COURSE EVALUATION

- Please take 5 minutes and complete the course evaluation for *History of Psychology*! We will discuss the results next week.

THANK YOU!

Session information

Sessions take place Mondays, 8.15-9.45, Chemie, Organische, Grosser Hörsaal OC.

#	Date	Topic	Instructor
1	23.09.2024	Session 1: Introduction	Tisdall
2	30.09.2024	Session 2: Pre-psychology	Mata
3	07.10.2024	Session 3: The birth of psychology	Mata
4	14.10.2024	Session 4: Psychoanalysis	Mata
5	21.10.2024	Session 5: Behaviorism	Mata
6	28.10.2024	Session 6: Gestalt psychology	Mata
7	04.11.2024	Session 7: Cognitive psychology	Mata
8	11.11.2024	Session 8: Psychology today	Tisdall
9	18.11.2024	Session 9: Psychotherapy research	Tisdall
10	25.11.2024	Session 10: Psychological testing	Tisdall
11	02.12.2024	Session 11: Decision science	Tisdall
12	09.12.2024	Session 12: What kind of science is psychology?	Mata

AGENDA

- Mock exam solutions: Please **send us your questions IN ADVANCE by Friday (December 6) via ADAM!** We will prepare answers and discuss during the last session (December 9)
- Recap: Last slides Psychological Testing (~15 minutes)
- Decision Science (~60 minutes)

RECAP: History of Psychology

Session 10: Psychological testing

Loreen Tisdall, Center for Cognitive and Decision Sciences
November 25, 2024

Psychological testing and psychometrics: Four phases and major events

PHASE I (1880s - 1890s)

The Origins:
Standardisation and objectivity in psychological testing

- **1883:** Francis Galton publishes *Inquiries into Human Faculty and Its Development*
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The Birth of IQ:
Norms and predictive validity

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Point scales, verbal, non-verbal, and 'culture-free' tests

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PHASE IV (1950s - present)

Methodological and empirical advances, behavioral genetics, and consensus

Gregory, R. J. (2004). *Psychological testing: History, principles, and applications*. Pearson Education India. Link to ebook
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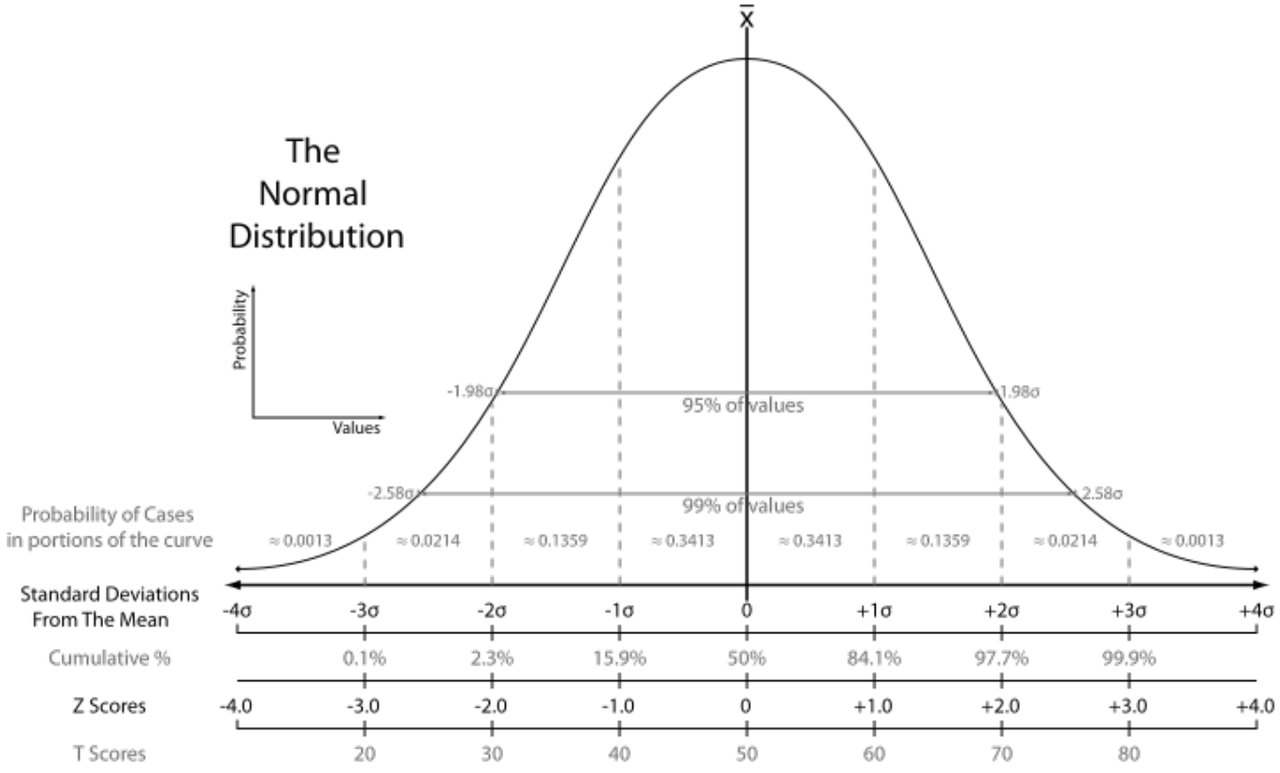
Wechsler Intelligence Scales

- The Wechsler scales were not revolutionary in the tests used (a lot of them were copied from other extant scales, as we have seen already)! The main innovation was the use of the point scale (rather than a chronological age scale as in Stanford-Binet scales)
- This allowed assigning points to each item and thus items to be grouped according to content The scale thus also allowed testers to obtain multiple scores for each individual.
- The point scale transformed how intelligence was measured and interpreted, providing a multidimensional perspective on cognitive abilities.



What does this new scoring method mean for the interpretation of what IQ is or measures?

