BDE 5

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**Methods**

Participants logged on to a web site where the instructions asked participants to familiarize themselves with the ball-drop machine and then make a prediction about where one ball dropped into the machine will land.

All participants were asked to become familiar with a presented ball drop machine. All machines had a height of 10 with 11 bins at the bottom. In the Plinko condition, participants were told that in this type of machine, a ball emerges from the slot on top and the ball drops down over a series of pegs. At each peg, the ball bounces to either the left or the right, and there is an equal chance of the ball bouncing either way. The bins at the bottom were labeled A-K. In the Coin Flip Outcome condition, participants were told that each peg, a coin would be flipped. If the coin lands Heads, the ball will drop to the right. If the coin lands Tails, the ball will drop to the left. The bins at the bottom were labeled with their coin flip outcomes (0 Heads/10 Tails, 1 Heads/9 Tails, etc.). In the Hybrid condition, participants received the same directions as in the Coin Flip Outcome condition. Bins in the Hybrid condition were labeled with directional outcomes (0 right/10 left bounces, 1 right/9 left bounces, etc.). Finally, in the Coin Flip Direction condition, participants received the same description as the Coin Flip Outcome condition. However, bins were labeled A-K. Participants could take as much time as they wanted to observing the Quincunx machines before they completed the survey.

All participants made two predictions regarding the probability of where the ball would land in a future simulation of the ball drop machine: an Item Confidence estimate and a Subjective Probability Interval Estimate (SPIES). The order of these elicitations was counterbalanced.

Participants were told that 100 more balls would be dropped into the ball-drop machine for both the Item Confidence and SPIES questions. The Item Confidence question asked participants to choose which bin the most balls would land in, as well as how many balls would land in this selected bin. The SPIES question asked participants to indicate how many balls would land in each of the eleven bins. The sum of all eleven bars for the SPIES probabilities was constrained to sum to 100.

**Results**

There was only a difference in bin chosen as most likely for the Item Confidence (IC) question for the Hybrid condition (p<0.01). In the Hybrid condition, participants were about .5 bins to the right from the correct bin, Bin 6 (p<0.01). Participants in all other conditions, chose the correct bin on average.

The bin chosen as most likely through the SPIES question, or the bin with the highest assigned probability did not depend on condition. Participants’ chosen most likely bin on SPIES across all conditions was about .3 bins to the left from the correct bin, Bin 6 (p=0.04).

Participants’ probability estimates of their chosen most likely bin for IC, regardless of whether this chosen bin was correct, were overconfident across all conditions. In the Plinko condition, participants were overconfident by 14% (p<0.001). In the Hybrid condition, participants were overconfident by 18% (p<0.001). In the Coin Flip Directions Only condition, participants were overconfident in their chosen bin by 17% (p<0.001). In the Coin Flip Outcomes condition, participants were overconfident by 21% (p<0.001). Those in this Coin Flip Outcomes condition were significantly more overconfident than those in any other condition (p<0.05).

Across all conditions, only 48% chose the correct bin, Bin 6. By condition, 44% of participants in the Plinko condition chose the correct bin, 56% in the Coin Flip condition, 55% in the Hybrid condition, and 38% in the Coin Flip Directions Only condition.

For SPIES probability estimates for each bin, participants were overconfident for the probabilities corresponding to outer bins and underconfident for the probabilities corresponding to inner bins across all conditions. Participants were 6% overconfident for Bin 1 likelihood (p<0.001), 6% overconfident for Bin 2 likelihood (p<0.001), and 4% overconfident for Bin 3 likelihood (p<0.001). For the inner bins, participants were 2% underconfident for Bin 4 likelihood (p<0.001), 8% underconfident for Bin 5 likelihood (p<0.001), 9% underconfident for Bin 6 likelihood (p<0.001), 8% underconfident for Bin 7 likelihood (p<0.001), and 3% underconfident for Bin 8 likelihood (p<0.001). For the remaining outer bins, participants were 3% overconfident for Bin 9 likelihood (p<0.001), 5% overconfident for Bin 10 likelihood (p<0.001), and 4% overconfident for Bin 11 likelihood (p<0.001). Again, we see that the participants’ SPIES probability estimates are flatter than the actual probability distribution as shown below in Graph 1.



Graph 1 shows actual probability distribution of bin likelihood (circles in black) and participants’ SPIES probability estimates across bins (in red).

There were no differences between SPIES probability estimates across bins except for Bin 6 probability estimates. Those in the Coin Flip Outcomes condition were underconfident, but 3% more accurate in their SPIES Bin 6 estimate (p<0.01).

SPIES order of appearance did not have a significant effect on the IC bin chosen as most likely (p=0.74) nor on the SPIES bin assigned the highest probability (p=0.3). Participants who saw the SPIES item first were 13% overconfident in their IC most likely bin probability estimates (p<0.001). Participants who saw the SPIES item last were 22% overconfident in their IC most likely bin probability estimates (p<0.001). The difference between these groups is significant, so that seeing SPIES first reduced overconfidence by 9% (p=0.001).

SPIES order of appearance did not have a significant effect on SPIES probability estimates across bins.