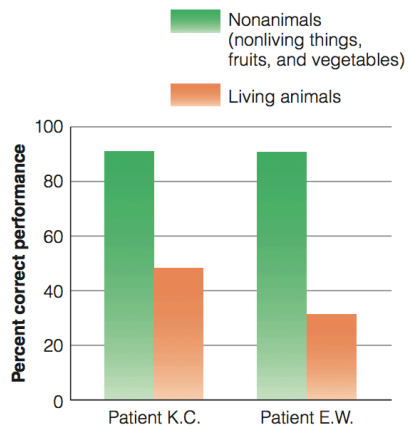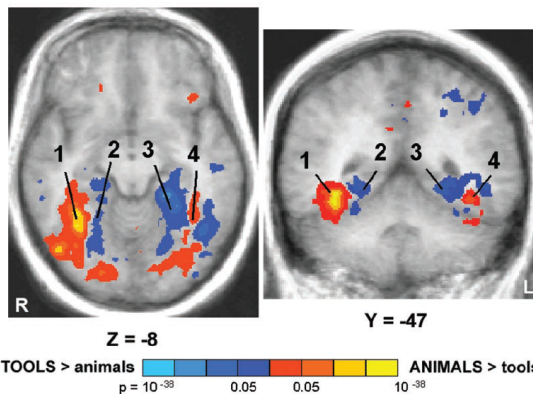# Categorization in the Brain
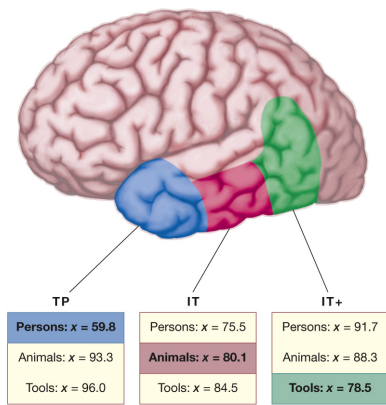
- Neuropsychological research has focused on patients with a condition called ***category-specific knowledge impairment***, in which the patient has trouble recognizing objects in a specific category

- Some patients are unable to unable to label living things and foods, while being able to identify inanimate objects (Warrington & Shallice, 1984)

- Other patients lose the ability to name living things but not non-living things, whereas other patients show the reverse pattern (Damasio et al., 1996)

Mahon & Caramazza (2009)

Chao et al. (2002)

TP
| Persons: $x = 59.8$ |
| Animals: $x = 93.3$ |
| Tools: $x = 96.0$ |

IT
| Persons: $x = 75.5$ |
| Animals: $x = 80.1$ |
| Tools: $x = 84.5$ |

IT+
| Persons: $x = 91.7$ |
| Animals: $x = 88.3$ |
| Tools: $x = 78.5$ |

Damasio et al. (1996)

Categorization in the Brain

- **Domain-specific hypothesis:** throughout the course of evolution certain categories of objects gained privileged processing in the brain, leading to specialized circuitry and brain areas (Caramazza & Shelton, 1998)

The sensory-functional hypothesis: *our ability to differentiate living things and artifacts depends on a memory system that distinguishes sensory attributes and a system that distinguishes functions*

Relevant Information	Relevant to ...	Deficit in ability to process relevant information causes...
Sensory	Living things (Ex: a tiger has stripes)	Problems identifying living things
Functional	Artifacts (Ex: A hammer hits nails)	Problems identifying artifacts

Intelligence

- "The ability to reason, plan, solve problems, think abstractly, comprehend complex ideas, learn quickly and learn from experience" and is different from "book learning or test-tasking ability"

- It is "an ability that is crucial for catching on, making sense of things, or figuring what to do" (Gottfredson, 1997)

Intelligence

- Intelligence research attempts to understand the degree to which individual differences in cognitive ability predict psychosocial outcomes

- Today's intelligence tests evolved largely from efforts to predict academic success

- The approach that seeks to understand the most valid way to measure intelligence is the *psychometric approach*

