

Search efficiency scales with audiovisual semantic relatedness

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Does semantics guide audiovisual search?

Semantic information is crucial to understanding real world environments¹

Sounds speed search for “perfect match” images (e.g., meow, cat)^{2,3}

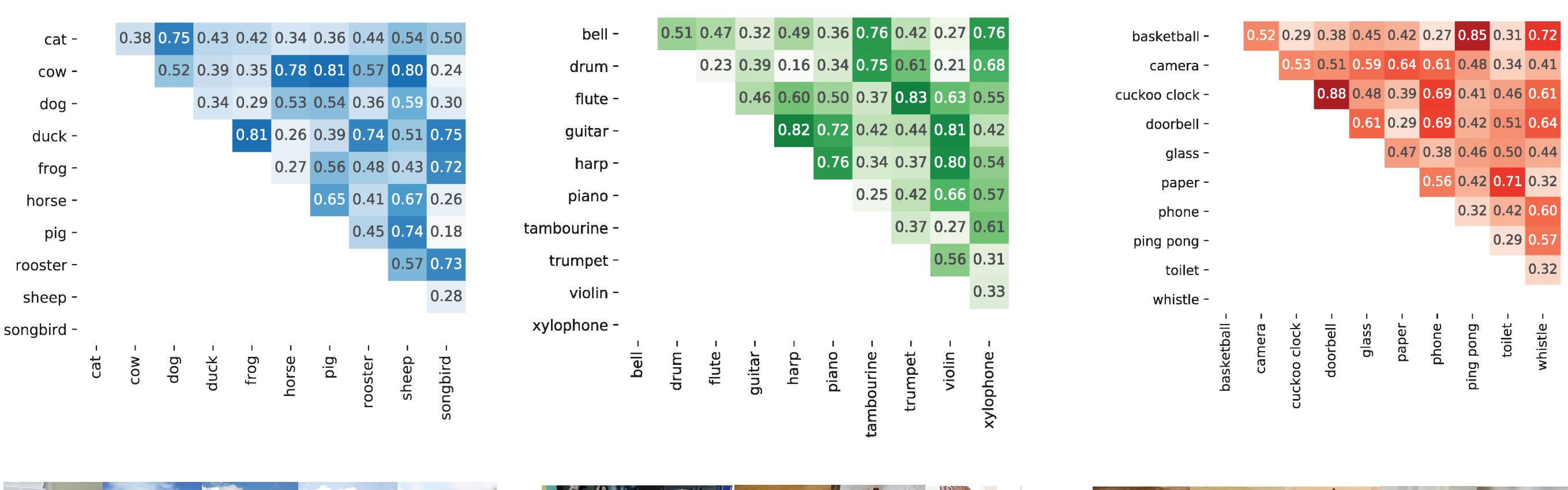
Is the audiovisual search benefit **specific** to perfect matches?

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

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

Quantifying semantic relatedness

Sight-Sound Semantics Database⁴: (Available on OSF!)



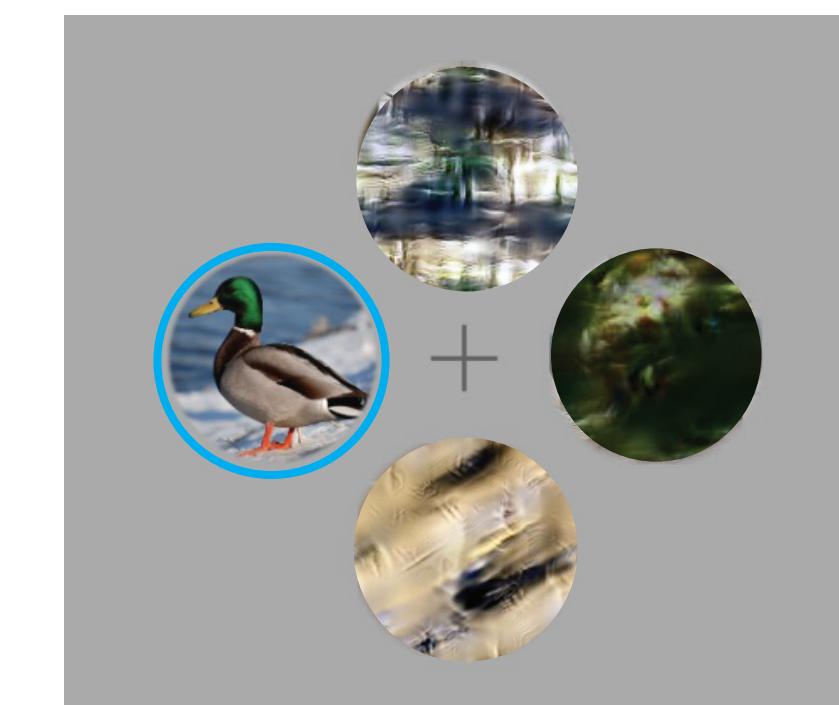
Measuring semantic influence on attention

