Cognitive Levels and Beliefs in Games

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Iterated Reasoning

Lisa's brain: Poor predictable Bart. Always takes 'rock'.
Bart's brain: Good ol' 'rock'. Nuthin' beats that!
Bart: Rock!
Lisa: Paper.
Bart: D'oh!

p-Beauty Contest

- First used by Nagel (1995) for studying iterated reasoning.
- A group of players simultaneously choose a number within the range [0,100].
- The player that chooses the closest number to the average of all chosen numbers multiplied by a parameter *p* (usually ⅔) wins the game.

Level k and Cognitive Hierarchy Models

- The number chosen by a player depends on the number of steps of reasoning he/she is capable of doing and the expectations he/she has about the cognitive levels of other players (Agranov, 2012).
- Level 0 players choose their number randomly.
- Level k players choose a number that is the best response to the choices of level k-1 players, or a distribution of level 0 to level k-1players (Camerer et al., 2004).

Previous Research

Previous studies considered the chosen number to be an estimator of beliefs in average choices and in the choices of others. (Lahav, 2015).

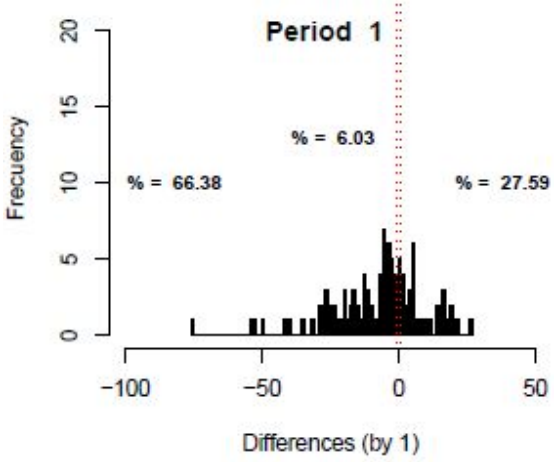
However, there is no information about the relationship between choices and beliefs.

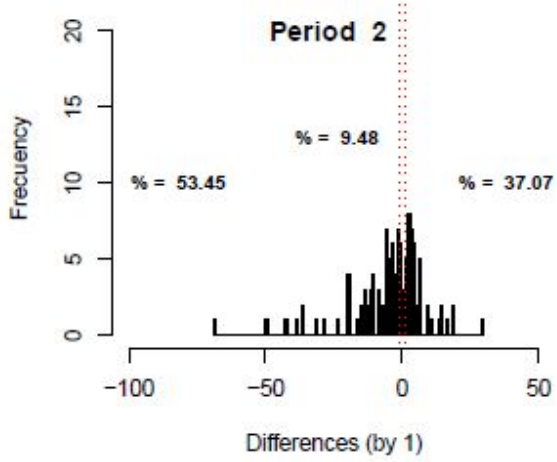
Are choices of participants consistent with their beliefs about others?

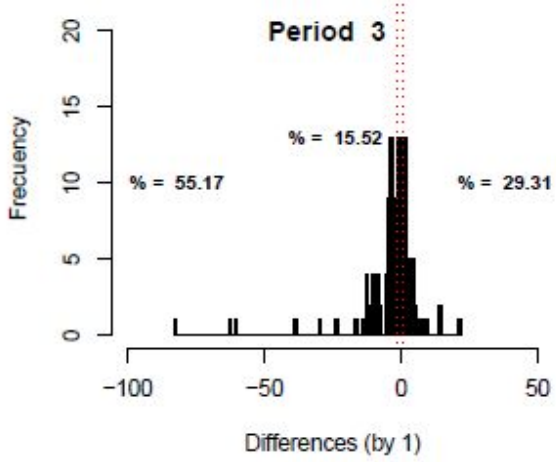
Previous Research

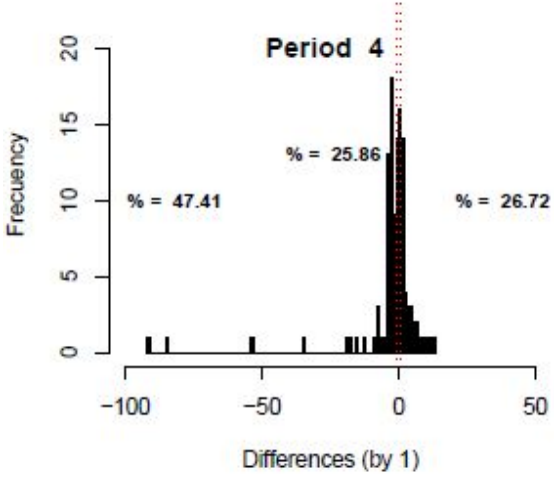
Lahav (2015) studied this by using belief elicitation. He concludes that choices do not reflect actual beliefs.

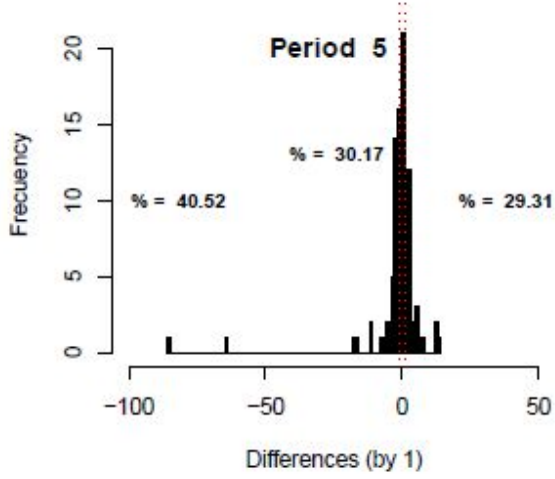
Period	Belief * 2/3	Belief
1	-3.81 (0.00)*	3.22 (0.00)*
2	-2.52 (0.01)*	3.87 (0.00)*
3	-2.42 (0.02)*	2.54 (0.01)*
4	-1.98 (0.05)*	2.12 (0.04)*
5	-1.38 (0.17)	2.44 (0.02)*

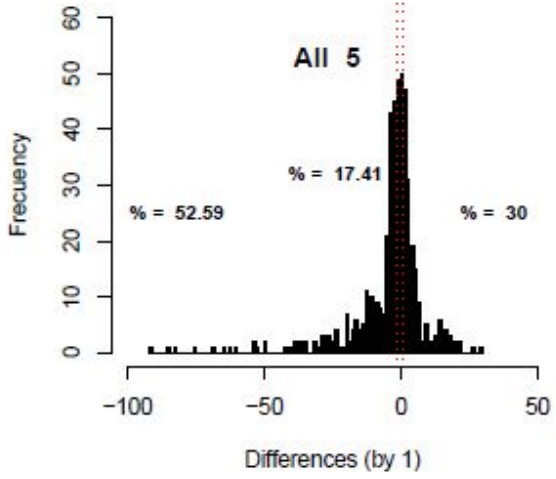

Period 1
% = 6.03
% = 66.38
% = 27.59
Frecuency
Differences (by 1)

