

# Search efficiency scales with audiovisual semantic relatedness

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## Does semantics guide audiovisual search?

Semantic information is crucial to understanding real world environments<sup>1</sup>

Sounds speed search for “perfect match” images (e.g., meow, cat)<sup>2,3</sup>

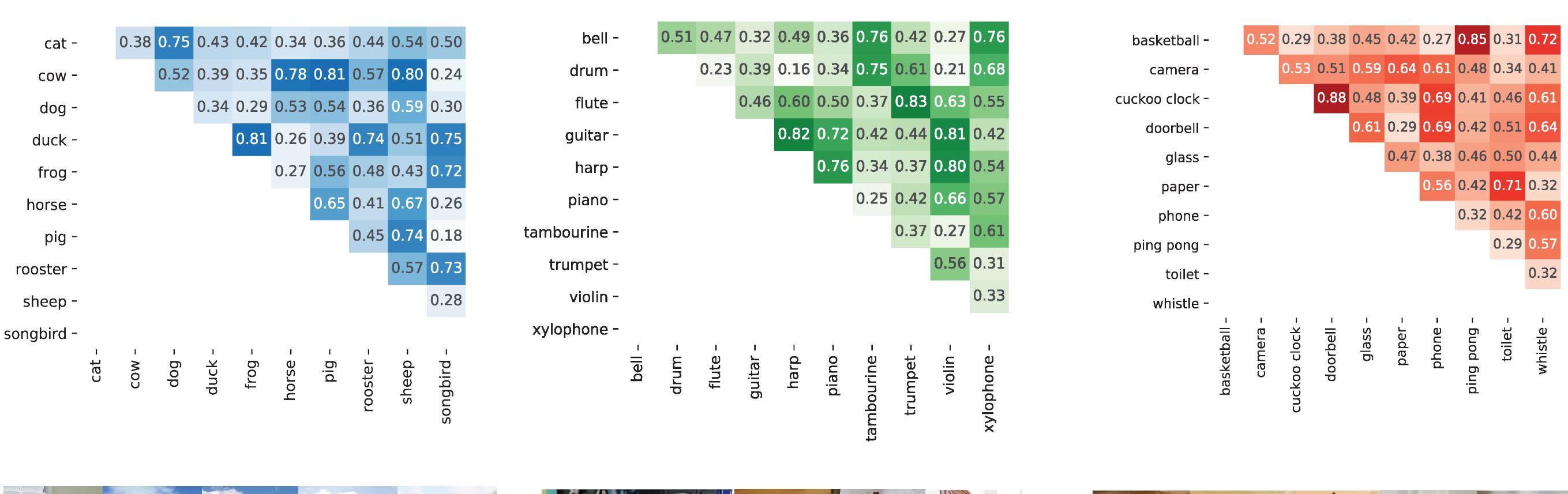
Is the audiovisual search benefit **specific** to perfect matches?

Is it **generalizable** to other semantic relationships?

