### Alles in orange sind Dinge, die noch fehlen oder Formulierungen, mit denen ich nicht ganz zufrieden bin. Kursiv sind die Teile die noch aus der Vorlage stammen.

In lila geschreibenes haben wir „geändert“ oder hinzugefügt

### Study Information

### **Title:** Perception and Identification of Randomness

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**Description:** Perception of randomness, the ability to perceive and discriminate structured versus unstructured events, is an important ability for survival and involved in many day-to-day activities and thus also important to study.

In this replication study, discrimination and identification of random versus non-random stimuli are tested between-participants in two experimental groups. Additionally, we are looking into a possible effect of language on the identification of randomness, as the experiment is conducted in German and in English.

* 1. ***Example****: Though there is strong evidence to suggest that sugar affects taste preferences, the effect has never been demonstrated in brownies. Therefore, we will measure taste preference for four different levels of sugar concentration in a standard brownie recipe to determine if the effect exists in this pastry.*
  2. ***More info****: The description should be no longer than the length of an abstract. It can give some context for the proposed study, but great detail is not needed here for your preregistration.*

**Hypothesis: “**The probability of correctly identifying stimuli from R [random sources] and N [non-random sources] coincides with the ease of distinguishing between the two sources.” (Zhao & Hahn, 2014)

In other words, the hypothesis is that a positive correlation between correct identification and correct discrimination exists.

### Design Plan

**Study type:** Experiment

**Blinding**: The participants are not informed that there are two different experimental groups and each participant is only assigned to one group. The experiment will be conducted via the internet, so no direct contact between experimenters and participants will take place.

**Study design**: The experiment is between-participants and has two experimental groups, so each participant only provides data for one experimental group. It is designed with factors …

A more detailed description can be found in the corresponding Experimental Design plan.

* 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.*
  2. *More info: This question has a variety of possible answers. The key is for a researcher to be as detailed as is necessary given the specifics of their design. Be careful to determine if every parameter has been specified in the description of the study design. There may be some overlap between this question and the following questions. That is OK, as long as sufficient detail is given in one of the areas to provide all of the requested information. For example, if the study design describes a complete factorial, 2 X 3 design and the treatments and levels are specified previously, you do not have to repeat that information.*

**Randomization:** The participants are randomly assigned to either the discrimination or the identification group by a coin-flip generator

### Sampling Plan

**Existing data:** As of the date of the submission of this preregistration, the data have not yet been collected.

**Data collection procedures:** Participants will be drafted through social media and direct messages (e-mails and text messages). Participation is voluntary and will not be compensated. After sending out the invitations, we will close the data collection at the 12th of August, which is X days after sending out the invitation. Participants are only eligible if they are at least 18 years old and, although this may seem redundant, if they have full or corrected vision. A participant is only allowed to participate once.

**Sample size:** We will try to recruit as many participants as possible. Expectations/Minimum/Target?

**Sample size rationale:** Since time is critical due to a deadline, our pool of reachable participants is limited and we do not offer any compensation for participation, we cannot state a minimum number of participants.

* 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.*

**Stopping rule:** We will stop data collection on time point X of the Xth day after sending out the invitations.

### 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.*

**Manipulated variables:** We manipulate the switch rate, that is the density of randomness, of the given stimuli picture. The switch rate has 51 different levels, each of which is shown ten times per participant. This switch rate lies between 0 and 1. The closer to 0.5 the switch rate, the more does the colour assignment happen like one would expect from a random source. More on this in the ‘Experimental design’.

* 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.*
  2. ***Example:*** *We manipulated the percentage of sugar by mass added to brownies. The four levels of this categorical variable are: 15%, 20%, 25%, or 40% cane sugar by mass.*
  3. ***More information****: For any experimental manipulation, you should give a precise definition of each manipulated variable. This must include a precise description of the levels at which each variable will be set, or a specific definition for each categorical treatment. For example, “loud or quiet,” should instead give either a precise decibel level or a means of recreating each level. 'Presence/absence' or 'positive/negative' is an acceptable description if the variable is precisely described.*

**Measured variables**: We will measure

For each participant in both conditions, the average discrimination and identification accuracy at every switch rate was calculated, then grand means were calculated by averaging across participants. Results are shown in Figure 1b. Overall, as the non-random half of the matrix became more random (i.e., switch rate closer to .5), both discrimination and identification accuracy decreased. The correlation between discrimination and identification accuracy.

* 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.*
  2. ***Example****: The single outcome variable will be the perceived tastiness of the single brownie each participant will eat. We will measure this by asking participants ‘How much did you enjoy eating the brownie’ (on a scale of 1-7, 1 being ‘not at all’, 7 being ‘a great deal’) and ‘How good did the brownie taste’ (on a scale of 1-7, 1 being ‘very bad’, 7 being ‘very good’).*

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 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.*
   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

*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.*

**Statistical models:** We use a Bayesian BLA model using the brms-package (citation?). …

* (between-subjects factor: discrimination vs. identification condition; within-subject factor: 51 levels of switch rates).
* Looking for effects for condition and for switch rate
* For each switch rate, the average performance of participants in each condition/group was obtained
  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.*

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 you’ll 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.*

**Data exclusion**: We will exclude data points that …

* 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.*

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.*

**Exploratory analysis:** We further plan to look for relationships between the language the participants stated as their main language and the results of the identification part. (?) (This of course only applies to those in the identification group.)

* 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 upfront, 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.*

### Other

This study is a replication of Experiment 1 in “Perception and identification of random events” by Zhao and Hahn (2014) ([https://doi.org/10.1037/a0036816](https://doi.apa.org/doi/10.1037/a0036816)). Changes we made to their experimental design and analysis are either stated here or in our ‘Experimental design’.