't form
hippocampus damaged
lives in the present

Memory trick: RETRO goes BACK in time. ANTERO goes FORWARD.
Old TV trope: hit on the head with a coconut, forget who you are (retrograde).

H.M.	Hippocampus removed to stop seizures → **anterograde** amnesia. Old memories intact; still learned **mirror tracing** (procedural, cerebellum) without remembering practicing.
Shana	Concussion: can't recall her past or her husband, but forms new memories → **retrograde**.
Infantile amnesia	No memories before age 3 to 4: an immature brain and little language.

Autobiographical memory

Memory of yourself: **episodic** events plus **semantic** facts about your life. It changes with mood, motivation and beliefs. **HSAM** (highly superior autobiographical memory) = remembering nearly every day; actress **Marilu Henner** says never forgetting arguments hurt her marriages. Forgetting can help.

Alzheimer's disease

Progressive brain disease: memory loss, worse thinking, personality change. Linked to low **acetylcholine**, **amyloid plaques** and the **ApoE4** gene (chromosome 19). About **10%** of Americans over 71 have dementia; risk doubles every 5 years until 85.

Harder to store

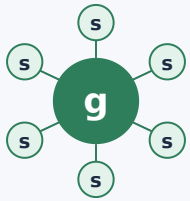
Blindness or deafness (less input), motor impairments, short attention spans, or trouble with language.

Name _____

Intelligence: Theories and the History of Testing

What is intelligence?

The ability to handle daily life, solve new problems and adapt to challenges. An abstract **construct**, and what counts as smart **varies by culture**: timed tests fit poorly where unhurried problem solving is valued; single-answer tests fit poorly where divergent thinking is.



Spearman: general intelligence (g)

Using **factor analysis**, he saw that people who score high on one test tend to score high on others: one general **g** under specific skills **s**. Your SAT or ACT composite is like g; the section scores are s.

Gardner: multiple intelligences

🎵 **Musical**	🤸 **Bodily-kinesthetic**	🤝 **Interpersonal**	🪞 **Intrapersonal**
📖 **Verbal-linguistic**	🔢 **Logical-mathematical**	🌿 **Naturalistic**	🎨 **Visual-spatial**

Criticized for little evidence, and for feeding the myth that people have "learning styles."

Sternberg: triarchic theory

Analytical
School problem solving; what IQ tests measure

Creative
New ideas, divergent thinking, many right answers

Practical
Everyday problems: "street smarts"

Which theorist?

"There is one general ability under all the others."	**Spearman**
"She is people smart and nature smart."	**Gardner**
"He aces tests but can't fix a flat tire."	**Sternberg**
"Intelligence is inherited; measure reaction time."	**Galton**

The history of testing

Francis Galton
Believed intelligence is **inherited**; coined "nature and nurture"; his ideas led to **eugenics**. Measured reaction time and senses. His tests favored upper-class white men like him: **confirmation bias**.

1905 · Binet and Simon
Found French children who needed extra help. Introduced **mental age**. Binet believed practice ("mental orthopedics") could raise ability.

1912 · William Stern
The IQ formula (below).

1916 · Lewis Terman
The **Stanford-Binet** for Americans; believed intelligence was genetic. His high-IQ "**Termites**" were healthier and better adjusted, but no more satisfied with life.

Early 1900s · Henry Goddard
Labeled most non-English-speaking immigrants at Ellis Island "feebleminded." A **misuse** that fed restrictive immigration laws. World War I: the army used IQ tests to sort soldiers.

