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Salience and tacit collusion

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This research is about tacit collusion, considered in abstract terms.

Question to be investigated: can salience be used to resolve tacit bargaining problems?

'Tacit bargaining problem' (:Schelling) = two (or more) players face a set of alternative payoff distributions; each of these is better for both players than the no-agreement point; but some favour one player, some another [as in Battle of the Sexes]; no communication.

Schelling's main reason for analysing tacit bargaining is modelling simplicity: he argues that many of the factors which influence tacit bargaining are operative in 'explicit' bargaining too.

But some real-world bargaining problems are tacit. Decision-making within illegal cartels may be an example.

Schelling argues that tacit bargaining problems are typically resolved by players converging on a focal point, i.e. an equilibrium that is distinguished by its prominence or salience.

Salience may depend on features of games that conventional game theory treats as irrelevant labelling. Schelling argues that game-theoretic 'bargaining solutions' (e.g. Nash bargaining solution) are just equilibria that happen to be salient to game theorists – so we shouldn't expect these solutions to predict behaviour of ordinary people, even people who are very rational (in a pragmatic sense).

Schelling's hypothesis wasn't new in 1960.

Hume, Treatise of Human Nature, 1740:

Hume argued that disputes over possession of goods are resolved by appeal to associations of ideas, especially association between claimant and object (first possession, long possession, 'contiguity' ['closeness']) and between unowned object and owned object ('accession').

Suppose a *German*, a *Frenchman*, and a *Spaniard* to come into a room, where there are plac'd upon the table three bottles of wine, *Rheinish*, *Burgundy*, and *Port*; and suppose they shou'd fall a quarelling about the division of them; a person, who was chosen for umpire, wou'd naturally, to shew his impartiality, give every one the product of his own country: And this from a principle, which, in some measure, is the source of those laws of nature, that ascribe orioperty to occupation, prescription and accession (509- 510).

However, very little experimental evidence on effects of salience in tacit bargaining games. Most research on salience has focused on pure coordination games.

Schelling treats pure coordination games as simple models for investigating factors which (he thinks) influence tacit bargaining problems too.

But do they?

I'll review two experimental investigations which seem to point in opposite directions, then tell you what 'our' research group (Andrea Isoni, Anders Poulsen, Kei Tsutsui, me) is doing to try to resolve the issue.

1. An experiment done at UEA many years ago: Judith Mehta, Chris Starmer and Robert Sugden, AER 1994.

2. An experiment by Crawford, Gneezy and Rottenstreich, AER 2008.

Our AER 1994 experiment

The first (?) attempt to replicate Schelling's 'informal' experiments in a controlled setting, with incentives.

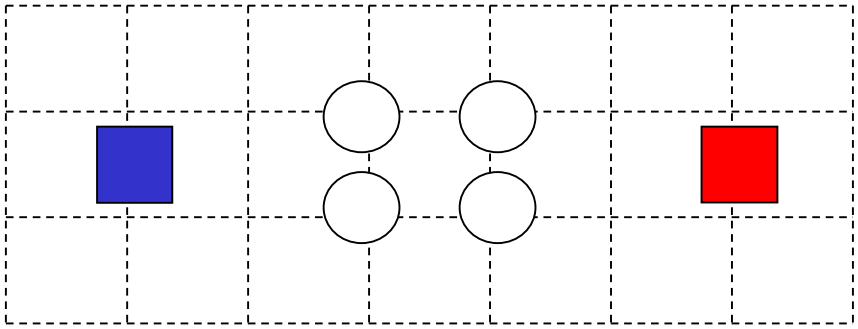
A set of 20 pure coordination games, presented in two treatments:

Coordination: as in Schelling's games: two players simultaneously face the same task (e.g. 'name any British town or city'); they are rewarded for giving the same answer.

Picking: same task, but instruction is: 'We are conducting a survey ... You may respond to these questions in any way you wish.'

Point of the picking treatment is is to find out how much coordination is explained by 'primary salience', i.e. correlation between unthinking responses of different individuals.