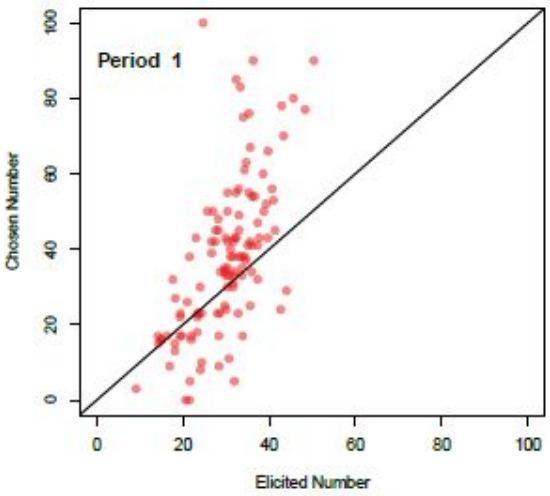

Period 2
% = 9.48
% = 53.45
% = 37.07
Frecuency
Differences (by 1)

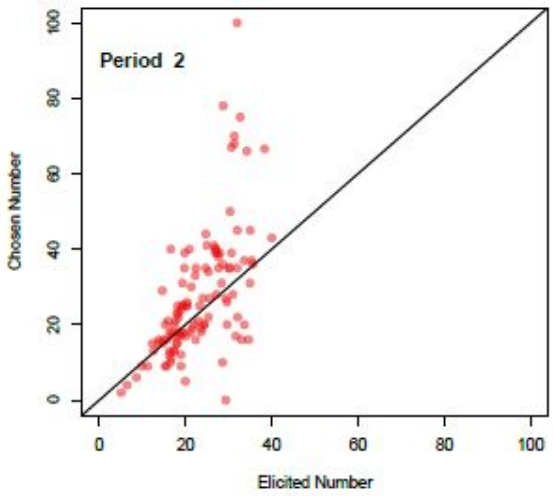

Period 3
% = 15.52
% = 55.17
% = 29.31
Frecuency
Differences (by 1)

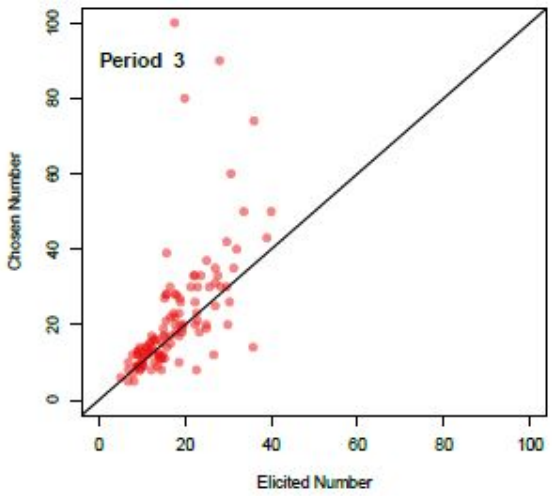

Period 4
% = 25.86
% = 47.41
% = 26.72
Frecuency
Differences (by 1)

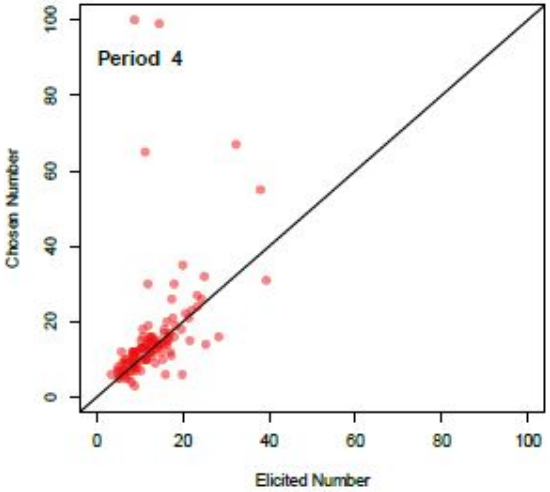

Period 5
% = 30.17
% = 40.52
% = 29.31
Frecuency
Differences (by 1)

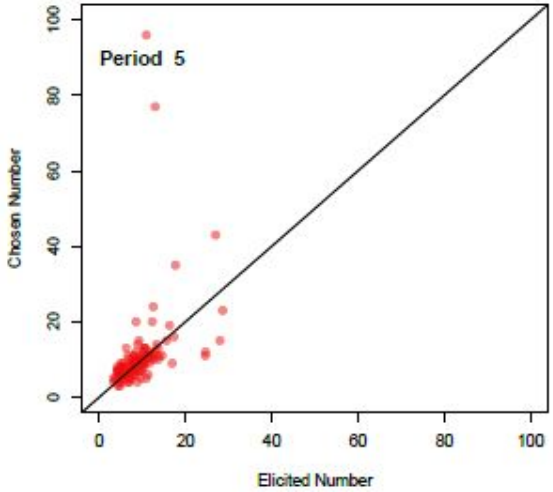

All 5
% = 17.41
% = 52.59
% = 30
Frecuency
Differences (by 1)

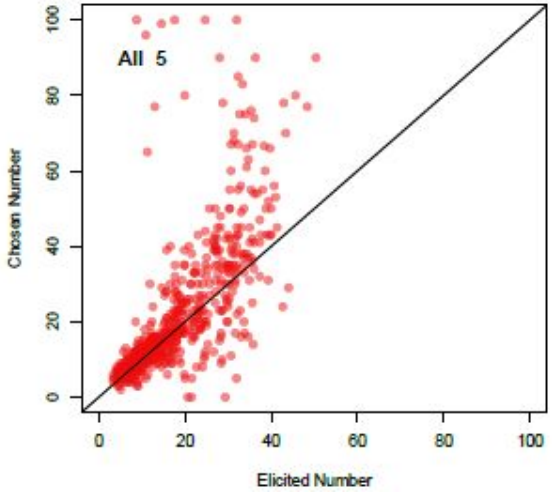

Period 1
Chosen Number
Elicited Number
0
20
40
60
80
100


Period 2
Chosen Number
Elicited Number
0
20
40
60
80
100


Period 3
Chosen Number
Elicited Number
0
20
40
60
80
100


Period 4
Chosen Number
Elicited Number
0
20
40
60
80
100


Period 5
Chosen Number
Elicited Number
0
20
40
60
80
100


All 5
Chosen Number
Elicited Number
0
20
40
60
80
100

Do inconsistencies diminish with experience?

Or is it just an effect of the tendency towards the equilibrium and the lower limit of the range of eligible numbers?

Slonim (2005) studied the effect of experience, by pairing experienced and inexperienced players in a Beauty contest game.

