

The **Attraction Effect** in Information Visualization



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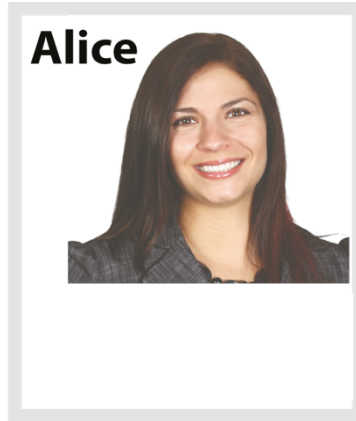
Bob



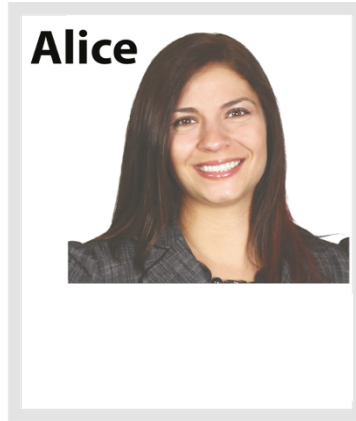
Alice



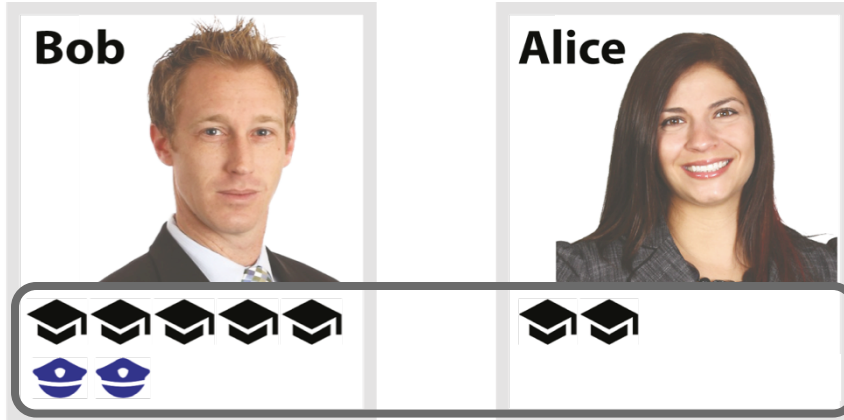
Education
Crime control



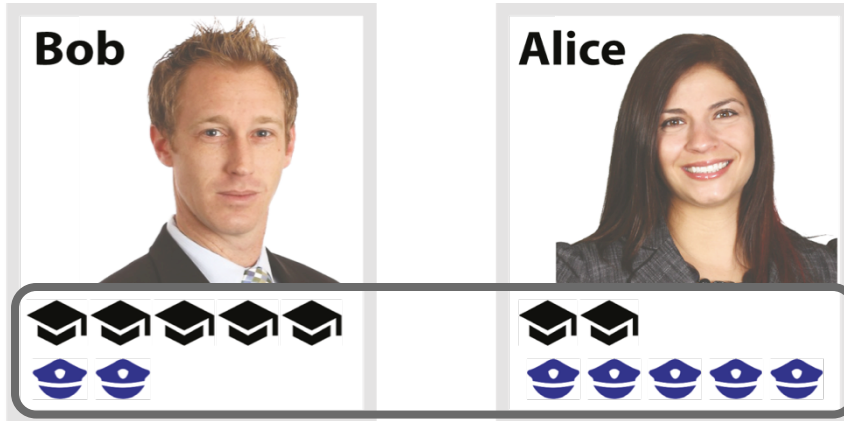
Education
Crime control



Education
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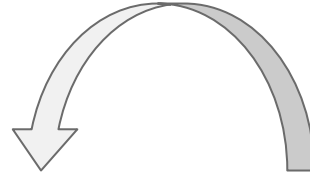
Education
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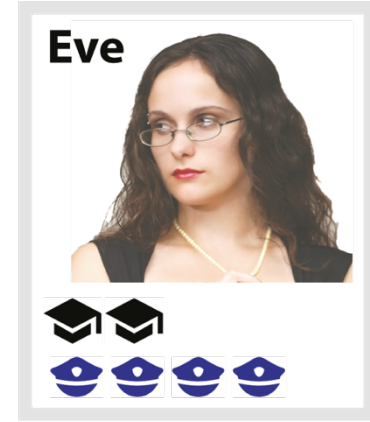


dominated by



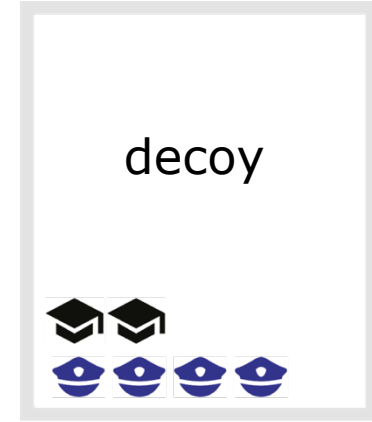
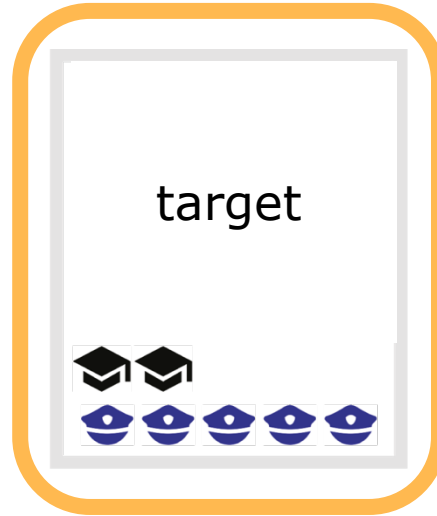
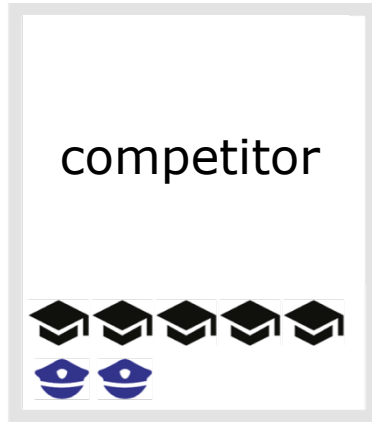
Attraction Effect - a biased decision

Education
Crime control



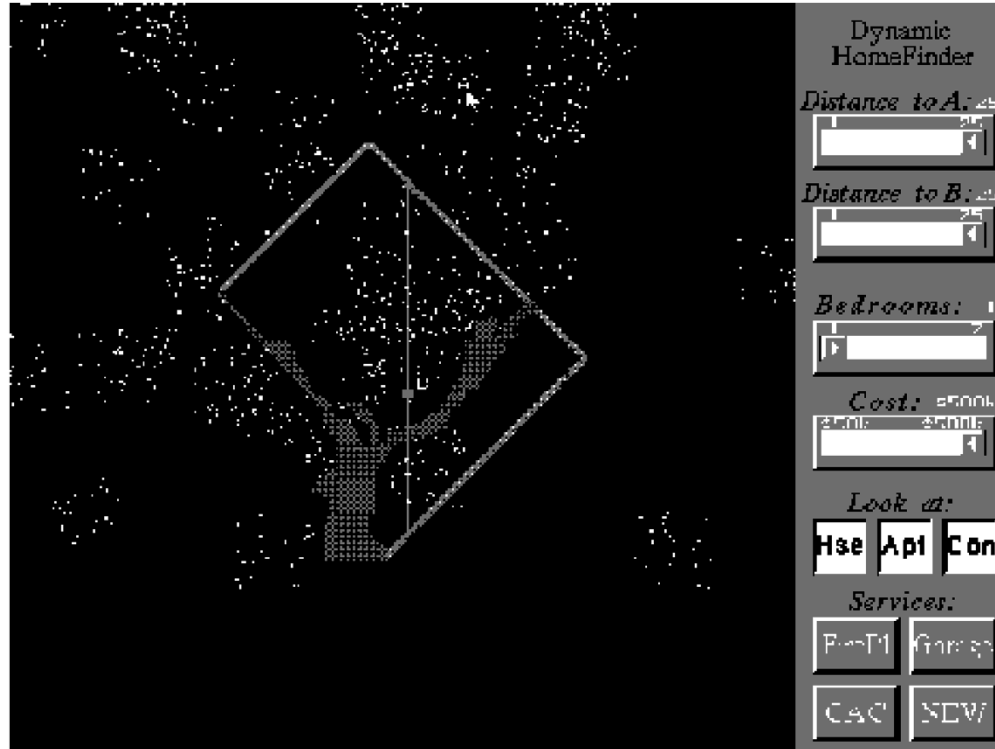
The Attraction Effect

Education
Crime control

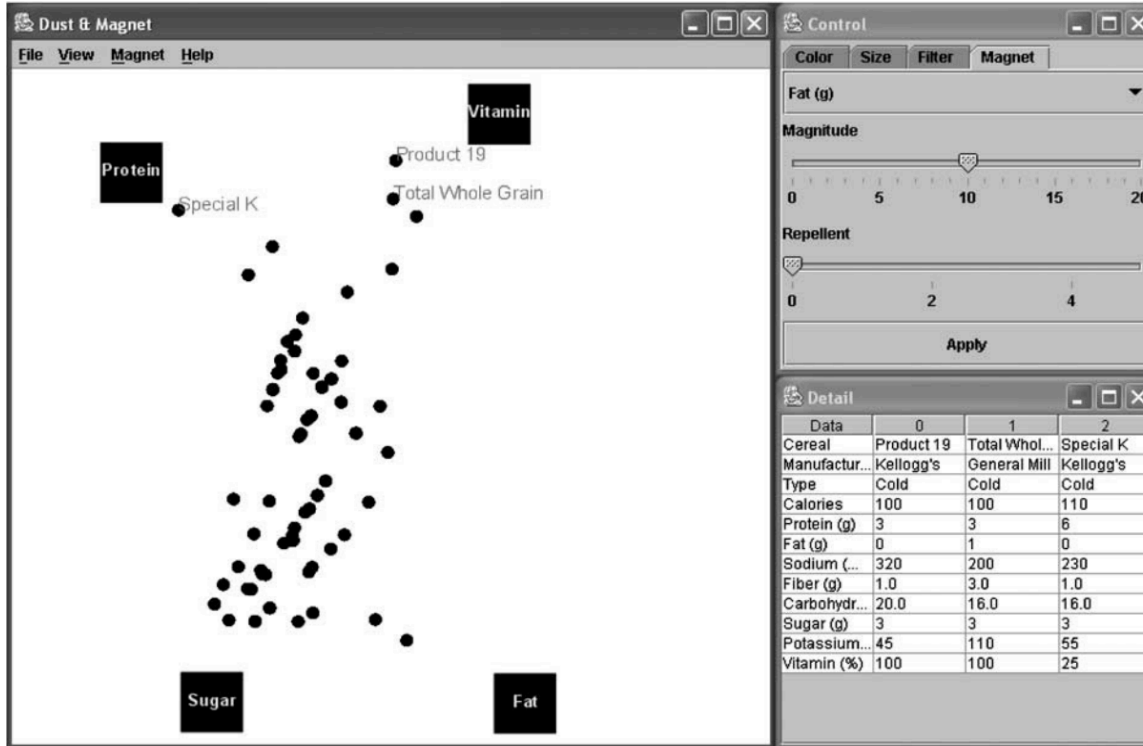


Why study the attraction effect in InfoVis?