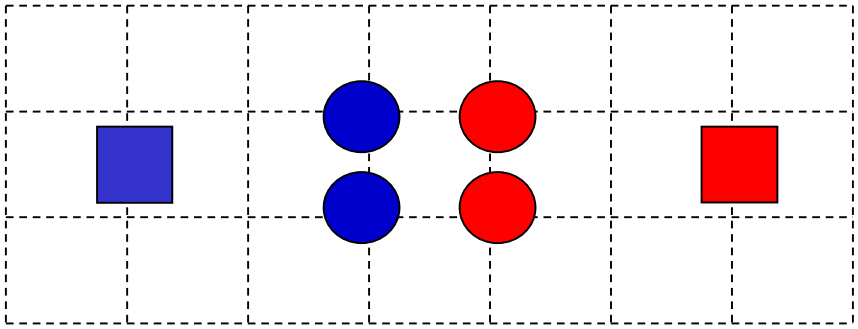
We included some questions which we thought might evoke forms of salience that would be relevant to bargaining problems – even though these questions were presented as pure coordination games.



Coordination treatment: 'You must assign each circle to one or other of the squares. You will score a point if this assignment is exactly the same as the other person's.'

Picking treatment: 'You must assign each circle to one or other of the squares' [with no effect on payoff]

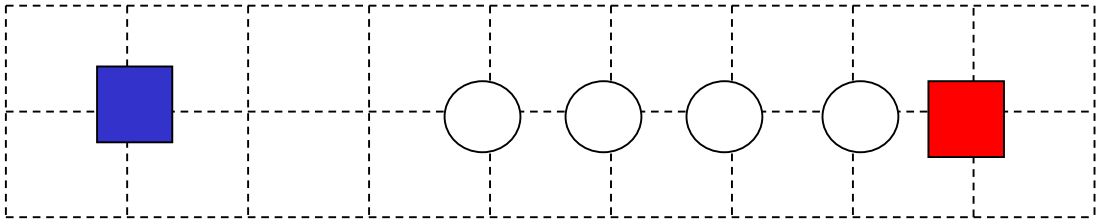
Our thought: this display may evoke ideas relevant to problem of dividing valuable objects between claimants.



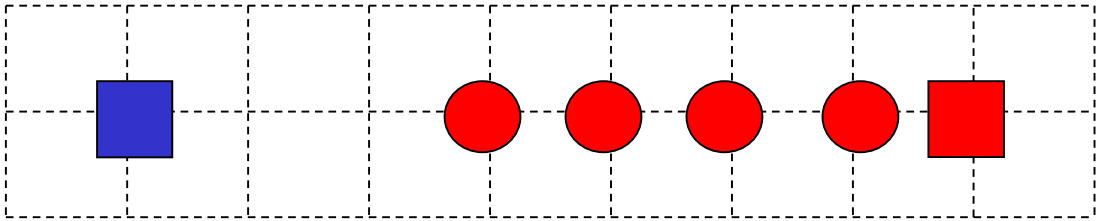
Coordination treatment: 67% per cent chose this assignment (= closeness + equality).

Picking treatment: 31% chose this.

[16 possible responses.]

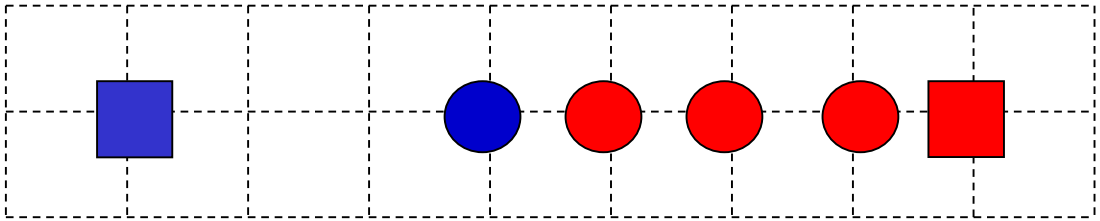


A more difficult task ...



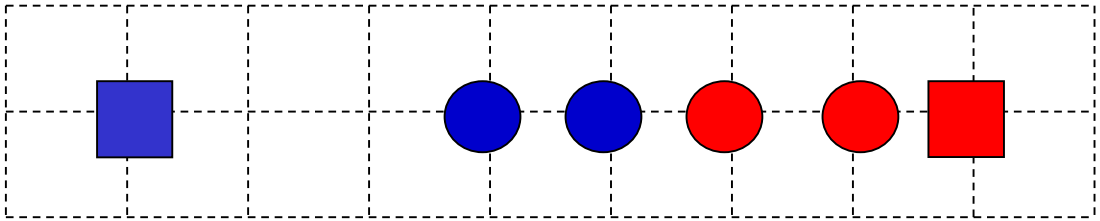
Coordination treatment: 29% chose this (= accession).

