Risk Aversion for Qualitative Losses

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in collaboration with:

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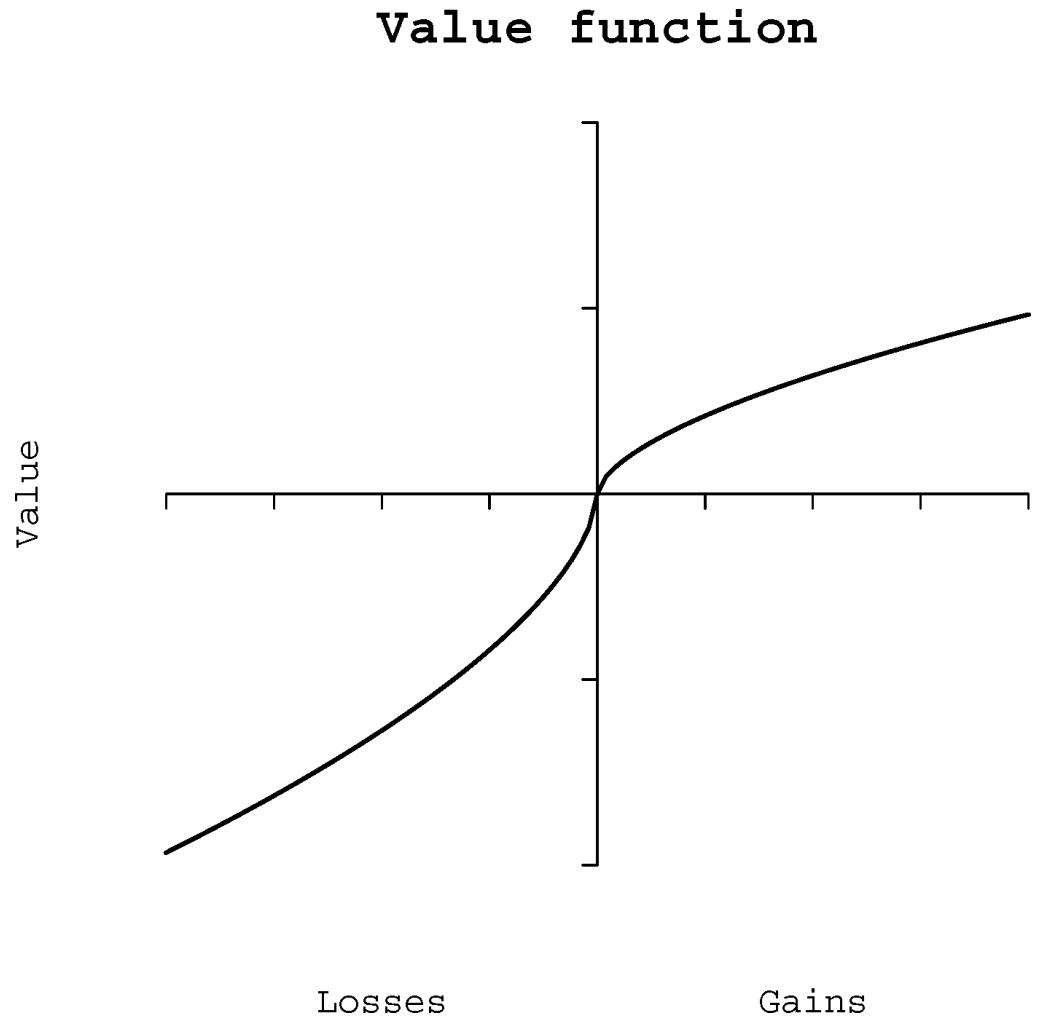
Risk Attitudes **without** Numbers?

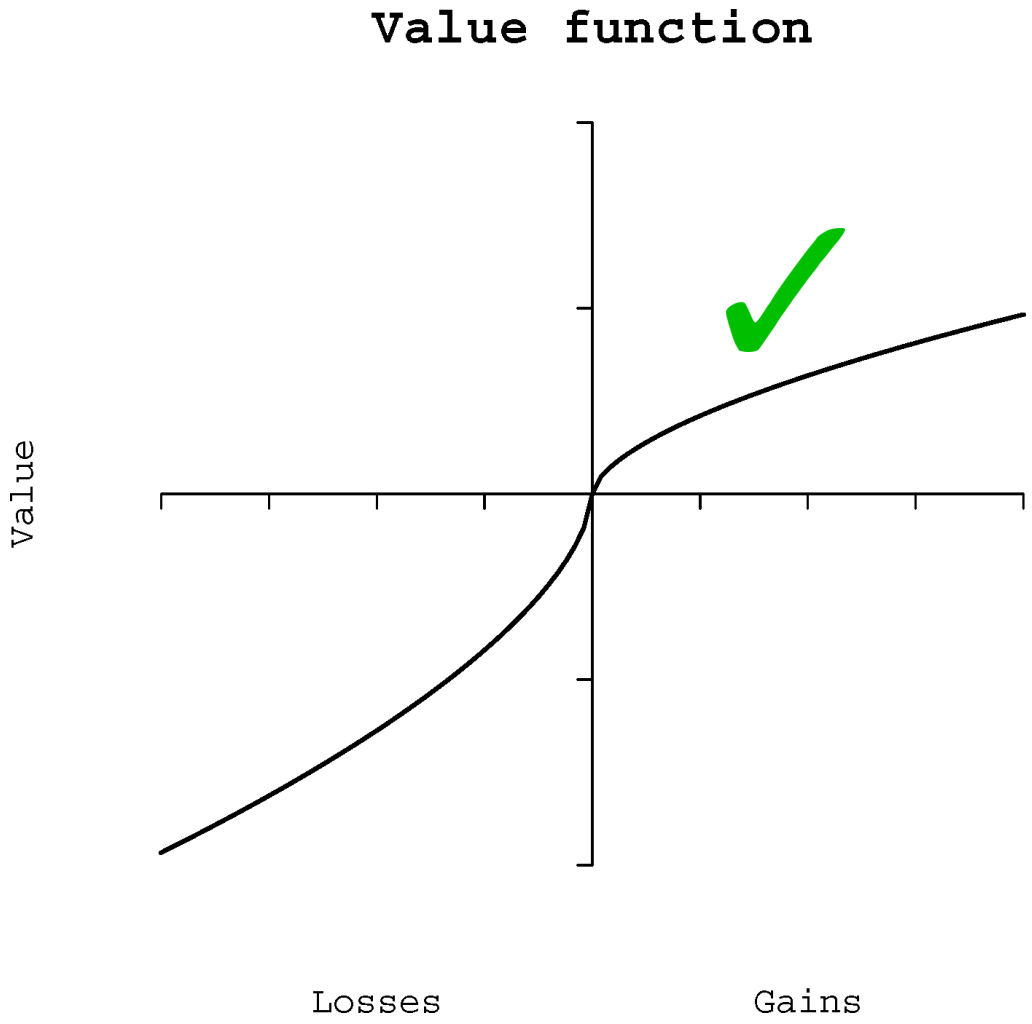


In previous work, we found that Prospect theory's value function is sensitive to the **numerical scales** used to represent outcomes.

Our findings suggested that its shape may reflect **diminishing sensitivity to numbers**, not outcomes (Müller-Trede et al., 2018).

So what would a value function for **qualitative outcomes** look like?

Risk Attitudes **without** Numbers?

