Lexical specificity in semantic and phonological effects: iconicity and the PWI paradigm

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Background: The underlying dynamics of spoken lexical access represent a crucial matter for psycholinguistic research. Studies comparing the activation of semantic and phonological representations of words, e.g. via the Picture-Word Interference (PWI) paradigm, repeatedly revealed coactivation effects such as semantic interference and phonological facilitation [1, 2]: i.e. naming latencies increase when target and distractor share semantic features but decrease when the two share phonological features [3–5]. The time course of these effects, with semantic interference typically having an earlier onset and offset than phonological facilitation, has been taken to show that semantics and phonology are activated in a discrete, invariant cognitive sequence, thus supporting serial models of word production [3]. While more recent studies relativized this [6] by showing the impact of different target-distractor relations [7, 8] and individual processing capacities [9] upon such effects, the specificity of the target word has mostly been overlooked. Yet, lexical units can differ in the proximity between their semantic and phonological representations. An example of this is iconicity, i.e. the property of having a non-arbitrary link between a word's phonological form and its referent [10]. As iconicity has been shown to influence word retrieval [11], it is possible that this property might also impact the coactivation of related features during lexical access. To investigate this, we tested whether semantic and phonological effects in production are affected by the iconicity of the word to be retrieved.

Method: We designed a picture naming task employing a PWI paradigm, and tested it on 31 native speakers of French. Participants were asked to name 144 pictures: 72 were associated to iconic words and the other 72 to non-iconic words (Fig. 1, left). While naming pictures, participants were exposed to auditory distractors they were instructed to ignore. Each picture was repeated three times, across which the type of distractor heard was manipulated (semantic, phonological, unrelated: Fig. 1, right). The Stimulus-Onset Asynchrony (SOA) between target and distractor was also manipulated: distractors for the same target were assigned to one of three SOAs (-150, 0, +150 milliseconds), with counterbalanced assignment across participants. All targets and distractors were balanced upon critical variables across experimental conditions.

Results: Preliminary results (n=22) are presented. Reaction times from correct trials were analysed via LMMs, computed separately for iconic and non-iconic targets. On iconic targets, the model revealed a significant main effect of Distractor ($p<.001$: semantic distractors induced interference and phonological distractors induced facilitation) and a significant interaction between Distractor and SOA ($p<.001$). Planned comparisons traced back the interaction to the fact that semantic distractors caused interference only at SOA=-150 (+40ms), while phonological distractors caused facilitation only at SOA=0 (-40ms). On non-iconic targets, the model revealed a significant main effect of Distractor ($p<.001$) but no interaction. As also highlighted by the inspection of RT differences (semantic/phonological minus unrelated: Fig. 2), this was due to the fact that for non-iconic words, interference and facilitation were more consistent over time. Specifically, for non-iconic targets, semantic distractors interfered with retrieval also at SOA=0 (+35ms) and, more weakly, at SOA=+150 (+25ms).

Discussion: In addition to replicating well-known semantic and phonological effects in production [3–5], the present study provides preliminary evidence that such effects might be sensitive to the underlying properties of the word to be produced [7]. Reliable semantic interference and phonological facilitation were found for both iconic and non-iconic targets. However, only the time course of iconic words'retrieval exhibited a strong difference in this respect: semantic interference was found exclusively at a negative SOA for iconic words, while also at later SOAs for non-iconic words. The finding of a different pattern linked to iconicity is coherent with the hypothesis that this property modulates the dynamics of (co)activation between different linguistic features [10, 11]. Specifically, it suggests

that iconicity might promote faster resolution of lexical selection: hence, the quicker decay of semantic interference. As such, the current results suggest that enhanced links between semantics and phonology can shape the structure of coactivation effects in production, constraining in turn the degree of interactivity in the cognitive processes that substantiate spoken lexical access [6].

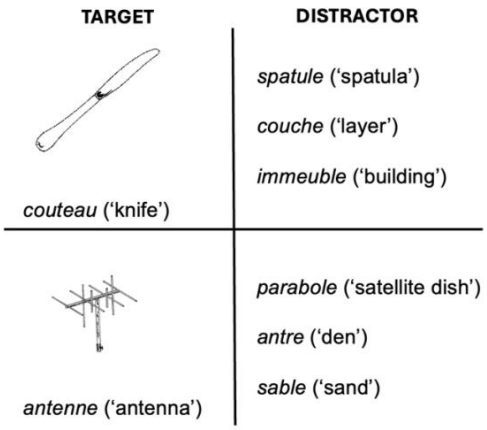

Figure 1: Left: examples of target words with prompt pictures. Following [10], the uppermost item (*couteau*) was categorized as iconic since the word's phonology raises an association – based on its phonemes' sound symbolic value – with a spiky shape, and the word's referent is indeed a spiky object. The lowermost item (*antenne*), instead, was judged as non-iconic since the word's phonology does not bias into thinking about any shape. Right: examples of distractor words. Following [3], uppermost items (*spatule*, *parabole*) were selected as semantic distractors since sharing semantic category with the target, but no phonological feature; central items (*couche*, *antre*) were selected as phonological distractors since sharing phonemic onset with the target, but no semantic feature; lowermost items (*immeuble*, *sable*) were selected as unrelated distractors since not sharing any semantic or phonological similarity with the target.

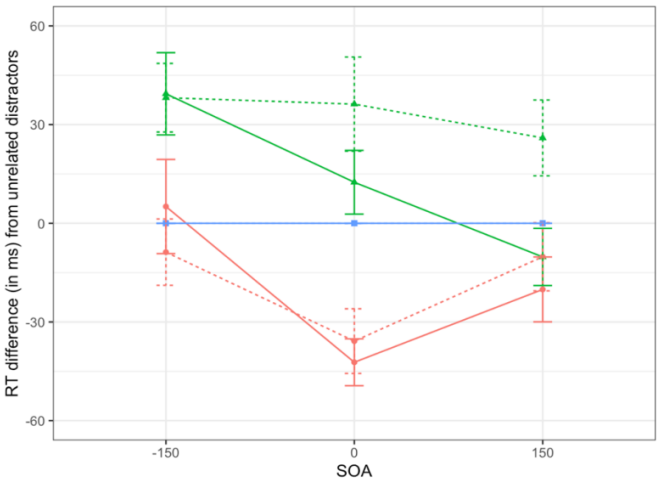

Figure 2: Differences in reaction times (in milliseconds) between experimental condition (phonological distractor: pink; semantic distractor: green) and baseline condition (unrelated distractor: blue). RT differences were computed by item and plotted by target iconicity (iconic: continuous line; non-iconic: dashed line) and SOA (-150: distractor onset 150ms before picture appearance; 0: distractor onset simultaneous to picture appearance; +150: distractor onset 150ms after picture appearance). Full points represent condition means, while vertical bars represent standard errors.

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