-> IQ is fundamentally relative, it quantifies the deviation of an individual's cognitive abilities from the statistical mean of a standardized norm-building sample.

$$IQ = 100 + 15 \times \frac{\text{Raw score - Mean}}{\text{Standard Deviation}}$$

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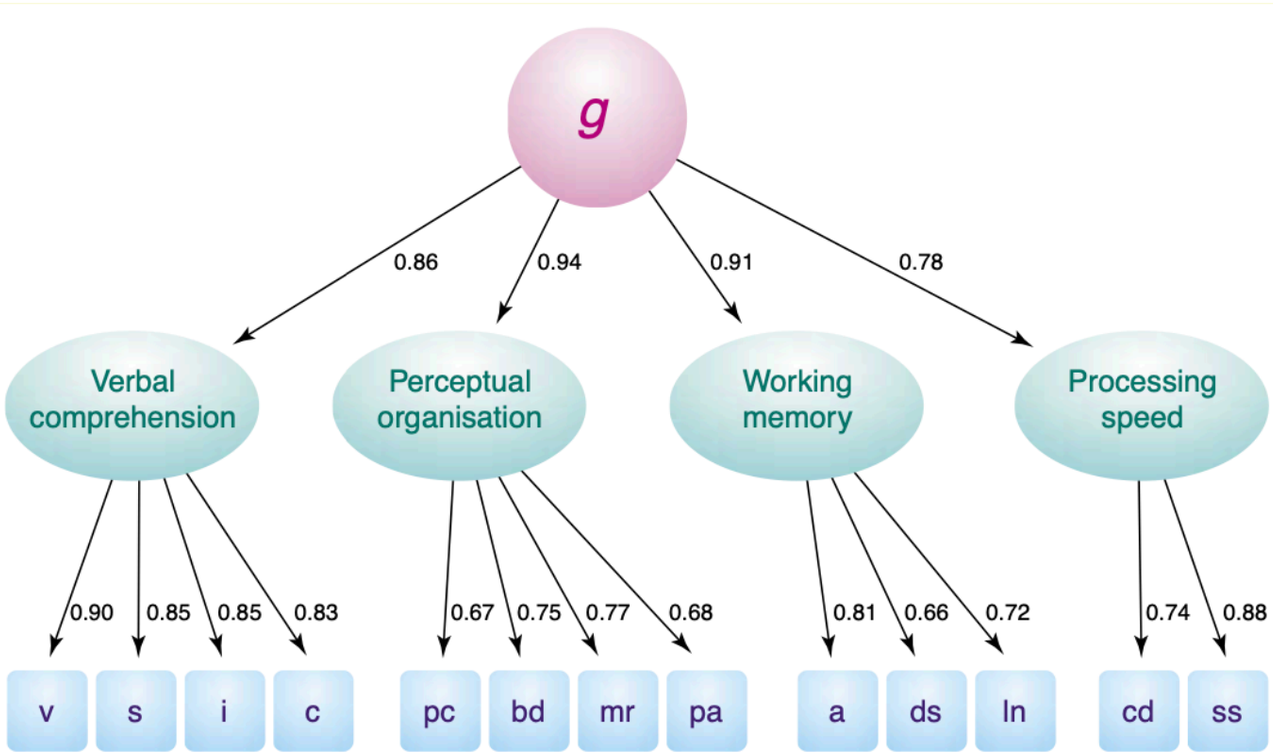
Wechsler Intelligence Scales

- Developed by David Wechsler (1896-1981), American psychologist (worked with Cattell and Spearman)
- Several versions, including Wechsler Adult Intelligence Scale (WAIS), Wechsler Intelligence Scale for Children (WISC), and Wechsler Preschool and Primary Scale of Intelligence (WPPSI-IV)
- WAISC is a revision of the Wechsler-Bellevue Intelligence Scale (originally released in 1939), contains multiple tasks that are supposed to capture different latent constructs

https://en.wikipedia.org/wiki/Wechsler_Adult_Intelligence_Scale



Scale	Abbreviation	Factor
Vocabulary	v	Verbal Comprehension
Similarities	s	
Information	i	
Comprehension	c	
Picture completion	pc	Perceptual Organization
Bloc design	bd	
Matrix reasoning	mr	
Picture arrangement	pa	
Arithmetic	a	Working Memory
Digit span	ds	
Letter-number sequencing	ln	
Digit-symbol coding	cd	Processing Speed
Symbol search	ss	

➡ **In line with the Cattell-Horn-Carroll three-stratum model of intelligence (but: # second stratum factors varies)!**

Deary, I. J. (2001). Human intelligence differences: a recent history. *Trends in cognitive sciences*, *5*(3), 127-130. Link to paper

