Anticipatory Anxiety and Wishful Thinking

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EEA

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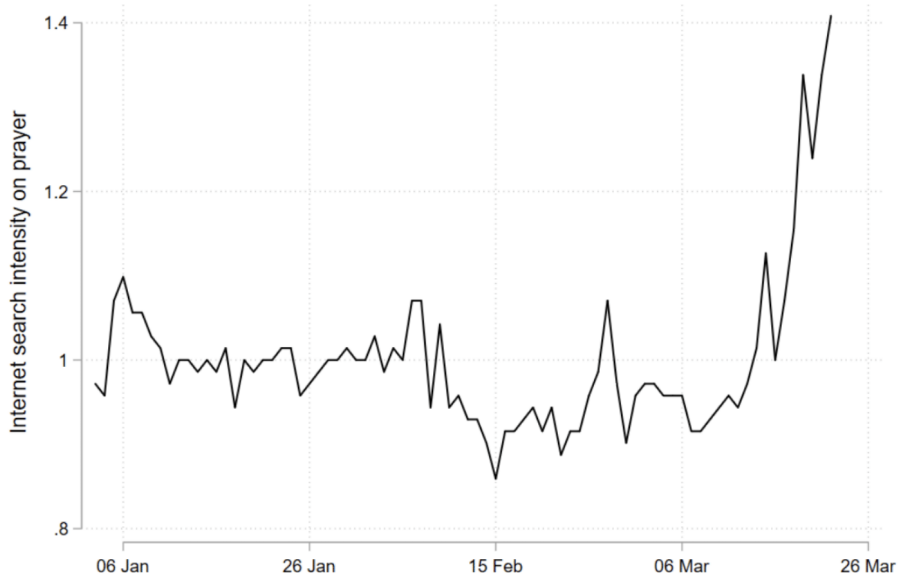
Figure 1: Worldwide Google searches for "prayer" during the first three months of 2020



Notes: Google searches on prayer relative to the total number of Google searches on the particular day, set to 1 on Feb 1st 2020. The searches include topics related to prayer, including alternative spellings and languages. The average for the world is calculated across appr. 150 countries. Data source: Google.trends.

Source: Bentzen (2020), JEBO.

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Theory: beliefs have consumption value or yield "anticipatory utility"

- *The greatest force of feeling and motive arises from the anticipation of a long-continued future* (Jevons 1871)

- Optimistic beliefs result from some optimization process (Brunnermeier and Parker 2005, Bénabou and Tirole 2002, 2011)

Literature: Mixed and puzzling evidence

- Scant evidence from experimental econ
  (Mayraz 2011-✓, Huseynov et al. 2023-✗!, Coutts 2018-✓✗✗, Barron 2020-✗, Mijovic-Prelec and Prelec 2010-✓)

- Inconclusive evidence from psychology on desirability bias (Krizan and Windschitl 2007-✓✗✗)

- Field evidence on info avoidance and motivated beliefs in health domain
  (Oster et al. 2013, Ganguly and Tasoff 2016, Orhum et al. 2021, Islam 2021 ✓)

Main research question: Do people self-deceive to reduce anxiety about bad future outcomes?

Secondary questions:

- **Ambiguity:** Does ambiguity of evidence facilitate wishful thinking?
- **Trade-offs:** Do incentives for accuracy constrain wishful thinking?
- **Heterogeneity:** Is wishful thinking a stable personal attribute?

Experiment 1

Pattern recognition

Pattern recognition

Pattern recognition

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Inducing anxiety

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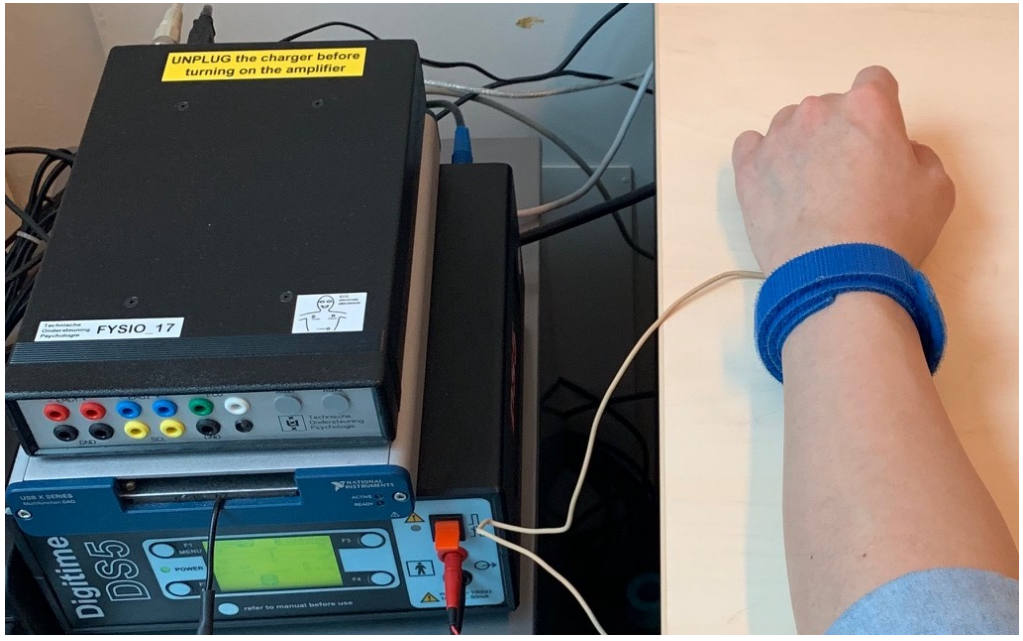
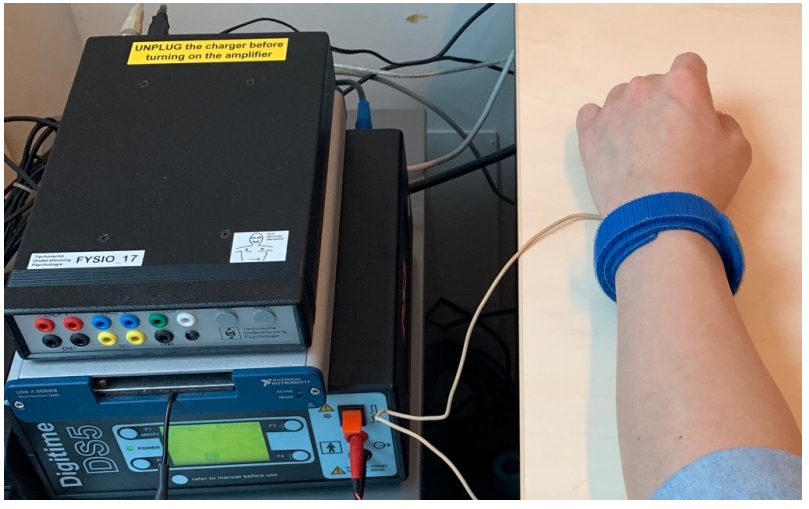


- Shocks cause anxiety: Berns et al. (2006); Schmitz and Grillon (2012); Engelmann et al. (2015, 2017, 2019)
- Precisely timed negative consumption events.

