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Sequence Discrimination Learning in Human Children

What Is Sequence Discrimination?

Sequence cognition is the capacity to organise, understand and act upon a series of steps in the order in which they were performed. This cognitive capacity is important in language, social interactions tool use and many more, all capabilities that are very developed in humans. The larger study attempted to answer the question of whether humans are better at discriminating between sequences then non-human primates, while this smaller project aims to understand whether a child's age impacts how good they are at discriminating between sequences, and whether giving a cue to the children will affects their success rates.

Hypothesis

This study has 2 hypotheses: 1) there is a general correlation between a child's age and their success in performing all types of trials. 2) participants will be more successful in reaching discrimination criteria in the "causal cue" condition rather than the "no causal cue" condition.

Discussion

The findings:

1) There is no clear connection that can be seen between the age of a participant and their success in the no-causal cue paper towel task. This result could very likely simply be a result of the study currently not having enough children in a few of the categories, meaning that a specifically high or low result is not currently representative of the age categories in question.

2) a trend can be seen in the Causal cue condition, which seems to show an overall increase in success rate with age. Overall the results seem to contradict the suggestion that sequence discrimination is an innate skill, and as such not one that significantly improves age.

3) despite the lack of clear results, one conclusion can be clearly drawn from this study; the no causal cue task is clearly harder for the children to discriminate between than the Causal cue tasks. across all the age categories, the children consistently performed better in the Causal cue task. As such, one of the hypotheses of the overall study is proven and will likely continue

References

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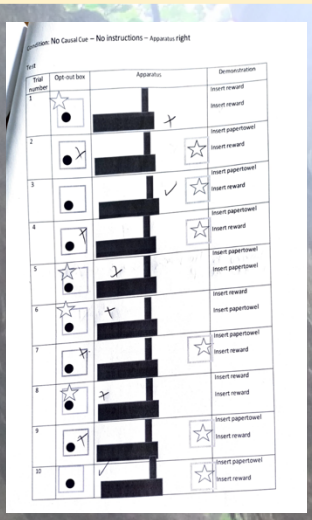
Background

Humans share many of their cognitive skills with other apes, as we are closely related to each other (Tomasello & Herrmann, 2010, p. 3), however, human cognitive skills are often more evolved. One such cognitive skill is sequence cognition. Endress et al (2009) suggested that evidence for the precursor to modern language can be seen with monkeys today (p. 750), suggesting that sequence discrimination does exist to some degree in many monkey and primate species. another study by Endress, Carden, Versace and Hauser (2010), found that chimpanzees could track the relative position of items in a sequence after limited exposure to sequences but didn't have sensitivity to relations among items in a sequence. Conway and Christiansen's (2001) study is also relevant, as it investigates sequential learning in primates, supporting the previous studies' validity. Overall, several studies concluded that non-human primates could discriminate between arbitrarily composed sequences to a limited capacity (Ghirlanda, Lind, & Enguist, 2017). However, this conclusion does not necessarily apply to non-arbitrary sequences, which is why this study has two conditions: the arbitrary condition 'No Causal Cue' and the non-arbitrary condition. 'Causal Cue'.



Left photo: an example of a coding sheet. Bottom photo: the set-up of the No Causal Cue condition during the testing phase.

Methods

Before the study begins informed written consent from the child's parent is necessary. Once consent is given the opt-out round begins. The child chooses between two boxes: a white one capable of containing the high reward, and a green one containing the low reward. The opt-out round contains 4 trials and requires a 75% success rate to progress to the training phase of the study. All of the participant's choices throughout the study are marked on a coding sheet (the testing phase coding sheet is seen above). Once a child progresses to the training phase they will be introduced to the apparatus (the grey box in the photo above to the right). The Training phase has two possible conditions, no causal cue and causal cue, which are chosen semi-randomly. The no causal cue condition contains another white box (As seen above), in which the token the child wins for high rewards is placed, rather than in the apparatus, like the causal cue condition. The child goes through six trials, three containing the high reward and three without. The choice is presented to the child in this order: 1) the sequence is performed in front of the child 2) once the child chooses either the tunnel is separated from the apparatus to show the insides of it to the child (causal cue) or the small white box is opened with the contents shown to the child. During the testing phase, the apparatus's tunnel is replaced by a longer grey tunnel without a sleeve (as seen above). The test phase also contains two conditions, which mirror the conditions in the training phase. The child goes through 12 trials, six containing the high reward and six without. The choice is presented to the child in this order: 1) the sequence is performed in front of the child 2) once the child chooses either the tunnel is separated from the apparatus to show the insides of it to the child (causal cue) or the small white box is opened with the contents shown to the child (no causal cue).Once the trials are finished the child is asked the question "How did you decide which box to choose?" with the answer being recorded on the coding sheet. If the answer isn't satisfactory a second question "Sometimes there was a sticker in this box (point to apparatus) and sometimes there wasn't. How did you know when to choose this box?" the second answer also being recorded on the coding sheet.