Is it **task-dependent or automatic?**

## Quantifying semantic relatedness

**Sight-Sound Semantics Database<sup>4</sup>:** (Available on OSF!)



Animals



Instruments



Household items

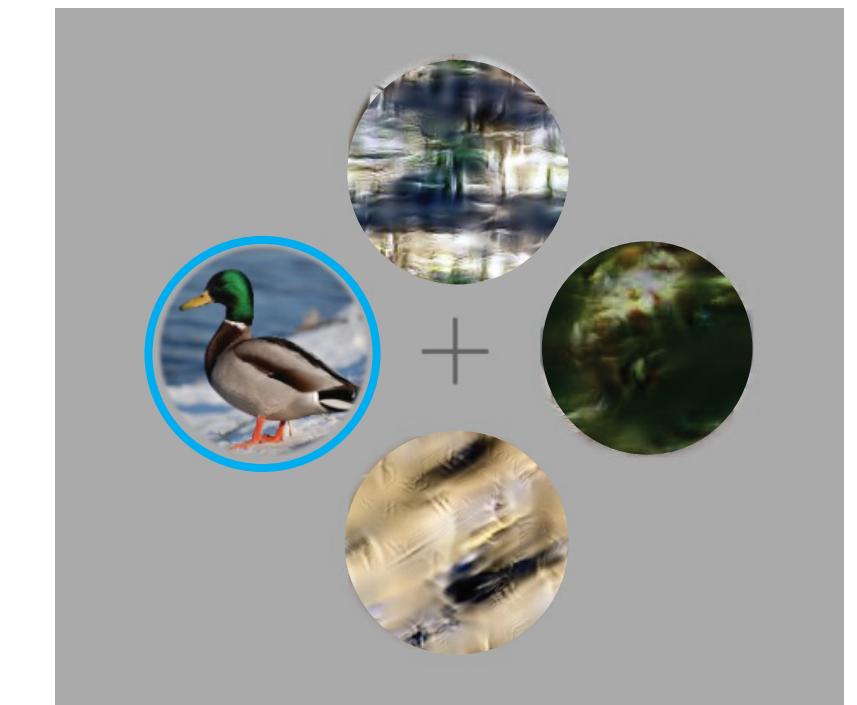
## Measuring semantic influence on attention

**Task dependent:** Where is the image for the target word?



- 109 participants
- 90 sound/image pairs (all possible pairs from database)

