Autologic object tracking vs. logic UPDATED (#204725)

Author(s)
This pre-registration is currently anonymous to enable blind peer-review.
It has 3 authors.

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1) Have any data been collected for this study already?
No, no data have been collected for this study yet.

2) What's the main question being asked or hypothesis being tested in this study?
Visual scenes and events are often ambiguous. For example, if one among different-looking objects is covertly moved into a box, the scene is compatible with multiple interpretations. In some cases, we can determine which possibility is true with a logical inference, for example, if we receive disambiguating evidence that rules out one of the alternatives. Previous developmental research has shown that this basic logical inference is spontaneously deployed by infants (Cesana-Arlotti et al., 2018, 2020), suggesting that it does not require the use of logical language, intentional effort, or adult-like working memory resources. In previous studies, we found initial evidence that this logical process may emerge spontaneously in adults, in a way that facilitates visual object recognition, and in spite of statistical counterevidence. In this study, we compare the impact of logical inference on visual object recognition with the impact of working memory mapping.
Subjects will be shown similar events to those used in the previous experiments. In each movie, one of two objects is scooped by a cup, and then one of the objects is found outside the cup. Finally, the object in the cup is visually revealed, and subjects are simply asked to report the actual identity of the revealed object, regardless of what events came before. The trials vary along two dimensions. On one-type trials, the initial set of objects is formed by two identical objects (e.g., two balls or two snakes). On two-type trials, the two initial objects are of different types (e.g., a ball and a snake). Additionally, on same-object trials, the revealed object is the same type of object as the object outside of the cup, and on different-object trials, the item revealed is a different type of object.
We are primarily interested in whether participants perform differently on two-type trials-where one may ask whether participants use either disjunctive inference or working memory mapping-relative to one-type trials, where only working memory mapping applies.
Specifically, if participants rely on working memory mapping to anticipate the identity of the scooped object in both the one-type and two-type conditions, we should observe a similar difference in error rate between same-object and different-object trials in both conditions.
On the contrary, if participants spontaneously deploy a disjunctive inference to anticipate the identity of the scooped object in the two-type condition but not in the one-type condition, then we may observe a difference in error rate between same-object and different-object trials in the two-type condition but not in the one-type condition; or else we may observe that the magnitude difference in error rate between same-object and different-object trials is different between two-type and one-type conditions.

3) Describe the key dependent variable(s) specifying how they will be measured.
Error rate: The percent of trials on which subjects recognized the object incorrectly.

4) How many and which conditions will participants be assigned to?
There will be two within-subjects conditions and two between-subjects conditions:
Within subjects, either the object that appears is a different type from the item revealed outside of the cups (e.g., a snake is revealed inside one of the cups after a ball is seen outside of the cups), or the same type (e.g., a snake is revealed inside one of the cups after a snake is seen outside of the cups).
Between subjects, approximately half of the participants will see the scenes in which the initial pair of objects is formed by two identical objects (e.g., two balls or two snakes), and approximately half will see the scenes in which the initial pair is of different types (e.g., a ball and a snake).
Other factors vary across trials, including the left-right position of the objects at the beginning of the scene before they are occluded, and which object is revealed to be outside of the cup. These conditions are fully counterbalanced within subjects and collapsed for our analysis.

5) Specify exactly which analyses you will conduct to examine the main question/hypothesis.
Update: We identified a mistake in our initial analysis plan and have corrected it here. This preregistration thus supersedes the previous version submitted for this study (AsPredicted #202816). No data were collected or analyzed under the previous version. The hypotheses and overall design remain unchanged, but the analysis plan has been corrected to address an error identified before data collection began.
For each participant, we will compute the average error rate on same-object and different-object trials. We will use a Bayesian paired difference test to evaluate the prediction that–for participants in the two-type condition–average error rate will be larger on same-object trials than on different-object trials.
A second Bayesian paired-difference test will be applied to determine whether participants in the one-type display a larger error rate on different-object trials relative to same-object trials. The nature of these tests will depend on whether the data are normally distributed, which we will determine based on a Shapiro-Wilk normality test. If the data are normally distributed, we will use a Bayesian paired t-test; if they deviate from normality, we will use the Bayesian Wilcoxon signed-rank test (Chechile, 2018).
We will then compute error rate difference scores for each participant. For participants in the two-type condition, we will compute this score as their average error rate on same-object trials minus their average error rate on different-object trials. For participants in the one-type condition, the difference

score will equal their average error rate on different-object trials minus their average error rate on same-object trials. We will then use a Bayesian independent samples test to evaluate the prediction that the average error rate difference is larger for the participants in the two-type condition than those in the one-type condition. If the data are normally distributed, we will use a Bayesian independent t-test; if they deviate from normality, we will use the Bayesian Mann-Whitney U test (Chechile, 2018).
For all Bayesian analyses, we will report Bayes Factors to quantify evidence for the null (H0) versus the alternative (H1). Evidence will be interpreted based on the following thresholds from Andraszewicz et al. (2015): BF10 > 10 (strong evidence for H1), BF10= 3−10 (moderate evidence for H1), BF10= 0.1−0.33 (moderate evidence for H0), and BF < 0.1 (strong evidence for H0).

6) Describe exactly how outliers will be defined and handled, and your precise rule(s) for excluding observations.
If a participant does not respond within 1 second, the trial will end, and they will be prompted to respond faster, so the maximum response time is 1 second.
Subjects will also rate their focus during the experiment on a scale of 1-100. Subjects who report a level of attention less than 25 will be excluded from the experiment.
We will also discard the first 4 trials from each subject, treating them as practice trials.

7) 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 continue to collect data until we reach a sample of 300 participants, post-exclusions, or until we reach 150 participants in each between-subjects condition.

8) Anything else you would like to pre-register? (e.g., secondary analyses, variables collected for exploratory purposes, unusual analyses planned?)
Nothing else to preregister.