

Sentence congruency constraints on letter identification

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BACKGROUND

How do readers identify letters in words?

PETAL petal *petal*

Require **flexibility** to overcome feature variation across case, font etc., whilst maintaining **specificity** to avoid identification errors with letters with similar feature combinations.

Word Superiority Effect
Reicher (1967)

bloom > blom

Readers are more accurate at identifying letters in words compared to non-words.

Sentence Superiority Effect
Snell & Grainger (2017)

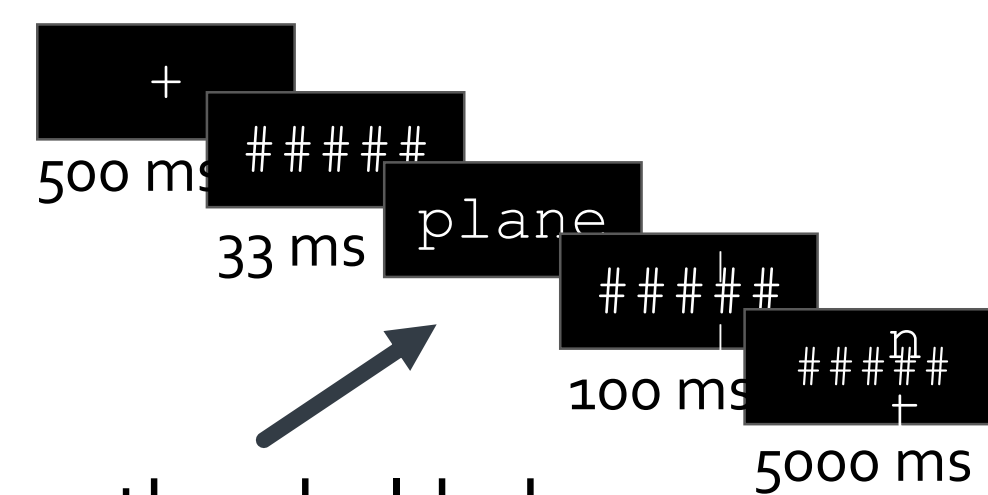
the cow jumped over the moon moon over the cow jumped the

Readers are also more accurate at identifying words in sentence compared to a jumbled word combination.

Research aim: to investigate whether readers integrate higher-level sentence cues during letter identification, and whether cues are hierarchically integrated based on available context.

SINGLE WORD CUES

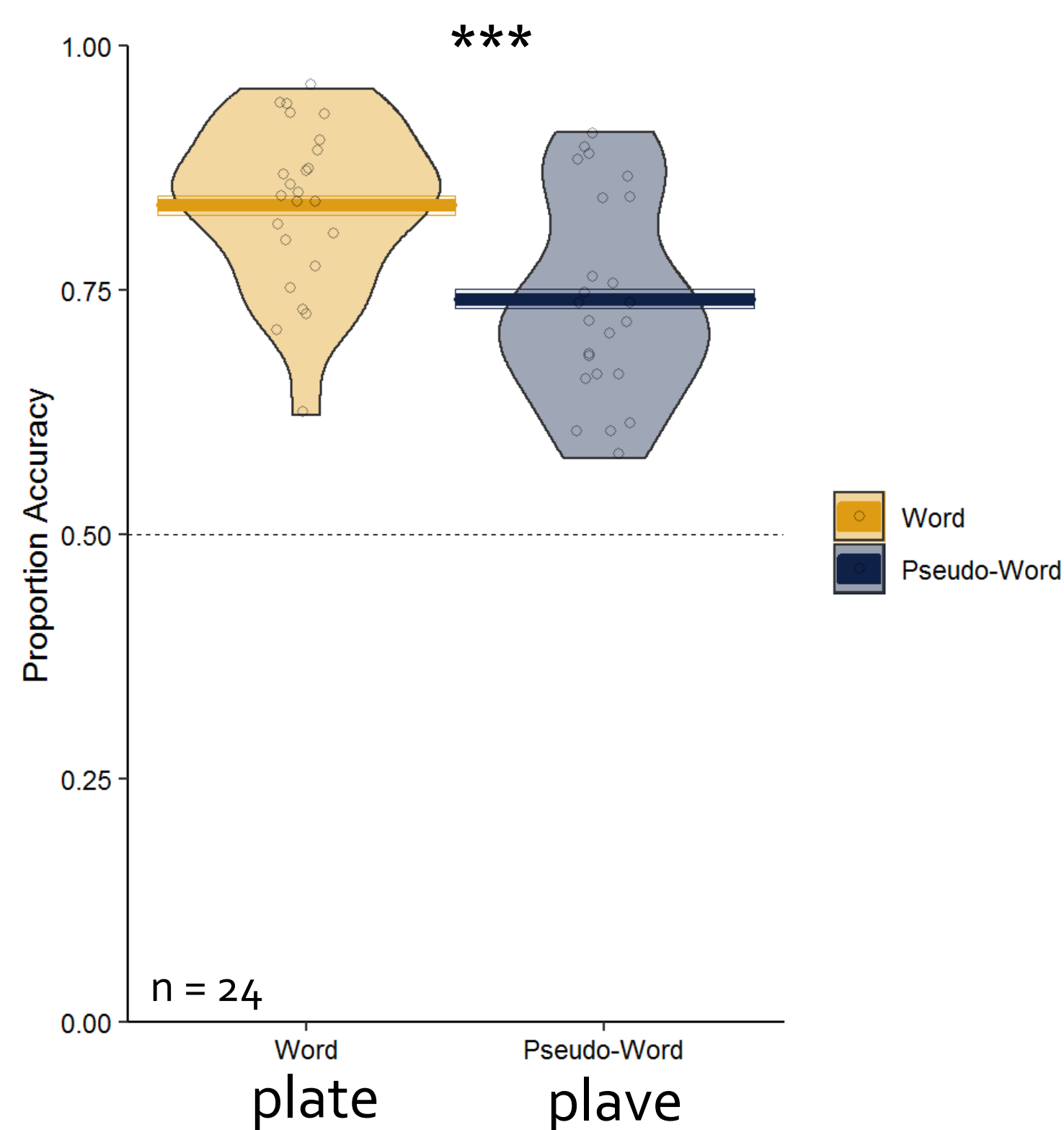
Condition	Target	Present	Absent
Word	plate	plate	plane
Pseudo-Word	plave	plave	plame



