

Applying Behavioral Science to Wearing Masks and Social Distancing

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<https://advanced-hindsight.com/health-research/>

DICON

November 13, 2020

Duke



Duke
UNIVERSITY



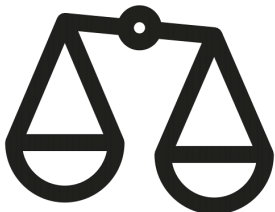
Challenge

- Universal masking policies in hospitals
- Suboptimal compliance, especially in administrative offices, shared work rooms, and break rooms (Advani et al., 2020)
- Why? How change?
- Some pieces of the puzzle

Homo economicus

ExpCost(mask) =

$$\text{Pr}(\text{infected} | \text{mask}) * (\text{Pr}(\text{ill} | \text{infected}) * \text{Cost}(\text{ill}) + \text{Cost}(\text{infected})) + \text{Cost}(\text{discomfort})$$



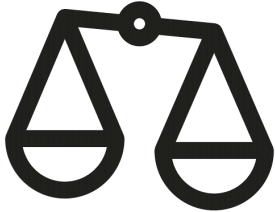
ExpCost(no mask) =

$$\text{Pr}(\text{infected} | \text{no mask}) * (\text{Pr}(\text{ill} | \text{infected}) * \text{Cost}(\text{ill}) + \text{Cost}(\text{infected})) + 0$$

Homo economicus

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$$\text{Pr}(\text{infected} | \text{mask}) * (\text{Pr}(\text{ill} | \text{infected}) * \text{Cost}(\text{ill}) + \text{Cost}(\text{infected})) + \text{Cost}(\text{discomfort})$$



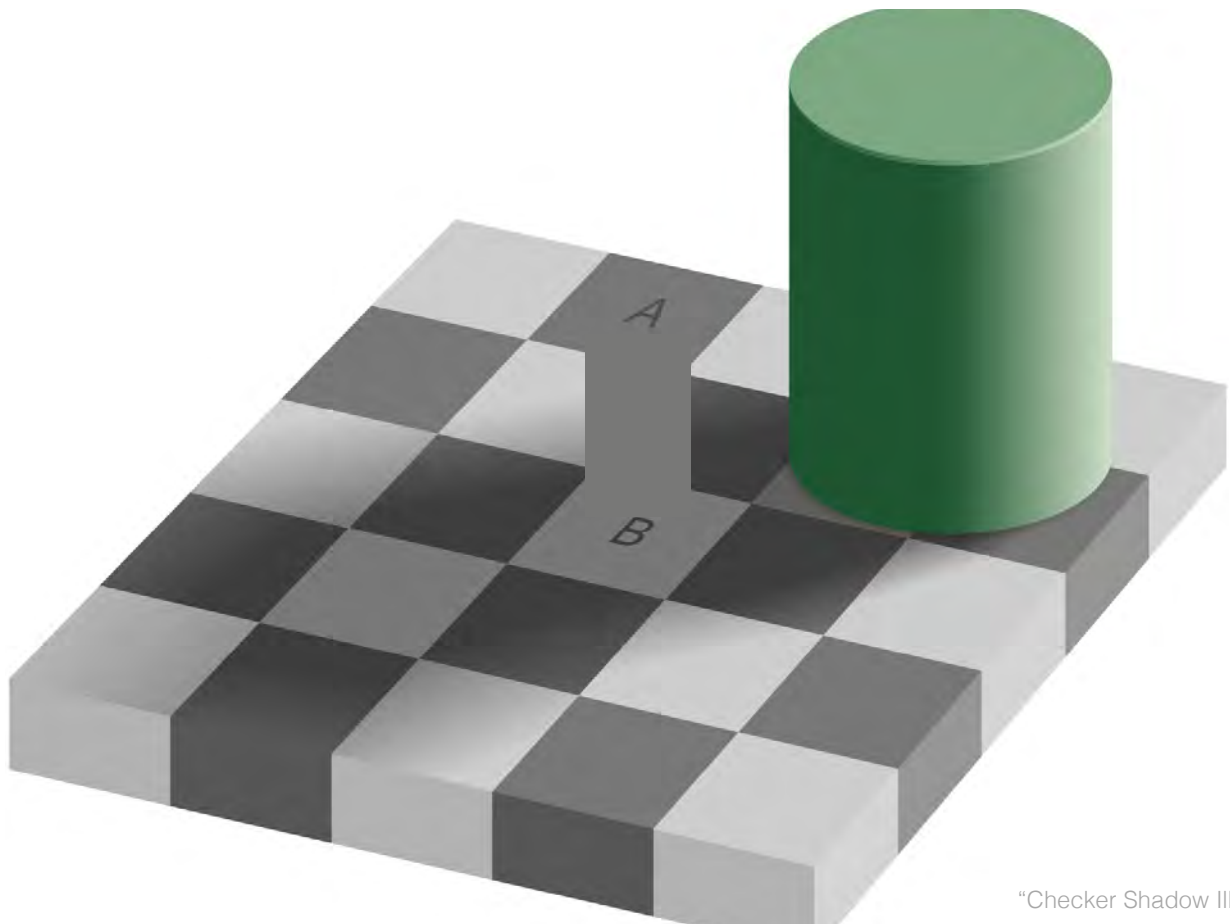
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$$\text{Pr}(\text{infected} | \text{no mask}) * (\text{Pr}(\text{ill} | \text{infected}) * \text{Cost}(\text{ill}) + \text{Cost}(\text{infected})) + 0$$

Perceived severity of disease ~ vaccination:
small-moderate (r = .16); smaller (r = .14) for medical personnel

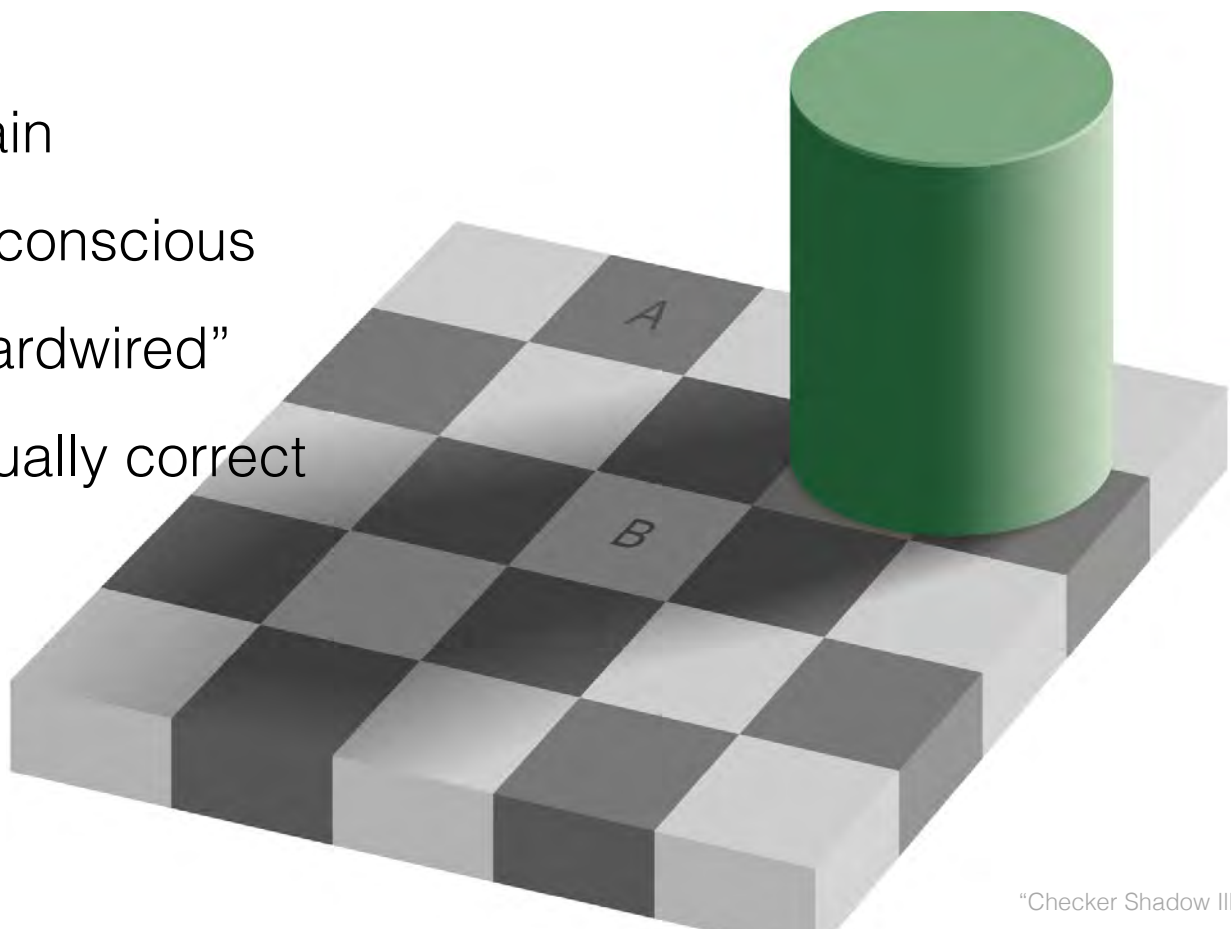
Perceived likelihood of contracting disease ~ vaccination:
moderate (r = .25); small (r = .07) for medical personnel

