[Magic Stones] Plots for Experiment 1

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1 Participant data

1.1 Raw data

(a) To the same shape

(b) To the same color

(c) To the same object

(d) To a different shape

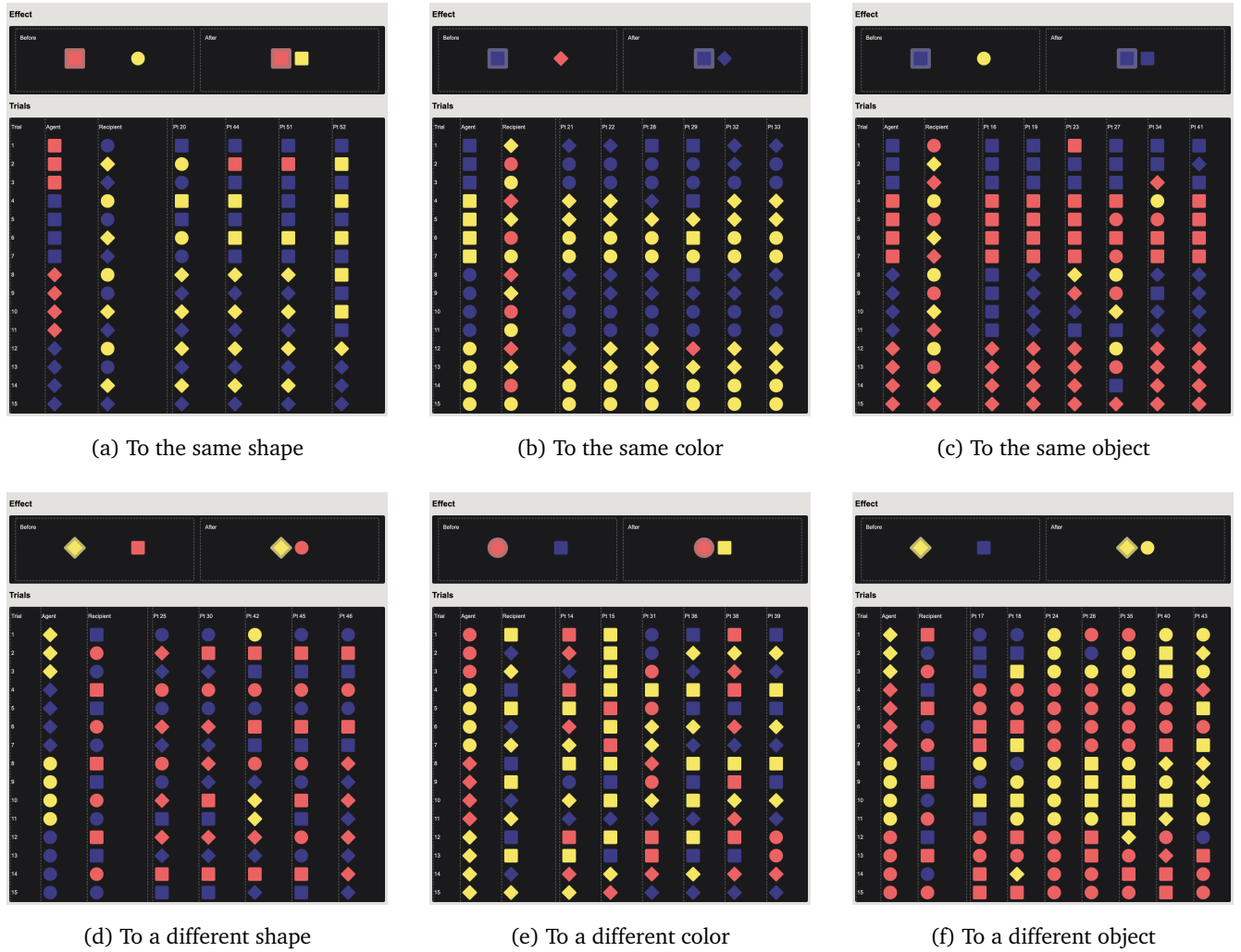(e) To a different color

(f) To a different object

Figure 1: Participant data per group per trial. Each figure is for one group - at the top is a summary of the magic effect participants watched, and below is a complete visualization of participant selections. In the selection part, each row is for one trial: the first two icons are the magic stone and normal stone that a participant is asked to make a prediction for, and the rest are participant selections.

