Salient phonological information modulates the effect of semantic priming

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Previous research disagrees about how much phonology informs lexical expectations[1] during reading [1, 2, 3, 4]. In this study, we distinguish the effect of *rhyming* on lexical expectations via two forced-choice tasks, finding that the presence of salient phonological structure strongly influences lexical expectations and can also greatly diminish the effect of semantic priming.

Experiment 1 (N=34) uses a forced-choice task with rhyming items. Participants read a poem in English with the final rhyming word left blank (Fig 1). The participants are then presented a word. If the word can fill in the blank, participants select "Yes" to advance. If they select "No", the participant then chooses one of three new rhyming words to fill in the blank, all which belong to one of the following categories: the original intended target of the rhyme (IT), an alternative semantically-possible rhyming target (AT), or a filler rhyming target (F). The word presented initially serves as a semantic prime to the AT. The experimental conditions determine which set of words appear: {IT + 2F (IT), AT + 2F (AT), IT + AT + 1F (BOTH), 3F (FILLER)} (Table 1), where #F is the number of filler rhyming targets. We analyze selections from "No" responses (>95% of trials) and the time (RT) it takes them to make a decision, focusing on choices involving the AT and IT. **Results**: Participants select the IT whenever it appears, even if the primed AT is present, suggesting participants predict a specific phonological form (Fig 3a). When the IT is not present, participants prefer the AT over FILLER. Using t-tests comparing the mean RTs for all conditions (Fig 4a) shows that there is no difference between the IT and BOTH conditions (t=1.23, p>.1) nor the AT and FILLER conditions (t=-0.37, p>.1). However, the mean RT for the AT condition is significantly higher than that of the IT (t=-10.09, p<.0001) and BOTH conditions (t=10.08, p<.0001). <u>These analyses indicate participants quickly and frequently choose the IT (IT, BOTH), but their decision times for selecting the AT when the IT is not present (AT) are as slow as those for FILLER trials.</u> **Experiment 2** (N=32) probes the interaction of semantic priming and phonological prediction in situations where phonology is less salient. To test this, we use the same paradigm, but we reduced phonological salience by deleting line breaks and providing non-rhyme continuations only (Fig 2, Table 2). **Results**: Participants select the IT in the BOTH condition at a lower rate (-27%) and the AT at a higher rate (+20%) in the AT and BOTH conditions relative to Exp 1, suggesting semantic priming is stronger in de-phonologized environments (Fig 3b). Using t-tests on the mean RTs for participant decisions (Fig 4b) shows the mean RT for the IT condition is significantly lower than the AT condition (t=-3.42, p<.001) but not from the BOTH condition (t=-0.81, p>0.1). Unlike Exp 1, the mean RT for the AT condition is not significantly different from the BOTH condition (t=2.47, p>.01), but is significantly lower than the FILLER condition (t=-1.42, p<0.001). <u>These findings show that the AT is preferred to a random word, suggesting semantic priming is a stronger influence on RTs in Exp 2 than in Exp 1.</u>

Discussion. In Exp 1, we find participants prefer a specific phonological target, choosing the IT whenever it is present. Without the IT, participants default to options that are semantically-primed (AT), though with RTs that are no different than choosing random rhymes. In Exp 2, we confirm the effect of phonology: without rhyming information, participants select the AT at higher rates in all conditions compared to Exp 1, indicating their expectations of the IT are weaker. These results support an analysis where phonological information modulates semantic priming effects during reading, with salient phonological structure strengthening lexical expectations.

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[1] In this poster, we do not make a claim for either a prediction or integration account of processing.

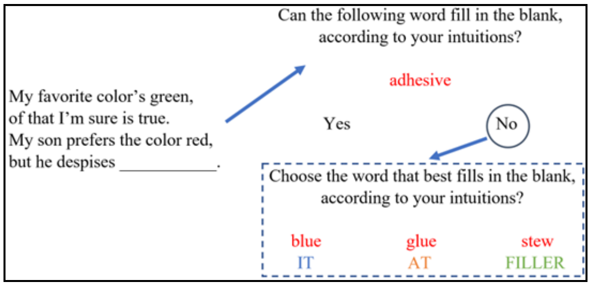


Figure 1: Sample stimuli from Experiment 1

IT + 2F	AT + 2F	IT, AT + 1F	3F
{blue, stew, dew}	{glue, stew, dew}	{blue, glue, stew}	{stew, dew, flu}