Brewer et al., 2007

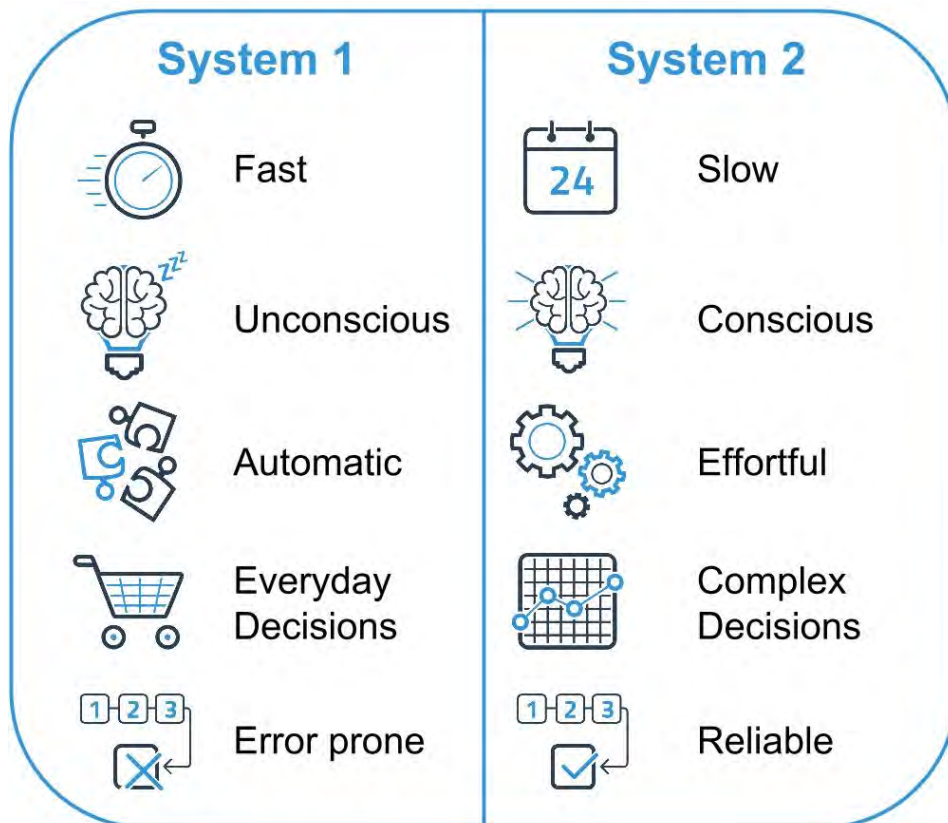


"Checker Shadow Illusion", Wikipedia

- Brain
- Unconscious
- “Hardwired”
- Usually correct



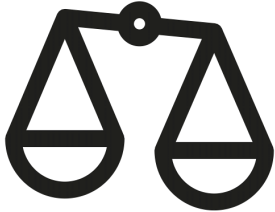
“Checker Shadow Illusion”, *Wikipedia*



Homo economicus

$$\text{ExpCost}(\text{mask}) = \text{Pr}(\text{infected} | \text{mask}) * (\text{Pr}(\text{ill} | \text{infected}) * \text{Cost}(\text{ill}) + \text{Cost}(\text{infected})) + \text{Cost}(\text{discomfort})$$

Present, certain
Future, uncertain



$$\text{ExpCost}(\text{no mask}) = \text{Pr}(\text{infected} | \text{no mask}) * (\text{Pr}(\text{ill} | \text{infected}) * \text{Cost}(\text{ill}) + \text{Cost}(\text{infected})) + 0$$

Tomorrow

PRECOMMITMENT

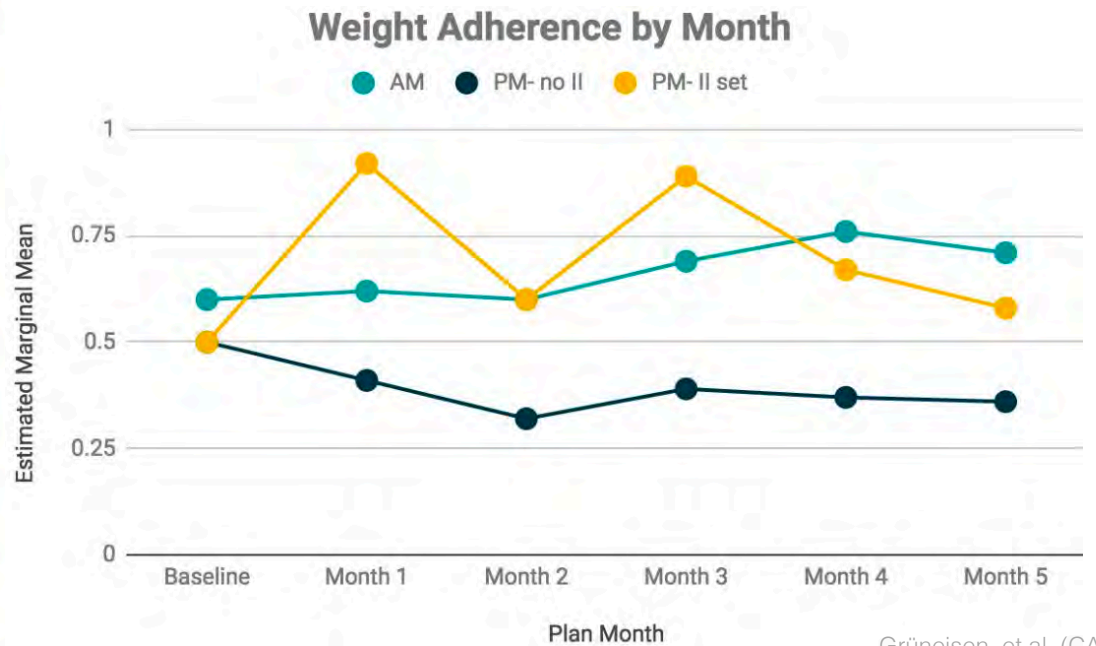
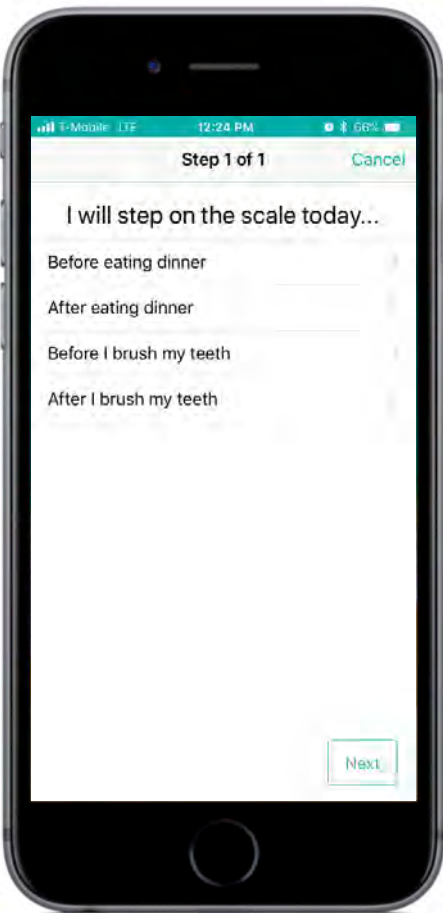
PRESENT BIAS

Masks/distancing?



33% → 65%

IMPLEMENTATION INTENTIONS



Grüneisen, et al. (CAH)

Some pieces of the masks/distancing puzzle

- Real people vs *Homo economicus*
- System 1 vs system 2
- Present bias, precommitment
- Implementation intentions

Ballot Ordering Nov-2000
Precinct 455080, Escondido

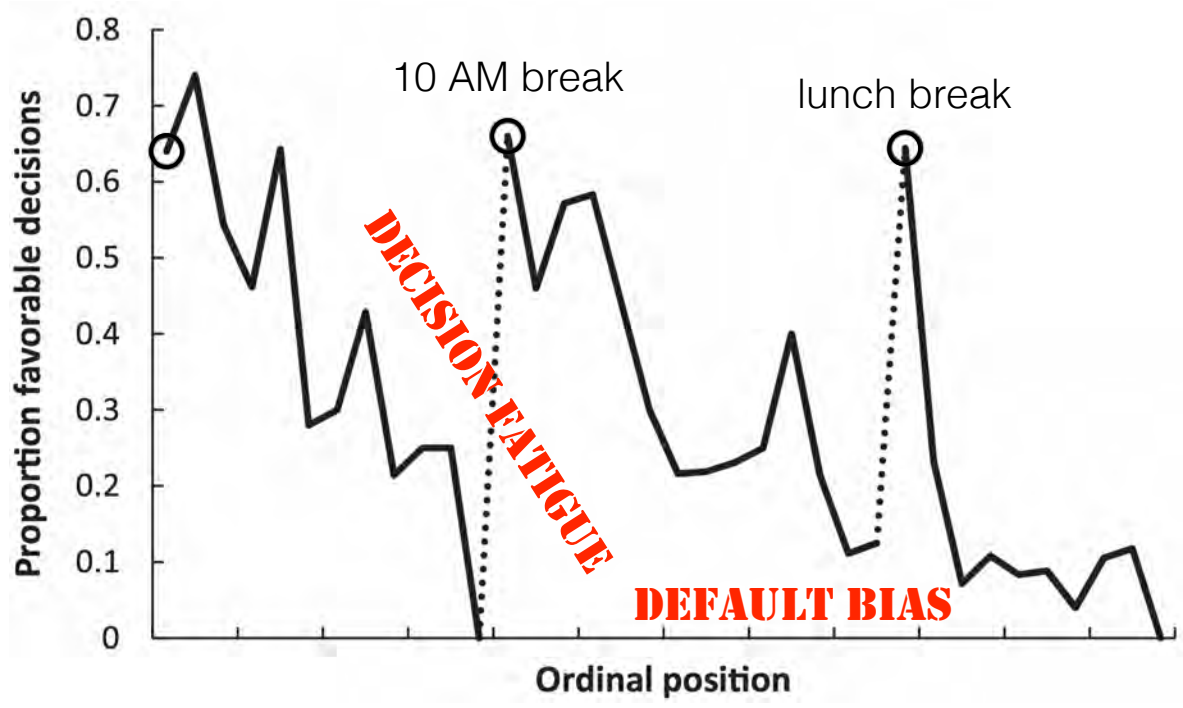
1. President
2. U.S. Senator
3. (L) U.S. Representative
4. (L) State Assemblyman
5. Superior Court Judge
6. (L) Palomar Community College
7. (L) Escondido City Council
8. (L) Escondido City Treasurer
9. (L) Palomar Health System
10. State Proposition 32
11. State Proposition 33
12. State Proposition 34
13. State Proposition 35
14. State Proposition 36
- ...
28. (L) City Proposition R

