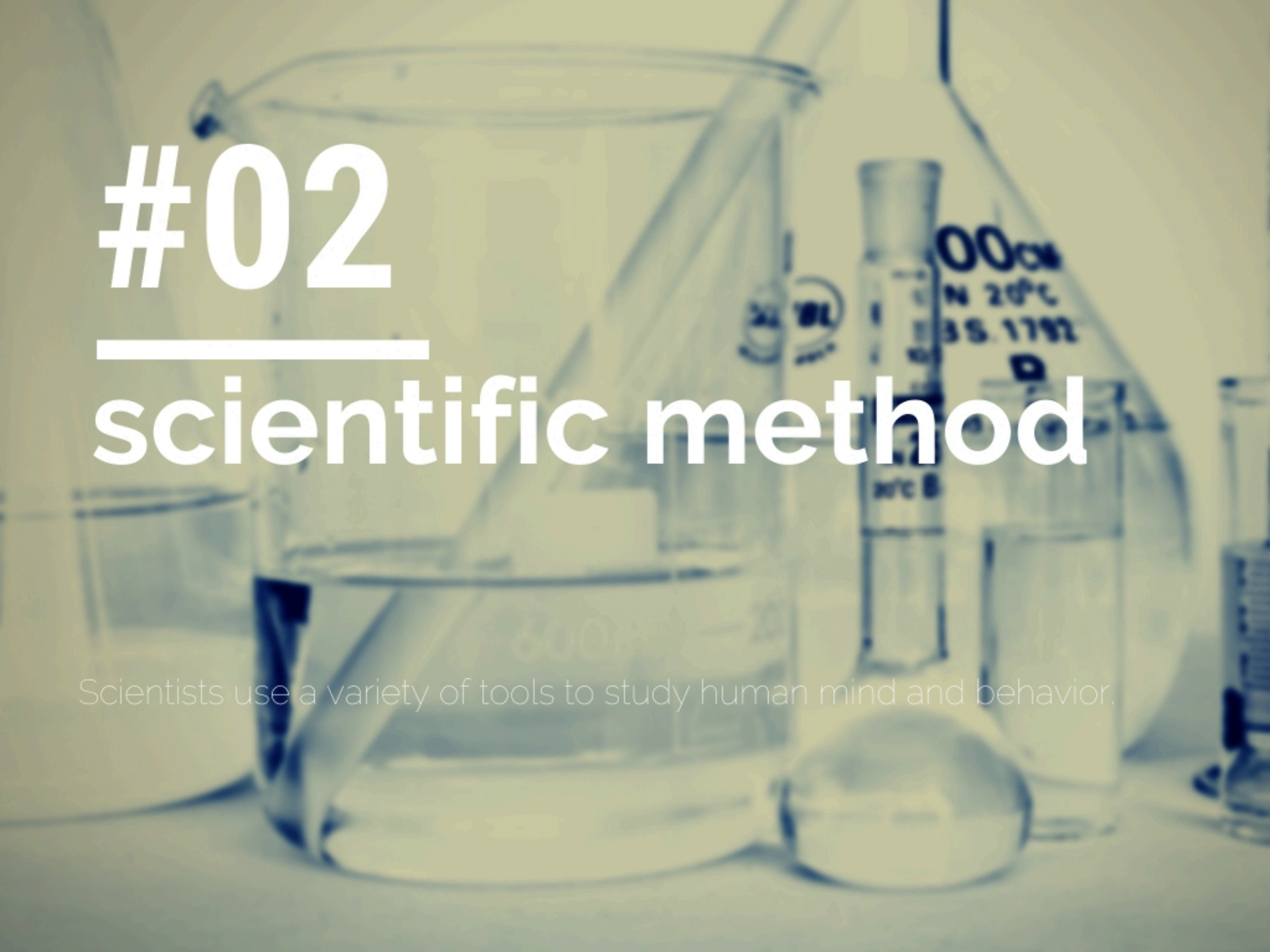


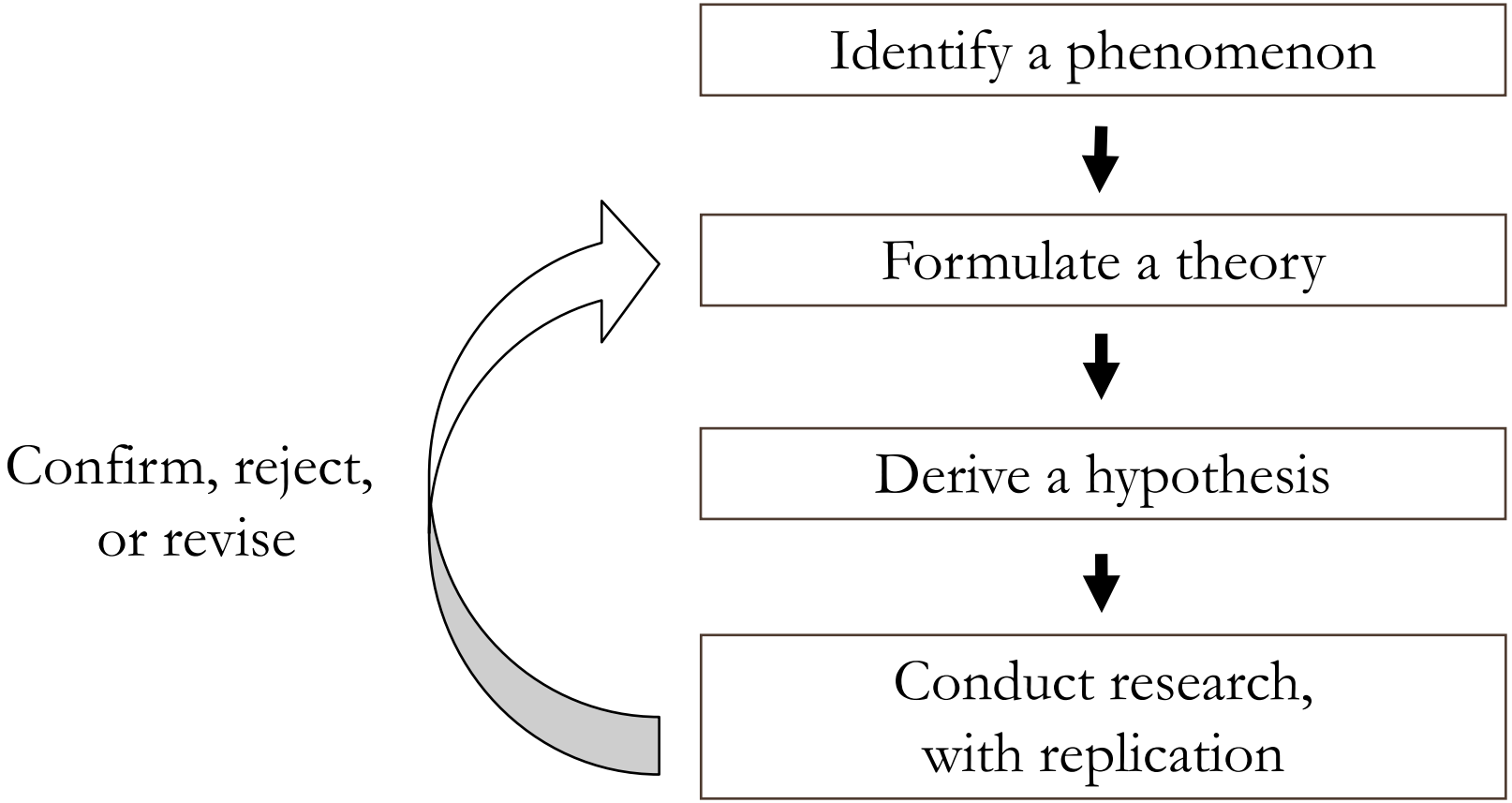
#02

scientific method

Scientists use a variety of tools to study human mind and behavior.

SCIENTISTS' TOOLBOX

- Science
  - A process of constructing best possible models about the world through observations and analyses
  - Objective, self-correcting

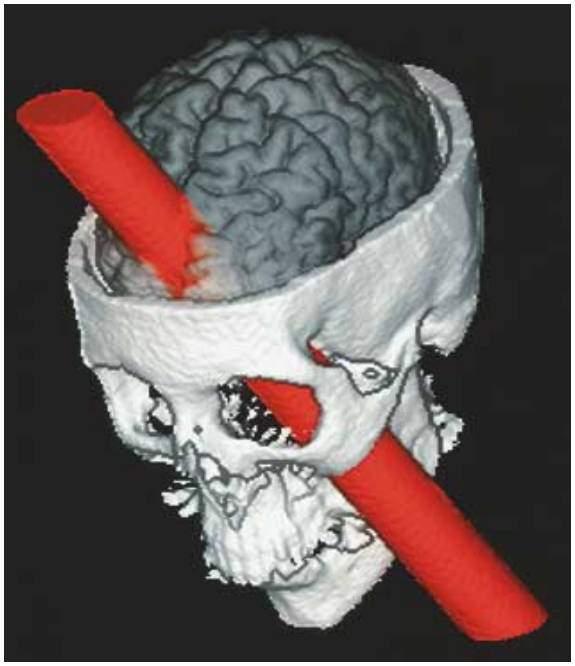


Theory: an explanation or set of principles that organizes isolated observations (e.g., sleep facilitates memory formation)

Hypothesis: a testable prediction that is derived from a theory (e.g., when sleep deprived, people remember less from the day before)

Replication: repeating the essence of a research, usually with different participants and different procedures

- Descriptive research
  - To create a snapshot of the thoughts, feelings, or behavior of an individual or a group
  - Useful for generating questions for further research
  - Data sources: e.g., case study, interviews, naturalistic observations, surveys, archival data



In 1848, Phineas Gage (1823-1861) survived an accident in which an iron rod was driven completely through his head, damaging both his left and right frontal cortices. His friends witnessed changes in him: from a mild-mannered, friendly, efficient worker, to a foul-mouthed, ill-tempered, undependable person (Damasio et al., 1994).

