

Graded Semantic Transparency and Sensitivity to Structure in Visual Word Processing: Distributional Evidence from a Morpheme Interference Experiment

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A central question in visual word recognition concerns how orthographic, semantic, and morphological representations interact to support access from print to meaning [1]. Evidence from the morpheme interference paradigm shows that letter strings with apparent morphological structure are harder to reject in lexical decision than non-pseudomorphemic nonwords (e.g., scentisk), indicating that morphological structure influences word recognition [2]. According to distributional accounts, this reflects sensitivity to statistical regularities in the mappings between orthographic form and meaning, rather than explicit decomposition into discrete morphemic units [3,4]. A central concept within this framework is semantic transparency. This refers to the extent to which the meaning of a complex word can be inferred from its constituent morphemes. Within distributional frameworks, semantic transparency should exert a graded influence on word recognition not only for morphologically complex real words, but also for pseudowords that contain form-meaning regularities. This graded influence has been observed across tasks and languages [5], yet its extension to pseudomorphemic forms remains underexplored.

A lexical decision experiment was conducted with English-speaking adults with four conditions designed to manipulate the degree of morphological well-formedness, namely (1) low-frequency derived words (scentful), (2) nonce items comprised of existing stems and suffixes in novel combinations (scentish), (3) non-suffix items (scentisk), and (4) non-stem items (scertish). Mixed-effects models and Bayesian analyses were then used to assess the effects of derivational condition and semantic transparency on response accuracy and reaction times [6,7,8]. A robust morpheme interference effect was observed, with real-morpheme conditions (derived words and nonce items) yielding significantly more "real word" judgments and longer reaction times than non-morpheme conditions (non-suffix and non-stem items). Building on this, semantic transparency was further examined as a continuous predictor using three measures: stem proximity (derived from a CAOSS compositional model applied to FastText representations [6,8]), orthographic-semantic consistency (OSC, derived directly from FastText semantic vectors [11]), and human-rated transparency judgments [12]. Semantic transparency exerted a graded influence both within and across conditions, with higher transparency associated with greater likelihood of "real word" judgments and longer reaction times, and evidence for non-linear patterns at higher transparency levels. However, this effect was not fully captured by algorithmic measures (stem proximity and OSC), whose sensitivity was attenuated in non-morpheme conditions, possibly due to the algorithm's reliance on valid morphological structure. Human-rated transparency, by contrast, predicted performance across all conditions, confirming that semantic transparency influences word recognition, even when morphological structure is degraded. These findings support a distributed account in which semantic transparency operates as a graded signal within a high-dimensional semantic space shaped by statistical regularities in form-meaning mappings [9,10]. This signal modulates word recognition across both morphologically well-formed and structurally degraded conditions. More broadly, these findings are consistent with morphological processing reflecting the interaction between graded semantic information and structural regularities, rather than via morphological decomposition alone.

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Figures and Tables

Figure 1: Example Figure



Table 1: Example Table

A	B	C
1	2	3