**Automatic:** Report the circle's color (blue or orange)

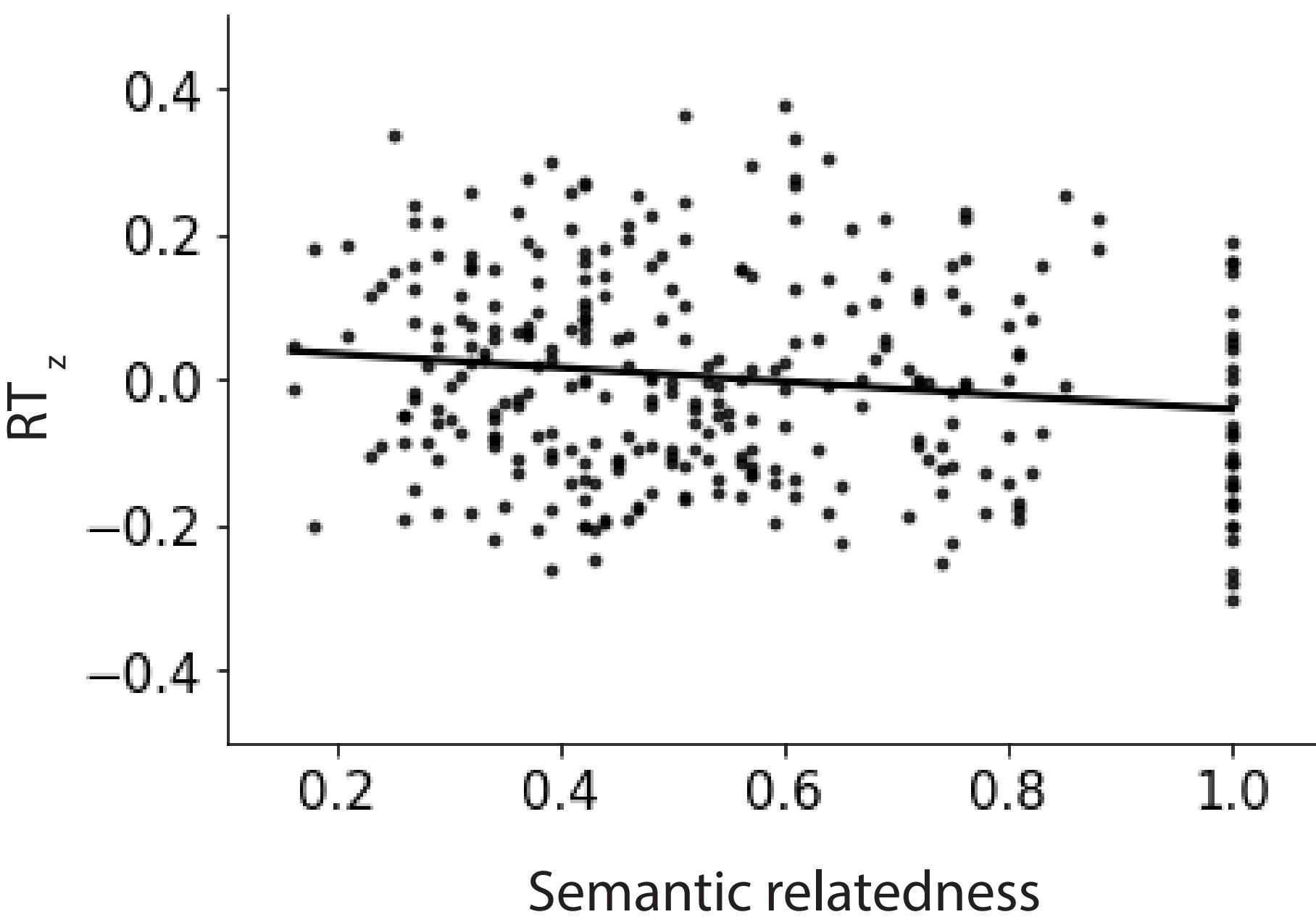


- 181 participants
- 60 sound/image pairs (all possible pairs for animals and instruments)
- Circle location is randomized orthogonally to sound/image pairs