(Picking treatment: 13%.)



Coordination treatment: 26% chose this (= closeness).

(Picking treatment: 30%.)



Coordination treatment: 21% chose this (= equality, with closeness as tie-breaker).

(Picking treatment: 9%.)

[Note: there are 16 possible responses; the three most common responses (accession, closeness, equality) collect 76% of coordinators' responses.]

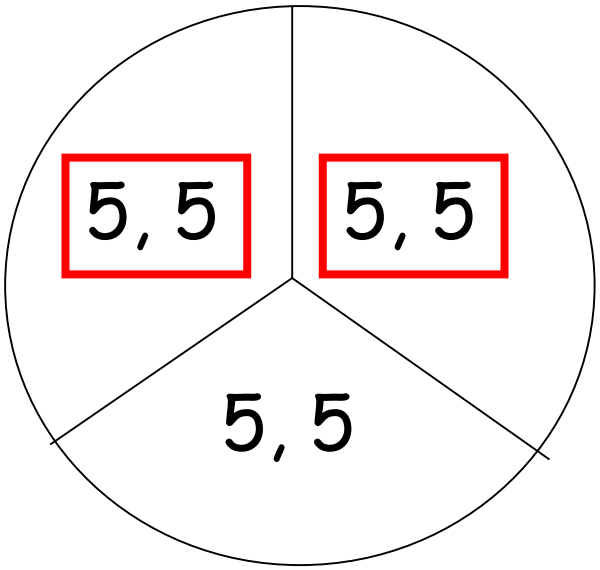
Implication of these (and other tasks in the experiment): when 'assign objects to claimants' problems are presented as pure coordination games, players use principles of salience that are potentially relevant to tacit bargaining problems (equality, closeness, accession).

But: we don't know whether these principles would be used in games that really were tacit bargaining problems.

Crawford et al: the title of their paper tells you what they found:

'The power of focal points is limited: even minute payoff asymmetry may yield large coordination failures'.

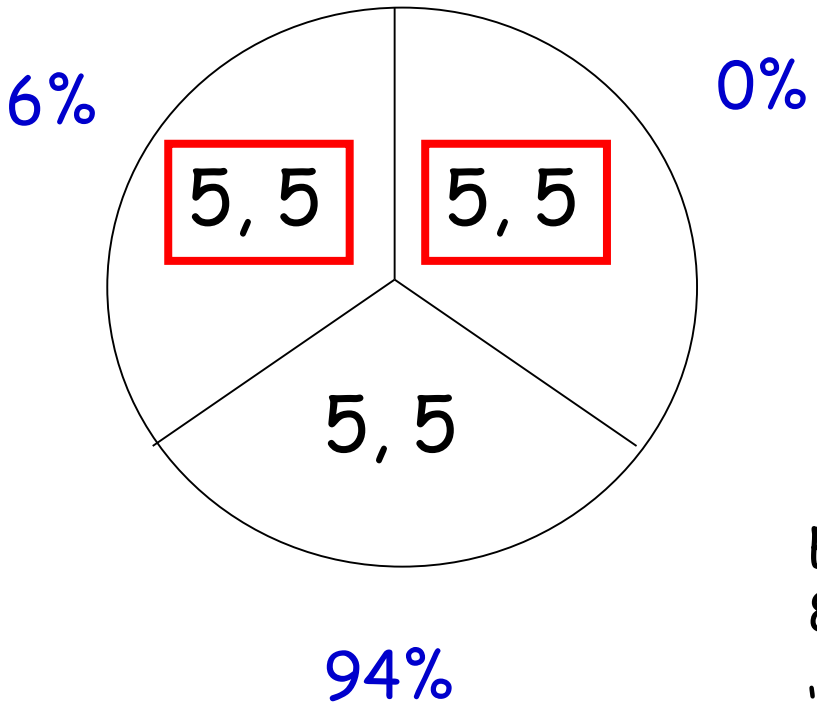
Crawford, Gneezy and Rottenstreich (AER, 2008): symmetrical pie game



(In experiment, whole slice shaded or unshaded.)

Instruction: You are player 1 [first payoff; or player 2: second payoff]. Choose a slice. If both players choose the same slice, you get the payoffs shown on the slice; otherwise, you both get nothing.