Table 1: Conditions for Experiment 1

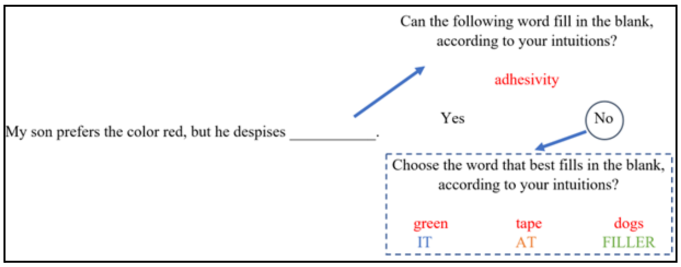
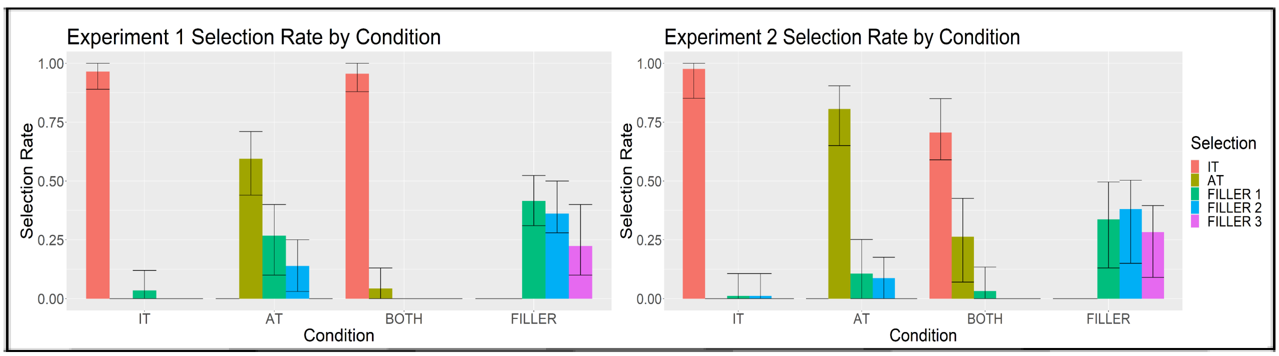


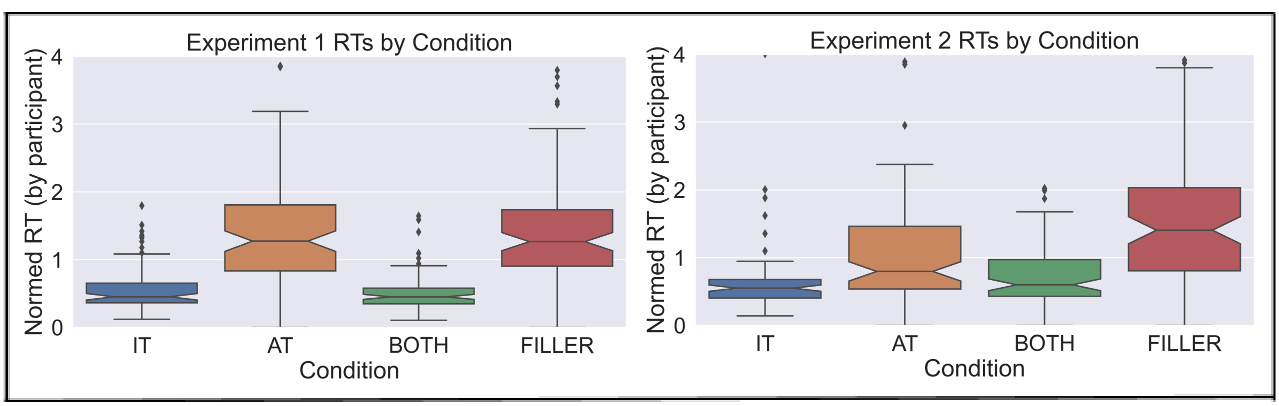
Figure 2: Sample stimuli from Experiment 2

IT + 2F	AT + 2F	IT, AT + 1F	3F
{green, dogs, pianos}	{tape, dogs, pianos}	{green, tape, dogs}	{dogs, pianos, fish}

Table 2: Conditions for Experiment 2



(a) Figure 3: Selection Rates by Condition for Experiments (b)



(a) Figure 4: RTs by Condition for Experiments (b)
(notches indicate 95% CIs determined by Gaussian-based asymptotic approximation)

References [1] Nieuwland et al. (2018). *ELife*. [2] Nieuwland (2019). *Neuroscience & Biobehavioral Reviews*. [3] Read et al. (2014). *Frontiers in psychology*. [4] Pickering & Garrod (2007). *Trends in cognitive science*.