**Like theseInstructions**:

* Under the “File” menu, select “Make a copy…” or “Download As” to make your own preregistration document.
* Preregister your study by either 1) attaching the document to an OSF project and registering with the “OSF Standard pre-data collection” form or 2) use the “OSF Prereg” form available here: (<https://osf.io/prereg>) (option 2 provides a better formated, final preregistration)
* Information on registering OSF projects and the different forms is available [on the OSF help docs](https://help.osf.io/hc/en-us/categories/360001550953-Registrations).
* General information about preregistration is available at <https://cos.io/prereg> and you can reach out to [prereg@cos.io](mailto:prereg@cos.io) or [@OSFprereg](https://twitter.com/osfprereg?lang=en). A preprint of this template is available at <https://osf.io/preprints/metaarxiv/epgjd/>

[Study Information](#_heading=h.gjdgxs)

[Design Plan](#_heading=h.30j0zll)

[Sampling Plan](#_heading=h.1fob9te)

[Variables](#_heading=h.3znysh7)

[Analysis Plan](#_heading=h.2et92p0)

[Other](#_heading=h.tyjcwt)

### Study Information

1. Title: The effect of different genres and tempos of music on teenager’s emotions
2. Authors (required)

David Rose

Siying Zhang

Tobi Gerstenberg

Shaun Nichols

Ellen Markman

1. Description (optional)

Our lives are full of music. Whether it is pop, classical, or rock, they are all essential to human’s everyday life, especially for teenagers. Different genres of music are often played on different occasions, e.g. some of the songs are for parties and some are for studying or working out. Music has also been one of the most common ways for teenagers to relieve stress and relax. However, what genre of music at what tempo does the best job at improving teenager’s moods? And conversely, what genre of music at what tempo has the counterproductive effects on teenager’s emotions? In this research, we will discuss the effects of different genres of music at different tempos on teenager’s mental states.

1. Hypotheses (required)

Hypothesis 1: The pop song played at 1.25x its original speed will have the most positive impact on teenager’s emotions

Hypothesis 2: The rhythm & blue song played at 0.75 its original speed will have the most negative effect on teenager’s emotions

### 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 (required)
   1. Experiment - A researcher randomly assigns treatments to study subjects, this includes field or lab experiments. This is also known as an intervention experiment and includes randomized controlled trials.
   2. Observational Study - Data is collected from study subjects that are not randomly assigned to a treatment. This includes surveys, ñnatural experiments,î and regression discontinuity designs.
   3. Meta-Analysis - A systematic review of published studies.
   4. Other
2. Blinding (required)
   1. Blinding describes who is aware of the experimental manipulations within a study. Mark all that apply.
      1. No blinding is involved in this study.
      2. For studies that involve human subjects, they will not know the treatment group to which they have been assigned.
      3. Personnel who interact directly with the study subjects (either human or non-human subjects) will not be aware of the assigned treatments. (Commonly known as “double blind”)
      4. Personnel who analyze the data collected from the study are not aware of the treatment applied to any given group.
3. Is there any additional blinding in this study? NA
4. Study design (required)
   1. The study design is a 2 (Question: Simple, Periphrastic) x 2 (Scenario: Sunburn, Flood) within-subjects design.

Children will begin with four warm up trials. They will be introduced to a puppet, Maggie, and will be told that they will help Maggie learn some English. They will first hear Maggie say two sentences: 1. I put socks on my feet. 2. I put socks on my feets. After hearing these two sentences, they will then be asked, for each one, whether it is right or wrong for Maggie to say that. They will say their answer out loud before proceeding to the third and fourth warm-up trials. For these they will hear Maggie again say two sentences: 3. I live in Maple Street. 4. I live on Maple street. Again they will then be asked, for each one, whether it is right or wrong for Maggie to say that. They will say their answer out loud. Then they will proceed to the test trials: the sunburn case and the flood case.