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)

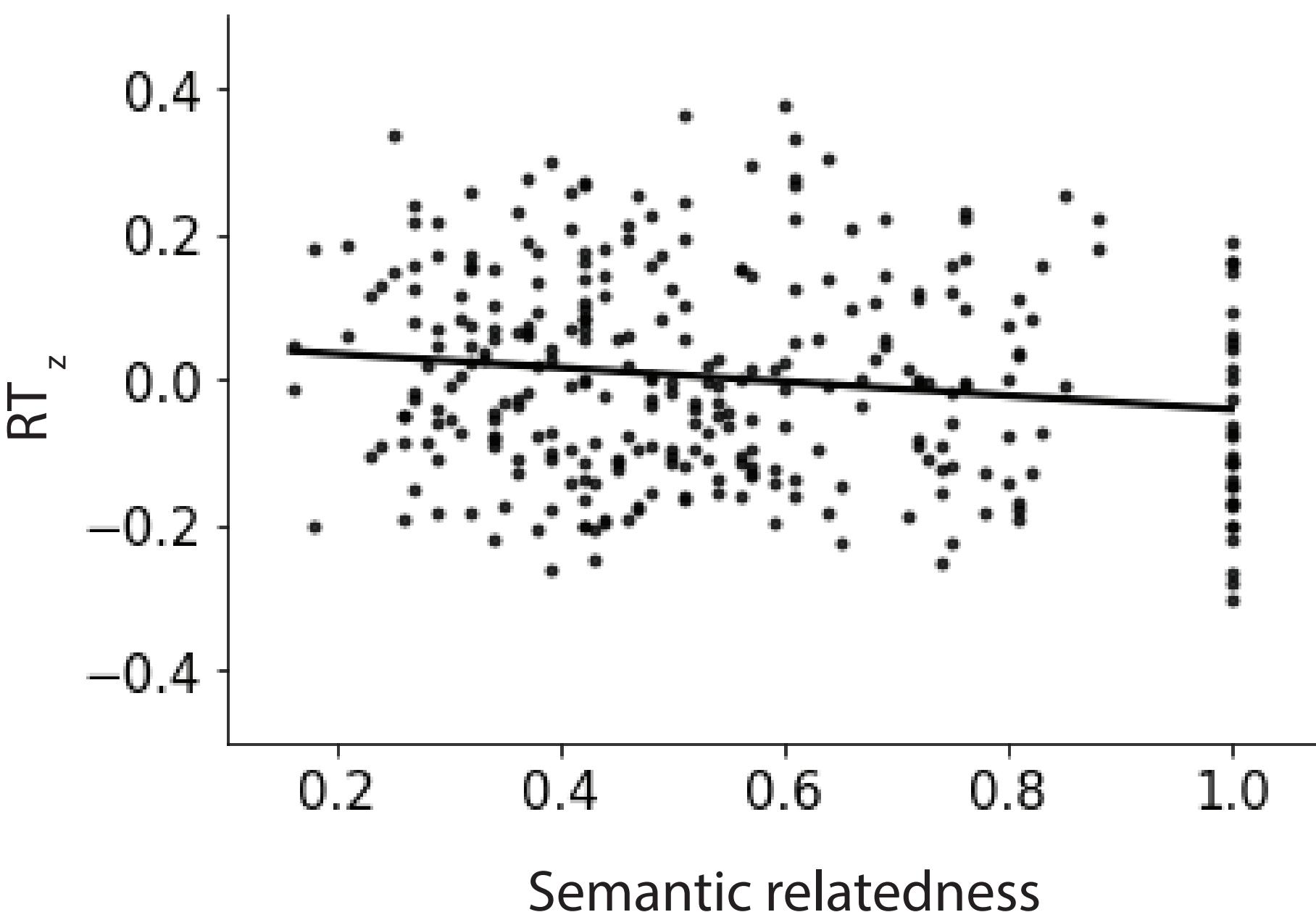


- 181 participants
- 60 sound/image pairs (all possible pairs for animals and instruments)
- Circle location is randomized orthogonally to sound/image pairs

