How does choice architecture influence attention and decision making?

Chaoyi Shi; Yu Luo; Dilip Soman; & Jiaying Zhao

Choice architecture

- Choice architecture guides decision making in a wide range of domains (Benartzi et al., 2017; Colby et al., 2020; Hummel & Maedche, 2019; Milkman et al., 2021)

- A recent meta-analysis suggests that effort-reducing (d=0.56) or attention-grabbing (d=0.37) interventions tend to have the largest effect sizes (Luo et al., 2022)
  - ✓Default: the default option tends to be chosen more often (Kaiser et al., 2020; Jachimowicz et al., 2019; Johnson & Goldstein, 2013; Mertens et al., 2022)
  - ✓Presentation order: options presented first tend to be chosen more often (Andersson & Nelander, 2021; Dayan & Bar-Hillel, 2011; Romero & Biswas, 2016; Wilson et al., 2017)

- How does choice architecture influence attention? Does attention mediate choice?
  - ✓Default and presentation order can both draw attention, therefore biasing choice

Attentional mechanisms

- Attention plays an active role in constructing decisions:
  - ✓Visually salient options that capture bottom-up attention are more likely to be chosen (Hilchey et al., 2023; Itti & Koch, 2000; Milosavljevic et al., 2012)
  - ✓Goal-relevant stimuli which activate top-down attention are more likely to be chosen (Jovancevic & Hayhoe, 2009; Hayhoe, 2000; Pieters & Warlop, 1999)

- Goal of the current study: How do default, instructions about the default, and presentation order influence attention and decision making?

A pre-registered experiment (osf.io/z5ch9)

- **Participants**: Amazon Mechanical Turk (N=1720 U.S. participants as an initial sample, N=646 as the final sample after exclusion)

- **Task**: choose the better credit card for themselves out of two options given their financial situation, using BubbleView task to track visual attention online

Design

- **Experimental design**: between-subjects factorial design with 8 conditions:
  - 2 pre-selection conditions (better card vs. worse card pre-selected) x
  - 2 instructions conditions (pre-selection was intentional vs. random) x
  - 2 presentation order conditions (better card vs. worse card presented on the left)
- **Primary measures**: attention and choice
- **Secondary measure**: memory of card features
- **Covariates**: financial literacy, numeracy, personal income, financial stress, age, education, political orientation

Infinite

Earn 1.5% in cash back dollars on grocery purchases, dining at restaurants and travel purchases

Earn 1.5% in cash back dollars on gas purchases and all other purchases

Annual fee $0

Purchase interest rate 14.99%

Default interest rate 20.74%

Signature

Earn 3% in cash back dollars on grocery purchases, dining at restaurants and travel purchases

Earn 1.5% in cash back dollars on gas purchases and all other purchases

Annual fee $95

Purchase interest rate 25.24%

Default interest rate 29.99%

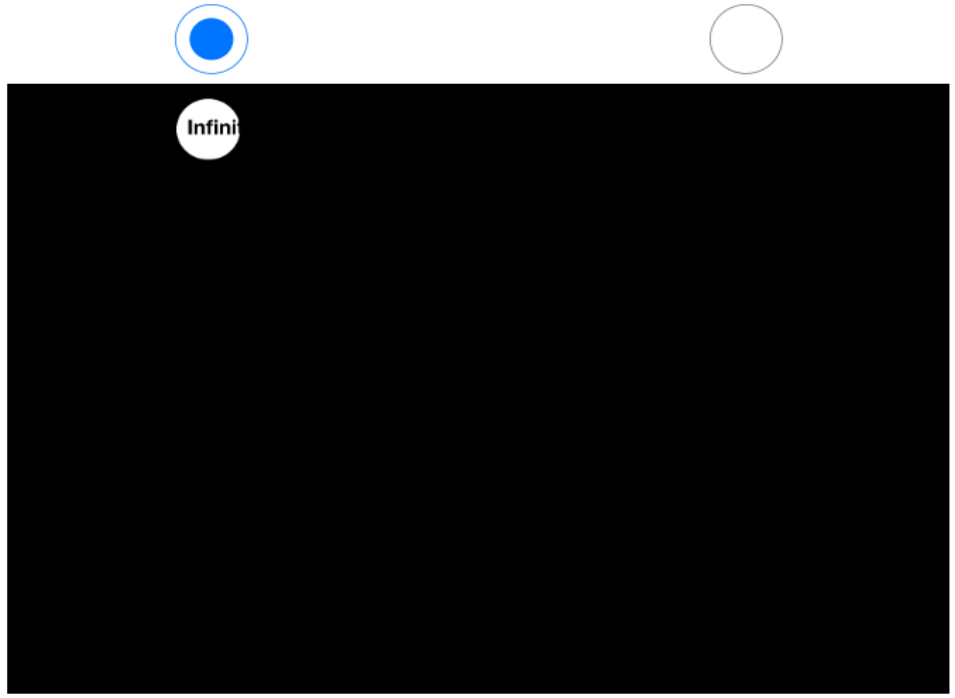
Pre-selection conditions

Infinite card pre-selected

Imagine you are applying for a credit card at a local bank. Here are two card options. Which card is better for you given your financial situation? **(A credit card has been pre-selected for you. We believe that it is the better option for you. You will get this option unless you switch to the other option.)**

The two cards are covered by a black mask. You can move our mouse to see the cards and their information below. Please view the cards carefully and make a decision on which card is better for you.