Target exposure duration was thresholded to each participant using a preliminary task

Prediction: letter identification will be more accurate in word targets compared to non-word targets.

Lexical cues constrain letter identification (word superiority effect).

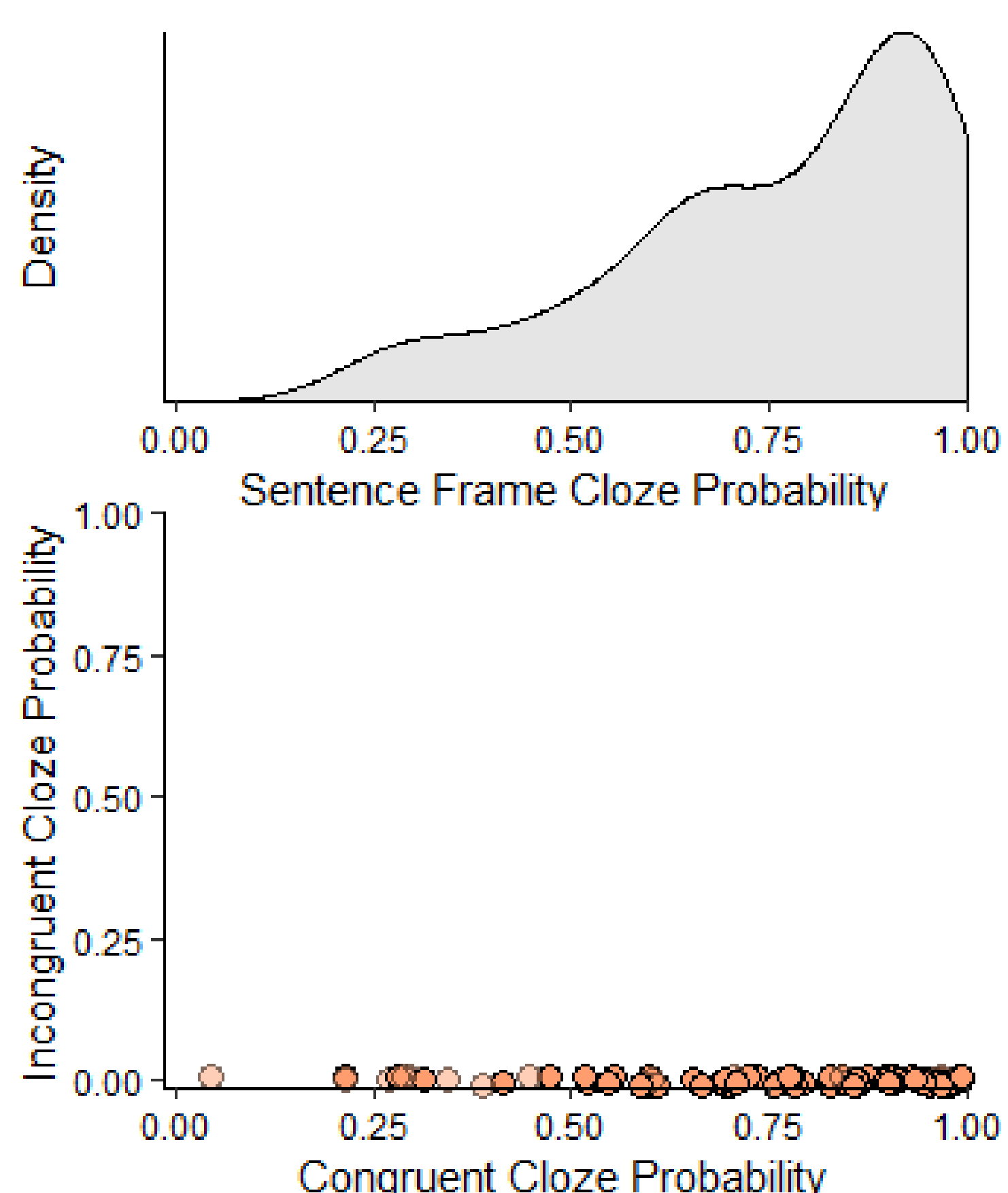


ONLINE SENTENCE CLOZE TASK (PREDICTABLE)

42 participants predicted the final word of 90 predictable sentence frames.