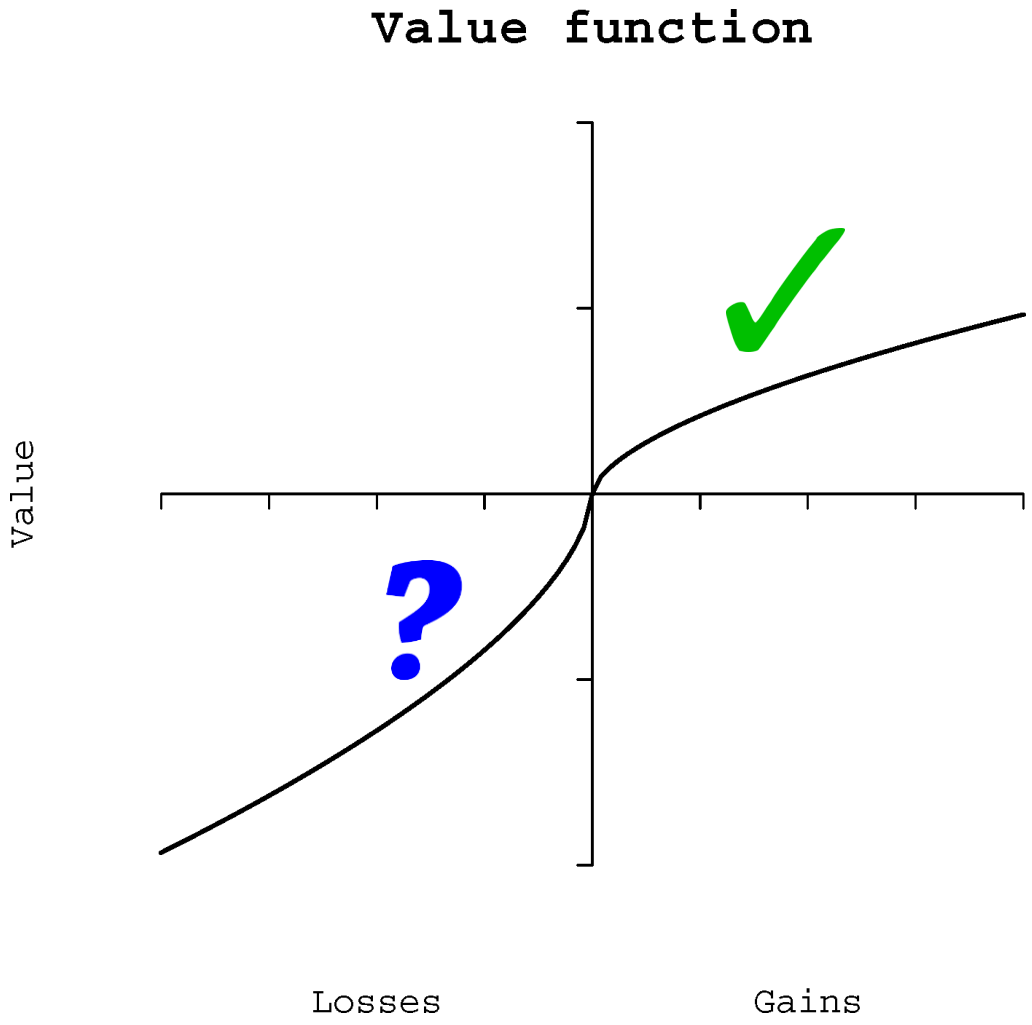


Risk aversion for gains

Many (qualitative and quantitative) gains have diminishing causal impact.

So on independent grounds, expect risk aversion for gains.

Risk Attitudes **without** Numbers?



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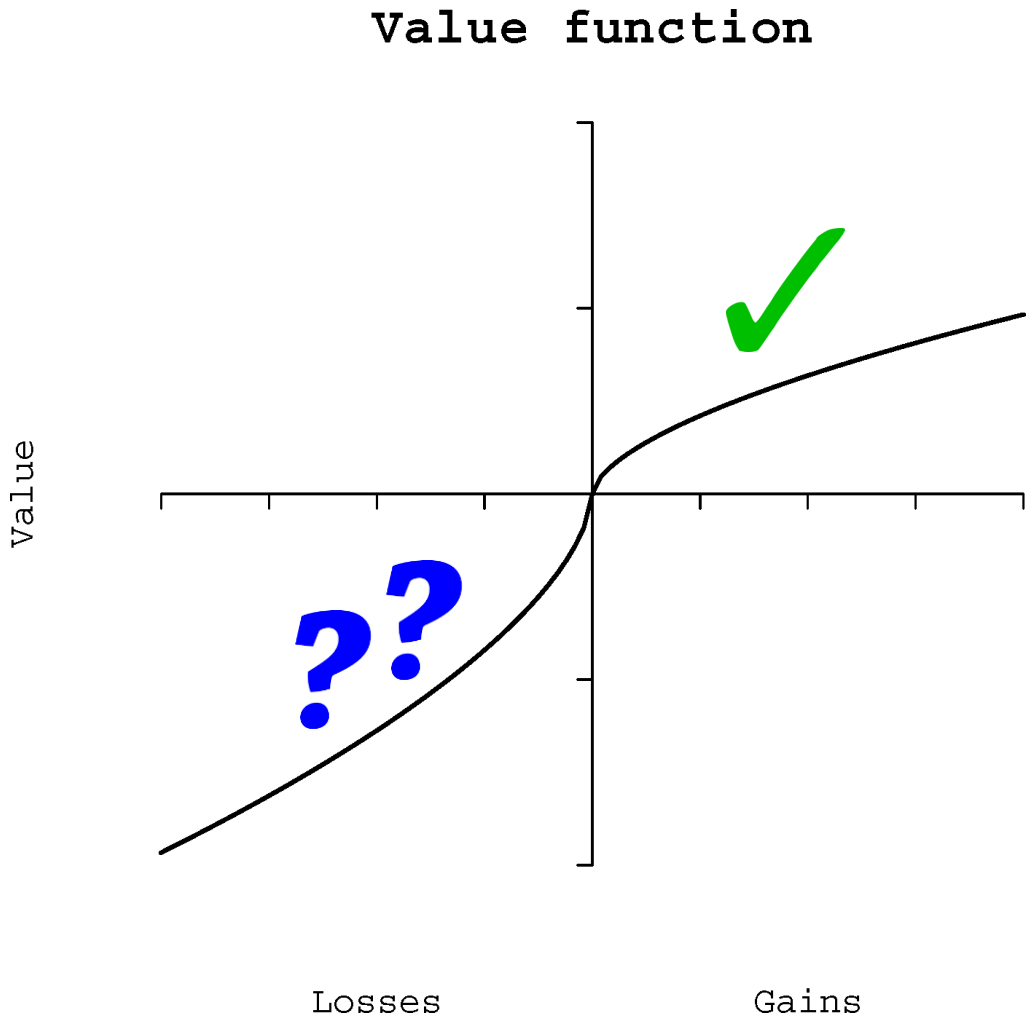
Risk seeking for losses?

The above suggests sensitivity to losses should be accelerating.

Risk Attitudes **without** Numbers?



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The psychophysics of pain do not reveal clear diminishing sensitivity.