You can select the card by clicking on the button below.



After you have made your choice, click on Next to proceed.

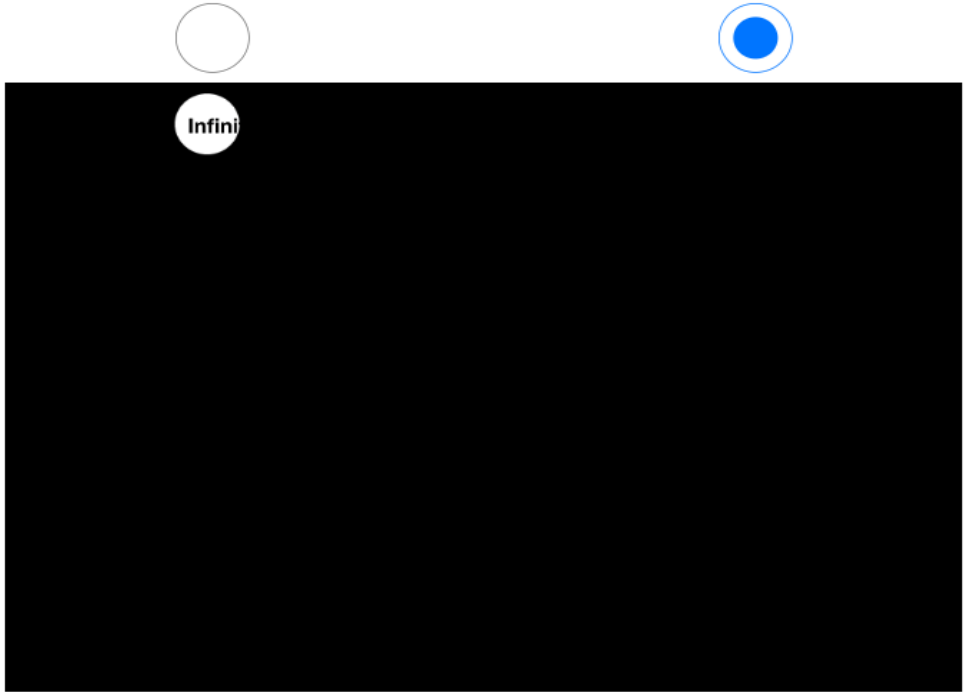
Next

Signature card pre-selected

Imagine you are applying for a credit card at a local bank. Here are two card options. Which card is better for you given your financial situation? **(A credit card has been pre-selected for you. We believe that it is the better option for you. You will get this option unless you switch to the other option.)**

The two cards are covered by a black mask. You can move our mouse to see the cards and their information below. Please view the cards carefully and make a decision on which card is better for you.

You can select the card by clicking on the button below.



After you have made your choice, click on Next to proceed.

Next

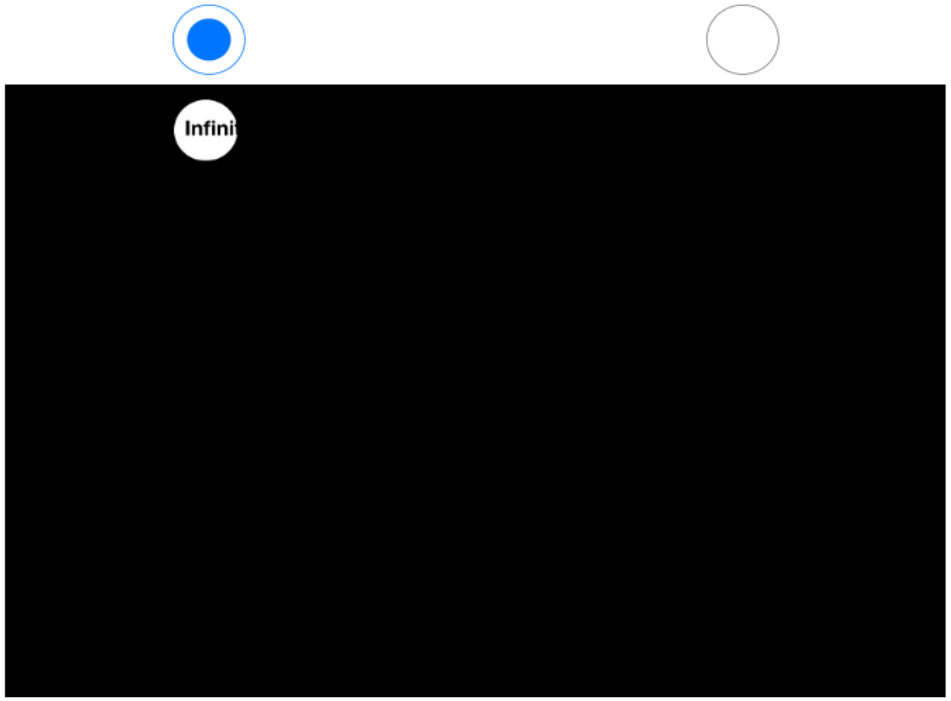
Instruction conditions

Intentional

Imagine you are applying for a credit card at a local bank. Here are two card options. Which card is better for you given your financial situation? **(A credit card has been pre-selected for you. We believe that it is the better option for you. You will get this option unless you switch to the other option.)**