Why study the attraction effect in InfoVis?



Why study the attraction effect in InfoVis?



Debate in decision making research

The Attraction Effect applies
only to
numerical tables

[Frederick et al, 2014]

[Yang and Lynn, 2014]



	A	B	C
attribute 1	2	5	5
attribute 2	5	2	1

Debate in decision making research

The Attraction Effect applies
only to
numerical tables

[Frederick et al, 2014]

[Yang and Lynn, 2014]

VS.

The Attraction Effect
is **robust**

[Huber et al, 2014]

[Simonson, 2015]

Debate in decision making research

consumer
products

[Simonson & Tversky, 1992]



Debate in decision making research

consumer
products

[Simonson & Tversky, 1992]



job
candidates

[Highhouse, 1996]



Debate in decision making research

consumer
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job
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[Highhouse, 1996]



real
gambles

[Herne, 1999]



Debate in decision making research

consumer
products

[Simonson & Tversky, 1992]



job
candidates

[Highhouse, 1996]



real
gambles

[Herne, 1999]



animals
e.g. bees, amoebae

[Shafir et al, 2002]

[Latty & Beekman, 2002]



Can the attraction effect occur in visualizations?

Can the attraction effect occur in visualizations?



The attraction effect may be limited to **numbers** and does not apply to "**perceptual**" representations.

[Frederick et al, 2014]

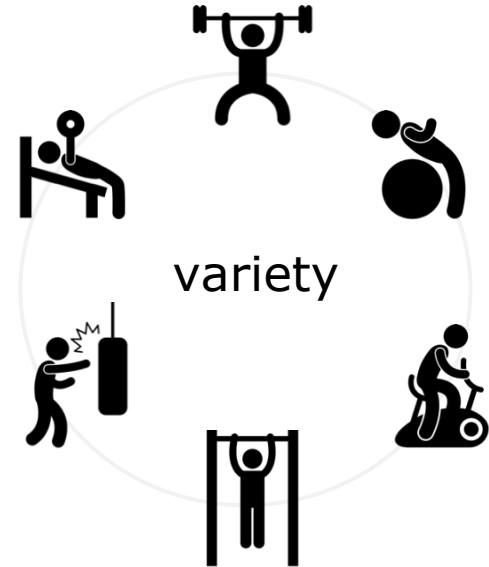
1st Experiment: "Choose a **gym**"

[Malkoc et al,2013]



cleanliness

VS.



1st Experiment: "Choose a gym"

better in **variety**

	A	B
variety	5	2
cleanliness	2	5

1st Experiment: "Choose a gym"

better in **cleanliness**

	A	B
variety	5	2
cleanliness	2	5

1st Experiment: "Choose a gym"

	A	B
variety	5	2
cleanliness	2	5

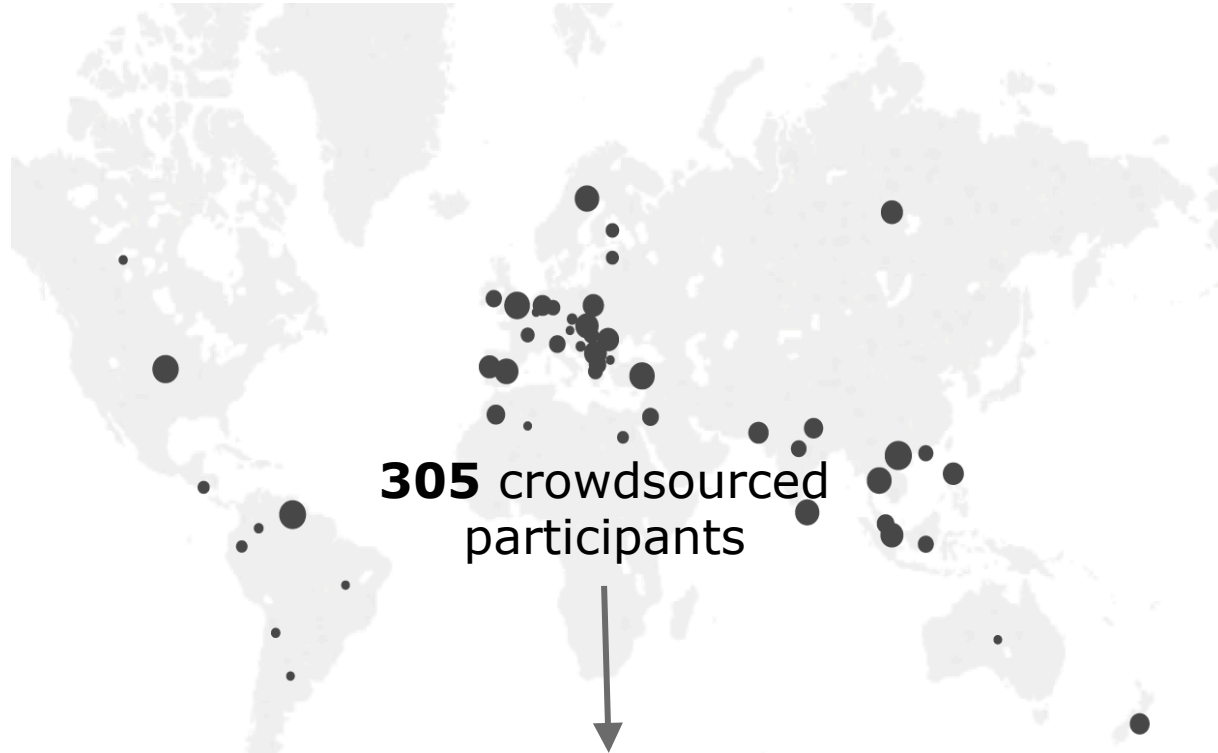
decoy

C
1
5

1st Experiment: "Choose a gym"



1st Experiment: "Choose a gym"



replication of the attraction effect design in **tables**

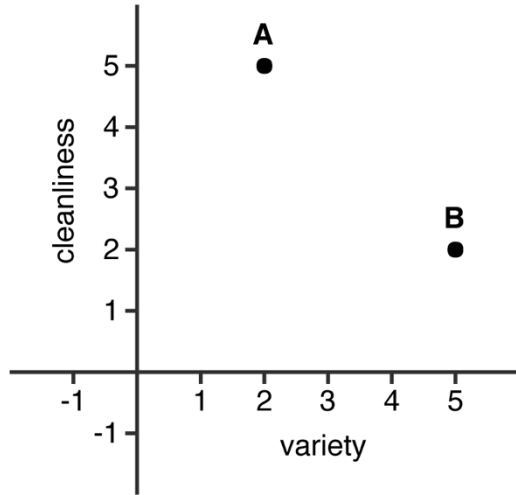
[Malkoc et al, 2013]

1st Experiment: "Choose a gym"

Can the attraction effect occur in visualizations?

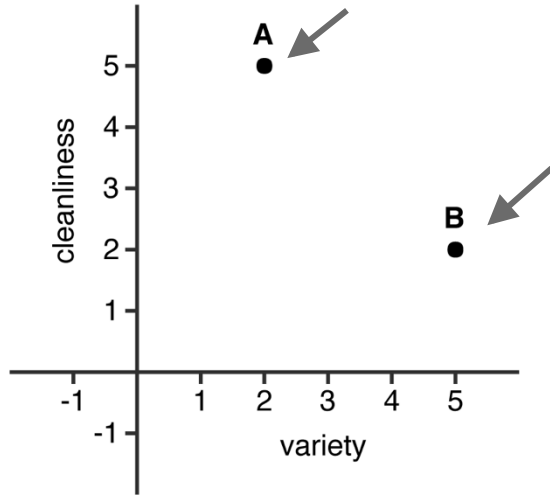


1st Experiment: "Choose a gym"



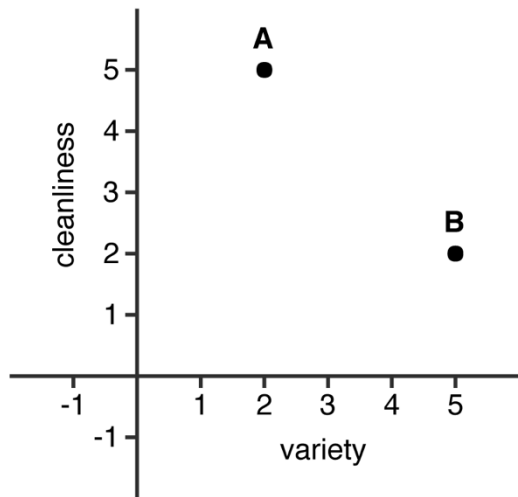
	A	B
variety	5	2
cleanliness	2	5

1st Experiment: "Choose a gym"

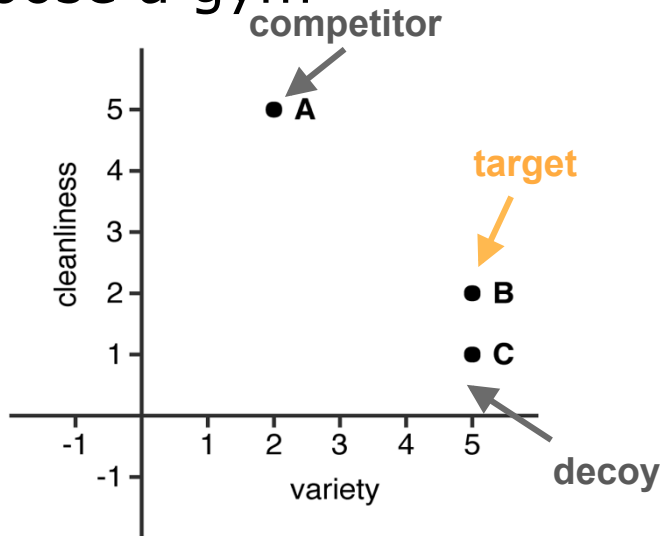


	A	B
variety	5	2
cleanliness	2	5

1st Experiment: "Choose a gym"