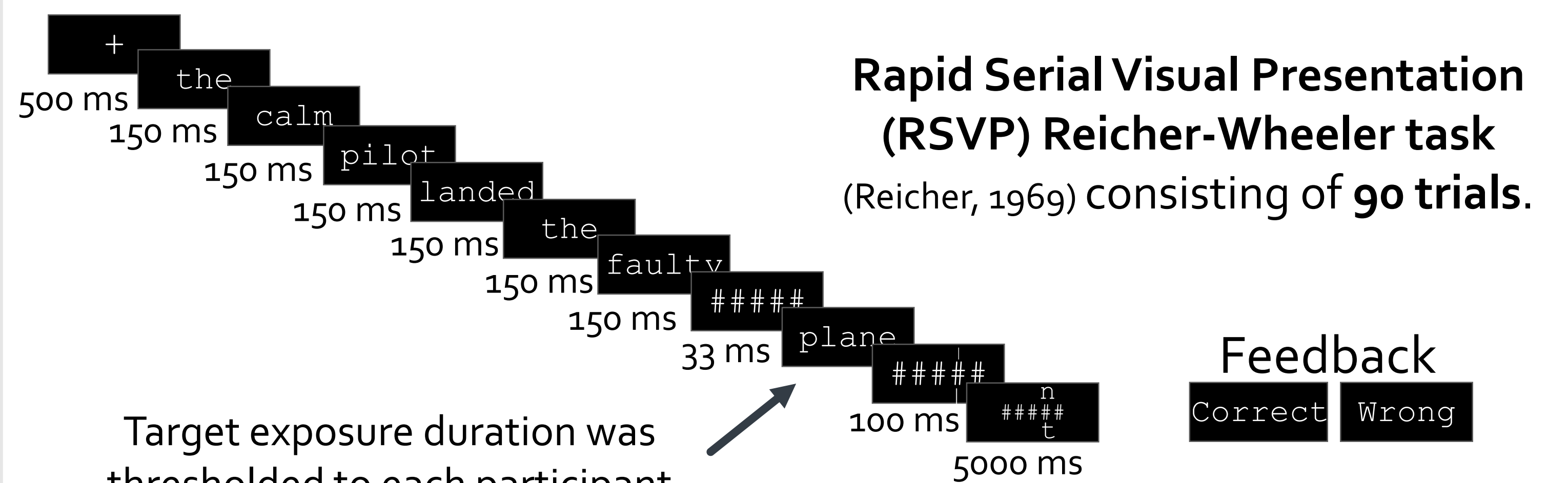
The calm pilot landed the faulty _____.

Sentence frames had an average cloze probability of 76%. The congruent target was the most frequent response in 82% of sentence frames. The incongruent target was never predicted.



PREDICTABLE SENTENCE CUES

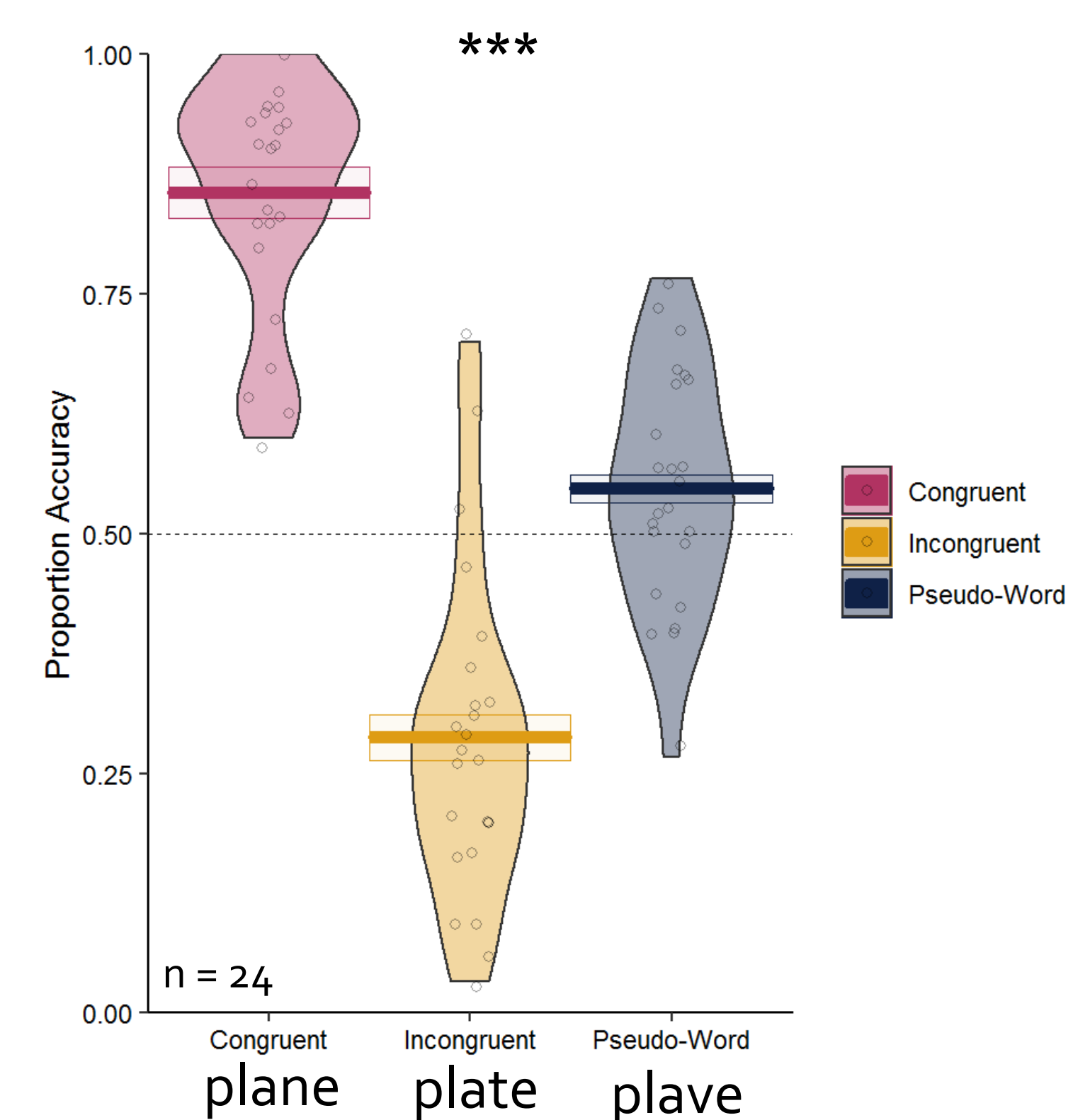
Condition	Predictable Sentence frame	Target	Present	Absent
Congruent		plane	plane	plate
Incongruent	the calm pilot landed the faulty	plate	plate	plane
Pseudo-Word		plave	plave	plame