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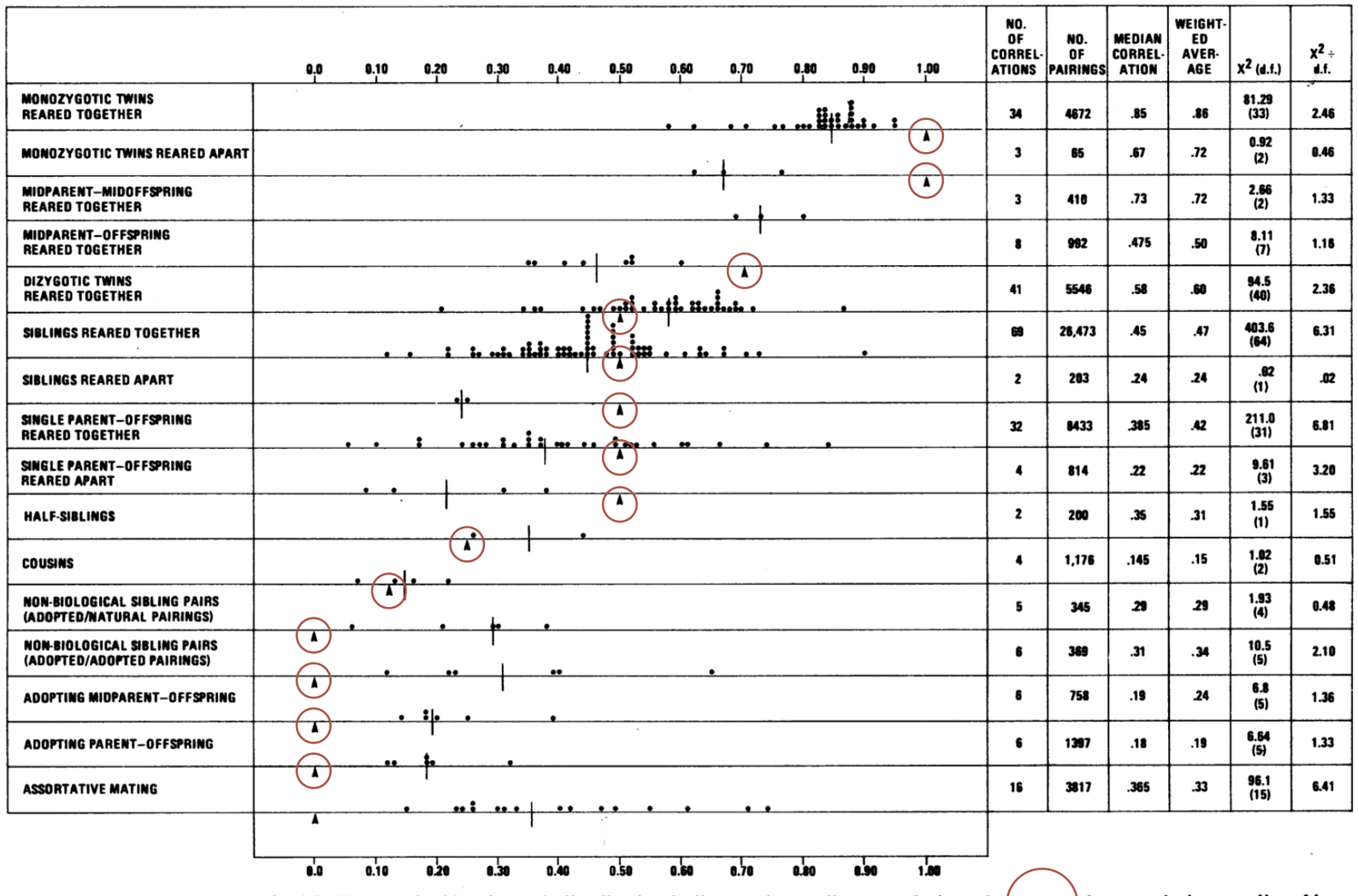
Behavioral genetics

"A summary of 111 studies identified in a survey of the world literature on familial resemblances in measured intelligence reveals a profile of average correlations consistent with a polygenic mode of inheritance. There is, however, a marked degree of heterogeneity of the correlations within familial groupings, which is not moderated by sex of familial pairing or by type of intelligence test used."



	NO. OF CORREL-ATIONS	NO. OF PAIRINGS	MEDIAN CORREL-ATION	WEIGHT-ED AVER-AGE	x^2 (d.f.)	$x^2 \div$ d.f.
MONOZYGOTIC TWINS REARED TOGETHER	34	4672	.85	.86	81.29 (33)	2.46
MONOZYGOTIC TWINS REARED APART	3	65	.67	.72	0.92 (2)	0.46
MIDPARENT–MIDOFFSPRING REARED TOGETHER	3	410	.73	.72	2.66 (2)	1.33
MIDPARENT–OFFSPRING REARED TOGETHER	8	992	.475	.50	8.11 (7)	1.16
DIZYGOTIC TWINS REARED TOGETHER	41	5546	.58	.60	94.5 (40)	2.36
SIBLINGS REARED TOGETHER	69	26,473	.45	.47	403.6 (64)	6.31
SIBLINGS REARED APART	2	203	.24	.24	.92 (1)	.02
SINGLE PARENT–OFFSPRING REARED TOGETHER	32	8433	.385	.42	211.0 (31)	6.81
SINGLE PARENT–OFFSPRING REARED APART	4	814	.22	.22	9.61 (3)	3.20
HALF-SIBLINGS	2	200	.35	.31	1.55 (1)	1.55
COUSINS	4	1,176	.145	.15	1.02 (2)	0.51
NON-BIOLOGICAL SIBLING PAIRS (ADOPTED/NATURAL PAIRINGS)	5	345	.29	.29	1.93 (4)	0.48
NON-BIOLOGICAL SIBLING PAIRS (ADOPTED/ADOPTED PAIRINGS)	6	369	.31	.34	10.5 (5)	2.10
ADOPTING MIDPARENT–OFFSPRING	6	758	.19	.24	6.8 (5)	1.36
ADOPTING PARENT–OFFSPRING	6	1397	.18	.19	6.64 (5)	1.33
ASSORTATIVE MATING	16	3817	.365	.33	96.1 (15)	6.41

Fig. 1. Familial correlations for IQ. The vertical bar in each distribution indicates the median correlation; the arrow, the correlation predicted by a simple polygenic model.

Behavioral Genetics

==> the field of study that examines the role of genetic and environmental influences on animal (including human) behaviour. Behavioural geneticists study the inheritance of behavioural traits. In humans, this information is often gathered through the use of the *twin study or adoption study*.

Heritability

==> a statistic used in breeding and genetics works that estimates how much *variation in a phenotypic trait in a population is due to genetic variation* among individuals in that population.

Bouchard Jr, T. J., & McGue, M. (1981). Familial studies of intelligence: A review. *Science*, *212*(4498), 1055-1059. Link to paper

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- **1997:** 52 intelligence researchers sign editorial on a consensus about intellgence and mental testing

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25-point consensus on intelligence and testing

"1. Intelligence is a very general mental capability that, among other things, involves the ability to reason, plan, solve problems, think abstractly, comprehend complex ideas, learn quickly and learn from experience. It is not merely book learning, a narrow academic skill, or test-taking smarts. Rather, it reflects a broader and deeper capability for comprehending our surroundings—"catching on," "making sense" of things, or "figuring out" what to do."

