

Evidence-based Decision Making Interventions

Rui Mata, FS 2023

Version: Feb 15th, 2023

Goals

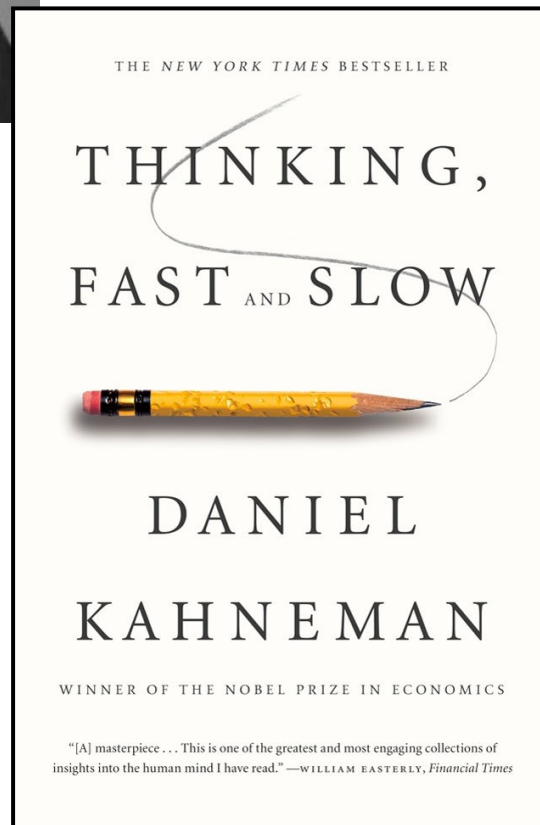
- be familiar with nudging as a type of behavioural intervention arising from a collaboration between psychology and economics - discuss conceptual and empirical strengths/weaknesses
- compare nudging to other interventions based on a taxonomy of behavioural interventions (i.e., behavioural change wheel)
- be aware of potential bias in academic work (on nudging), and factors other than efficacy that are relevant to the adoption of evidence-based interventions in practice...

Behavioral sciences to the rescue!