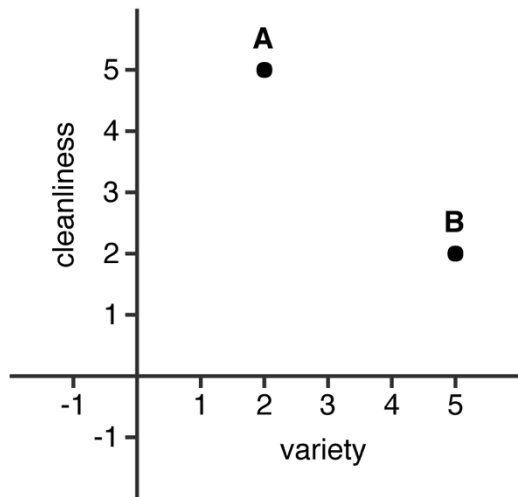


	A	B
variety	2	5
cleanliness	5	2

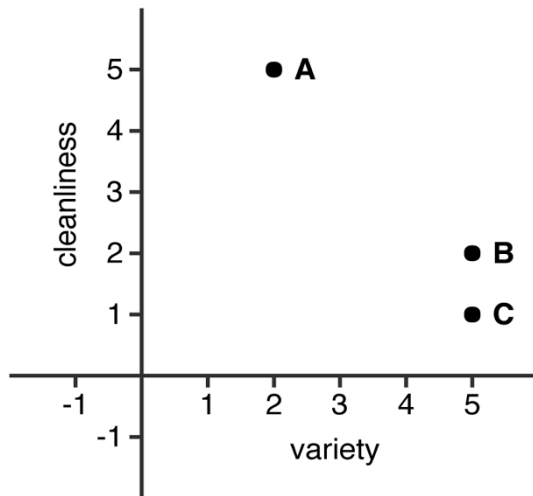


	A	B	C
variety	2	5	5
cleanliness	5	2	1

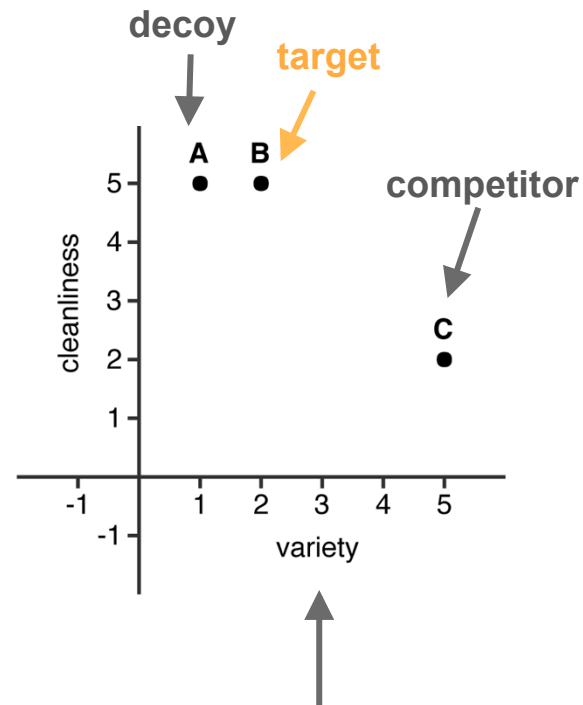
1st Experiment: "Choose a gym"



	A	B
variety	5	2
cleanliness	2	5

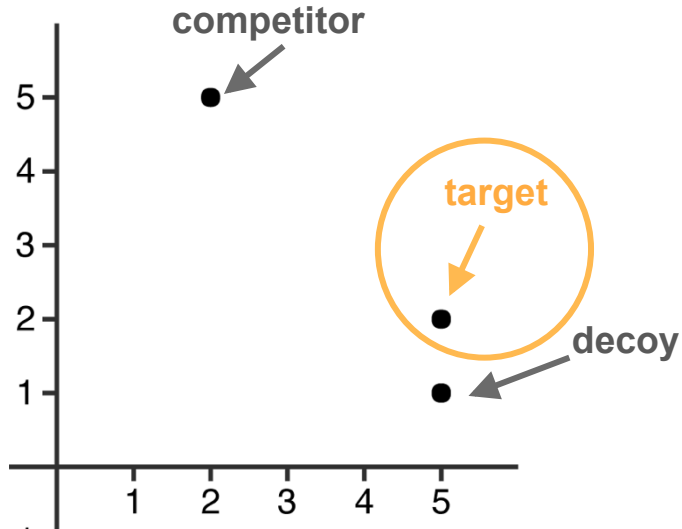


	A	B	C
variety	5	5	2
cleanliness	1	2	5

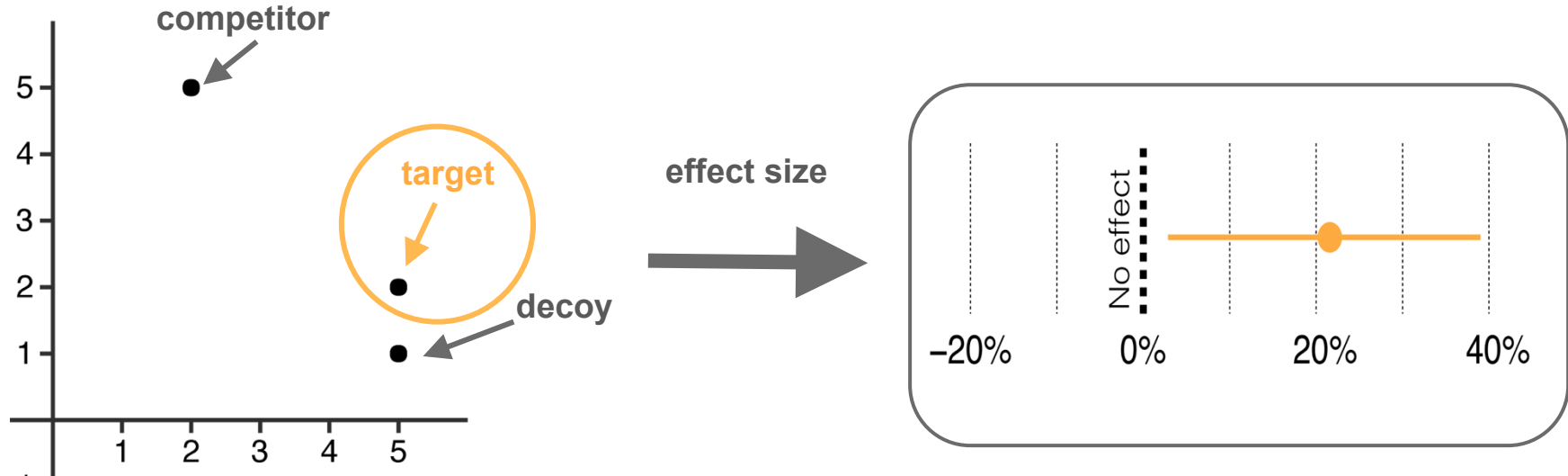


	A	B	C
variety	5	2	1
cleanliness	2	5	5

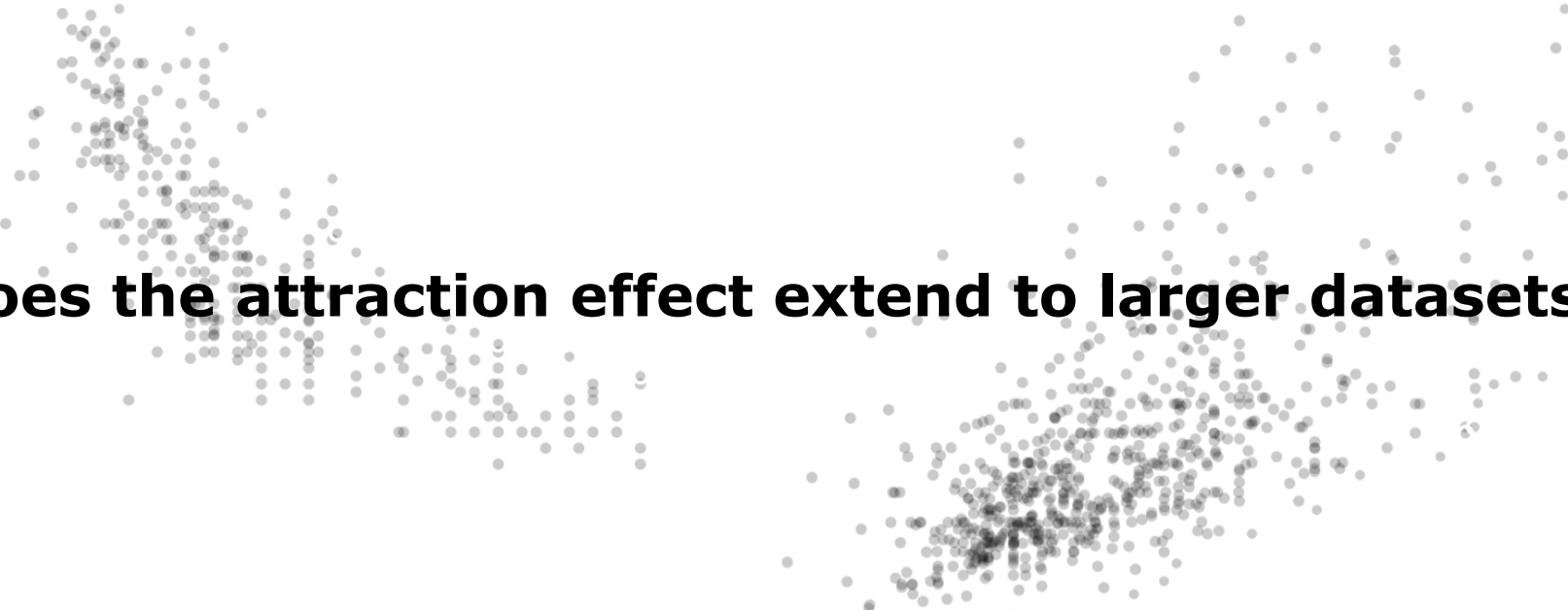
Can the attraction effect occur in visualizations?



Can the attraction effect occur in visualizations?



*** all error bars in this talk are 95% confidence intervals



Does the attraction effect extend to larger datasets?



Does the attraction effect extend to larger datasets?

The attraction effect requires asymmetric dominance relationships to be **"perceptual in nature"** and **"easy to access"**.

The bias should be eliminated as the number of pairwise comparisons increases.