Slonim found a ‘reset’ effect when new players enter a game.

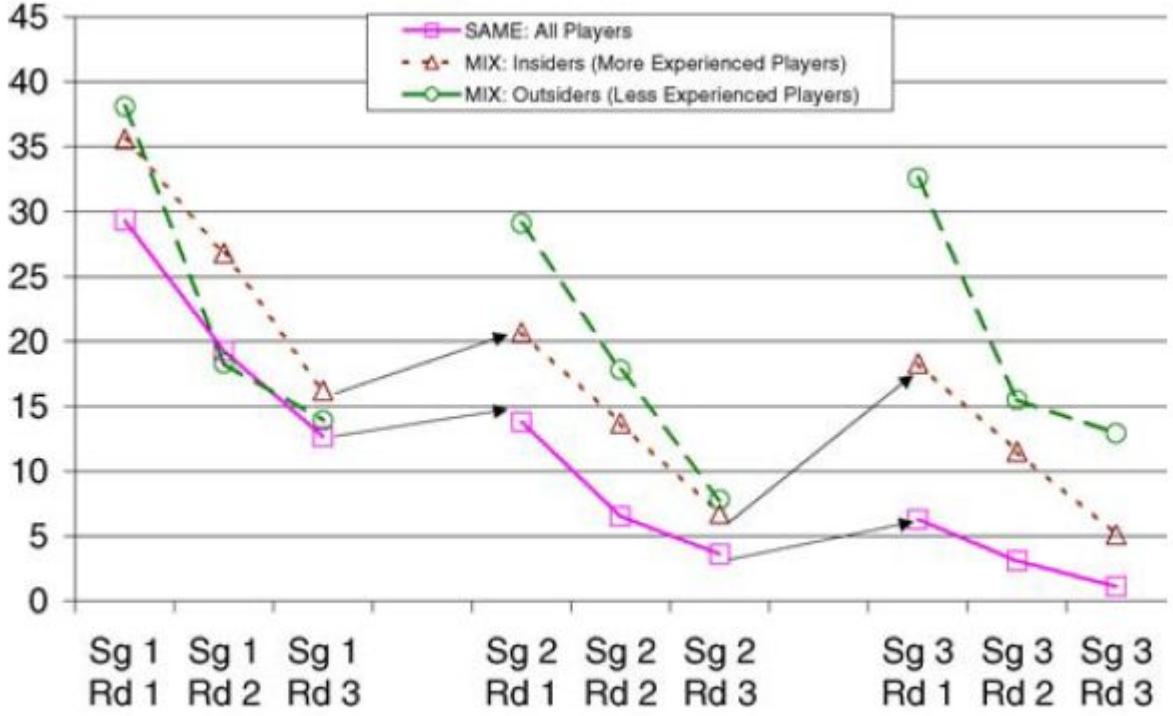


Figure 1. Average numbers chosen.

Research Questions

- Differences between choices and beliefs diminish with experience?
  - Inconsistencies between choices and beliefs will decrease for an experienced player, even when a reset effect is elicited?

- How do beliefs differ between experienced and inexperienced players?

Experimental Design

10 Sessions

Participant A
Participant B
Participant C
Participant D
Participant E

SubGame 1
4 Periods
Participant A
Participant B
Participant C

SubGame 2
4 Periods
Participant A
Participant D
Participant E

ID: S3PB	My Chosen Number:	Numbers of Other Players:
Period 1	_____	_____ & _____

