**Study Information**

1. Title
   1. Provide the working title of your study. It may be the same title that you submit for publication of your final manuscript, but it is not a requirement.

Event boundaries in perception affect memory encoding in children

1. Authorship

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\*\*\* An additional researcher will be added to the author list; this person will likely become first author

1. Research Questions
   1. Please list each research question included in this study.

Adults have been shown to segment events (e.g. in a video) according to perceived changes in location, goal, and the passage of time, among other factors (e.g. Zacks et al., 2001). Previous research has also shown that associative memory for information within the same event is greater than memory for information across events (Swallow et al., 2009; Ezzyat & Davachi, 2011). This study will test whether event segmentation imposes a similar organization on memory in children (spanning 7-9 years).

1. Hypotheses
   1. For each of the research questions listed in the previous section, provide one or multiple specific and testable hypotheses. Please state if the hypotheses are directional or non-directional. If directional, state the direction. A predicted effect is also appropriate here.

Previous research has shown that, in adults, associative memory for information within the same event is greater than memory for information across events. For example, while participants watched a video, short-term memory for information that occurred within the same event as the memory probe was enhanced versus when that information had occurred in a different event from the probe (Swallow et al., 2009). We hypothesize that event segmentation imposes a similar organization on memory in children (spanning 7-9 years). That is, children’s memory of objects in a video should be similarly enhanced when a memory probe occurs in the same event in which the object was shown. Both children and adult data will be collected to confirm (or disconfirm) the hypothesis that children show a similar pattern of results to adults.

**Sampling Plan**

In this section we will ask you to describe how you plan to collect samples, as well as the number of samples you plan to collect and your rationale for this decision. Please keep in mind that the data described in this section should be the actual data used for analysis, so if you are using a subset of a larger dataset, please describe the subset that will actually be used in your study.

1. Existing data
   1. Preregistration is designed to make clear the distinction between confirmatory tests, specified prior to seeing the data, and exploratory analyses conducted after observing the data. Therefore, creating a research plan in which existing data will be used presents unique challenges. Please select the description that best describes your situation. Please do not hesitate to contact us if you have questions about how to answer this question ([prereg@cos.io](mailto:prereg@cos.io)).
      1. Registration prior to creation of data: As of the date of submission of this research plan for preregistration, the data have not yet been collected.
2. Explanation of existing data
   1. If you indicate that you will be using some data that already exist in this study, please describe the steps you have taken to assure that you are unaware of any patterns or summary statistics in the data. This may include an explanation of how access to the data has been limited, who has observed the data, or how you have avoided observing any analysis of the specific data you will use in your study. The purpose of this question is to assure that the line between confirmatory and exploratory analysis is clear.

N/A

1. Data collection procedures.
   1. Please describe the process by which you will collect your data. If you are using human subjects, this should include the population from which you obtain subjects, recruitment efforts, payment for participation, how subjects will be selected for eligibility from the initial pool (e.g. inclusion and exclusion rules), and your study timeline. For studies that don’t include human subjects, include information about how you will collect samples, duration of data gathering efforts, source or location of samples, or batch numbers you will use.

Adult participants will be recruited from the local student community of University of Toronto St. George campus, and children participants (ages 7-9 years) from the greater Toronto area. Adult participants will respond to online advertisements, and a parent/guardian of each child participant will be called on the phone. The following inclusion criteria will be used for recruitment:

1. Adults: age between 18-30 years; children: age between 7-9 years

2. Fluent English speakers

3. No history of neurological or psychiatric disorder

Upon arrival at the laboratory, adult participants and children’s parents/guardians will complete a self-reported demographics form to confirm that participants meet the eligibility. Adult participants will receive course credit for their participation, and parents/guardians will be paid $10 for the entire session in the form of a gift card or a children’s toy.

The experiment will be conducted in a single session of 75 minutes (maximum).

1. Sample size
   1. Describe the sample size of your study. How many units will be analyzed in the study? This could be the number of people, birds, classrooms, plots, interactions, or countries included. If the units are not individuals, then describe the size requirements for each unit. If you are using a clustered or multilevel design, how many units are you collecting at each level of the analysis?