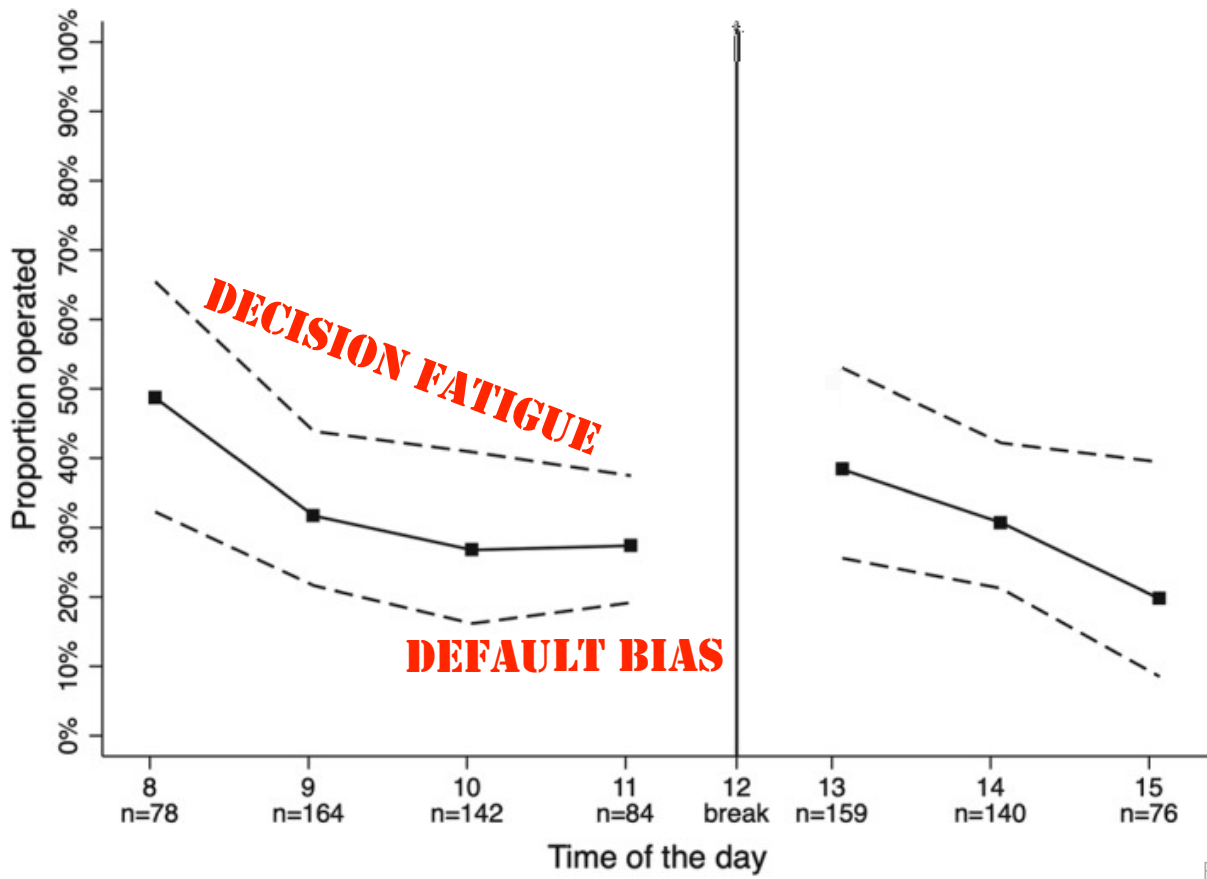
Ballot Ordering Nov-2000
Precinct 457270, Escondido

1. President
2. U.S. Senator
3. (L) U.S. Representative
4. (L) State Senator
5. (L) State Assemblyman
6. Superior Court Judge
7. (L) Palomar Community College
8. (L) Local School Board
9. (L) Local School Board
10. (L) Local School Board
11. (L) Local School Board
12. (L) Escondido City Council
13. (L) Escondido City Treasurer
14. (L) Palomar Health System
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16. State Proposition 33
17. State Proposition 34
18. State Proposition 35
19. State Proposition 36
- ...
33. (L) City Proposition R

