

Mere Controllability of Interface Modulates Perception of Reward Probability and Behavior in Gambling Task



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Background

- * The opportunity to choose has a positive value for human (Leotti & Delgado, 2011) and he/she desires to make choice (Botti & McGill, 2006).
- ⇔ It can disturb human adoptive cognition, particularly related to reward (e.g., *Illusion of control*; Langer, 1975).
- Those effects were observed in the situation where participants didn't have explicit memory or belief that "I chose it".

? The on-line sensation with choice also modulates the perception or behavior related to reward?

Sense of Control : the feeling to control external events through one's own action

The sense that "users are in charge of the system and the system responds to their action" is important as a factor of the interface design (Shneiderman, 1992).

Method

◎ A simple card drawing game as a gambling task (N = 64, 37 females, mean age 22.17 ± 1.64 years)

1. **Betting**: Deciding the amount of bet point in each trial by pressing one of 1-10 keys.
2. **Choosing**: Dragging a card with a mouse to move and place the card on either of gray spaces on the upper and lower parts of screen.

➔ **Manipulation of controllability to modulate sense of control**

Controllable condition: dragged card always moved in the direction corresponding to participant's operation of mouse cursor.

Uncontrollable condition: the card moved in some different directions from the cursor with a coordinate transformation randomly selected from 3 patterns*.

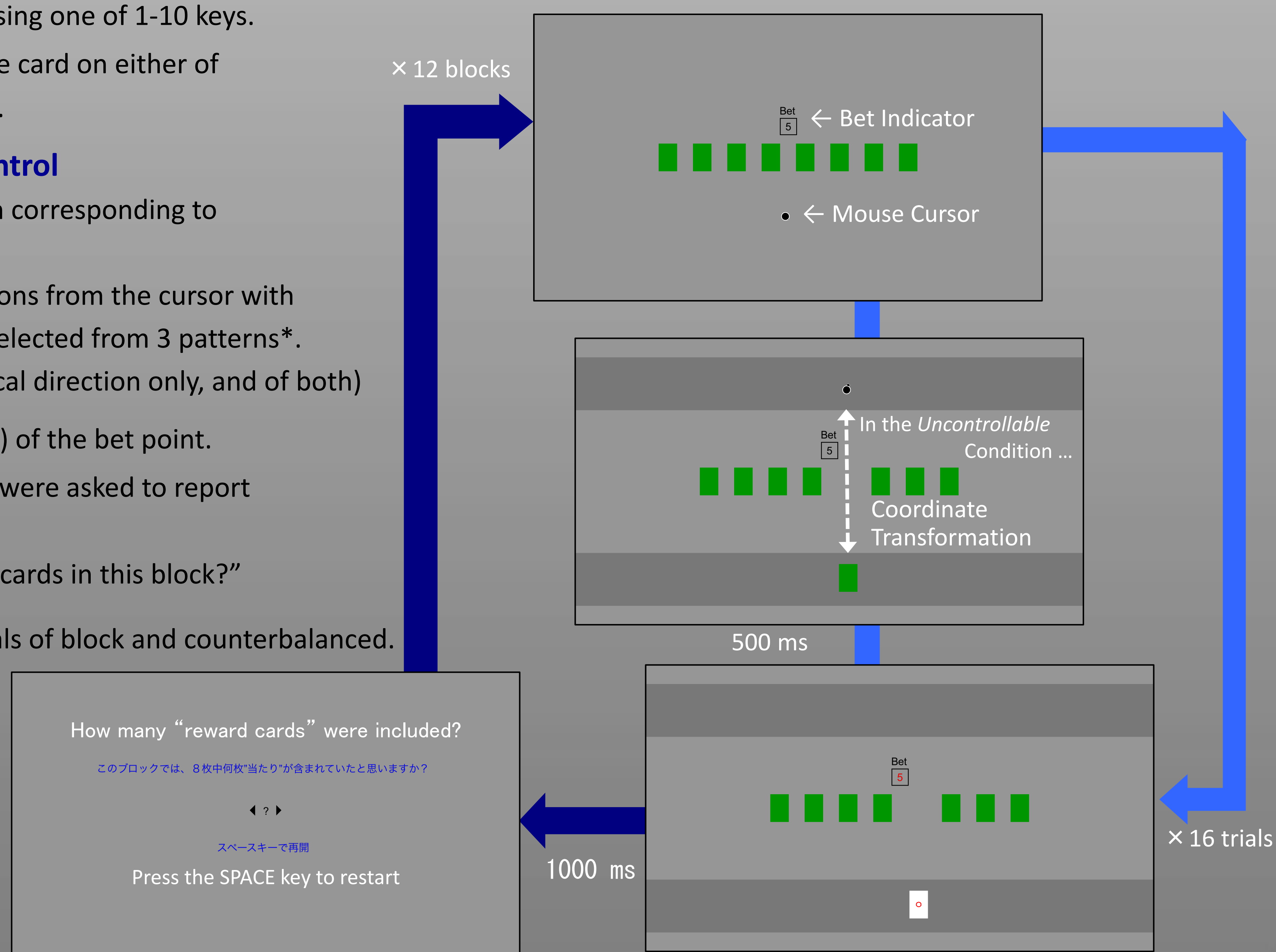
(* the inversion of horizontal direction only, of vertical direction only, and of both)