As semantic relatedness increases, search speeds decrease

All categories

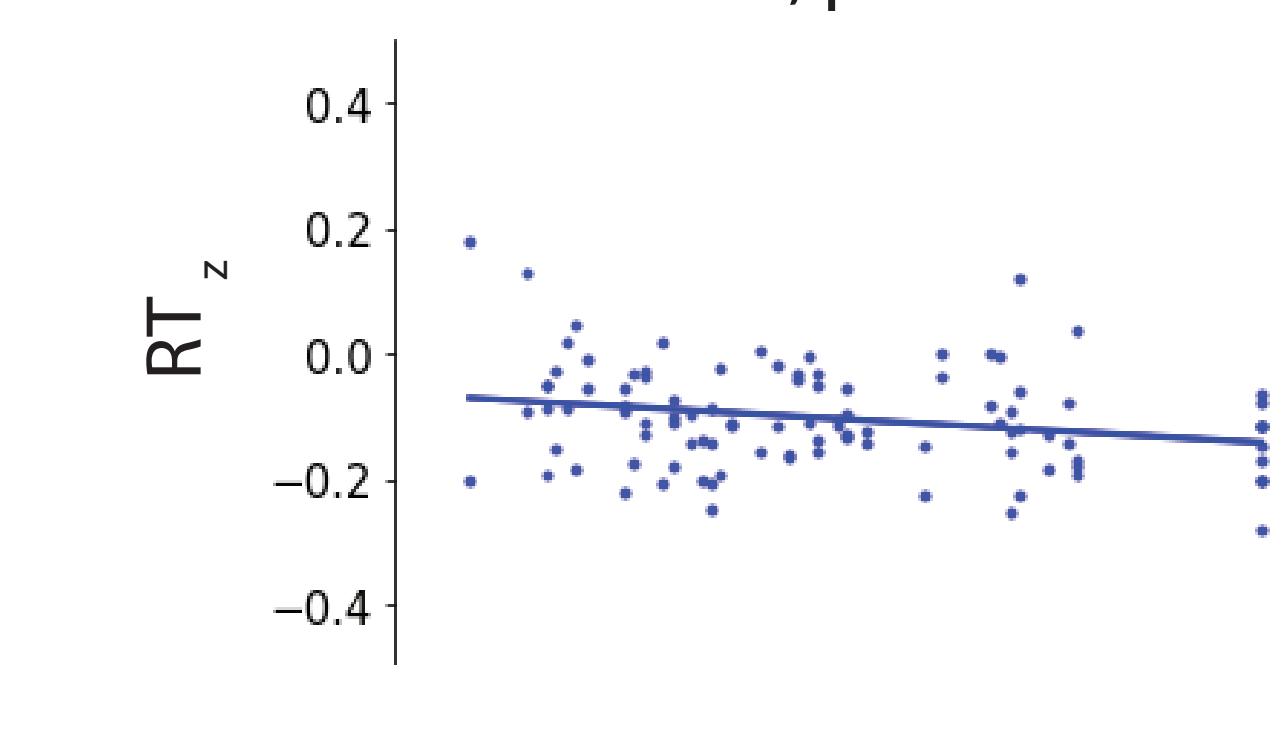
$r = -0.14, p = 0.009$



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