## As semantic relatedness increases, search speeds decrease

### All categories

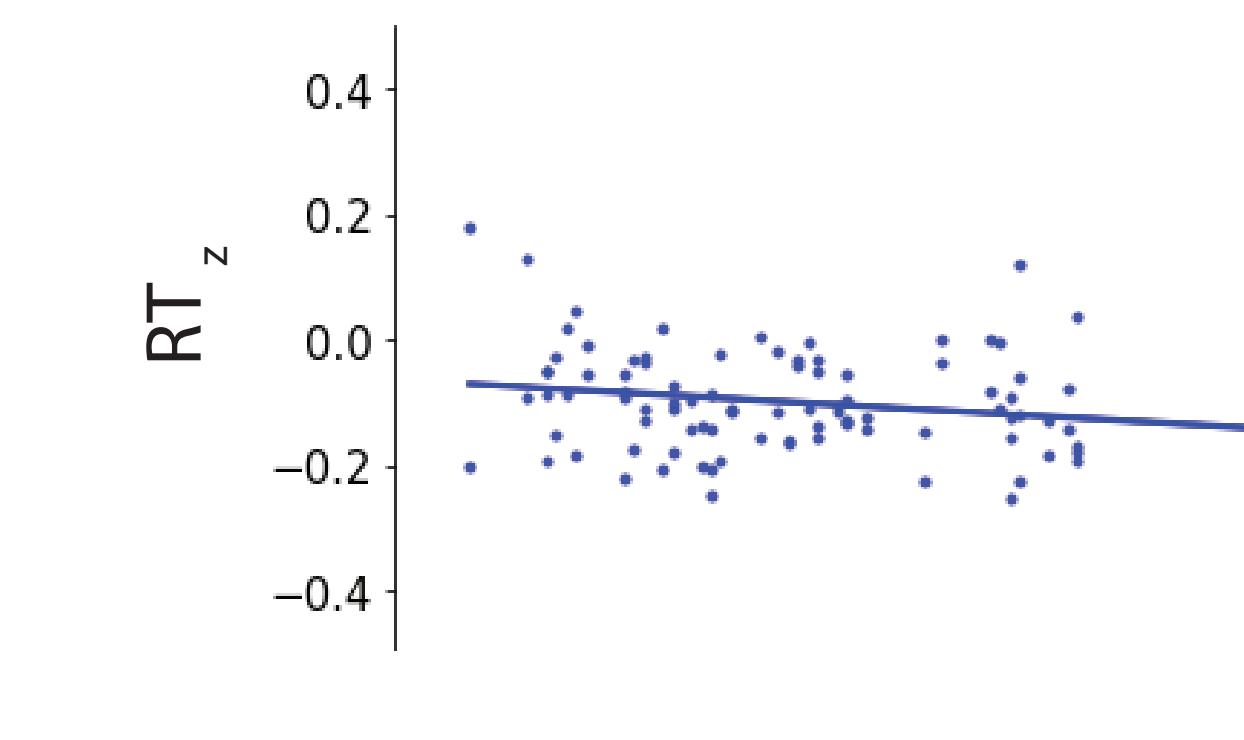
$r = -0.14, p = 0.009$



- Each point is a sound/image pair
- RT is z scored for each participant
- Relatedness is z scored across all categories