Daniel Kahneman

2002 Nobel Memorial Prize
in Economic Sciences

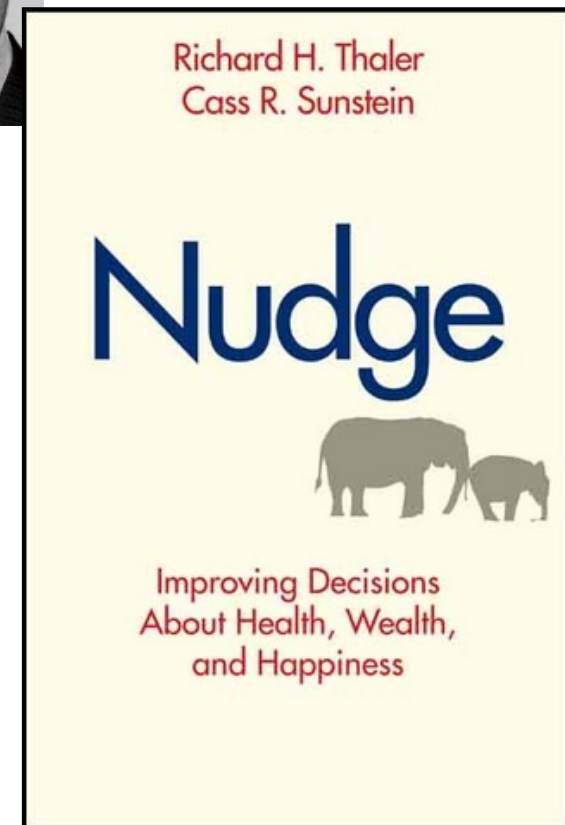


2011



Richard Thaler

2017 Nobel Memorial Prize
in Economic Sciences

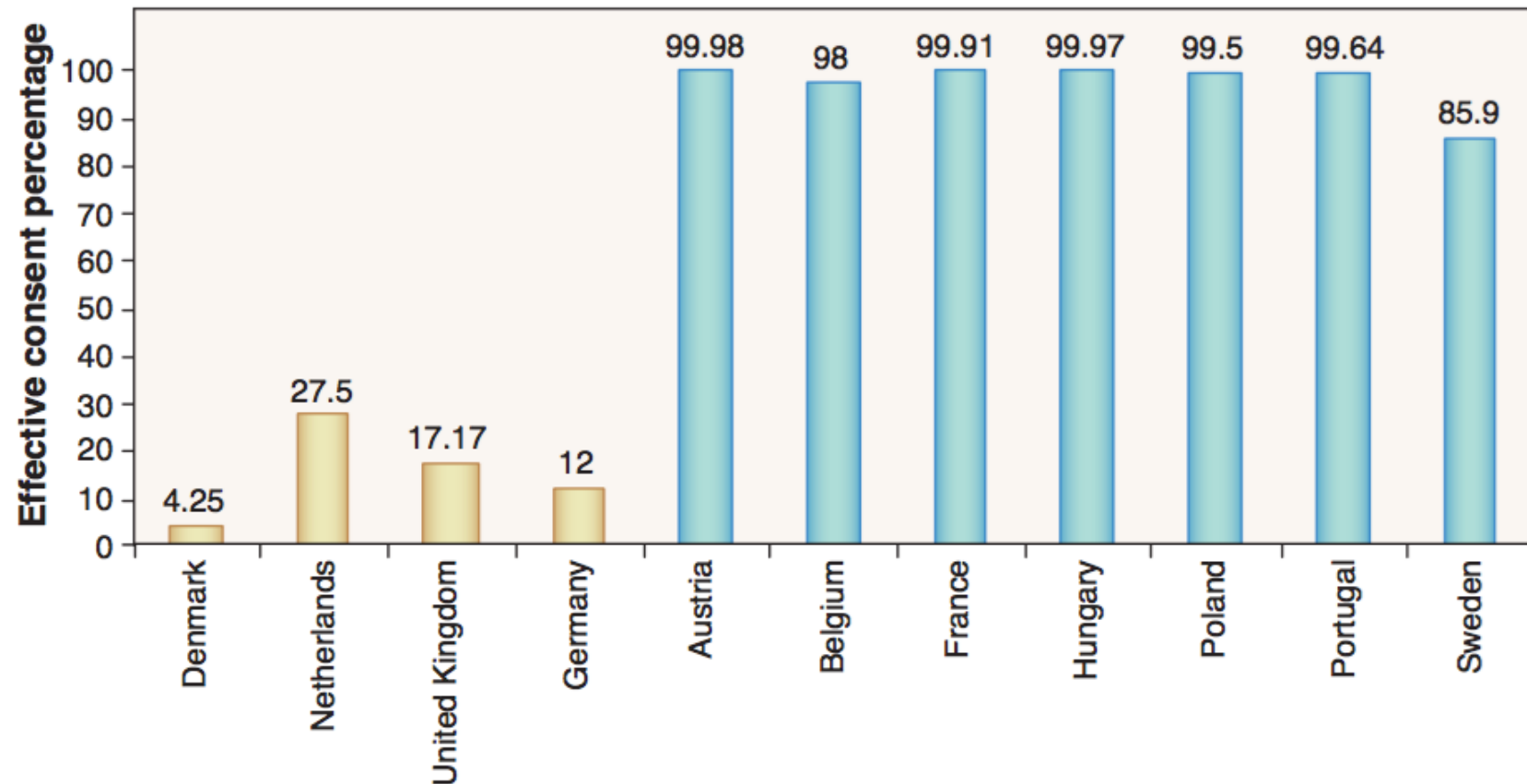


2008

Nudges



Nudges



Effective consent rates, by country. Explicit consent (opt-in, gold) and presumed consent (opt-out, blue).

Johnson, E. J., & Goldstein, D. (2003). Do defaults save lives? *Science*, 302(5649), 1338–1339.

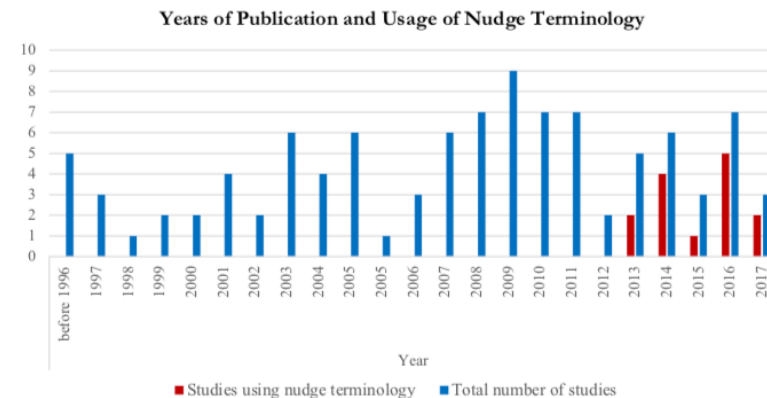
Nudges

1. help decision makers achieve a desired goal
2. exploit known cognitive/motivational shortcomings
3. affect features over which people claim not to care about (e.g., position in a list, defaults, framing)
4. are in principle reversible, allowing the chooser to decide freely

Grüne-Yanoff, T., & Hertwig, R. (2015). Nudge versus Boost: How coherent are policy and theory? *Minds and Machines*, 1–35.