Obviously, generalizations are not random, as shown in Figure 2. Take the third column from left for example, a dominant selection can be observed across 15 trials.

Figure 2: Participant raw selections summary. Each row is for one trial, and each column is for one task. For each sub-figure, y-axis is percentage, and x-axis from left to right is: bc, bd, bs, rc, rd, rs, yc, yd, ys.

If we plot each participant selection relative to the agent stone and recipient stone in that generalization task, the uniformity of generalization is even clearer. In the last raw of Figure 3, almost everyone made a same choice across 6 different learning tasks.
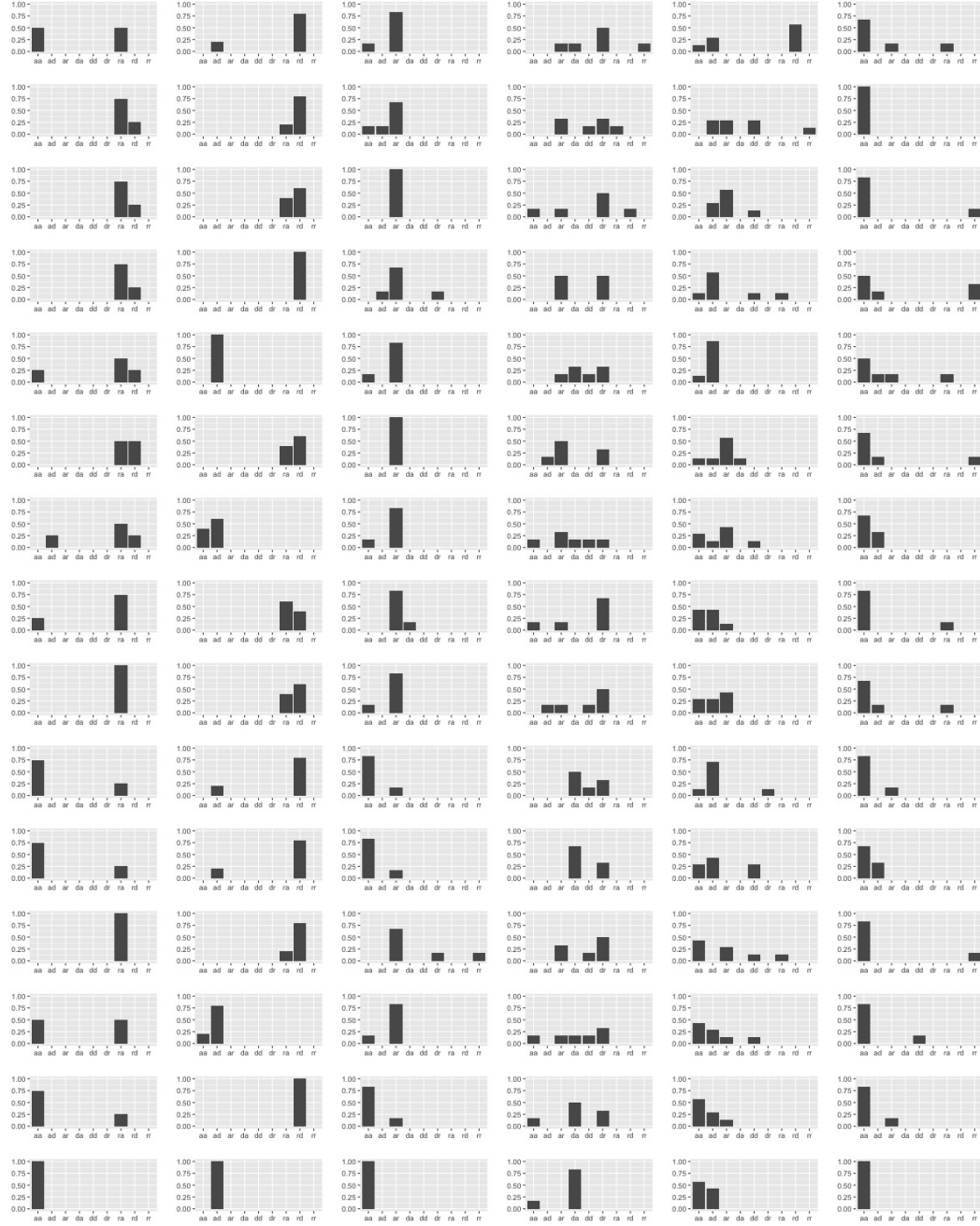

Figure 3: Relative selections summary. Each row is for one trial, and each column is for one task. For each sub-figure, y-axis is percentage, and x-axis from left to right is: aa, ad, ar, da, dd, dr, ra, rd, rr.