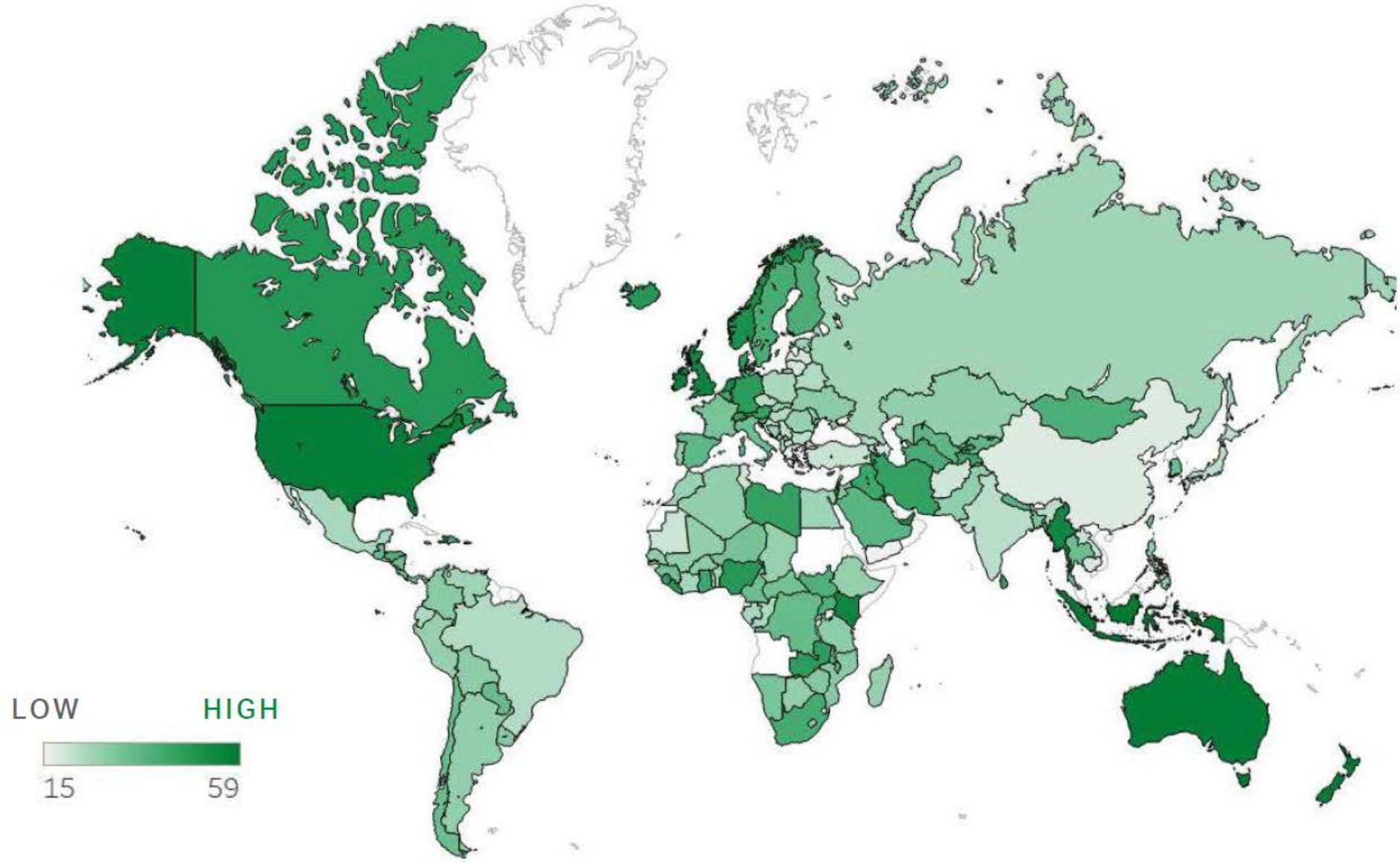
Walking speed, speed with which postal clerks complete a simple request, and accuracy of public clocks were observed in 31 countries (Levine & Norenzayan, 1999).