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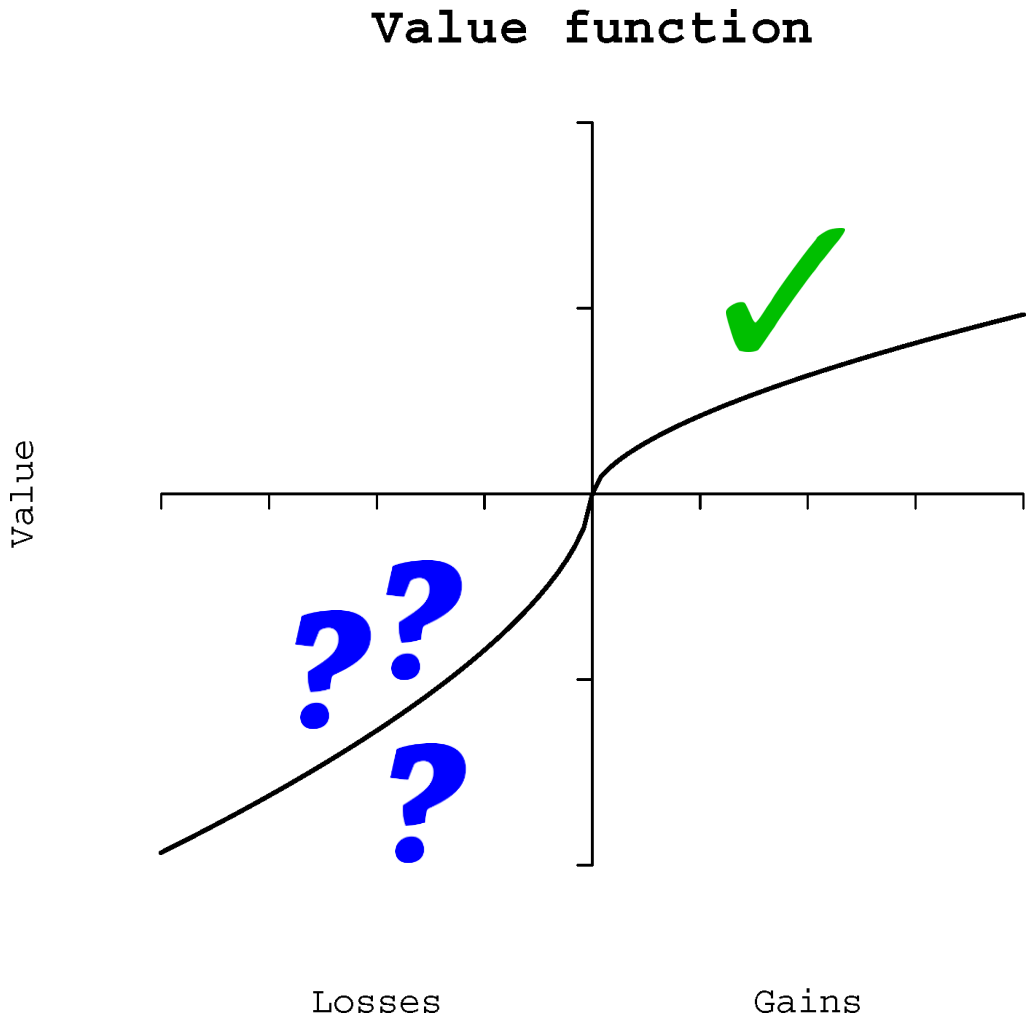

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Risk seeking for losses?

The above suggests sensitivity to losses should be accelerating.

The psychophysics of pain do not reveal clear diminishing sensitivity.

We do not find risk-seeking in a modified Asian disease problem.

Pre-study 1

Qualitative Gain

Imagine you have a choice between two options, A and B.

In Option A, there is a small probability you will gain a lot.

In Option B, you will gain a little for sure.

Based on this information, which option would you choose?

- ○ Option A
- ○ Option B

Qualitative Loss

Imagine you have a choice between two options, A and B.

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63.4% choose sure gain
($p < .001$)

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- ○ Option A
- ○ Option B

65.4% choose sure loss
($p < .0001$)

N = 320 MTurkers

Testing diminishing sensitivity

Take 2 losses $\mathcal{L}$ and $\mathcal{S}$ with $|u(\mathcal{L})| > |u(\mathcal{S})|$

Testing diminishing sensitivity

Take 2 losses $\mathcal{L}$ and S with $|u(\mathcal{L})| > |u(S)|$

Then for an incremental loss x,

diminishing sensitivity implies $|u(x+\mathcal{L})| - |u(\mathcal{L})| < |u(x+S)| - |u(S)|$

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Intuition: *The incremental loss hurts less when it is added to the larger rather than the smaller baseline loss*.

This condition can be considered a definition of diminishing sensitivity.

Testing diminishing sensitivity

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Letting $\mathcal{S} = 0$ and $x = s$, it follows that

$$|u(s+\mathcal{L})| < |u(s)| + |u(\mathcal{L})|$$

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Intuition: *The pain of jointly losing both goods is less than the summed pain of losing each good in isolation.*

Exp. **1**, method

Imagine you currently own **a TV that you enjoy watching**, and **a bicycle that you enjoy riding**.

Now imagine you have to make a choice involving potential losses of these goods.

You have two options, A and B. If you choose Option A, you will lose one of the goods (selected at random) but you won't lose the other. If you choose Option B, you will have a 50% chance of losing both of the goods, and a 50% chance of not losing anything.

Your options are summarized in the table below.

Option A	50% chance of losing the TV, but not the bicycle 50% chance of losing the bicycle, but not the TV
Option B	50% chance of losing both the TV and the bicycle 50% chance of losing nothing

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$$w(\tfrac{1}{2})\, u(\mathcal{s}) + w(\tfrac{1}{2})\, u(\mathcal{L})$$

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$w(\frac{1}{2})\ [u(\mathscr{s})\ +\ u(\mathscr{L})]$

$w(\frac{1}{2})\ u(\mathscr{s}+\mathscr{L})$

Diminishing sensitivity $|u(\mathscr{s}+\mathscr{L})| < |u(\mathscr{s})| + |u(\mathscr{L})|$ implies $B \succ A$

Exp. **1**, results

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Your options are summarized in the table below.

Option A	50% chance of losing the TV, but not the bicycle 50% chance of losing the bicycle, but not the TV
Option B	50% chance of losing both the TV and the bicycle 50% chance of losing nothing

Which would you choose?

81.1%
($p < .0001$)

N = 122 UCSD undergrads


Qualitative Loss
Percentage of Risk Averse Choices
100%
80%
60%
40%
20%
0%
Exp1

Exp. **2**, method

Imagine you currently own a and a . You like each of them, and you use them often.

...

Your options are summarized in the table below.

Option A	50% chance of losing both the and the 50% chance of losing nothing
Option B	50% chance of losing the , but not the 50% chance of losing the , but not the

Which would you choose?

- ○ Option A
- ○ Option B

Exp. **2**, method

Imagine you currently own a and a . You like each of them, and you use them often.

...

{ bicycle; TV; sofa; nice coat }

Your options are summarized in the table below.

Option A	50% chance of losing both the and the 50% chance of losing nothing
Option B	50% chance of losing the , but not the 50% chance of losing the , but not the

Which would you choose?

- ○ Option A
- ○ Option B

Exp. **2**, results

Imagine you currently own a and a . You like each of them, and you use them often.

{ bicycle; TV; sofa; nice coat }

...

Your options are summarized in the table below.

Option A	50% chance of losing both the and the 50% chance of losing nothing
Option B	50% chance of losing the , but not the 50% chance of losing the , but not the

Which would you choose?

