

Review: O'Donoghue et al. – Disentangling the influences of curiosity and active exploration on environmental memory

This preregistered report is proposing to test the relationship between curiosity, active exploration, and spatial memory. In a replication and expansion of a study that is currently in a preprint, the authors propose to compare an active exploration group with a group that sees a video of the same exploration path. All participants give assessments of their curiosity before entering each room to explore. They are tested with a drawing task.

This preregistration is based on a preprint from the same lab. This makes assessment rather difficult because the preprint has not yet been vetted by peer review, and so some of the things I will point out here might come out in the review of the other manuscript, but might not. Some of my concerns are about the general methodology, the logic/rationale of the predicted hypotheses, and the theoretical basis of the study. Finally, there is a literature on active learning, on both spatial and non-spatial information, that would be useful for the authors to consider.

Introduction/Rationale:

1. From the abstract and the basic task description in the introduction, it sounds like it is just a straight active-passive manipulation without anything related to curiosity. It is not stated clearly in either place that people will also do the curiosity assessment. Being passive does not prevent someone from being curious, so it is important to clearly delineate how these factors are going to be tested.
2. The theoretical basis of this study is not clearly laid out in the introduction. Are the authors hypothesizing that curiosity is a larger factor than active learning? Or vice versa? The hypotheses for the passive group are non-specific, but I think more thinking through all the alternatives regarding the relative contributions of active learning and curiosity would help bring clarity to the possible outcomes.
3. Relatedly, in the design table, an alternative outcome is that there will be no group difference, and thus supporting the idea of curiosity. But this seems to go against the rationale for there being a group difference favoring active learning. The predicted group difference then seems to indicate that active learning is more important than curiosity. The logic here seems to be a bit off from the authors' overarching claims about curiosity.
4. There is already a literature on active learning and several studies that have examined active learning (especially making decisions about how to explore), both in a spatial context and in more general principles. Some of the authors questions may have been addressed already. Here are several references that are important and could aid adding to the theoretical basis of this study:
Chrastil & Warren 2012 Active and passive contributions to spatial learning, *Psychonomic Bulletin & Review*
Chrastil & Warren 2015 Active and passive spatial learning in human navigation:

Acquisition of graph knowledge

Gureckis & Markant 2012 Self-directed learning: A cognitive and computational perspective, *Perspectives on Psychological Science*

Markant & Gureckis 2014 Is it better to select or to receive? Learning via active and passive hypothesis testing, *JEP: General*

Voss et al. 2011 Hippocampal brain-network coordination during volitional exploratory behavior enhances learning, *Nature Neuroscience*

Methods:

1. For the power analysis, what is the effect/model that the authors are trying to test? What was the actual value of this effect? For example, is the simulation based on the correlation between path roaming entropy and curiosity? What about the between-subjects manipulation of active-passive groups? The previous study was within-subjects, so there needs to be a sample size justification for the between-subjects comparisons.
2. Ratings of the drawings are the primary outcome measure of this experiment, but they are quite subjective. The ratings could also interact with drawing, even though participants were just told to put a box around an object – those instructions could actually make some of the spatial distortions and proportions less accurate (e.g., someone might just put the same sized box in the same orientation for everything if they did not understand of the instruction. There is not a lot of nuance in “draw simple boxes with labels in them”).
3. Has the previous research examined whether any of the 16 rooms tend to have higher curiosity scores on their own? Are the rooms matched for basic information like the number of objects in them and how much space is possible to move in? This is not as relevant to the main question of active learning, but interesting on its own.
4. Is there eye tracking being done here? It doesn't sound like it, but the head is being tracked and gaze direction seems like it would be very helpful here.
5. Since head direction is being tracked, list the equipment information for that tracking.
6. The passive group does not need to work with the controls, but please elaborate on the active group's training and familiarization procedures with the controls to ensure that using the controls does not distract the active group during learning.
7. Provide more rationale for why the curiosity score is mean-centered for each individual.
8. For the second step of the analysis plan, Path RE and head direction RE are entered as predictors, but that should be the same across groups since the passive group is matched to the active. Say more on how this works.
9. In the design table, for the second research question second column, it is not clear what “nondirectional” means in this context.