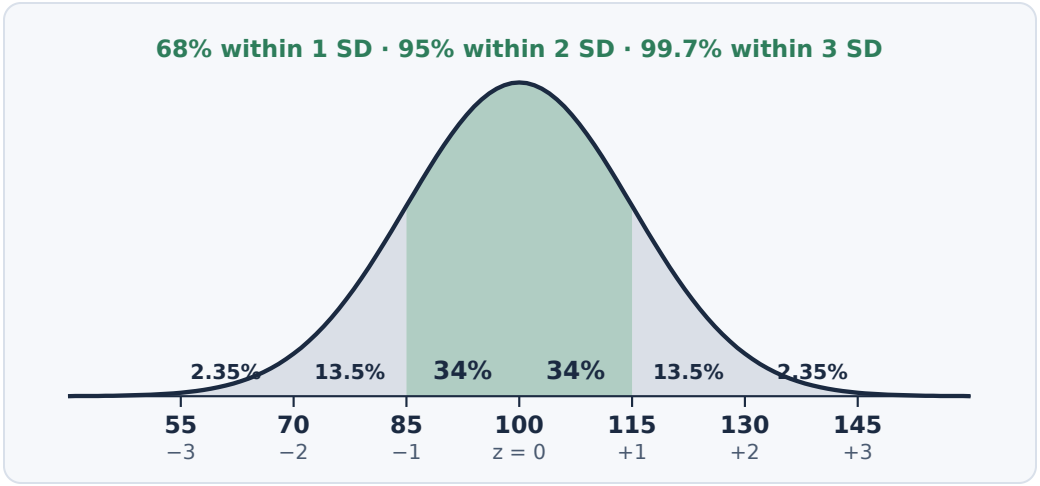
David Wechsler · WAIS, WISC
Said tests leaned too much on words; added **performance** scales. Four indexes: verbal comprehension, working memory, perceptual organization, processing speed.

$$\text{IQ} = \frac{\text{mental age}}{\text{chronological age}} \times 100$$

A 10-year-old with a mental age of 12: 12 ÷ 10 × 100 = **120**. Average is **100**.

Name _____

What Makes a Good Test, and What Scores Mean



Percentile rank

Share of people scoring at or below you. IQ 100 = **50th** percentile. ACT 28 = 88th.

Z-score

Standard deviations from the mean (SD = 15). IQ 130 = **+2**; 100 = **0**; 85 = **−1**.

Flynn effect

Average IQ scores have **risen** over generations (nutrition, health care, schooling, test familiarity), so tests are re-normed to keep the mean at 100.

Reaction range

Genes set a **range** of potential; environment decides where in it a person lands.

IQ	Z-score	Percentile (about)	How to get it
85	−1	16th	50 − 34
115	+1	84th	50 + 34
130	+2	98th	50 + 34 + 13.5
70	−2	2nd	only 2.35 + 0.15 below

Standardization and norms

Same directions, timing and scoring for everyone (AP Psych: 90 minutes for 75 questions). **Psychometric psychologists** compare your score to **norms** from a defined sample group.

Reliability = consistent

Test-retest: similar score each time you take it.

Split-half: odd and even questions give similar scores.

Validity = accurate

Measures what it claims to measure. A test can be reliable but not valid (a scale always 5 lb off), never valid but unreliable.

Validity	Asks	Example
Predictive	Does it forecast future performance?	ACT predicting first-year college success
Content	Does it cover the whole subject?	A *Beowulf* exam full of *Beowulf* questions, no geometry
Face	Does it look right at a glance?	A stats-heavy psych test looks like a math test to an outsider
Construct	Does it capture the whole idea?	Wechsler: Stanford-Binet lacked performance tasks
Concurrent	Does it agree with established tests?	Four tests say 115 to 120; a fifth says 85

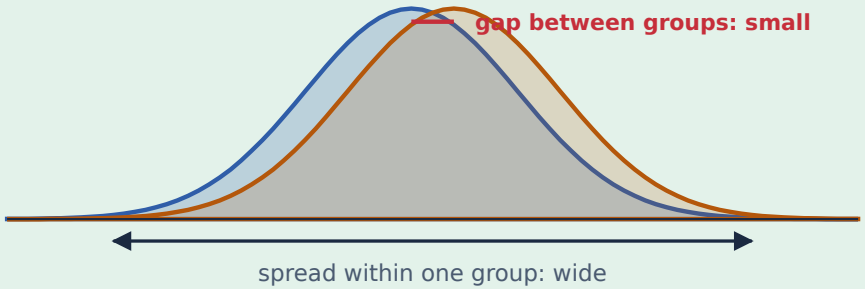
Memory hook

Reliability = **R**epeatable. **V**alidity = **V**alid aim: hitting the right target.