Preliminary Results

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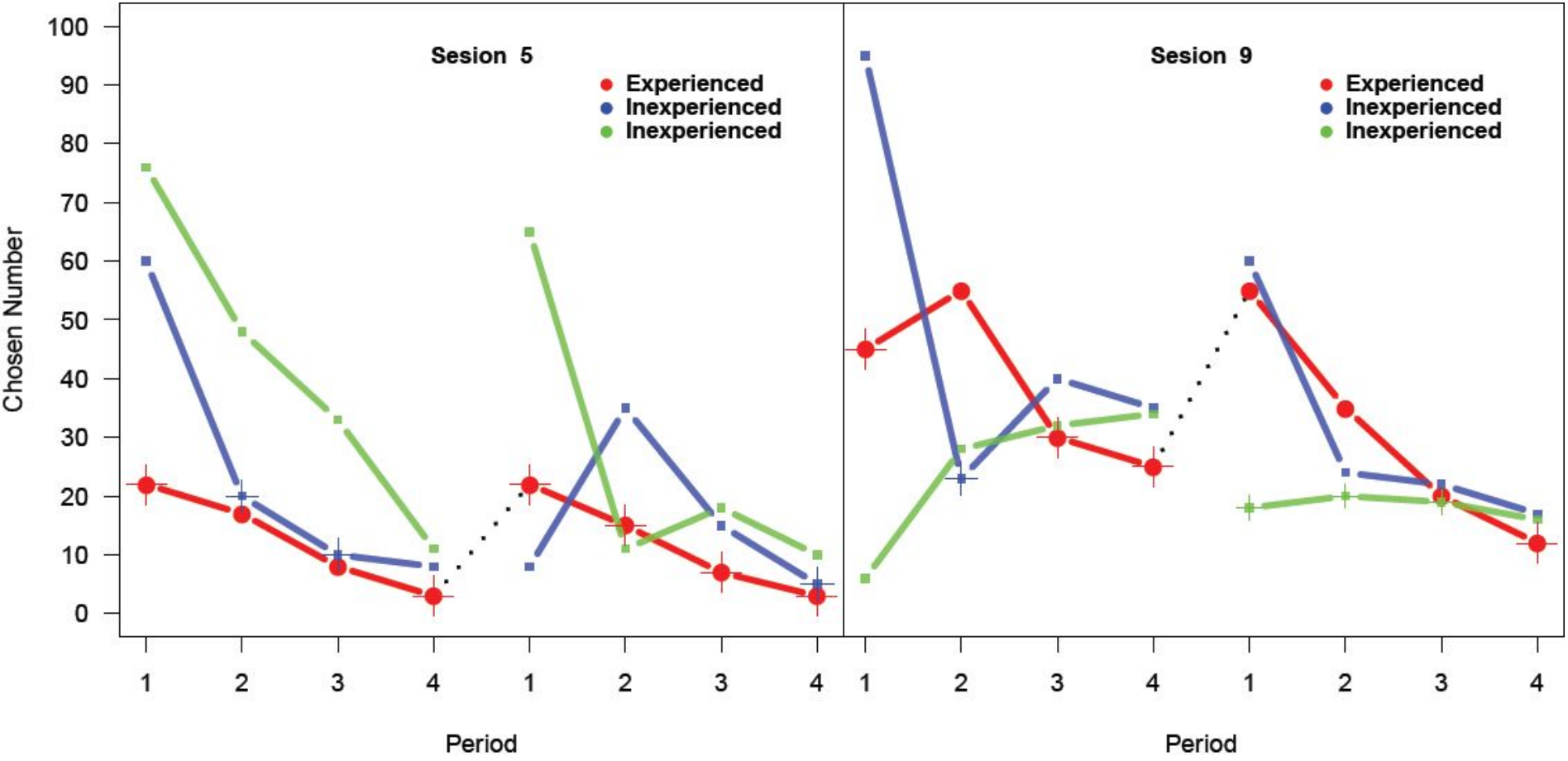