The two cards are covered by a black mask. You can move our mouse to see the cards and their information below. Please view the cards carefully and make a decision on which card is better for you.

You can select the card by clicking on the button below.



After you have made your choice, click on Next to proceed.

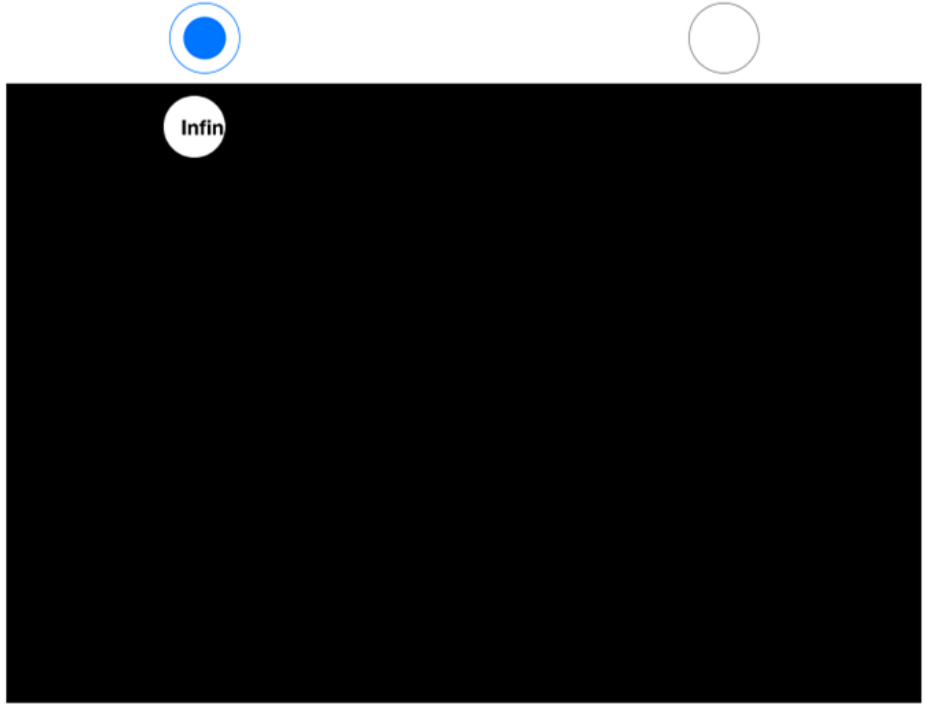
Next

Random

Imagine you are applying for a credit card at a local bank. Here are two card options. Which card is better for you given your financial situation? **(A credit card has been pre-selected for you. This pre-selection is randomly determined based on a coin flip. You will get this option unless you switch to the other option.)**

The two cards are covered by a black mask. You can move our mouse to see the cards and their information below. Please view the cards carefully and make a decision on which card is better for you.

You can select the card by clicking on the button below.



After you have made your choice, click on Next to proceed.