"2. Intelligence, so defined, can be measured, and intelligence tests measure it well. They are among the most accurate (in technical terms, reliable and valid) of all psychological tests and assessments. They do not measure creativity, character, personality, or other important differences among individuals, nor are they intended to."

…

More consensus on intelligence and testing

Table 1
Predictive Validity for Overall Job Performance of General Mental Ability (GMA) Scores Combined With a Second Predictor Using (Standardized) Multiple Regression

Personnel measures	Validity (r)	Multiple R	Gain in validity from adding supplement	% increase in validity	Standardized regression weights	
					GMA	Supplement
GMA tests[a]	.51					
Work sample tests[b]	.54	.63	.12	24%	.36	.41
Integrity tests[c]	.41	.65	.14	27%	.51	.41
Conscientiousness tests[d]	.31	.60	.09	18%	.51	.31
Employment interviews (structured)[e]	.51	.63	.12	24%	.39	.39
Employment interviews (unstructured)[f]	.38	.55	.04	8%	.43	.22
Job knowledge tests[g]	.48	.58	.07	14%	.36	.31
Job tryout procedure[h]	.44	.58	.07	14%	.40	.20
Peer ratings[i]	.49	.58	.07	14%	.35	.31
T & E behavioral consistency method[j]	.45	.58	.07	14%	.39	.31
Reference checks[k]	.26	.57	.06	12%	.51	.26
Job experience (years)[l]	.18	.54	.03	6%	.51	.18
Biographical data measures[m]	.35	.52	.01	2%	.45	.13
Assessment centers[n]	.37	.53	.02	4%	.43	.15
T & E point method[o]	.11	.52	.01	2%	.39	.29
Years of education[p]	.10	.52	.01	2%	.51	.10
Interests[q]	.10	.52	.01	2%	.51	.10
Graphology[r]	.02	.51	.00	0%	.51	.02
Age[s]	−.01	.51	.00	0%	.51	−.01

➡ Mental tests (i.e., general mental ability) have predictive validity in the real world, such as in job performance (average correlation ~ 0.5)!

Schmidt, F. L., & Hunter, J. E. (1998). The validity and utility of selection methods in personnel psychology: Practical and theoretical implications of 85 years of research findings. *Psychological bulletin*, *124*(2), 262. Link to paper

Summary

- **Psychological testing:** initially fuelled by eugenics and need for objective measurement; dual focus on theory of psychological faculties and applications to real-world problems (selection)

- **Measurement:** researchers first emphasised standardisation of measurement conditions and later standardisation of scoring; introduction of points and homogenisation across batteries (i.e., IQ) facilitated determining (age appropriate) norms, and distinction of components (e.g., verbal vs. non-verbal)

- **Methods:** development of statistical methods to quantify association between variables (e.g., Pearson correlation) and perform dimensionality reduction (e.g., factor analysis/principal component analysis)

- **Conceptual issues:** theoretical consensus by the end of the 20th century, some agreement about biological (behavioural genetics) and environmental bases (still debate about the nature of *g*, neural basis, etc.).

- **Main applications:** personnel selection/job performance, academic achievement