Experimental design

Pattern recognition

Electric shock



Treatment varies whether shocks occur for left or right-tilted patterns

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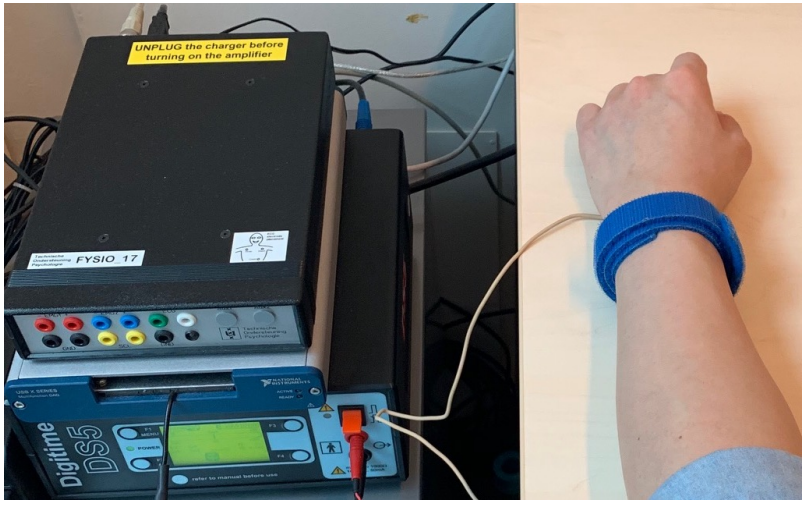

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$\rightarrow$ *A wishful thinker is more likely to believe that they saw a no-shock pattern*

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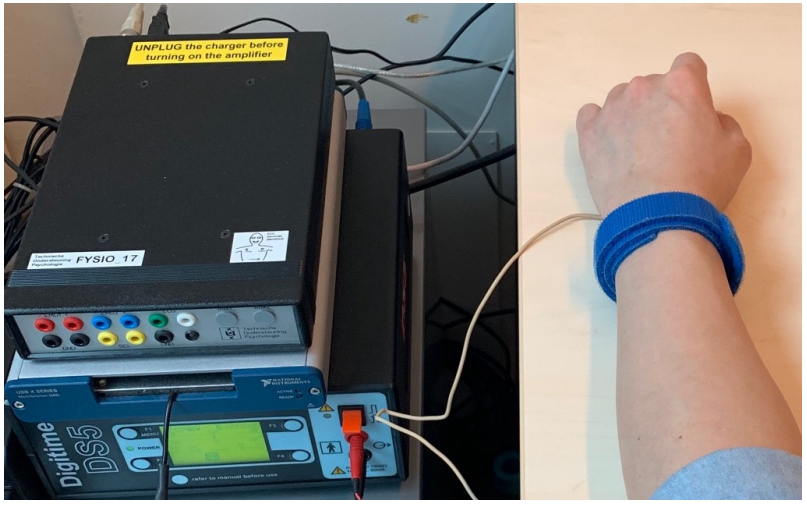

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Measure of wishful thinking: Accuracy no-shock patterns – accuracy shock patterns

Experimental design

Further treatments:

- Ambiguity of evidence: High, medium, and low
- Accuracy incentives: Either 1 euro or 20 euro prize in Becker-DeGroot Marschak of one randomly selected trial

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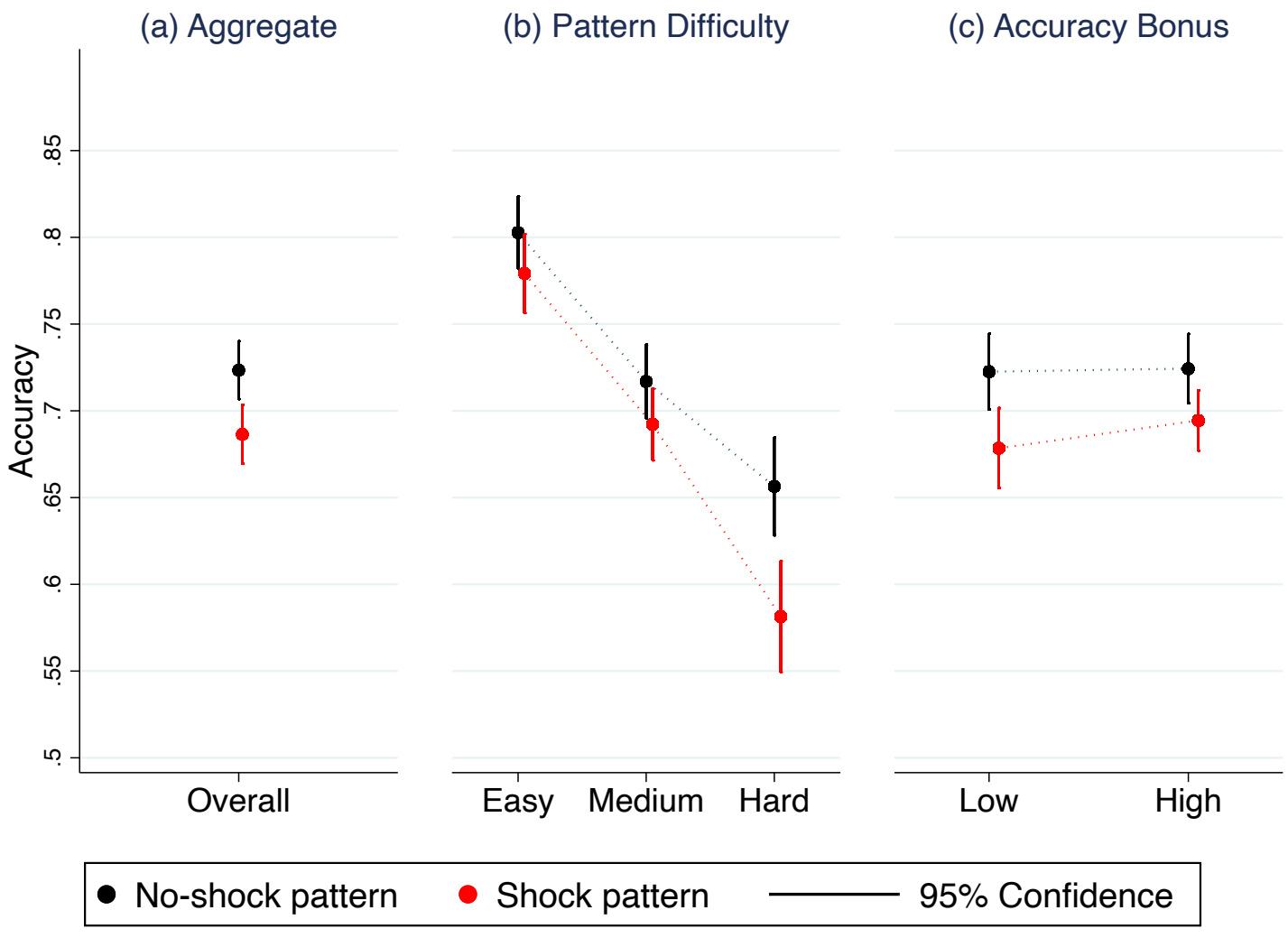
Details:

- 60 subjects (31 female, av. age =21), individual sessions in Amsterdam
- within-subject treatments across many trials
- Preregistered at Aspredicted.org

Results



- Wishful thinking of about 4 percentage points (p-value < 0.01)