[Bettman et al, 2014]

2nd Experiment: "Choose a **lottery ticket**" [Wedell, 1991]



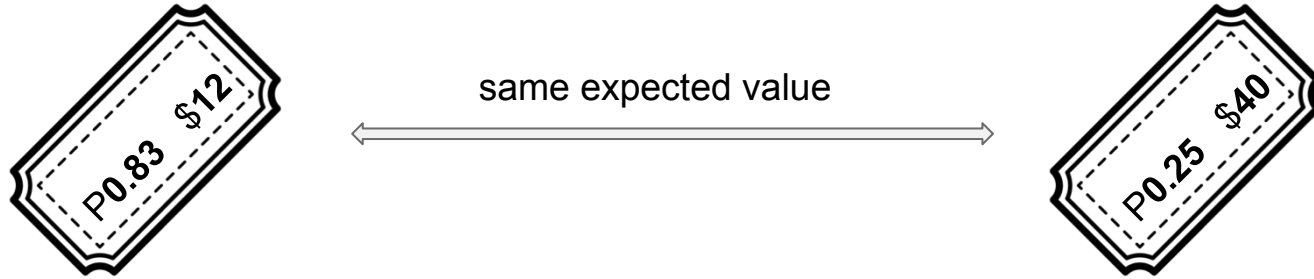
probability

VS.

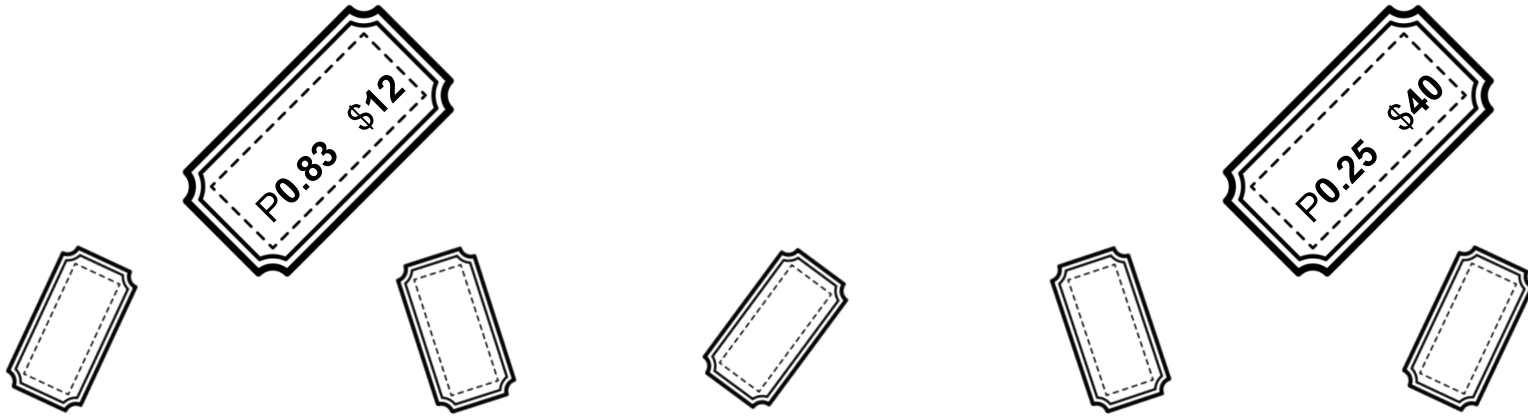


prize

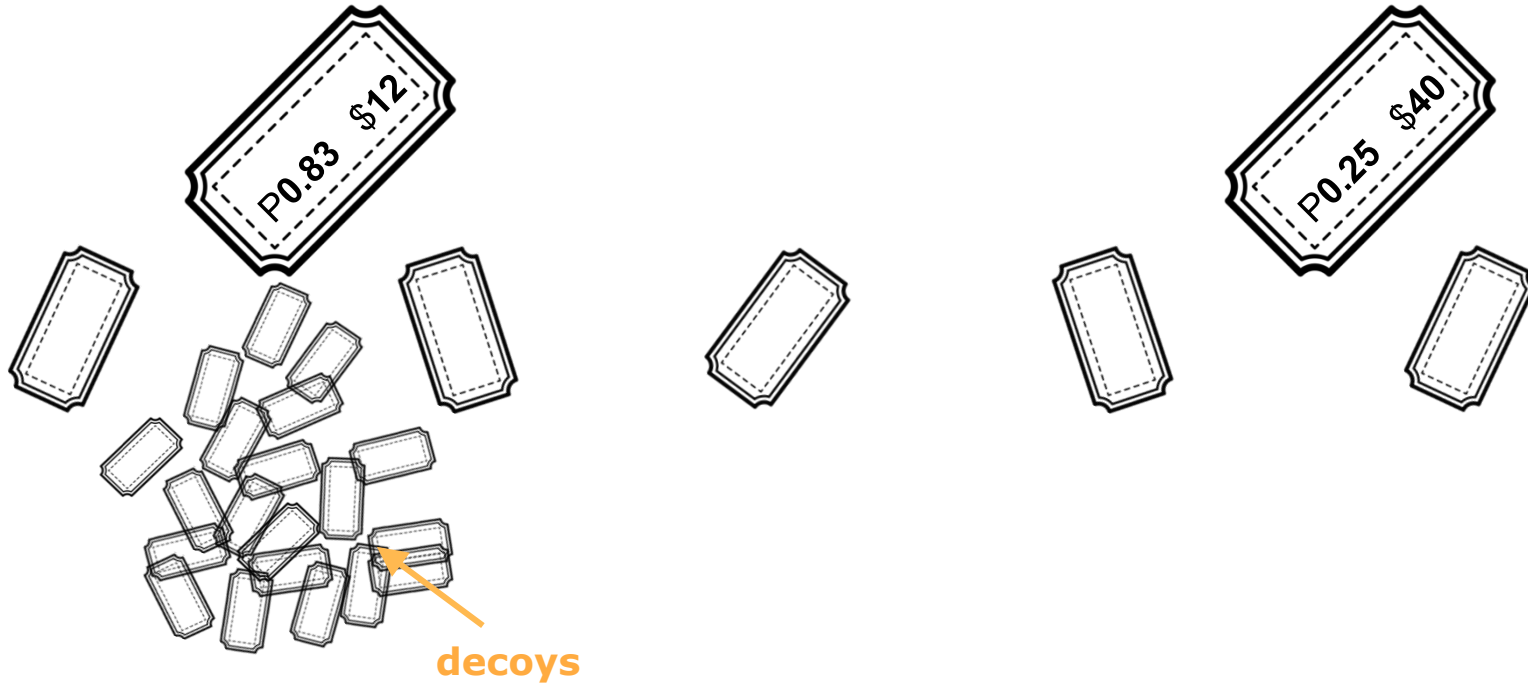
2nd Experiment: "Choose a **lottery ticket**" [Wedell, 1991]



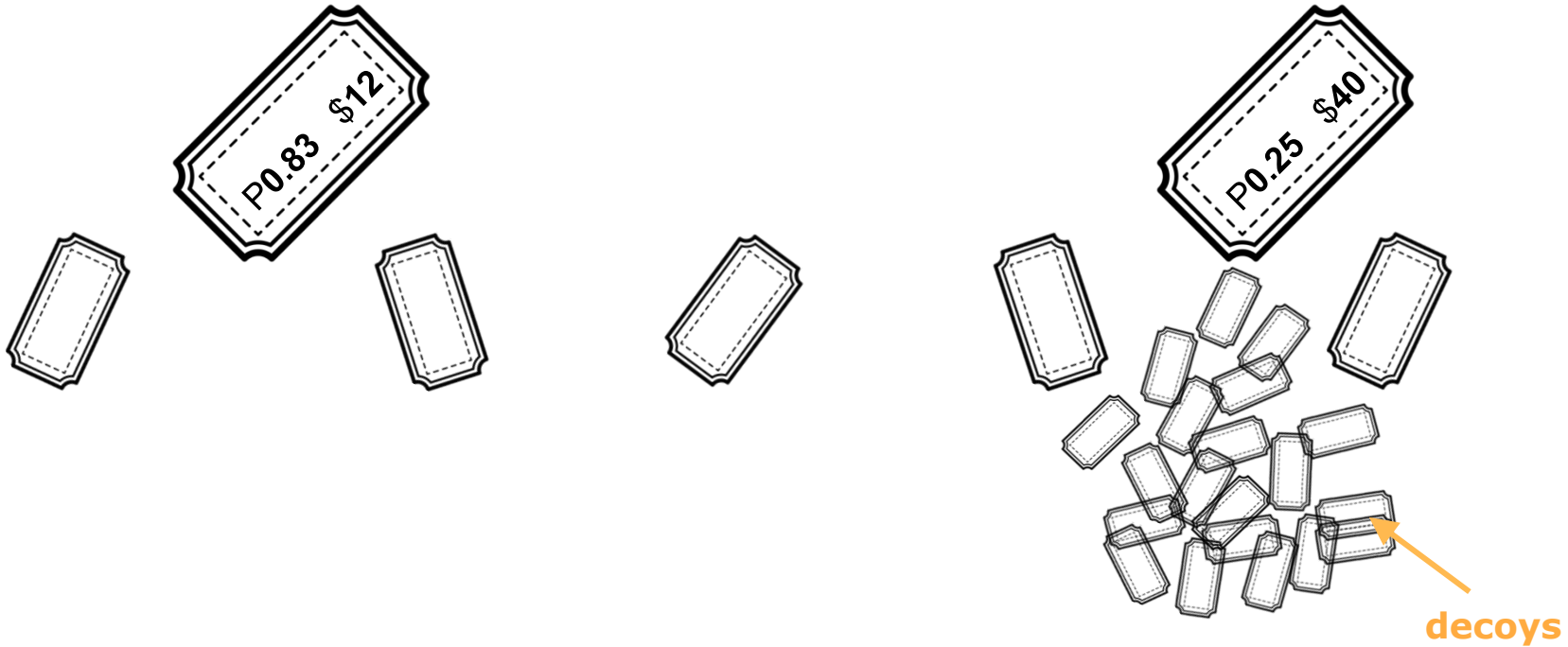
2nd Experiment: "Choose a **lottery ticket**" [Wedell, 1991]



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Does the attraction effect extend to larger datasets?