Target exposure duration was thresholded to each participant using a preliminary task.

Prediction: letter identification will be more accurate in semantically congruent targets compared to incongruent targets.

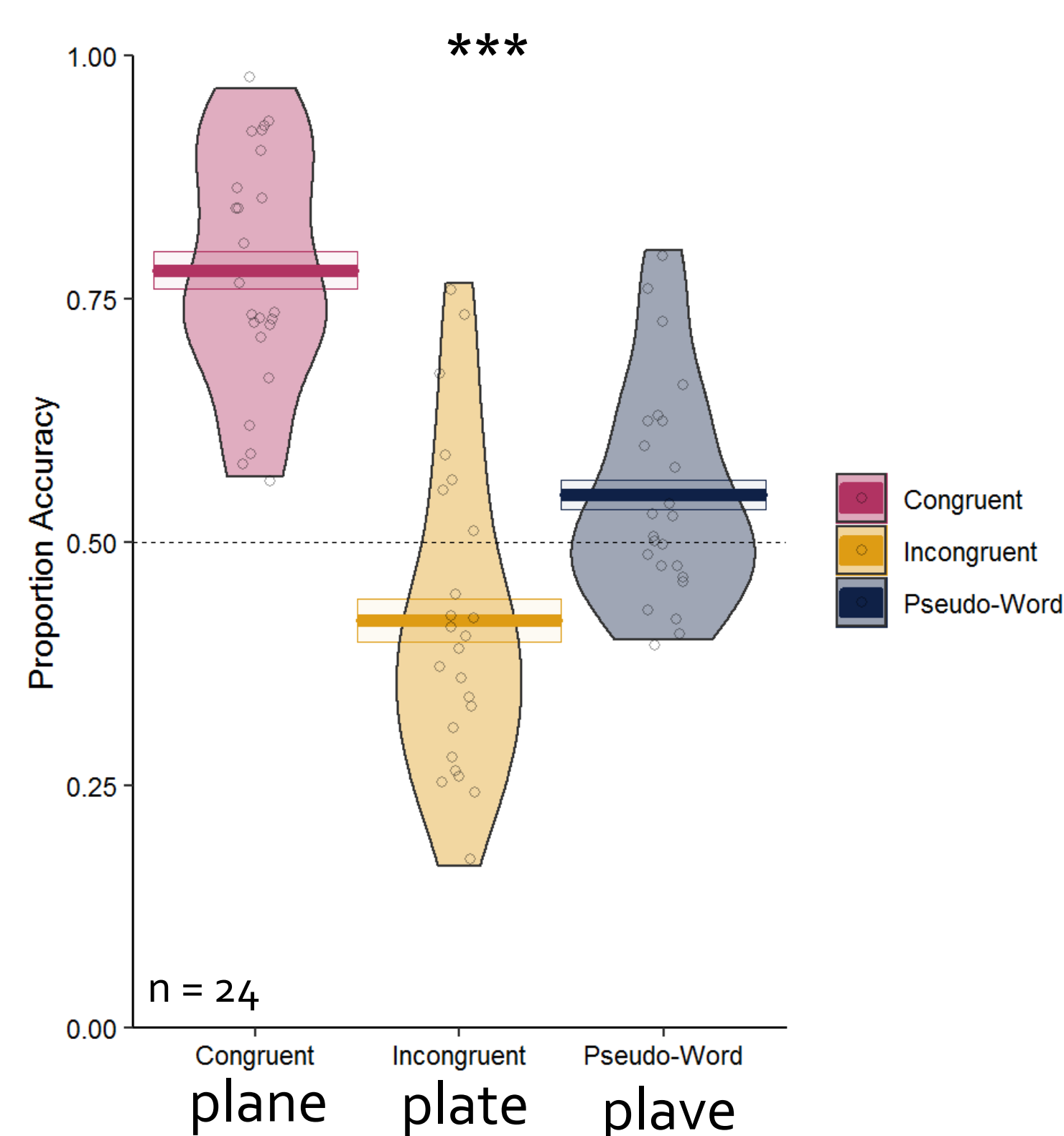
the calm pilot landed the faulty



Sentence level semantic cues constrain letter identification, eliminating the word superiority effect for incongruent words.