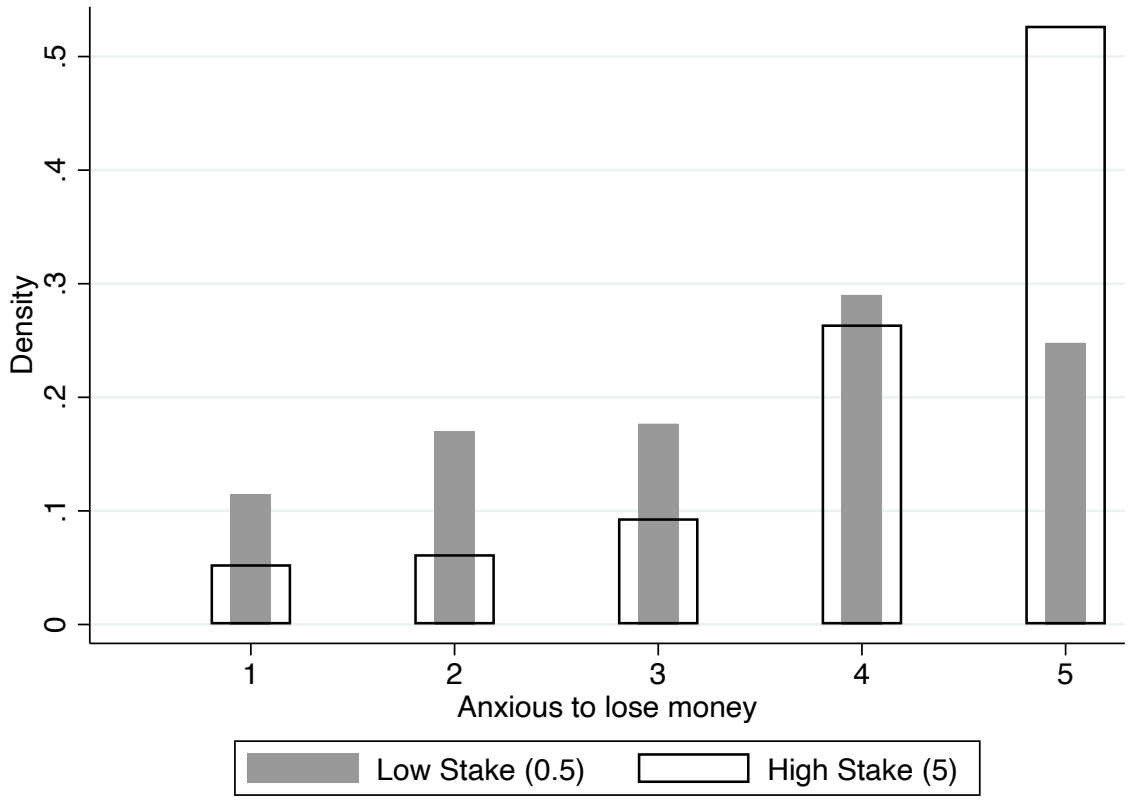
Experiment 2: Monetary losses

Experiment 2 (N=221, Prolific)

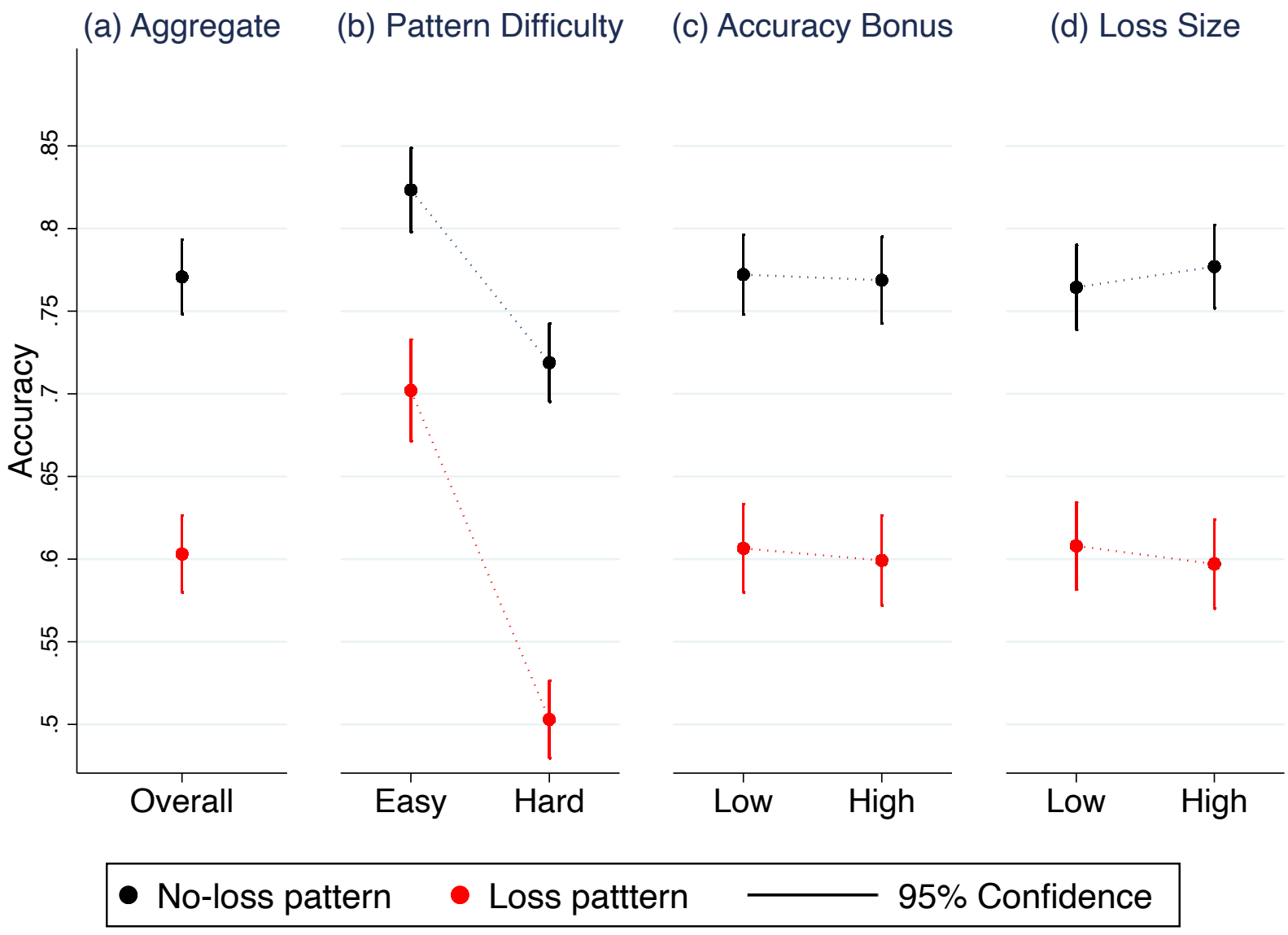
- Does wishful thinking respond to the size of losses?
  - Low stakes: Endowment 50 penny, 10 penny loss possibility each trial
  - High stakes: Endowment 25 pounds, 5 pound loss possibility each trial
- Does wishful thinking respond to accuracy incentives?
  - Low bonus: 10 penny (one trial randomly paid)
  - High Bonus: 8 pounds (one trial randomly paid)

Manipulation check

Did higher stakes lead to higher self-reported anxiety?