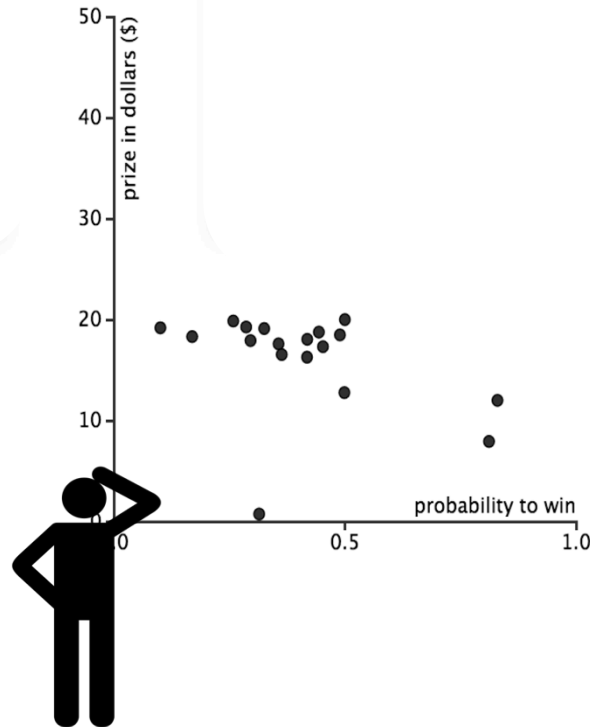
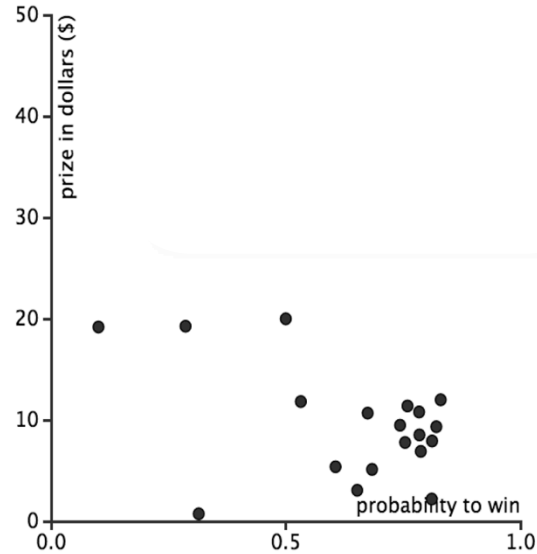


2nd Experiment: "Choose a **lottery ticket**" [Wedell, 1991]

Does the attraction effect extend to larger datasets?

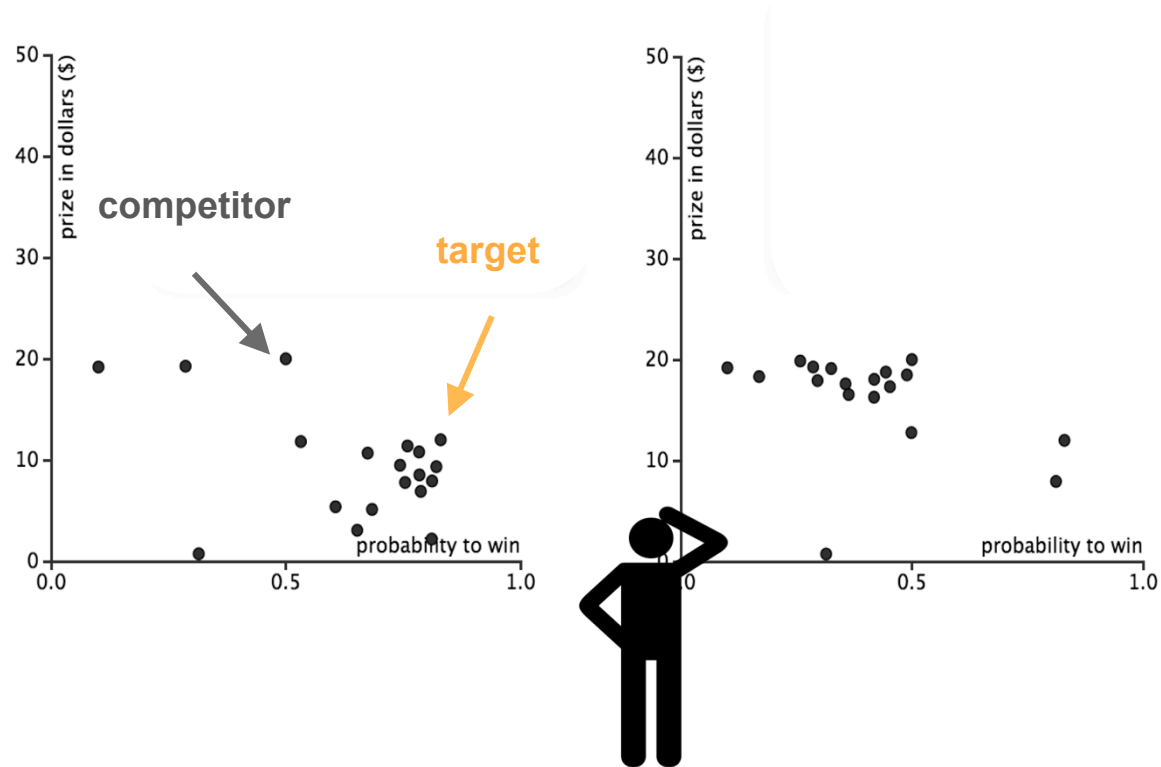


2nd Experiment: "Choose a **lottery ticket**"

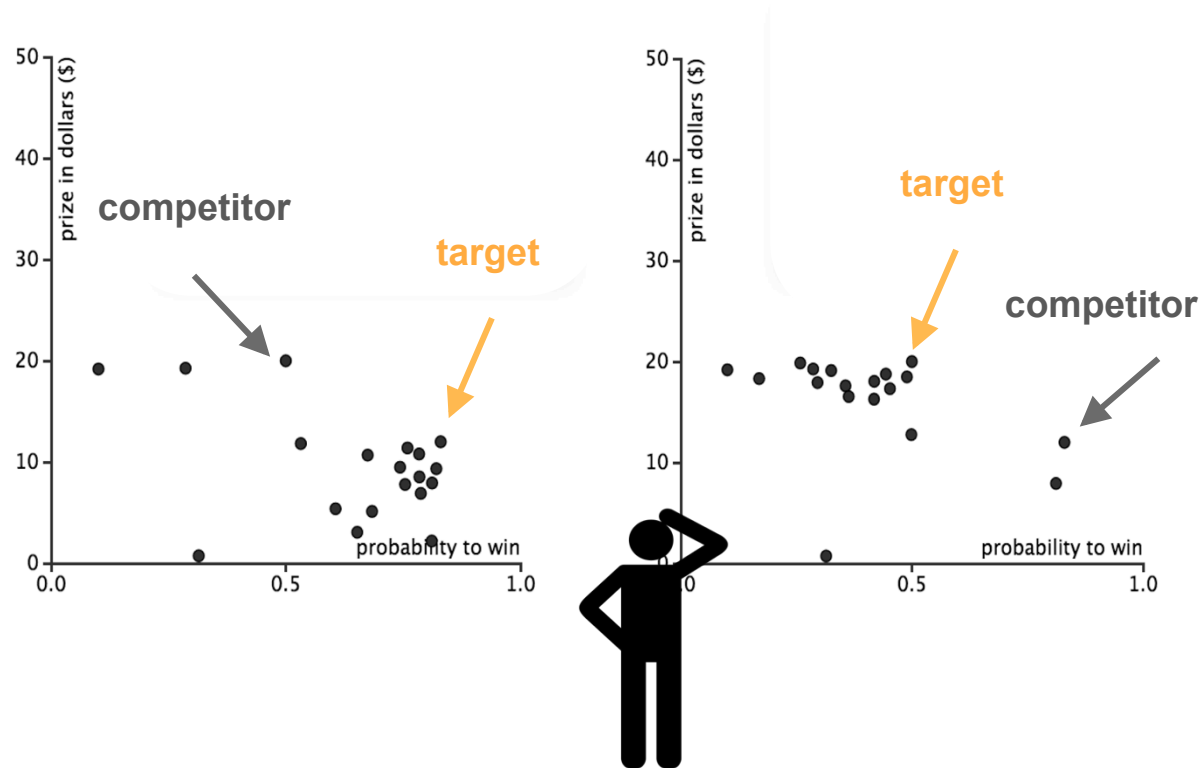


**real
choice !**

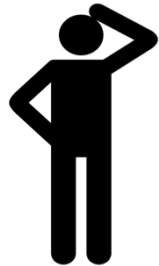
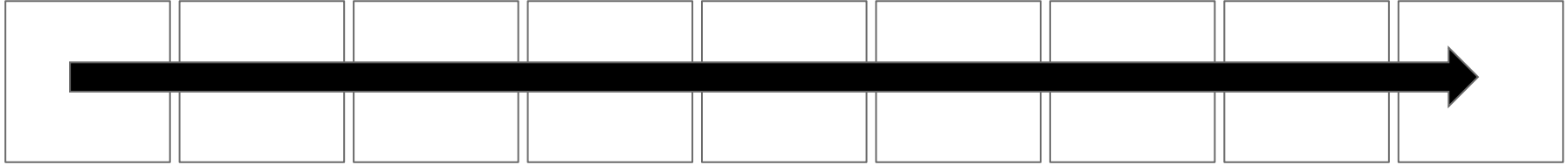
2nd Experiment: "Choose a **lottery ticket**"



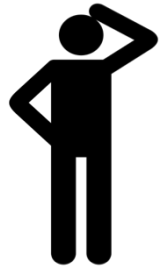
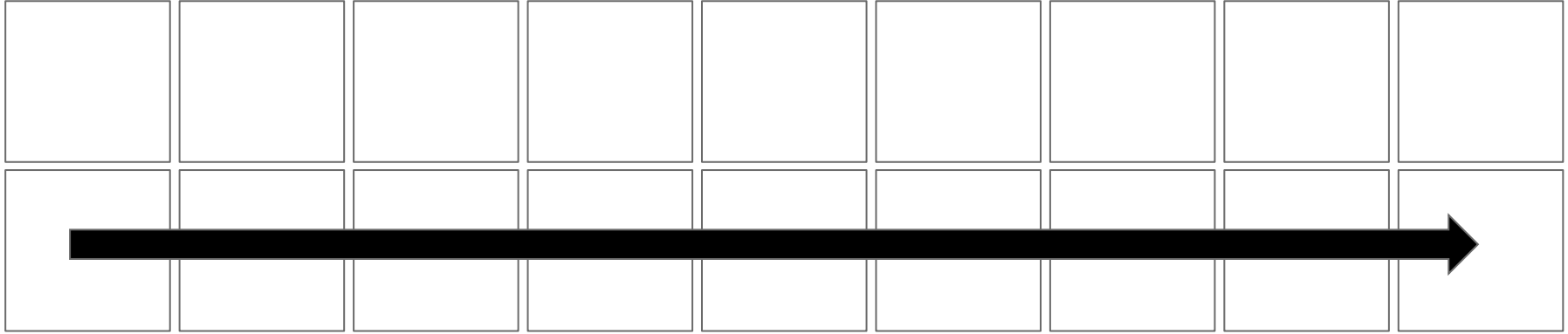
2nd Experiment: "Choose a **lottery ticket**"



