

# Words activate categorization even before the category forming task has been offered

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## Research Question

The effect of language on category learning is an ongoing debate among researchers. According to previous research words can facilitate category formation even if they aren't used as feedback. However, in most studies addressed this question, the verbal label always corresponds the definite set of perceptual features. It doesn't allow to clarify if the language is a means of perception augmentation (language-feedback hypothesis; Lupyan, 2012) or a social marker for generalization (word-meaning-as-intention hypothesis; Waxman, Markow, 1995).

In our previous research (Kotov et al., 2012) we found that labels can cause categorical attitude to objects even before the category task is given. If a subject names objects by two different labels and sees just a part of all features then he, being presented with the rest of them, will find more frequent features (i.e. categorical) faster than if he names objects by a single general label.

**Can the lexical contrast accompanied with uncategorical actions help to define the whole categorical structure when the conditions for categorization will appear but labels won't longer be there?**

## Method

Between-subject **experimental design (label- and no-label conditions)**

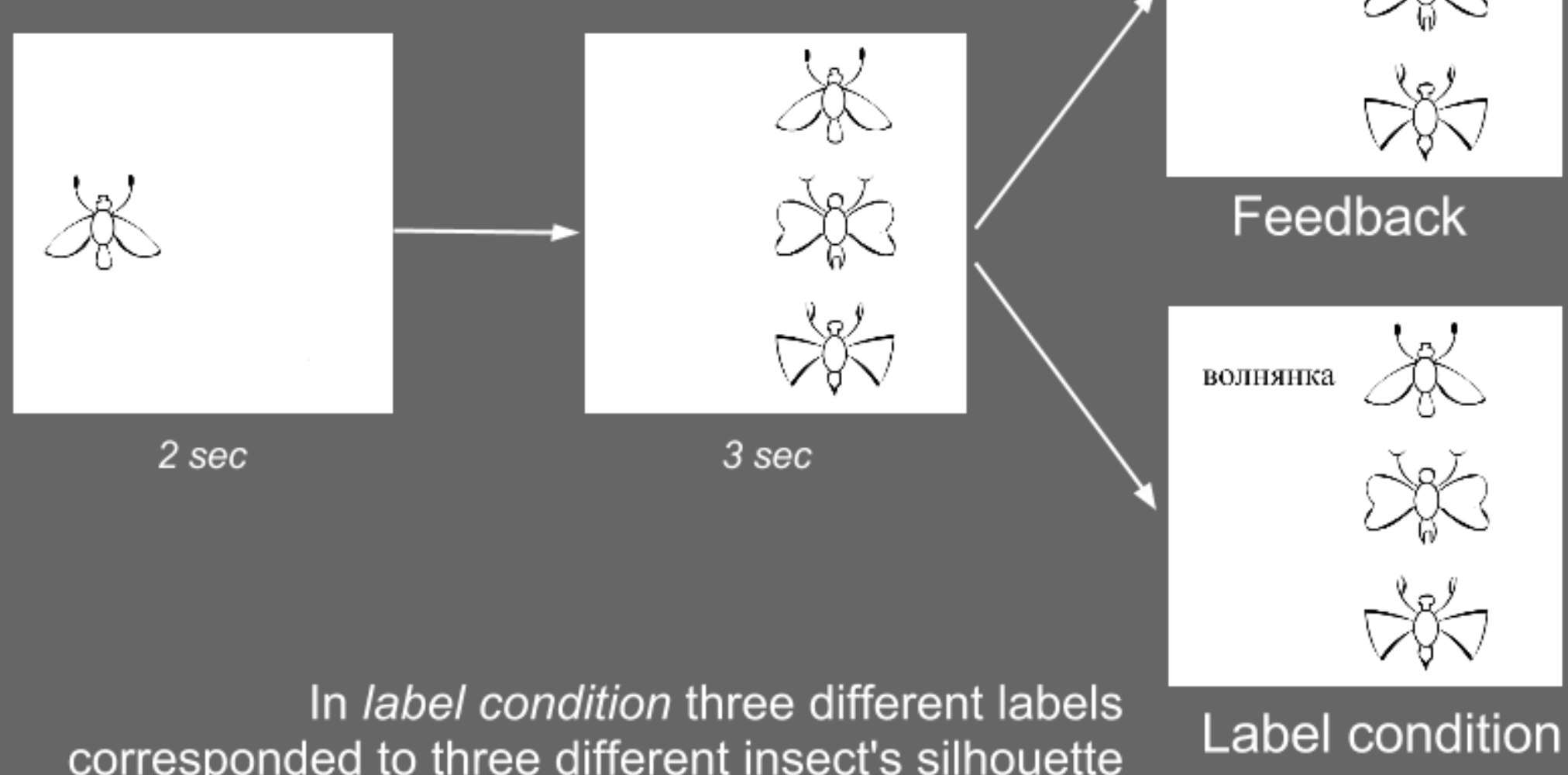
**Dependent variables** – proportion of correct answers and reaction time