Old wine in new bottles?

Nudge category	Number	Example
A. Decision information		
A1 Translate information	9 (7%)	Emphasizing consequences for patients of proper hand hygiene (Grant & Hofmann, 2011)
A2 Make information visible	23 (19%)	Suggesting alternatives when clinicians propose antibiotics (Meeker et al., 2016)
A3 Provide social reference point	7 (6%)	Showing general practitioners that they prescribe more antibiotics than their peers (Hallsworth et al., 2016)
B. Decision structure		
B1 Change choice defaults	9 (7%)	Changing the default for tests from optional to pre-selected (Olson et al., 2015)
B2 Change option-related efforts	8(6%)	Putting medical tools in line of sight (hand hygiene dispensers) (Nevo et al., 2010)
B3 Change range or composition of options	10 (8%)	Grouping tests on order forms or displaying them individually (Kahan et al., 2009)
B4 Change option consequences	4 (3%)	Asking for accountable justifications (Meeker et al., 2016)
C. Decision assistance		
C1 Provide reminders	28 (23%)	Putting reminders on operating room schedules (Patterson, 1998)
C2 Facilitate commitment	5 (4%)	Hanging poster-sized commitment letters including photographs and signatures (Meeker et al., 2014)
Other (Multifaceted)	21 (17%)	Providing cues through posters and stickers in a schematic breast shape with space for recording three mammography referrals on charts (Grady, Lemkau, Lee & Caddell, 1997)
Total (n)	124	(This is higher than the number of studies as some studies addressed multiple nudges.)



Nagtegaal, R., Tummers, L., Noordegraaf, M., & Bekkers, V. (2019). Nudging healthcare professionals towards evidence-based medicine: A systematic scoping review. *Journal of Behavioral Public Administration*, 2(2), 1–20. <http://doi.org/10.30636/jbpa.22.71>

Efficacy: How effective is nudging?

Table 1
Overview of existing literature reviews and quantitative analyses on nudging.

Reference	Context	Main variable	#Papers	Method	Exemplary results
Abrahamse et al. (2005)	Energy	Household energy conservation	38	SLR	Information results in higher knowledge levels, but not necessarily in behavioral change or save energy
Skov et al. (2013)	Health	Eating behavior in self-service settings	12	SLR	Labeling, plate and cutlery size, assortment and other manipulations associated with healthier food choices
Arno and Thomas (2016)	Health	Adult dietary behavior	37	SLR & QA	Nudges resulted in average 15.3 % increase in healthier dietary or nutritional choices
Adam and Jensen (2016)	Health	Obesity related interventions at supermarkets	42	SLR	Most studies reported that store interventions were effective in promoting purchase of healthy food
Bucher et al. (2016)	Health	Positional influences	15	SLR	Manipulating food product order & proximity can influence food choice
Wilson et al. (2016)	Health	Healthy food and beverage choices	13	SLR	Mixed effectiveness of nudging healthier food and beverage choices
Mirsch et al. (2017)	Digital	Digital Nudging	65	SLR	Psychological mechanisms that underlie digital nudging
Lycett et al. (2017)	Health and education	Children's dietary behaviors in the home	40	SLR	Studies showed improvement in dietary behaviors and were more effective in older children
Cadario and Chandon (2018)	Health	Healthy eating nudges	78	QA	Experiments yields a moderate but significant overall effect size ($d = 0.28$)
Benartzi et al. (2017)	Cross-context	Nudging and tradit. policy tools	18	QA	Nudges often compare favorably with traditional interventions
This study	Cross-context	Overall effect sizes of nudging	100	SLR & QA	See below

Note: SLR = systematic literature review; QA = quantitative analysis

Hummel, D., & Maedche, A. (2019). How effective is nudging? A quantitative review on the effect sizes and limits of empirical nudging studies. *Journal of Behavioral and Experimental Economics*, 80, 47–58.

<http://doi.org/10.1016/j.socec.2019.03.005>

Efficacy: How effective is nudging?