3. **Feedback**: Presentation of participants' gain (win) or loss (lose) of the bet point.
4. **Estimation**: At the end of each block (= 16 trials), participants were asked to report the subjective estimation of reward probability.
- i.e., "How many *reward cards* was included in 8 cards in this block?"

* The frequency of win was manipulated within former/latter 8 trials of block and counterbalanced.

12 blocks (2: controllability × 6: block type) were conducted.

Block Type	Former	Latter	Total	Expectation
1	3	4	7	3.5
2	3	6	9	4.5
3	4	3	7	3.5
4	4	5	9	4.5
5	5	2	7	3.5
6	5	4	9	4.5



Result & Conclusion

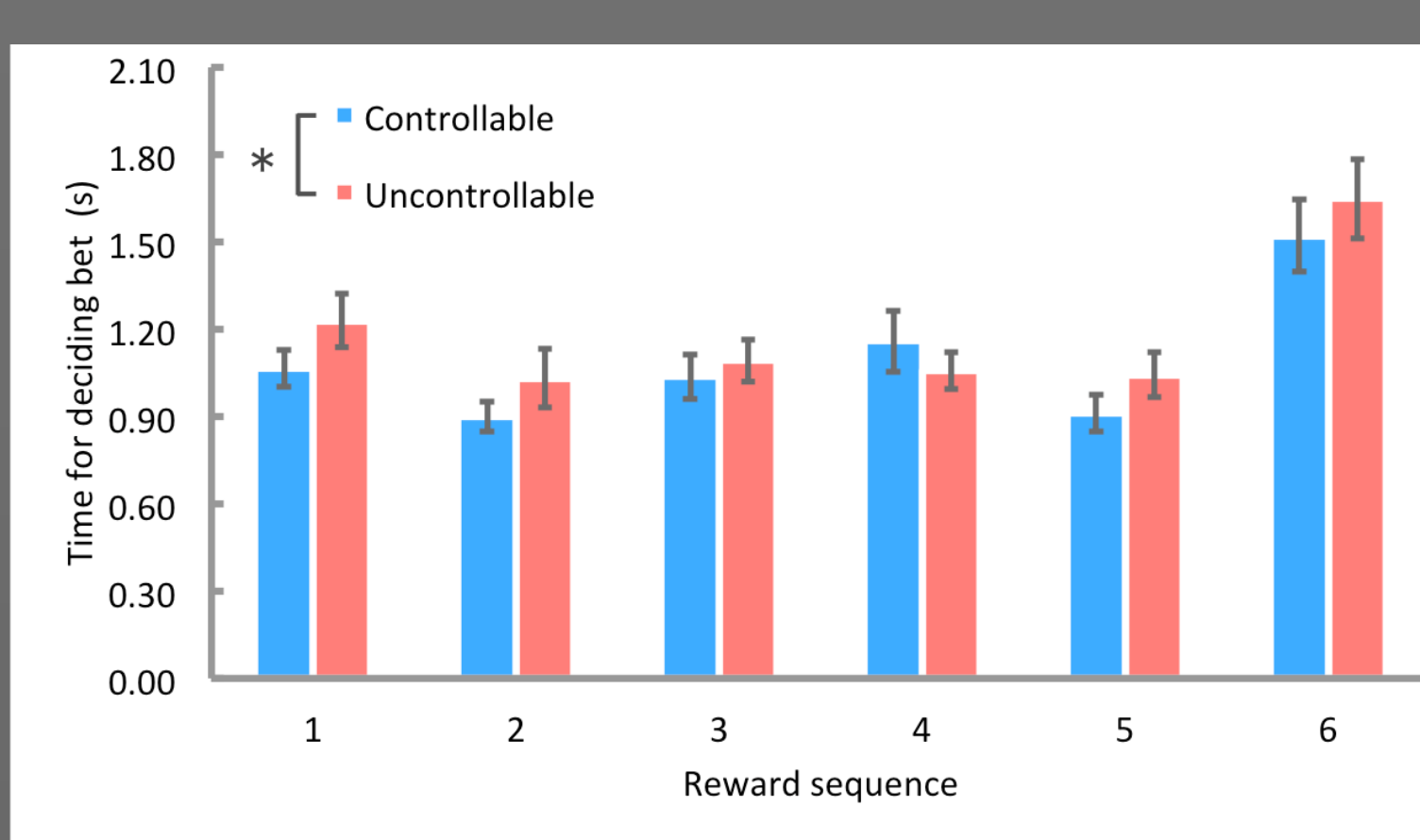
Analysis with repeated measures ANOVA showed ...