**Subjects:** Sixty-four subjects, 18-24 years old

## Materials and procedure

### Task 1. Visual detection

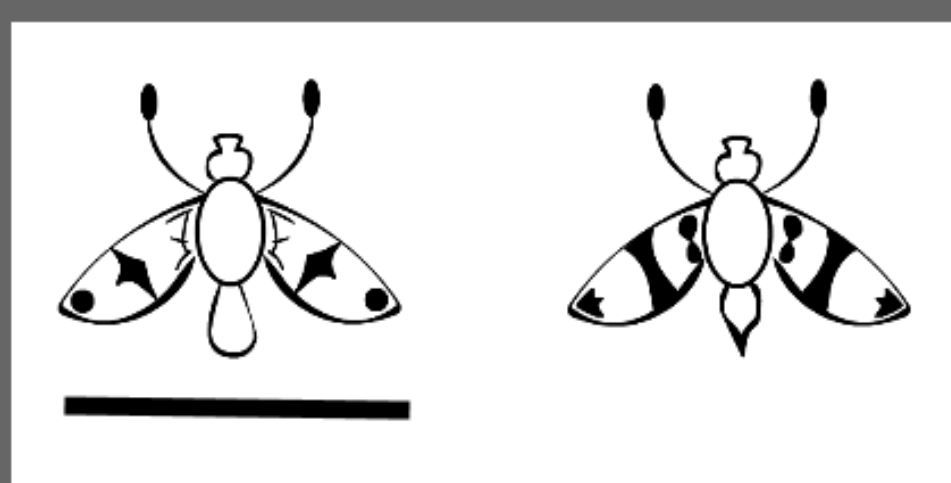
Subjects' goal was to find the target insect in the group of different insects as soon as possible



### Task 2. Categorization

Subjects had to define which image was the full version i.e. one of targets in previous task (and memorize its wing pattern) and which one was the hybrid (and pay no attention to its wing pattern).

full-image      hybrid



feedback without labels

Category structure (wing pattern features)

|   | full-image |   | hybrid |   |
|---|------------|---|--------|---|
| 1 | 1          | 0 | 0      | 1 |
| 1 | 0          | 1 | 0      | 1 |
| 0 | 1          | 1 | 1      | 0 |

### Task 3. Test

Subjects were shown only full version images with some wing pattern for 3 sec. They were asked to assess if the wing pattern corresponded with the silhouette image

| Test items       |       |
|------------------|-------|
| Full-example     | 1 1 0 |
| Hybrid-example   | 0 0 1 |
| Full-prototype   | 1 1 1 |
| Hybrid-prototype | 0 0 0 |

## Results

Repeated measures analysis of variance (ANOVA) didn't reveal significant difference in reaction time,  $F(1;30)=0.92$ ,  $p>0.1$ ,  $\eta^2_p=0.002$ .