WITH FEEDBACK

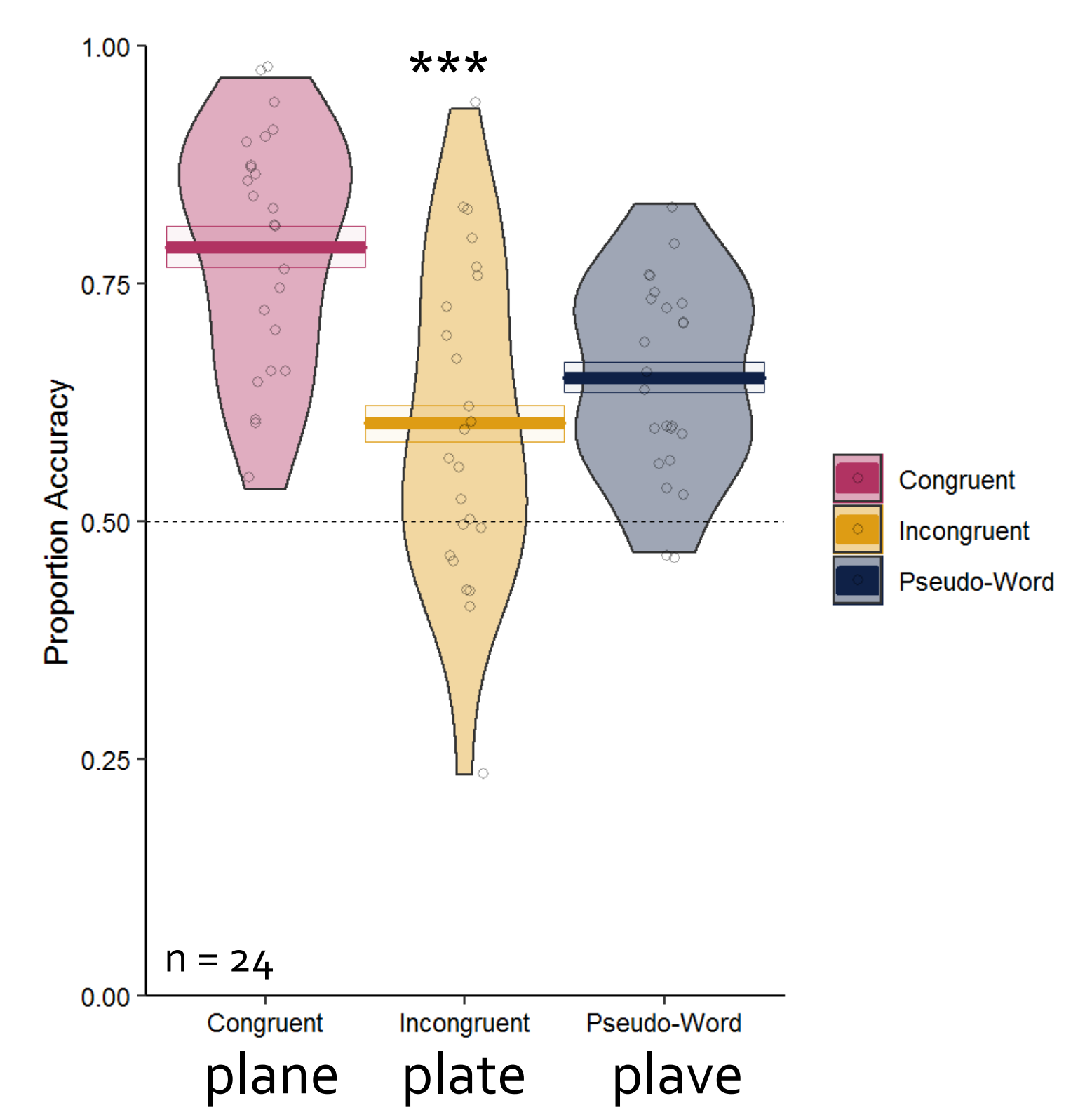
the calm pilot landed the faulty



Sentence level semantic cues constrain letter identification – even when feedback suggests these cues are unreliable.

DISRUPTED WORD ORDER

landed the pilot the faulty calm



Sentence level semantic cues constrain letter identification – even when sentence word order is disrupted.

Sentence congruency constraints on letter identification

(continued)



FOLLOW UP: WHICH CUES ARE USED WHEN BOTH TARGETS ARE EQUALLY AS LIKELY?