Dimension	Characteristic									
Setting (100)	Conventional (68)					Digital (32)				
Choice architecture tool (304)	Structuring the choice task (117)					Describe choice options (187)				
Category (290)	Default (60)	Simplification (12)	Social ref. (49)	Change effort (41)	Disclosure (18)	Warnings/graphics (55)	Precommitment (6)	Reminders (34)	Implement. Intent. (8)	
Application context (96)	Health (38)	Environment (19)	Finances (12)	Energy (10)	Policy Making (10)					
Clusters of outcomes (317)	Energy consumption (18)	Healthy products chosen or purchase (60)	Sales of environmentally friendly products (43)	Amount donated (20)	Other (176)					
Data collection (291)	Online experiment (46)	Lab experiment (47)	Field experiment (150)	Experiment (other) (6)	Survey (experiment) (42)					
Significance (308)	Insignificant effect (118)					Significant effect (190)				
Magnitude (273)	Low (<10%) (78)			Medium (10%-30%) (81)			High (>30%) (112)			

Fig. 2. Morphological box of empirical nudging studies including counting.

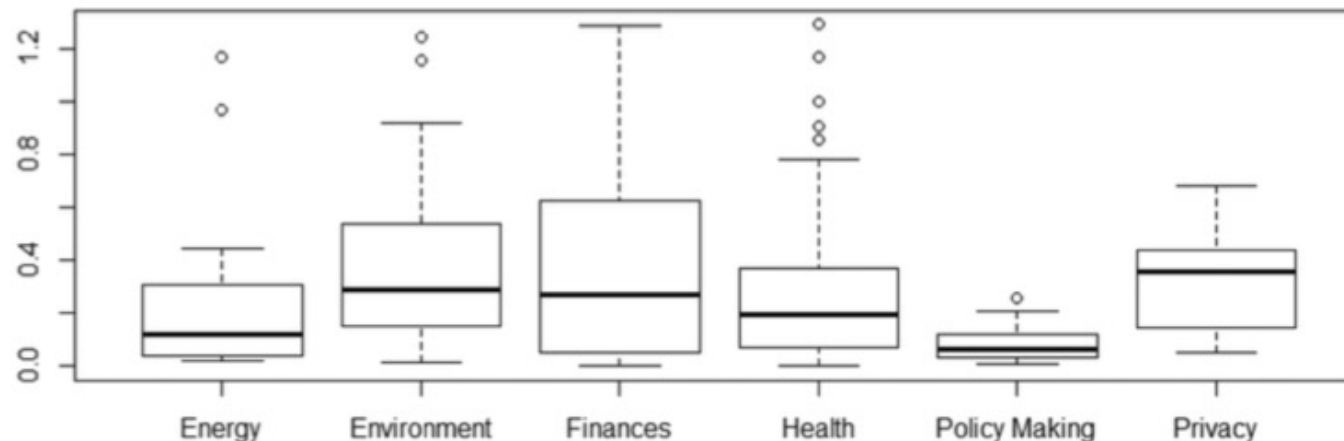
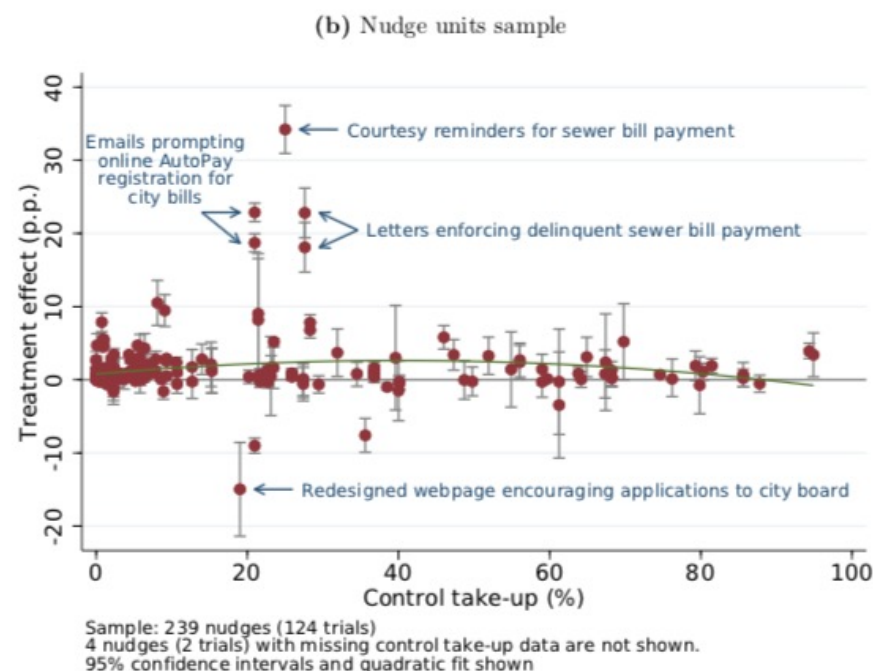
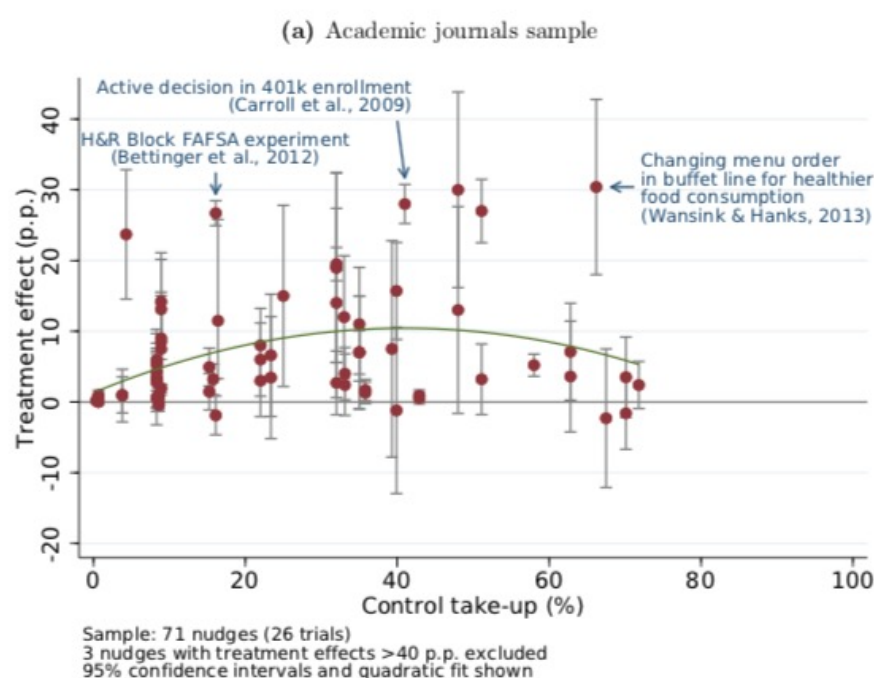