1.2 Aggregated by relative selection

Between-subject aggregation shows that different learning tasks induce different generalization patterns, as illustrated by Figure 4.
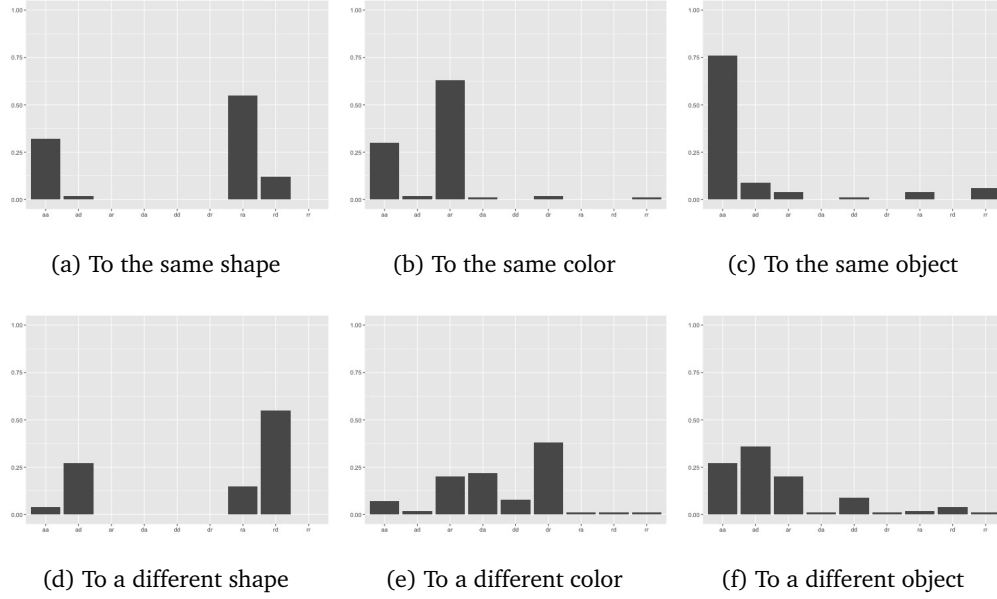

(a) To the same shape

(b) To the same color

(c) To the same object

(d) To a different shape

(e) To a different color

(f) To a different object

Figure 4: Aggregated relative selections per task. For each sub-figure, y-axis is percentage, and x-axis from left to right is: aa, ad, ar, da, dd, dr, ra, rd, rr.