N = XX participants (each age group, i.e. adults and children)

1. Sample size rationale
   1. This could include a power analysis or an arbitrary constraint such as time, money, or personnel.

We conducted a power analysis from a previous study, and found that a sample size of N = XX participants (each age group) will be needed to achieve power of 0.8 at an alpha level of .05 (two-tailed).

1. Stopping rule
   1. If your data collection procedures do not give you full control over your exact sample size, specify how you will decide when to terminate your data collection.

When N = XX participants is reached

**Variables**

In this section you can describe all variables (both manipulated and measured variables) that will later be used in your confirmatory analysis plan. In your analysis plan, you will have the opportunity to describe how each variable will be used. If you have variables that you are measuring for exploratory analyses, you are not required to list them, though you are permitted to do so.

1. Manipulated variables
   1. Describe all variables you plan to manipulate and the levels or treatment arms of each variable. For observational studies and meta-analyses, simply state that this is not applicable.

**Age group**: Adults vs. children

**Within- and across-event**: If the memory probe occurs within the same (or different) event of the object that is being tested on

1. Measured variables
   1. Describe each variable that you will measure. This will include outcome measures, as well as any predictors or covariates that you will measure. You do not need to include any variables that you plan on collecting if they are not going to be included in the confirmatory analyses of this study.

Outcome: Reaction time

Outcome: Accuracy

Covariate: Baseline difficulty level of each target-foil stimulus pair (forced-choice task) in a separate stimulus norming session

1. Indices
   1. If any measurements are going to be combined into an index (or even a mean), what measures will you use and how will they be combined? Include either a formula or a precise description of your method. If you are using a more complicated statistical method to combine measures (e.g. a factor analysis), you can note that here but describe the exact method in the analysis plan section.

N/A

**Design Plan**

In this section, you will be asked to describe the overall design of your study. Remember that this research plan is designed to register a single study, so if you have multiple experimental designs, please complete a separate preregistration.

1. Study type
   1. Experiment

This study will investigate how children (compared to adults) perceive event structure in continuous video narrative, namely how event perception impacts children’s memory of the videos. Participants will watch the same two cartoons, which are accessible to both children and adults. These cartoons will be 7-minute clips from the *Rugrats* and *Busy World* series.

Throughout each cartoon, there will be memory questions that probe participants’ memory of an object that was recently shown in the cartoon. Some of these memory probes will occur during the same event in which the tested object is shown, and some of the memory probes will occur after a new event has started (i.e. here a probe tests participants’ memory of an object that occurred in the preceding event). The amount of time that passes between when a tested object goes off the screen and the onset of its memory probe will be fixed across the two conditions (i.e. within and across events). An event is here defined as an episode of activity separated by a change in scene, goal, character, or some other factor, which marks the start of a new event. Events will be defined according to data collected in a previous session (i.e. event boundaries were identified by adult participants).

During each memory probe, a target and foil will be presented at the same time, and participants will have 5s to select which object was recently shown in the cartoon. The foils will be objects that may have plausibly appeared in the cartoon. After each memory probe, the cartoon will resume but be set back 10s to reinstate context and ensure continuity.

1. Blinding
   1. Blinding describes who is aware of the experimental manipulations within a study. Mark all that apply.
      1. For studies that involve human subjects, they will not know the treatment group to which they have been assigned.
2. Study design
   1. Describe your study design. Examples include two-group, factorial, randomized block, and repeated measures. Is it a between (unpaired), within-subject (paired), or mixed design? Describe any counterbalancing required. Typical study designs for observation studies include cohort, cross sectional, and case-control studies.

This study will have a two-group (age group), within-subject design. The order in which the two cartoons are presented will be counterbalanced across individual participants from each age group.

1. Randomization
   1. If you are doing a randomized study, how will you randomize, and at what level?

This study is within-subject where all participants perform each condition.

**Analysis Plan**

You may describe one or more confirmatory analysis in this preregistration. Please remember that all analyses specified below must be reported in the final article, and any additional analyses must be noted as exploratory or hypothesis generating.