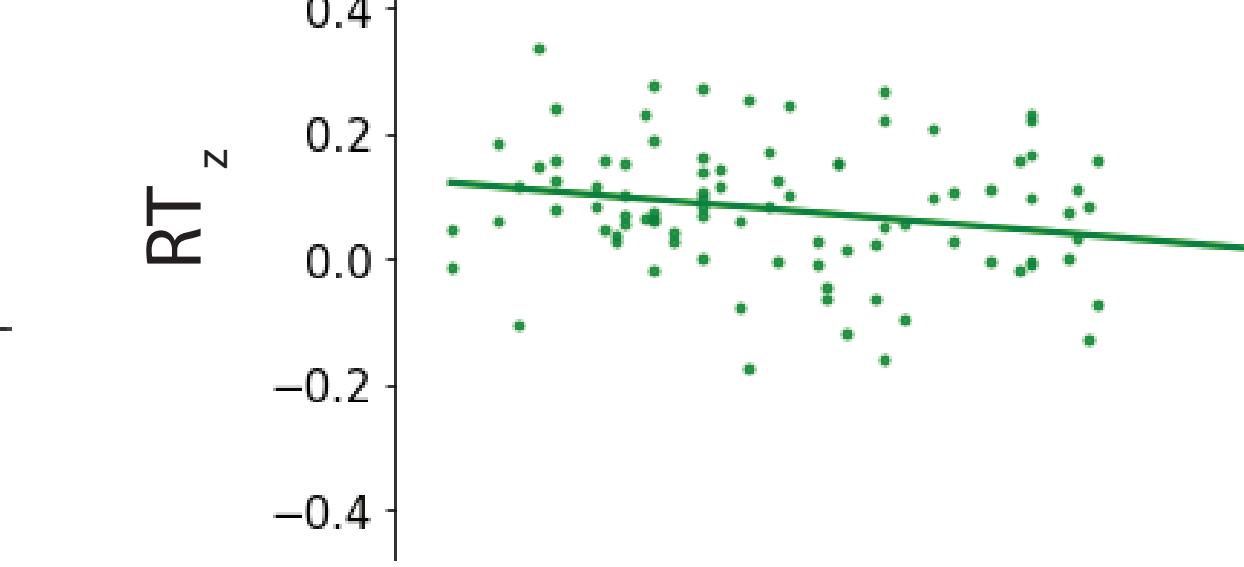
### Animals

$r = -0.27, p = 0.01$



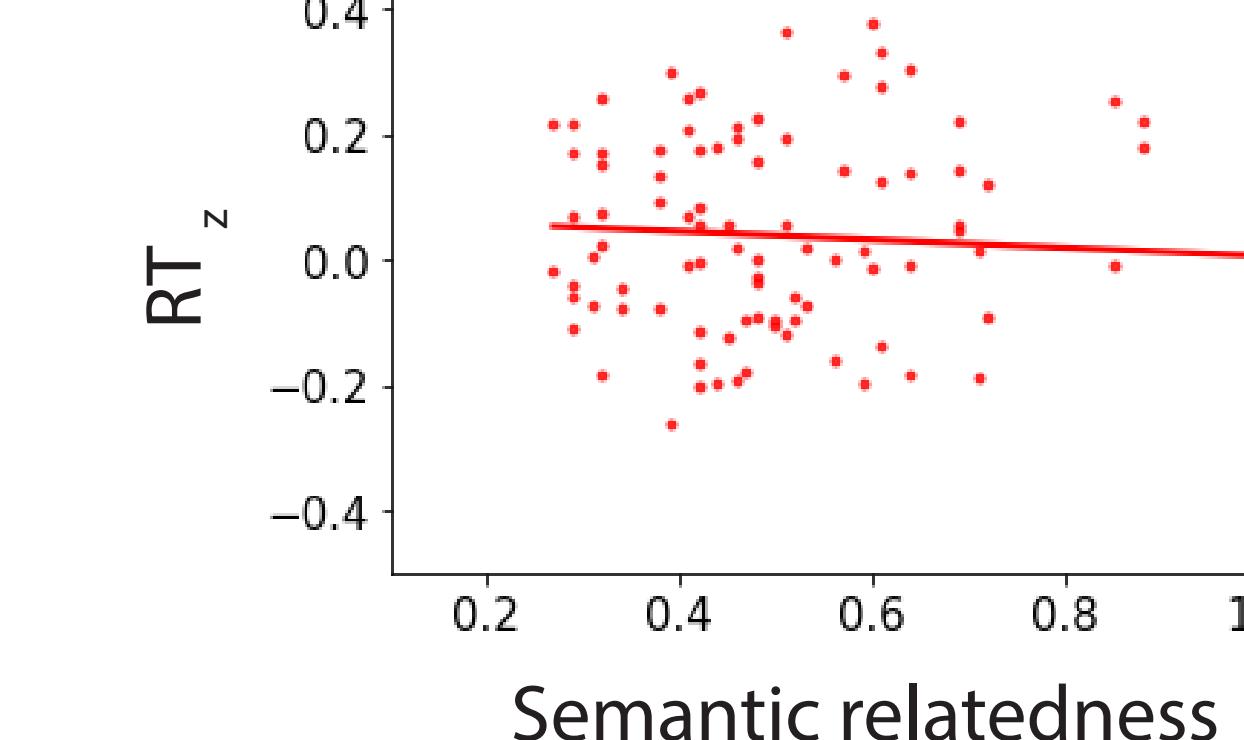
### Instruments

$r = -0.23, p = 0.005$



### Household items

$r = -0.08, p = 0.4$



## Conclusions

Search efficiency is modulated by audiovisual semantic relatedness

The audiovisual semantic benefit is:

1. not specific to “perfect matches”
2. sensitive to category factors
3. potentially becomes a distraction effect when not task relevant