Next

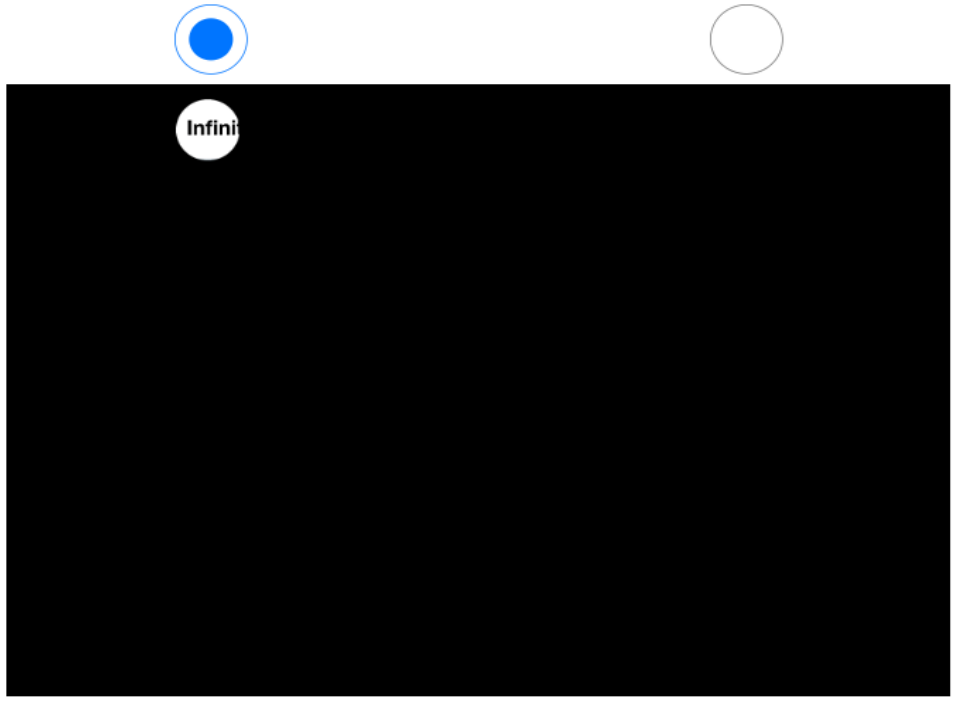
Presentation order conditions

Infinite card on the left

Imagine you are applying for a credit card at a local bank. Here are two card options. Which card is better for you given your financial situation? **(A credit card has been pre-selected for you. We believe that it is the better option for you. You will get this option unless you switch to the other option.)**

The two cards are covered by a black mask. You can move our mouse to see the cards and their information below. Please view the cards carefully and make a decision on which card is better for you.

You can select the card by clicking on the button below.



After you have made your choice, click on Next to proceed.

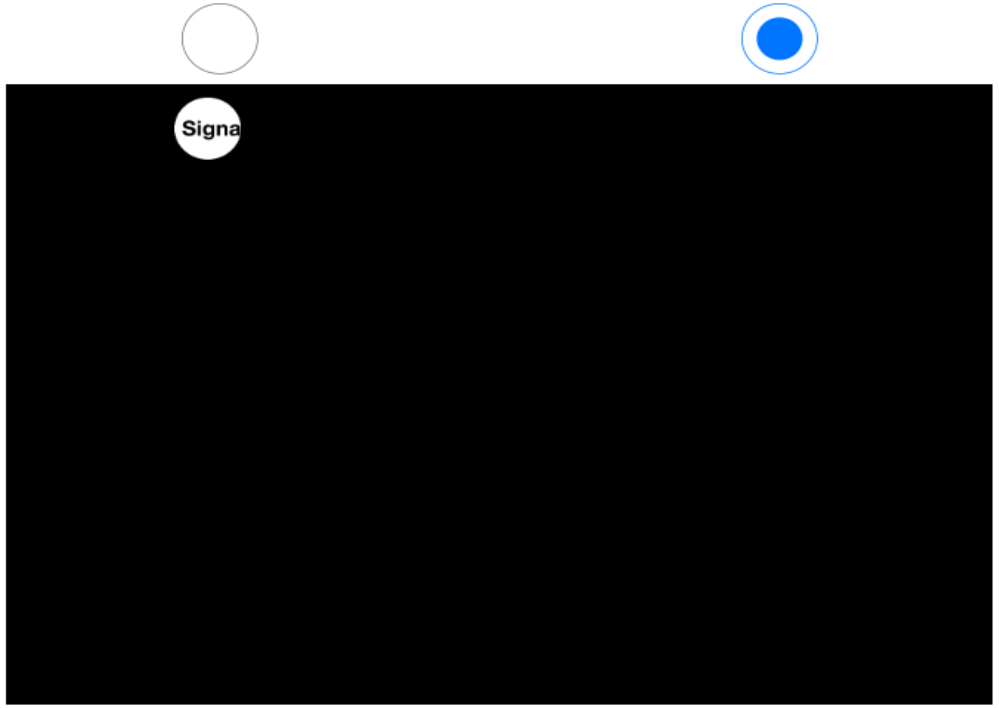
Next

Signature card on the left

Imagine you are applying for a credit card at a local bank. Here are two card options. Which card is better for you given your financial situation? **(A credit card has been pre-selected for you. We believe that it is the better option for you. You will get this option unless you switch to the other option.)**

The two cards are covered by a black mask. You can move our mouse to see the cards and their information below. Please view the cards carefully and make a decision on which card is better for you.

You can select the card by clicking on the button below.



After you have made your choice, click on Next to proceed.

Next

Pre-registered hypotheses

- **Attention**

1. Participants will pay more **attention** to the card when it's **pre-selected** than when it's not pre-selected
2. Participants will pay more **attention** to the pre-selected card in the **intentional** pre-selection condition than in the random pre-selection condition
3. Participants will pay more **attention** to the card when it's presented **on the left** than when it's presented on the right

- **Choice**

1. Participants are more likely to **choose** the card when it's **pre-selected** than when it's not pre-selected
2. Participants are more likely to **choose** the pre-selected card in the **intentional** pre-selection condition than in the random pre-selection condition
3. Participants are more likely to **choose** the card when it's presented **on the left** than when it's presented on the right

Two measures of attention

- **Proportional dwell time**: total dwell time on the card / total dwell time overall

