

The authors designed a study to understand the relationship between curiosity and environmental memory, and whether active exploration mediates it. Previous studies (Cen et al., 2024) found heightened curiosity about a virtual room to correlate with how widely active participants chose to explore it and their subsequent memory of elements from the virtual room. However, existing studies cannot confirm whether the observed memory benefits are due to curiosity itself or curiosity-induced patterns in exploration, operationalized as path roaming entropy (Path RE). The authors propose to address this question by replicating Cen et al. (2024) and extending the original design with a passive group. They expect to replicate findings from Cen et al. (2024) and record better memory in the Active, compared to the Passive group. The authors do not have specific predictions on the main effects of Path RE and curiosity on memory. Overall, the proposal presents a valid and interesting research plan. However, some clarifications are needed to ensure the soundness of the analyses. I also have concerns (see section 1E) about the conclusions it will be possible to draw from a yoked design.

1A. Scientific validity

While several studies have examined the relationship between free choice/exploration and memory, often with a yoked design, they did not examine the direct relationship between curiosity and memory benefits. Therefore, the research question addressed in the present paper is interesting, and the authors' attempt to address it is commendable.

1B. Logic, rationale, and plausibility of the proposed hypotheses (where a submission proposes hypotheses)

Overall, the authors' explanation of the research gap and hypotheses is clear, but the authors do not mention whether they have considered any possible effects of interactions between Path RE and curiosity on memory.

Moreover, hypothesis #3 could be split into two (e.g., #3a and #3b) to ease references to the effects of Path RE vs. curiosity since these are addressed separately in the study.

1C. Soundness and feasibility of the methodology and analysis pipeline (including statistical power analysis or alternative sampling plans where applicable)

Overall, the methodology seems sound and feasible. However, the following points should be addressed.

The authors mention participants may be compensated with either course credits or monetary compensation. Does this mean some participants will be compensated in one way, and others in another? If so, different compensation schemas might affect participants' behavior in the experiment, interacting with the effects of interest. For example, monetary compensation,

compared to course credits, might reduce the effects of curiosity. Do the authors plan to test/control for this? If not, why not?

The authors state that condition assignment to either the active or passive group will be non-random. However, the authors do not mention any condition assignment matching based on specific demographics, compensation strategies, and whether the experiment is taking place in a room with other people or not (e.g., could 5 participants recruited individually be matched with 5 participants who did the experiment in a single large room), nor whether any such information about participants will be recorded.

1D. Clarity and degree of methodological detail

Some details are missing from the current methodology sections.

If the authors used a specific software to obtain the reported sample size, this should be appropriately cited.

Participants will be allowed to take a 5-minute break before taking the memory test. Differences in how people decide to use this time (e.g., by passively mind-wandering or scrolling through social media) might affect the results. The authors should clarify whether participants will be allowed to use their own devices during this time.

Information about the specific instructions participants received should be reported, particularly regarding whether participants were aware of the memory test from the beginning of the experiment, and the exact phrase used to instruct participants in the Active vs. Passive group regarding the room exploration/viewing section of the task.

Information about curiosity and interest scales is inconsistent: the authors describe a 10-point scale on page 8 as well as the Figure 2 caption, but a 6-point scale on page 10.

The <https://map-scoring.vercel.app/> link to view the coding system by Cen et al. (2024) requires credentials. Could the authors please provide instructions on how to access this?

1E. Sufficient outcome-neutral conditions (e.g. absence of floor or ceiling effects; positive controls; other quality checks) for ensuring that the obtained results are able to test the stated hypotheses or answer the stated research question(s)

A major issue in the current study design and analysis plan is that authors assume that active exploration is the only difference between Active and Passive conditions. However, several differences between the two groups could be introduced by the yoked design (see Gureckis & Markant, 2012). For instance, Passive participants will likely be less engaged in the task,

potentially paying less attention to the screen and/or not looking at the scene in front of them. Participants in the Active condition may also be testing specific hypotheses or have particular expectations guiding their exploration, a process that would be disrupted in the Passive viewing condition. Broadly, Active participants would be more likely to have experiences directly connected to their internal stream of thoughts, which could facilitate the integration of new information within the existing knowledge base. The authors should explain how they will control for alternative explanations, clarify how they will adjust their interpretation of the results given this limitation, or address it with additional experimental conditions.

Minor comments and typos

It would be useful to define “environmental memory” as the authors intend it early in the manuscript, as the phrase might have different meanings in different fields or be new to the reader.

Path RE and Head-Direction RE are not capitalized as in the rest of the manuscript on page 13.