

Concreteness Fading – Differences between abstract and concrete learning (#1416)

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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?

Is learning novel symbols through concreteness fading more effective than using abstract or concrete representations alone?
Is learning through abstract representations alone more effective than learning through concrete representations alone?

3) Describe the key dependent variable(s) specifying how they will be measured.

The key dependent variable is accuracy on a symbolic comparison task.

Children will first complete a training phase during which they will be shown a symbol at the top of the screen and an array of dots or pictures (depending on condition) underneath for 1000ms. Children are asked to remember how many dots or pictures are associated with each symbol. There are five different symbols associated with the numerosities 5, 10, 15, 20 or 25. The association between symbol and numerosity will be counter-balanced across children. There will be 200 trials presented in random order. The nature of the array will differ depending on between-groups condition: all abstract (all arrays are dots), all concrete (all arrays are pictures), concrete to abstract (arrays are split into five blocks each with a different percentage of picture arrays: 100% pictures, 75% pictures 25% dots, 50% pictures 50% dots, 25% pictures 75% dots, 100% dots), abstract to concrete (arrays are split into five blocks each with a different percentage of dot arrays: 100% dots, 75% dots 25% pictures, 50% dots 50% pictures, 25% dots 75% pictures, 100% pictures).

Following the training phase, participants will complete a symbolic comparison task to assess whether they have formed associations between the symbols and non-symbolic arrays. Two symbols will be displayed, one on the right of the screen and one on the left until the participant responds by pressing a key on the keyboard to indicate which was associated with the greater numbers of dots/pictures. In this test phase the arrays are not presented. There will be a total of 80 test trials. The dependent variable will be the accuracy.

4) How many and which conditions will participants be assigned to?

There will be four between subject conditions and participants will be assigned to one of four conditions (abstract only, concrete only, concrete fading and abstract fading).

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

The data will firstly be checked for normality and outliers. If appropriate we will use a one-way ANOVA to test if there are any significant differences in accuracy between the four conditions. If the ANOVA reveals a significant main effect of condition, then Tukey's post hoc tests will show where the differences between the conditions lie.

If the data is not appropriate for this analysis (i.e. does not meet the conditions needed to conduct an ANOVA) the equivalent non-parametric tests will be used (Kruskal-Wallis one way ANOVA).

6) Any secondary analyses?

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.

A power analysis using pilot testing shows a sample of 216 children will be needed to have enough power to detect a small effect.

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

Data Exclusions – Any outliers will be removed using the criteria that those who are 3 standard deviations above or below the mean accuracy will be removed.