COGNITIVE BIAS: WHAT IT IS, WHY IT'S A PROBLEM, AND WHAT WE CAN DO ABOUT IT

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Social Research and Demonstration Corporation (SRDC)

SRDC is a non-profit policy research organization, established in 1991

Specialize in evaluating programs and new policy ideas "at scale" in "real-world" settings

Demonstration projects and social experiments using randomized control trials (RCTs)

Implemented studies in every province, in over 75 communities, and have recruited and randomly assigned over 70,000 participants in our studies

Behavioural economics experience

Current study (for Financial Consumer Agency of Canada) investigating the links between cognitive bias and various financial outcomes, including savings and exposure to debt

For Employment and Social Development Canada, designing a simplified enrolment scheme to improve participation in voluntary retirement savings plans

For the Higher Education Quality Council of Ontario and the Canada Millennium Scholarship Foundation, studies that measured cognitive bias and assessed its impact on the pursuit of higher education

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Standard vs. behavioural economics

Homo economicus

Rational self-interest - well-defined preferences, and behaviour aligned with preferences

Errors → lack of information, or inability to understand available information

Interventions focus on enhancing knowledge, and/or presenting information in better ways

But having accurate information does not mean it will be used effectively

Improving knowledge often has little impact on outcomes (e.g. financial literacy)

Psychological factors as important or more important than knowledge

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Homo irrationalis

E.g. Employer sponsored savings plans (Choi, Laibson, & Madrian 2011)

Employee contributions matched by employer

Employees older than 59.5 can withdraw contributions at any time without penalty AND keep employer matching $$ (maximize wealth inside the savings plan, while leaving resources outside the plan unaffected)

Rational self-interest – no one should contribute less than the employer matching threshold.

Yet 41% do, leading to annual losses as high as $7,500

Field experiment – employees contributing below threshold were asked to calculate how much they were losing by doing so (average of $1200 per year)

Yet less than 1% raised their contribution rates.

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Cognitive bias

Departures from "rationality" – not always a defect

People have limited information processing capabilities and limited time

Often cannot make decisions that are both fast and accurate; tradeoffs

Brain is built to use shortcuts, rules of thumb - usually "good enough", but occasional errors (e.g. optical illusions)

Often "bias" may be more of a design feature than a defect (Beau Lotto's lab)

When cognitive bias is a problem

Psychological factors may produce deviations from classic economic rationality that result in self-defeating behaviour

E.g. Overspending/undersaving, consumption of habit-forming goods (cigarettes, drugs, alcohol), unhealthy food choices, not exercising, non-adherence to medications, screening, vaccination recommendations, etc.

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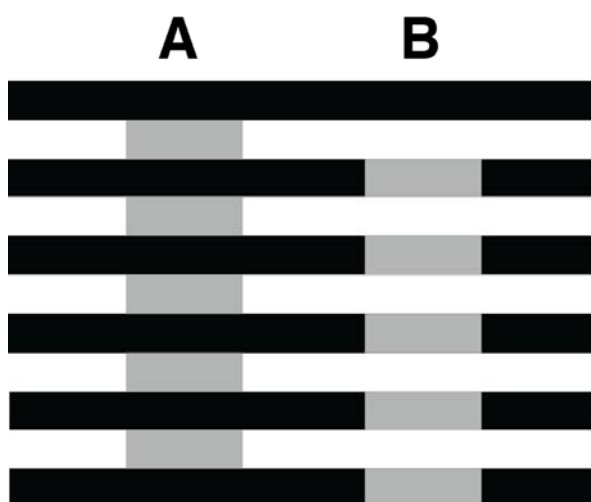
The "two selves" problem

T. Schelling (1980): "People behave sometimes as though they had two selves…one who wants a lean body and another who wants dessert"

One of the most important sources of self-defeating behaviour is *time-inconsistent preferences* (also known as *present bias)*

Future self has defined preferences, but present self acts contrary to those preferences

No one with fully time-consistent preferences would make the following statements
- Next month, I'll quit smoking
- Starting next week, I'll exercise more
- In the new year, I'll start eating better
- Next time I have extra money, I'll start saving for retirement

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Present bias

Can measure the extent to which people are present biased in various contexts

Decisions made by "present self", asked to state both present and future preferences

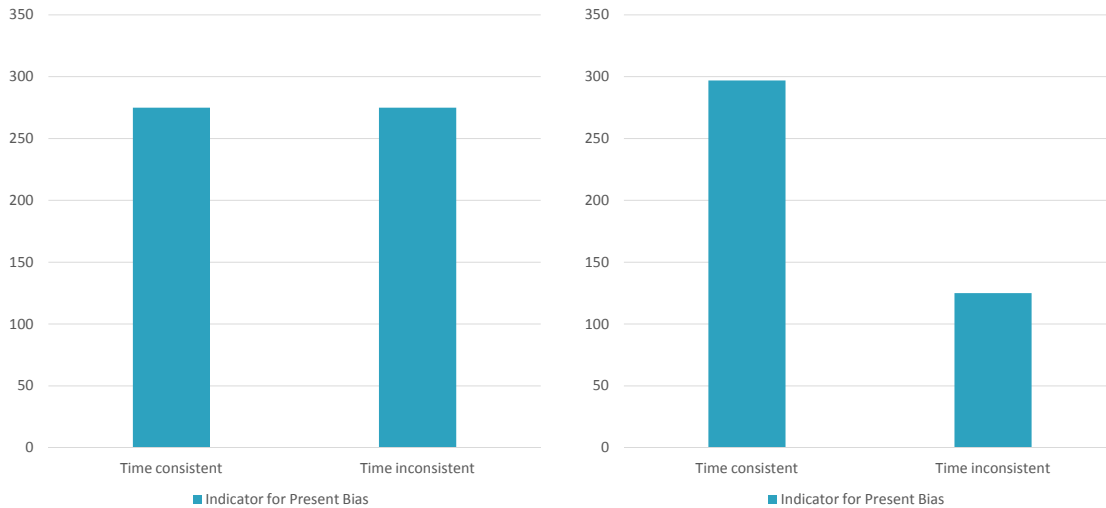| Time consistent	Time inconsistent
1) $40 today or $50 a month from today	1) $40 today or $50 a month from today
2) $40 a year from today or $50 a year and a month from today	2) $40 a year from today or $50 a year and a month from today

