Temporal Divisions: Segmenting Space through Time (#134633)

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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?
To test the effect of temporal segmentation on spatial memory. The participants will learn half of the objects placed in an environment at one time point, and half in another. The objects within one time point are divided into two groups whose locations are learned by traveling between objects of each group. This division allows us to estimate the effect of traveling between objects separately from the effect of temporal segmentation. The object locations are interspersed so that all groups are spatially equidistant on average. We hypothesize that temporal segmentation affects spatial memory, independent of spatial proximity and independent of whether landmarks are travelled between.

3) Describe the key dependent variable(s) specifying how they will be measured.
Six dependent variables will be derived from four behavioral tasks; each task allows us to assess aspects of the spatial representations of the landmarks.
Free recall task - Order of remembered objects
Judgment of Relative Direction (JRD) task - Angular accuracy
Distance estimation task - Accuracy of distance estimation
Distance comparison task - Which object is perceived closer to the anchor object
Object viewing task - Response time for each trial
Mapping task - Comparing pointed vs actual object locations

4) How many and which conditions will participants be assigned to?
One condition - Each participant will undergo the same experimental design. Each participant will learn 8 landmarks at timepoint 1 then 8 different landmarks at timepoint 2. Landmark groups will be counterbalanced across participants.

5) Specify exactly which analyses you will conduct to examine the main question/hypothesis.
Free recall task - To check for the effect of temporal separation on the probability of sequential object recall while controlling for spatial distance, the number of within session object recalls from adjacent quadrants will be compared with the number of across section object recall from adjacent quadrants. We expect participants to remember objects from same session together with these objects showing up consequently in recall task.
JRD task – The angular accuracy of JRD estimation will be compared for targets that are within the same session but not traveled between, and targets from different session to check for any effect of temporal separation on accuracy using two-tailed Wilcoxon signed-rank test. We expect significantly better accuracy for targets within same session but not traveled between over targets from different session.
Distance estimation task - First, we test for any decrease in accuracy when comparing object pairs within same session but not traveled between, and object pairs across sessions by calculating the correlation between real and estimated distances separately for the groups mentioned above and compare the two values. Second, to test for elongation of distance estimates across these segments, we will compare the average distance estimates for object pairs mentioned earlier. Third, effect of temporal segmentation on response times will be tested for trials that are preceded by a within session but not traveled between object trial, or by a different session object trial. Two-tailed paired sample Wilcoxon signed rank test will be used for all three contrasts mentioned. We expect participants to perceive objects from same session to be closer and have quicker response time for such trials.
Distance comparison task - Effect of temporal segmentation will be tested by analyzing difference in accuracy in selecting the closer object to the anchor object between trials where objects are from the same session but not travelled between, or from different session with respect to the anchor object using paired sample Wilcoxon signed rank test. We expect higher accuracy when objects are from the same session.
Object viewing task - Compare the average response times for trial pairs where the preceding trial is from the same session but not traveled between, and different sessions using two-tailed Wilcoxon signed-rank test. We expect to see significantly lower response times for trials preceded by same session objects.
Mapping task - Compare the pointed object locations with actual locations, and measure the distance between objects that are in same session versus in different session. We expect average distance between objects in the same session to be lower than actual distance, and higher between objects from different session.

6) Describe exactly how outliers will be defined and handled, and your precise rule(s) for excluding observations.
Participant fails to complete all testing phases. Technical error affecting more than 10% of trials on any one task. Participant could not learn the environment within 1 hour at both timepoints.

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.

Using GPower power curve for two-tailed Wilcoxon signed rank test, we expect to recruit 72 participants which yields a power of 0.9 for an effect size of 0.4.

8) Anything else you would like to pre-register? (e.g., secondary analyses, variables collected for exploratory purposes, unusual analyses planned?)

We will include Santa Barbara sense of direction questionnaire to get participants' self-reported navigational ability, and video game questionnaire to get their video game proficiency and preferences.