- ○ Option A
- ○ Option B

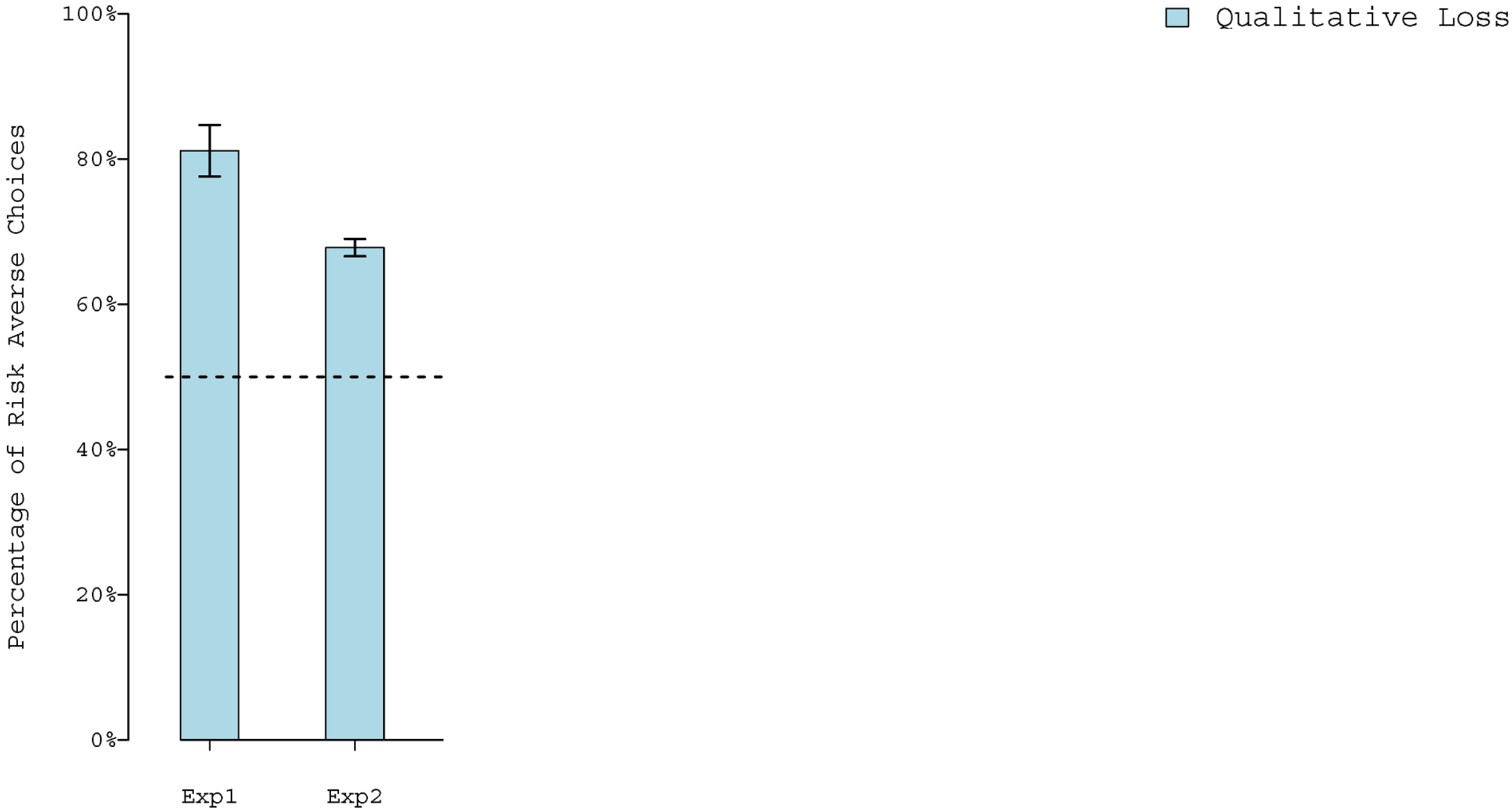
% risk averse choices by item pair

	TV	sofa	nice coat
bicycle	74.9%	67.6%	67.5%
TV		N/A	64.7%
sofa			64.8%

(all *p*s ≤ .0001)

Order effect favoring the top option

Pre-registered, N = 1528 on Prolific


Qualitative Loss
Percentage of Risk Averse Choices
100%
80%
60%
40%
20%
0%
Exp1
Exp2

Exp. **3**, method

Option A	Lose the bicycle
Option B	50% chance of losing both the TV and the bicycle

Option A	Lose the TV
Option B	50% chance of losing both the TV and the bicycle

Option A	Lose $400
Option B	50% chance of losing $800

Exp. **3**, method

Option A	Lose the bicycle
Option B	50% chance of losing both the TV and the bicycle

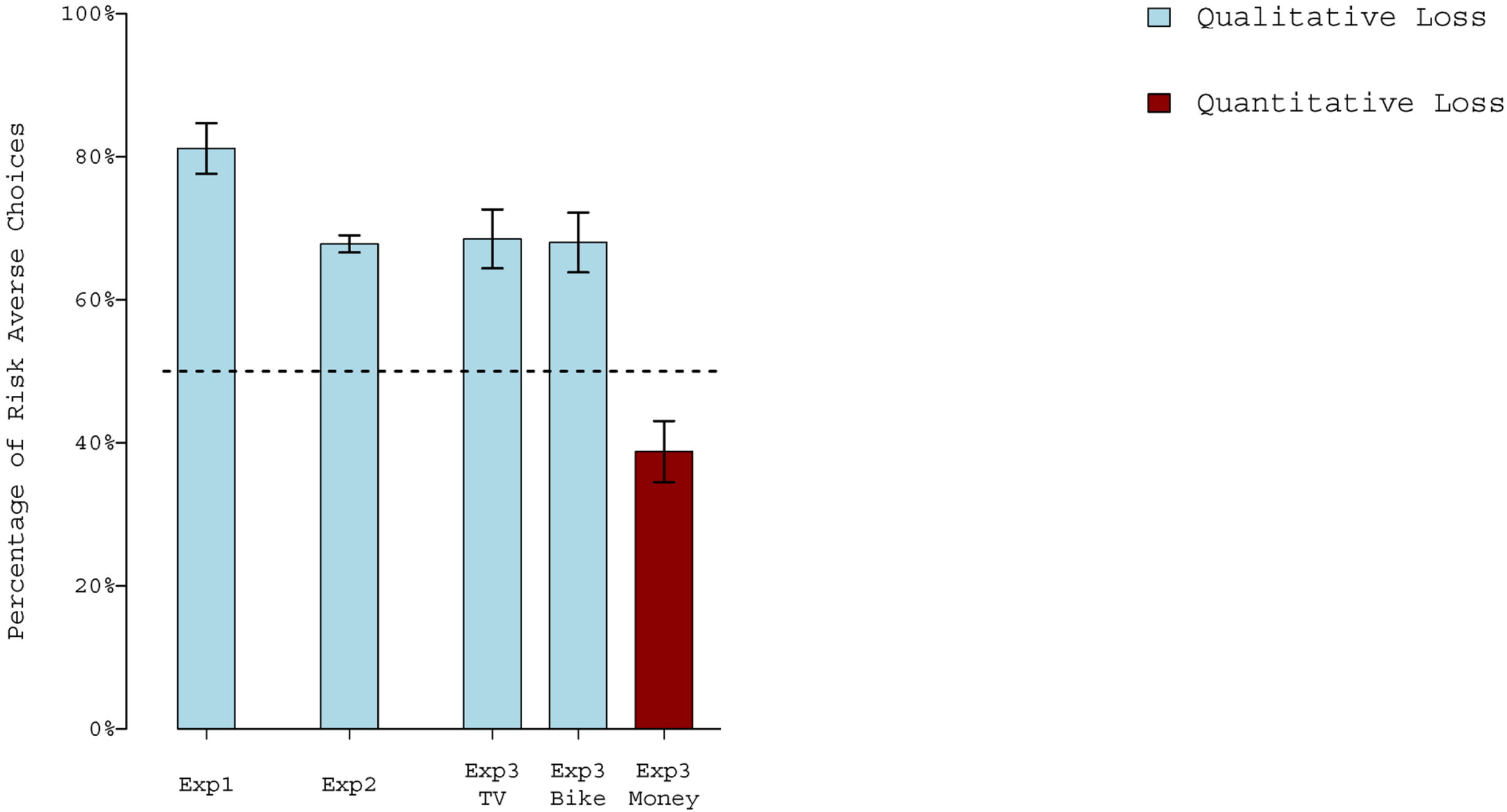
Option A	Lose the TV
Option B	50% chance of losing both the TV and the bicycle

Option A	Lose $400
Option B	50% chance of losing $800

If many subjects strongly prefer one qualitative good over the other, this could generate inconsistent risk attitudes across conditions, or risk neutrality in both.

But **consistent risk aversion** across the two qualitative conditions would provide strong evidence against dim. sensitivity to losses!

N = 381 UCSD undergrads


Qualitative Loss
Quantitative Loss
Percentage of Risk Averse Choices
100%
80%
60%
40%
20%
0%
Exp1
Exp2
Exp3 TV
Exp3 Bike
Exp3 Money

Exp. **4**, method

Imagine you have to make a choice between two options involving potential losses. In each option, there are two possible outcomes, depending on the result of a coin toss.

Your options are summarized in the table below.

Option A	50% chance of losing $100 and your smartphone 50% chance of losing $1000
Option B	50% chance of losing $100 50% chance of losing $1000 and your smartphone

Which would you choose?

Option A

Option B

Exp. **4**, method

Imagine you have to make a choice between two options involving potential losses. In each option, there are two possible outcomes, depending on the result of a coin toss.

Your options are summarized in the table below.