These simple measures may predict important outcomes

E.g. pursuit of higher education (SRDC/HEQCO)

E.g. financial outcomes (SRDC/FCAC)

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Intended savings from tax refund　　　　**Actual savings**

Source: Benton, Meier, & Sprenger 2007

Time consistent　　　Time inconsistent
■ Indicator for Present Bias

Time consistent　　　Time inconsistent
■ Indicator for Present Bias

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Health applications

Self-control issues related to health – results inconsistent with standard model, more consistent with present bias

    Gym attendance – purchase yearly passes (intention); per-visit passes would be cheaper (action)

    Smoking – measured present bias predicts both smoking probability and dependence

    Default effects – changing default from opt-in to opt-out raises organ donation rates, vaccination rates, HIV screening, etc.

    "Payday" effects – larger purchases at the beginning of the cycle, may run out before the end (e.g. food stamps)

Present bias may be made worse by other cognitive biases
    Self-serving bias (blame failures on external factors)
    Projection bias (overestimate stability of current preferences)
    Overconfidence/optimism bias (personal risk < general risk)

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Options for intervention

Present bias starts early, and persists

Delay of gratification among preschoolers predicts body mass index (BMI) 30 years later. (SAT scores too)

Individual differences → no "one-size-fits-all" solution

Intervention strategies

"Nudges" – exploit cognitive biases (inertia/status quo bias, loss aversion) by changing choice default settings; default people into programs (let them opt out if they want), once in they will stay.

Commitment devices – self-managed ("soft", e.g. self-rationing, visualization tools); or commitment contracts ("hard", e.g. link health goals with monetary deposits)

Deadlines – make offers (e.g. to join health plan) time limited, and require a choice, to prevent procrastination

Sin Taxes – go beyond recouping external costs to society; incorporate "internalities" as well (e.g. from present bias)

Social Preferences – appeals to altruistic motivation; leverage desire to help others (another kind of cognitive "bias"

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A role for education

In some cases, "boosts" may be more appropriate than "nudges"

Where self-control is an issue, education is often not likely to achieve large gains

However, in some cases information can be framed in ways that minimize bias, facilitate cognitive processing and decision-making

Base rate neglect/bias (among patients and physicians)

Ignore general information (base rate) and focus on information pertaining to a specific case

Health statistics usually presented in terms of conditional probabilities

E.g. for breast cancer screening → prevalence in population (base rate), sensitivity of test (probability of testing positive if patient has cancer), and false-positive rate (probability of testing positive if patient does not have cancer)

"De-biasing" - base rate bias minimized if information is presented in terms of *frequencies*

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Problem presented in terms of conditional probabilities

Assume you conduct breast cancer screening using mammography in a certain region. You know the following information about the women in this region:

1) The probability that a woman has breast cancer is 1% (prevalence; base rate)

2) If a woman has breast cancer, the probability that she tests positive is 90% (sensitivity)

3) If a woman does not have breast cancer, the probability that she nevertheless tests positive is 9% (false-positive rate)

A woman tests positive. What are the chances she has breast cancer?

Few physicians answered correctly

A.   The probability that she has breast cancer is about 81%.

B.   Out of 10 women with a positive mammogram, about 9 have breast cancer.

C.   Out of 10 women with a positive mammogram, about 1 has breast cancer.

D.   The probability that she has breast cancer is about 1%.

Source: Gigerenzer et al. 2007

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Problem presented in terms of frequencies

Assume you conduct breast cancer screening using mammography in a certain region. You know the following information about the women in this region:

1) Ten out of every 1,000 women have breast cancer

2) Of these 10 women with breast cancer, 9 test positive

3) Of the 990 women without cancer, about 89 nevertheless test positive

A woman tests positive. What are the chances she has breast cancer?

Most physicians answered correctly

A.   The probability that she has breast cancer is about 81%. (1% of physicians)

B.   Out of 10 women with a positive mammogram, about 9 have breast cancer. (6% of physicians)

C.   Out of 10 women with a positive mammogram, about 1 has breast cancer. (87% of physicians)

D.   The probability that she has breast cancer is about 1%. (6% of physicians)

Source: Gigerenzer et al. 2007

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Problem presented in terms of conditional probabilities

Assume you conduct breast cancer screening using mammography in a certain region. You know the following information about the women in this region:

1) The probability that a woman has breast cancer is 1% (prevalence; base rate)

2) If a woman has breast cancer, the probability that she tests positive is 90% (sensitivity)

3) If a woman does not have breast cancer, the probability that she nevertheless tests positive is 9% (false-positive rate)

A woman tests positive. What are the chances she has breast cancer?

Few physicians answered correctly

A. The probability that she has breast cancer is about 81%. (13% of physicians)

B. Out of 10 women with a positive mammogram, about 9 have breast cancer. (47% of physicians)

C. Out of 10 women with a positive mammogram, about 1 has breast cancer. (21% of physicians)

D. The probability that she has breast cancer is about 1%. (19% of physicians)

Source: Gigerenzer et al. 2007

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