

The concreteness effect in healthy ageing; An attenuation or preservation?

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Introduction

- The concreteness effect (the processing advantage for concrete over abstract nouns) has been widely demonstrated in the study of concepts. The Embodied Cognition approach suggests this is because concrete concepts have a 'motoric' component and are represented across sensorimotor networks; abstract concepts do not have such a component, and therefore the processing of such does not recruit sensorimotor information.
- Recent evidence has found that the concrete advantage diminished for older aged participants (Peters & Daum, 2008). Borghi and Setti (2017) have suggested that this is because the motor cortex degrades in older aging, therefore, the representation of concrete concepts is comparatively "weaker". As abstract concepts do not rely on sensorimotor information, such processing does not draw upon this "diminished" system.
- Given evidence that concrete concepts are predominantly taxonomically related, and abstract concepts thematically related (Crutch et al., 2009), the present aim is to test if the concreteness effect attenuates in healthy aging, and to test if this advantage exists across taxonomic and thematic relations for concrete and abstract concepts.
- PREDICTION 1: Abstract trials will be faster when they are thematically associated and concrete trials will be faster when they are taxonomically similar.**
- PREDICTION 2: If the Concreteness effect degrades in healthy aging, then an advantage will be found for the younger adults, but this will be weaker (or even diminished) for the older adults.**

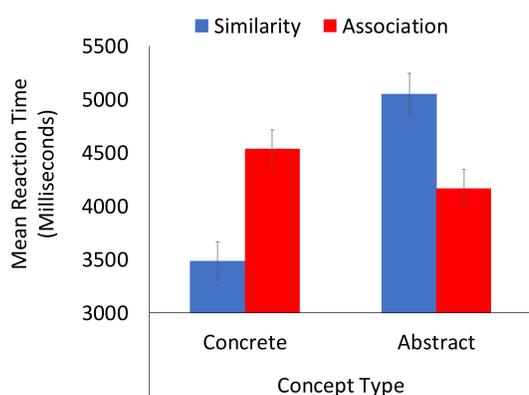
Method

- 17 healthy adults (18-59) and 17 healthy older adults (60+) completed the odd-one-out task from Crutch et al. (2009) using a 2 x 2 x 2 x 2 mixed-design:
 - Age Group (Younger vs Older) [BS]
 - Concept Type (Concrete vs Abstract) [WS]
 - Relationship (Association vs Similarity) [WS]
 - Presentation Type (Switch vs Same) [WS]
- Participants were matched on the digit span task and the Geriatric Depression Scale. However, participants were not matched on IQ with the older adults scoring significantly higher on the NART.
- Four item sets were used in which the related words were either concrete or abstract, and related by similarity or association, e.g., *Jeep-Taxi-Lorry-Mushroom* (concrete-similarity), *Crime-Punishment-Theft-Mimic* (abstract-association).
- On each trial participants clicked a cross-hair and after 500ms the stimuli appeared. **Participants were instructed to click on the odd-one-out as quickly as possible.**
- Following the design of Landrigan and Mirman (2018), two of each trial type were presented consecutively to test whether participants demonstrated a switching cost across both relationship type and concept type. This led to 'same' and 'switch' trials where participants were expected to be slower on the latter.



Results

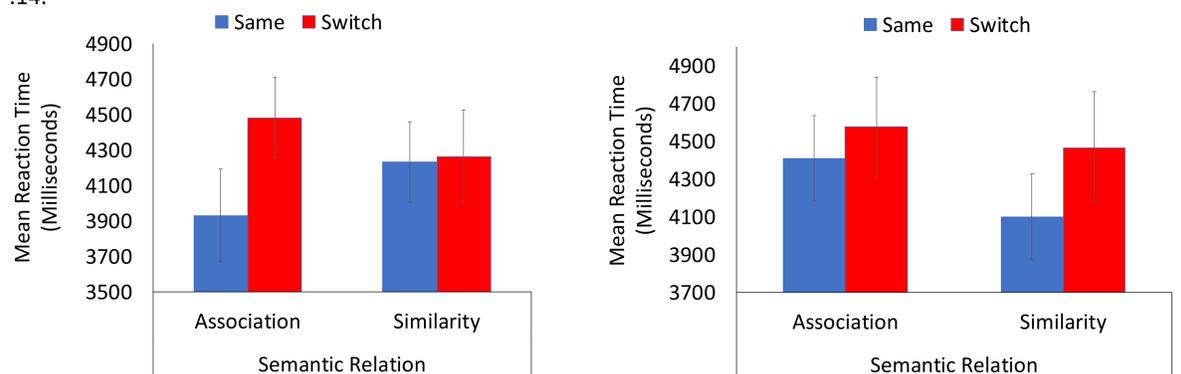
- Reaction times (RT's) were analysed using a 2 x 2 x 2 x 2 mixed ANOVA.
- RT's were faster to respond to concrete than to abstract trials**, $F(1, 32) = 42.35$, $p < .001$, $\eta^2 = .57$
- RT's were faster to respond to same than to switch trials**, $F(1, 32) = 13.38$, $p = .001$, $\eta^2 = .30$
- Concept Type interacted with Relationship, $F(1, 32) = 109.85$, $p < .001$, $\eta^2 = .77$. **RT's were faster for concrete-similarity than concrete-association** ($p < .001$), and **faster for abstract-association than to abstract-similarity trials** ($p < .001$).



- Concept Type was not found to interact with Age group.

Results cont'd

- A 3-way interaction was found between Age Group, Relationship and Presentation Type, $F(1, 32) = 5.22$, $p = .029$, $\eta^2 = .14$.



Younger adults showed no delay between same and switch trials when assessing taxonomic similarity, but showed a processing cost for switch trials when assessing thematic association ($p < .001$).

Older adults showed no delay between same and switch trials when assessing thematic associations, and while RT's were slower for switch trials when assessing taxonomic similarity, this was non-significant after adjusting for multiple comparisons ($p = .031$).

Discussion

- The results of Crutch et al. (2009) were replicated here demonstrating that concrete **objects are processed faster when they are taxonomically related, while abstract objects are faster when they are thematically related**. And a strong concreteness effect was found overall.
- In contrast to the hypothesis, the concreteness effect was consistent across the age groups**; younger and older adults showed advantages in processing concrete over abstract concepts. Therefore, the concreteness effect does not attenuate in older age as previously predicted suggesting that the representation of concrete concepts does not solely rely on sensorimotor activity (as suggested by strong proponents of Embodied Cognition).
- Categorical dissociations were found across the age groups; younger adults showed a processing advantage for taxonomic strategies while older adults show an advantage for thematic strategies.

References

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- Crutch, S. J., Connell, S., & Warrington, E. K. (2009). The different representational frameworks underpinning abstract and concrete knowledge: Evidence from odd-one-out judgements. *The Quarterly Journal of Experimental Psychology*, 62(7), 1377-1390.
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