Binet and Simon's Intelligence Test

| AGE	ITEM
3	Give family name
4	Repeat three numbers
5	Compare two weights
6	Distinguish morning and afternoon
7	Describe a picture
8	Give a day and date
9	Name months of the year in order
10	Criticize absurd statements
12	Describe abstract words
15	Give three rhymes for a word in one minute
Adult	Give three differences between a president and a king

Binet & Simon (1905)

The Stanford-Binet intelligence scales *incorporated a scoring scheme called the intelligence quotient (IQ)*

| MEASURE	CHILD 1	CHILD 2	CHILD 3	CHILD 4
Mental age (MA)	6 years	6 years	9 years	12 years
Chronological age (CA)	6 years	9 years	12 years	9 years
$IQ = \frac{MA}{CA} \times 100$	$\frac{6}{6} \times 100 = 100$	$\frac{6}{9} \times 100 = 67$	$\frac{9}{12} \times 100 = 75$	$\frac{12}{9} \times 100 = 133$

Intelligence

- The most widely used intelligence tests today are the Wechsler scales, which aim to measure "the global capacity of a person to act purposefully, to think rationally, and to deal effectively with his/her environment" (Wechsler, 1939)

- These tests provided a significant advance to the psychometric approach by attempting to minimize the degree to which intelligence scores were shaped by ***linguistic and cultural differences***
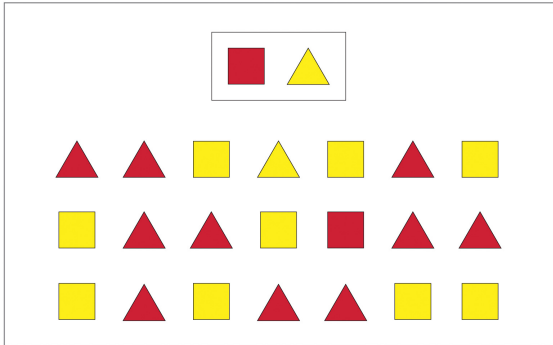
Wechsler Adult Intelligence Scale (WAIS)
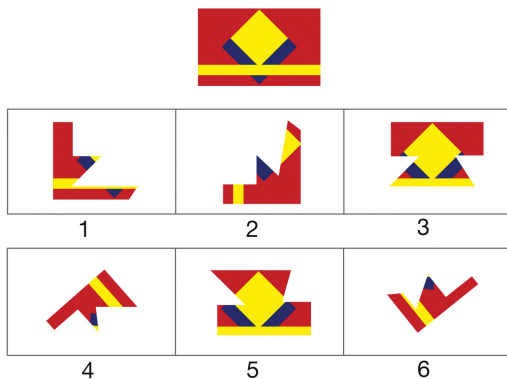
Wechsler Adult Intelligence Scale (WAIS)
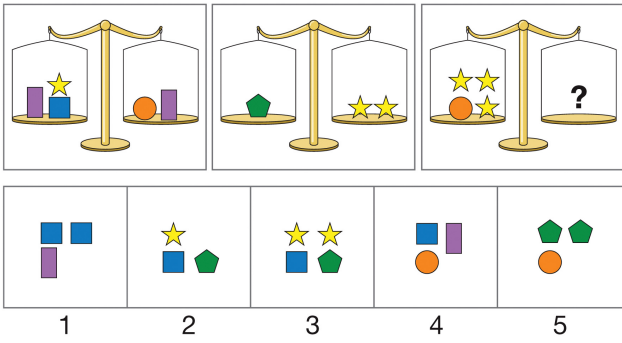
## Wechsler Adult Intelligence Scale (WAIS)

Reliability and Validity

- Intelligence tests have strong test-retest reliability (Plomin & Spinath, 2004)
- Remarkable stability in IQ scores, even over spans as long as 70-80 years (Deary, 2014)

Reliability and Validity

- Intelligence tests are generally good predictor of academic performance (Cronbach & Snow, 1977)

- The correlation between IQ scores and academic performance is about 0.50 (Arneson et al., 2011)