Results


(a) Aggregate
(b) Pattern Difficulty
(c) Accuracy Bonus
(d) Loss Size
Accuracy
.5
.55
.6
.65
.7
.75
.8
.85
Overall
Easy
Hard
Low
High
Low
High
No-loss pattern
Loss patttern
95% Confidence

Incentive effects

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Two channels for incentives to reduce wishful thinking (see models in paper):

1. **Ex-post signal distortion**: trade-off between material and psychological incentives shapes intensity of self-deception ("optimal expectations")

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So far:

- bonus did not affect accuracy $\rightarrow$ rules out second channel
- lack of incentive effect despite evidence for mental effort and presence of wishful thinking $\rightarrow$ suggests first channel is not so important

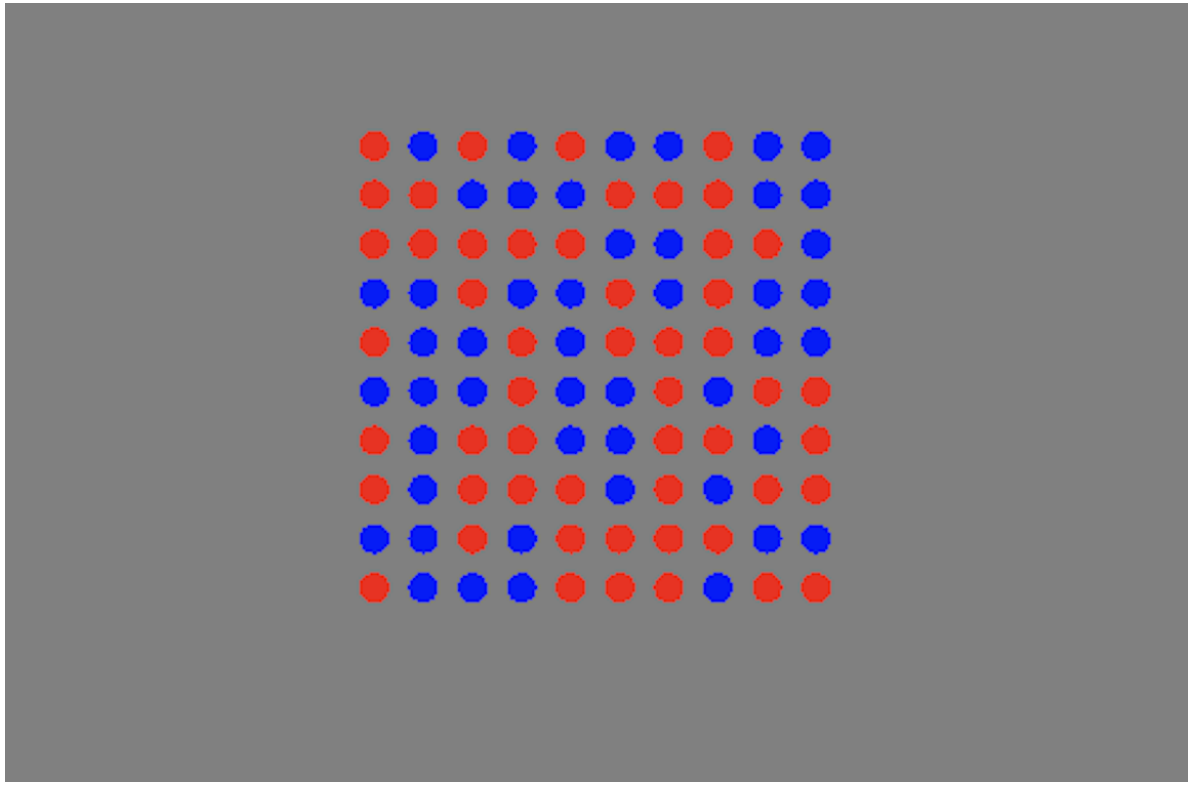
Experiments 4:
Task characteristics and accuracy incentives

Experimen 4 (N>400, Prolific)

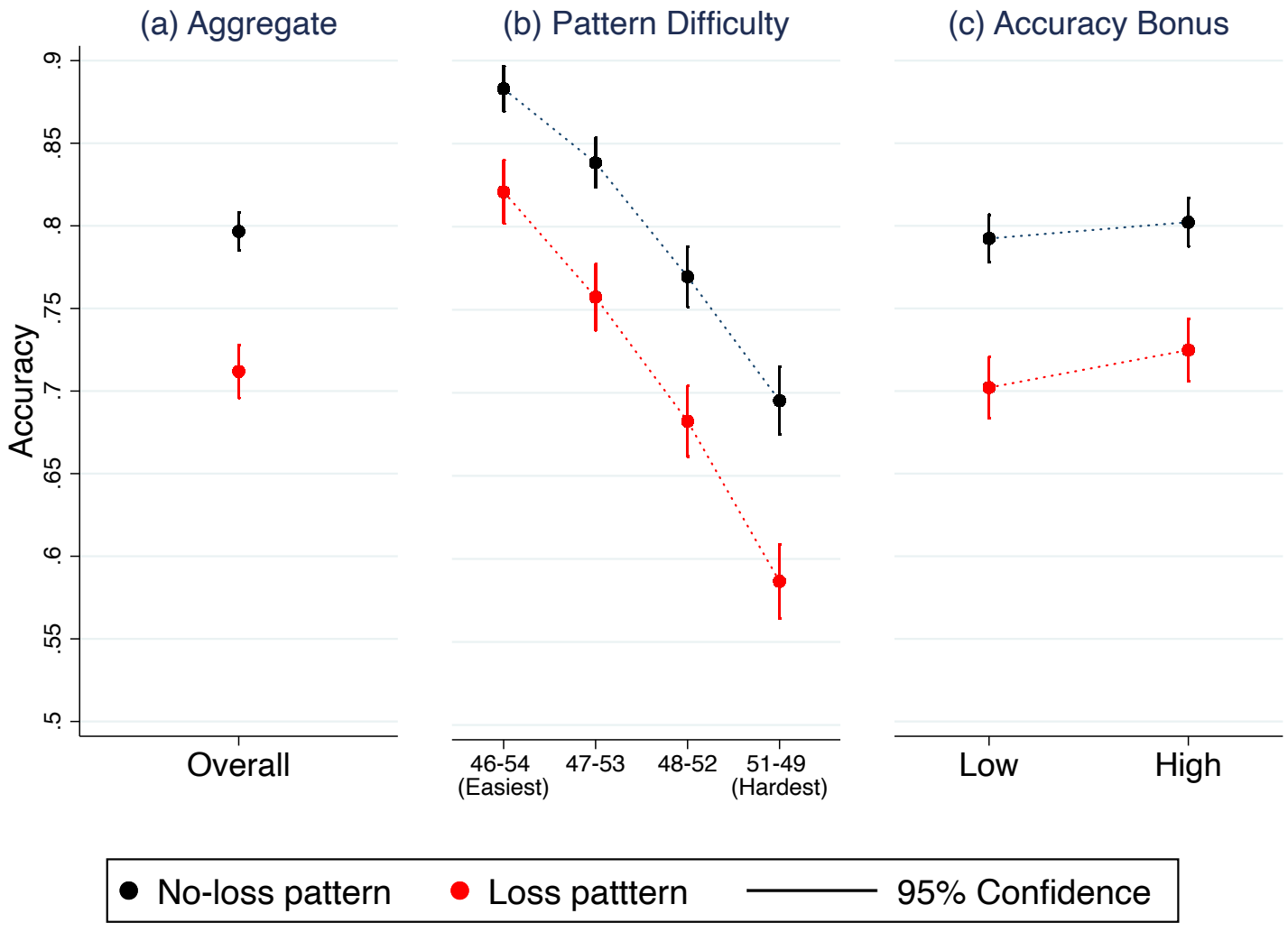
- Open up effort-accuracy channel
  - New tasks more susceptible to effort
  - Accuracy incentives maximally salient (stake size fixed)
  - Demanding attention
- Test robustness of wishful thinking in tasks drawing on different cognitive processes
- Increase power