✓ Betting Behavior

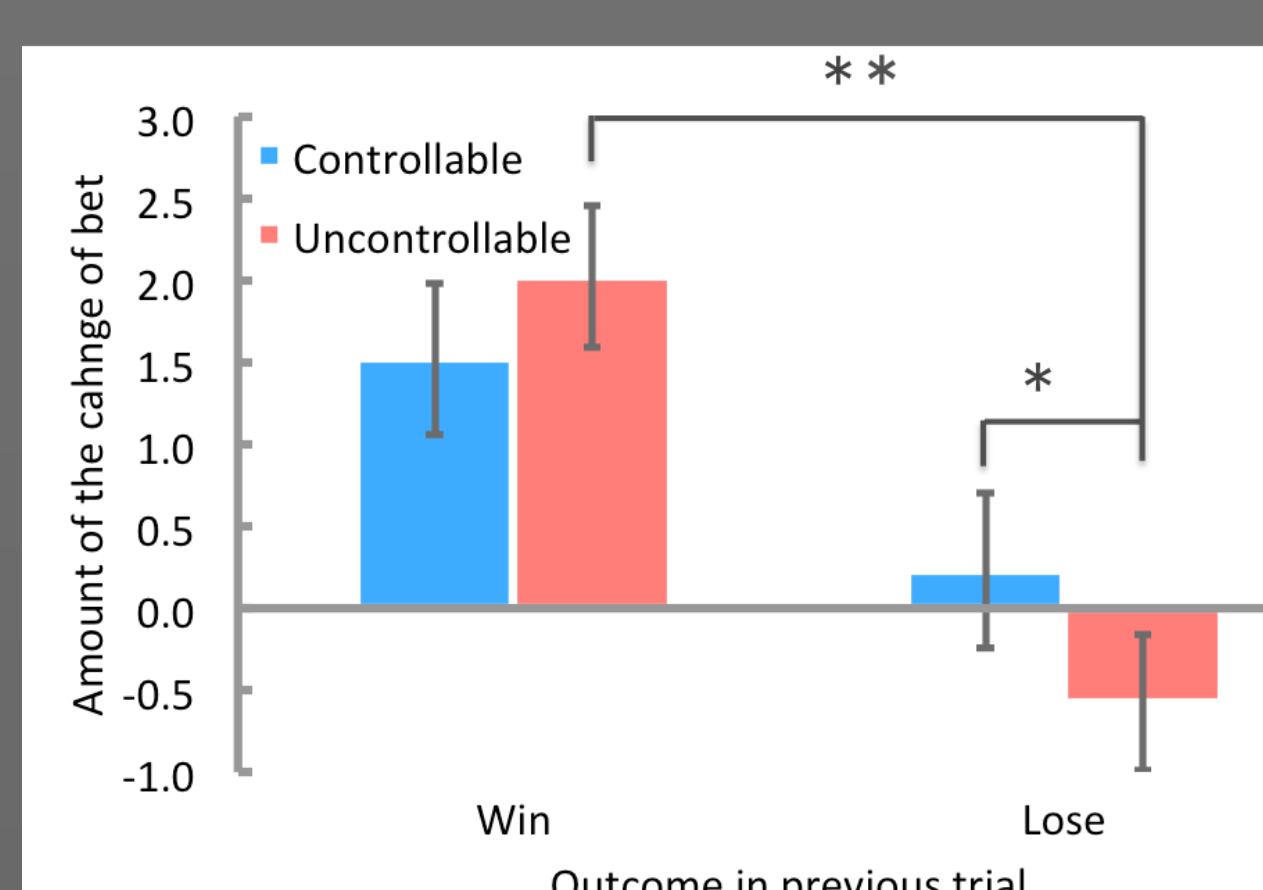
- * Time for deciding bet was shorter in *controllable* condition than *uncontrollable condition* ($F(5,61) = 7.83, p < .01$).
- * Participants increased / decreased less amount of bet in the trial after win / lose in *controllable* condition relative to *uncontrollable* condition ($F(1,62) = 8.80, p < .01$; $F(1,62) = 4.80, p < .05$).
- Participants were more likely to increase bet after lose and decrease bet after win in *controllable* condition ($F(1,62) = 6.49, p < .05$; $F(1,62) = 2.80, p = .09$).