History of Psychology

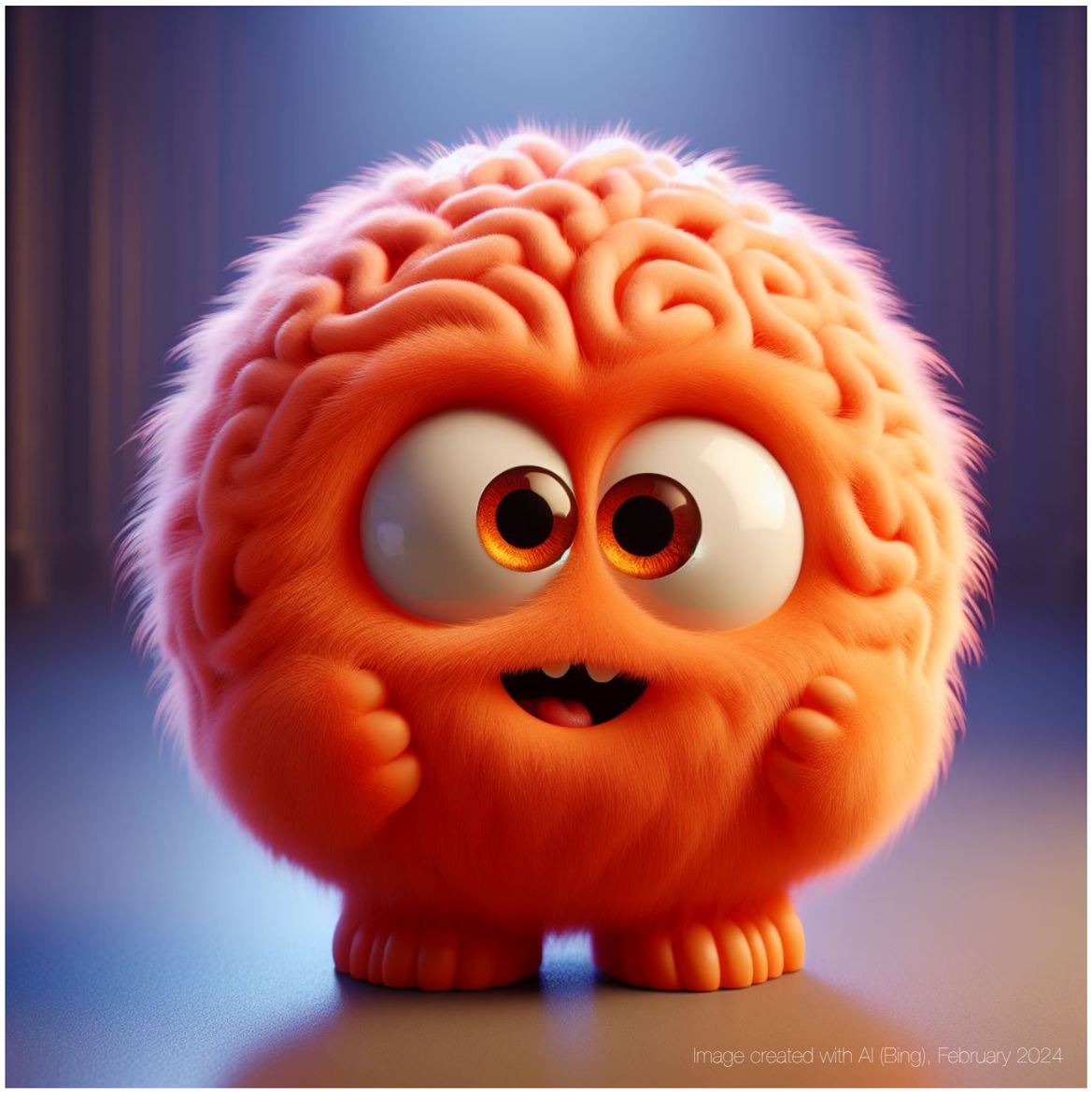
Session 11: Decision science

Loreen Tisdall, Center for Cognitive and Decision Sciences
December 2, 2024

Learning Objectives for Today

- Identify utility as an important concept in Psychology and Economics
- Understand key differences between models of choice under uncertainty

Your turn!



What is the main aim of decision science? Which disciplines feed into this field? What is its relevance?

~ 1 minute

Decision science: useful terminology

- Field of study into **how decisions *should*** optimally (rationally) **be made, *are* made**, and how to ***bridge*** **the two**
- **Multi / interdisciplinary field** that includes psychologists, engineers, economists, mathematicians, philosophers, statistics, marketing, amongst others
- A key aspect in decision science is trying to understand **decision-making under uncertainty** (uncertainty regarding outcome magnitudes, probabilities, directions, temporal aspects)
  - ➡ Distinction between **risk** (outcomes and their probabilities are given or can be ascertained; e.g., roll of a die) versus **Knightian uncertainty** (ambiguity; outcomes and their probabilities are not given and cannot be ascertained, e.g., impact of Artificial General Intelligence)
  - ➡ Addresses **deviations from rational models** when navigating uncertainty (e.g., how cognitive limitations, heuristics, and biases influence decision-making when faced with incomplete or ambiguous information)

Busemeyer, J. R. (2015). Cognitive science contributions to decision science. *Cognition*, *135*, 43-46. https://www.sciencedirect.com/science/article/pii/S0010027714002303

Hertwig, R. (2015). Decisions from experience. The Wiley Blackwell handbook of judgment and decision making, 2, 239-267. https://onlinelibrary.wiley.com/doi/10.1002/9781118468333.ch8

Normative, descriptive, and prescriptive models

NORMATIVE: How should ultra-intelligent, super-rational people make decisions?

- Sets out how to make optimal (instead of actual) decisions
- The profession of economists

DESCRIPTIVE: How do people actually make decisions?

- Account for and explain decisions
- The profession of psychologists

PRESCRIPTIVE: How can better decisions be made?

- Integration of descriptive and normative perspectives (creating a bridge!)
- The profession of practitioners and engineers

Raiffa, H. (2007). *Negotiation analysis: The science and art of collaborative decision making. Cambridge, Massachusetts:* Harvard University Press.

From normative to descriptive models

Expected Value Theory (EVT)

Normative Origins and Rational Foundations

- **1654:** Attempting to solve the “problem of points”, Blaise Pascal and Pierre de Fermat propose EVT as one of the earliest mathematical approaches to decision-making under uncertainty
- Includes the notion of expected value, EV: a choice was thought rational if it maximized EV
- ***EV = “the product of the probability of an outcome and the value of that outcome” (sum of products for multiple outcomes)***

Expected Utility Theory (EUT)

Expected Utility and Risk Preferences

Prospect Theory (PT)

Behavioral Insights and Real-World Choices

Newell, B. R., Lagnado, D. A., & Shanks, D. R. (2022). Decision quality and a historical context. Link to chapter

Ore, O. (1960). Pascal and the invention of probability theory. *The American Mathematical Monthly*, *67*(5), 409-419. Link to paper

Integration of value and probability

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Normative Origins and Rational Foundations

Expected Utility Theory (EUT)

Expected Utility and Risk Preferences

Prospect Theory (PT)

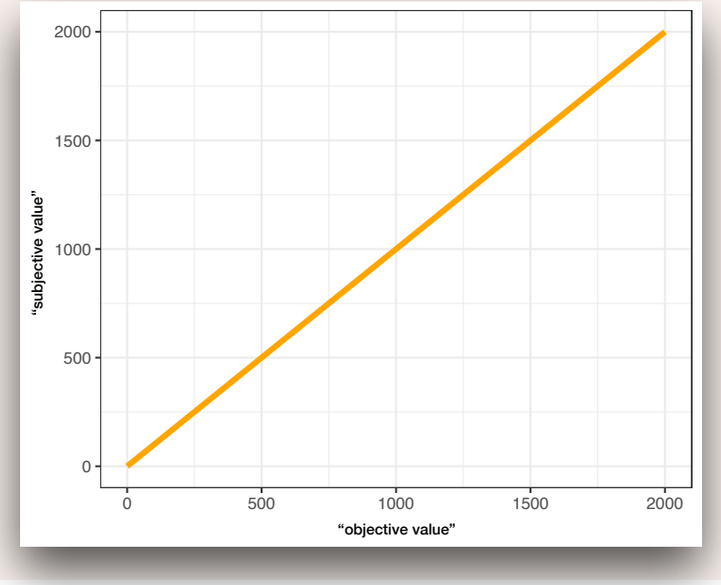
Behavioral Insights and Real-World Choices

Example for 2 options

$EV = p_1 * x_1 + p_2 * x_2$

$EV = 0.5 * 100 + 0.5 * 0 = 50$

Value function x is linear



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Expected Utility and Risk Preferences

- **1738:** Daniel Bernoulli publishes *Exposition of a New Theory on the Measurement of Risk,* the foundation for EUT, but originally received little attention