Fig. 4. Boxplot of relative effect sizes per context.

Hummel, D., & Maedche, A. (2019). How effective is nudging? A quantitative review on the effect sizes and limits of empirical nudging studies. *Journal of Behavioral and Experimental Economics*, 80, 47–58.

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Efficacy vs. Effectiveness? No, publication bias...



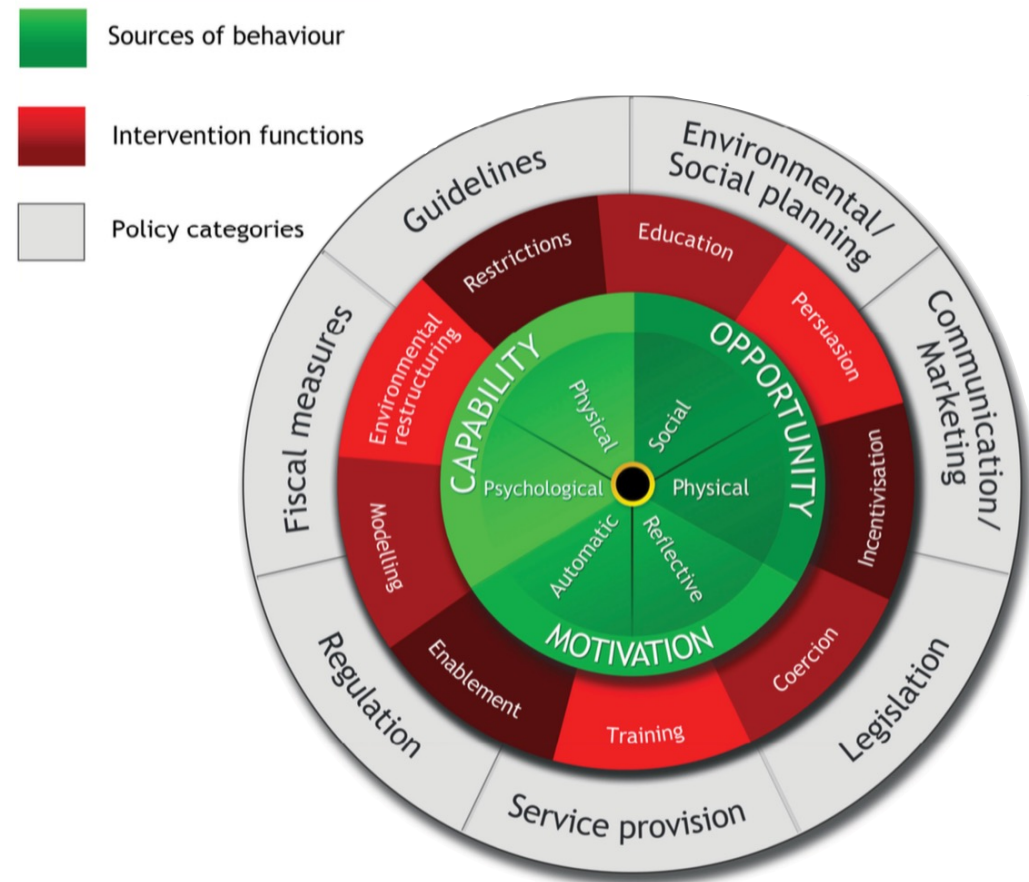
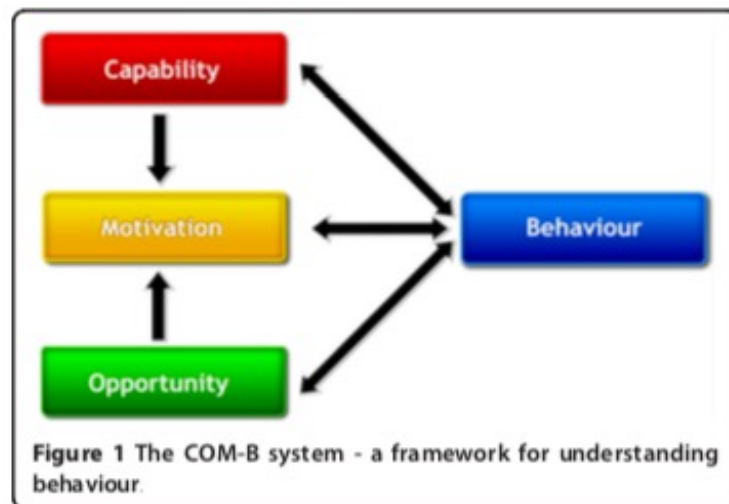
“In papers published in academic journals, the average impact of a nudge is very large – an **8.7** percentage point take-up increase over the control. In the Nudge Unit trials, the average impact is still sizable and highly statistically significant, but smaller at **1.4** percentage points. We show that a large share of the gap is accounted for by publication bias, exacerbated by low statistical power, in the sample of published papers; in contrast, the Nudge Unit studies are well-powered, a hallmark of “at scale” interventions. Accounting for publication bias, and some differences in characteristics, reconciles the two estimates. We also compare these results to the predictions of academics and practitioners. Most forecasters over-estimate the impact for the Nudge Unit interventions, though nudge practitioners are almost perfectly calibrated.”

Cost-benefit analysis

Article	Intervention type	Treatment	Impact	Cost	Relative effectiveness
Carroll, Choi, Laibson, Madrian, & Metrick (2009)	Nudge	New employees at a company were required to indicate their preferred contribution rate in a workplace retirement-savings plan within their first month of employment.	\$200 increase in savings-plan contributions per employee ^a	\$2 per employee for distributing the form and for following up with employees who did not respond	\$100 increase in savings-plan contributions per \$1 spent ^a