Aggregation by trials (within-subject) emphasizes that while the generalization scenario further differs from the learning scenario, participants tend to make a more similar decision.
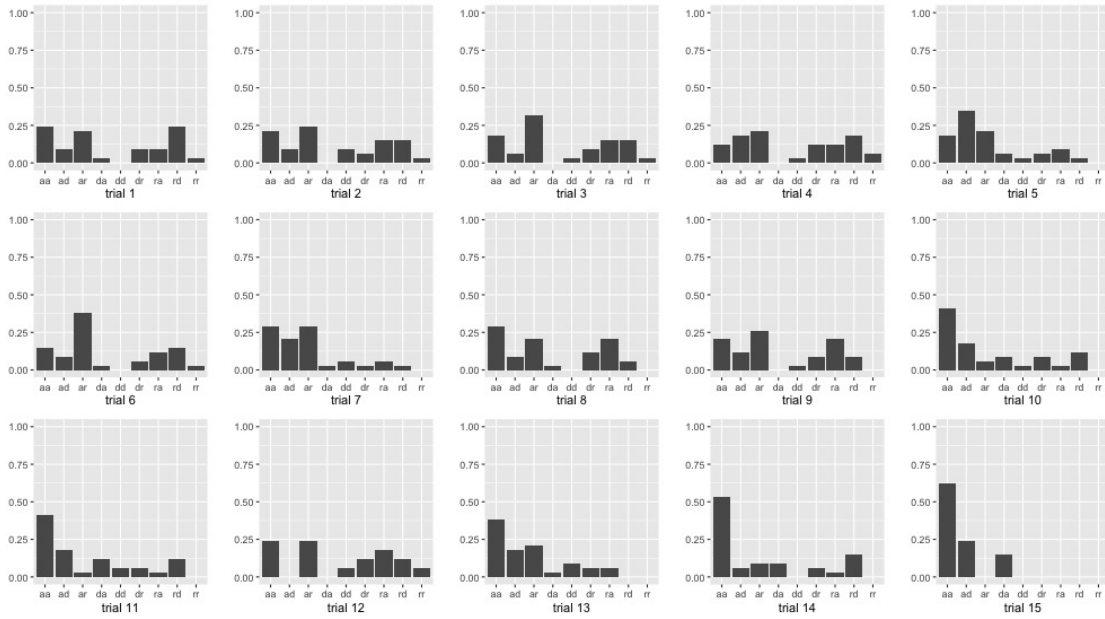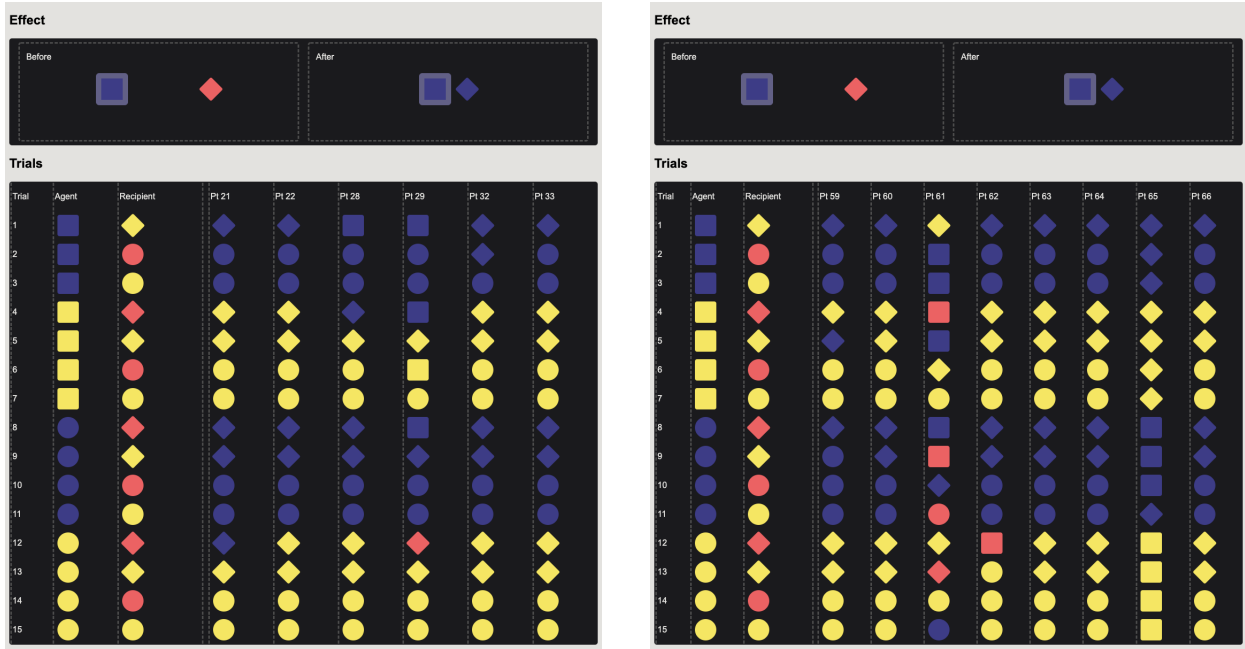

Figure 5: Aggregated relative selections per trial. For each sub-figure, y-axis is percentage, and x-axis from left to right is: aa, ad, ar, da, dd, dr, ra, rd, rr.

1.3 Order effects? Not really

Comparing a randomized sequence of trials and ordered sequence of trials shows no significant difference.

(a) Task 3 ordered. (b) Task 3 randomized.

Figure 6: Order does not effect generalization predictions.