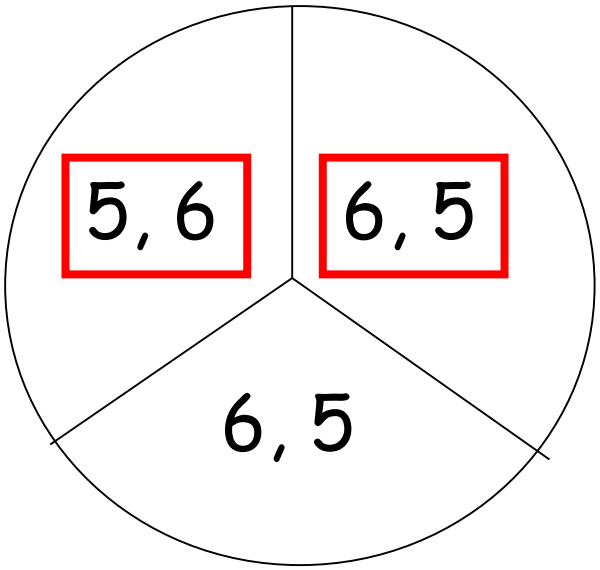
symmetrical pie game:



Expected coordination rate: 89%

'Odd one out' rule used to coordinate.

assymmetrical pie game

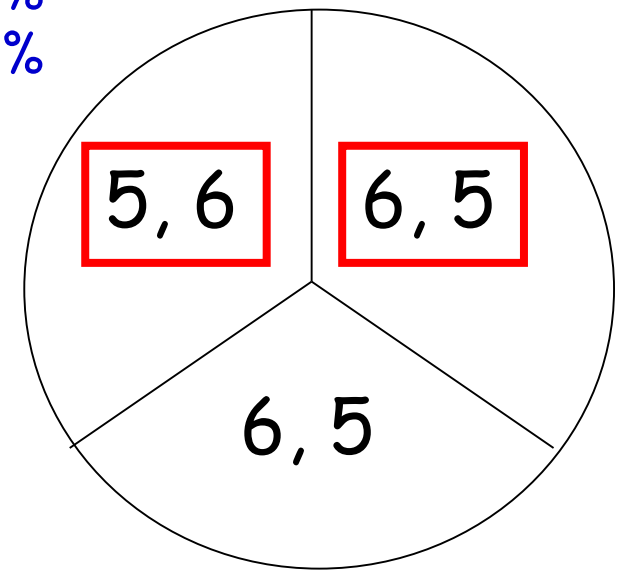


(In experiment, whole slice shaded or unshaded.)

Instruction: You are player 1 [first payoff; or player 2: second payoff]. Choose a slice. If both players choose the same slice, you get the payoffs shown on the slice; otherwise, you both get nothing.

asymmetrical pie game:

Player 1: 53%
Player 2: 21%



Player 1: 16%
Player 2: 33%

Player 1: 32%
Player 2: 46%

Expected coordination rate: 31%

Notice tendency to choose 5 – this produces discoordinaton.

Implication: pure coordination games are resolved effectively by salience; but salience is not used in tacit bargaining games (resulting in lack of coordination).

Intuitively: asymmetry in payoffs diverts players' attention from salience.

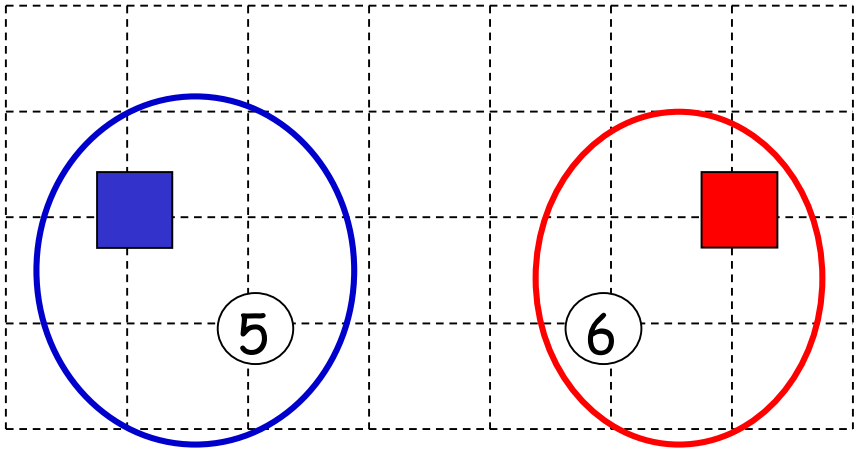
[Crawford et al explain this by adapting cognitive hierarchy theory.]

