Looks like a bad sign: Illusory negative correlation between the outcomes of choice options

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Background

Imagine you want to invest some money, and hesitate between stock A and stock B. You finally decide to go with stock A. A few days later, you hear on the radio that stock B is doing great. Would you draw any conclusion about stock A's value?

Following a choice, we sometimes get feedback on both the outcome of the chosen option and the outcome of the unchosen option (the alternative outcome). In this study, we tested whether when the alternative outcome is presented first, it creates expectations regarding the outcome of the chosen option. We focus on cases in which the alternative outcome has in fact no predictive power.

Hypothesis

People see a good alternative outcome as a bad sign regarding the outcome of the option they chose, when the two outcomes are in fact uncorrelated.
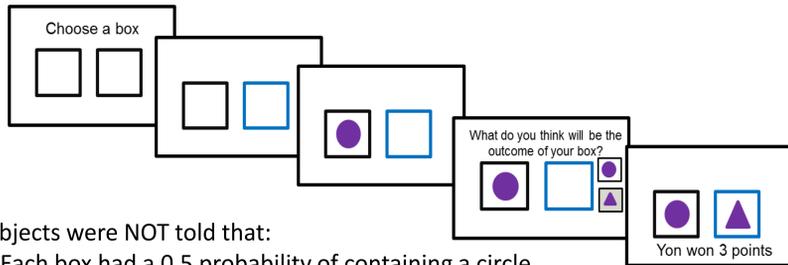
Experiment 1 – The Prediction Game

Method
53 subjects played a computerized decision-making game.
Two types of trials were mixed:

- **Regular Trials** (50):
  - Subjects chose one of two boxes.
  - Each box contained either a triangle or a circle.
  - The unchosen box was opened first, followed by the chosen box.
  - The shape in the chosen box determined subjects' payoffs:
   - Circle→ Subjects won 1 point.
    - Triangle→ Subjects lost 1 point.
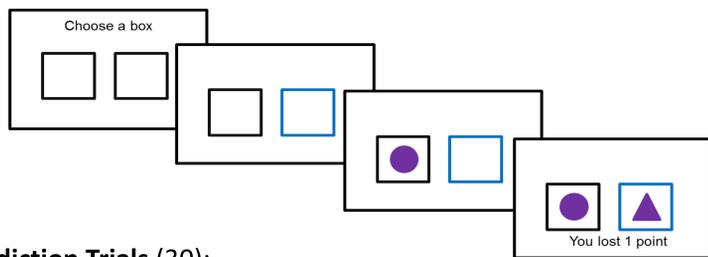
- **Prediction Trials** (30):
  - After the unchosen box was opened, subjects were asked to predict what the chosen box contained.
  - They were then shown the content of the chosen box.
  - Subjects won 3 points when their predictions were accurate. In those trials, the content of the chosen box did not influence their payoff.

Subjects were NOT told that:
- Each box had a 0.5 probability of containing a circle
- The contents of the two boxes were independent.

Results

- Subjects were significantly more likely to predict "Gain" when the alternative outcome was a loss than when the alternative outcome was a gain (p<0.001).

- The influence of the alternative did not decrease in the 2nd half of the experiment (Alternative*Half Interaction: p=0.812)

Mean probability of predicting "Gain" by alternative
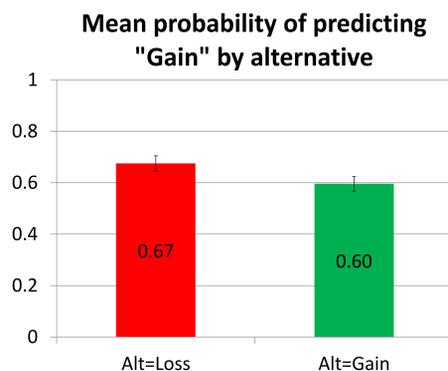

Experiment 2 – Pass or Take

Question
Does the bias found in Experiment 1 influence decision-making?

Method
40 subjects played a computerized decision-making game.
Two types of trials were mixed:

- **Regular Trials** (120):
Same as in Experiment 1, with green/red coins symbolizing gains/losses of 5 points.