2 Normative model simulations

2.1 Raw simulations

Different from the participant data, the normative model is more uncertain when the generalization scenario differs more from the learning task, as shown in the last few columns in Figure 7. In the same situation, humans tend to concentrate on one selection instead of choosing randomly.
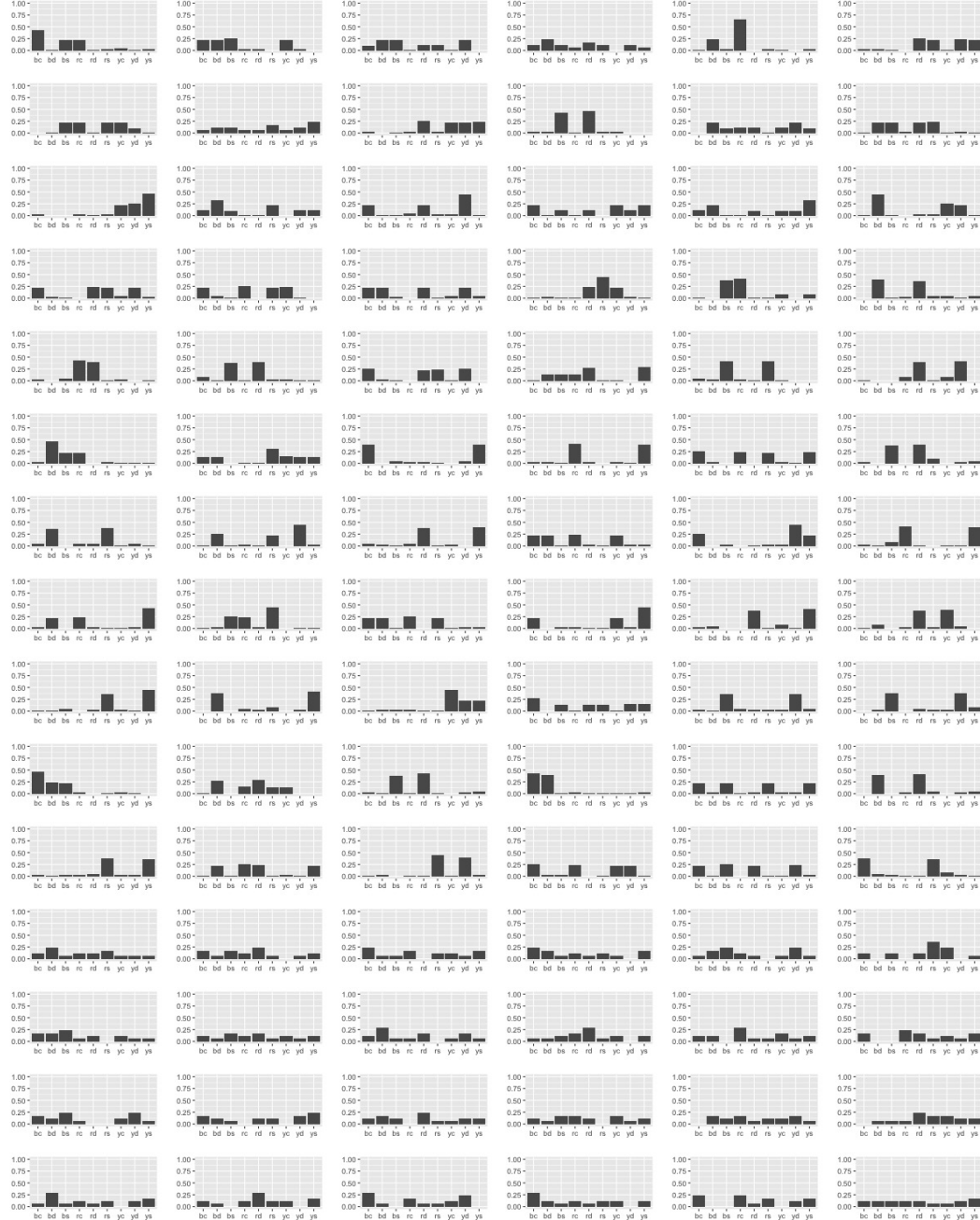