TABLE 1
Means[a] and Ranks on Pace Measures by Country

	Overall Pace Index		*Walking Speed*		*Postal Speed*		*Clock Accuracy*	
Country	M	*Rank*	M	*Rank*	M	*Rank*	M	*Rank*
Switzerland	–3.43	1	11.80	3	16.91	2	19.29	1
Ireland	–3.02	2	11.13	1	17.49	3	51.42	11
Germany	–3.00	3	12.01	5	13.46	1	43.00	8
Japan	–2.68	4	12.11	7	18.61	4	35.00	6
Italy	–2.13	5	12.75	10	23.00	12	24.17	2
England	–2.09	6	12.00	4	20.78	9	53.72	13
Sweden	–1.96	7	12.92	13	19.10	5	40.20	7
Austria	–1.43	8	14.08	23	20.60	8	25.00	3
Netherlands	–1.42	9	11.45	2	24.42	14	82.33	25
Hong Kong	–1.39	10	13.10	14	20.10	6	54.83	14
France	–1.36	11	12.34	8	27.84	18	49.00	10
Poland	–1.32	12	12.90	12	25.83	15	43.00	8
Costa Rica	–1.13	13	13.33	16	21.13	10	55.38	15
Taiwan	–0.73	14	13.58	18	20.22	7	68.00	21
Singapore	–0.65	15	14.75	25	22.42	11	32.00	4
United States	–0.30	16	12.03	6	36.99	23	67.87	20
Canada	–0.26	17	12.86	11	30.50	21	70.00	22
S. Korea	–0.02	18	13.76	20	29.75	20	58.00	16
Hungary	0.01	19	13.75	19	28.45	19	64.17	18
Czech Republic	0.28	20	13.80	21	27.73	17	76.07	23
Greece	0.54	21	13.10	14	24.33	13	117.0	29
Kenya	0.78	22	12.58	9	42.50	30	77.14	24
China	1.03	23	14.26	24	39.63	25	51.82	12
Bulgaria	1.59	24	15.57	27	33.67	22	60.00	17
Romania	2.42	25	16.72	30	42.25	29	32.46	5
Jordan	2.44	26	15.79	28	39.92	27	66.16	19
Syria	3.26	27	15.95	29	40.02	28	94.52	27
El Salvador	3.63	28	14.04	22	25.88	16	210.0	31
Brazil	3.98	29	16.76	31	38.17	24	108.0	28
Indonesia	4.14	30	14.82	26	39.64	26	161.5	30
Mexico	4.23	31	13.56	17	70.00	31	92.31	26

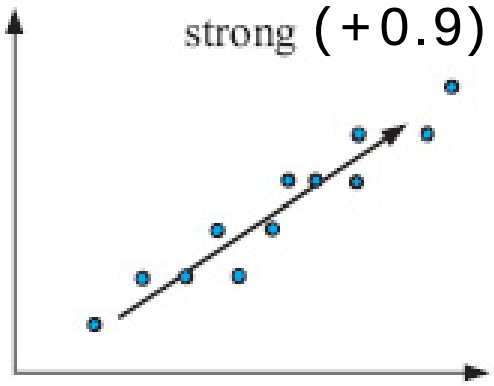
A survey study based on more than 153,000 surveys with adults in 146 countries in 2017 (Gallup, 2018)

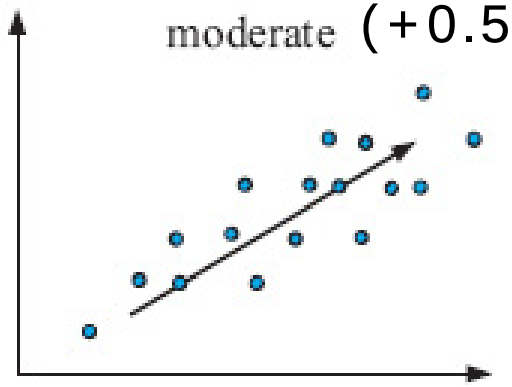
Civic Engagement Worldwide in 2017

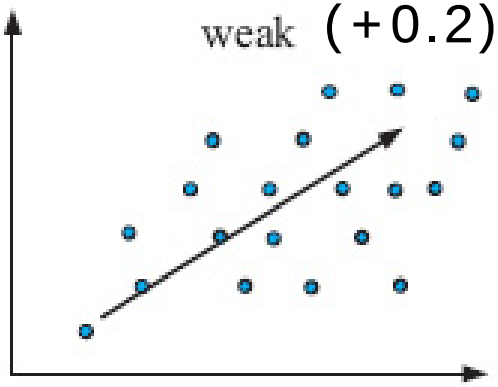


- Correlational research
  - Determines the relationship between variables
  - Allows hypothesis or theory testing
  - Data sources: e.g., naturalistic observations, surveys, archival data

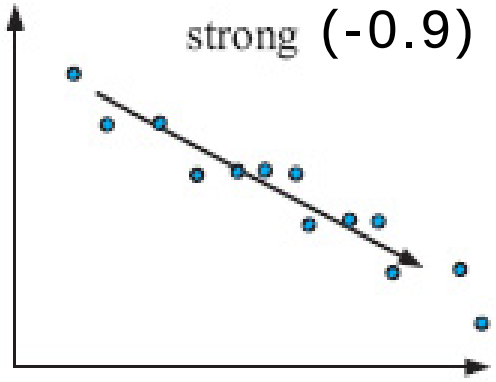
For **positive relationships** we would classify the following scatterplots as:

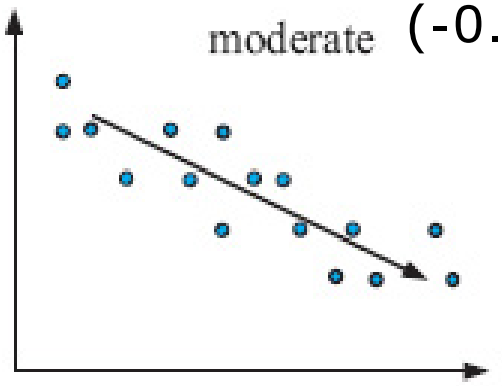


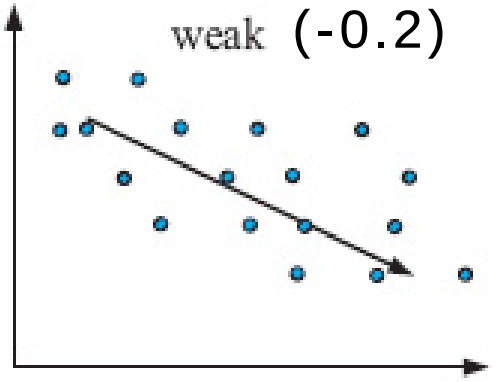




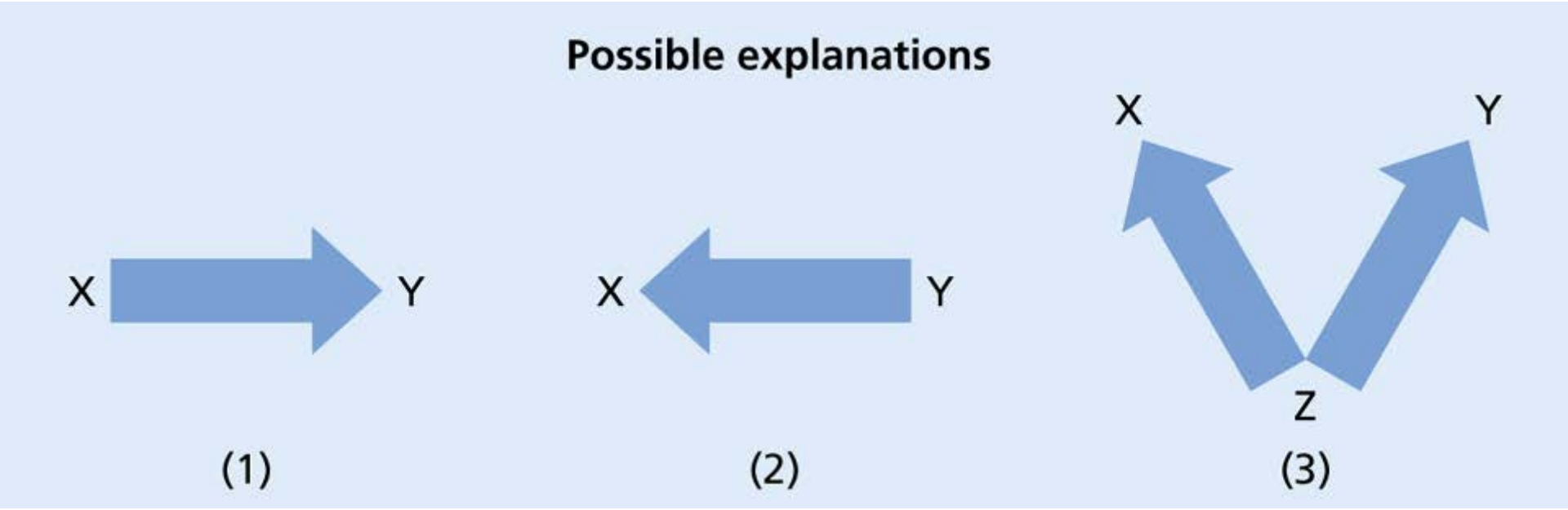
Similarly there are strength classifications for **negative relationships**:





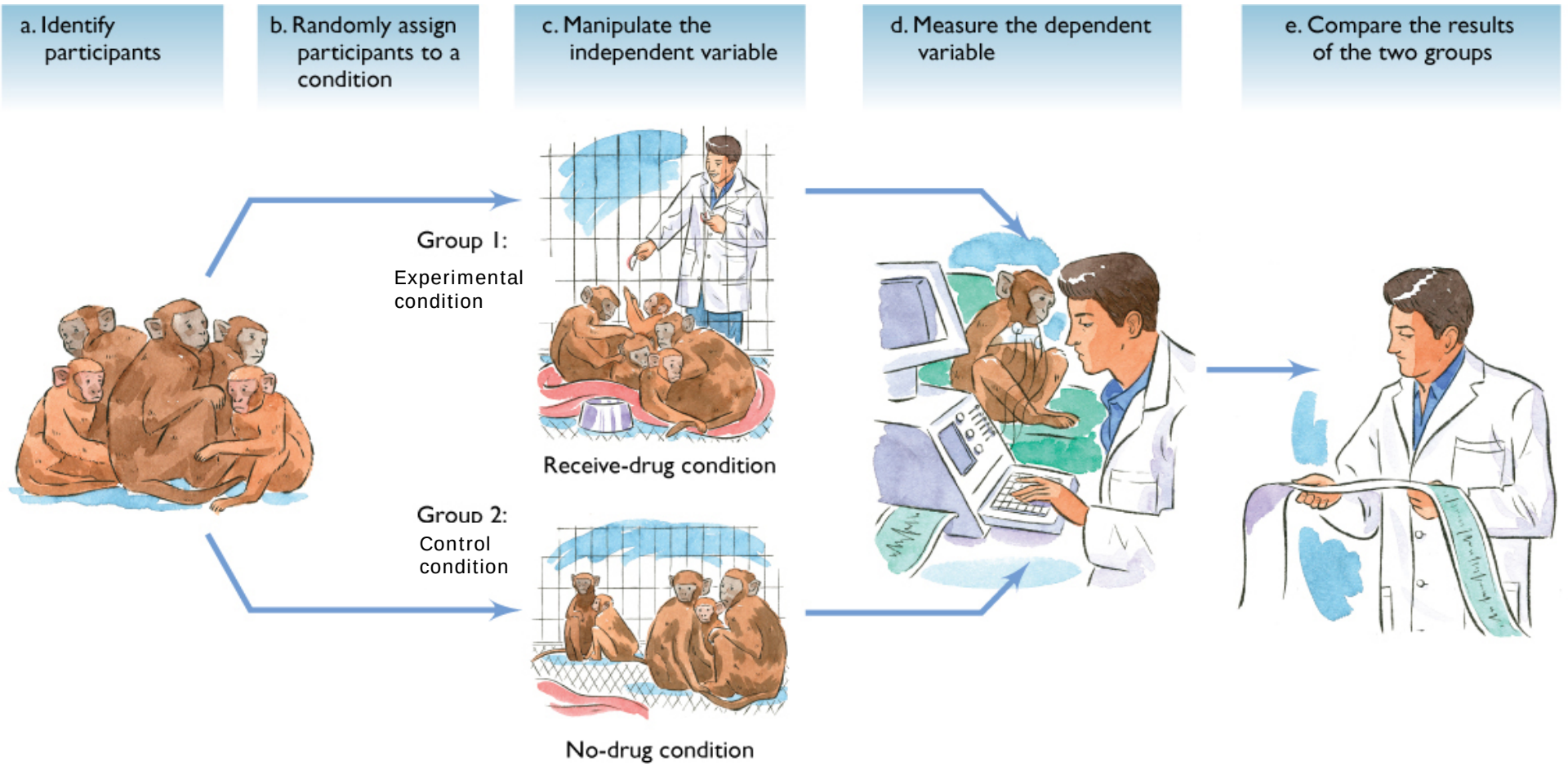


Correlations can be quantified by correlation coefficients, which can be positive or negative, and weak or strong (from 0 to 1).



Correlation ≠ Causation. Note these possible explanations for an observed correlation. Note the possible influence of a third variable (Z).

- Experiment
  - Manipulates one variable (independent variable) and observe its effect on another variable (dependent variable)
  - Allows hypothesis or theory testing
  - Establishes causal relationships