Option A	50% chance of losing $100 and your smartphone 50% chance of losing $1000
Option B	50% chance of losing $100 50% chance of losing $1000 and your smartphone

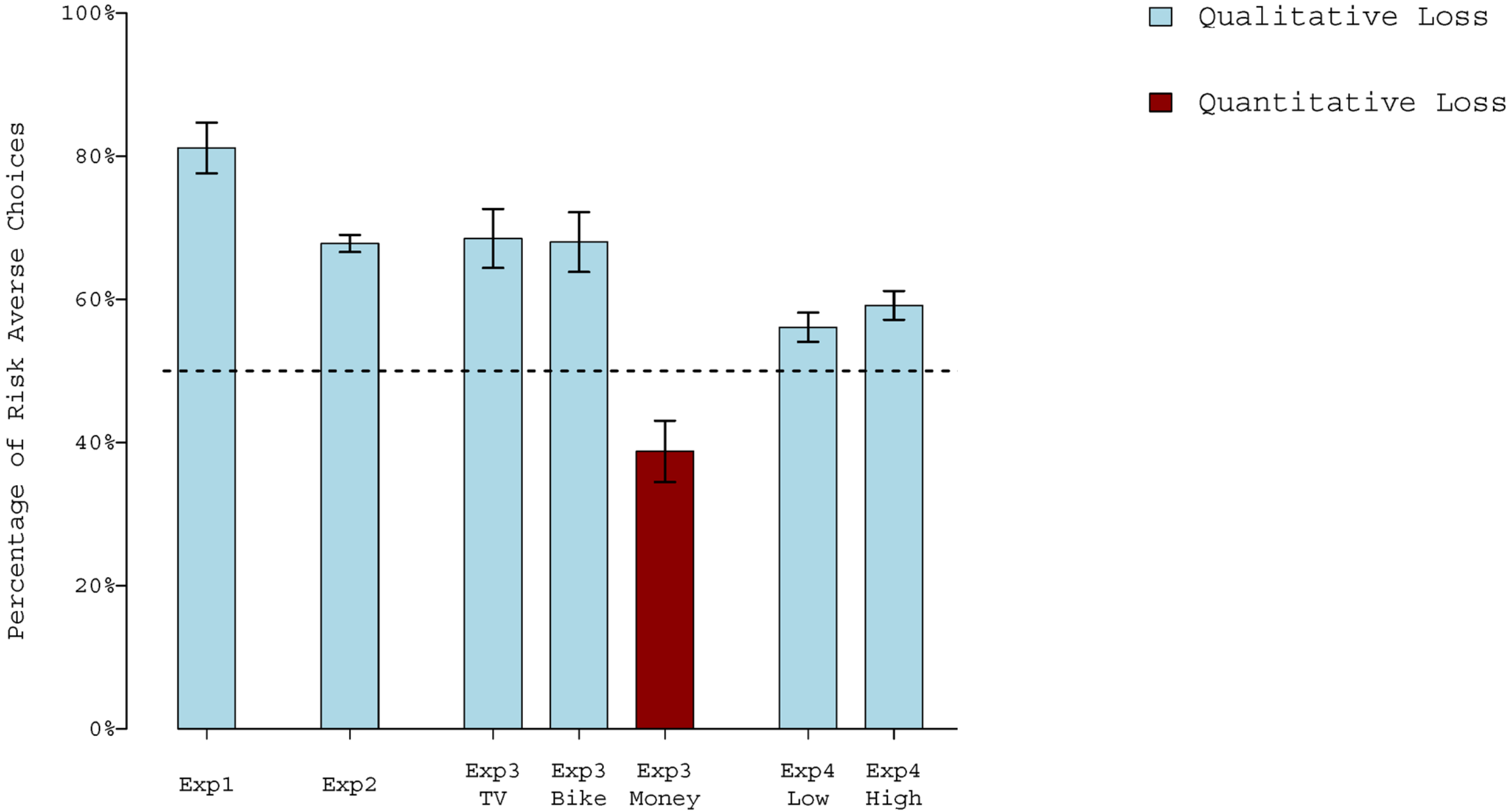
Which would you choose?

Option A

Option B

2 **baseline** conditions,
LOW baselines with $10 and $100
HIGH baselines with $100 and $1000

N = 1158 on mTurk


Qualitative Loss
Quantitative Loss
Percentage of Risk Averse Choices
100%
80%
60%
40%
20%
0%
Exp1
Exp2
Exp3 TV
Exp3 Bike
Exp3 Money
Exp4 Low
Exp4 High

Exp. **5**, method, pre-stage

The list below presents a number of items.

Please indicate whether you currently own or do not own each of these items.

	I own this item	I do not own this item
Bluetooth speaker	○	○
Video projector	○	○
Personal-use drone	○	○
Headphones with noise cancellation	○	○
Vinyl player	○	○
Outdoor grill	○	○
Gaming chair	○	○
Sony Playstation 5	○	○
Ray Ban sunglasses	○	○
Fitness tracker watch	○	○
Wine cooler	○	○
Telescope	○	○
Robot vacuum	○	○
Air fryer	○	○
Treadmill	○	○
Espresso machine	○	○

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Sony Playstation 5	○	○
Ray Ban sunglasses	○	○
Fitness tracker watch	○	○
Wine cooler	○	○
Telescope	○	○
Robot vacuum	○	○
Air fryer	○	○
Treadmill	○	○
Espresso machine	○	○

if at least 1 item owned and 1 item not owned, random assignment to GAINS vs. LOSSES

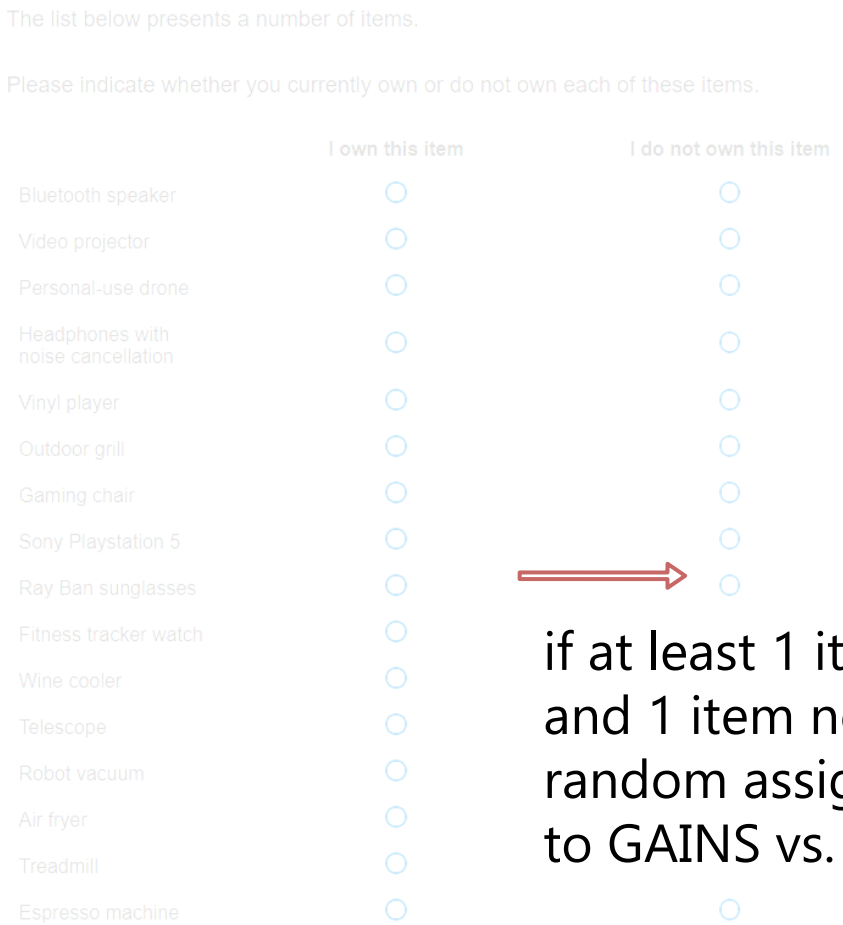
Now take a moment to consider the items that you DO own from the previous list.

For each item below, please indicate how much you personally like the item.