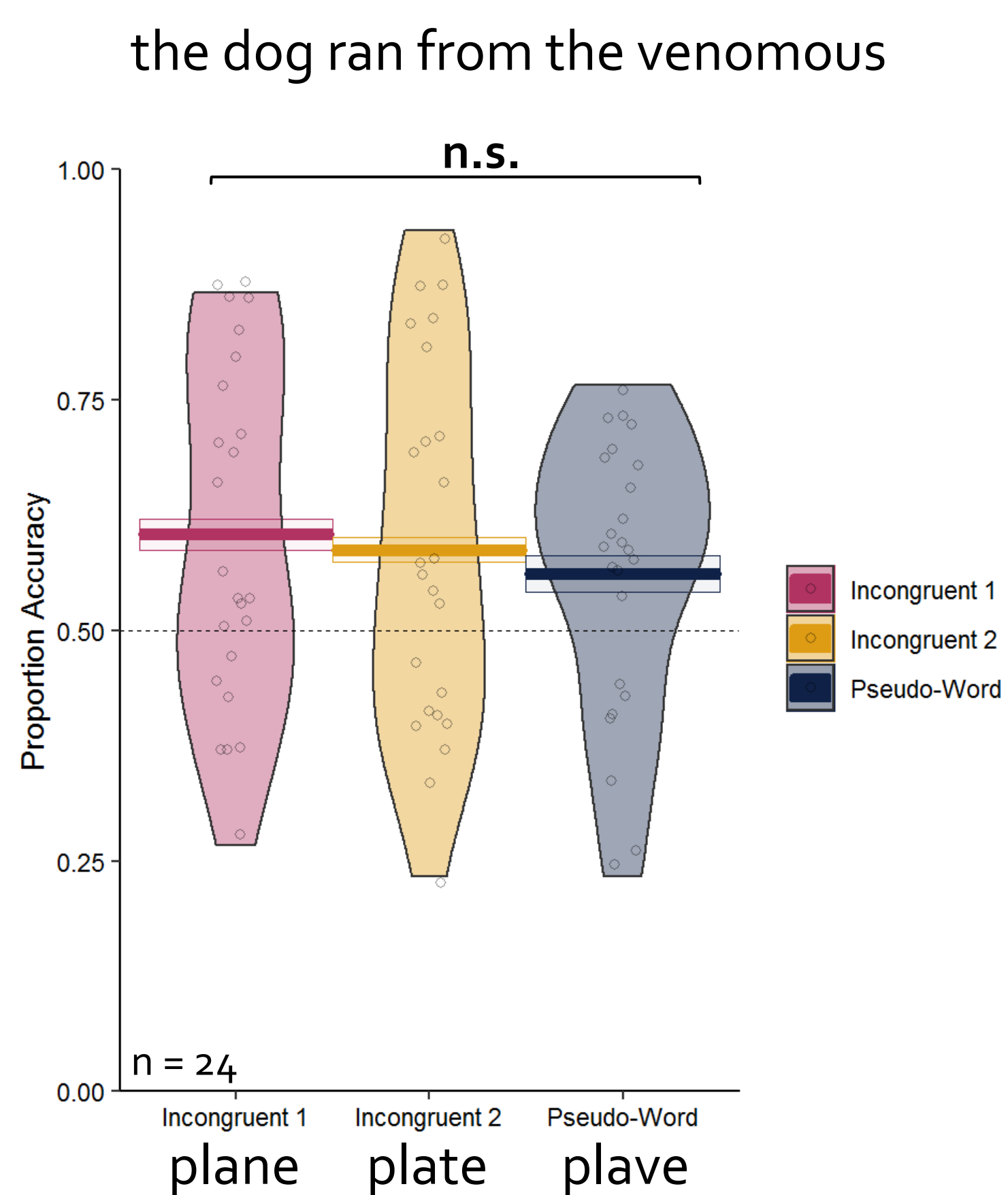
Unpredictable targets

We re-assigned predictable sentence frames to different targets so that both word targets were unlikely.

Condition	Predictable Sentence frame	Target	Present	Absent
Incongruent 1	the dog ran from the venomous	plane	plane	plate
Incongruent 2		plate	plate	plane
Pseudo-Word		plave	plave	plame

RSVP Reicher-Wheeler paradigm (as used in previous tasks).

Prediction: the reader will revert to prioritising lexical cues when a congruent candidate is unavailable (word superiority effect).



The word superiority effect is eradicated when neither of the word targets fit the sentence context.