Task in experiment 4

- Array of 100 dots: Are there more red or blue dots?
- Just enough time for participants to count dots if they choose to $\rightarrow$ more explicit effort choice



Results of experiment 4



Results Experiment 4: Dot counters

Only participants who reported sometimes (38%) or always (9%) counting dots exerted more effort and became more accurate under higher incentives

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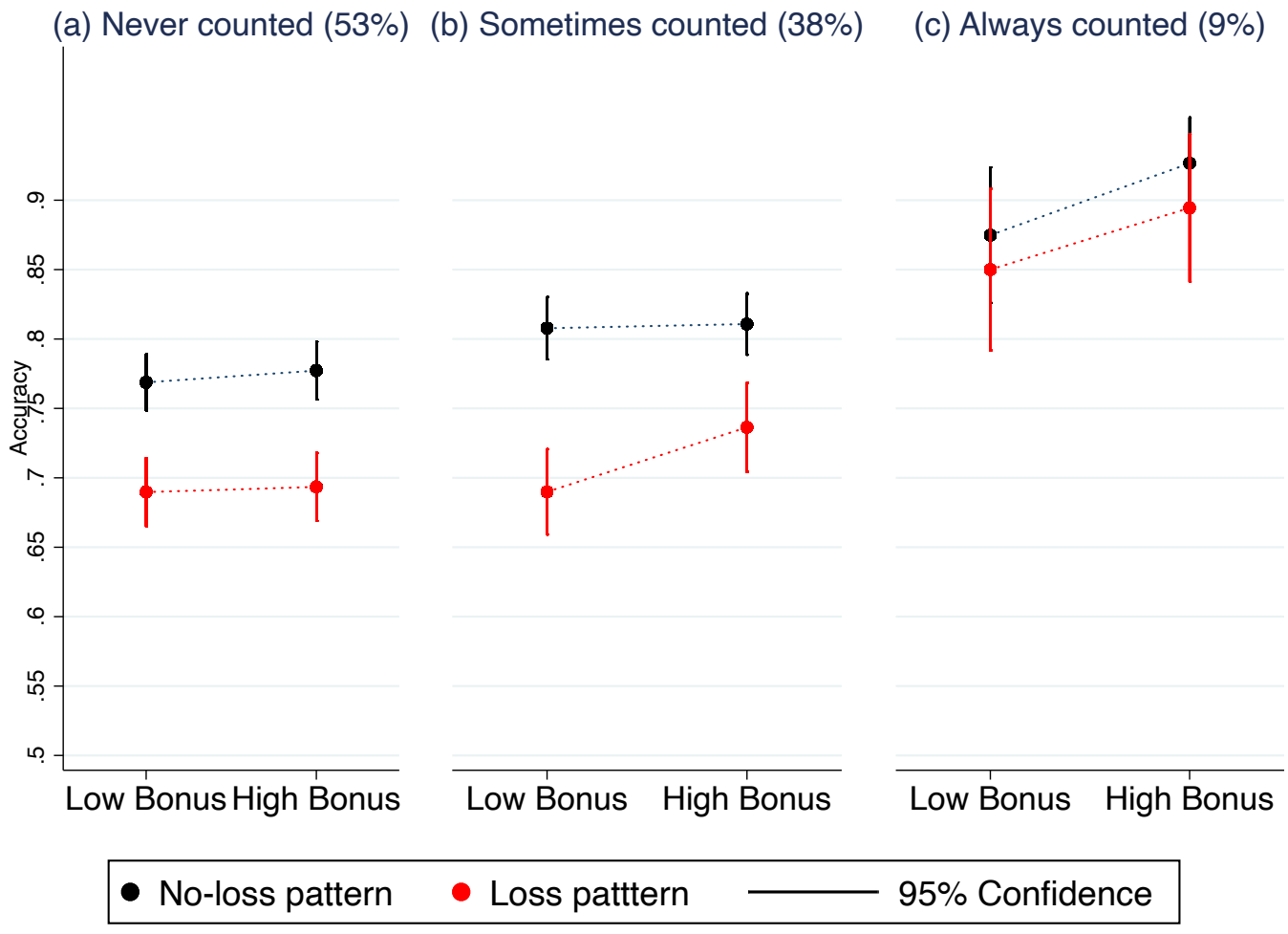
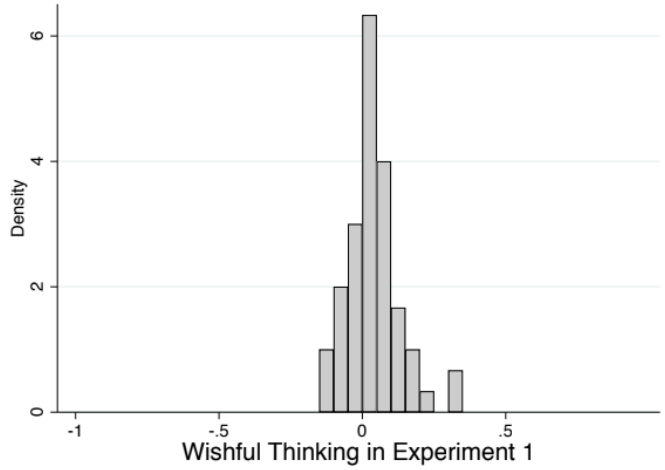
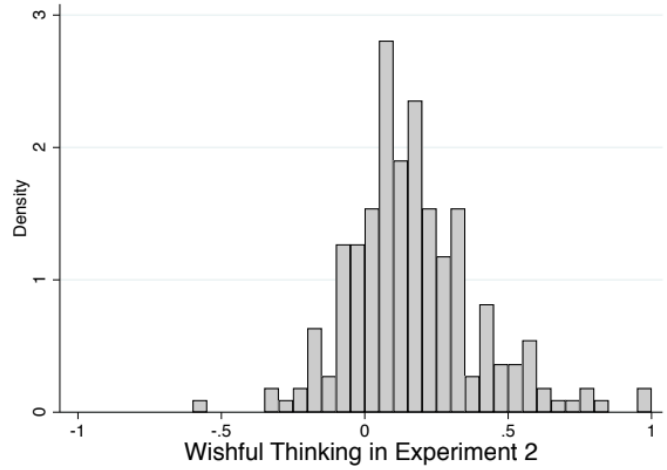
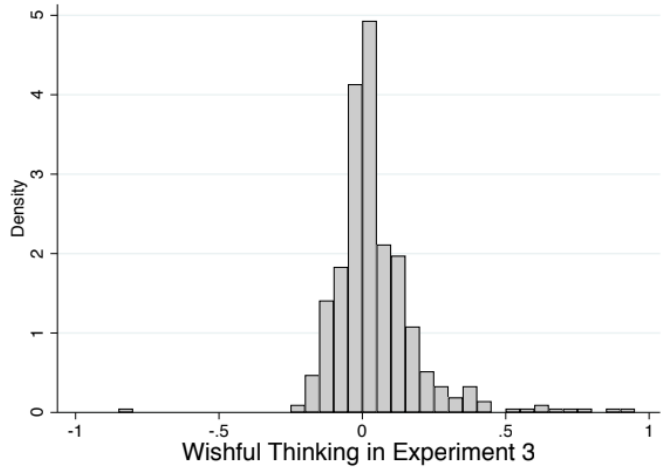
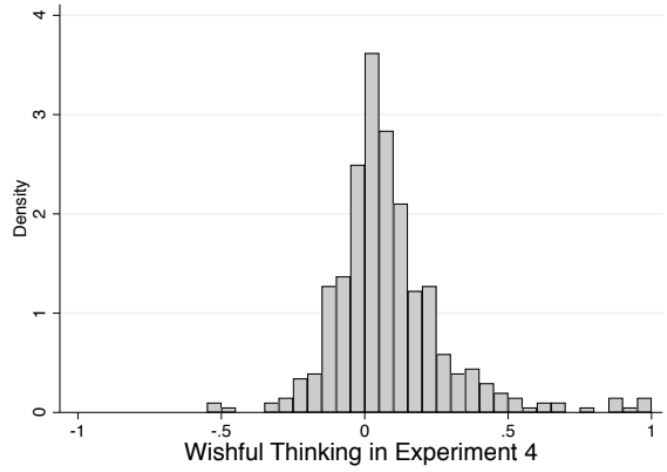