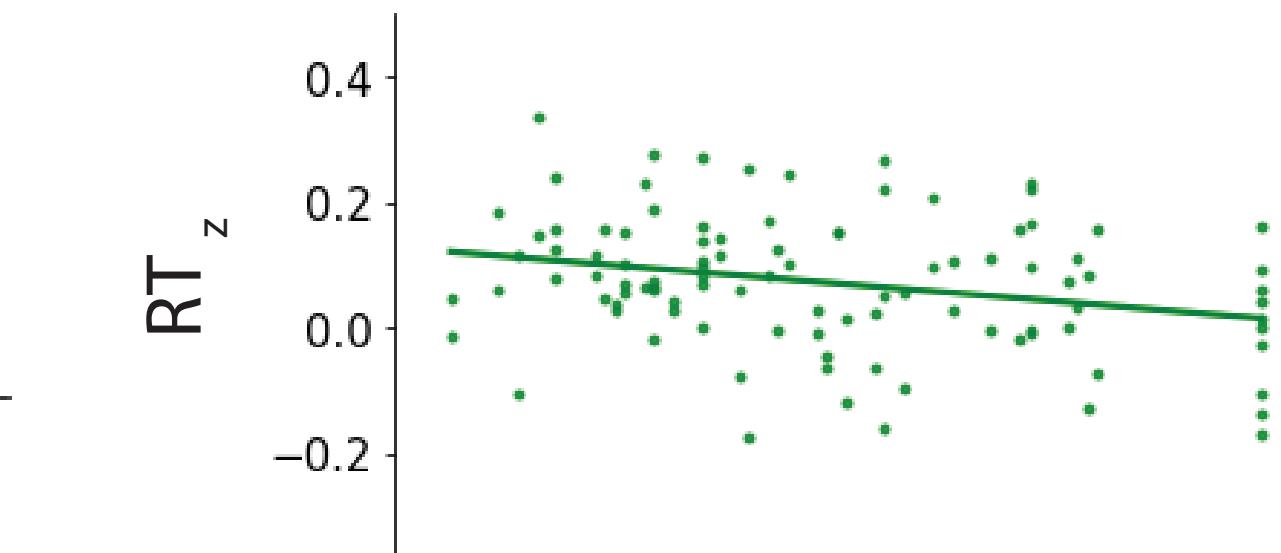
Animals

$r = -0.27, p = 0.01$



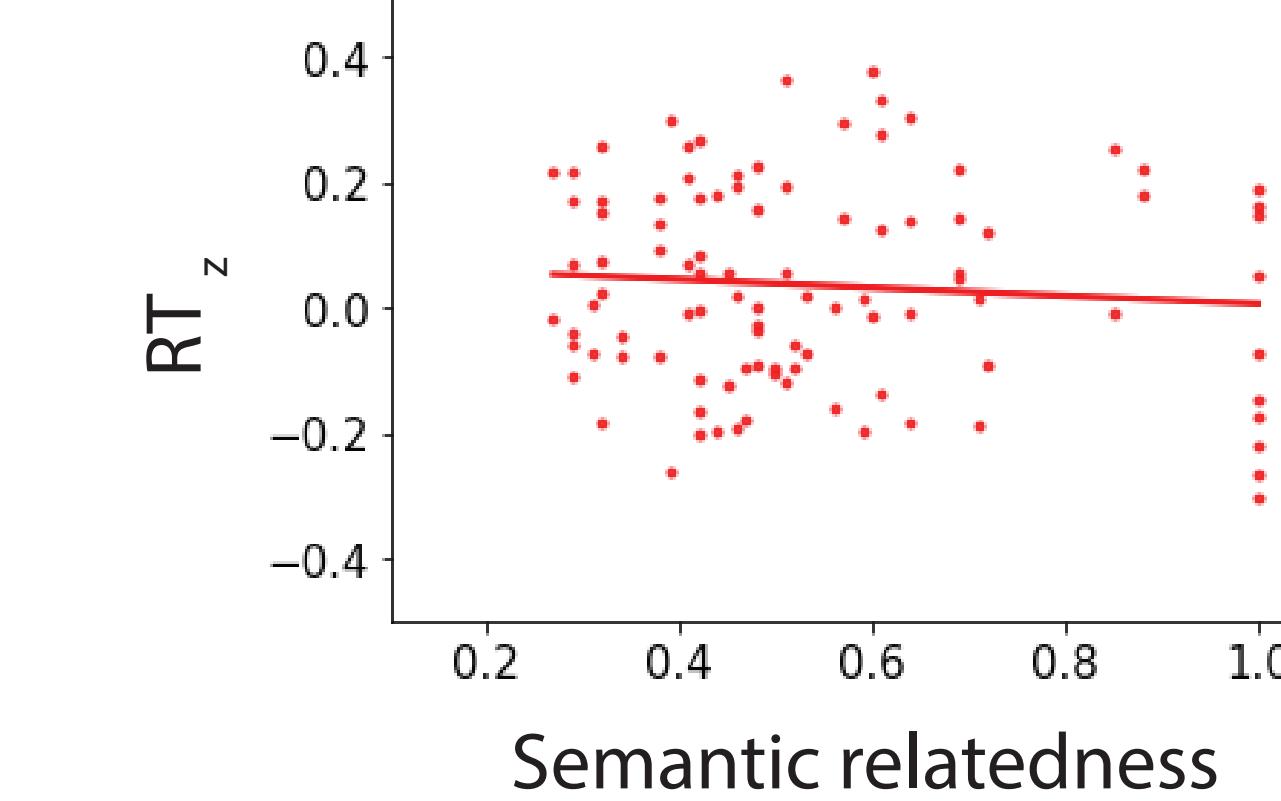
Instruments

$r = -0.23, p = 0.005$