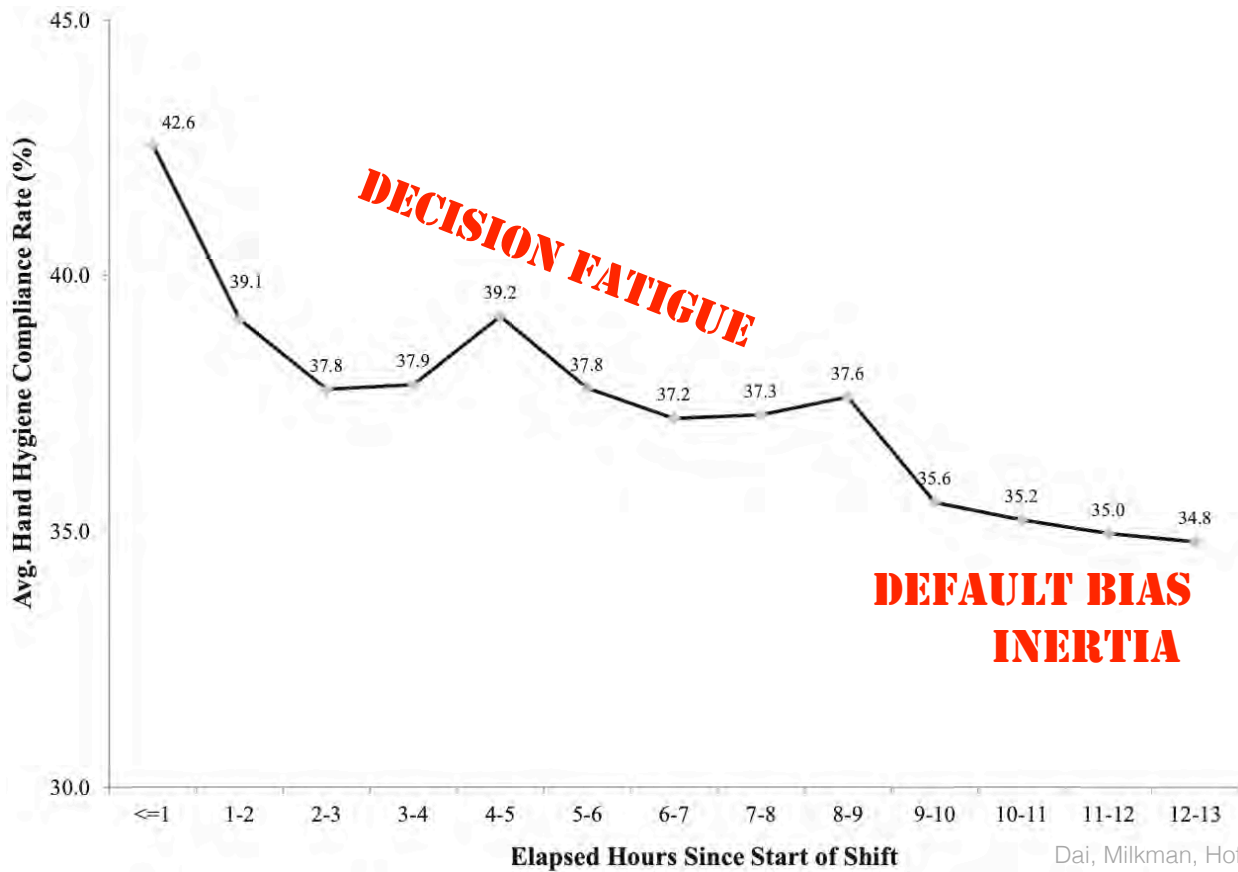
DECISION FATIGUE
DEFAULT BIAS
INERTIA

Augenblick & Nicholson, 2016



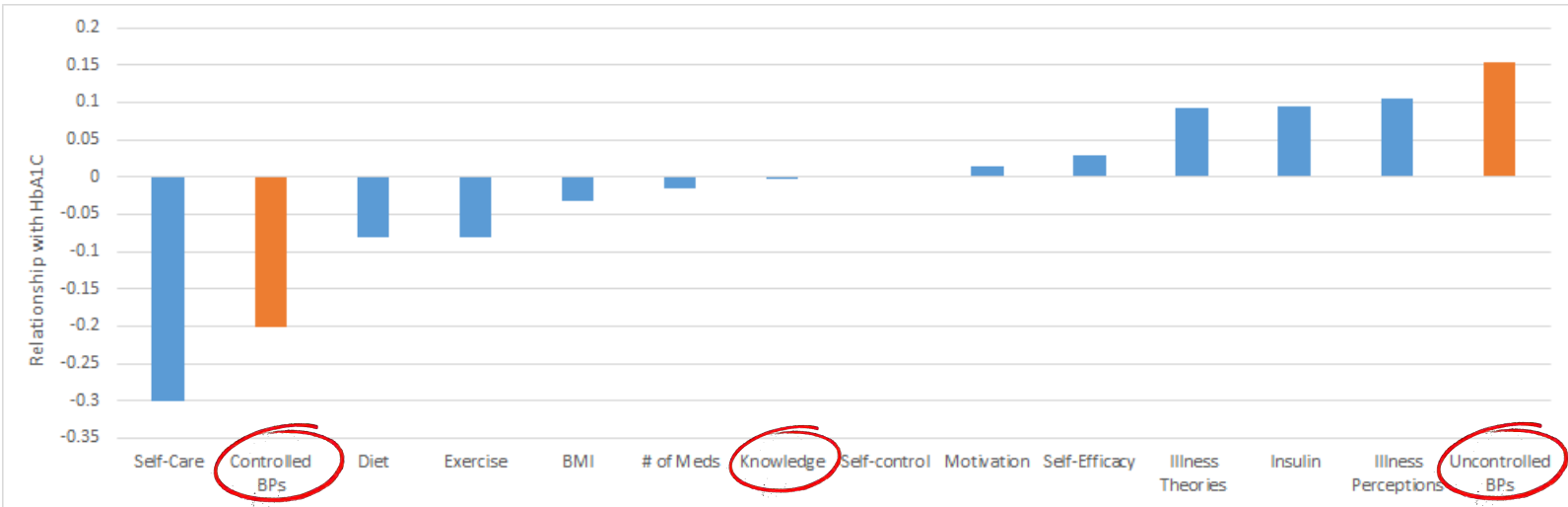


Persson et al., 2019



Dai, Milkman, Hofmann, & Staats, 2015

BREAKING POINTS

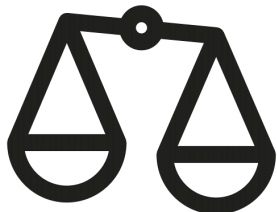


Clark, et al. (CAH)

Homo economicus

ExpCost(mask) =

$\text{Pr}(\text{infected} | \text{mask}) * (\text{Pr}(\text{ill} | \text{infected}) * \text{Cost}(\text{ill}) + \text{Cost}(\text{infected})) + \text{Cost}(\text{discomfort})$



Calculation

+ Cost(put on)

Friction

ExpCost(no mask) =

$\text{Pr}(\text{infected} | \text{no mask}) * (\text{Pr}(\text{ill} | \text{infected}) * \text{Cost}(\text{ill}) + \text{Cost}(\text{infected})) + \text{Cost}(\text{take off})$



Convenience
enhancements



Descriptive
labeling



Evaluative
labeling



Healthy
eating calls



Hedonic
enhancements

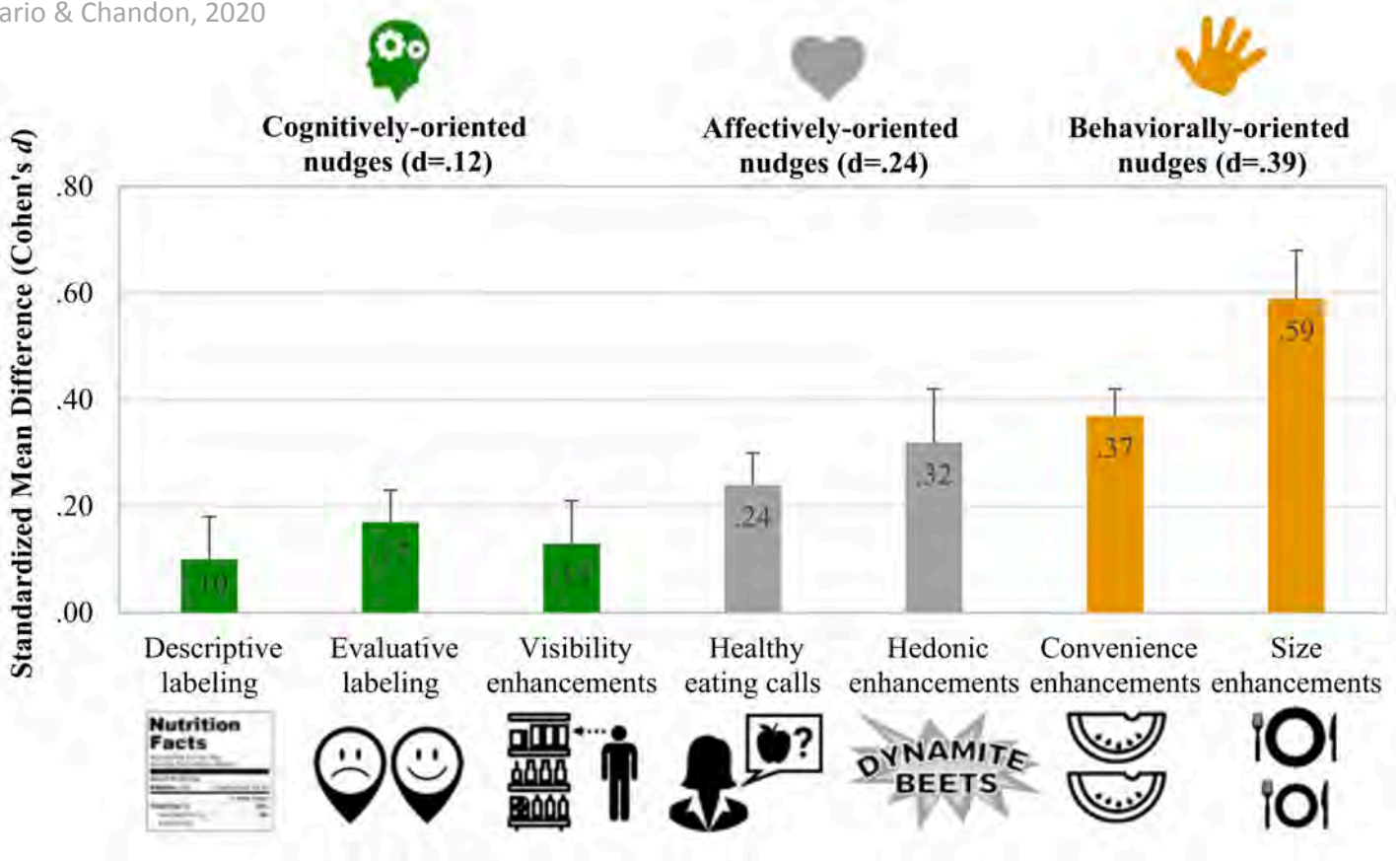
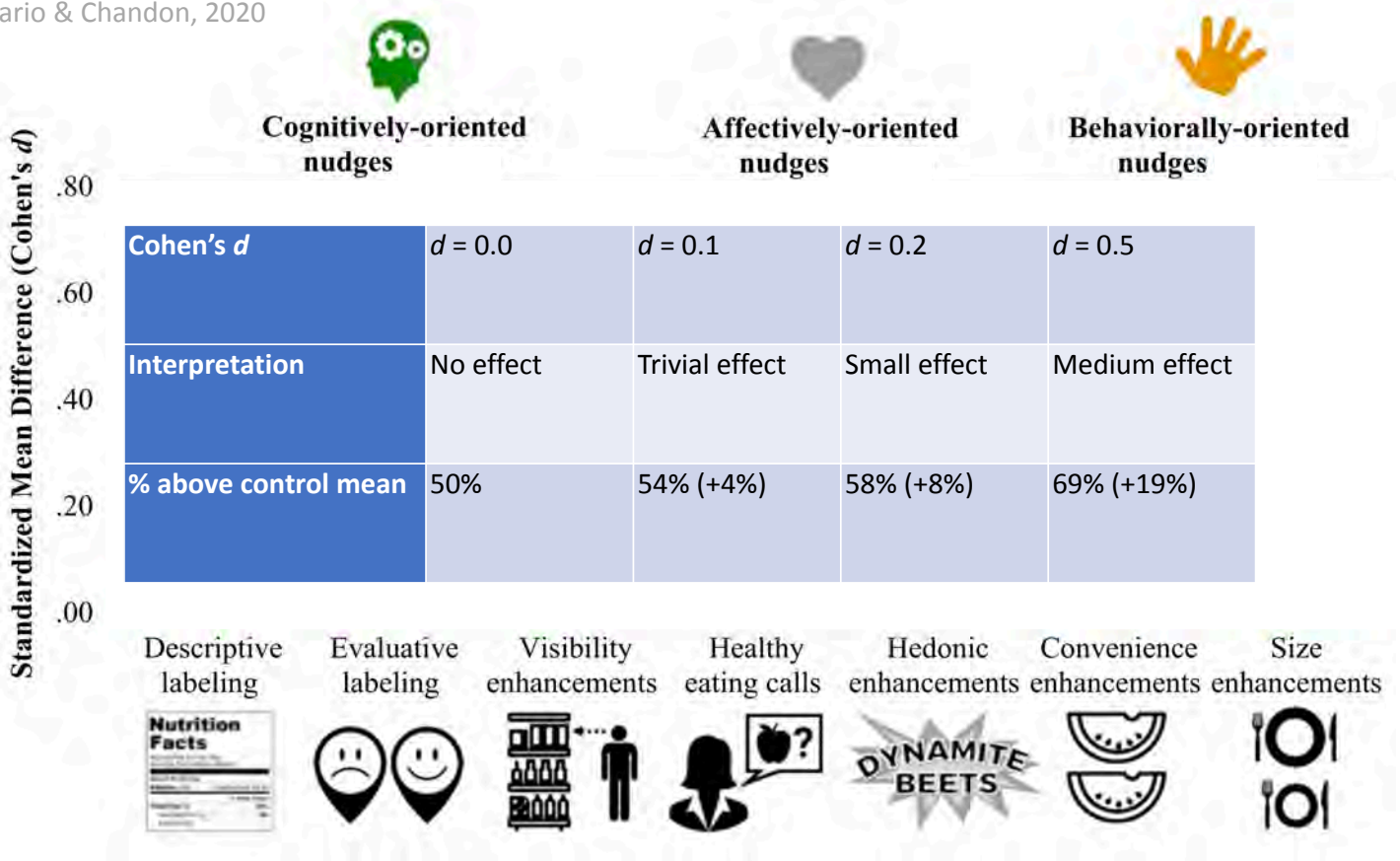