A confirmatory analysis plan must state up front which variables are predictors (independent) and which are the outcomes (dependent), otherwise it is an exploratory analysis. You are allowed to describe any exploratory work here, but a clear confirmatory analysis is required.

1. Statistical models
   1. What statistical model will you use to test each hypothesis? Please include the type of model (e.g. ANOVA, multiple regression, SEM, etc) and the specification of the model (this includes each variable that will be included as predictors, outcomes, or covariates). Please specify any interactions that will be tested and remember that any test not included here must be noted as an exploratory test in your final article.
2. A mixed-design ANOVA will be run on reaction time and accuracy separately; each ANOVA will be 2 (age group [between-subjects]) x 2 (within- vs. across-event [within-subjects]).
3. Bayes factors will also be calculated to confirm (or disconfirm) the hypothesis that there will be no difference between children and adults.
4. A linear mixed effects regression (LMER) will also be performed on trial-by-trial reaction time and accuracy separately; here the predictors will be age group, participant, a continuous metric that maps onto within- vs. across-event conditions (i.e. % of participants who thought there was an event boundary between object and memory test, collected in a different session), and reaction time and accuracy (separate predictors) from a separate stimulus norming session that provides a baseline level of difficulty for each trial.
5. Transformations
   1. If you plan on transforming, centering, recoding the data, or will require a coding scheme for categorical variables, please describe that process.
6. Reaction time may be log-transformed to ensure normality, if necessary.
7. In the LMER, all continuous predictors will be mean-centered.
8. Follow-up analyses
   1. If not specified previously, will you be conducting any confirmatory analyses to follow up on effects in your statistical model, such as subgroup analyses, pairwise or complex contrasts, or follow-up tests from interactions. Remember that any analyses not specified in this research plan must be noted as exploratory.

Paired t-tests will be used to unpack particular contrasts from the above ANOVAs.

1. Inference criteria
   1. What criteria will you use to make inferences? Please describe the information you will use (e.g. p-values, Bayes factors, specific model fit indices), as well as cut-off criterion, where appropriate. Will you be using one or two tailed tests for each of your analyses? If you are comparing multiple conditions or testing multiple hypotheses, will you account for this?

p<0.05, two-tailed

Bayes factors

1. Data exclusion
   1. How will you determine what data or samples, if any, to exclude from your analyses? How will outliers be handled?

Individual trial data will be removed from a given participant’s data if reaction time exceeds 2.5 standard deviations from the mean.

1. Missing data
   1. How will you deal with incomplete or missing data?

N/A

1. Exploratory analysis (optional)
   1. If you plan to explore your data set to look for unexpected differences or relationships, you may describe those tests here. An exploratory test is any test where a prediction is not made up front, or there are multiple possible tests that you are going to use. A statistically significant finding in an exploratory test is a great way to form a new confirmatory hypothesis, which could be registered at a later time.

**Script (Optional)**

The purpose of a fully commented analysis script is to unambiguously provide the responses to all of the questions raised in the analysis section. This step is not common, but we encourage you to try to create an analysis script, refine it using a modeled dataset, and use it in place of your written analysis plan.

1. Analysis scripts (Optional)
   1. (Optional) Upload an analysis script with clear comments. This optional step is helpful in order to create a process that is completely transparent and increase the likelihood that your analysis can be replicated. We recommend that you run the code on a simulated dataset in order to check that it will run without errors.

**Other**

1. Other
   1. If there is any additional information that you feel needs to be included in your preregistration, please enter it here.

Pilot data analyses

**References**

Ezzyat, Y., & Davachi, L. (2011). What constitutes an episode in episodic memory? *Psychological Science*, *22*(2), 243–52. https://doi.org/10.1177/0956797610393742

Swallow, K. M., Zacks, J. M., & Abrams, R. A. (2009). Event boundaries in perception affect memory encoding and updating. *Journal of Experimental Psychology: General*, *138*(2), 236–257. https://doi.org/10.1037/a0015631

Zacks, J. M., Tversky, B., & Iyer, G. (2001). Perceiving, remembering, and communicating structure in events. *Journal of Experimental Psychology. General*, *130*(1), 29–58. https://doi.org/10.1037/0096-3445.130.1.29