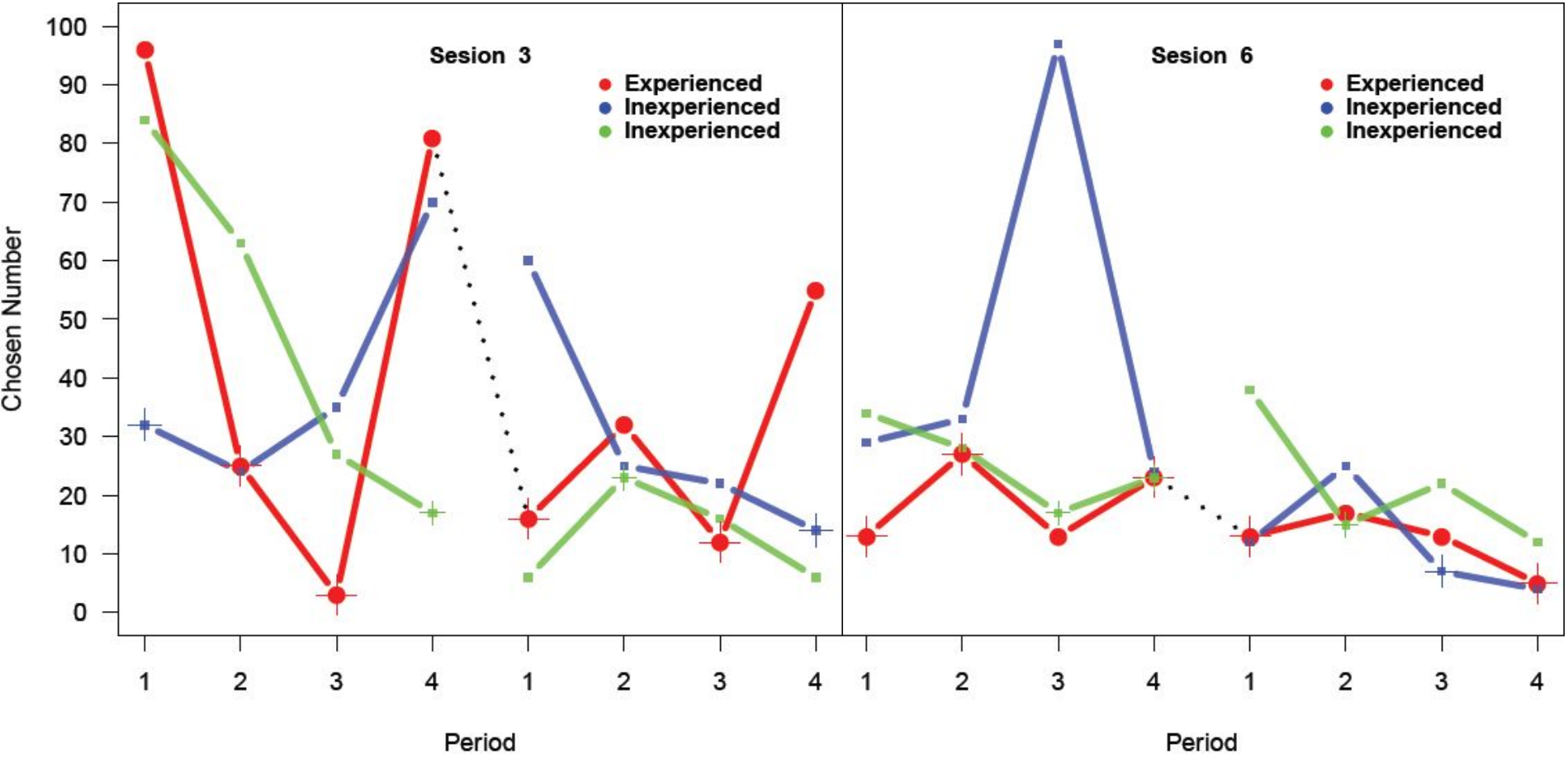
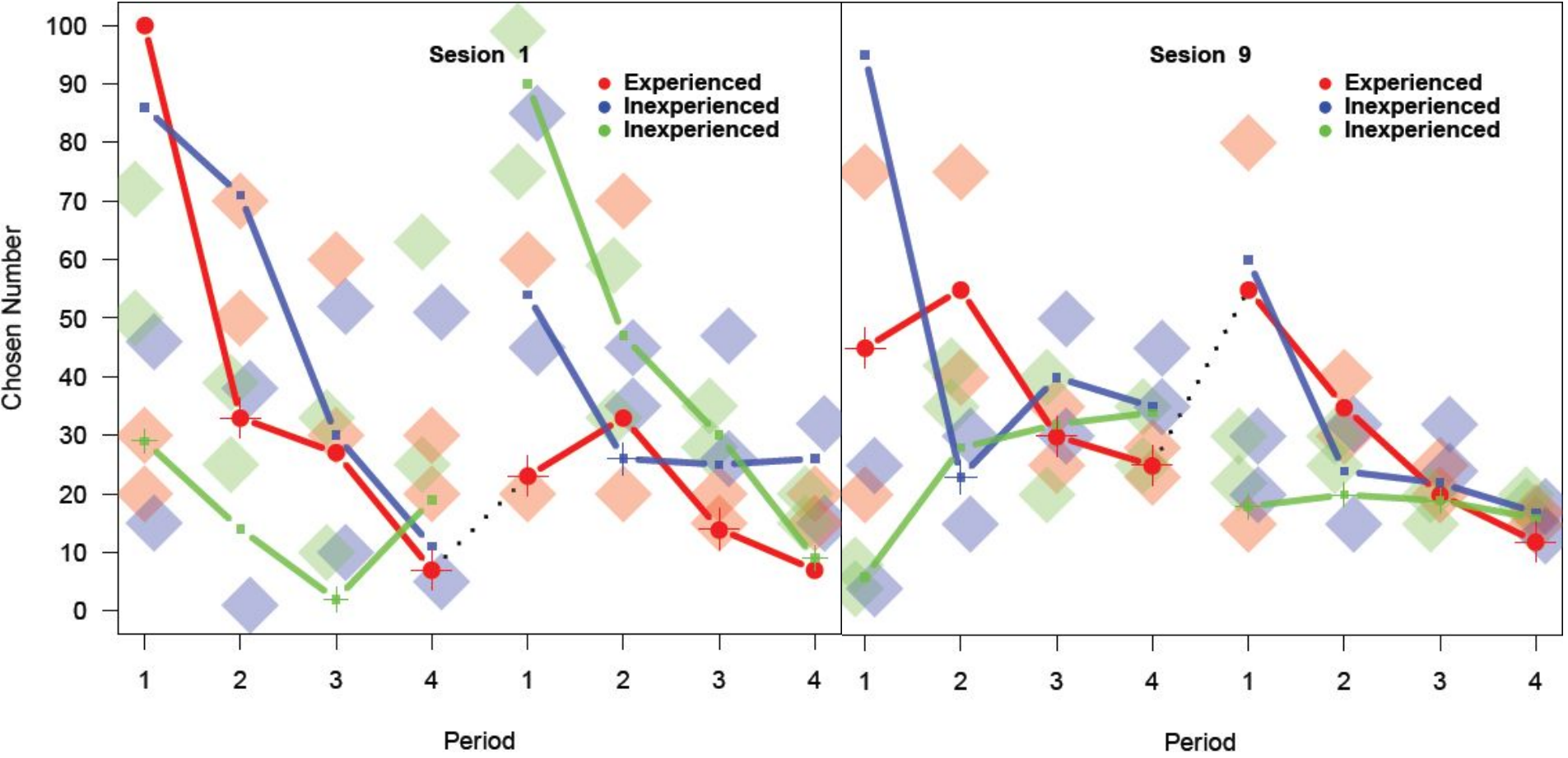
Reset effect examples