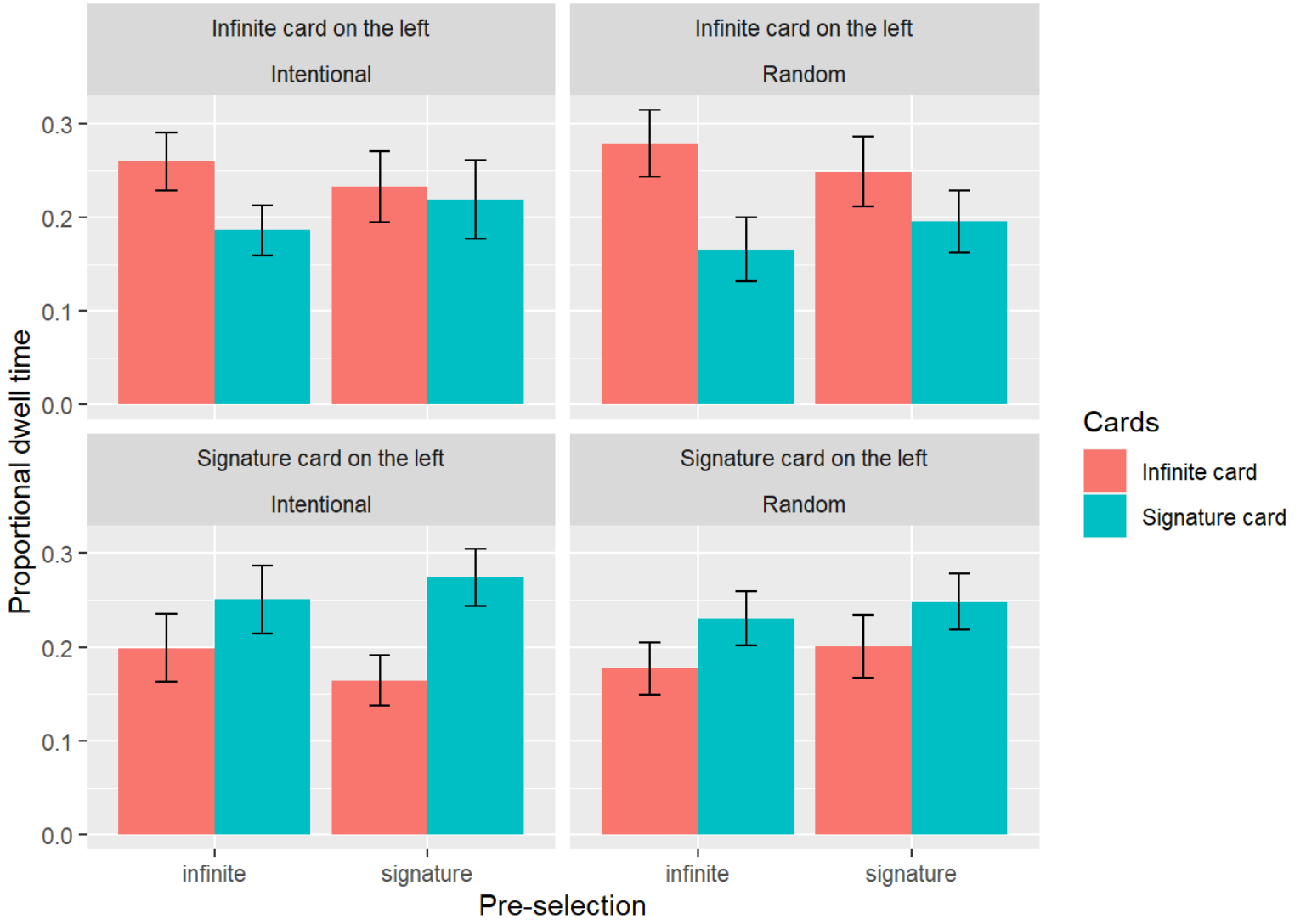
    - Dwell time: the amount of time participants spend in a given AOI

- **Proportional fixations**: total fixations on the card / total fixations overall
-

    - Fixations: the number of mouse landings in a given AOI

Attention Measure 1: Proportional dwell time

(total dwell time on the card / total dwell time overall)