Chetty, Friedman, Leth-Petersen, Nielsen, & Olsen (2014)	Traditional (financial incentive)	The Danish government changed the tax deduction for contributions to one type of pension account for the roughly 20% of earners who were in the top tax bracket.	\$540 (27) change in contributions to the affected pension account per person affected	\$195 change in government revenue per person affected	\$2.77 (0.14) change in contributions to the affected pension account per \$1 spent
Duflo & Saez (2003)	Traditional (education)	Monetary inducements were offered to employees of a large university for attending a benefits fair where they would receive information about the retirement savings plan.	\$58.95 increase in savings-plan contributions per employee ^a	\$4.04 per employee for monetary inducements	\$14.58 increase in savings-plan contributions per \$1 spent ^a
Duflo, Gale, Liebman, Orszag, & Saez (2006)	Traditional (financial incentive)	Clients preparing a tax return at offices in low- and middle-income neighborhoods in St. Louis, Missouri, were offered 20%, 50%, or no matching contributions for the first \$1,000 of additional contributions to a retirement savings account.	20% match: \$93.6 (9.0) in incremental contributions per person; 50% match: \$244.5 (12.8) in incremental contributions per person	20% match: \$16.70 in matching dollars per person; 50% match: \$82.40 in matching dollars per person	20% match: \$5.59 (0.54) increase in contributions per \$1 spent; 50% match: \$2.97 (0.16) increase in contributions per \$1 spent
Duflo, Gale, Liebman, Orszag, & Saez (2007)	Traditional (financial incentive)	The U.S. federal government increased the tax credit on the first \$2,000 of retirement savings from 20% to 50% when adjusted gross income dropped below a specified threshold.	\$11.6 (1.00) increase in retirement-account contributions per person	\$9.35 increase in tax credits per person	\$1.24 (0.11) increase in retirement-account contributions per \$1 spent

