Do divided attention effects for objects require semantic processing?

Recent work has revealed large divided attention effects for judgments of multiple visual stimuli in:
- semantic categorization of words [5]
- semantic categorization of nameable objects [2]
- recognition of faces [1]

Alternative hypotheses:
1. Divided attention effects require semantic processing.
2. Divided attention effects require processing multi-part objects.
3. Divided attention effects require memory processes.

These hypotheses are not mutually exclusive.

Divided attention models:
- Independent parallel model: Observers can judge two stimuli as accurately as they can judge one.
- Fixed-capacity parallel model: Observers can judge two stimuli less accurately than they can judge one (following the sample-size model from [3]).
- All-or-none serial model: Observers can judge only one stimulus at a time; there is no information about the other.

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Experiment 1: Animal categorization
In this experiment, we created a new set of words of objects made of interchangeable parts.

Stimulus examples
The stimulus set had 6 animal categories: fox, cat, dog, moose, rabbit, squirrel, and wolf. Each category included 30 exemplar images, for a total of 240 images in the stimulus set. Shown, 12 exemplaries from “fox” and “moose” categories.

Participants recognized one of two given animal categories, or the stimulus belonged to (2 alternative locational choices).

Procedure
- Briefly presented and masked stimulus.
- The red cue and prompt indicate the relevant location.
- Participants responded whether the probe object was the same as a specific target object.
- Participants responded whether the probe object was the same as a specific target object.
- Participants responded whether the probe object was the same as a specific target object.

Results
Dual-task deficit = 1 % (n = 23)

Discussion
- Preliminary results from Experiment 2 show a divided attention effect for a task with abstract object stimuli.
- This finding is consistent with the hypothesis that semantic processing is necessary to generate divided attention effects.
- The divided attention effects in Experiment 2 could instead arise from either the processing of multi-part objects or from memory requirements.

Conclusion
Semantic processing is not necessary for divided attention effects.

References:

Experiment 2: Abstract object recognition
In this experiment, we created a new set of abstract objects made of interchangeable parts.

Stimulus examples
Each stimulus set had 4 combinations of three (interchangeable) parts chosen from 7 possible parts. Each set was created for a total of 36 stimuli 210 unique multi-part objects.

Procedure
- Participants responded whether the probe object was the same as a specific target object.
- Participants responded whether the probe object was the same as a specific target object.
- Participants responded whether the probe object was the same as a specific target object.

Results
Dual-task deficit = 1 % (n = 4)

Comparison to previous divided attention studies
- Prior studies show a variety of effect magnitudes, from small to large.
- The results of Experiment 1 are most similar to the intermediate effects observed with nameable objects.
- The preliminary results of Experiment 2 are most similar to the large effects observed with words and faces.

Plotted as Attention Operating Characteristic (4)

Distributors probe objects were a different stimulator. Participants responded whether the probe object was the same as a specific target object.

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Conclusion
Semantic processing is not necessary for divided attention effects.