Our plans for a new experiment

Main idea: to use the 'circles and squares' display of the 1994 AER paper, but with the payoff structure of a tacit bargaining game.

Our hunch (following Hume): in tacit bargaining games, the most salient solutions evoke associations between claimants and objects (rather than giving salient labels to payoff distributions, as in Crawford et al).

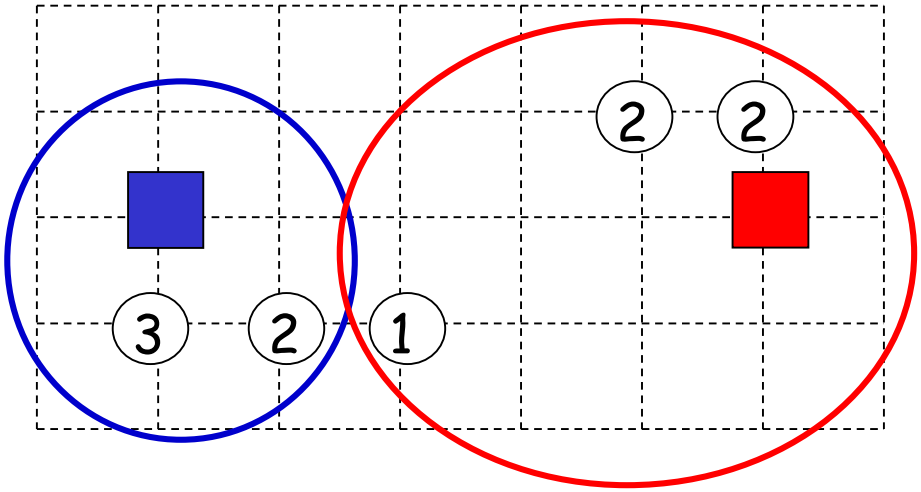
A tacit bargaining game with same payoff structure (after elimination of dominated strategies) as Crawford et al's game:



Instruction: You are Blue [Red]. Claim as many discs as you like by 'lassoing' them to your square. If no disc is claimed by both players, you will each be paid the value of the discs you have claimed; otherwise, you both get nothing.

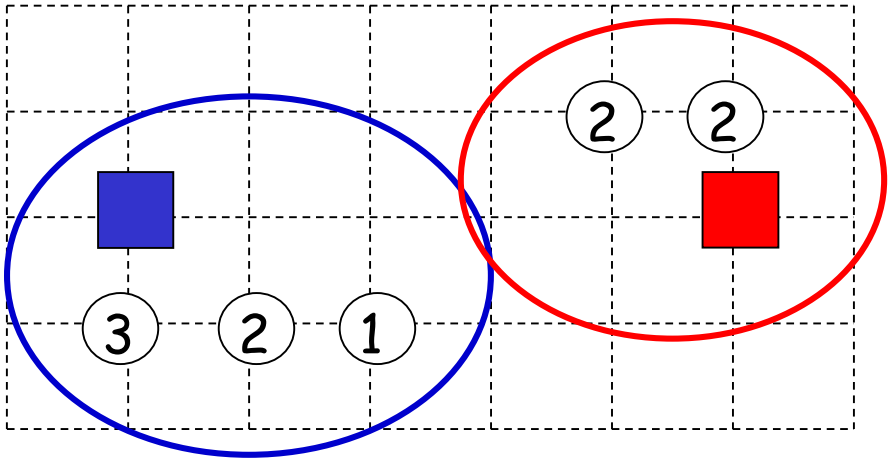
What players might do ...

Another game with the same rules ...



Here any integer division of 10 is possible.

E.g. equal division (with closeness as tie-breaker) ....