Participants paid more attention to the card

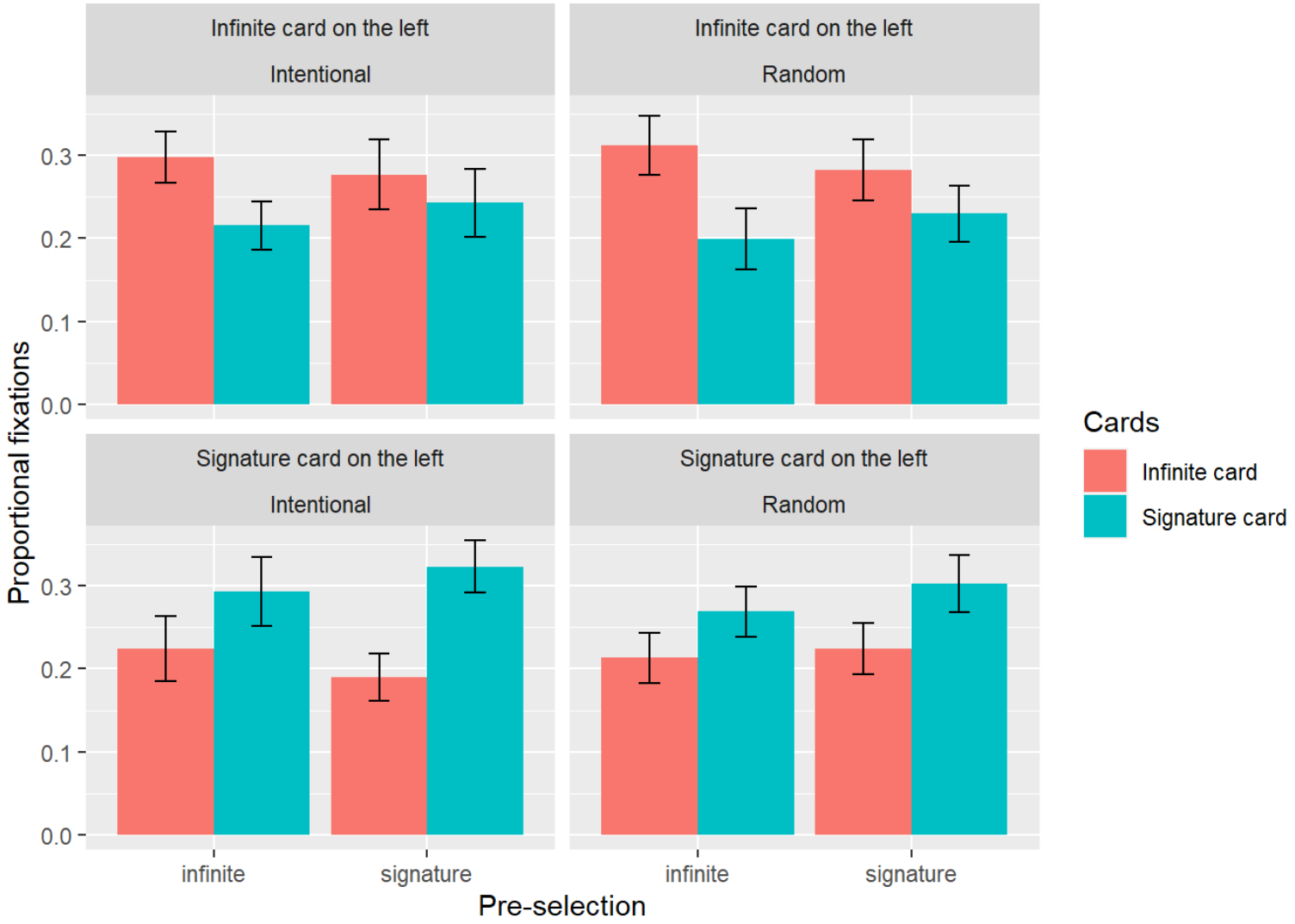
1) when it's **pre-selected** than when it's not [$F(1)=7.88$, $p=.005$, η^2_G**=.008**]

2) when it's presented **on the left** than on the right [$F(1)=51.96$, $p<.001$, η^2_G**=.049**] - larger effect

But **no effect of instructions** [$F(1,1)=1.75$, $p=.187$, $\eta^2_G=.002$]

Attention Measure 2: Proportional fixations

(total fixations on the card / total fixations overall)



Participants paid more attention to the card

1) when it's **pre-selected** than when it's not [F(1)=9.02, p=.003, η2G=.010]

2) when it's presented **on the left** than on the right [F(1)=63.71, p<.001, η2G=.063] - larger effect

But **no effect of instructions** [F(1,1)=.86, p=.354, η2G=.001]

Choice of the better card

Conditions	Infinite card (N)	Signature card (N)
infinite pre-selected, intentional, infinite card left	**74**	18
infinite pre-selected, intentional, signature card left	**50**	17
infinite pre-selected, random, infinite card left	**70**	11
infinite pre-selected, random, signature card left	**57**	34
signature pre-selected, intentional, infinite card left	25	**42**
signature pre-selected, intentional, signature card left	29	**64**
signature pre-selected, random, infinite card left	29	**41**
signature pre-selected, random, signature card left	27	**58**

Participants were more likely to choose the better card

1) when it's **pre-selected** than when it's not (*B*=-1.88, *SE*=.26, *p*<.001, **OR=.15**) - larger effect

2) when it's presented **on the left** than on the right (*B*=-.57, *SE*=.18, *p*=.001, **OR=.56**)

But **no effect of instructions** (*B*=.26 *SE*=.35, *p*=.469, OR=1.29)