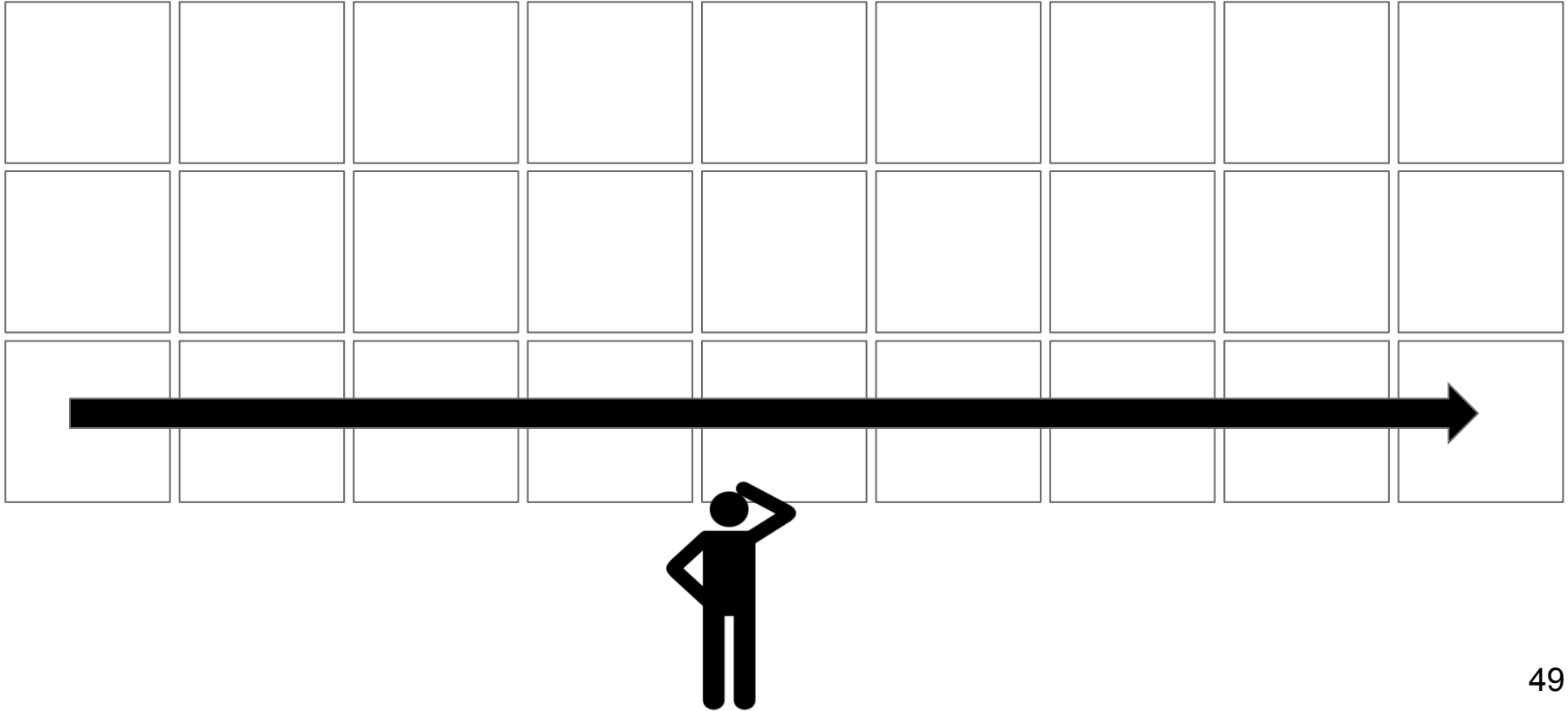
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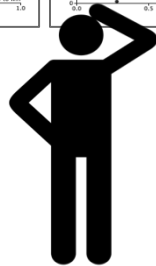
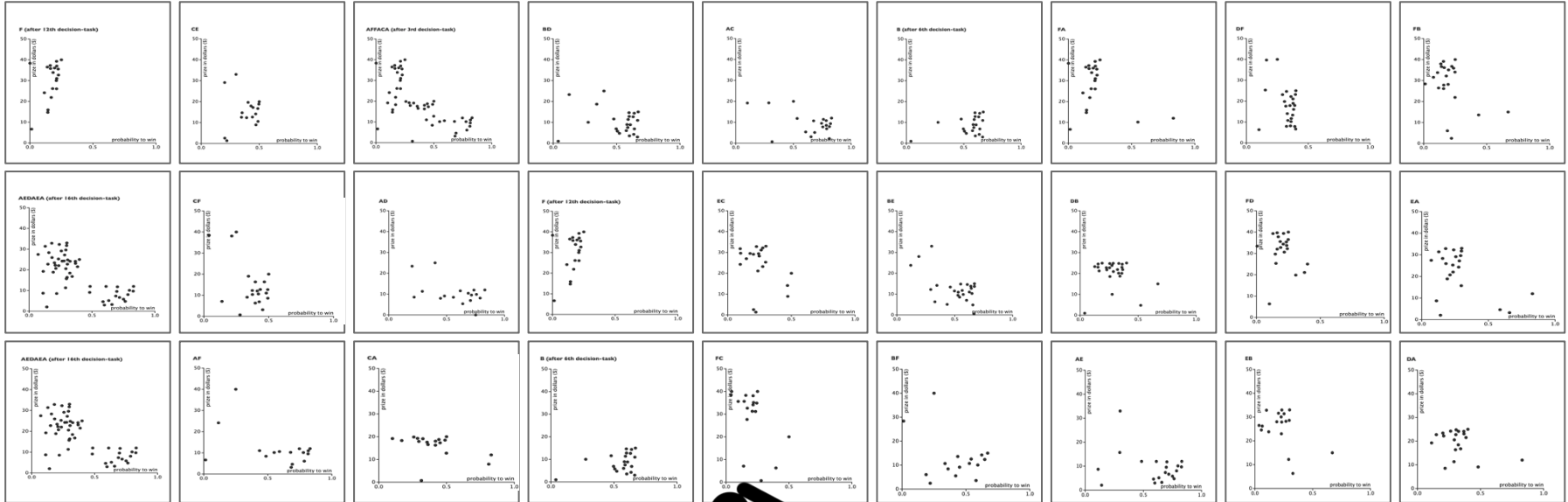
2nd Experiment: "Choose a **lottery ticket**"



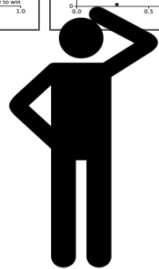
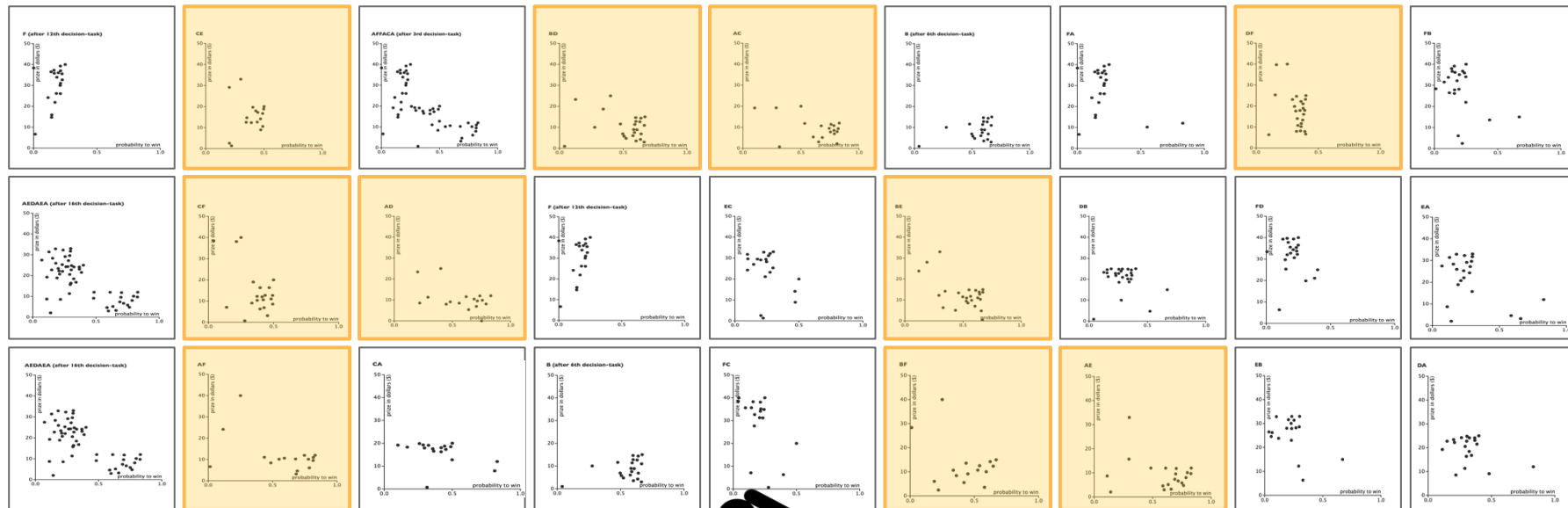
2nd Experiment: "Choose a **lottery ticket**"



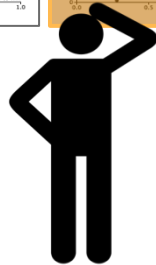
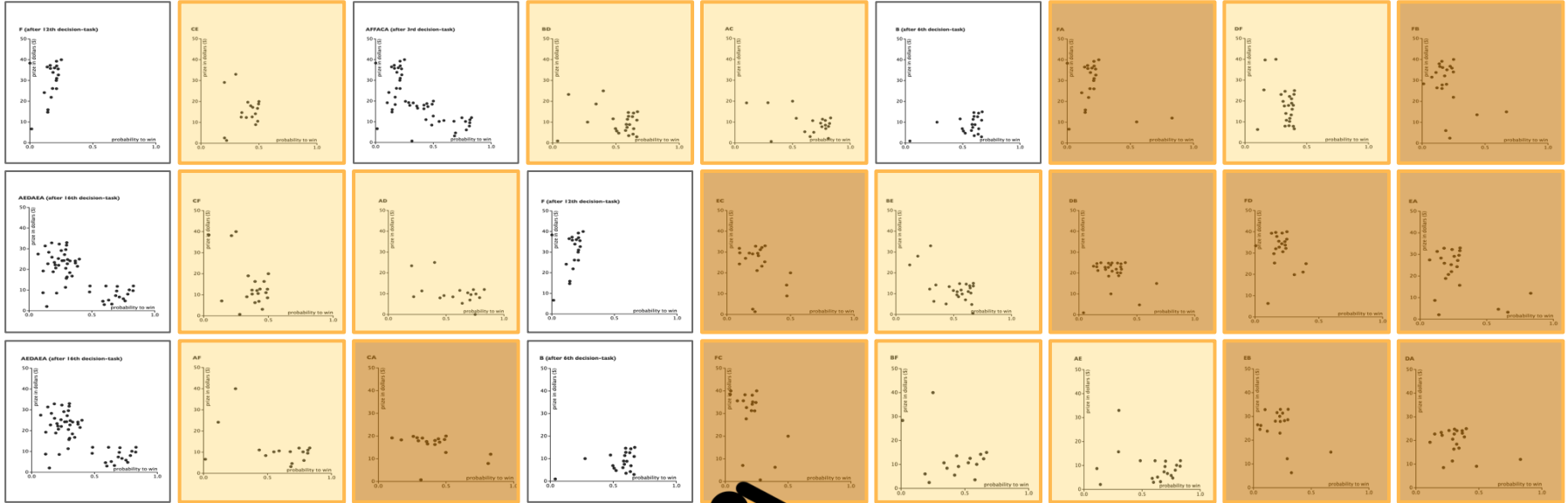
2nd Experiment: "Choose a **lottery ticket**"