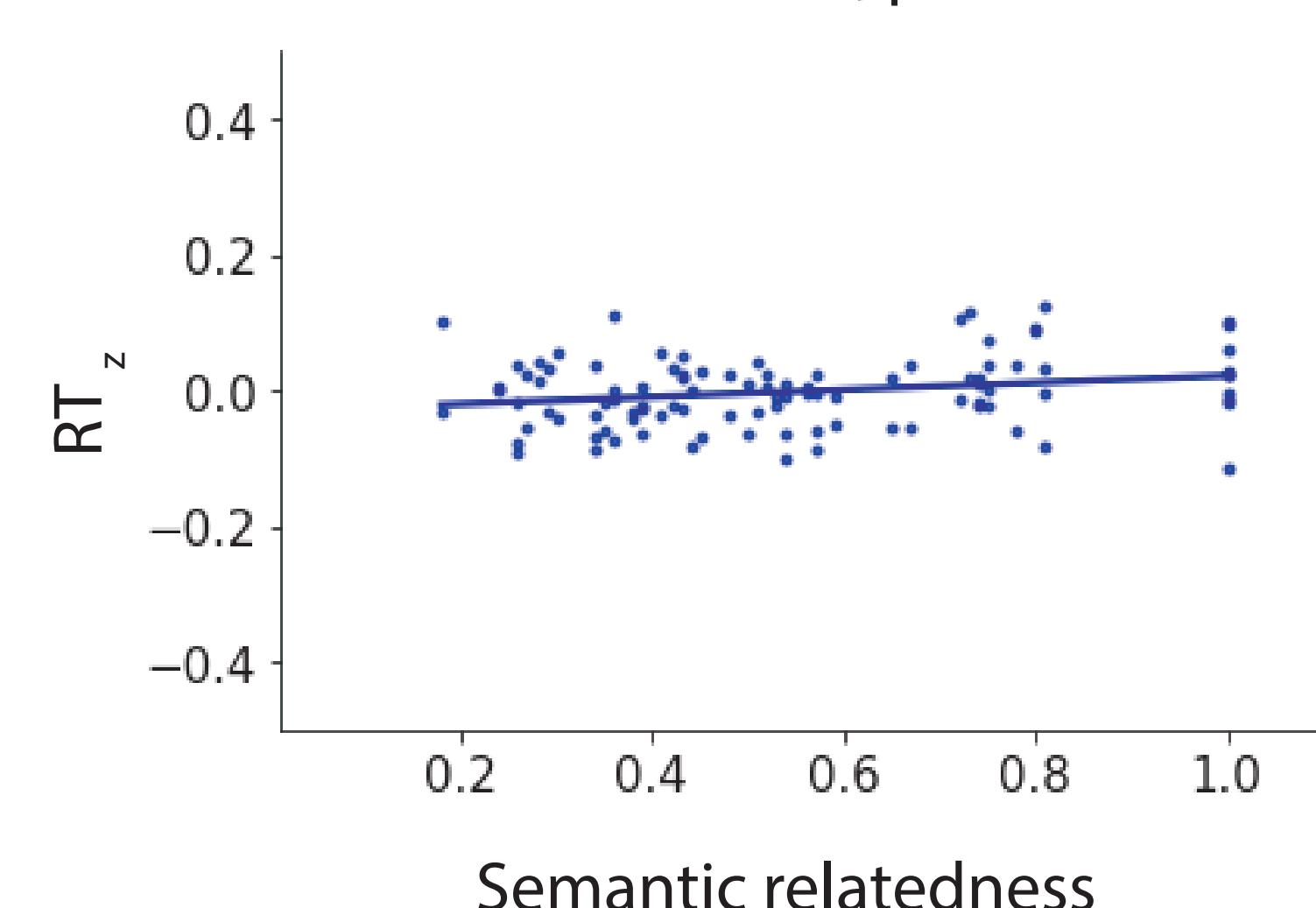
Leading to larger theoretical implications, such as:

1. More types of semantic relationships may influence attention than thought
2. Semantic information may influence attention more rapidly & automatically than previously thought