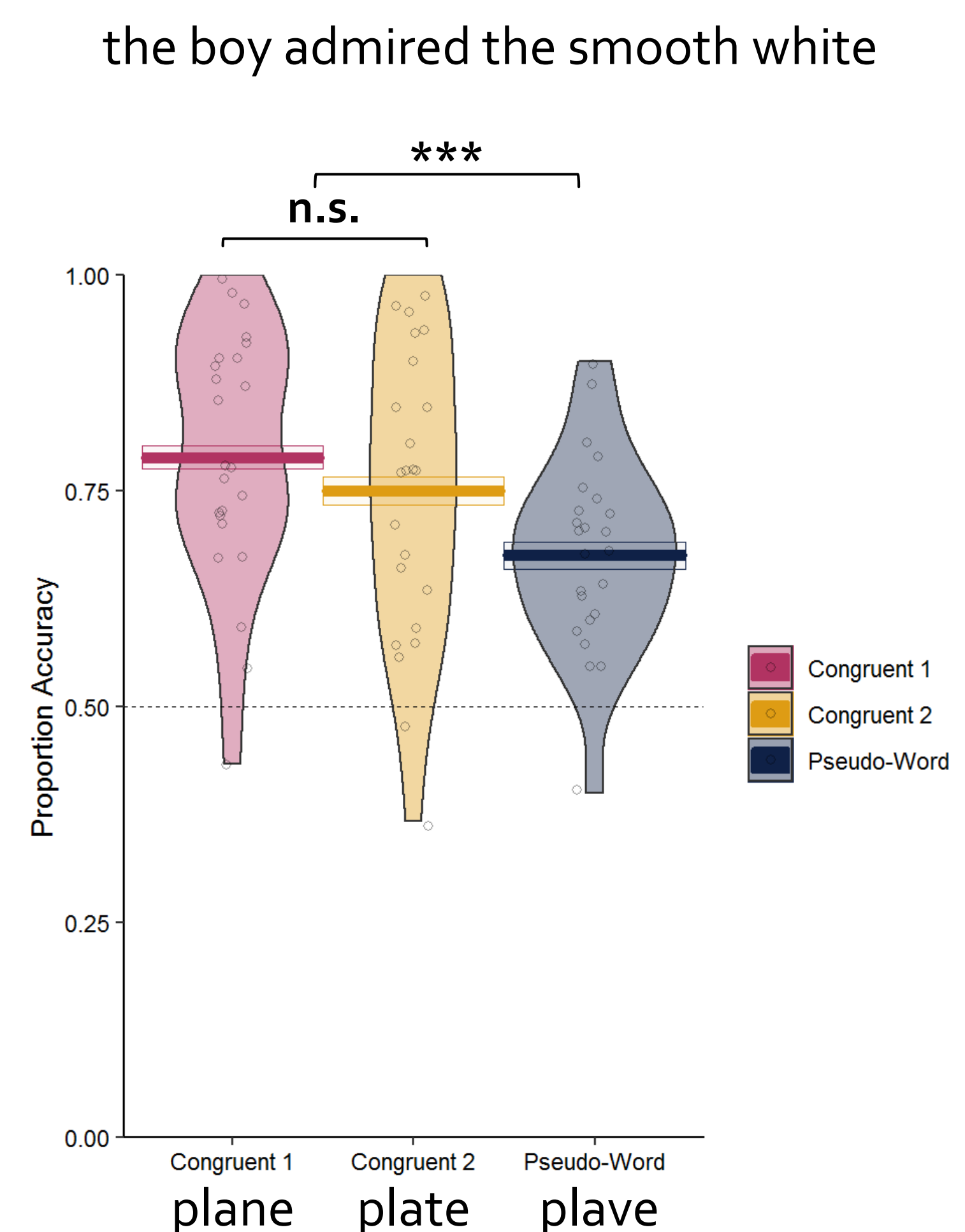
Predictable targets

We used neutral sentence frames so that both word targets were likely.

Condition	Neutral Sentence frame	Target	Present	Absent
Congruent 1	The boy admired the smooth white	plane	plane	plate
Congruent 2		plate	plate	plane
Pseudo-Word		plave	plave	plame

RSVP Reicher-Wheeler paradigm (as used in previous tasks).

Prediction: the reader will revert to prioritising lexical cues when a congruent candidate is unavailable (word superiority effect).



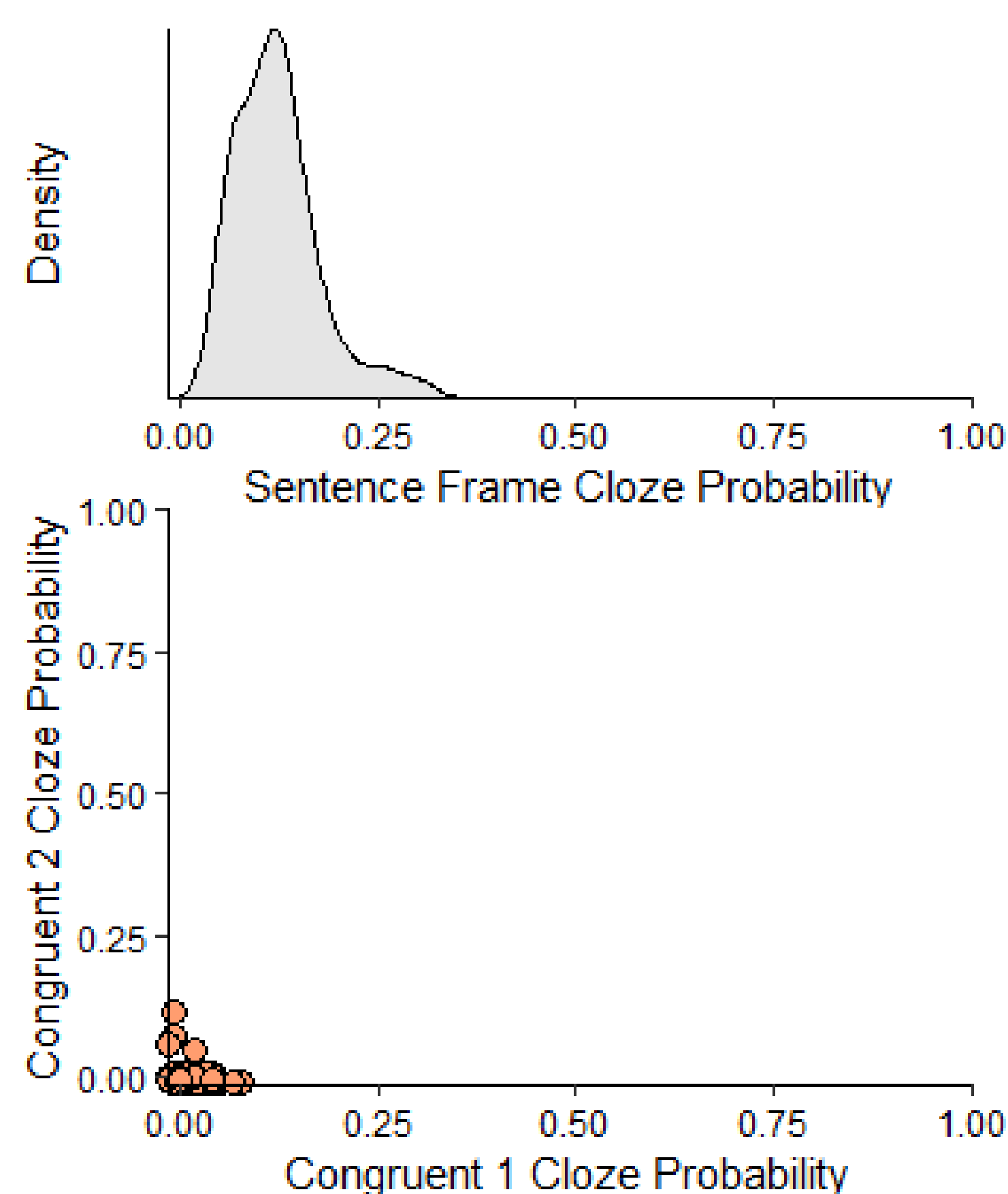
The word superiority effect is restored when both word targets fit the sentence context.