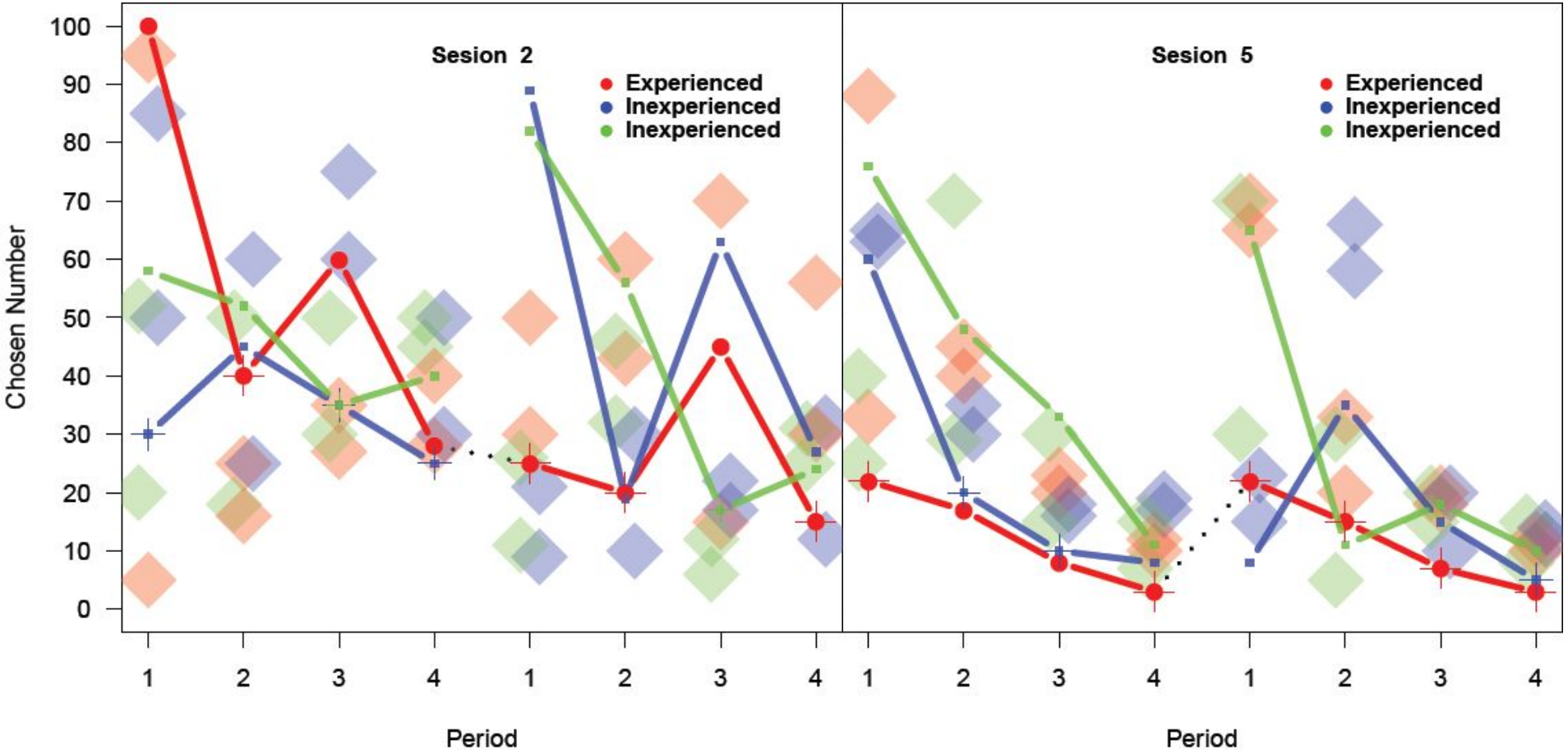
Reset effect not found



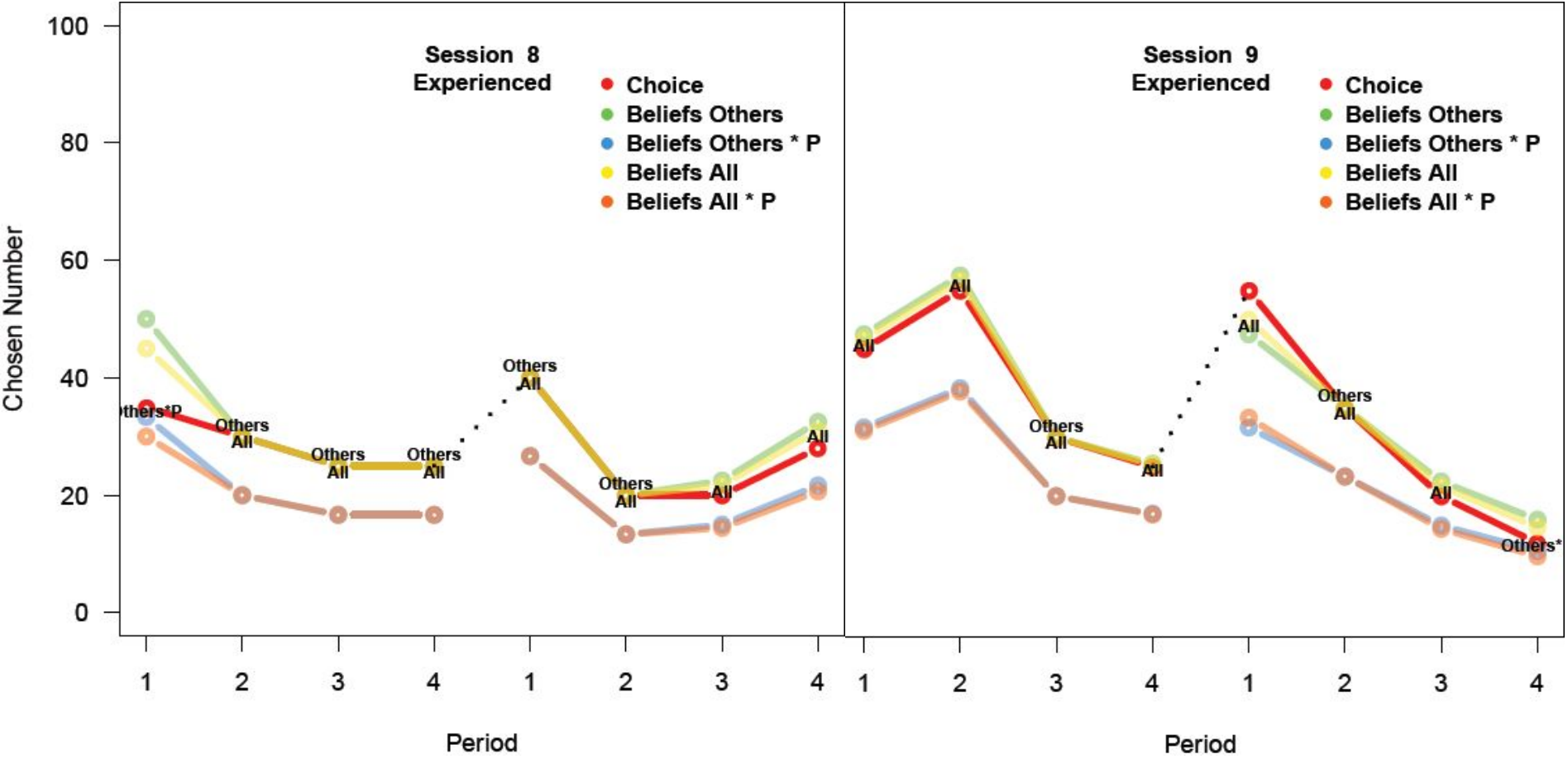
Beliefs follow Choices



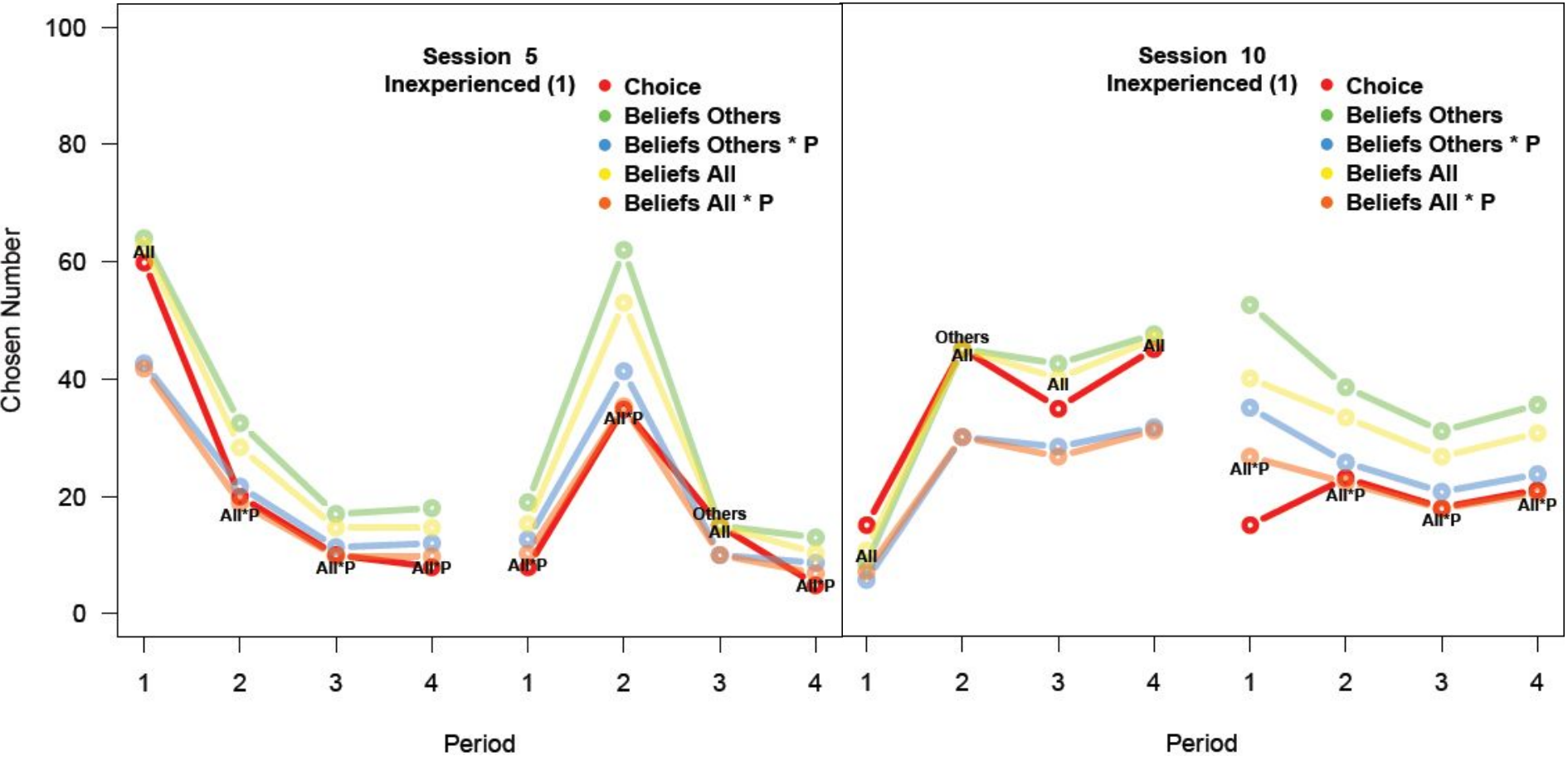
Choices in Period 1 SubGame 1 seem to affect Choices in Period 1 SubGame 2 for Experienced Players



