Soccer Game Study 1: Children's future task choice based on past outcomes (#172619)

Author(s)
This pre-registration is currently anonymous to enable blind peer-review.
It has 3 authors.

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?
This study will explore how 4- and 5-year-olds respond after playing a tablet game that "freezes" midway through an attempt to reach a goal (i.e., a ball making its way toward a net). We hypothesize that 4- and 5-year-old children will be more likely to want to keep playing the game if their most recent attempt would have resulted in a success (Almost condition) than if it would have missed (Miss condition).

3) Describe the key dependent variable(s) specifying how they will be measured.
After the children fail to reach the goal three consecutive times (outcomes of the first three attempts are identical across all children), they will attempt to do so a fourth time. Midway through their fourth attempt (as the ball is launching toward the goal), the tablet will suddenly freeze, such that the outcome of the attempt is not observed. The trajectory of the ball on the fourth attempt differs by condition.

The experimenter will then ask children whether they would rather (1) keep playing the current game, in which case they will have to wait for the experimenter to restart it, or (2) play a different game right away. The key dependent measure is whether children choose to keep playing the current game or switch to a different game.

4) How many and which conditions will participants be assigned to?
Children will be assigned randomly to either the Almost condition, or the Miss condition (between-subjects). Children will play a game in which they blow into a mouthpiece at the bottom of a tablet, which will then launch a virtual ball from the bottom of the tablet screen to the top of the screen. The goal of the game is to blow the ball into the goal at the top of the screen (children's performance, however, is fixed and surreptitiously controlled by the experimenter). Children will attempt the game four times; the critical condition difference occurs on their fourth attempt, where their ball will either head straight for the goal (Almost condition), or veer for a miss (Miss condition), before freezing.

5) Specify exactly which analyses you will conduct to examine the main question/hypothesis.
We will run the following Bayesian generalized linear model in the rstanarm (Goodrich et al., 2024) package in order to determine whether task choice differs by condition:

stan_glm(formula = choice ~ condition,
family = binomial,
data = data)

"Choice" corresponds to the primary dependent measure (i.e., whether children will want to keep playing the same game (coded as 1) or switch to a different game (coded as 0)), and "condition" corresponds to either the Almost or Miss condition (between-subjects).

We will use the package default of weakly informative priors (normal distributions on coefficients with SD = 2.5, scaled to predictor magnitudes).

In order to assess the hypothesis of an effect of condition on choice, we will compute the Bayes Factor using the bridgesampling (Gronau et al., 2020) package in R. We will compare a model with a condition term (i.e., choice ~ condition) and one without (i.e., intercept-only model; choice ~ 1):

bf(conditionterm_model, interceptonly_model)

We will interpret a BF10 > 10 as strong evidence, BF10 > 5 as moderate evidence, and BF10 > 3 as weak but meaningful evidence for a condition effect. We will use the same thresholds to interpret evidence in favor of the null (i.e., BF01).

In addition to reporting the Bayes Factor, we will also report the credible intervals and coefficient estimates.

6) Describe exactly how outliers will be defined and handled, and your precise rule(s) for excluding observations.
Participants will be excluded for interference (teachers, children, or other individuals), experimenter error (e.g., large deviations from the study script), failure to complete the study, ambiguous or uncodeable choice, having parent-reported developmental delays, or technical errors (e.g., video does not record, tablet game does not work).

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.

We are uncertain as to the size of the effect we will observe (if any), thus we plan a sequential Bayes Factor analysis (e.g., Mani et al., 2021). We will calculate the Bayes Factor via model comparison (see analysis plan): comparing a model with a condition term (i.e., choice ~ condition) and one without (i.e., intercept-only model; choice ~ 1).

We will test an initial sample of 20 children (4- and 5-year-olds) in each condition, then evaluate the Bayes Factor on the hypothesis of an effect of condition on task choice (i.e., bf(conditionterm_model, interceptonly_model)) after every 4 data points (2 per condition). We will stop testing at BF10 > 10, BF10 < ⅒, or at N = 72 (36/condition).

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

We may also investigate the effect of age in our study, using the formula:

stan_glm(formula = choice ~ condition*age, family = binomial, data = data)