**1) Data collection.** Have any data been collected for this study already?

* Yes, we already collected the data.
* No, no data have been collected for this study yet.
* It's complicated. We have already collected some data but explain in Question 8 why readers may consider this a valid pre-registration nevertheless.

(Note: "Yes" is not an accepted answer.)

**2) Hypothesis**. What's the main question being asked or hypothesis being tested in this study?

In a previous study, we investigated what effect social cognition may have on the probabilistic reasoning capabilities of the Tsimane’, a farming-foraging group native to the Bolivian Amazon. Specifically, how does our knowledge of agents influence how we reason about the likelihood of events? We showed that participants underestimated the likelihood of events that appeared to be more orderly—sampling a group of 7 blue and 9 yellow balls was judged to be more likely than sampling a group of 8 blue and 8 yellow balls. In this study, we’re interested in whether or not this is present in U.S. participants.

Participants will be presented with a box with blue and yellow balls in equal proportions. Then, they will watch a brief video demonstrating how an agent samples groups of balls from this box. Finally, using a 2AFC paradigm, participants will be shown two potential samples of balls and asked which of the two is more likely. We will split participants into two conditions that vary the sampling process.

We predict that participants’ answers will be consistent with the relative probability of drawing each sample, with the exception of trials where at least one of the samples has a structure that suggests that an agent generated it (see conditions in Q4). Specifically, in cases where it’s more likely to sample a particular configuration of balls (e.g., 8 blue and 8 yellow vs. 7 blue and 9 yellow), we expect participants to sway away from the more “structured” option despite it being more statistically probable. We also predict that structure will have a larger effect on larger sample sizes (e.g., 8 blue and 8 yellow will look less random than 2 blue and 2 yellow).

**3) Dependent variable**. Describe the key dependent variable(s) specifying how they will be measured.

The dependent variable will be the group of balls that participants choose in each trial as the group that is more likely to have been blindly sampled rather than intentionally sampled (“eyes closed” condition; see Q4) or the group that will be produced first (“pouring” condition; see Q4).

**4) Conditions.** How many and which conditions will participants be assigned to?

We will have two conditions that vary the way an agent samples groups of balls from a box—an “eyes closed” condition and a “pouring” condition.

“Eyes Closed” Condition:

In this condition, the video will demonstrate the agent sampling groups of balls with their eyes-closed. When participants are shown the two potentially-sampled groups, they will be told that the agent sampled one of these groups with their eyes open and the other with their eyes closed. Finally, participants will be asked which one of these groups they think the agent sampled with their eyes closed.

“Pouring” Condition:

In this condition, the video will demonstrate the agent pouring groups of balls onto a tray, putting them back into the box, shaking it, and repeating the process several times. When participants are shown the two potentially-sampled groups, they will be asked which one of these groups they think would appear first if the agent continued the process in the video.

**5) Analyses.** Specify exactly which analyses you will conduct to examine the main question/hypothesis.

Our first analysis will consist of correlating participants’ responses with the responses predicted by a simple model that selects choices proportional to their probability of being sampled. We predict that this model will correlate highly with participant responses, but will differ in the “structured” arrangements (see Q2), where participants will judge them as less likely to have been generated, relative to the model’s predictions.

Our second analysis will consist of correlating participants’ responses with the predictions of a model that combines both the probability of sampling arrangements by chance, with the probability that different arrangements would be intentionally sampled by an agent. The probability that an arrangement is sampled by an agent will be computed through the assumption that agents sample “structured” arrangements, which can be formalized as samples that can expressed in a compact way under a simple pCFG that generates sampling programs (e.g. “take n objects”, or “take one red ball and three blue balls”).

We will also compute the percentage of choices in each trial along with 95% bootstrapped confidence intervals. In addition, the distribution produced by bootstrapping responses will be used to compute the probability that the effect size is in a certain range.

**6) Outliers and Exclusions.** Describe exactly how outliers will be defined and handled, and your precise rule(s) for excluding observations.

To make sure the participants understand the task, we employ two warm-up trials per condition (see Q4). Participants who fail one or both of these catch trials more than once will be excluded.

**7) Sample Size.** How many observations will be collected or what will determine sample size? No need to justify decision, but be precise about exactly how the number will be determined.

We will recruit 40 participants in each of our two conditions (see Q4). This sample size was determined by a previous experiment with the Tsimane’, a farming-foraging group in the Bolivian Amazon. Participants that are excluded (see Q6) will be replaced so that the final sample size is 80 participants.

**8) Other.** Anything else you would like to pre-register?

(e.g., secondary analyses, variables collected for exploratory purposes, unusual analyses planned?)

See experiment materials at:

**9) Name.** Give a title for this AsPredicted pre-registration.

Suggestion: use the name of the project, followed by study description.

U.S. Sampling