Pre-registered hypotheses

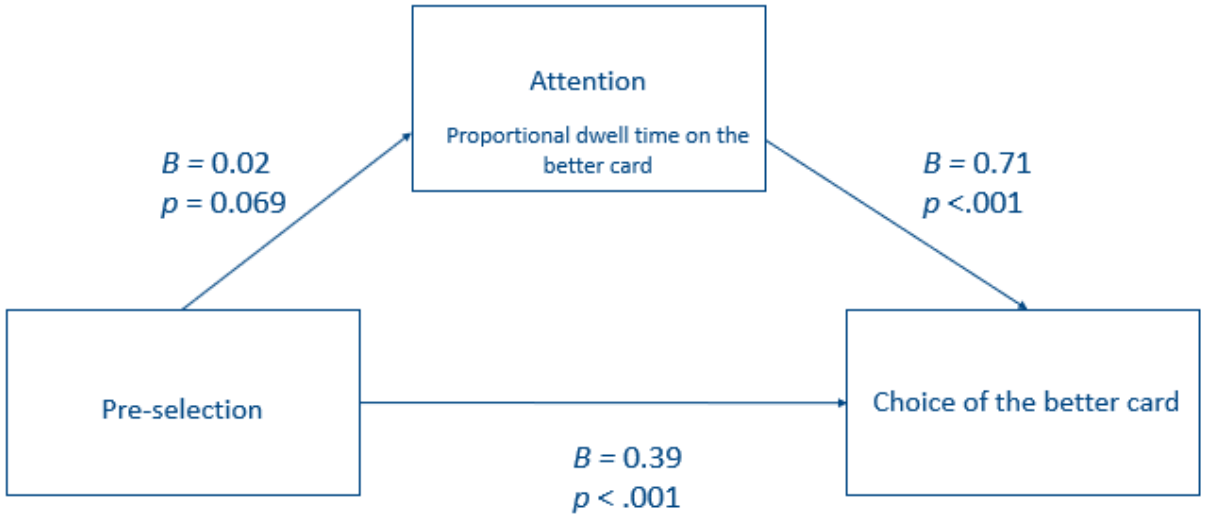
Attention

1. Participants will pay more **attention** to the card when it's **pre-selected** than when it's not pre-selected ✓
2. Participants will pay more **attention** to the pre-selected card in the **intentional** pre-selection condition than in the random pre-selection condition ✗
3. Participants will pay more **attention** to the card when it's presented **on the left** than when it's presented on the right ✓

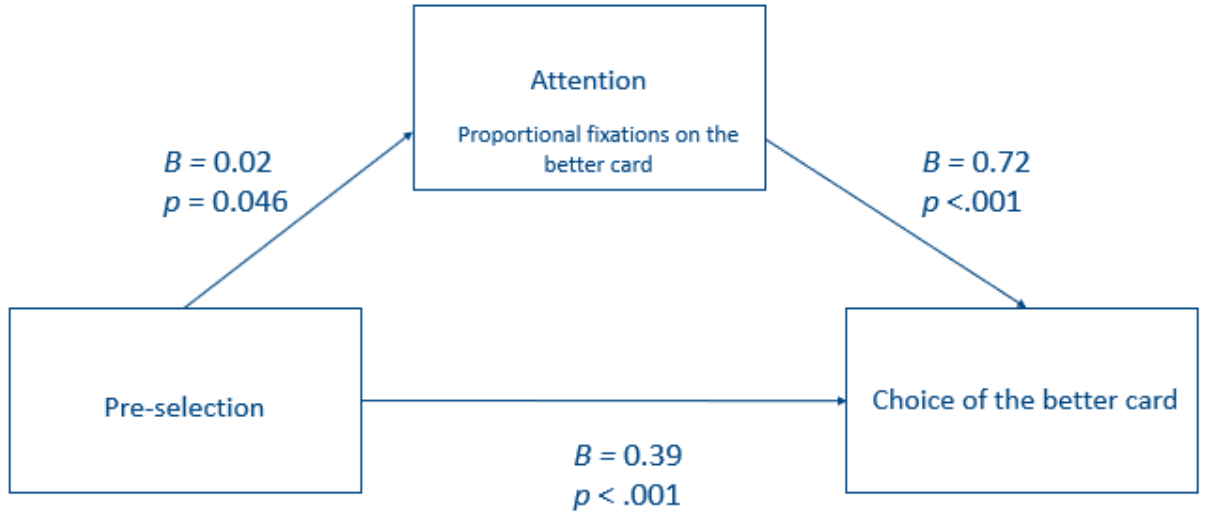
Choice

1. Participants are more likely to **choose** the card when it's **pre-selected** than when it's not pre-selected ✓
2. Participants are more likely to **choose** the pre-selected card in the **intentional** pre-selection condition than in the random pre-selection condition ✗
3. Participants are more likely to **choose** the card when it's presented **on the left** than when it's presented on the right ✓