Benartzi, S., Beshears, J., Milkman, K. L., Sunstein, C. R., Thaler, R. H., Shankar, M., et al. (2017). Should Governments Invest More in Nudging? *Psychological Science*, 28(8), 1041–1055. <http://doi.org/10.1177/0956797617702501>

Beyond nudges: The behaviour change wheel



Michie, S., van Stralen, M. M., & West, R. (2011). The behaviour change wheel: A new method for characterising and designing behaviour change interventions. *Implementation Science*, 6(1), 42.

Beyond nudges: The behaviour change wheel

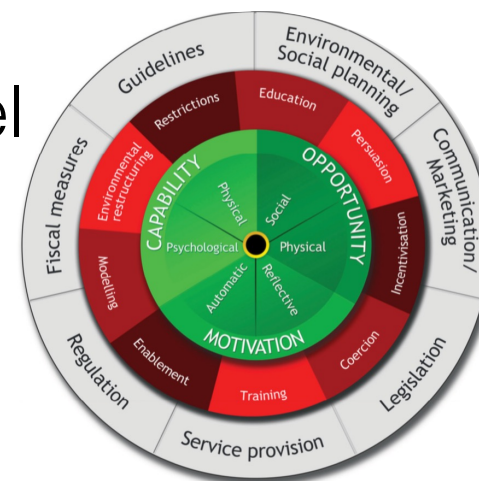


Table 1 Definitions of interventions and policies

Interventions	Definition	Examples
Education	Increasing knowledge or understanding	
Persuasion	Using communication to induce positive or negative feelings or stimulate action	
Incentivisation	Creating expectation of reward	
Coercion	Creating expectation of punishment or cost	
Training	Imparting skills	
Restriction	Using rules to reduce the opportunity to engage in the target behaviour (or to increase the target behaviour by reducing the opportunity to engage in competing behaviours)	
Environmental restructuring	Changing the physical or social context	
Modelling	Providing an example for people to aspire to or imitate	
Enablement	Increasing means/reducing barriers to increase capability or opportunity ¹	

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Beyond nudges: The behaviour change wheel

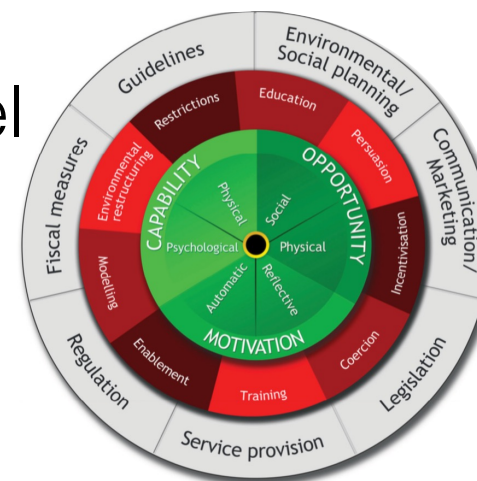


Table 2 Links between the components of the 'COM-B' model of behaviour and the intervention functions

Model of behaviour: sources	Education	Persuasion	Incentivisation	Coercion	Training	Restriction	Environmental restructuring	Modelling	Enablement
C-Ph					✓				✓
C-Ps	✓				✓				✓
M-Re	✓	✓	✓	✓					
M-Au		✓	✓	✓			✓	✓	✓
O-Ph						✓	✓		✓
O-So						✓	✓		✓

1. Physical capability can be achieved through physical skill development which is the focus of training or potentially through enabling interventions such as medication, surgery or prostheses.
2. Psychological capability can be achieved through imparting knowledge or understanding, training emotional, cognitive and/or behavioural skills or through enabling interventions such as medication.
3. Reflective motivation can be achieved through increasing knowledge and understanding, eliciting positive (or negative) feelings about behavioural target.
4. Automatic motivation can be achieved through associative learning that elicit positive (or negative) feelings and impulses and counter-impulses relating to the behavioural target, imitative learning, habit formation or direct influences on automatic motivational processes (e.g., via medication).
5. Physical and social opportunity can be achieved through environmental change.