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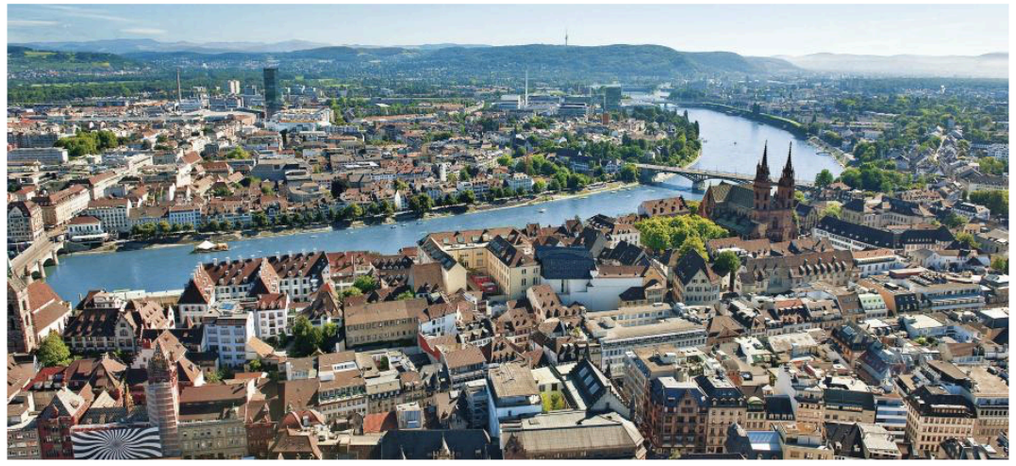
Daniel Bernoulli

University of Basel

Bernoulli Network for the Behavioral Sciences

About | Bernoulli Lectures | Bernoulli Workshops | Symposium on Risk



Welcome to the Bernoulli Network for the Behavioral Sciences!

The Bernoulli Network for the Behavioral Sciences is a joint initiative of the **Faculty of Psychology** and the **Faculty of Business and Economics** of the University of Basel, with the aim of fostering interdisciplinary dialogue in the behavioral sciences. The initiative honours the polymath Daniel Bernoulli (1700-1782) who contributed greatly to conceptions of utility and risk that are central to Psychology, Economics, and related disciplines.

The Bernoulli Network organises the › **Bernoulli Lectures for the Behavioral Sciences**, annually honouring a researcher who has contributed significantly to the development of the behavioural sciences, and the › **Bernoulli Workshops**, a set of yearly workshops allowing researchers in the behavioural sciences at the University of Basel to present and discuss their work and establish interdisciplinary collaborations. In addition, the Bernoulli Network organizes other special interest events related to the behavioural sciences, such as the › **Bernoulli Symposium on Risk** (2017) or › **WiDS Basel** (Women in Data Science Basel Conference, 2019).

The Bernoulli Network was initiated by Prof Dr. › Ralph Hertwig in 2010 (now Director of the Center for Adaptive Rationality, Max Planck Institute for Human Development, Berlin) and currently involves Prof. Dr. › Jörg Rieskamp, Prof. Dr. › Rainer Greifeneder, Prof. Dr. › Rui Mata, at the Faculty of Psychology, and Prof. Dr. › Georg Nöldeke, Prof. Dr. › Alois Stutzer, and Prof. Dr. › Miguel Brendl at the Faculty of Business and Economics, University of Basel.

To receive information about upcoming events, please contact the administrative assistant, Laura Wiles: › laura.wiles@unibas.ch.

Newell, B. R., Lagnado, D. A., & Shanks, D. R. (2022). Decision quality and a historical context. Link to chapter

From normative to descriptive models

Expected Value Theory (EVT)

Normative Origins and Rational Foundations

- **1654:** Attempting to solve the “problem of points”, Blaise Pascal and Pierre de Fermat propose EVT as one of the earliest mathematical approaches to decision-making under uncertainty
- Includes the notion of expected value, EV: a choice was thought rational if it maximized EV
- ***EV = “the product of the probability of an outcome and the value of that outcome” (sum of products for multiple outcomes)***

Expected Utility Theory (EUT)

Expected Utility and Risk Preferences

- **1738:** Daniel Bernoulli publishes *Exposition of a New Theory on the Measurement of Risk,* the foundation for EUT
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Prospect Theory (PT)

Behavioral Insights and Real-World Choices

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Integration of value and probability

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Behavioral Insights and Real-World Choices