- An IQ score is a strong predictor of how someone will perform on the job, although it matters for some jobs more than others (Sackett et al., 2008)
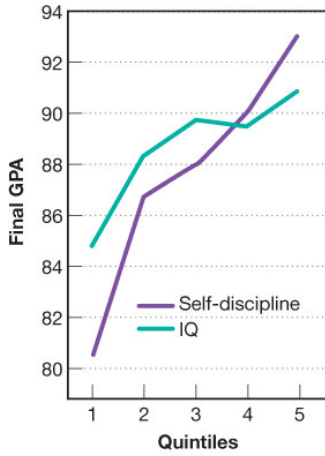
Duckworth & Seligman (2005)

Dweck's Motivational Theory of Intelligence

| Theory	Goal	Response to failure
Entity ⟶	Judgment ⟶	Helplessness
Incremental ⟶	Development ⟶	Mastery

Stereotype Threat

- People's performance on tests can sometimes depend on their own *expectations* about how well or how poorly they will do

- Sometimes those expectations can be affected by negative (or positive) cultural stereotypes

- Stereotypes that portray some groups as unintelligent cause members of those groups to feel a burden of doubt about their abilities — called *stereotype threat*

Stereotype Threat

- Occurs when people perform poorly because they fear their performance will confirm a negative stereotype associated with their group (Massey & Owens, 2014)

- Negative thoughts intrude and disrupt their concentration, and the anxiety they feel impairs their performance and diminishes their motivation

Blacks performed worse than whites when they were told the test was diagnostic of their intellectual ability, but not when they were told that it was a challenging test
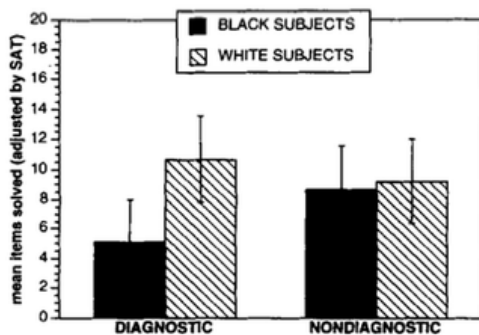
Steele & Aronson (1995)

Blacks in the diagnostic condition made excuses for their performance probably because they feared it would confirm the negative stereotype about their intelligence

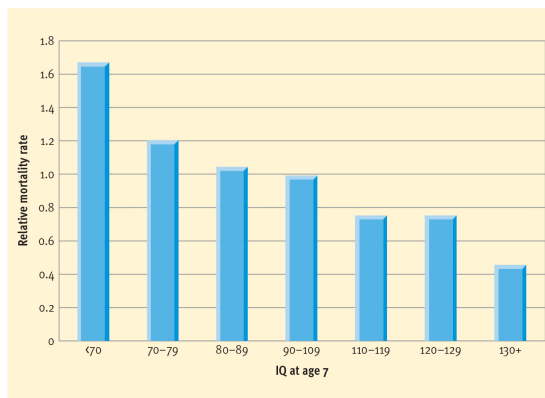Table 1
Self-Handicapping Responses in Study 3

| | Experimental condition | | | |
| | Diagnostic | | Nondiagnostic | |
Measure	Blacks ($n = 12$)	Whites ($n = 11$)	Blacks ($n = 11$)	Whites ($n = 10$)
Hours of sleep	5.10$_a$	7.48$_b$	7.05$_b$	7.70$_b$
Ability to focus	4.03$_a$	5.88$_b$	5.85$_b$	6.16$_b$
Current stress	5.51$_a$	5.24$_a$	5.00$_a$	5.02$_a$
Tests unfair	5.46$_a$	2.78$_b$	3.14$_b$	2.04$_b$

Note. Means not sharing a common subscript differ at the .01 level according to Bonferroni procedure. Means sharing a common subscript do not differ.

Steele & Aronson (1995)

Reliability and Validity

- Scores on intelligence tests have been found to predict several life outcomes, such as job performance (Barrett & Depinet, 1991)

- Women who had scored at least 1 SD below average when they were 11 years old were only 75% as likely to live to age 76 as were women who scored higher (Whalley & Deary, 2001)

Deary & Batty (2011)