Figure 7: Simulation raw selections summary. Each row is for one trial, and each column is for one task. For each sub-figure, y-axis is percentage, and x-axis from left to right is: bc, bd, bs, rc, rd, rs, yc, yd, ys.
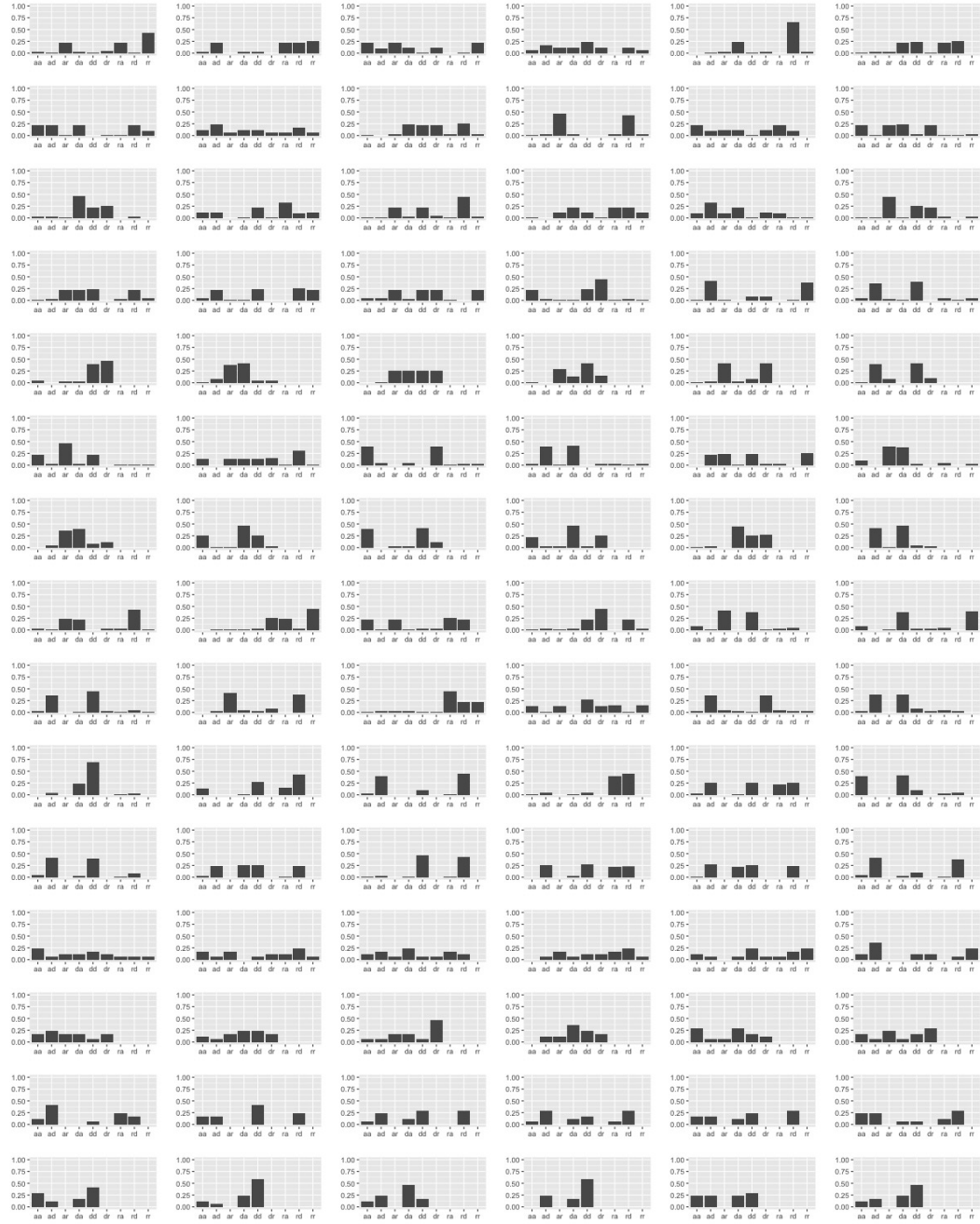
Figure 8: Relative selections summary. Each row is for one trial, and each column is for one task. For each sub-figure, y-axis is percentage, and x-axis from left to right is: aa, ad, ar, da, dd, dr, ra, rd, rr.

2.2 Aggregated by relative selections

The normative model does not show specific patterns towards each learning task (Figure 9). It does show a tendency to concentrate on one selection as the generalization scenarios further differs from the learning scenarios (last figure in Figure 10), but it predicts a different concentration point compared with participant data.