ONLINE SENTENCE CLOZE TASK (NEUTRAL)

42 participants predicted the final word of 90 neutral sentence frames.

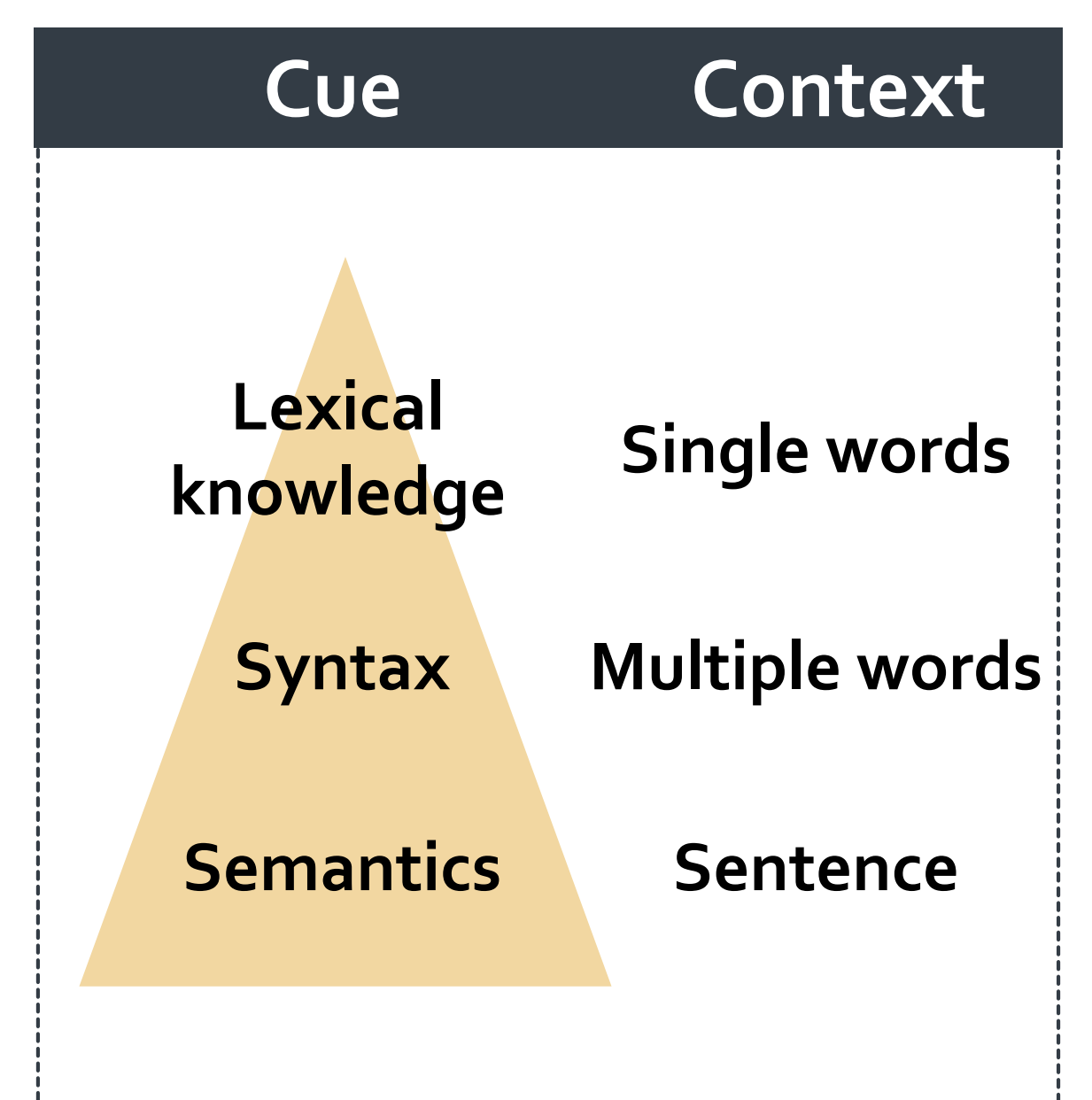
The boy admired the smooth white _____.

Sentence frames had an average cloze probability of 12%. Target 1 (previously congruent) was the most frequent response in 0.3% of sentence frames. Target 2 (previously incongruent) was the most frequent response in 0.4% of sentence frames.



CONCLUSIONS

Higher level sentence cues inform letter identification, and priority assigned to cues is modulated by orthographic context.



REFERENCES

- Bates, D., Maechler, M., Bolker, B., & Walker, S. (2015). Fitting linear mixed effects models using lme4. *Journal of Statistical Software*, 67, 1-48. <https://arxiv.org/abs/1406.5823>.
- Mirault, J., Snell, J., & Grainger, J. (2018). You that read wrong again! A transposed-word effect in grammaticality judgments. *Psychological Science*, 29(12), 1922-1929. <https://doi.org/10.1177/0956797618806296>.
- R Core Team (2016). R: A language and environment for statistical computing [Computer software]. R Foundation for Statistical Computing, Vienna, Austria. Retrieved from: <http://www.R-project.org/>.
- Reicher, G. M. (1969). Perceptual recognition as a function of meaningfulness of stimulus material. *Journal of Experimental Psychology*, 81(2), 275-280. <http://dx.doi.org/10.1037/h0027768>.
- Snell, J. & Grainger, J. (2017). The sentence superiority effect revisited. *Cognition*, 168, 217-221. <https://doi.org/10.1016/j.cognition.2017.07.003>.

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