Example for 2 options

$EV = p_1 * x_1 + p_2 * x_2$

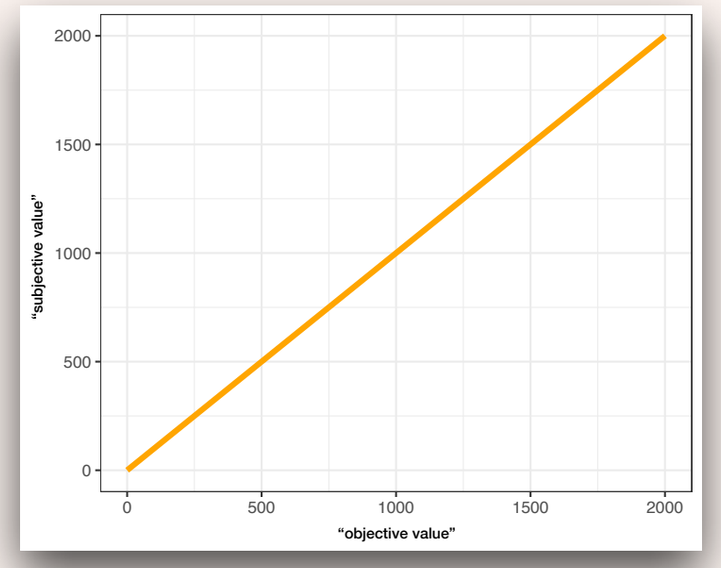
$EV = 0.5 * 100 + 0.5 * 0 = 50$

Example for 2 options

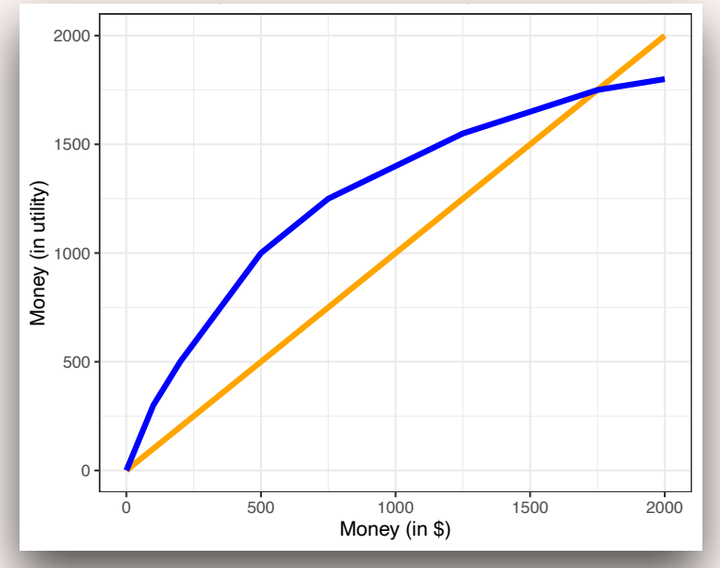
$EU = p_1 * u(x_1) + p_2 * u(x_2)$

$EU = 0.5 * 80 + 0.5 * 0 = 40$

Value function x is linear



Value function u(x) is concave



How do we find the 'U' in EU?
What experimental approach would be suitable?

Repeated choices in lotteries

50 CHF

vs.

0 CHF

100 CHF

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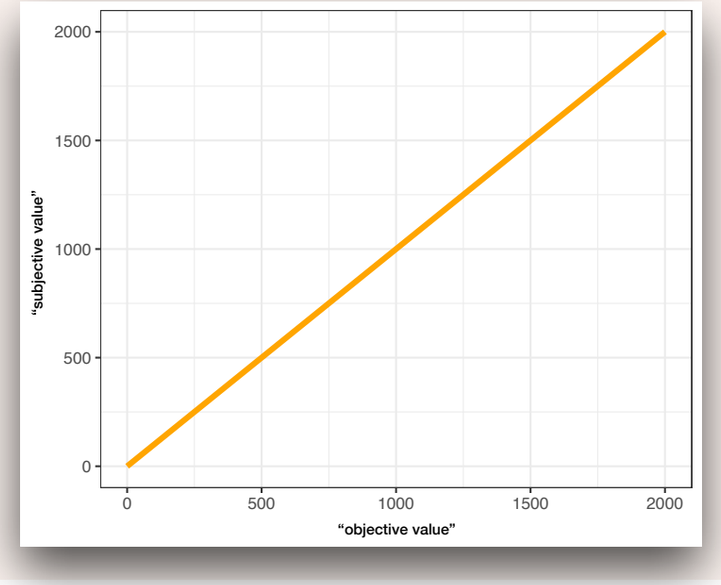

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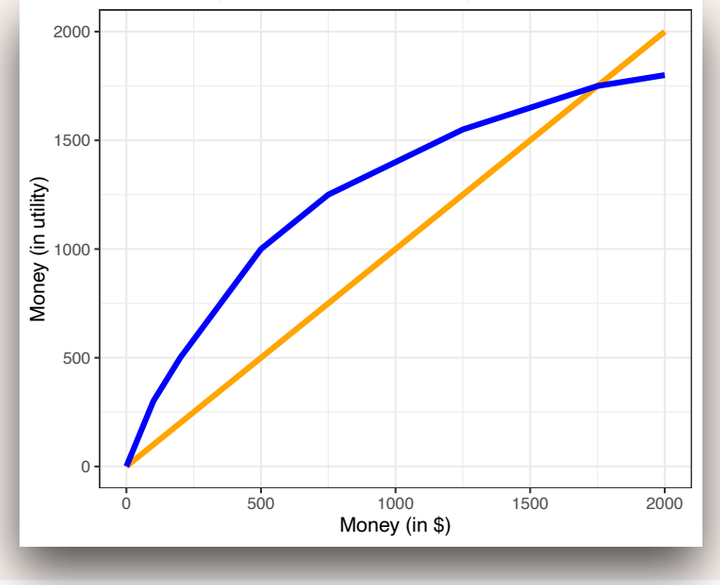


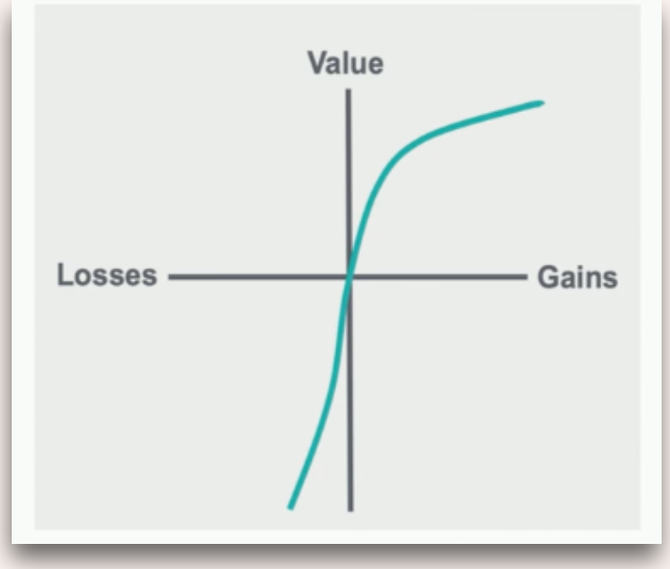
Prospect Theory (PT)