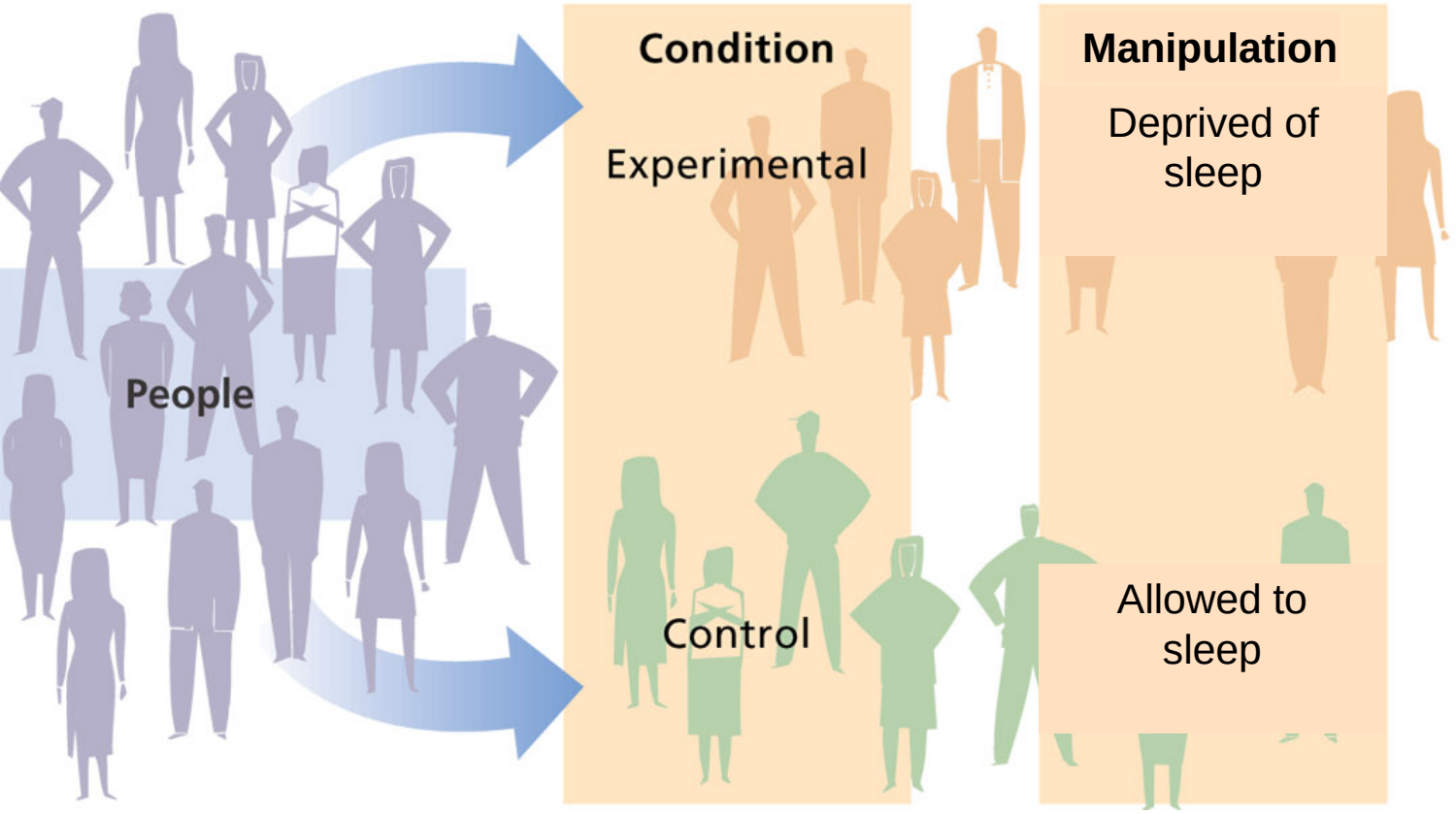

a. Identify participants
b. Randomly assign participants to a condition
c. Manipulate the independent variable
d. Measure the dependent variable
e. Compare the results of the two groups
Group 1:
Experimental condition
Receive-drug condition
Group 2:
Control condition
No-drug condition

- Experiment
  - Important to assure initial equivalence between the experimental condition and the control condition
  - Confounding variables: variables that are irrelevant to the hypothesis that can give rise to alternative explanations for the results

- Experiment
  - Random assignment: A procedure in which participants are assigned to the conditions based on chance alone

Random assignment

Equivalence of conditions (e.g., same physical settings, same food intake)



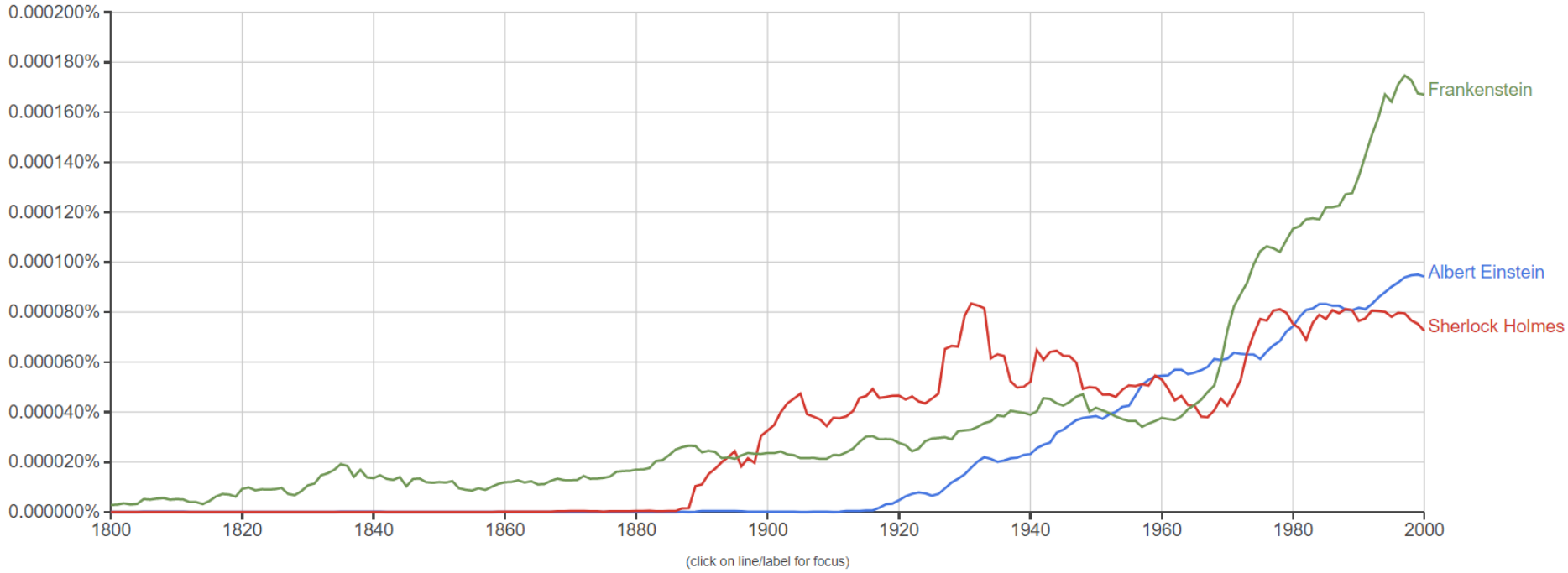
TWO MORE ISSUES

- Digital traces
  - With the increase in computing power and global connectedness, enormous records of human behavior emerge (e.g., social media posts, credit card transactions)