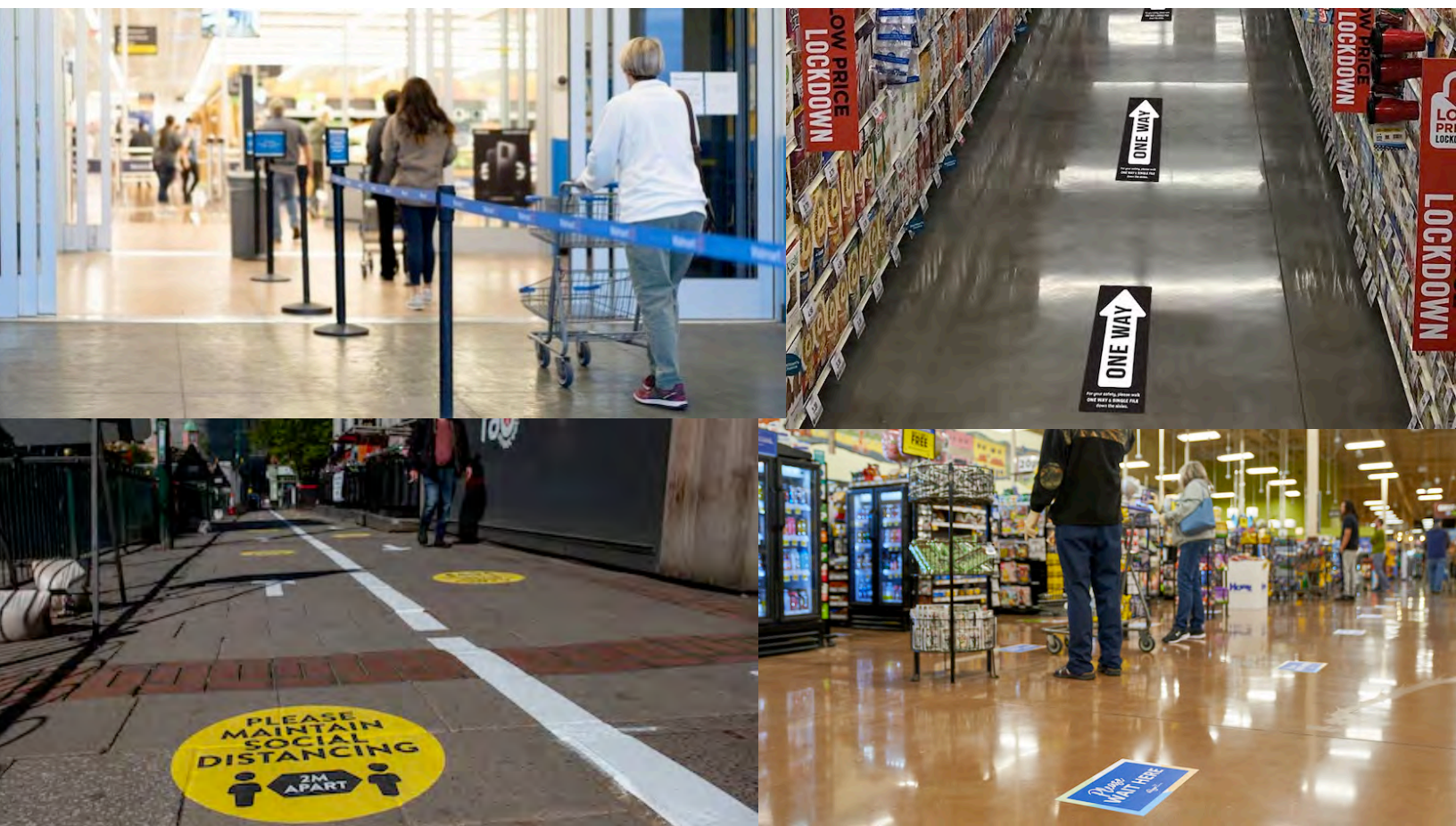
Size
enhancements



Visibility
enhancements







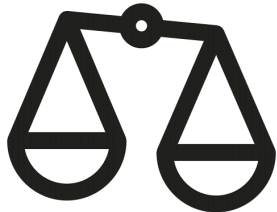
Some pieces of the masks/distancing puzzle

- Real people vs *Homo economicus*
- System 1 vs system 2
- Present bias, precommitment
- Implementation intentions
- Decision fatigue, breaks
- Default bias, status quo bias, friction
- Cognitive vs affective vs behavioral nudges

Homo economicus

ExpCost(mask) =

$$\Pr(\text{infected} | \text{mask}) * (\Pr(\text{ill} | \text{infected}) * \text{Cost}(\text{ill}) + \text{Cost}(\text{infected})) + \text{Cost}(\text{discomfort})$$



“Hand hygiene prevents **you** from catching diseases” vs
 “Hand hygiene prevents **patients** from catching diseases”