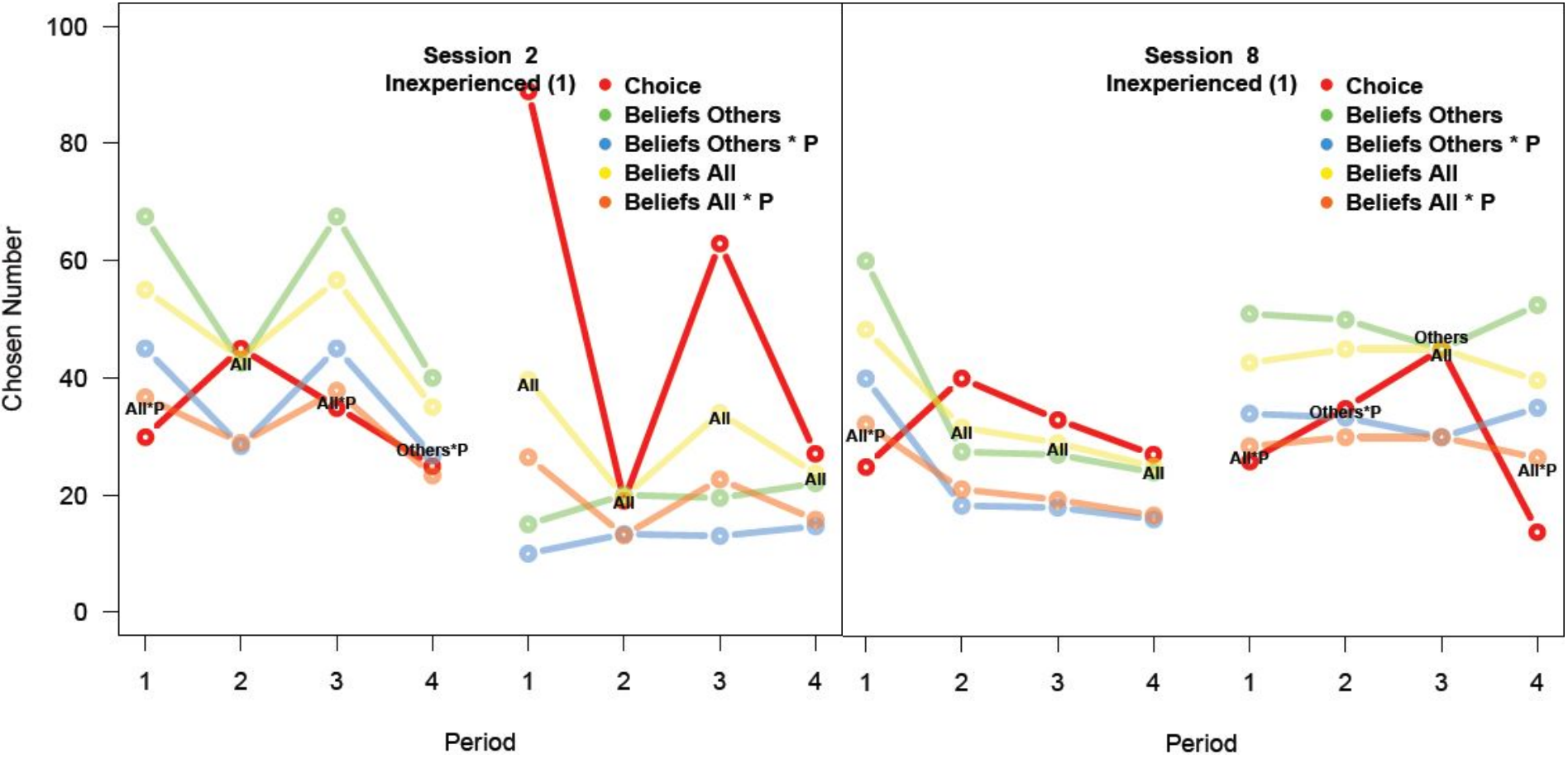
Some Players don’t consider the *P



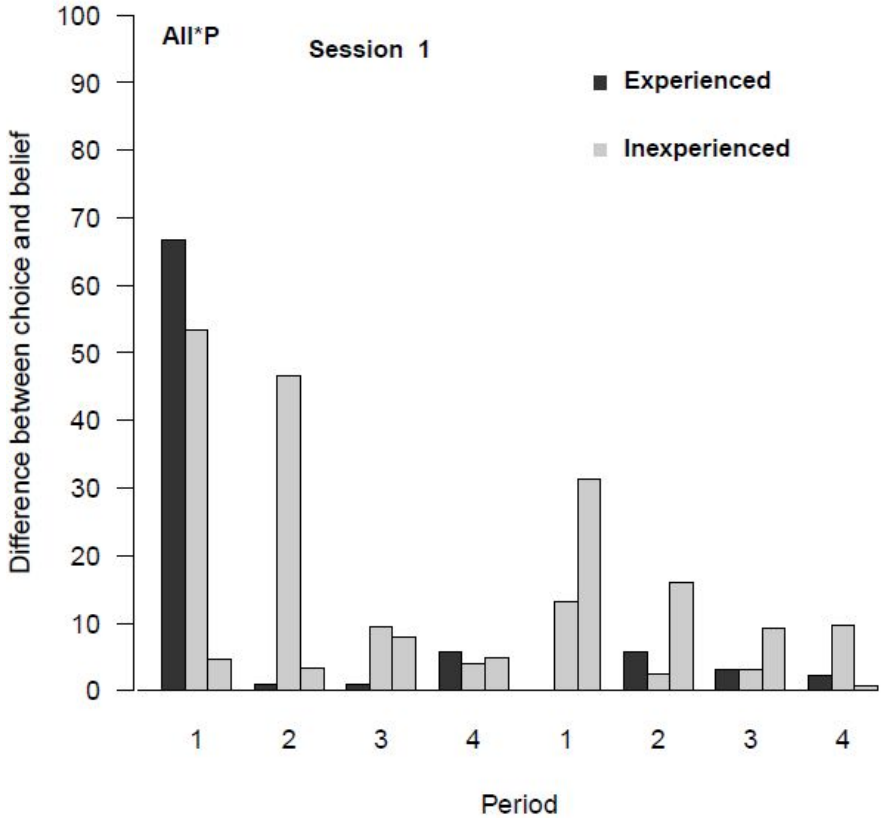
Some Players are both consistent and sophisticated

