

## Can word form emerge soon(er) in retrieval? Iconicity impacts dynamics of phonological interference in picture naming

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**Background:** Although contemporary models of language production drifted apart from assumptions of strict seriality, the degree of cascading or interactivity across levels of processing remains debated [1-2]. For instance, studies show that phonological forms can be activated very quickly, potentially along with semantics, during word retrieval [3-4]. At the same time, the increasing interference caused by auditory distractors over time suggests that phonological encoding is an incremental process that only peaks close to articulation [5-6]. This time course has mostly been seen as independent from the specific properties of words. However, a different connectivity between a word's semantic and phonological dimensions might play a key role in this respect. An instance of this is iconicity, i.e., the property of having a non-arbitrary link between a phonological form and its referent [7]. Iconicity has been shown to speed up retrieval in picture naming [8]: arguably, this may be due to faster encoding of iconic words' phonology thanks to enhanced (cascaded or interactive) links with semantics. To investigate this, we tested whether the time course of phonological encoding, as pinpointed by phonological interference in a passive-dual task paradigm, can be modulated by iconicity.

**Method:** Twenty-eight native speakers of French named 160 pictures, half of which associated to iconic words, and the other half to non-iconic words (Fig. 1). While naming pictures, participants were exposed to to-be-ignored auditory distractors. Four syllables of French were interspersed across conditions; their phonology never overlapped with the expected word. Stimulus-Onset Asynchrony (SOA) was also manipulated: distractors were assigned to one of four SOAs (0, 150, 300, or 450ms after image presentation), with counterbalanced assignment across participants. Stimuli were balanced upon critical factors across conditions.

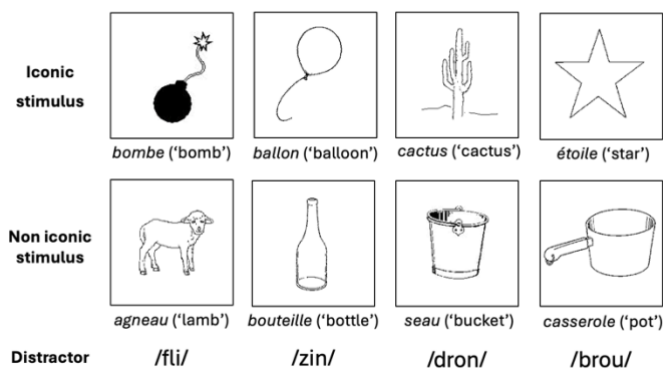
**Results:** A linear mixed-effects model run on reaction times (RTs, for correct trials only) revealed a significant main effect of SOA ( $p < .001$ : RTs increased linearly with SOA) and a significant interaction between SOA and Iconicity ( $p = .018$ ). Planned comparisons traced the interaction back to the fact that non-iconic items showed a gradual increase in RTs, only reaching significance between earliest and latest SOAs (e.g., 0 and 450: +35ms). Iconic items, instead, showed a significant increase in RTs already between SOA=0 and 150 (+45ms), and such difference persisted, but did not reliably increase at later SOAs (Fig. 2).

**Discussion:** Our results replicate previous observations of phonological interference effects, supporting the view that these index the incremental mobilization of phonological encoding over time [6]. Interestingly, our results also suggest that the temporal dynamics of such effects are sensitive to the presence of enhanced links between semantics and phonology. While interference grew slowly and steadily for non-iconic words, iconic words witnessed a first peak of interference already at SOA=150, which rather plateaued afterwards. This can be taken as evidence that, when retrieved for speech, iconic words activate their phonology faster and more suddenly than non-iconic words [7-8]. Therefore, our results suggest that properties of word forms contribute to modulate the time course of phonological encoding. This supports the view that overlap between different processes, as determined by the degree of cascading or interactivity throughout retrieval [1-2], might be partially specific to the words to be retrieved.

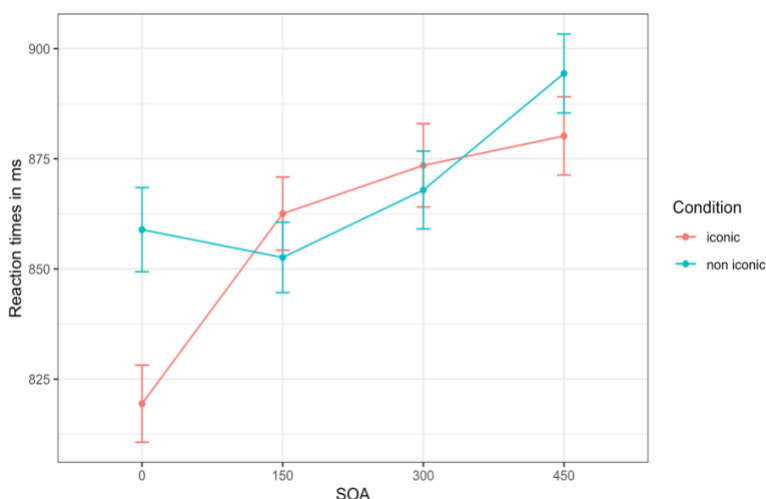
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## Figures



**Figure 1.** Examples of experimental stimuli. Following [8], iconic stimuli (top line) consisted in items whose word's phonology raised an association with a round/spiky shape, and whose visual referent was indeed round/spiky. Non-iconic stimuli (central line) consisted in items whose word's phonology did not raise any association with visual shape. Iconic and non-iconic stimuli were assigned to one of four syllables acting as distractors (bottom line).



**Figure 2.** Mean reaction times (in milliseconds) across experimental conditions upon correct trials. Full points represent condition means; bars represent standard errors. For non-iconic items (light blue line), significant differences were observed between SOA=0 and 450 ( $p=.017$ ) as well as 150 and 450 ( $p<.01$ ). For iconic items (red line), significant differences were observed between SOA=0 and 150 ( $p<.01$ ), 0 and 300 ( $p<.001$ ), as well as 0 and 450 ( $p<.001$ ).