45%+

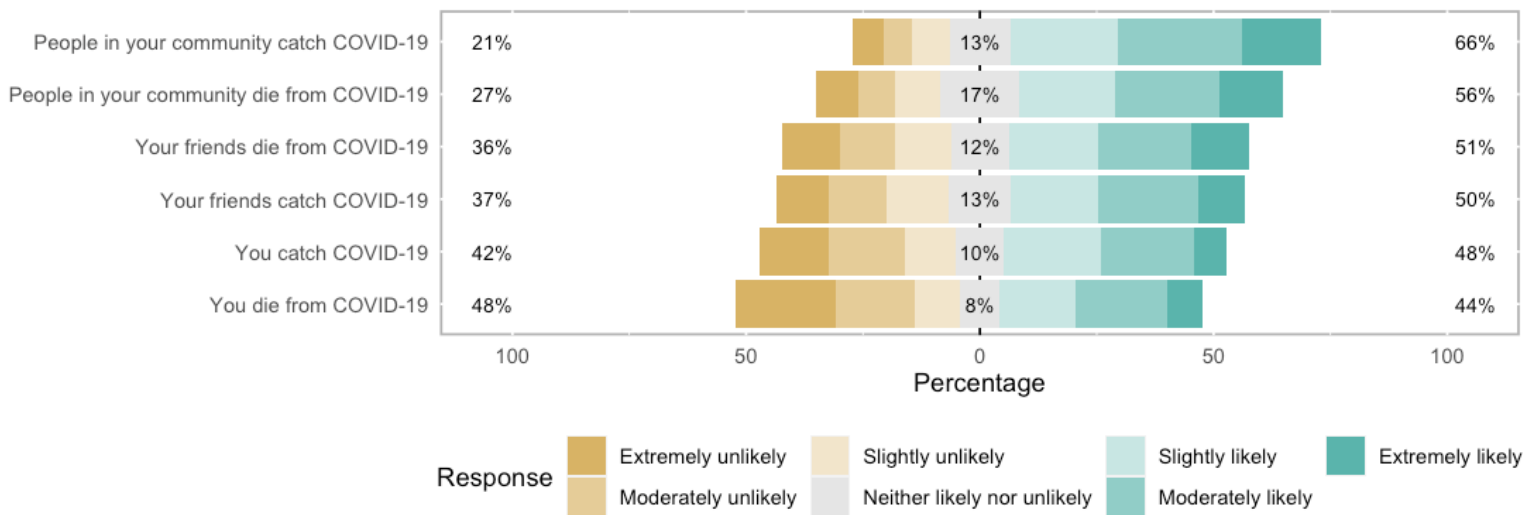
Grant & Hoffman, 2011

ExpCost(no mask) =

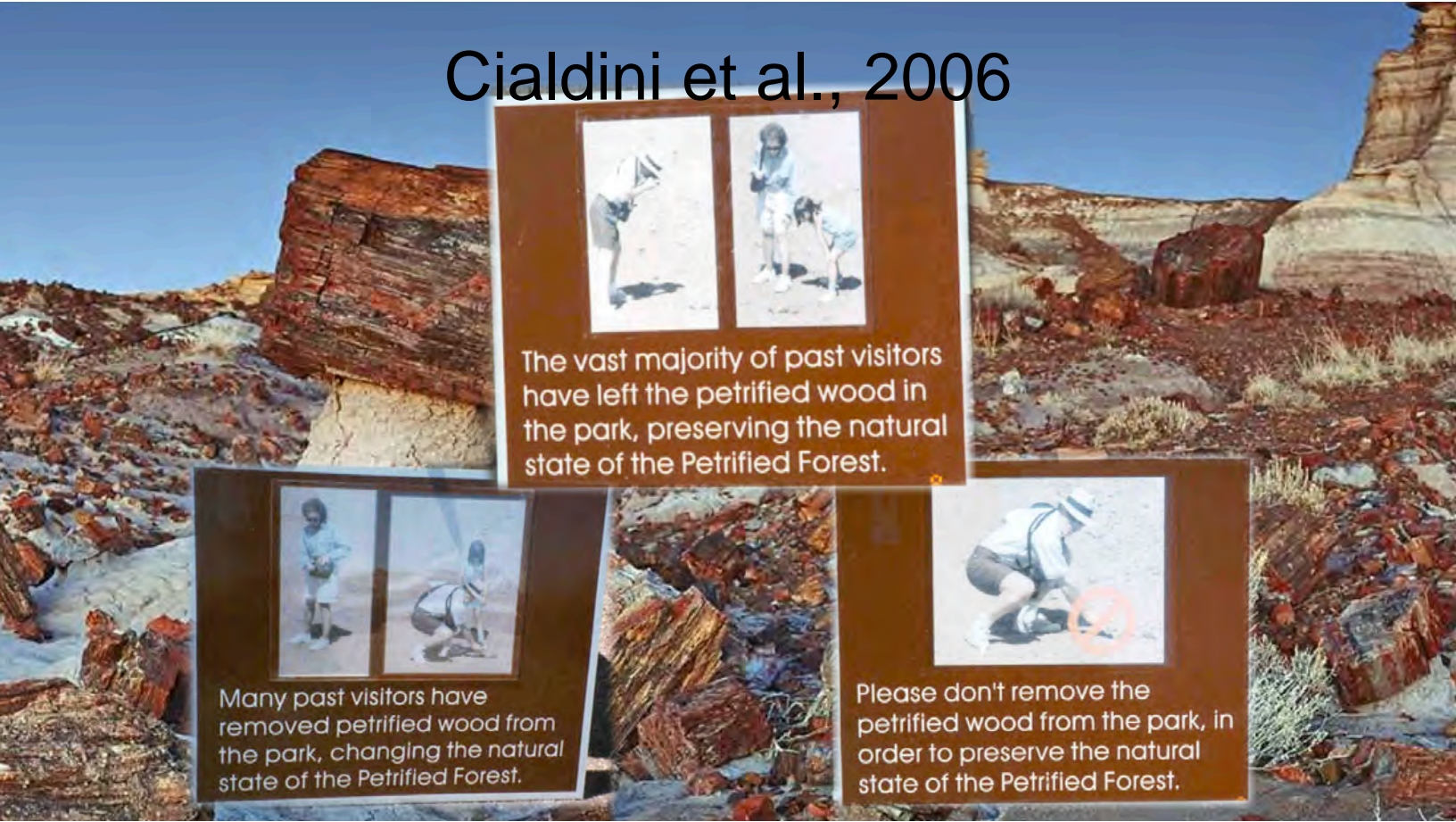
Self **Other**

$$\Pr(\text{infected} | \text{no mask}) * (\Pr(\text{ill} | \text{infected}) * \text{Cost}(\text{ill}) + \text{Cost}(\text{infected})) + 0$$

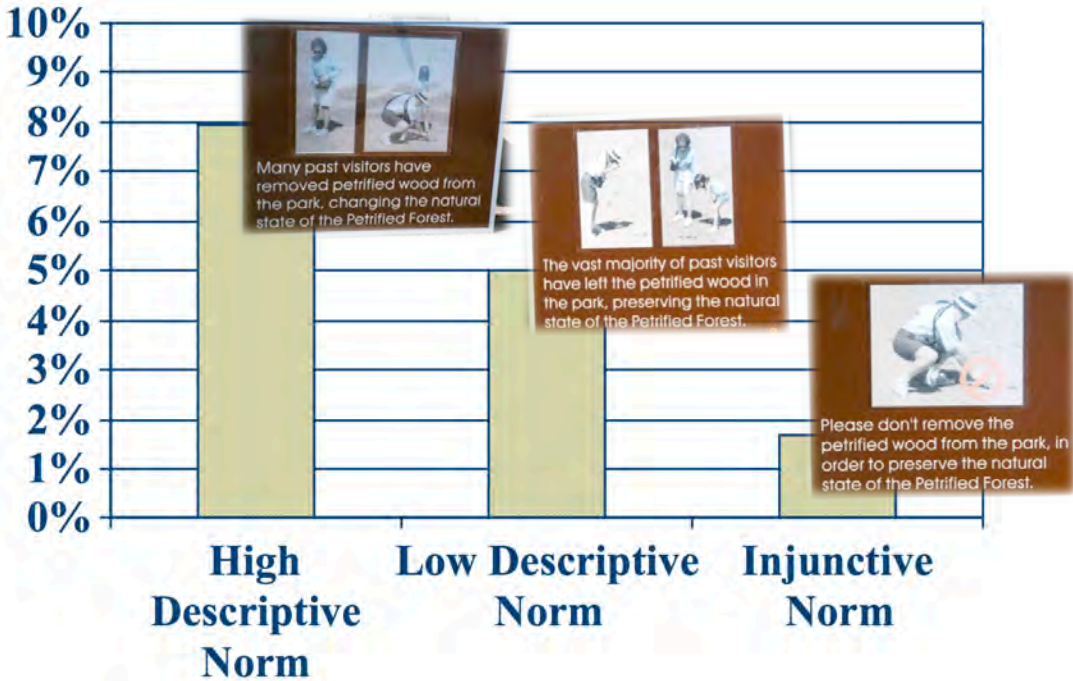
Optimism bias



Cialdini et al., 2006



Cialdini et al., 2006



Kidney Allocation for Donors with KDPI 21% - 34% MATCH RESULTS

OPO Contact Number: [REDACTED]

Note: These data are provided for organ allocation and monitoring purposes and are subject to applicable privacy and confidentiality regulations. Use of these data for any other purpose is not sanctioned by the OPTN/UNOS and may require compliance with Federal Policy for the Protection of Human Subjects. Seek guidance from your counsel or Institutional Review Board (IRB) before using these data for any other purpose.

Electronics By Notify View all Provisional Acceptances>>
 Match ID: [REDACTED] KE # Per Page: 100 Hide empty classifications - Page 1 of 297

View candidates from all centers +

100% CPRA, 0-ABDR mismatch, Local, blood type identical or permissible

Seq#	Center	Name	SSN	Age	ABO	CPRA	Score	Mismatch			Other Organs	Email/Fax Status	Offer Response
								A	B	DR			
173	SCMU-TX1	[REDACTED]	[REDACTED]	44	O	100	209.289041	0	0	0			

MAKE AN ORGAN OFFER

Candidate Information for [REDACTED] | Waitlist Organ: Kidney | Waitlist ID: [REDACTED]
 Age: 44 yrs HLA: [REDACTED] A (1, 3) B (8, 51) BW4: P BW6: P C (7, 14) Crossmatch result at time of match: No Results
 Gender: Female DR (1, 17) DR51: DR52: DR53: DQB1 (2, 5) Crossmatch Required:
 ABO: O CPRA: 100 Other Organs: None
 HLA Antibody Tested: Yes, antibodies detected UNOS Status: Active (1)
 Mismatch A,B,DR: 0, 0, 0

View all candidate information + View all potential recipients at SCMU-TX1 View score breakdown +
 Contact Notified: Evaluation Started:
 Notification Date: Evaluation Date:
 Acknowledged Date: Time Remaining:
 Organ Verification

Offer details Offer Response: Refuse Provisional Yes
 Comments:

OPO phone: [REDACTED]
 Offer made by: [REDACTED]
 Offer respond date:
 Offer made to:
 Response Type:
 Save Save & Go Next Save & Go Next Incomplete Next Offer

Stewart et al. (with CAH)

redacted

Details Tests Attachments

PROVIDER INFORMATION
 OPO: TXSA - Texas Organ Sharing Alliance
 Donor hospital: [REDACTED]
 Time zone: Central Is Daylight Savings Time observed?: YES

DONOR INFORMATION
 Name: ***** Height: 5 ft 4 in / 163.00 cm
 Date of birth: [REDACTED] Weight: 154 lbs / 70.0000 kg
 Age: 70 Years Body Mass Index (BMI): 26.346 kg / m²
 Gender: FEMALE
 Current KDPI: 90%
 Graft Survival Rates by KDPI
 Ethnicity/race: White: White: Not Specified/Unknown

Cause of death: CEREBROVASCULAR/STROKE Admit date: [REDACTED]
 Mechanism of Injury: INTRACRANIAL HEMORRHAGE/STROKE Pronouncement of death date: [REDACTED]
 Circumstance of death: DEATH FROM NATURAL CAUSES Cross-clamp date: [REDACTED]
 Cold Ischemic Time: [Cross-clamp data not available.]