✓ Subjective Estimation

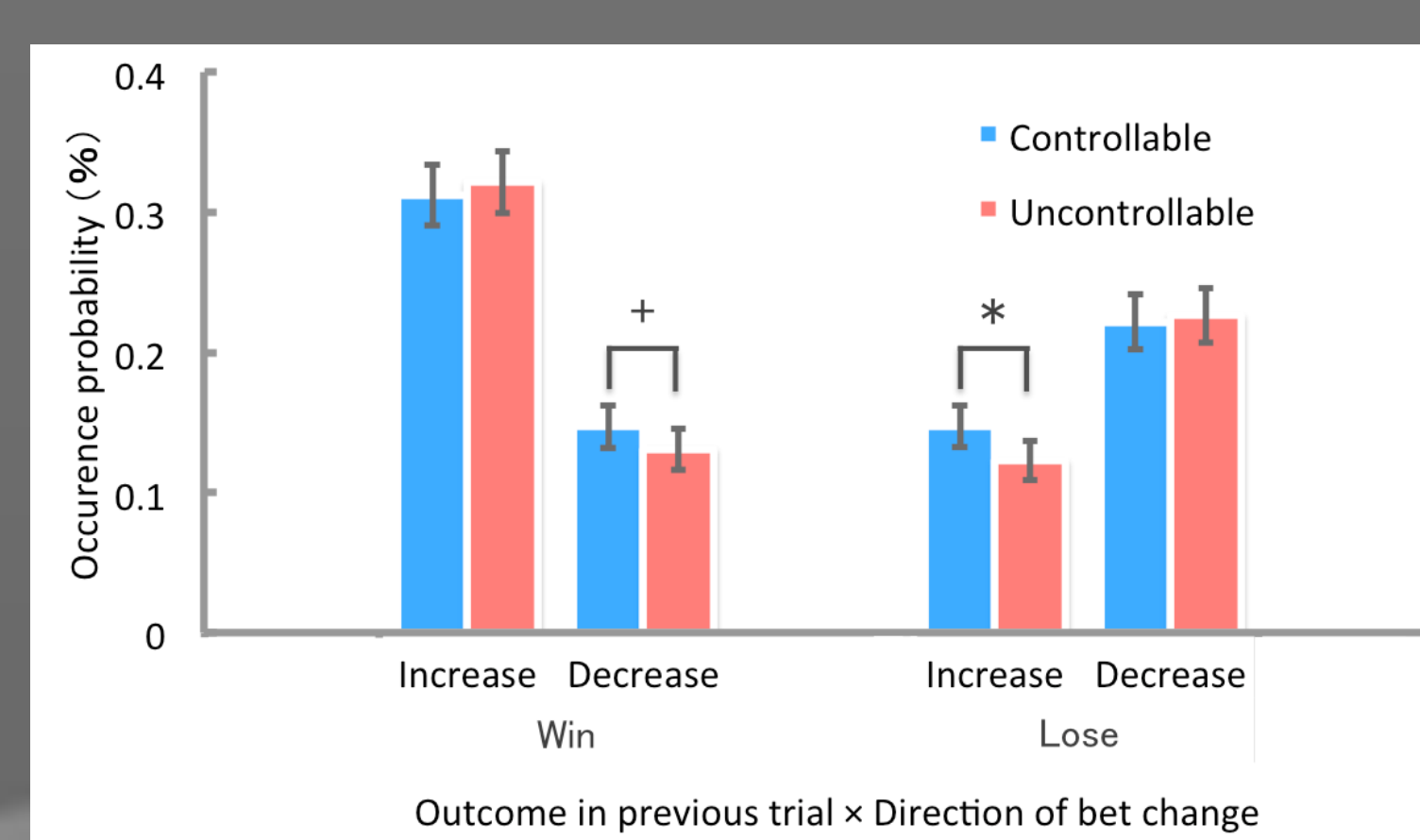
- * Sense of control didn't influence subjective estimation of reward probability regardless of condition.
- ⇔ It seems to depend on reward frequency in former part of block.