Michie, S., van Stralen, M. M., & West, R. (2011). The behaviour change wheel: A new method for characterising and designing behaviour change interventions. *Implementation Science*, 6(1), 42.

Summary

“Nudges” is an heterogeneous (ill-defined?) category of interventions that arose from the collaboration between psychology and economics (i.e., techniques that help decision makers achieve a desired goal by using features over which people claim not to care about; in line with libertarian paternalism by leading to reversible decisions);

Qualitative and quantitative reviews support efficacy and favourable cost-benefit ratios of nudges, yet academic literature may not provide an accurate depiction of their efficacy...

The behavioural change wheel presents a broader taxonomy of behavioural interventions, which may encompass “nudges” but provide a larger tool-kit of interventions.



Efficacy isn't everything...

Relevance	To what extent are the programme objectives justified in relation to needs?
Efficiency	Have the objectives been achieved at the lowest cost?
Effectiveness	To what extent has the outcome been achieved?
Sustainability	Are the results and impacts, including institutional changes, durable over time?
Impact	Are the results still evident after the intervention is completed?

World Health Organization (2013). *WHO evaluation practice handbook*.

Efficacy isn't everything...

Table 1 Characteristics of Efficacy vs. Effectiveness Trial Designs (after [8])

	Efficacy Trial	Effectiveness Trial
Validity Priority	Internal > External	External \geq Internal
Population and Sample	<ul style="list-style-type: none"> • Highly selected for condition of interest, narrowly defined • Few comorbidities • Willing and motivated participants 	<ul style="list-style-type: none"> • Selected for condition of interest, reflecting presentation in source population • Comorbidities resemble those in population to which results will be applied; only those who cannot practically or ethically participate are excluded
Intervention	<ul style="list-style-type: none"> • Intervention staff are highly qualified • Training may be intensive • Fidelity monitoring may be similarly intensive 	<ul style="list-style-type: none"> • Staff selection, training, and fidelity monitoring resemble those likely to be feasible in target sites outside of the protocol proper
Outcome Measures and Data Collection	<ul style="list-style-type: none"> • Outcome measurements can be extensive, casting a wide net for potential secondary effects, moderators and mediators, or adverse effects • Since subjects are motivated, respondent burden less of a concern 	<ul style="list-style-type: none"> • Outcome batteries minimize respondent burden (in terms of both frequency and length of assessments) since subjects are heterogeneous in their willingness and capability to participate • Accordingly, outcome measures chosen carefully to target fewer outcomes, and must be simple to complete
Data Analysis	<ul style="list-style-type: none"> • Standard statistical approaches suffice, and data-intensive analyses may be feasible 	<ul style="list-style-type: none"> • Analyses to account for greater sample heterogeneity • Analyses account for more missing data and data not missing at random

Bauer, M. S., Damschroder, L., Hagedorn, H., Smith, J., & Kilbourne, A. M. (2015). An introduction to implementation science for the non-specialist. *BMC Psychology*, 3(1), 65–12. <http://doi.org/10.1186/S40359-015-0089-9>

Efficacy isn't everything...

Table 2 Types of Studies to Address Blockages in the Implementation Process

Implementation Process Gap	Types of Studies
Limited external validity of efficacy/effectiveness studies	<ul style="list-style-type: none"> • Design clinical interventions ready for implementation earlier in the research pipeline, emphasizing tools, products, and strategies that mitigate variations in uptake across consumer, provider, and or organizational contexts
Quality gaps across systems due to variations in organizational capacity (e.g., resources, leadership)	<ul style="list-style-type: none"> • Assess variations and customize implementation strategies based on organizational context • Data infrastructure development to routinely capture or assess implementation fidelity, patient-level processes/outcomes of care, and value/return-on-investment measures • Further refinement of implementation strategies involving organizational and/or provider behavior change • Development of provider/practice networks to conduct implementation studies or evaluation of national programs
Frontline provider competing demands (e.g., multiple clinical reminders)	<ul style="list-style-type: none"> • Refinement of implementation strategies using cross-disciplinary methods that address provider behavior/organizational change (e.g., business, economics, policy, operations research. etc.) • Positive deviation or adaptation studies especially to improve implementation at lower-resourced, later-adopter sites
Misalignment with national or regional priorities	<ul style="list-style-type: none"> • National policy/practice roll-outs • Randomized evaluations of national programs or policies

Bauer, M. S., Damschroder, L., Hagedorn, H., Smith, J., & Kilbourne, A. M. (2015). An introduction to implementation science for the non-specialist. *BMC Psychology*, 3(1), 65–12. <http://doi.org/10.1186/S40359-015-0089-9>