For the sunburn case, children will be introduced to Suzy and told that she is planning to go to the beach. As she leaves for the beach she grabs her sunglasses but forgets her sunscreen. While at the beach she gets a sunburn. They will then be asked:

What caused Suzy’s skin to burn? (They will say their answer out loud)

What burned Suzy’s skin? (They will say their answer out loud)

For the flood cases, children will be introduced to Andy. The latch on Andy’s basement window is broken so he removes it and takes it to his workshop to fix. As he leaves the basement, the window opens. It begins raining very hard and his basement becomes flooded. After seeing the case, they will then be asked:

What caused Andy’s basement to flood? (They will say their answer out loud)

What flooded Andy’s basement? (They will say their answer out loud)

Participants will receive both scenarios and the accompanying questions with the order of the scenarios and questions being randomized across participants.

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

### Statement and Scenario will be randomized.

### Sampling Plan

In this section we’ll 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 (required)
   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, created, or realized.
      2. Registration prior to any human observation of the data: As of the date of submission, the data exist but have not yet been quantified, constructed, observed, or reported by anyone - including individuals that are not associated with the proposed study. Examples include museum specimens that have not been measured and data that have been collected by non-human collectors and are inaccessible.
      3. Registration prior to accessing the data: As of the date of submission, the data exist, but have not been accessed by you or your collaborators. Commonly, this includes data that has been collected by another researcher or institution.
      4. Registration prior to analysis of the data: As of the date of submission, the data exist and you have accessed it, though no analysis has been conducted related to the research plan (including calculation of summary statistics). A common situation for this scenario when a large dataset exists that is used for many different studies over time, or when a data set is randomly split into a sample for exploratory analyses, and the other section of data is reserved for later confirmatory data analysis.
      5. Registration following analysis of the data: As of the date of submission, you have accessed and analyzed some of the data relevant to the research plan. This includes preliminary analysis of variables, calculation of descriptive statistics, and observation of data distributions. Please see cos.io/prereg for more information.
2. Explanation of existing data (optional)
   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.
   2. **Example**: An appropriate instance of using existing data would be collecting a sample size much larger than is required for the study, using a small portion of it to conduct exploratory analysis, and then registering one particular analysis that showed promising results. After registration, conduct the specified analysis on that part of the dataset that had not been investigated by the researcher up to that point.
   3. **More info**: An appropriate instance of using existing data would be collecting a sample size much larger than is required for the study, using a small portion of it to conduct exploratory analysis, and then registering one particular analysis that showed promising results. After registration, conduct the specified analysis on that part of the dataset that had not been investigated by the researcher up to that point.
3. Data collection procedures (required)
   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 donÍt 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.

Participants will be recruited through Lookit. Inclusion criteria are that participants be between 4 and 6 years old and provide their own answers, without input from parents, siblings, etc., on all test trials.

1. Sample size (required)
   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?
   2. **Example**: Our target sample size is 280 participants. We will attempt to recruit up to 320, assuming that not all will complete the total task.
   3. **More information**: For some studies, this will simply be the number of samples or the number of clusters. For others, this could be an expected range, minimum, or maximum number.

We will recruit a total of 90 participants (30 4 year olds, 30 5 year olds and 30 6 year olds) who meet our inclusion criteria.

1. Sample size rationale (optional)
   1. This could include a power analysis or an arbitrary constraint such as time, money, or personnel.
   2. **Example**: We used the software program G\*Power to conduct a power analysis. Our goal was to obtain .95 power to detect a medium effect size of .25 at the standard .05 alpha error probability.
   3. **More information**: This gives you an opportunity to specifically state how the sample size will be determined. A wide range of possible answers is acceptable; remember that transparency is more important than principled justifications. If you state any reason for a sample size upfront, it is better than stating no reason and leaving the reader to “fill in the blanks.” Acceptable rationales include: a power analysis, an arbitrary number of subjects, or a number based on time or monetary constraints.

1. Stopping rule (optional)
   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.
   2. **Example**: We will post participant sign-up slots by week on the preceding Friday night, with 20 spots posted per week. We will post 20 new slots each week if, on that Friday night, we are below 320 participants.
   3. **More information**: You may specify a stopping rule based on p-values only in the specific case of sequential analyses with pre-specified checkpoints, alphas levels, and stopping rules. Unacceptable rationales include stopping based on p-values if checkpoints and stopping rules are not specified. If you have control over your sample size, then including a stopping rule is not necessary, though it must be clear in this question or a previous question how an exact sample size is attained.