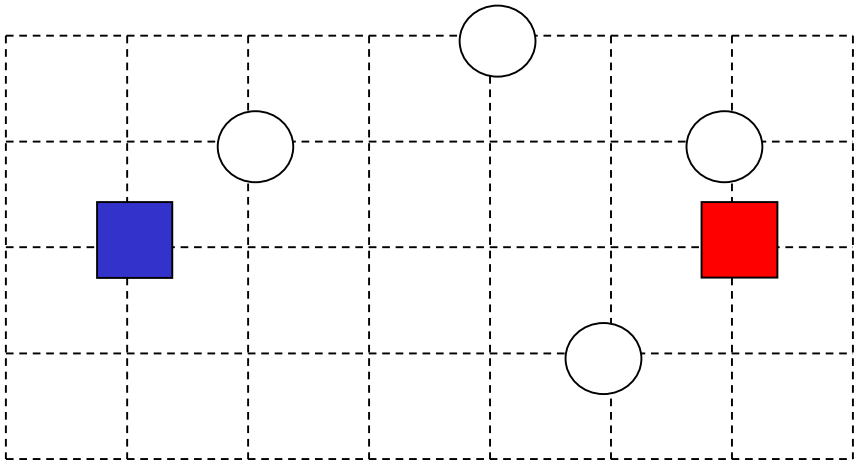


... or unequal division suggested by closeness and accession.

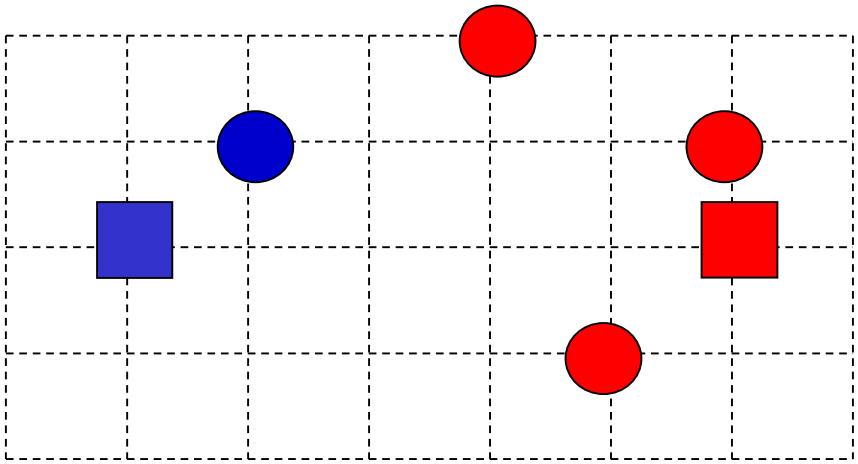
My expectation is that spatial concepts of salience will be used in these games, and will sometimes trump payoff-based principles (especially equality of payoff).

Mixed signals from pilot experiments – we must wait and see what happens when we run the experiments for real ...

Thank you for listening.

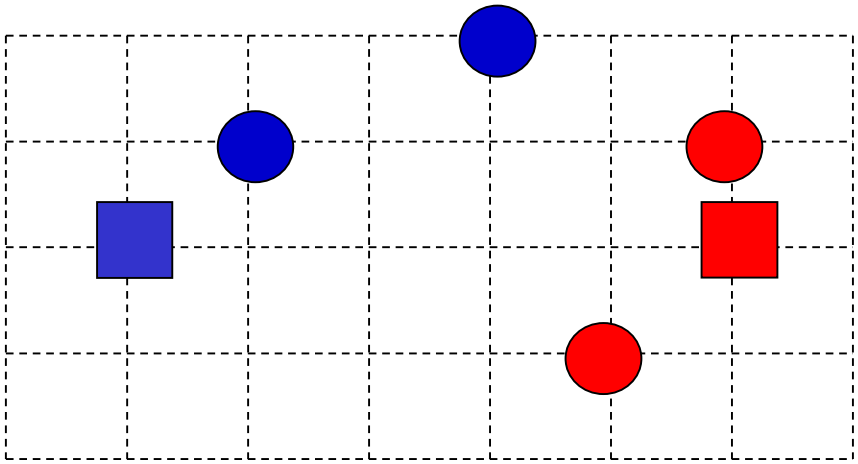


A more difficult task with the same rules.



Coordination treatment: 41% chose this (= closeness).

(Picking treatment: 26%.)



Coordination treatment: 32% chose this (= equality, with closeness as tie-breaker).

(Picking treatment: 14%.)

Cognitive hierarchy theory

'Level 0' players 'choose the salient' – interpreted as best payoff to them, or odd one out as tie-breaker.

'Level 1' players choose best replies to level 0.

'Level 2' players choose best replies to level 1.

Most common level = 1, followed by 2.

In symmetrical games, everyone chooses the odd one out (so 100% coordination).

In asymmetrical games, level 1 players choose 5, level 2 players choose 6 (so low rate of coordination, with most common choice = 5).