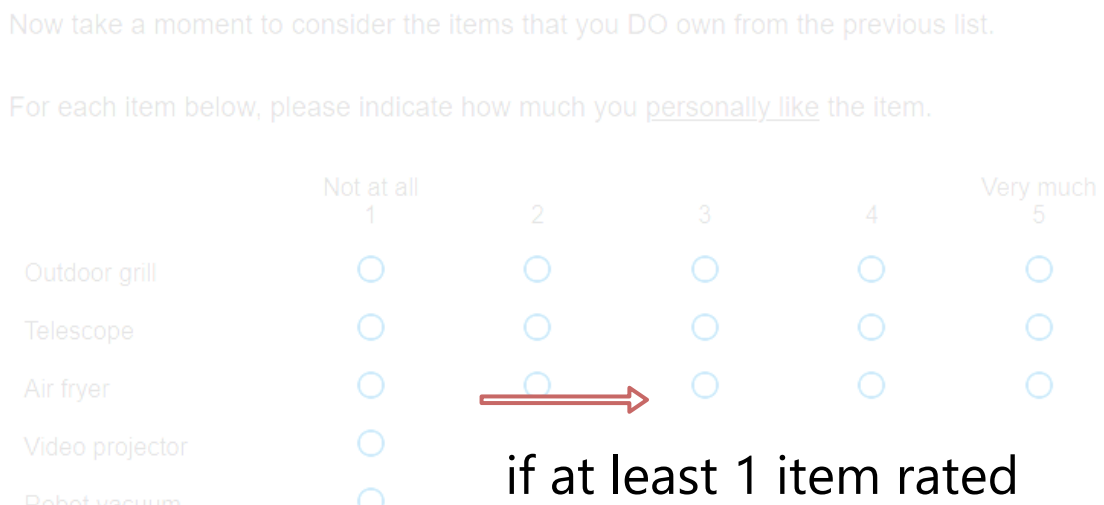
	Not at all 1	2	3	4	Very much 5
Outdoor grill	○	○	○	○	○
Telescope	○	○	○	○	○
Air fryer	○	○	○	○	○
Video projector	○	○	○	○	○
Robot vacuum	○	○	○	○	○

Pre-registered, N = 2226 on Prolific

Exp. **5**, method, pre-stage



if at least 1 item owned and 1 item not owned, random assignment to GAINS vs. LOSSES



if at least 1 item rated a 4 or a 5 on the 5-point scale, proceed to main stage

Pre-registered, N = 2226 on Prolific

Exp. **5**, method, main stage

GAIN condition

Imagine you have to make a choice between two options involving potential gains. In each option, there are two possible outcomes, depending on the result of a coin toss.

Your options are summarized in the table below.

Option A	50% chance of gaining $20 and an air fryer 50% chance of gaining $400
Option B	50% chance of gaining $20 50% chance of gaining $400 and an air fryer

Which would you choose?

Option A

Option B

LOSS condition

Imagine you have to make a choice between two options involving potential losses. In each option, there are two possible outcomes, depending on the result of a coin toss.

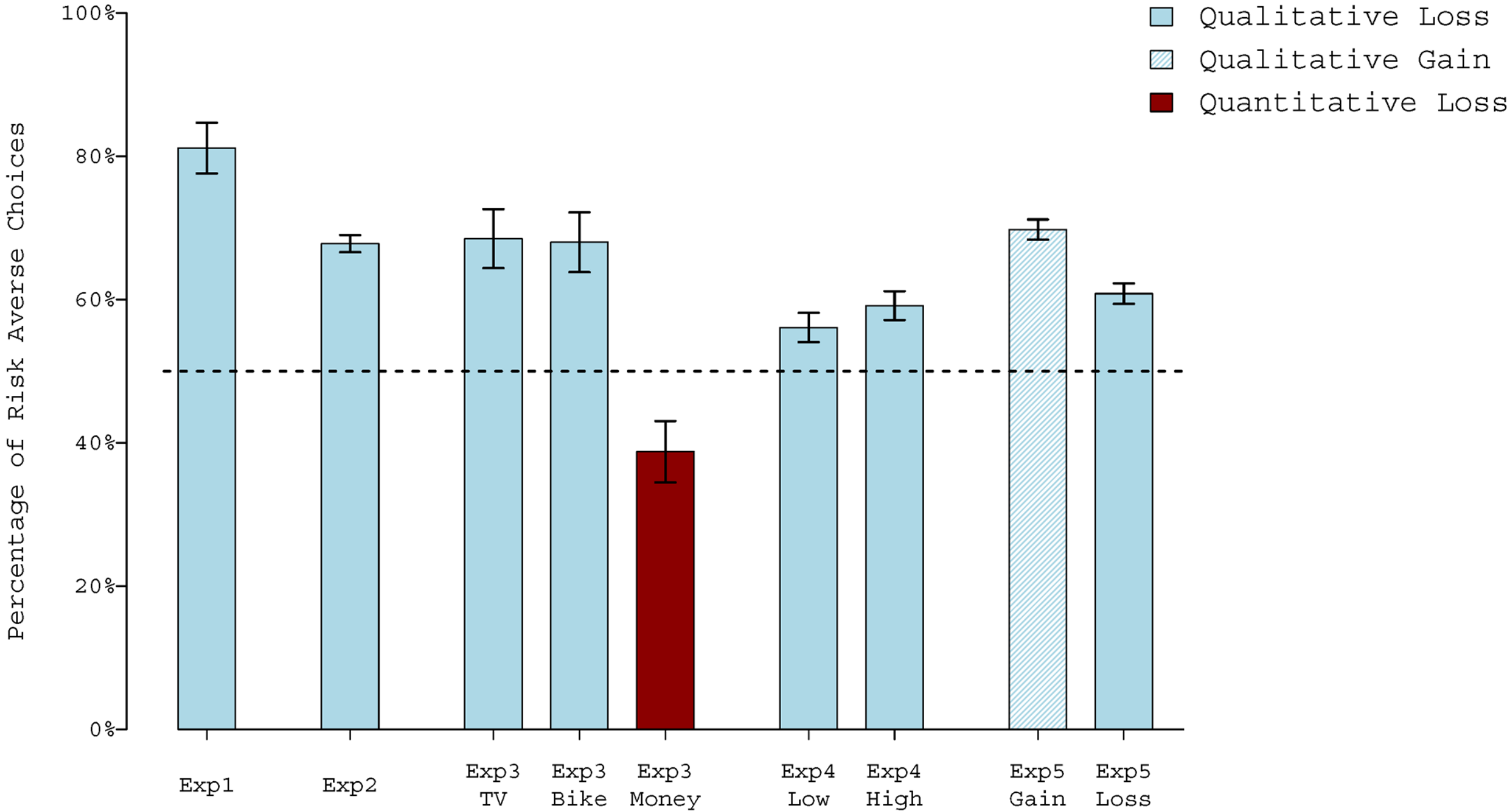
Your options are summarized in the table below.

Option A	50% chance of losing $20 50% chance of losing $400 and your air fryer
Option B	50% chance of losing $20 and your air fryer 50% chance of losing $400

Which would you choose?

Option A

Option B


Qualitative Loss
Qualitative Gain
Quantitative Loss
Percentage of Risk Averse Choices
100%
80%
60%
40%
20%
0%
Exp1
Exp2
Exp3 TV
Exp3 Bike
Exp3 Money
Exp4 Low
Exp4 High
Exp5 Gain
Exp5 Loss

Exp. **6**, method

Imagine you have to make a choice between two options involving potential losses. In each option, there are two possible outcomes, depending on the result of a coin toss.

If you choose Option A, you will have equal chances of losing $20 or losing $690. If you choose Option B, you will have equal chances of losing $310 or losing $400.

Your options are summarized in the table below.

Option A	50% chance of losing $20 50% chance of losing $690
Option B	50% chance of losing $310 50% chance of losing $400

Which option would you choose?

Option A

Option B

Exp. **6**, method

Imagine you have to make a choice between two options involving potential losses. In each option, there are two possible outcomes, depending on the result of a coin toss.

If you choose Option A, you will have equal chances of losing $20 or losing $690. If you choose Option B, you will have equal chances of losing $310 or losing $400.

Your options are summarized in the table below.

Option A	50% chance of losing $20 50% chance of losing $690 ⟸ $400 + *M*
Option B	50% chance of losing $310 ⟸ $20 + *M* 50% chance of losing $400

Which option would you choose?