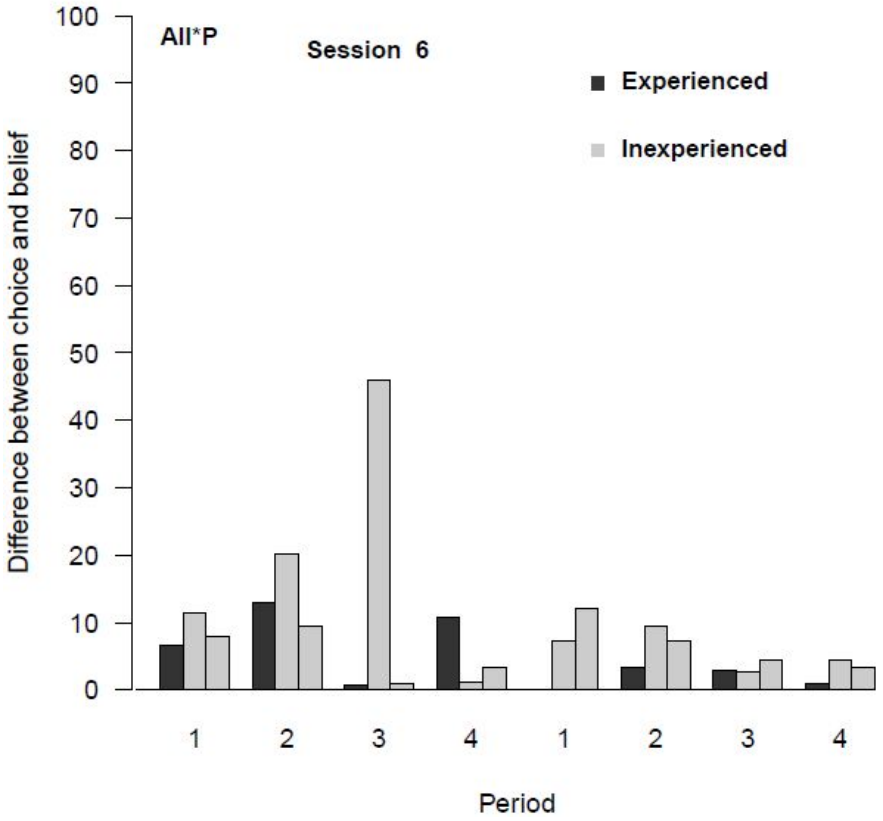


Some Players are not consistent

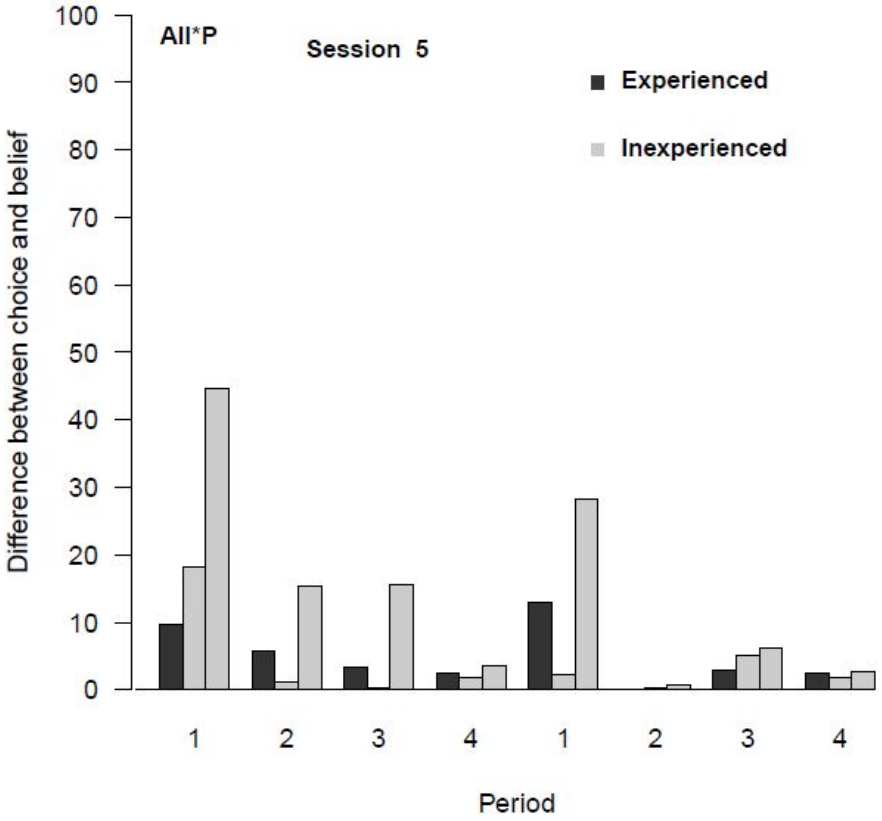


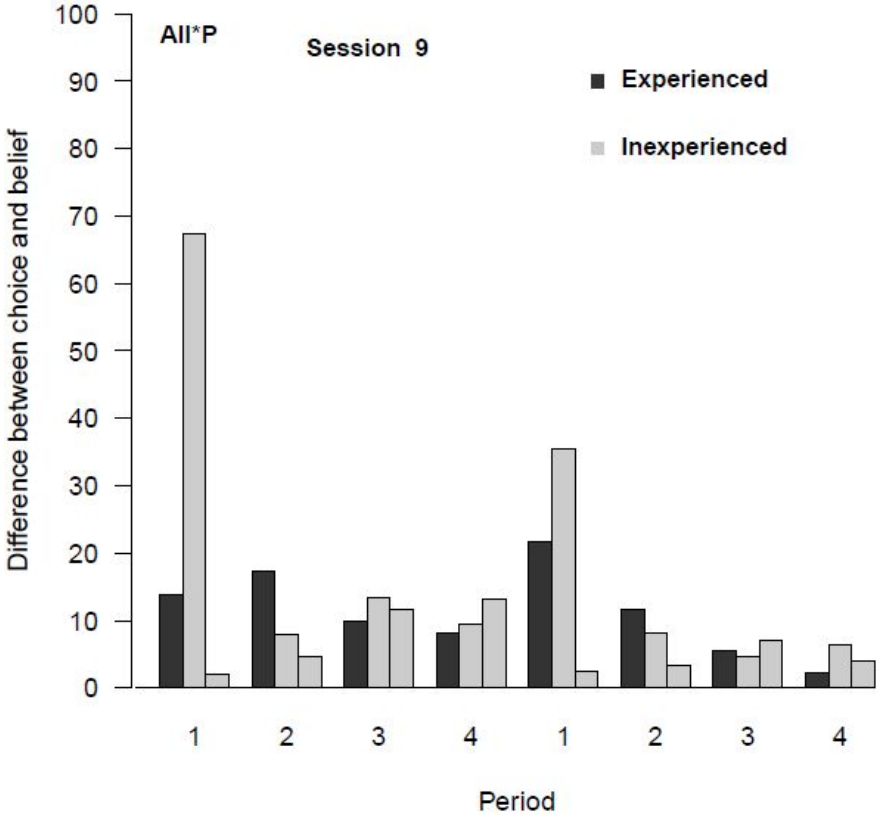
Most experienced players show reduced differences between choices and beliefs in SubGame 2.





Some experienced players don’t show reduced differences between choices and beliefs in SubGame 2.





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References

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That’s it… for now

THANK YOU