## Automaticity may depend on category features

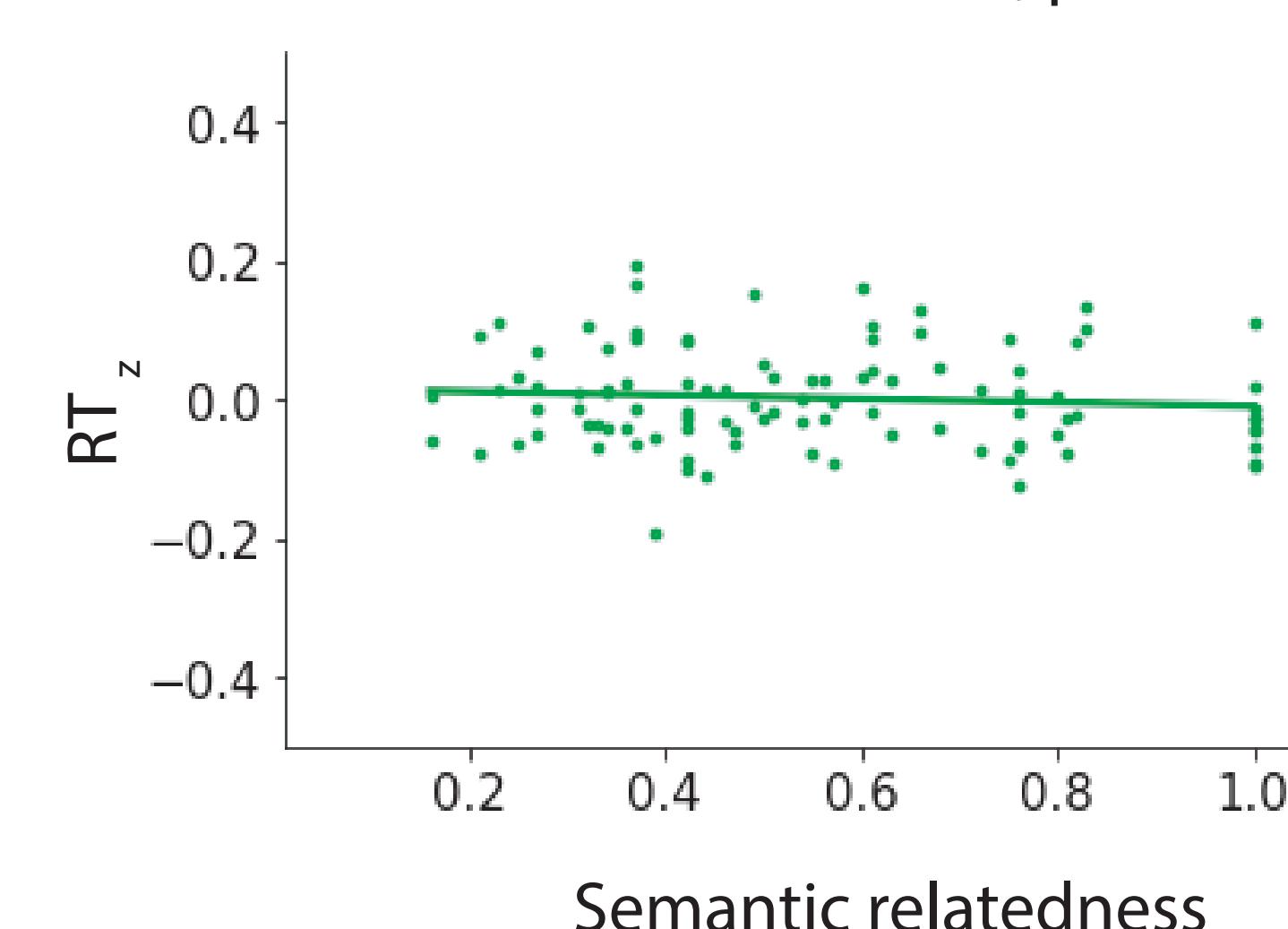
### Animals

$r = 0.22, p = 0.02$



### Instruments

$r = -0.08, p = 0.4$



- Semantically related animal sounds slow search when the semantic information is task irrelevant
- Animals sounds may be overlearned, which allows semantic information to still influence performance even when task irrelevant

## Future questions

What neural mechanisms underpin attentional prioritization for semantically related sounds & images?

Are attentional prioritization maps multisensory in nature?

Can visual information modulate attentional priority for auditory signals?

**References** (1) Malcolm, et al 2016 (2) Iordanescu, et al 2008  
(3) Kvasova, et al 2019 (4) Wegner-Clemens, et al, 2022

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