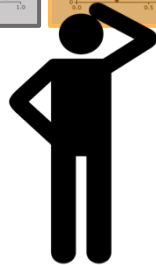
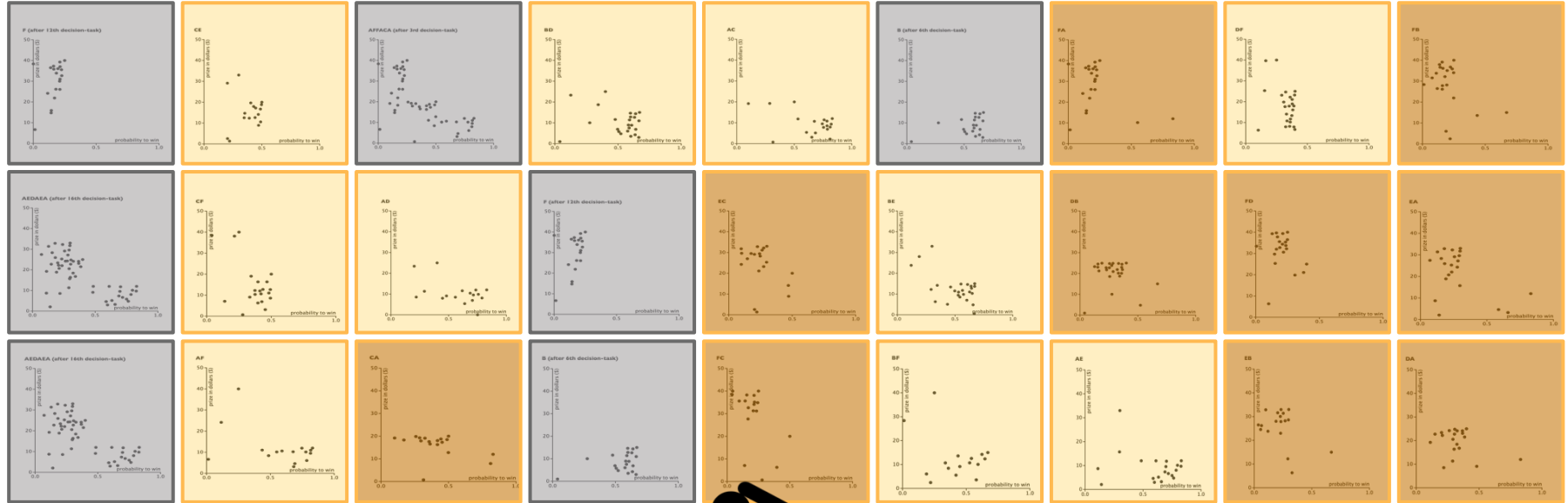
2nd Experiment: "Choose a **lottery ticket**"



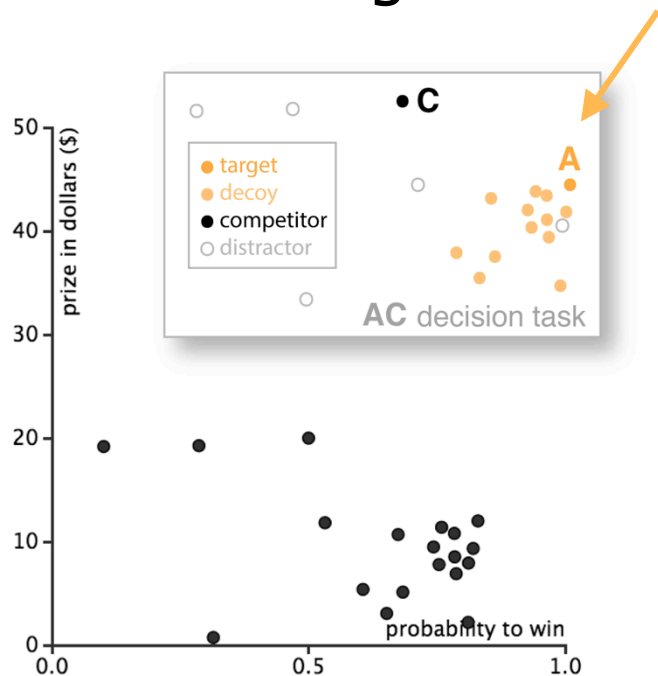
2nd Experiment: "Choose a **lottery ticket**"



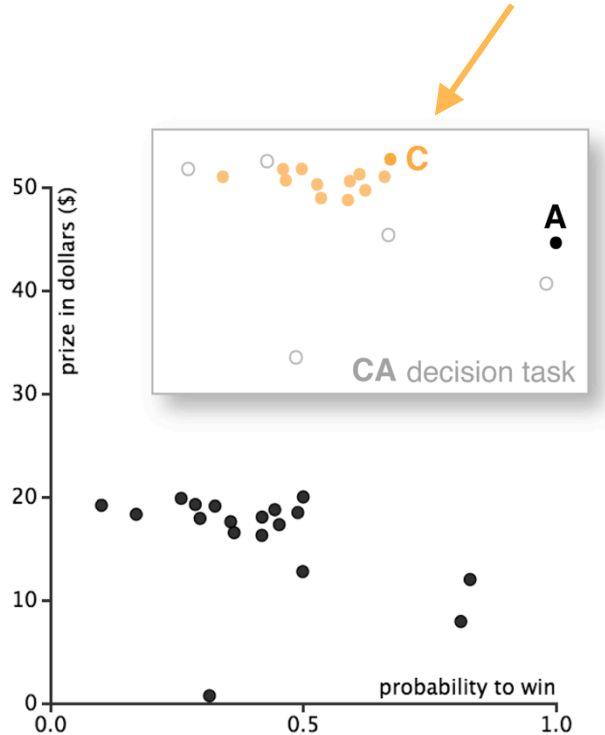
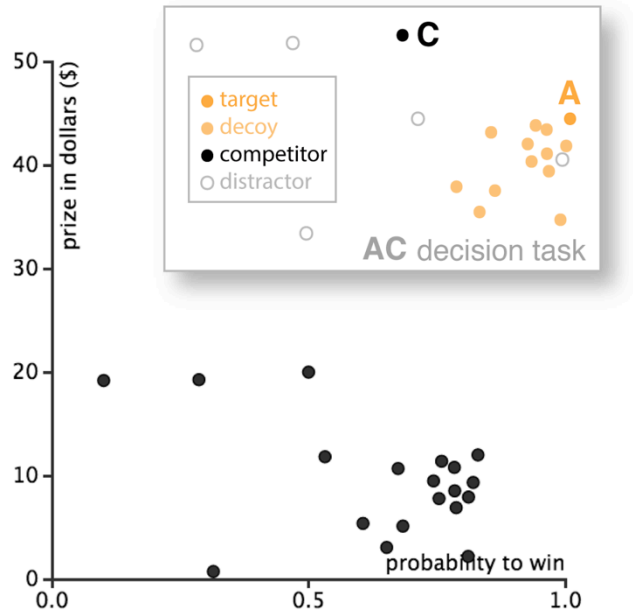
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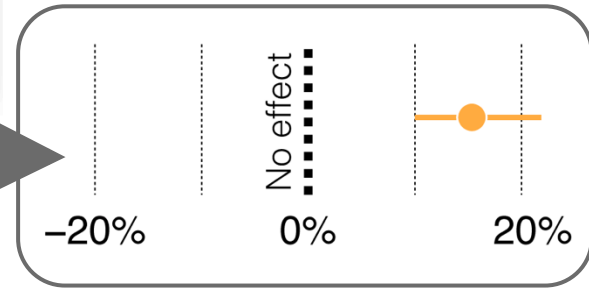
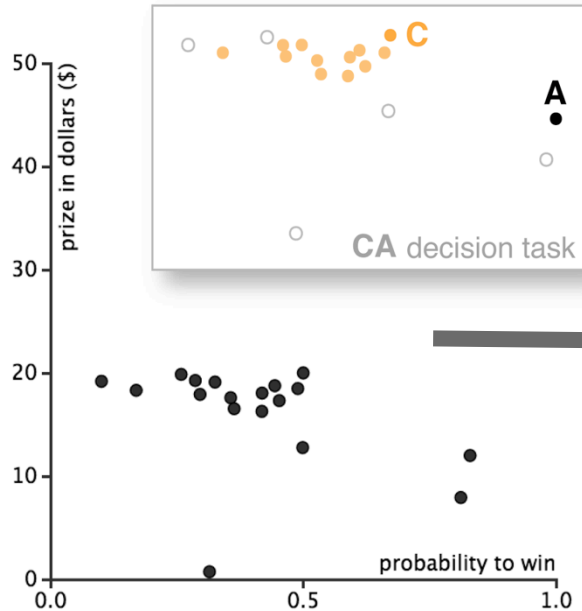
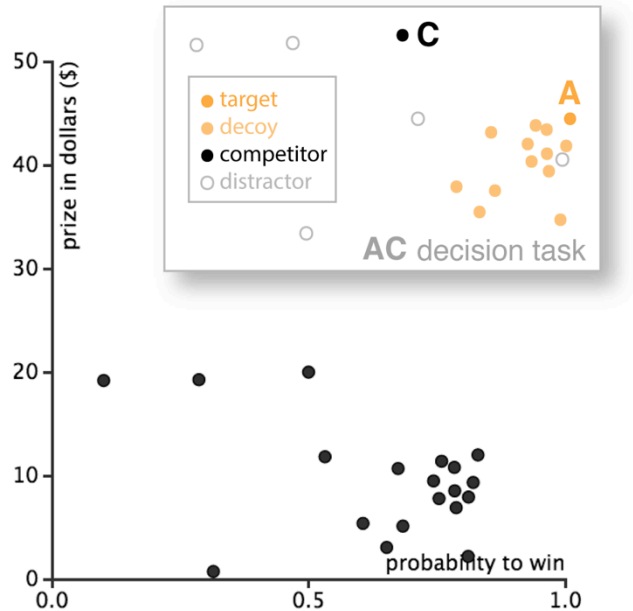
Does the addition of decoys increase the attractiveness of the target?