### 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 which you are measuring for exploratory analyses, you are not required to list them, though you are permitted to do so.

1. Manipulated variables (optional)
   1. Describe all variables you plan to manipulate and the levels or treatment arms of each variable. This is not applicable to any observational study.

There are two manipulated variables: (1) whether the verb used in the question is in simple or periphrastic form and (2) whether the scenario involves a sunburn or a flood.

1. Measured variables (required)
   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.

Our measurement variable is participant explanations. In the sunburn case, appealing to the sun will count as a direct cause while appealing to the sunscreen will count as an absence. In the flood case, appealing to the water or rain will count as a direct cause while appealing to the latch or window being open will count as an absence. More specifically:

For the sunburn case we will count the occurance of the following words as appealing to either direct causes or absences:

Direct cause: “sun”

Absence: “sunscreen”

For the flood case we will count the occurrence of the following words as appealing to either direct causes or absences:

Direct cause: “water”, “rain”

Absence: “window”, “latch”

In addition to coding explanations as appealing to direct causes or absences in R (by checking whether or not one of the "direct cause", or" absence" words was mentioned) , we will also, as an additional analysis, have two coders independently code explanations as appealing to direct causes or absences. The coding scheme is not mutually exclusive: so it is possible for a child to refer to both a direct cause and an absence in the same explanation.

1. Indices (optional)
   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 your 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.
   2. **Example**: We will take the mean of the two questions above to create a single measure of ‘brownie enjoyment.’
   3. **More information**: If you are using multiple pieces of data to construct a single variable, how will this occur? Both the data that are included and the formula or weights for each measure must be specified. Standard summary statistics, such as “means” do not require a formula, though more complicated indices require either the exact formula or, if it is an established index in the field, the index must be unambiguously defined. For example, “biodiversity index” is too broad, whereas “Shannon’s biodiversity index” is appropriate.

### 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 (required)
   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, subgroup analyses, pairwise or complex contrasts, or follow-up tests from omnibus tests. If you plan on using any positive controls, negative controls, or manipulation checks you may mention that here. Remember that any test not included here must be noted as an exploratory test in your final article.
   2. **Example**: We will use a one-way between subjects ANOVA to analyze our results. The manipulated, categorical independent variable is 'sugar' whereas the dependent variable is our taste index.
   3. **More information**: This is perhaps the most important and most complicated question within the preregistration. As with all of the other questions, the key is to provide a specific recipe for analyzing the collected data. Ask yourself: is enough detail provided to run the same analysis again with the information provided by the user? Be aware for instances where the statistical models appear specific, but actually leave openings for the precise test. See the following examples:
      * 1. If someone specifies a 2x3 ANOVA with both factors within subjects, there is still flexibility with the various types of ANOVAs that could be run. Either a repeated measures ANOVA (RMANOVA) or a multivariate ANOVA (MANOVA) could be used for that design, which are two different tests.
        2. If you are going to perform a sequential analysis and check after 50, 100, and 150 samples, you must also specify the p-values you’ll test against at those three points.

To test hypothesis 1, that the extent to which participants appeal to direct causes doesn’t differ based on the causal verb (simple, periphrastic) in the question, we will fit a logistic mixed effects model with random intercepts for participants and scenario using the following formula in R:

direct\_cause ~ 1 + verb + (1 | participant) + (1 | scenario)

We will fit the model using Bayesian analysis via the brm() function from the brms package. We predict that the 95% credible interval of the posterior distribution of the fixed effect "verb" that captures the difference between using the periphrastic versus the simple expression will contain 0.

To test hypothesis 2, that the extent to which participants appeal to absences does differ based on the causal verb (simple, periphrastic) in the question, we will fit a logistic mixed effects model with random intercepts for participants and scenario using the following formula in R:

absence ~ 1 + verb + (1 | participant) + (1 | scenario)

Again, we will fit the model using Bayesian analysis via the brm() function from the brms package. We predict that the fixed effect "verb" will be positive (showing that participants are more likely to cite an absence when the verb is periphrastic versus simple) and that the 95% credible interval of the posterior distribution of the fixed effect does not contain 0.