Donor meets DCD criteria: NO
 Cardiac arrest/down time?: NO
 CPR administered?: NO

Donor Highlights:
 Serologies resulted EBV IgG (+) but IgM (-) NATs (-) for HBV, HCV, HIV Organ Procurement terminated due to liver mass. OR set for 0300 on 10/2/16 Regular Insulin 2units IV given for BS 178 9/30/16 21:03. Regular Insulin 20 units IV given on 10/01/2016 at 0603 as part of T4 protocol.
 Admission course comments:
 70 y/o CF who had been complaining of intermittent headaches for couple of days. On [REDACTED] she told her husband that her headache was more severe. Within an hour of the PT saying this she became unresponsive and the husband called EMS. PT was transferred to [REDACTED] ED and then intubated in ED to protect her airway. She was then taken for a CT head showing a massive left temporoparietal hemorrhage with subfalxine herniation. Neurosurgery discussed the results of the CT head with the husband and went over possible options for a decompressive craniectomy, and the risks and benefits of the surgery. After a long conversation of the possibility of a meaningful survival being very low, the husband decided against proceeding with surgery. PT was transferred to the ICU for comfort care. Around 1830 pt developed SVT, was given diltiazem and adenosine and converted back to NSR. PT became areflexic and Dr. [REDACTED] order a CBF. The findings are consistent with an absence of cerebral blood flow and brain death. PT was pronounced by [REDACTED].

MEDICAL & SOCIAL HISTORY
 History of diabetes: NO
 History of cancer: NO
 History of hypertension: NO
 History of coronary artery disease (CAD): NO
 Previous gastrointestinal disease: NO
 Chest trauma: NO
 Cigarette use (>20 pack years) ever: NO
 Heavy alcohol use (2+ drinks/daily): NO
 I.V. drug usage: NO
 According to the OPTN policy in effect on the date of referral, does the donor have risk factors for blood-borne disease transmission: NO
 Medical & social history comments:
 See DRA1

Stewart et al. (with CAH)

redacted

Match ID: [REDACTED] # Per Page: 100 Hide empty classifications Page 1 of 87

Regional, blood type identical or permissible

Seq#	Center	Name	SSN	Age	ABO	CPRA	Score	Mismatch			Other Organs	Email/Fax Status	Offer Response
								A	B	DR			
2	****	***, ***	***, ***, ****	64	O	0	14.509589	2	1	2			X 801
3	****	***, ***	***, ***, ****	61	O	82	10.446575	2	1	1			X 830
4	TXBC-TX1	[REDACTED]	[REDACTED]	64	O	0	10.120548	1	1	1			X 830
5	****	***, ***	***, ***, ****	50	O	84	9.967123	1	1	2			X 830
6	****	***, ***	***, ***, ****	42	O	0	9.956164	1	0	2			X 830
7	****	***, ***	***, ***, ****	51	O	51	9.915068	2	1	1			X 830
8	****	***, ***	***, ***, ****	61	O	0	9.868493	2	1	1			X 830
9	TXBC-TX1	[REDACTED]	[REDACTED]	53	O	11	9.747945	2	1	1			X 830
10	****	***, ***	***, ***, ****	58	O	17	9.668493	1	0	2			X 830
11	TXBC-TX1	[REDACTED]	[REDACTED]	68	O	0	9.649315	1	1	2			X 830
12	****	***, ***	***, ***, ****	60	O	69	9.613699	1	1	1			X 830
13	****	***, ***	***, ***, ****	61	O	0	9.284932	2	1	1			X 830
14	****	***, ***	***, ***, ****	59	O	0	8.909589	2	1	2			X 830
15	****	***, ***	***, ***, ****	57	O	41	8.841096	2	1	1			X 830
16	****	***, ***	***, ***, ****	70	O	0	8.789041	2	1	2			X 830
17	****	***, ***	***, ***, ****	59	O	0	8.638356	1	1	1			X 830
18	****	***, ***	***, ***, ****	61	O	0	8.624658	2	1	2			X 801
19	****	***, ***	***, ***, ****	62	O	0	8.616438	1	1	2			X 801
20	****	***, ***	***, ***, ****	55	O	0	8.526027	2	1	2			X 830
21	TXBC-TX1	[REDACTED]	[REDACTED]	36	O	0	8.517808	1	1	1			X 830
22	****	***, ***	***, ***, ****	56	O	84	8.479452	2	1	2			X 830
23	****	***, ***	***, ***, ****	58	O	53	8.438356	1	1	2			X 830
24	TXBC-TX1	[REDACTED]	[REDACTED]	57	O	0	8.389041	1	1	2			X 830
25	TXBC-TX1	[REDACTED]	[REDACTED]	58	O	17	8.347945	2	1	2			X 830
26	****	***, ***	***, ***, ****	66	O	0	8.287671	2	1	1			X 830
27	****	***, ***	***, ***, ****	59	O	0	8.208219	1	1	1			X 830
28	****	***, ***	***, ***, ****	53	O	3	8.021918	1	1	2			X 830

100% CPRA, 0-ABDR mismatch, Local, blood type identical or permissible

Seq#	Center	Name	SSN	Age	ABO	CPRA	Score	Mismatch			Other Organs	Email/Fax Status	Offer Response
173	SCMU-TX1	[REDACTED]	[REDACTED]	44	O	100	209.289041	0	0	0			

Offer details
Offer Response: Refuse Provisional Yes

descriptive
norm

Stewart et al. (with CAH)

redacted

SimNet | Match Results MENU

Kidney Allocation for Donors with KDPI 0% - 20%

Donor:
Male / 25 years

Summary

Your candidate listed below has just received a primary offer for a kidney at sequence # 31 on the match run. The kidney has been turned down on behalf of 30 other candidates, due to candidate-specific issue (4), donor age/quality (5), anatomical damage/defect (0), organ-specific issue (6), donor social history (9), positive serologies (0), or other (6) reasons.

Allocation Classification: National blood type identical or permissible

Seq #	Name	Age	ABO
31	Darnell, Pablo	43 years	O

CANDIDATE INFORMATION FOR DARNELL, PABLO +

ADDITIONAL CANDIDATE INFORMATION +

Offer Response:

Refuse Provisional Yes

SimNet | Donor Summary MENU

Donor:
Male / 25 years

PROVIDER INFORMATION -

OPO: Import offer from NVLV-OP1

DONOR INFORMATION +

MEDICAL & SOCIAL HISTORY +

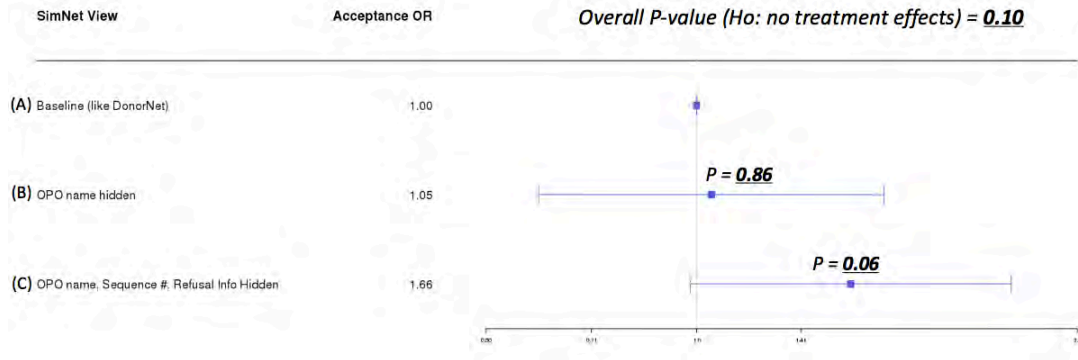
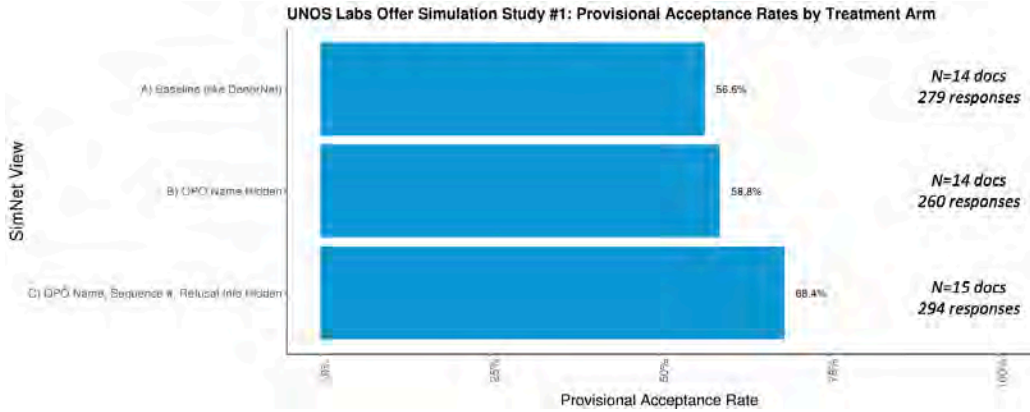
VITAL SIGNS - DONOR MANAGEMENT INDICATORS +