- **Pass or Take Trials** (80):
After the unchosen box was opened, but before the chosen box was opened, subjects were given the possibility to pay 1 point in order to give up the content of the chosen box ("Pass").
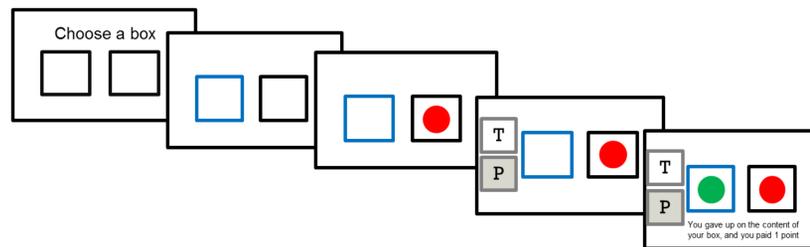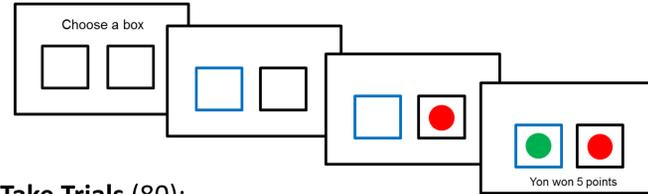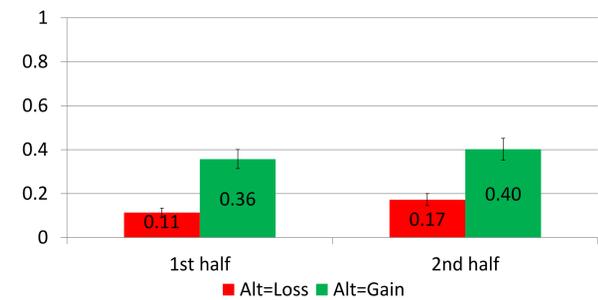
Hypothesis

If subjects see a good alternative as a bad sign regarding their outcome, they should be more likely to choose "Pass" when the alternative outcome is a gain.

Results

Mean probability of choosing "Pass" by alternative and by half

- Subjects were significantly more likely to choose "Pass" when the alternative outcome was a gain than when the alternative outcome was a loss (p<0.001).

- The influence of the alternative decreased in the 2nd half of the experiment but it was significant in both halves (1st half: p<0.001; 2nd half: p<0.001; Alternative*Half Interaction: p=0.046).

Experiment 3 – The Inverse Prediction Game

Question
Do subjects present the same bias found in Experiments 1 and 2 when the outcome of the chosen option is shown first?

Method
- We replicated Experiment 1 with 2 between-subjects conditions:
  - "Alternative first": Subjects always saw first the outcome of the alternative (n=40)
  - "Chosen first": Subjects always saw first the outcome of the chosen box (n=40).

- There were 120 Regular trials and 80 Prediction trials.

### Results
- We found a Condition*First_Outcome_Displayed*Half Interaction (p=0.037).

- In the Alternative First condition, subjects' predictions were biased in the 1st half of the experiment (p=0.043), but not in the 2nd half (p=0.546, Alternative*Half Interaction: p=0.04, one tailed).

- No bias was found in the Chosen First condition (1st half: p=0.263; 2nd half: p=0.499, Chosen_outcome*Half Interaction: p=0.223)

Mean probability of predicting "Gain" in the Alternative First condition
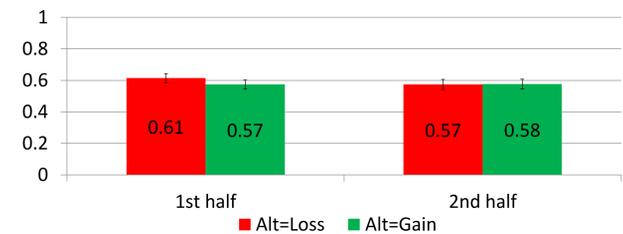
Mean probability of predicting "Gain" in the Chosen First condition
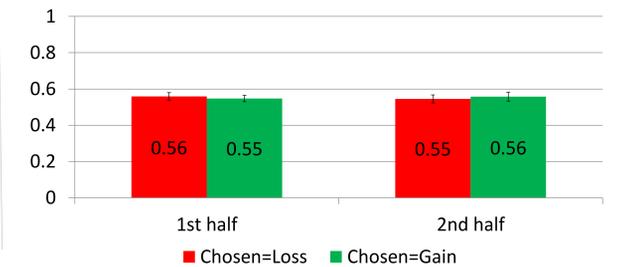
Conclusions

- Extensive research has been conducted on the way we perceive correlations (Beyth-Marom, 1982). However, to our knowledge, this study is the first to examine the (mis)perception of correlation between the outcomes of choice options.
- Subjects viewed a good (bad) alternative as a bad (good) sign regarding the outcome of the chosen option when the two outcomes were in fact uncorrelated (Exp. 1, 2 and 3).
- This negative illusory correlation might influence several judgment and decision making processes:
  1) It can influence choice behavior (Exp.2).
  2) By creating expectations, it is likely to impact subjects' satisfaction with their own outcome (Oliver, 1980).
- Subjects became less biased when they were exposed to a high number of trials (Exp. 2 and 3), which indicates that people can learn to overcome this bias.
- No bias was found when the outcome of the chosen box was presented first (Exp.3). This suggests that the illusory correlation is modulated by self-relevance, as other judgment biases (e.g. Mark & Mellor, 1991).

References
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Oliver, R. L. (1980). A cognitive model of the antecedents and consequences of satisfaction decisions. *Journal of marketing research*, 460-469.

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