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 semantic meaning is not task relevant

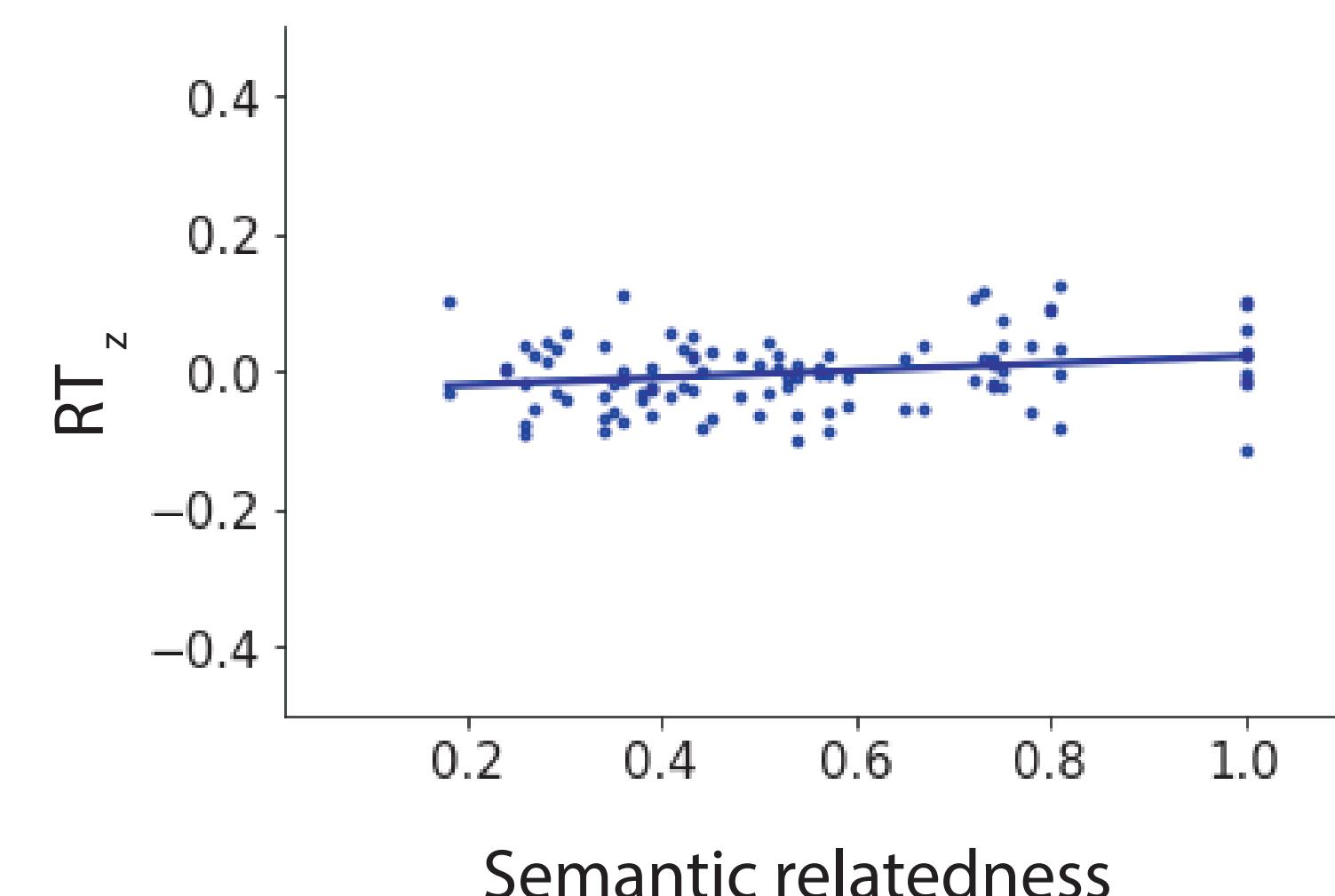
Leading to larger theoretical implications, such as:

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

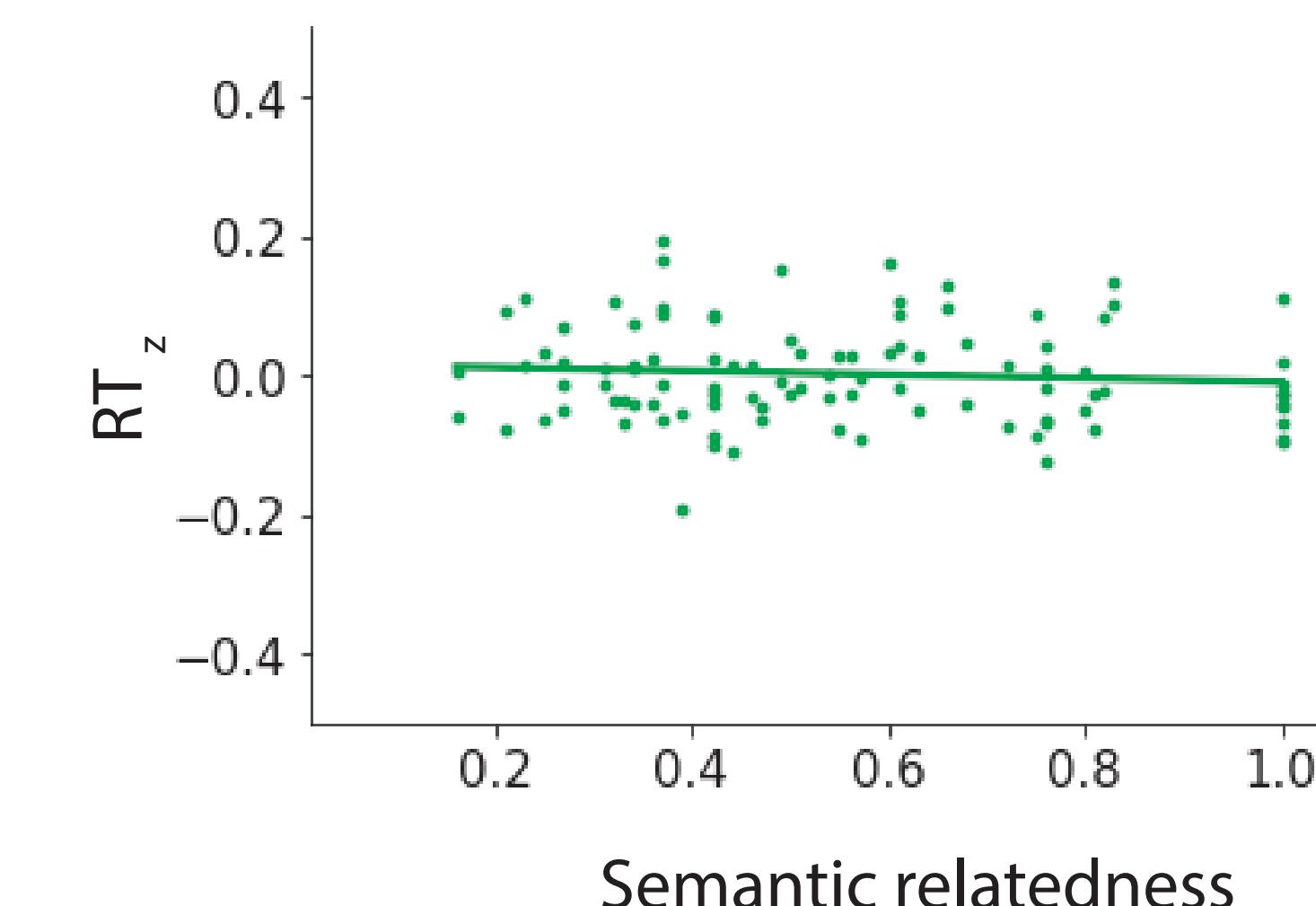
Animals

$r = 0.22, p = 0.02$



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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