Heterogeneity









- Stability: Average half-split correlation of wishful thinking is $\geq$0.5
- Individual-level wishful thinking and self-reported anxiety are correlated

Experiment 5: Are losses special?

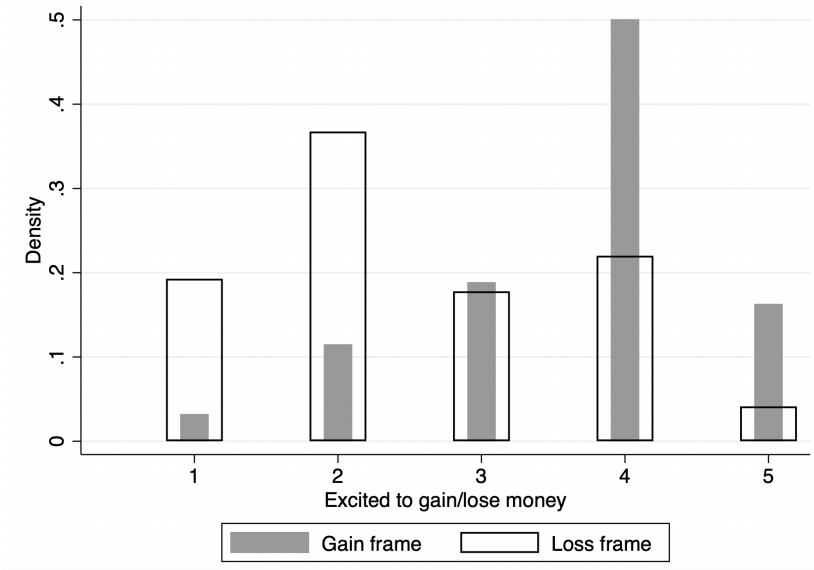
Experiment 5 (N=604, Prolific)

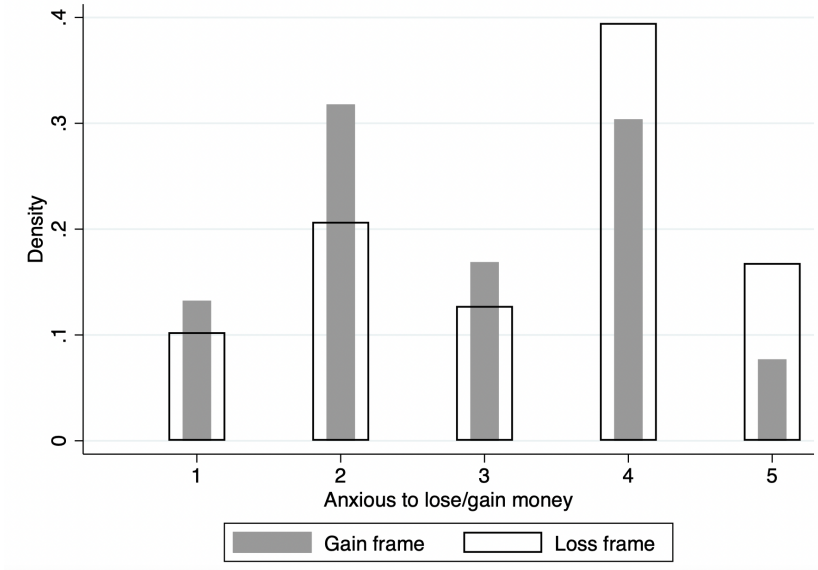
Experiment features 32 trials of single Gabor patches