COMPLETE BLOOD COUNT (CBC) +

LAB PANEL -

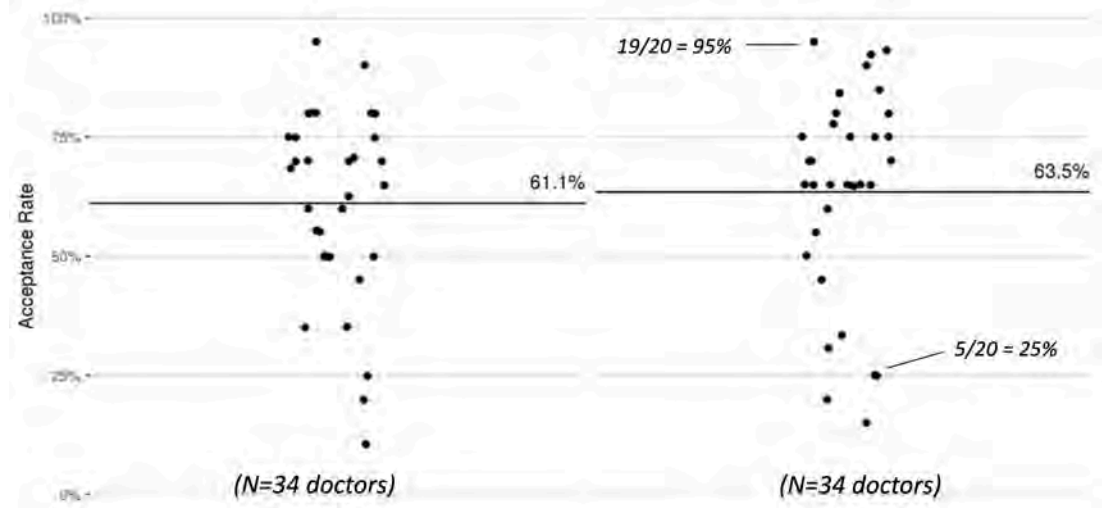
Lab	Initial	Peak	Latest
Na (mEq/L)	142	145	134
K+ (mmol/L)	3.9	4.5	2.9
Cl (mmol/L)	107	112	99
CO ₂ (mg/dL)	19	26	25
BUN (mg/dL)	15	16	13
Creatinine (mg/dL)	1.17	1.17	0.89

Stewart et al. (with CAH)



Stewart et al. (with CAH)

Show Hide



Stewart et al. (with CAH)

PROBLEM:

95% of Americans support organ donation but only



40% are registered

www.organize.org, November 2015

Lindemans, Kessler, Jiang, & Ariely (CAH)

INJUNCTIVE NORM

ORGANIZE

THIS

GIVING TUESDAY...

GIVE WITH YOUR HEART NOT YOUR WALLET

REGISTER NOW

1% registered

ORGANIZE

THIS

GIVING TUESDAY...

GIVE WITH YOUR HEART NOT YOUR WALLET

95% of Americans support organ donation.

REGISTER NOW

5% registered

Lindemans, Kessler, Jiang, & Ariely (CAH)



Don't just **sit** there as he drives dangerously! **STAND UP. SPEAK UP. NOW!**

This message has been given in the interest of passenger safety with support from:



1.69	1.82	2.91
4.67	4.81	3.05
5.82	5.06	4.28
6.36	5.19	4.57

1.69	1.82	2.91	
4.67			
5.82	1.69	1.82	2.91
6.36	4.67	4.81	3.05
	5.82	5.06	4.28
	6.36	5.19	4.57

0.49	0.74	1.17
3.72	2.00	1.22
3.75	5.22	5.67
8.83	8.23	7.70

0.47	4.58	2.57
3.15	3.82	4.38
4.94	5.42	5.98
2.95	4.86	7.54

0.17	2.46	2.44
6.02	5.60	2.63
6.05	6.21	6.60
8.22	8.19	7.54

0.46	1.98	2.38
0.48	1.79	2.48
0.58	1.69	2.59
1.65	0.98	2.94

0.06	5.07	5.39
1.71	0.03	8.98
2.10	4.96	9.42
4.53	4.65	9.92

0.85	1.62	1.63
6.06	5.63	1.69
6.25	5.01	1.78
6.36	3.16	1.91

0.15	0.95	1.31
4.98	2.90	2.88
6.66	6.73	7.67
9.75	9.85	8.17

0.63	0.65	1.02
2.64	2.34	2.12
2.89	5.98	8.89
9.49	9.37	9.33

0.14	0.15	0.32
5.51	5.68	0.52
5.48	6.15	0.84
5.28	3.31	1.17

0.84	1.54	7.28
4.42	3.54	7.18
5.54	4.78	5.55
6.99	6.93	6.76

0.77	1.47	1.69
3.38	3.18	2.28
3.62	3.01	2.48
3.68	2.93	2.53

0.63	0.74	2.23
8.05	7.68	3.71
8.31	7.06	4.51
8.45	6.44	5.29

0.12	0.71	0.74
4.27	3.07	2.27
5.09	5.73	5.82
9.27	7.03	6.79

0.74	1.93	2.76
7.24	5.03	3.14
7.71	6.38	3.8
8.28	9.18	9.48

0.14	0.67	2.22
5.96	5.58	5.22
7.04	7.59	9.33
9.77	9.50	8.52

0.20	2.54	2.8
1.05	2.39	2.96
1.44	2.28	3.00
1.73	2.19	3.85

Gino, Ayal and Ariely, 2009

Ingroup-outgroup bias

1.69	1.82	2.91	
4.67			
5.82	1.69	1.82	2.91
6.36	4.67	4.81	3.05
	5.82	5.06	4.28
	6.36	5.19	4.57

0.49	0.74	1.17
3.72	2.00	1.22
3.75	5.22	5.67
8.83	8.23	7.70

0.47	4.58	2.57
3.15	3.82	4.38
4.94	5.42	5.98
2.95	4.86	7.54

0.17	2.46	2.44
6.02	5.60	2.63
6.05	6.21	6.60
8.22	8.19	7.54

0.46	1.98	2.38
0.48	1.79	2.48
0.58	1.69	2.59
1.65	0.98	2.94

0.06	5.07	5.39
1.71	0.03	8.98
2.10	4.96	9.42
4.53	4.65	9.92

0.85	1.62	1.63
6.06	5.63	1.69
6.25	5.01	1.78
6.36	3.16	1.91

0.15	0.95	1.31
4.98	2.90	2.88
6.66	6.73	7.67
9.75	9.85	8.17

0.63	0.65	1.02
2.64	2.34	2.12
2.89	5.98	8.89
9.49	9.37	9.33

0.14	0.15	0.32
5.51	5.68	0.52
5.48	6.15	0.84
5.28	3.31	1.17

0.84	1.54	7.28
4.42	3.54	7.18
5.54	4.78	5.55
6.99	6.93	6.76

0.77	1.47	1.69
3.38	3.18	2.28
3.62	3.01	2.48
3.68	2.93	2.53

0.63	0.74	2.23
8.05	7.68	3.71
8.31	7.06	4.51
8.45	6.44	5.29

0.12	0.71	0.74
4.27	3.07	2.27
5.09	5.73	5.82
9.27	7.03	6.79

0.74	1.93	2.76
7.24	5.03	3.14
7.71	6.38	3.8
8.28	9.18	9.48

0.14	0.67	2.22
5.96	5.58	5.22
7.04	7.59	9.33
9.77	9.50	8.52

0.20	2.54	2.8
1.05	2.39	2.96
1.44	2.28	3.00
1.73	2.19	3.85

- Conditions
 - Control
 - Shredder
 - And confederate
 - And he wears University of Pittsburg T-shirt
- Result: control (~7) < Pitt T-shirt (~9) < no confederate (~12) < plain T-shirt (~15)
- Universal masking: the 3rd year student who spoke up...



Gino, Ayal and Ariely, 2009

Self-concept maintenance

1.89	1.82	2.91	0.53	1.88
4.87				
5.82	1.69	1.82	2.91	
6.36	4.67	4.81	3.05	
2.3	5.82	5.06	4.28	
3.33				
5.87	6.36	5.19	4.57	

0.06	5.07	5.39
1.71	0.03	8.98
2.10	4.96	9.42
4.53	4.65	8.82

0.85	1.82	1.63
6.06	5.83	1.69
6.25	5.01	1.78
6.36	3.16	1.91

0.15	0.95	1.31
4.88	2.90	2.88
6.66	6.73	7.67
9.75	9.85	8.17

0.63	0.65	1.02
2.64	2.34	2.12
2.89	5.98	8.89
9.49	9.37	9.33

0.14	0.15	0.32
5.51	5.68	0.52
5.48	6.15	0.84
5.28	3.31	1.17

0.84	1.54	7.28
4.42	3.54	7.18
5.54	4.78	5.55
6.99	6.93	6.76

0.77	1.47	1.89
3.38	3.18	2.28
3.82	3.01	2.48
3.68	2.93	2.53

0.83	0.74	2.23
8.05	7.88	3.71
8.31	7.08	4.51
8.45	6.44	5.29

0.12	0.71	0.74
4.27	3.07	2.27
5.08	5.73	5.82
9.27	7.03	6.79

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7.71	8.38	3.8
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0.14	0.67	2.22
5.96	5.58	5.22
7.04	7.59	8.33
9.77	9.50	8.52

0.20	2.54	2.8
1.05	2.39	2.96
1.44	2.28	3.00
1.73	2.19	3.85

- Conditions
 - Control
 - Shredder
 - And token



- Result: control (~3.5) < no token (~6) < token (~9.5)
- Categorization malleability
- Universal masking: “We’re 100% compliant. ... In break rooms and working rooms it’s sort of half-half.”

Mazar, Amir, & Ariely, 2008

Some pieces of the masks/distancing puzzle

- Real people vs *Homo economicus*
- System 1 vs system 2
- Present bias, precommitment
- Implementation intentions
- Decision fatigue, breaks
- Default bias, status quo bias, friction
- Cognitive vs affective vs behavioral nudges
- Optimism bias
- Injunctive vs descriptive norms
- Ingroup–outgroup bias
- Self-concept maintenance, categorization malleability



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<https://advanced-hindsight.com/health-research/>