Option A

Option B

Exp. **6**, method

Imagine you have to make a choice between two options involving potential losses. In each option, there are two possible outcomes, depending on the result of a coin toss.

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Your options are summarized in the table below.

Option A	50% chance of losing $20 50% chance of losing $690	⟸ $400 + *M*
Option B	50% chance of losing $310 50% chance of losing $400	⟸ $20 + *M*

Which option would you choose?

Option A

Option B

3 levels of **stakes** conditions:

LOW, with *M* in (50, 60, 70, 80, 90, 100)
MEDIUM, with *M* in (250, 260, 270, 280, 290, 300)
HIGH, with *M* in (450, 460, 470, 480, 490, 500)

Exp. **6**, method

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3 levels of **stakes** conditions:

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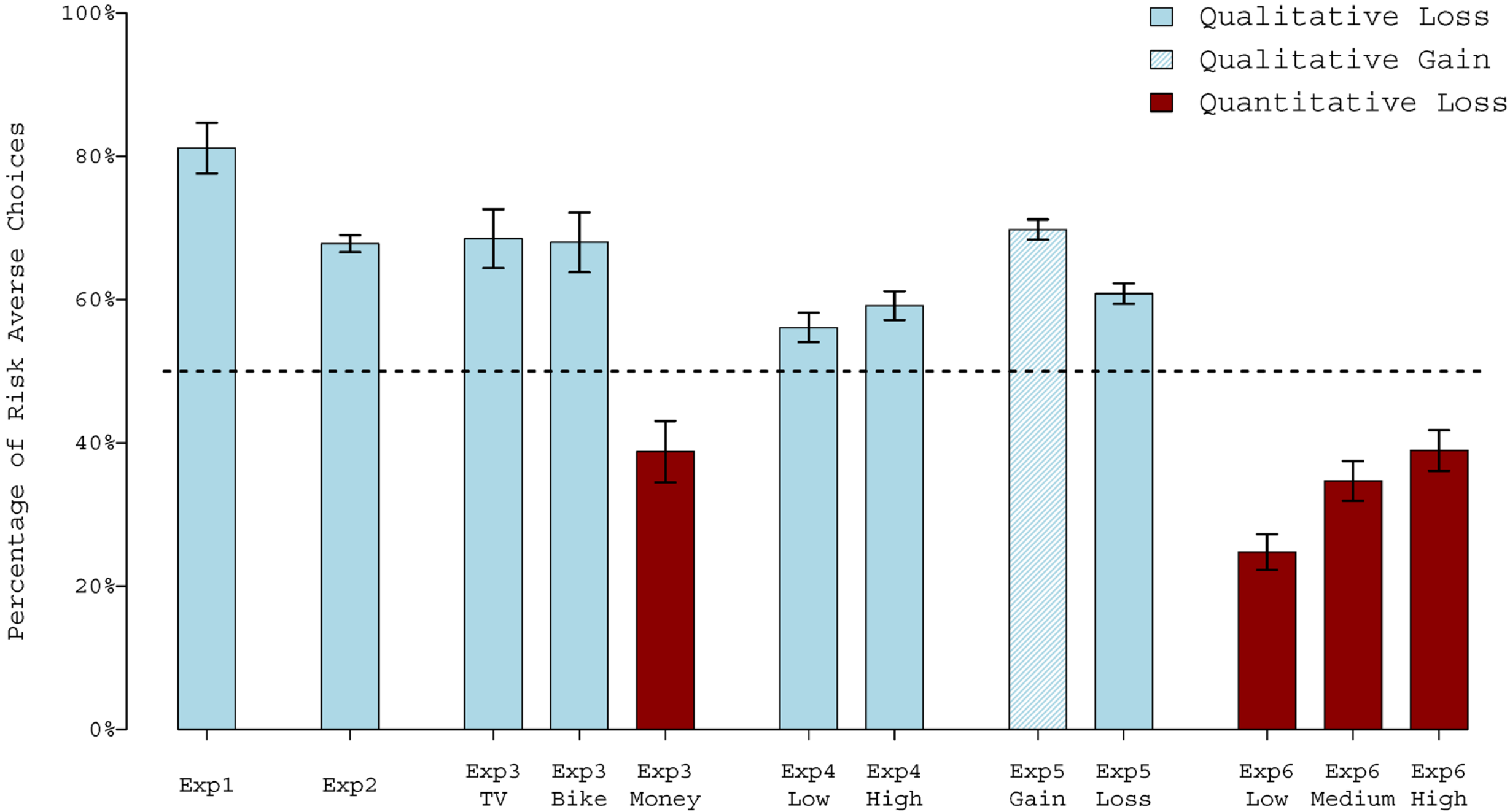
HIGH, with *M* in (450, 460, 470, 480, 490, 500)

Effectively 18 between-subject conditions, pre-registered main analyses to collapse across all 18 and to collapse across each of the 3 levels