To test hypothesis 3 and 4, we will first combine data obtained here with 4 - 6 year olds with data obtained from our previous experiment with 7 - 9 year olds (see <https://osf.io/3ha4k>). We will use sum coding for the categorical predictor "verb" (coding "simple" as -1, and "periphrastic" as 1), and we will center the "age" predictor.

To test hypothesis 3, we will fit the following logistic mixed effects model:

direct\_cause ~ 1 + verb \* age + (1 | participant) + (1 | scenario)

We predict that the 95% credible interval of the parameter estimate for "verb" will include 0. We predict that the parameter for "age" will be positive and that the 95% credible interval will exclude 0. We predict that the 95% credible interval of the parameter estimate for the interaction between "verb" and "age" will include 0.

To test hypothesis 4, we will fit the following logistic mixed effects model:

absence ~ 1 + verb \* age + (1 | participant) + (1 | scenario)

We predict that the parameter for "verb" will be positive and that the 95% credible interval will exclude 0. We predict that the parameter for "age" will be positive and that the 95% credible interval will exclude 0. We predict that the interaction between "verb" and "age" will be positive and that the 95% credible interval will exclude 0.

1. Transformations (optional)
   1. If you plan on transforming, centering, recoding the data, or will require a coding scheme for categorical variables, please describe that process.
   2. **Example**: The “Effect of sugar on brownie tastiness” does not require any additional transformations. However, if it were using a regression analysis and each level of sweet had been categorically described (e.g. not sweet, somewhat sweet, sweet, and very sweet), ‘sweet’ could be dummy coded with ‘not sweet’ as the reference category.
   3. **More information**: If any categorical predictors are included in a regression, indicate how those variables will be coded (e.g. dummy coding, summation coding, etc.) and what the reference category will be.
2. Inference criteria (optional)
   1. What criteria will you use to make inferences? Please describe the information youÍll 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?
   2. **Example**: We will use the standard p<.05 criteria for determining if the ANOVA and the post hoc test suggest that the results are significantly different from those expected if the null hypothesis were correct. The post-hoc Tukey-Kramer test adjusts for multiple comparisons.
   3. **More information:** P-values, confidence intervals, and effect sizes are standard means for making an inference, and any level is acceptable, though some criteria must be specified in this or previous fields. Bayesian analyses should specify a Bayes factor or a credible interval. If you are selecting models, then how will you determine the relative quality of each? In regards to multiple comparisons, this is a question with few “wrong” answers. In other words, transparency is more important than any specific method of controlling the false discovery rate or false error rate. One may state an intention to report all tests conducted or one may conduct a specific correction procedure; either strategy is acceptable.

We are using Bayesian statistics and the inference criteria are described in the analysis section above.

1. Data exclusion (optional)
   1. How will you determine what data or samples, if any, to exclude from your analyses? How will outliers be handled? Will you use any awareness check?
   2. **Example**: No checks will be performed to determine eligibility for inclusion besides verification that each subject answered each of the three tastiness indices. Outliers will be included in the analysis.
   3. **More information**: Any rule for excluding a particular set of data is acceptable. One may describe rules for excluding a participant or for identifying outlier data.

We will exclude data from participants who fail to meet our inclusion criteria.

1. Missing data (optional)
   1. How will you deal with incomplete or missing data?
   2. **Example**: If a subject does not complete any of the three indices of tastiness, that subject will not be included in the analysis.
   3. **More information**: Any relevant explanation is acceptable. As a final reminder, remember that the final analysis must follow the specified plan, and deviations must be either strongly justified or included as a separate, exploratory analysis.
2. 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.
   2. **Example**: We expect that certain demographic traits may be related to taste preferences. Therefore, we will look for relationships between demographic variables (age, gender, income, and marital status) and the primary outcome measures of taste preferences.

We will conduct exploratory analyses of question order effects.

### Other

1. Other (Optional)
   1. If there is any additional information that you feel needs to be included in your preregistration, please enter it here. Literature cited, disclosures of any related work such as replications or work that uses the same data, or other context that will be helpful for future readers would be appropriate here.