Google Books Ngram Viewer

Graph these comma-separated phrases: Albert Einstein,Sherlock Holmes,Frankenstein case-insensitive

between 1800 and 2000 from the corpus English with smoothing of 3 . Search lots of books



https://books.google.com/ngrams

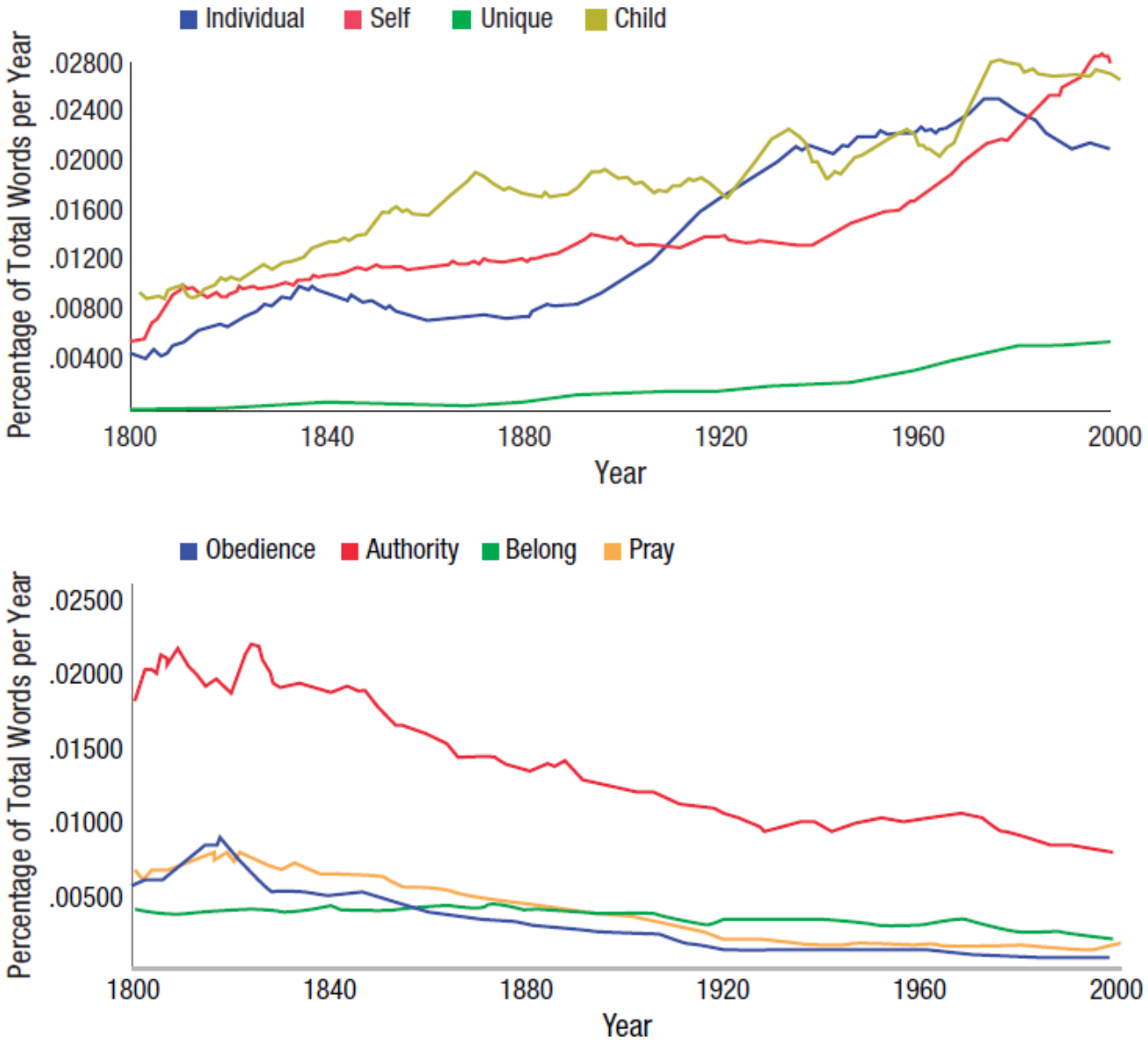


Fig. 5. Frequency of words indexing gesellschaft-adapted values (top panel) and words indexing gemeinschaft-adapted values (bottom panel) from the years 1800 through 2000. The graph was made with the Google Books Ngram Viewer (Michel et al., 2011), with a smoothing of 3.

Greenfield (2013)

- Research ethics
  - Protection of participants from physical and mental harm

- Research ethics
  - Protection of participants from harm
  - Institutional approval
  - Informed consent
    (e.g., research purpose, procedures, benefits and risks, privacy and confidentiality, rights to withdraw)
  - Debriefing