Name _____

Group Differences, Testing Fairness and Mindset

Within groups vs between groups



Score differences **within** any group are far larger than differences **between** groups, and genetic diversity lies mostly within populations. *The Bell Curve* (1994) claimed racial gaps were genetic; that claim is discredited.

Environment matters

- **Poverty and malnutrition** in early childhood impair memory, attention and problem solving
- **Toxins** such as lead, plus pollution and noise, lower scores
- **Unequal schools:** poor facilities, fewer qualified teachers, fewer books and learning toys

⬇ Stereotype threat

Fear of confirming a negative stereotype about your group **lowers** performance. Women told women do worse at math score lower; with no threat, they score the same as men.

⬆ Stereotype lift

A reminder of a **positive** stereotype about your group **raises** performance: women reminded they excel at verbal tasks do better on a verbal exam.

Bias in testing

Personal bias	The examiner's expectations, such as confirmation bias about a test-taker's background
Sociocultural bias	Items built on one culture's language and references
Responsive assessment	Removing regional language and cultural references to reduce bias

Achievement test

What you **have learned**: an AP exam, a unit test, a final.

Aptitude test

What you **can learn**: predicts future success (spatial or mechanical reasoning for engineers and architects).

Uses and misuses

Tests place students in gifted or special education programs and college. Employment tests have excluded minority candidates through culturally biased items. Up to **75%** of job performance is unrelated to IQ: conscientiousness and work ethic matter.

Carol Dweck: mindset

Fixed mindset

"Intelligence is set at birth."

"I'm terrible at math." "I just can't learn a second language."

→ avoids challenges, learned helplessness

Growth mindset

"Intelligence grows with effort, grit and practice."

"I can't do it yet."

→ resilience and academic success

Name _____

Don't Mix These Up

Bottom-up vs top-down
Senses first vs knowledge first

Inattentional vs change blindness
Miss something new vs miss a change from before

Selective attention vs cocktail party effect
Focusing on one thing vs your name breaking through

Schema vs perceptual set
The stored framework vs the expectation it creates now

Retinal disparity vs convergence
Two images compared vs eyes turning inward

Stroboscopic movement vs phi phenomenon
Still frames in a row vs blinking lights

Assimilation vs accommodation
Fit into the old schema vs change the schema

Algorithm vs heuristic
Step by step, guaranteed vs shortcut, can fail

Representativeness vs availability
"Looks like the type" vs "examples come to mind"

Mental set vs functional fixedness
Stuck on a method vs stuck on an object's use

Priming vs framing
An earlier cue vs the wording of the choice

Gambler's vs sunk-cost fallacy
Random outcome is "due" vs keep going because you've spent

Convergent vs divergent thinking
One right answer vs many possible answers

Episodic vs semantic
Your experiences vs general facts

Explicit vs implicit
Knowing that (say it) vs knowing how (do it)

Short-term vs working memory
Holds it vs holds it and works on it

Maintenance vs elaborative rehearsal
Repeating vs connecting to meaning

Primacy vs recency
First items, in LTM vs last items, still in STM

Spacing vs massed practice
Short sessions over days vs cramming

Retrograde vs anterograde amnesia
Past lost vs no new memories (hippocampus)

Hippocampus vs cerebellum
New explicit memories vs procedural skills

Iconic vs echoic memory
Visual sensory memory vs auditory sensory memory

Reliability vs validity
Consistent vs measures the right thing

Predictive vs construct validity
Forecasts the future vs covers the whole idea

Achievement vs aptitude test
What you have learned vs what you can learn

Spearman vs Gardner vs Sternberg
One g vs eight intelligences vs three

Stereotype threat vs lift
Negative stereotype lowers vs positive raises

Fixed vs growth mindset
Ability is set vs ability grows with effort