(a) To the same shape   (b) To the same color   (c) To the same object

(d) To a different shape   (e) To a different color   (f) To a different object
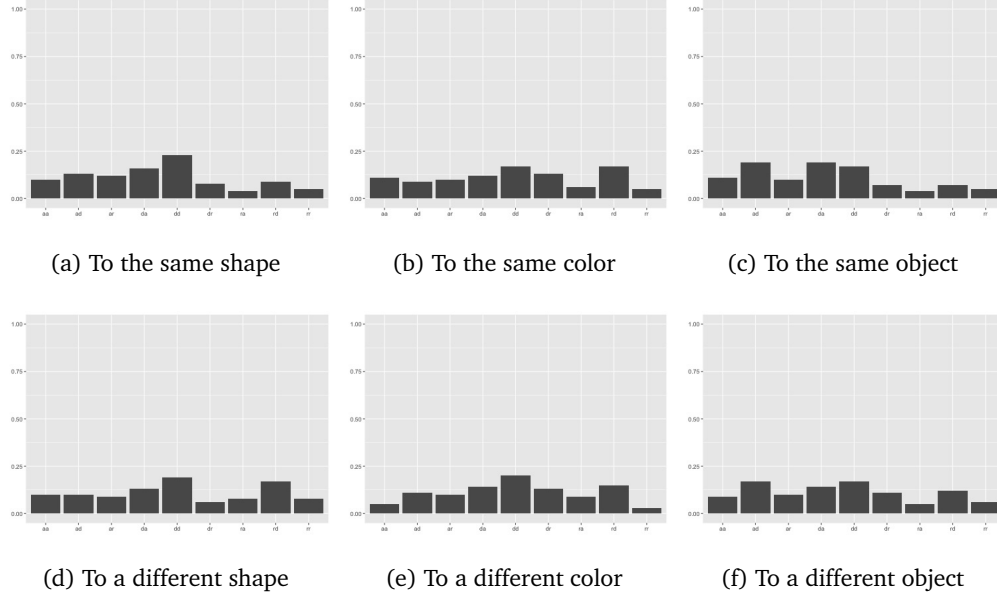
Figure 9: Aggregated relative selections per task. For each sub-figure, y-axis is percentage, and x-axis from left to right is: aa, ad, ar, da, dd, dr, ra, rd, rr.
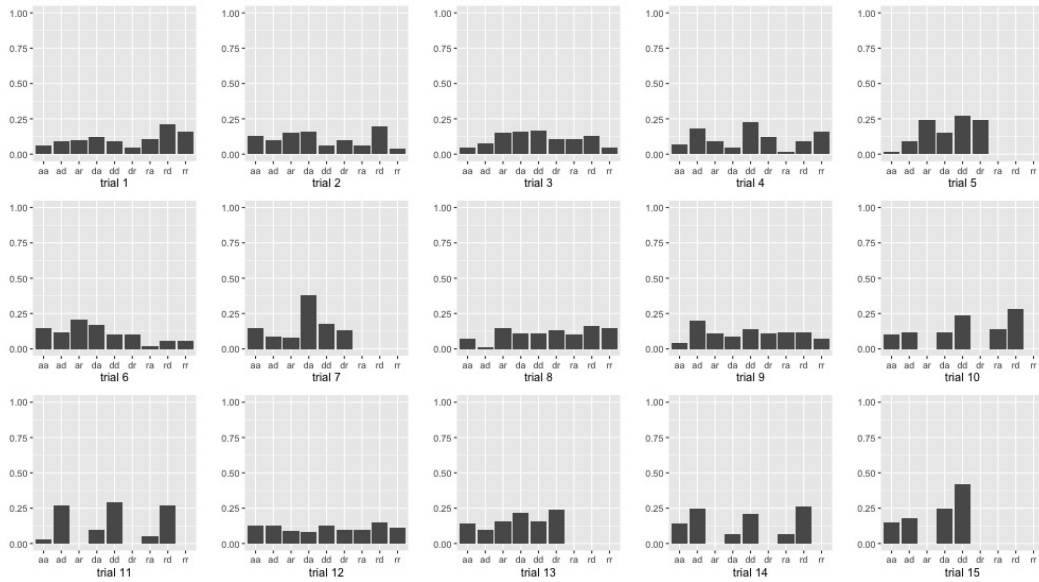

Figure 10: Aggregated relative selections per trial. For each sub-figure, y-axis is percentage, and x-axis from left to right is: aa, ad, ar, da, dd, dr, ra, rd, rr.