Card Game Debriefing Form

Background: *Research in the field of* ***cognitive psychology*** *has shown that after we learn new information by repeated exposure and rehearsal, this well-learned knowledge could serve as a foundation upon which more information can be added. Later on, when we encounter novel information that is related to our prior knowledge, we can remember such information more rapidly by incorporating it to what we have learned before[1]. For example, it is easier to remember the location of a new vase in your bedroom than that in a doctor's office where you have only been to once, because of your extensive experience with your bedroom. Previous studies have provided evidence for such enhanced learning in adult humans and rodents[2,3]. However, this ability has been shown to be supported by brain regions that are relatively late to mature, so it remains unclear whether young children show a similar kind of benefit[4], which has received little attention in the field of* ***developmental psychology****. Thus, this study aims to investigate the developmental trajectory of the ability to anchor new information onto prior knowledge in order to accelerate learning.*

Experiment description: *The card game aspect of this experiment consisted of 3 stages. You learned the locations of objects in a particular "world" or layout by flipping cards, and you succeed by correctly finding all objects in the layout twice in a row. In the first stage, you learned 16 object-location associations. In the second stage, you either learned 16 new object-location associations that could be incorporated into a previously learned layout or 16 new associations in a novel layout. In the final stage, you were brought back to the layout you learned in the first stage, and we tested your memory for associations in the original layout.*
In addition to the card games, you completed a "number sequence" or backwards digit span task. In this task, you viewed increasingly large sequences of numbers and reported back each sequence in reverse order.

Hypotheses: *We hypothesize that for* ***adults****, it will take less time to learn the object-location associations in the second stage when they are anchored to a previously encountered layout, compared to when they are in a novel layout; for* ***young children****, we predict that their learning of new associations in the second stage will not benefit from being in a learned context. Such a finding would suggest that young children are not capable of anchoring new information to prior knowledge to accelerate learning, and such an ability emerges with age. We also hypothesize that performance on the backwards digit span task will be associated with performance on the card layout task for both age groups. This finding would suggest that capacity for holding and manipulating information in memory - measured by the backwards digit span task - is related to how much previous knowledge can enhance new learning.*

Variables of interest: *The <u>independent variables</u> were (1) whether the 6 new associations in the second stage were from a previously learned layout or in a novel layout and (2) age. The <u>dependent variables</u> were (1) the amount of time required to learn the 16 new associations in the second card game stage, which will be compared between the learned layout and new layout, and (2) the number of digits remembered in the correct placement for the digit span task, summed across the whole task.*

Control procedures: *There are 2 layouts (A, B) that contain 32 total object-location associations. In the first stage, 1 of the 2 layouts are used (e.g. A). In the second stage, 16 new associations are added to one of the two layouts from stage 1 (e.g. A), or 16 are added to the layout not learned in stage 1 (e.g. B). The assignment of the layouts to each stage is counterbalanced across participants, as is whether they see the same layout or a different one in stage 2. There are 32 object images in total, and they are randomly assigned to each location in the layouts.*

Implications: *This experiment will help us understand the development of implicit learning strategies from childhood to adulthood, specifically, the emergence of the ability to incorporate new information with previously learned knowledge. The finding will also be helpful for designing appropriate educational methodologies for young children.*

Sources of Information:

1. *Bartlett, F. (1932). Remembering: A Study in Experimental and Social Psychology. Cambridge: Cambridge University Press.*
2. *Sommer, T. (2017). The emergence of knowledge and how it supports the memory for novel related information. Cerebral Cortex, 27(3), 1906--1921.*
3. *Tse, D., Takeuchi, T., Kakeyama, M., Kajii, Y., Okuno,H., Tohyama, C., ... & Morris, R. G. (2011). Schema-- dependent gene activation and memory encoding in neocortex. Science, 333(6044), 891--895.*
4. *Brod, G., Werkle--Bergner, M., & Shing, Y. L. (2013). The influence of prior knowledge on memory: a developmental cognitive neuroscience perspective. Frontiers in behavioral neuroscience, 7, 139.*

***Textbook Reference**: Cacioppo, J. T., & Freberg, L. A. (2017). The Connected Mind. In Discovering Psychology: The Science of Mind (3rd ed.) (pp. 498-545). Retrieved from https://bookshelf.vitalsource.com/#/books/9781337670609*

For more information about our research, check out our website:
http://buddingmindslab.utoronto.ca