Behavioral Insights and Real-World Choices

Example for 2 options

$V = v(x_1){*}w(p_1) + v(x_2){*}w(p_2)$

Value function v(x) is concave for gains and convex for losses



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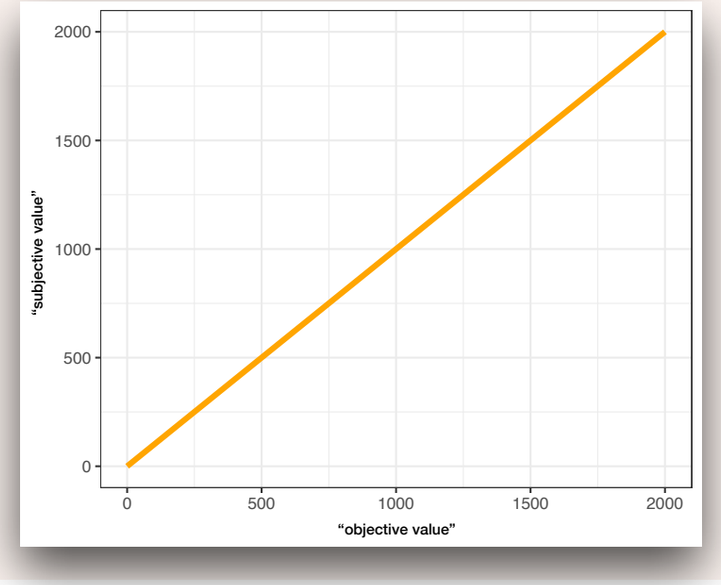
Value function x is linear
Probability function p is linear



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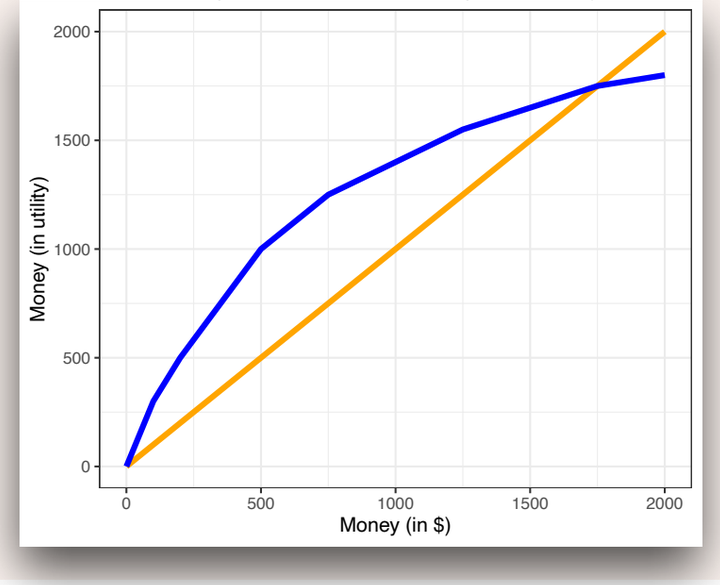


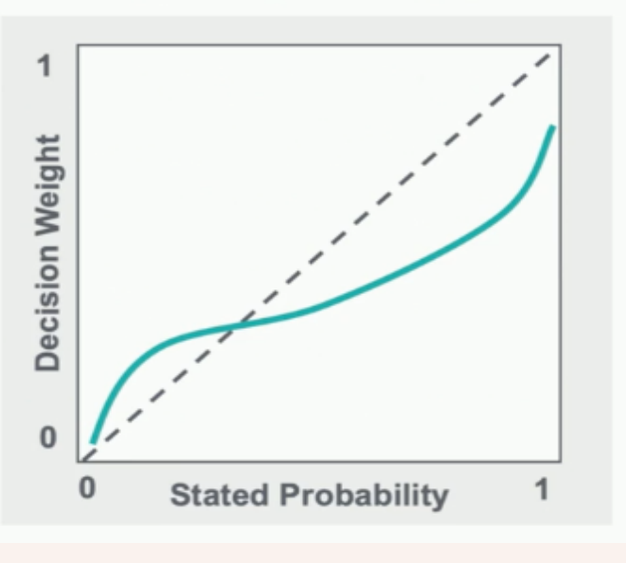
Prospect Theory (PT)

Behavioral Insights and Real-World Choices

Example for 2 options

$V = v(x_1){*}w(p_1) + v(x_2){*}w(p_2)$

Value function v(x) is concave for gains and convex for losses, probability function w(p) is weighted



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- Behavioral choice patterns that are in violation of EUT but are in line with PT:
  - *Certainty effect*
  - *Reflection effect*
  - *Framing effect*

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Summary

- **Utility** is a central concept in decision science that represents a subjective quantity of value or worth; first formalised in 18th century by Daniel Bernoulli, it has since been a central concept in both economics and psychology (as the causal principle underlying choices) and is central to concepts such as motivation, happiness and well-being

- Amongst other factors, **models of choice under uncertainty** differ in how outcomes and probabilities are treated: Expected Value Theory evaluates choices using objective monetary values and linear probabilities; Expected Utility Theory incorporates subjective utility to reflect risk preferences while maintaining linear probabilities; and Prospect Theory accounts for psychological biases by both a value and a probability weighting function.

- The history of decision science is characterised by **transitions from purely normative to more descriptive models** of choice —> fruitful marriage between empirical research and theoretical work!

Questions ???

Key reading

Newell, B. R., Lagnado, D. A., & Shanks, D. R. (2022). Decision quality and a historical context. In *Straight choices* (3rd ed., pp. 12). Psychology Press. https://doi.org/10.4324/9781003289890 **(download via ADAM: https://adam.unibas.ch/goto_adam_file_1940530_download.html)**

Additional reading (optional)

Ruggeri, K., Alí, S., Berge, M. L., Bertoldo, G., Bjørndal, L. D., Cortijos-Bernabeu, A., ... & Folke, T. (2020). Replicating patterns of prospect theory for decision under risk. *Nature human behaviour*, *4*(6), 622-633. https://www.nature.com/articles/s41562-020-0886-x.pdf

Comment by Kellen (2020). The Limited Value of Replicating Classic Patterns of Prospect Theory. https://communities.springernature.com/posts/the-limited-value-of-replicating-classic-patterns-of-prospect-theory