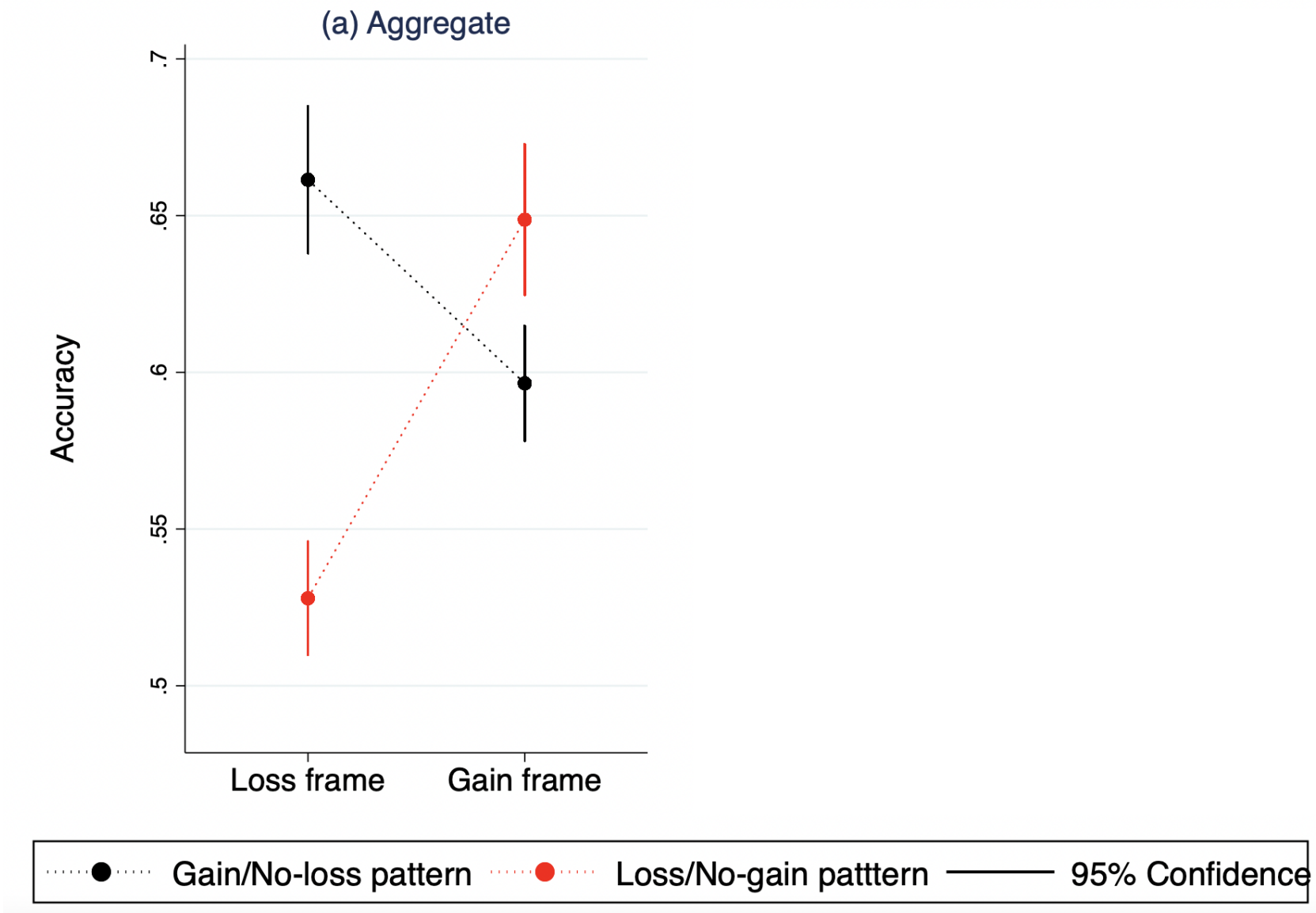
Treatment varies the framing

- Loss frame: Endowment 16 pounds, -50 penny after "loss pattern"
- Gain frame: +50 penny after "gain pattern"

Hypothesis: Higher wishful thinking under loss frame.


Density
0
.1
.2
.3
.4
.5
1
2
3
4
5
Excited to gain/lose money
Gain frame
Loss frame


Density
0
.1
.2
.3
.4
1
2
3
4
5
Anxious to lose/gain money
Gain frame
Loss frame


(a) Aggregate
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Loss frame
Gain frame
Gain/No-loss pattern
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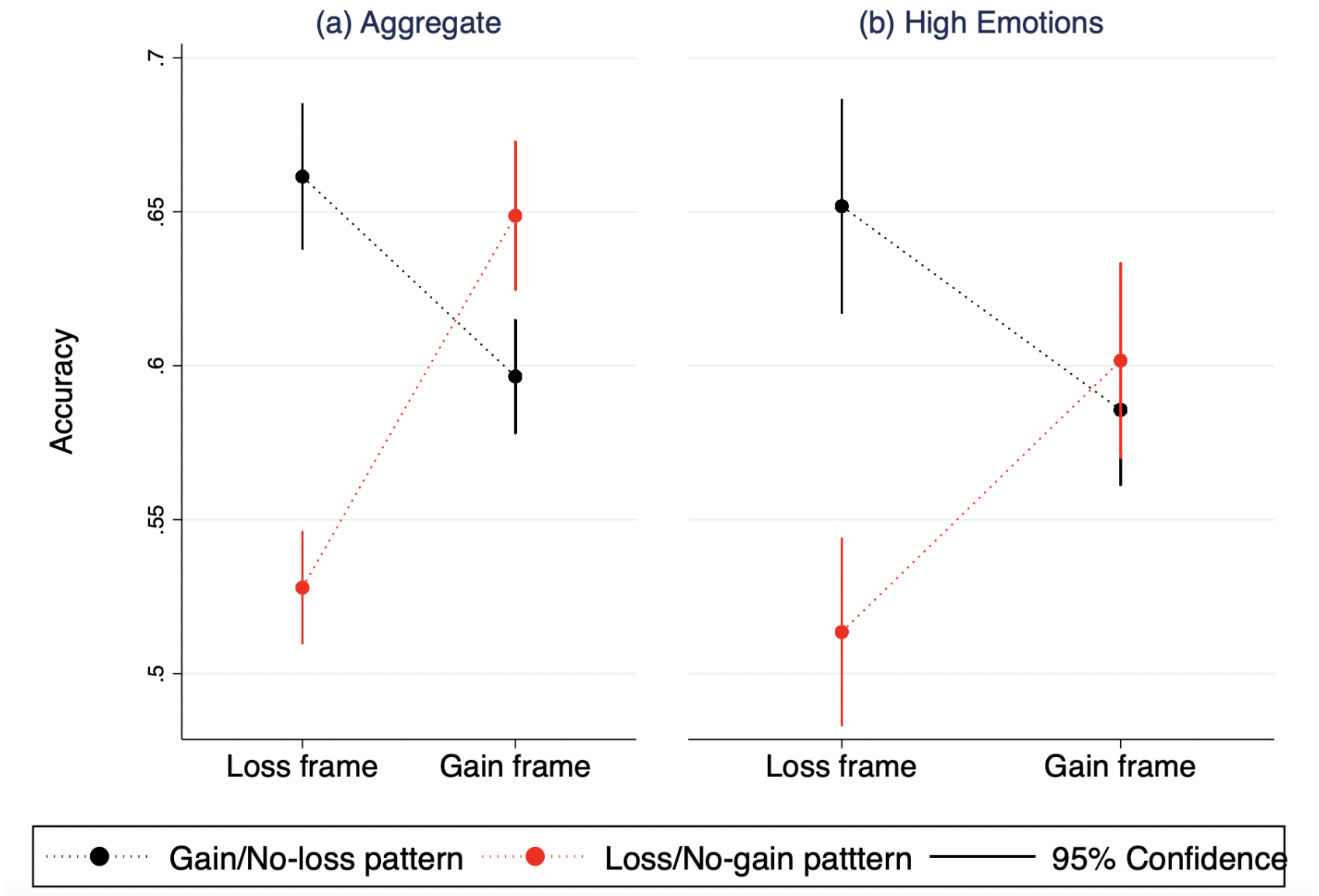
(a) Aggregate
(b) High Emotions
Accuracy
.5
.55
.6
.65
.7
Loss frame
Gain frame
Loss frame
Gain frame
Gain/No-loss pattern
Loss/No-gain patttern
95% Confidence

Conclusion

Five experiments show that wishful thinking is

- highly robust across sources of anxiety and cognitive tasks (4 replications)
- increasing in the ambiguity of evidence
- not very responsive to monetary stakes
- responsive to accuracy incentives, but only through signal precision
- heterogeneous across, but stable within individuals
- not present in the gain domain, and plausibly driven by emotions of anxiety and fear

Thank you!