Attention mediating the effect of pre-selection on choice

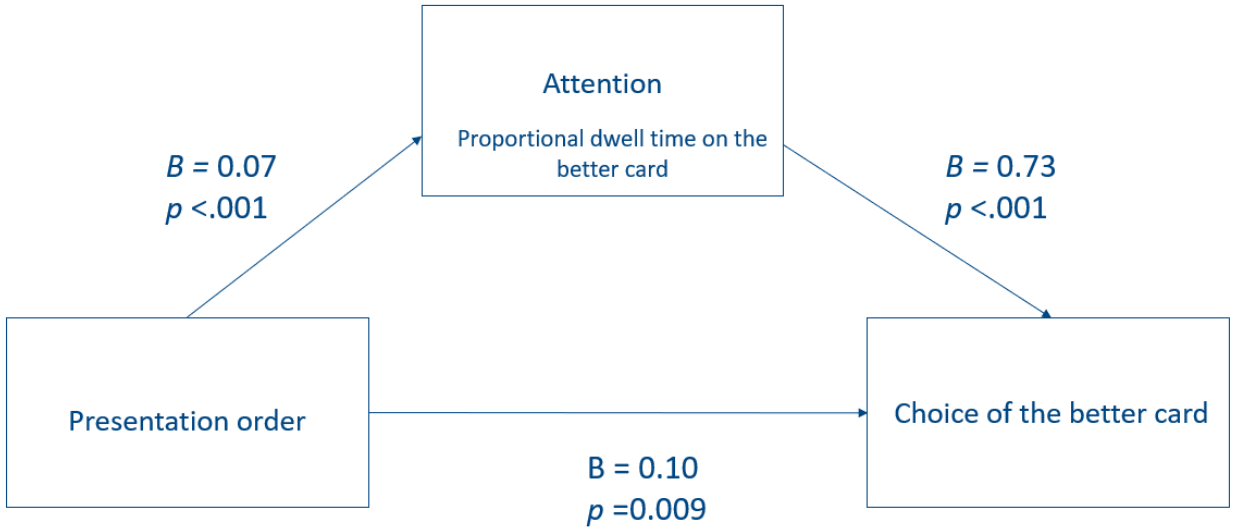


Attention as proportional dwell time



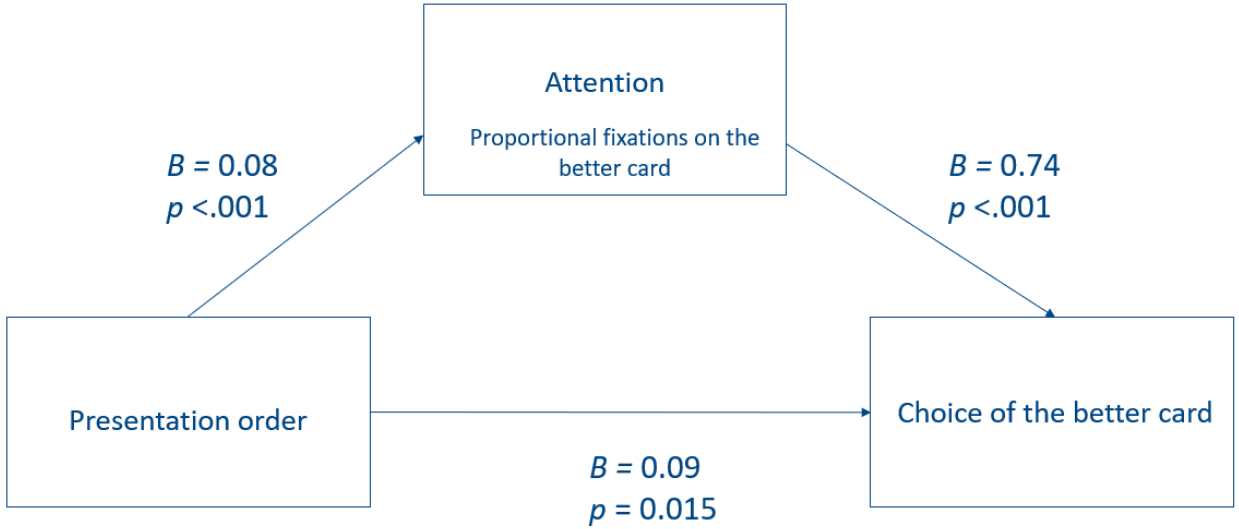
Attention as proportional fixations

Attention mediating the effect of presentation order on choice



Total effect = 0.15 (95%CI: 0.08, 0.23)
Indirect effect = 0.05 (95%CI: 0.03, 0.08)

Attention as proportional dwell time



Total effect = 0.15 (95%CI: 0.08, 0.23)
Indirect effect = 0.06 (95%CI: 0.04, 0.09)

Attention as proportional fixations

Discussion

Default and presentation order can guide attention which mediates decision making

- Whether the default is intentional or random matter less

Strong left-side bias (reading direction) could explain why presentation order had a stronger influence on attention than default

The default option may reduce decision effort more than presentation order, which could explain why default had a stronger influence on choice than presentation order

Practical implications: Careful design of choice architecture to

- guide consumers to make better decisions for themselves

Thank you!

Our Research Team:

Chaoyi Shi: cshi@psych.ubc.ca

Yu Luo: yu.luo@ubc.ca

Dilip Soman: Dilip.Soman@rotman.utoronto.ca

Jiaying Zhao: jiayingz@psych.ubc.ca