Pre-registered, N = 891 on Prolific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Qualitative Gain
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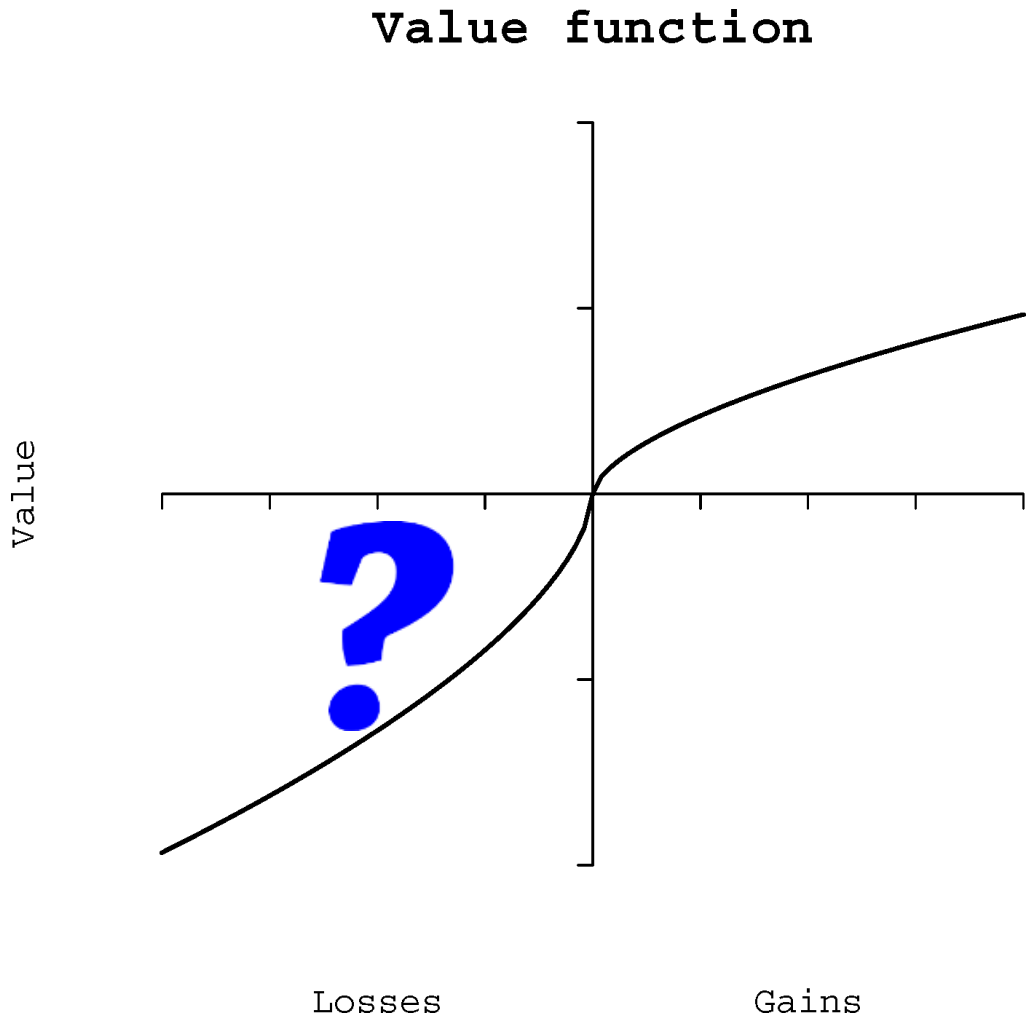
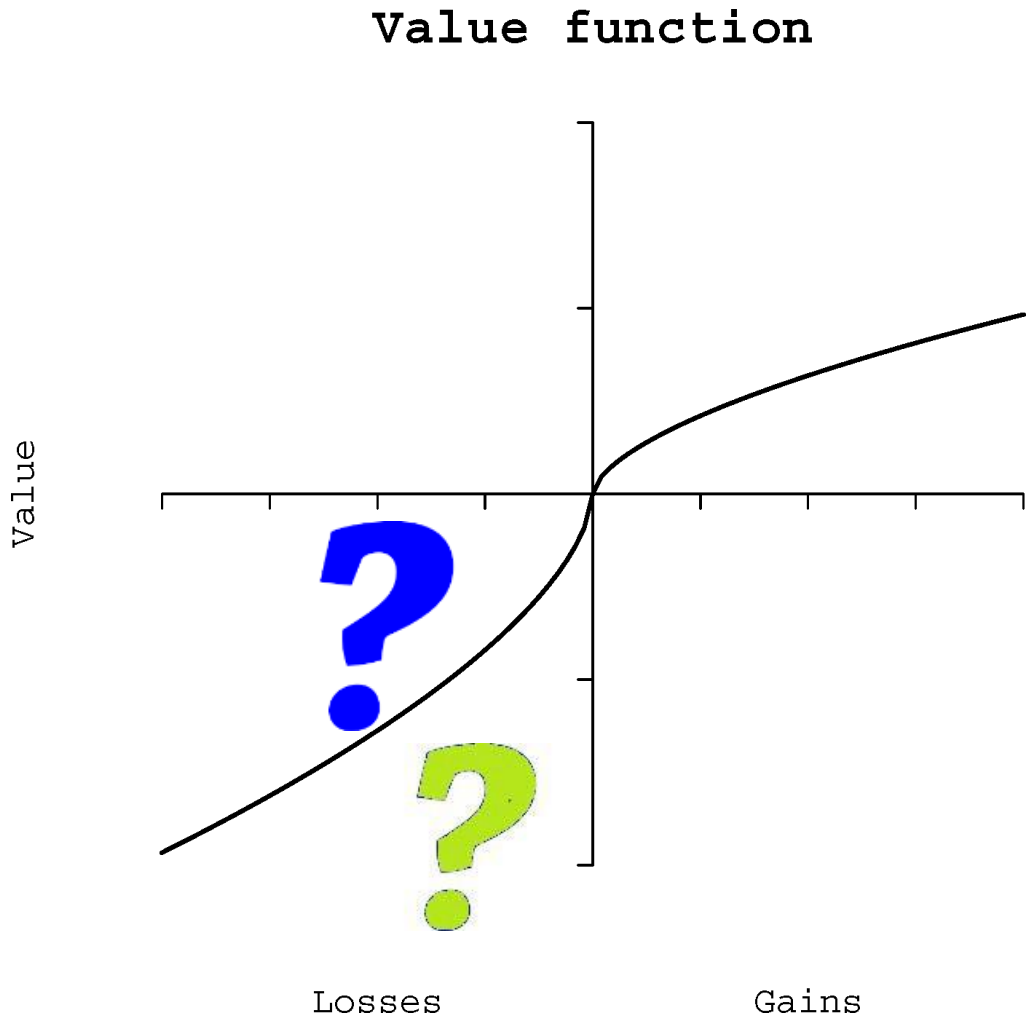
Exp3 TV
Exp3 Bike
Exp3 Money
Exp4 Low
Exp4 High
Exp5 Gain
Exp5 Loss
Exp6 Low
Exp6 Medium
Exp6 High

Risk Aversion for qualitative losses



1. Across six studies, we consistently find risk aversion in choice problems involving qualitatively described outcomes, without numerical quantifiers.

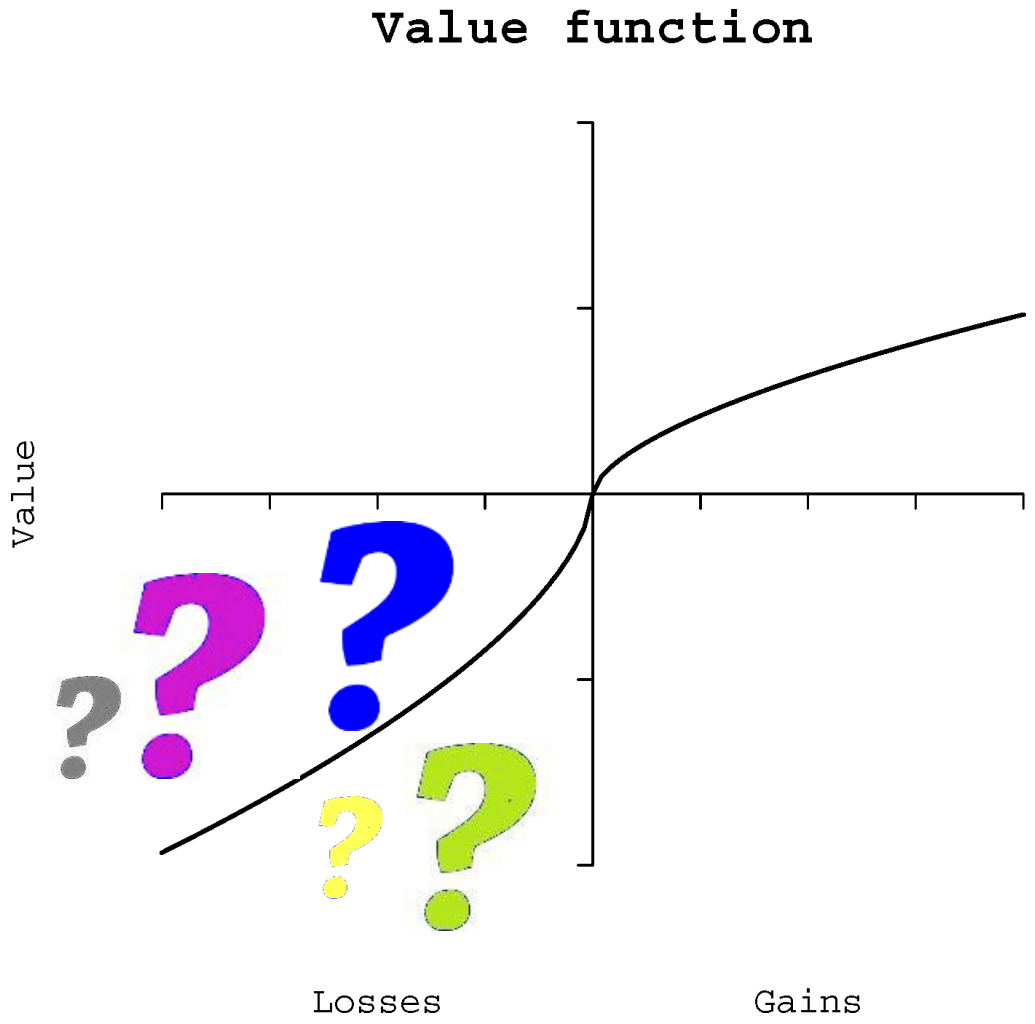
Risk Aversion for qualitative losses



1. Across six studies, we consistently find risk aversion in choice problems involving qualitatively described outcomes, without numerical quantifiers.

2. Our findings are suggestive of accelerating, not diminishing, sensitivity for losses.

Risk Aversion for qualitative losses



1. Across six studies, we consistently find risk aversion in choice problems involving qualitatively described outcomes, without numerical quantifiers.

2. Our findings are suggestive of accelerating, not diminishing, sensitivity for losses.

3. Could the diminishing sensitivity to monetary losses captured by prospect theory be driven primarily by diminishing sensitivity to numbers?