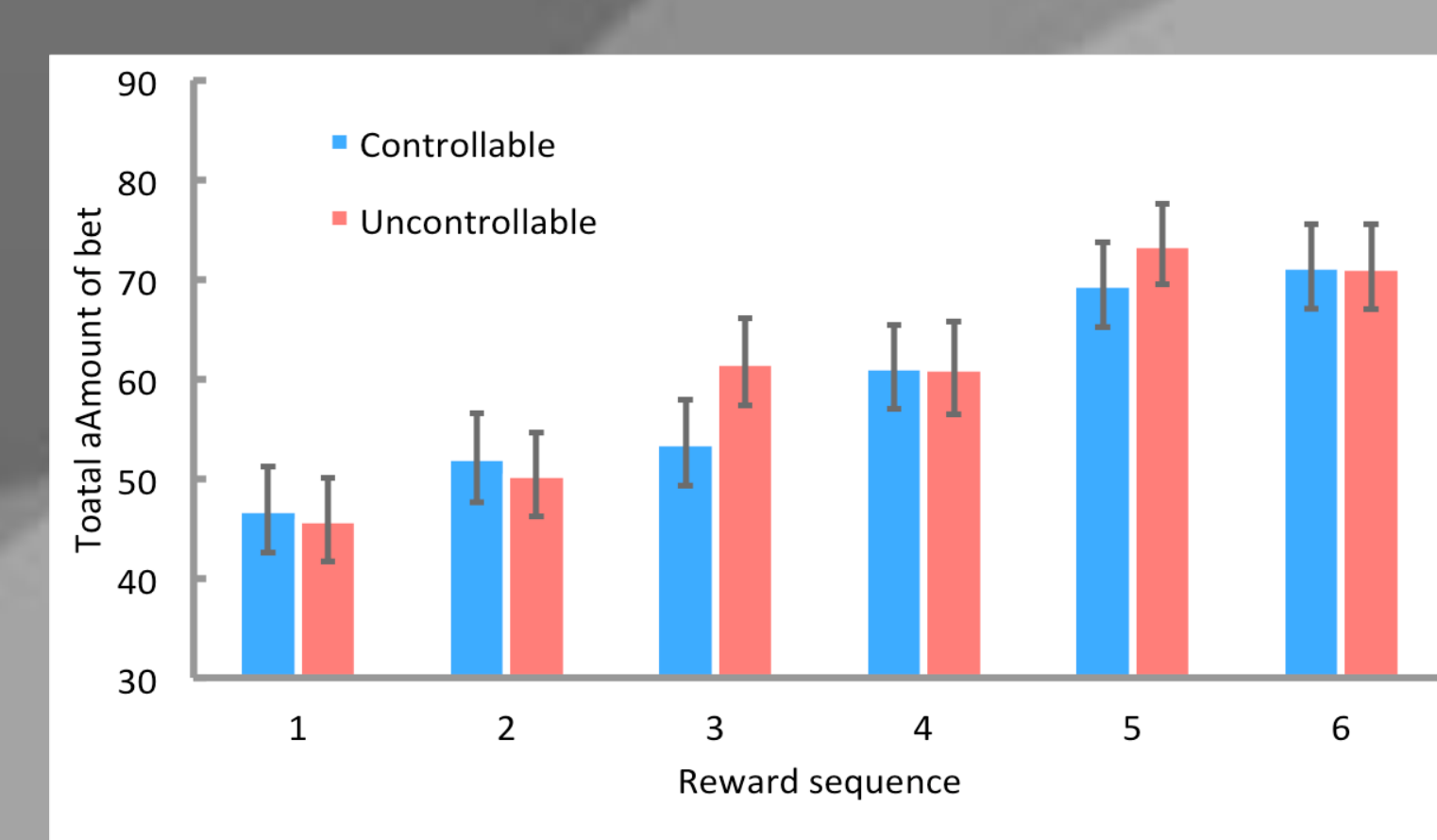
Time for deciding the bet



Amount of the change of bet



Occurrence probability of change of bet



Estimation of the number of reward cards

✓ Controllability *didn't* modulate subjective perception but behavior related to reward.

✓ Mere sense of control on choice behavior, not the practical opportunity to choose, may elicit our inadequate cognition.