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A simple example

Suppose a participant

1. is told right-tilted patterns yield shocks, i.e. $r_z = 1$,
2. observes the pattern with $r_t = \{0, 1\}$ and associated signal strength s,
3. forms an unbiased belief $p(r_t, s)$ about the pattern being right-tilted,
4. and then chooses her distorted beliefs $\hat{p}$ to maximize

$$U = \frac{1}{2}\left(1 + 2p\hat{p} - \hat{p}^2\right) M \quad - pZ \quad - \sigma_z \hat{p} Z \quad - \lambda(s)(p - \hat{p})^2$$

A simple example

Her optimal belief for right-tilted shocks is given by

$$\hat{p}^*(r_z = 1) = p(s, r_t) - \frac{\sigma_z Z}{M + 2\lambda(s)}$$

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For left-tilted shocks it is

$$\hat{p}^*(r_z = 0) = p(s, r_t) + \frac{\sigma_z Z}{M + 2\lambda(s)}$$

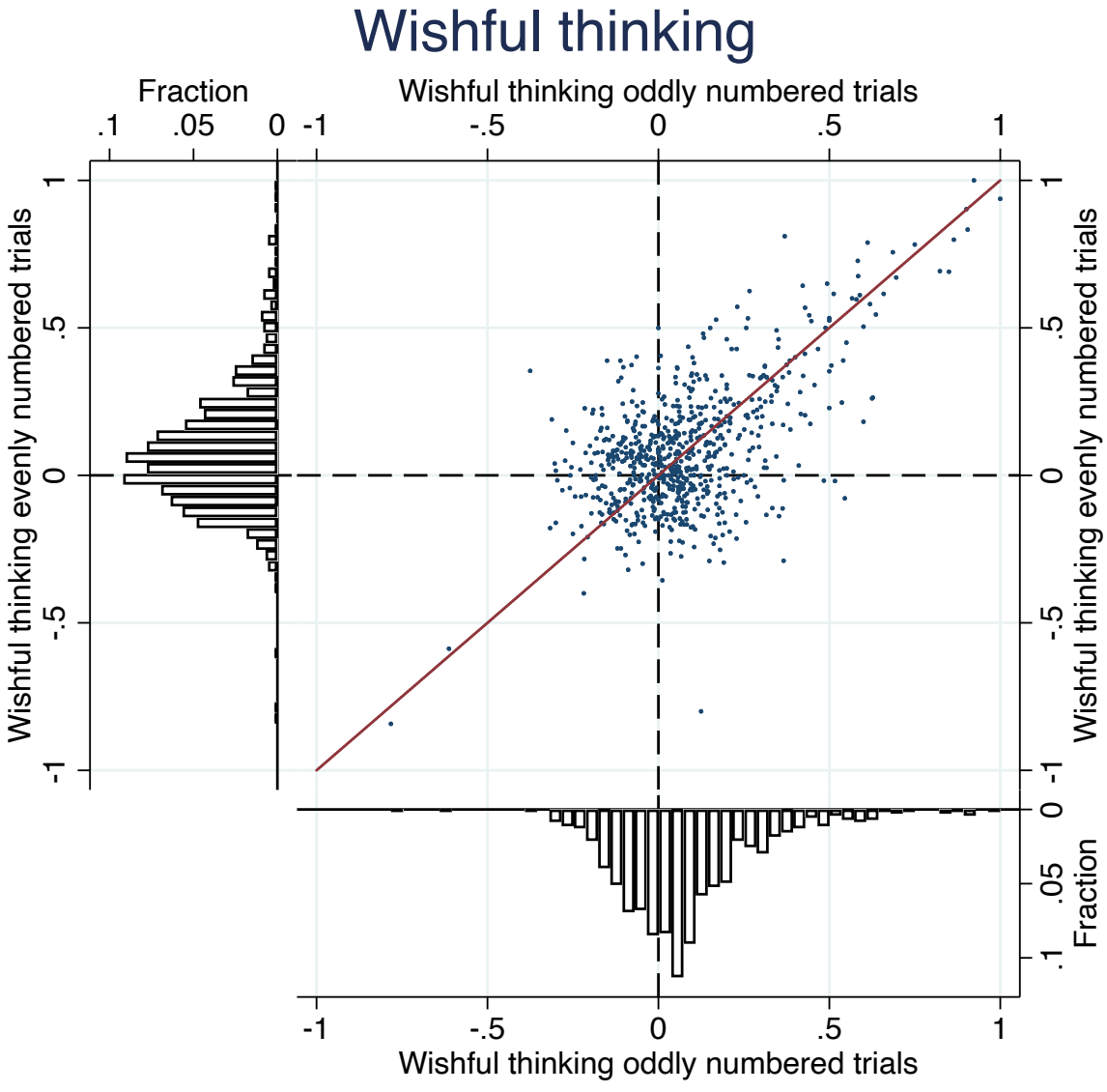
Now suppose that $r_t = 0$, then wishful thinking is given by

$$WT = \hat{p}^*(r_z = 0) - \hat{p}^*(r_z = 1) = \frac{2\sigma_z Z}{M + 2\lambda(s)}$$

Competing explanations for apparent wishful thinking

- **Magical thinking:** Perhaps participants believe that their guess affects the true state
  - Pre-task instructions explicitly ask to confirm understanding
  - Excluding participants who voice post-task confusion does not change results
- **Noise-based explanation**: Shock pattern associated with more noise as anxious subjects "forget" the signal
  - 'No stakes' condition in experiment 2 to rule this out: non-aligned patterns lead to higher accuracy than no-stakes patterns

Heterogeneity



Plot includes 45 degree line, correlation = 0.58

Correlates of wishful thinking

	(1)	(2)	(3)	(4)
Dep. variable:	Wishful	Wishful	Wishful	Wishful
Concentration	-0.0275***	-0.0314**	-0.0376***	-0.0454***
	(0.00963)	(0.0123)	(0.0109)	(0.0136)
Defensive pessimism	-0.00781*	-0.0137**	-0.0106**	-0.0179**
	(0.00413)	(0.00625)	(0.00440)	(0.00693)
Anxiety		0.0133		0.0171*
		(0.00832)		(0.00900)
Controls	Yes	Yes	Yes	Yes
Excl. strugglers	No	No	Yes	Yes
Constant	0.349***	0.364***	0.399***	0.425***
	(0.0512)	(0.0679)	(0.0570)	(0.0766)
Observations	1049	624	743	421
R^2	0.068	0.060	0.089	0.086

Table: Omitted controls: age, gender and experiment dummies. Standard errors in parentheses. * p$<$ 0.1, ** p$<$ 0.05, *** p$<$ 0.01.

Correlates of wishful thinking

	(1) Risk seeking	(2) After-life	(3) Climate worry	(4) Risk seeking	(5) After-life	(6) Climate worry
Wishful Thinking	0.338	0.201	-0.0437	0.708**	0.969**	0.0238
	(0.243)	(0.344)	(0.262)	(0.312)	(0.443)	(0.341)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Excl. strugglers	No	No	No	Yes	Yes	Yes
Constant	4.097***	3.019***	5.242***	3.966***	2.711***	5.009***
	(0.158)	(0.350)	(0.268)	(0.200)	(0.433)	(0.339)
Observations	1049	1027	1007	743	733	724
R^2	0.038	0.028	0.062	0.036	0.030	0.073

Table: Omitted controls: age, gender and experiment dummies. Standard errors in parentheses. * p$<$ 0.1, ** p$<$ 0.05, *** p$<$ 0.01.