Design Plan:

The effect of atypical exemplars on the manual response in a categorization task - a replication study

Background

In the past few decades, the process of categorization has attracted more and more interest in research. Categorization describes the mental process of sorting objects into categories in order to facilitate the understanding and organization of things and objects in the world. It is based on distinguishing the members of a category from nonmembers by recognizing their features. Thus, the concept of typicality is also of great relevance here. The following example illustrates how this concept works. A cat is a typical instance of a mammal since it exhibits many features of the category such as the presence of fur and skin and being a vertebrate animal. If looking at a whale, it is noticeable that this instance does not share many typical features of the category mammal but still belongs to it. Therefore, the whale is a less typical exemplar. It even exhibits several features of the category fish like living underwater and having fins. As result, the categories are competing because the exemplar whale shows features of both, being a fish and a mammal. Only after cognitively solving the competition there can be a reliable category assignment for the instance.

The presented study partly is a replication of the study 'Graded motor responses in the time course of categorizing atypical exemplars' by Dale et al. that was published in 2007 in 'Memory & Cognition'. We will take a closer look at the real-time categorization of animal names and whether atypical exemplars of a category (e.g. the exemplar whale of the category mammal) cause more competition between the correct and incorrect category than typical exemplars (e.g. the exemplar dog of the category mammal). More specific, we will look at the relation between cognitive processes during

categorization and the effectors responsible for manual action to investigate whether graded representations are involved in the real-time taxonomic categorization of names of animals. To do so we will utilitate mouse tracking to track the participants manual motor output continuously. Mouse tracking in general is used to collect participants mouse cursor positions on the computer. The participants' mouse movements can be seen as an indicator of commitment to or conflict between choice options during decision processes. Thus, this method allows us to access insides into the cognitive competition between categories.

Hypothesis

(1) The participants' mouse trajectories gravitate to the alternative (incorrect) category more when presented with an atypical exemplar than when presented with a typical instance.

(2) Category members which are more typical instances are recognized more quickly than atypical exemplars.

(3) Category members which are more typical instances are recognized more accurate than atypical exemplars.

(4) When provided with atypical exemplars, the participants' mouse movements show evidence of competition between the two categories, noticeable as bias toward the competing category.

Design

Materials:

Our study is based upon parts of the study 'Graded motor responses in the time course of categorizing atypical exemplars' by Dale et al. which was published in 'Memory & Cognition' in 2007. We will use the following atypical and typical animal stimuli in the experiment. In total, we have 19 instances, six atypical and thirteen typical exemplars. The stimuli will be presented as lexical representations in the bottom center of the screen, written in black color.

In the table below, the competing categories for the animal instances are given in parenthesis, the correct category is here written in italian.

Atypical	Typical
Eel (*fish*; reptile)	Hawk (*bird*; reptile)
	Dog (*mammal*; insect)
Whale (*mammal*; fish)	Horse (*mammal*; bird)
Sea lion (*mammal*; fish)	Shark (*fish*; mammal)
	Alligator (*reptile*; mammal)
Penguin (*bird*; fish)	Rabbit (*mammal*; reptile)
	Chameleon (*reptile*; insect)
Butterfly (*insect*; bird)	Cat (*mammal*; reptile)
Bat (*mammal*; bird)	Sparrow (*bird*; mammal)
	Goldfish (*fish*; amphibian)
	Salmon (*fish*; mammal)
	Rattlesnake (*reptile*; amphibian)
	Lion (*mammal*; fish)

Procedure:

    (1) Welcoming view

    (2) Instructions

    (3) 3 practice trials

    (4) Transition view to target trials

    (5) 19 target trials

    (6) Question about handedness

    (7) Post-experiment questionnaire

At first, the participants will see the welcoming view which roughly explains what the experiment is about and asks the partakers to focus their full attention on the experiment. In addition the participants will be instructed to do the experiment on a device with mouse or mouse pad as smartphones are inoperable for data collection. If the participant clicks on the "Read instructions" button on the screen, they will be transferred to the written instructions about the task telling them what exactly they are supposed to do. The participants will read the written instructions about the task including the specific indication to only use their right hand when performing the trials. The instructions give an outlook that there will be three practice trials before the main trials begins and will emphasize to the participants to answer as quickly and correctly as possible. The participants can confirm the instructions by pressing the "Go to practice trials"-Button. Then, the three practice trials will follow. The order in which the stimuli will be presented is completely random and each trial looks as follows. First, the participants will be presented with two different animal category names that will appear on the two upper left and right corners of the screen, the side will be assigned randomly. A 2000ms-pause is used to offer the chance to get familiar with the category names. Now, a button ("Click me!") will appear at the bottom center of the screen and the participants will have to click it to see the animal stimulus which will appear at the same position. The animal stimulus will be a lexical

representation of the animal. The participants have to choose the believed correct category that the animal instance belongs to by moving the mouse to the appropriate corner and clicking on the respective animal category name.

After three repetitions, the practice trials will be over and another instruction view appears on screen, telling the participants to begin with the target trials. Again, the instructions will say to strive to maximize accuracy and speed. By clicking the "Go to target trials"-button, the participants will start the main trials which will be structured exactly like the practice trials described above. The order in which the stimuli will appear is completely random again.

After completing the 19 main trials, the participants face a question, asking them if they are left- or right-handed.

After answering this question, the partaker will have the possibility to fill out a post-experiment questionnaire, but this is not an obligation. The participants will be able to provide information regarding their age, gender and level of education as well as additional comments to make the analysis easier for the researchers.

References

Dale, R., Kehoe, C., Spivey, M. J. (2007). Graded motor responses in the time course of categorizing atypical exemplars. *Memory & Cognition, 35 (1), 15-28*