Main factor of the block number was significant but not a very strong one - on average it took 1.39 sec to find the target in first 9 trials (SE=0.23) and 1.17 sec in the following 9 ones (SE=0.20),  $F(1;30)=99.32$ ,  $p<0.01$

There was no interaction between factors,  $p>0.1$

Percentage of mistakes in target finding (in first and second blocks correspondently)

| No-label condition | Label condition |                               |
|--------------------|-----------------|-------------------------------|
| 3.4%               | 13.5%           | $\chi^2(1)=19.65$ , $p<0.001$ |
| 3.8%               | 8.4%            | $\chi^2(1)=6.83$ , $p<0.01$   |

Percentage of incorrect identifications of the full-images

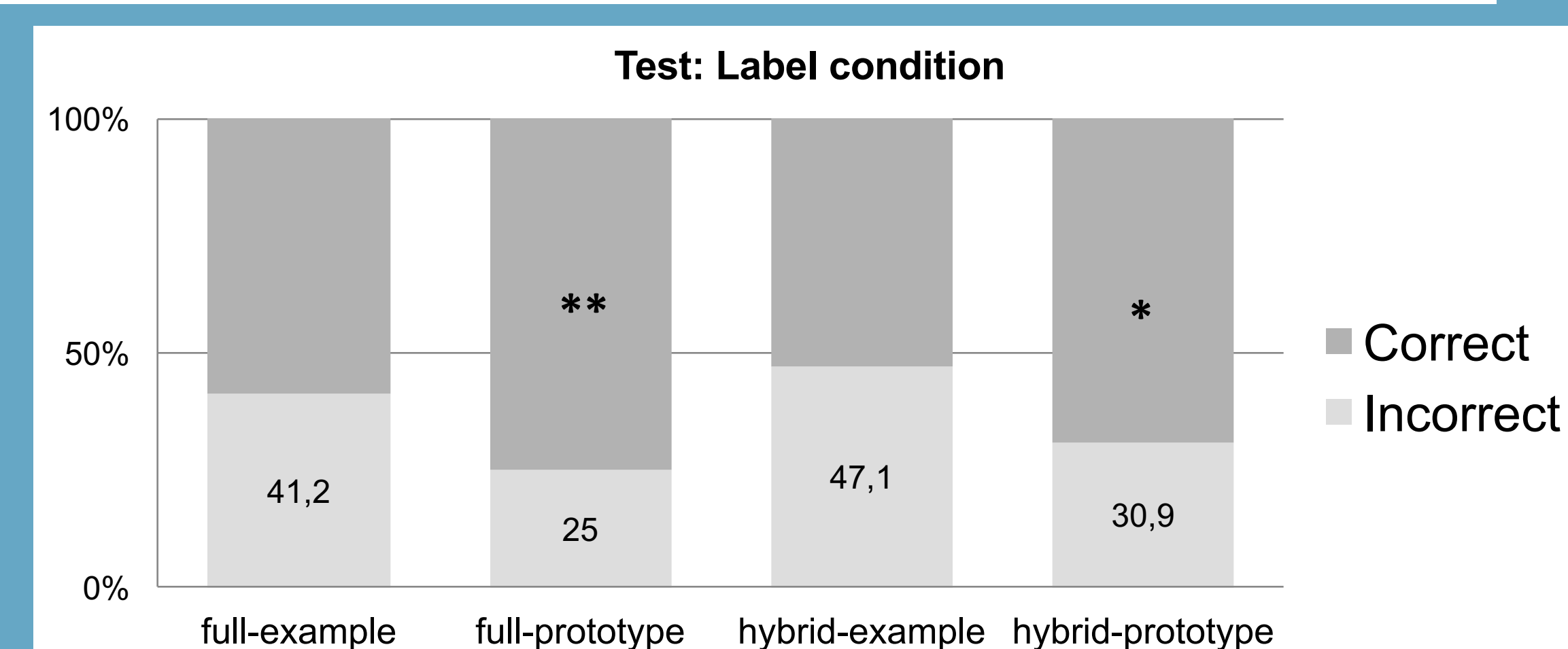
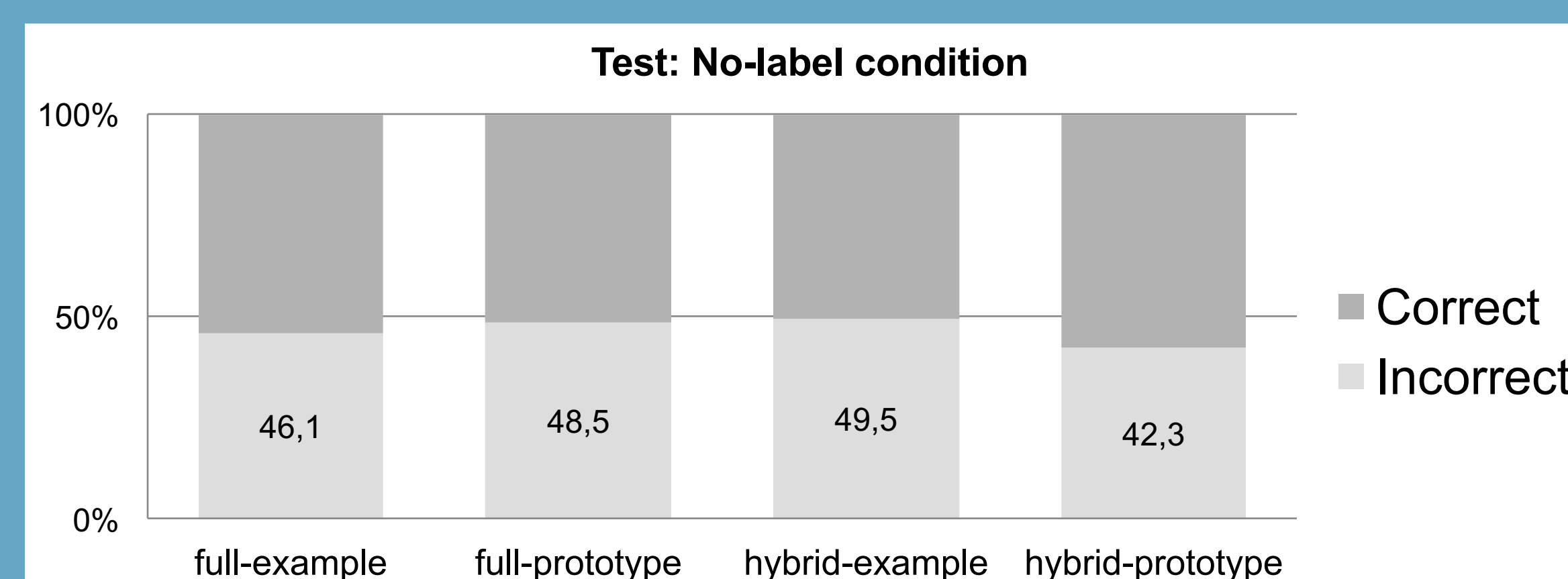
| No-label condition | Label condition |
|--------------------|-----------------|
| 28.6%              | 22.4%           |

$\chi^2(1)=3.62$ ,  $p>0.05$

Reaction Time

| No-label condition  | Label condition     |
|---------------------|---------------------|
| M=2.55 sec, SD=1.02 | M=2.70 sec, SD=0.97 |

$t(30)=2.11$ ,  $p=0.35$



## Conclusions

- In the label condition participants formed a category but in the no-label condition they did not. The given data agree with word-meaning-as-intention hypothesis.
- The categorical structure was learned not only for the full-image objects but also for the object-distractors (hybrid)
- Words activate categorization even before the category learning task has been offered on artificial material.

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