Strength-of-preference vs. decisions in binary choice

**Pre-registration questions**  
   
1)      Data collection. Have any data been collected for this study already?  
  
i.  Yes, we already collected the data  
ii.  No, no data have been collected for this study yet  
iii. It’s complicated. We have already collected some data but explain in Question 8 why readers may consider this a valid pre-registration nevertheless.  
  
No, no data have been collected for this study yet.  
  
2)      Hypothesis. What’s the main question being asked or hypothesis being tested in this study?  
   
We are interested in the effects of attention (as measured by time spent looking at an object using eye-tracking) and value (as elicited from the subjects directly via ratings) when determining choices between two objects (such as between two bags of chips, or two pictures of nature, or between two fruits). In previous experiments, we have found that choice is predicted by an interaction of attention and value: people attend to objects they like more and are more likely to choose them. However, in other experiments there are only additively separable effects of attention and value on choice: people are more likely to pick the option they value more and/or they are more likely to choose the option they attend to more, but that these effects do not interact (i.e. looking more does not have a bigger effect when the value difference is bigger).

The current experiment will attempt to identify which properties lead to the interactive vs. additive effect of attention and value. Here, we will compare simple binary choice between two pictures (Would you prefer Picture A or Picture B on your wall?) with a strength of preference comparison (By how much would you prefer Picture A over Picture B, or vice versa?). We hypothesise that the size of the interaction term will be greater in the strength-of-preference condition than in the choice condition.

3)      Dependent variable. Describe the key dependent variable(s) specifying how they will be measured.  
  
We will use the choice and continuous valuation of relative preference (between the two pictures in each trial) as the dependent variable in the choice and strength-of-preference conditions respectively. Attention (either number of fixations, or the proportion of time spent looking at each lottery in each trial) will be used as both dependent variable (when examining the effect of condition/value upon attention) and independent variable (when examining the effect of attention upon preference). Value (rated value of each picture by the individual participants) will be used as an independent variable.  
   
4)      Conditions. How many and which conditions will participants be assigned to?  
   
All subjects will undergo two conditions:  
   
1. Binary choice: Block of 50 trials where the participants has to select which picture they would prefer on each trial.

2. Strength of preference: Block of 50 trials where the participants have to judge by how much they would prefer one picture over another.   
   
The order in which the subjects experience these blocks of trials will be counterbalanced based on participant number.

Prior to the main experimental tasks, participants will also complete a valuation block to acquire their preference ratings for each individual stimulus on a scale between 1 and 7.

5)      Analyses. Specify exactly which analyses you will conduct to examine the main question/hypothesis.

We are interested in the existence of an interaction effect between attention and value on picture choice. If we find that there are clear order effects in their choices, we will exclude the second block from the analysis, and analyze a between-subjects contrast of the first block of lotteries each subject experiences.

Assuming no order effects, the interaction effect between attention and value on picture choice will be investigated using regression analysis with the choice (between the two pictures) as the dependent variable, while using attention (either number of fixations, or the proportion of time spent looking at each lottery) and value (expected value of each lottery) as independent variables. Since subjects will make choices over a number of lottery trials in each of our two conditions, we will allow for both fixed and random effects of attention and value on choice by using a mixed-model logistic regression.

[NS: Can we add a R-code like model specification:

For within-subjects analysis:

glmer(choice ~ value.difference \* attention.difference \* condition + (1 | value.difference \* attention.difference \* condition || subject), family=binomial)

For first block only between-subjects analysis

glmer(choice ~ value.difference \* attention.difference \* condition + (1 | value.difference \* attention.difference || subject), family=binomial)

As an alternative, we will also run a standard logistic regression separately for each subject, and then perform an analysis of variance (ANOVA) test on the interaction effect between attention and value on choice across the two condition blocks of lottery trials. We expect to only report the results of the mixed-model logistic regression, unless there are significant differences from the results of the ANOVA analysis. If that is the case, we will investigate and report the reasons behind the discrepancy between the two statistical methods.  
   
6)      Outliers and Exclusions. Describe exactly how outliers will be defined and handled, and your precise rule(s) for excluding observations.  
  
We will exclude subjects in the following circumstances:  
  
1. Some individuals cannot be calibrated to the eye tracker, usually due to the physiology of their eye. Anyone who cannot be calibrated with our eye tracking equipment will be excluded.  
  
2. It is common that for a minority of subjects, despite accurate measurements during the calibration procedure, the quality of their eye tracking data during the task is poor. Data for an experiment run at the University of Warwick suggests that in a choice task using these stimuli, subjects that spend less than 90% of the time looking at the Areas of Interest (AOIs--in this case, the pictures) are outliers in the amount of time that their attention is directed towards task related information. This is generally suggestive of poor calibration. When deciding when to stop collecting data (see section 7) we will use this as a threshold to determine whether to exclude subjects (in the choice condition only). Then, prior to data analysis, we will check the distribution of these measures for our subjects, and identify the analogous cutoff threshold within this sample, and with the relative preference valuation condition as well. Subjects below these thresholds in our sample will be excluded.    
  
As a robustness check, we will re-run our statistical analyses after adding excluded subjects back in, to check the effect that outliers have on our results.

We will also exclude trials where the reaction time is less than 200 ms, and trials where the reaction time is 3 standard deviations above the mean reaction time across all trials.

Finally, we will remove the data from the second block if there are significant difference in task performance due to order. We will determine if that’s the case by fitting a regression model that includes task order as a factor. If the effect of task order is significant, we will conduct between-subject analyses instead of within-subject analyses.

7)      Sample Size. How many observations will be collected or what will determine sample size?  
   
We will run testing until either a) we collect the data of 50 participants after exclusions, or b) we attempt data collection from 80 participants; whichever comes first.   
  
 8)      Other. Anything else you would like to pre-register?  
   
We will collect age, and gender for all participants. We will not report the summary statistics of these variables, nor include them as covariates in our regression analyses, unless requested by referees during the publication process.  
   
9)      Name. Give a title for this AsPredicted pre-registration.  
   
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10)   For record keeping purposes, please us the type of study you are pre-registering.  
i.                 Class project or assignment  
ii.                Experiment  
iii.               Survey  
iv.               Observational/archival study  
  
Experiment.