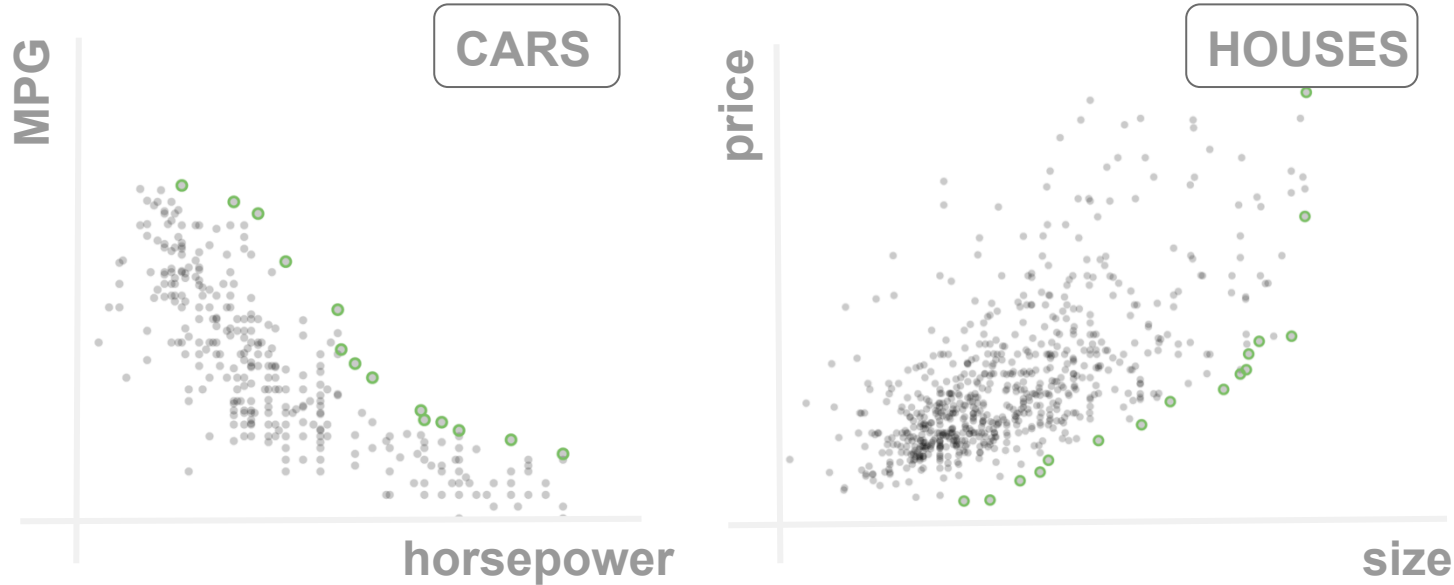
Does the addition of decoys increase the attractiveness of the target?



Does the addition of decoys increase the attractiveness of the target?



Implications of the attraction effect



Discussion

Discussion

- does it generalize to other visualizations?

Discussion

- does it generalize to other visualizations?

[Bettman et al, 2014]

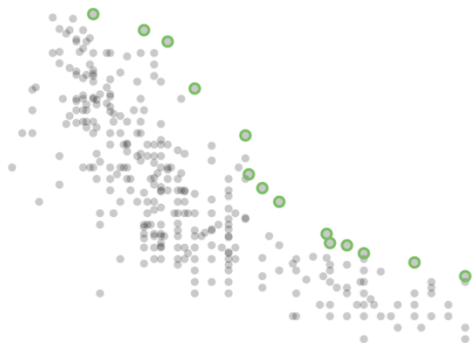
The attraction effect requires asymmetric dominance relationships to be "***perceptual in nature***" and "***easy to access***" .

Discussion

- does it generalize to other visualizations?
- how can we alleviate the attraction effect?

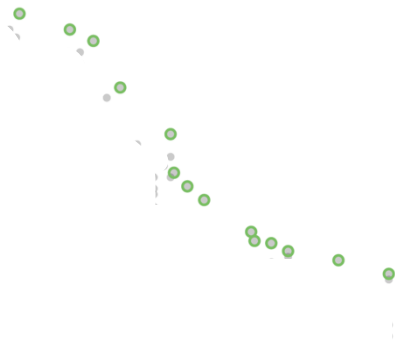
Discussion

- does it generalize to other visualizations?
- how can we alleviate the attraction effect?



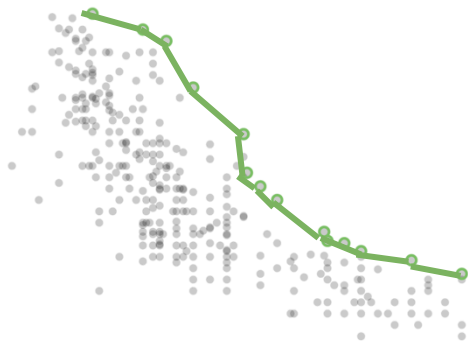
Discussion

- does it generalize to other visualizations?
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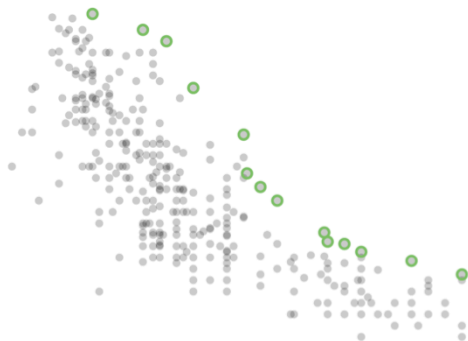
Discussion

- does it generalize to other visualizations?
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Discussion

- does it generalize to other visualizations?
- how can we alleviate the attraction effect?



Discussion

- does it generalize to other visualizations?
- how can we alleviate the attraction effect?

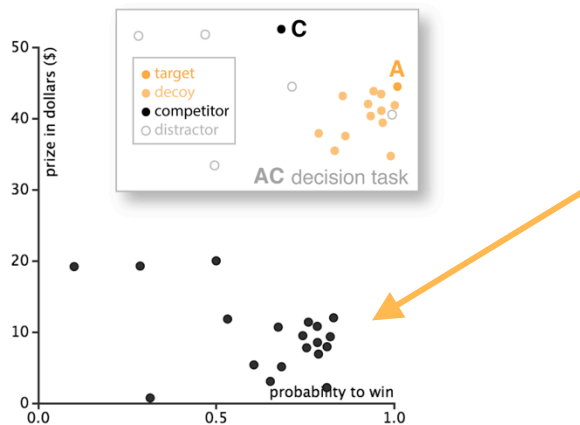


Discussion

- does it generalize to other visualizations?
- how can we alleviate the attraction effect?
- visual saliency effect?

Discussion

- does it generalize to other visualizations?
- how can we alleviate the attraction effect?
- visual saliency effect?



Important observation



only **24** over the 1460
choices were a
dominated alternative
(3% "wrong" answers)

Also in visualizations,
perfectly informed people
do not always make
good decisions

The **Attraction Effect** in Information Visualization



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replication & supplementary material: <http://www.aviz.fr/decoy>

References

- [1] Y. P. S. O'Curry and R. Pitts. The attraction effect and political choice in two elections. *Journal of Consumer Psychology*, 4(1):85–101, 1995.
- [2] Figure Bob, Alice and Eve: Benjamin Miller, FSP Standard License, icons by Ivan Boyco, CC-BY license
- [3] J. Huber, J. W. Payne, and C. Puto. Adding asymmetrically dominated alternatives: Violations of regularity and the similarity hypothesis. *Journal of Consumer Research*, 9(1):90–98, 1982
- [4] S. Frederick, L. Lee, and E. Baskin. The limits of attraction. *Journal of Marketing Research*, 51(4):487–507, 2014.
- [5] S. Yang and M. Lynn. More evidence challenging the robustness and usefulness of the attraction effect. *Journal of Marketing Research*, 51(4):508–513, 2014.
- [6] J. Huber, J. W. Payne, and C. P. Puto. Let's be honest about the attraction effect. *Journal of Marketing Research*, 51(4):520–525, 2014
- [7] I. Simonson. Vices and virtues of misguided replications: The case of asymmetric dominance. *J. of Marketing Research*, 51(4):514–519, 2014.
- [8] Figures Beer (by Lloyd Humphreys), Car (by Rflor), Meeting (by Creative Stall), Roll a dice (by Oliviu Stoian), Bee (by Arturo Alejandro Romo Escartin), Bacteria (by Ilsur Aptukov), Cleanliness (by Douglas Santos) workout machines (by Gan Khoon Lay), Money Bag (by Vaibhav Radhakrishnan) chance (by Bohdan Burmich) Ticket (by Tinashe Mugayi) lost (by Andrew Doane) from the Noun Project (<https://thenounproject.com/>)
- [9] I. Simonson and A. Tversky. Choice in context: Tradeoff contrast and extremeness aversion. *Journal of Marketing Research*, 29:281–295, 1992.
- [10] S. Highhouse. Context-dependent selection: The effects of decoy and phantom job candidates. *Organizational Behavior and Human Decision Processes*, 65(1):68 – 76, 1996
- [11] Herne, Kaisa. (1999). The effects of decoy gambles on individual choice. *Experimental Economics*, 2 (1), 31–40.
- [12] S. Shafir, T. A. Waite, and B. H. Smith. Context-Dependent Violations of Rational Choice in Honeybees (*Apis mellifera*) and Gray Jays (*Perisoreus canadensis*). *Behavioral Ecology and Sociobiology*, 51(2):180–187, 2002.
- [13] T. Latty and M. Beekman. Irrational decision-making in an amoeboid organism: transitivity and context-dependent preferences. *Proceedings of the Royal Society B: Biological Sciences*, 278(1703):307, 2011.
- [14] S. A. Malkoc, W. Hedgcock, and S. Hoeffler. Between a rock and a hard place: The failure of the attraction effect among unattractive alternatives. *Journal of Consumer Psychology*, 23(3):317 – 329, 2013
- [15] D. H. Wedell. Distinguishing among models of contextually induced preference reversals. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 17(4):767, 1991

Why the participants were influenced by the decoys?

Why you think there are more tickets closer to A?



64 participants

Why you think there are more tickets closer to A?

9 participants



Why you think there are more tickets closer to A?

4 participants



had the explanation in mind
during the task !

Why you think there are more tickets closer to A?



1. *"to tempt people to choose tickets of high prize but with low probability, increasing the profitability of the lottery owner"*
2. *"to distract from choosing the higher chances of winning"*
3. *"customers want to win a higher prize"*
4. *"maybe more people played the same"*