The Representation of Polysemous Nouns, Verbs, and Adjectives in the Mental Lexicon

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2. Stimuli

Stimuli: 48 Russian polysemous words (24 nouns, 12 verbs and 12 adjectives), each with literal, metonymic and metaphorical senses

Semantic clustering paradigm: Participants were asked to sort 6-12 short phrases containing the same word: phrases with the same perceived word sense should be sorted into the same virtual basket

Participants: 2,080 volunteers (727 with linguistic background)
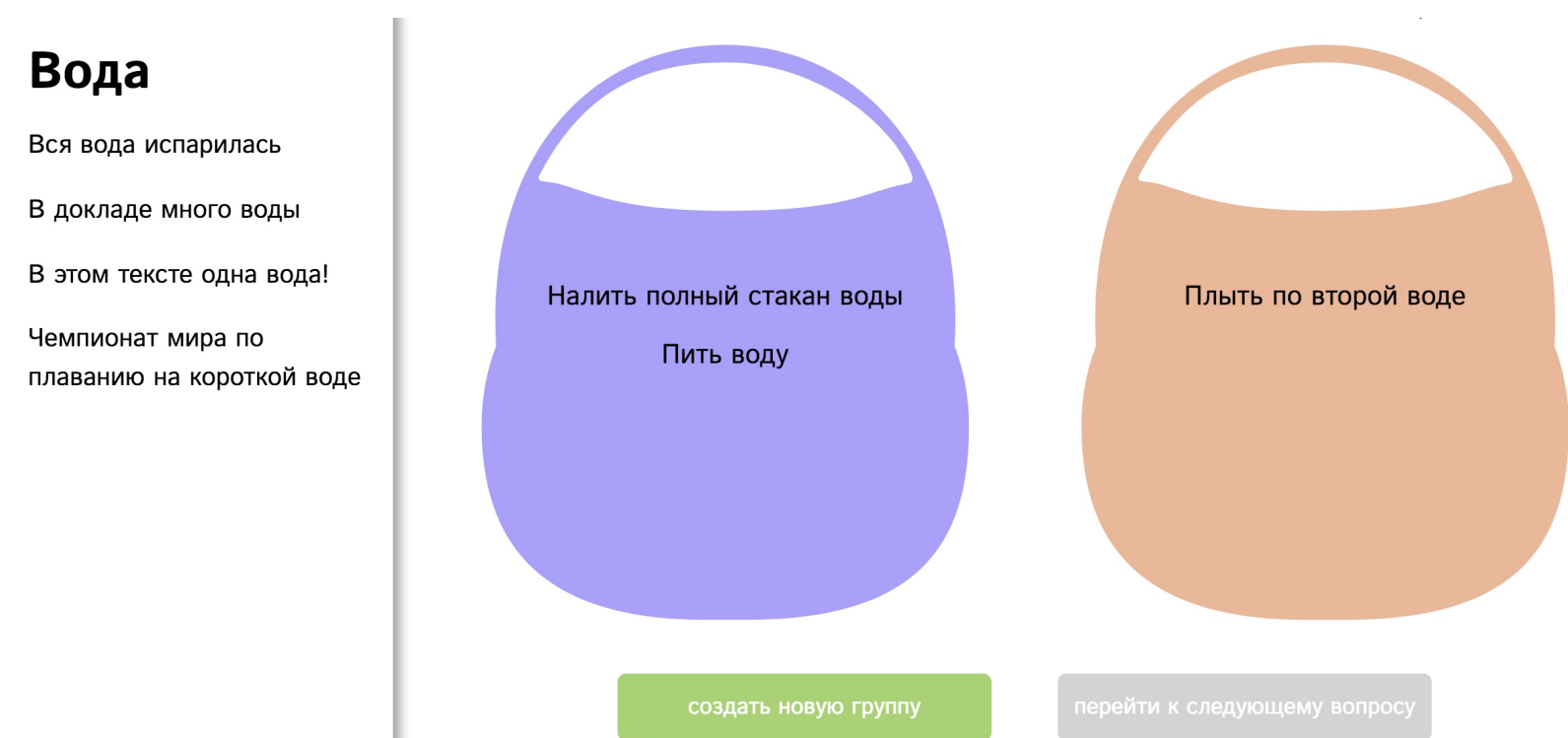
1. Introduction

- **Separate sense account**: polysemous words are assumed to have an exhaustive list of senses that are stored in separate representations in the mental lexicon and accessed during language processing.

- **Single sense account**: there is one core representation of each polysemous word in the mental lexicon. Specific senses of a word are constructed based on context and patterns of extension, such as the animal/food metonymic pattern for the words *chicken, lamb, fish*, etc.

- **Hybrid approach to sense storage**: some senses are closer than other. Metonymies are stored in the same mental representations as literal senses, while metaphors are stored as separate representations.

The present study aims to investigate the closeness of literal, metonymic, and metaphorical senses in three word classes — nouns, verbs, and adjectives.
We compared sense relatedness (that reflects the historic development of the polysemy) and sense similarity (that shows how much the two senses overlap). Sense relatedness measures were obtained from the experiment. In order to quantify sense similarity we exploited the corpora-based methodology of distributional semantics.
To study the possible difference between speakers with and without linguistic backgrounds we analyzed the responses of professional linguists and non-linguists (naive language speakers) separately.

4. Experiment. Results
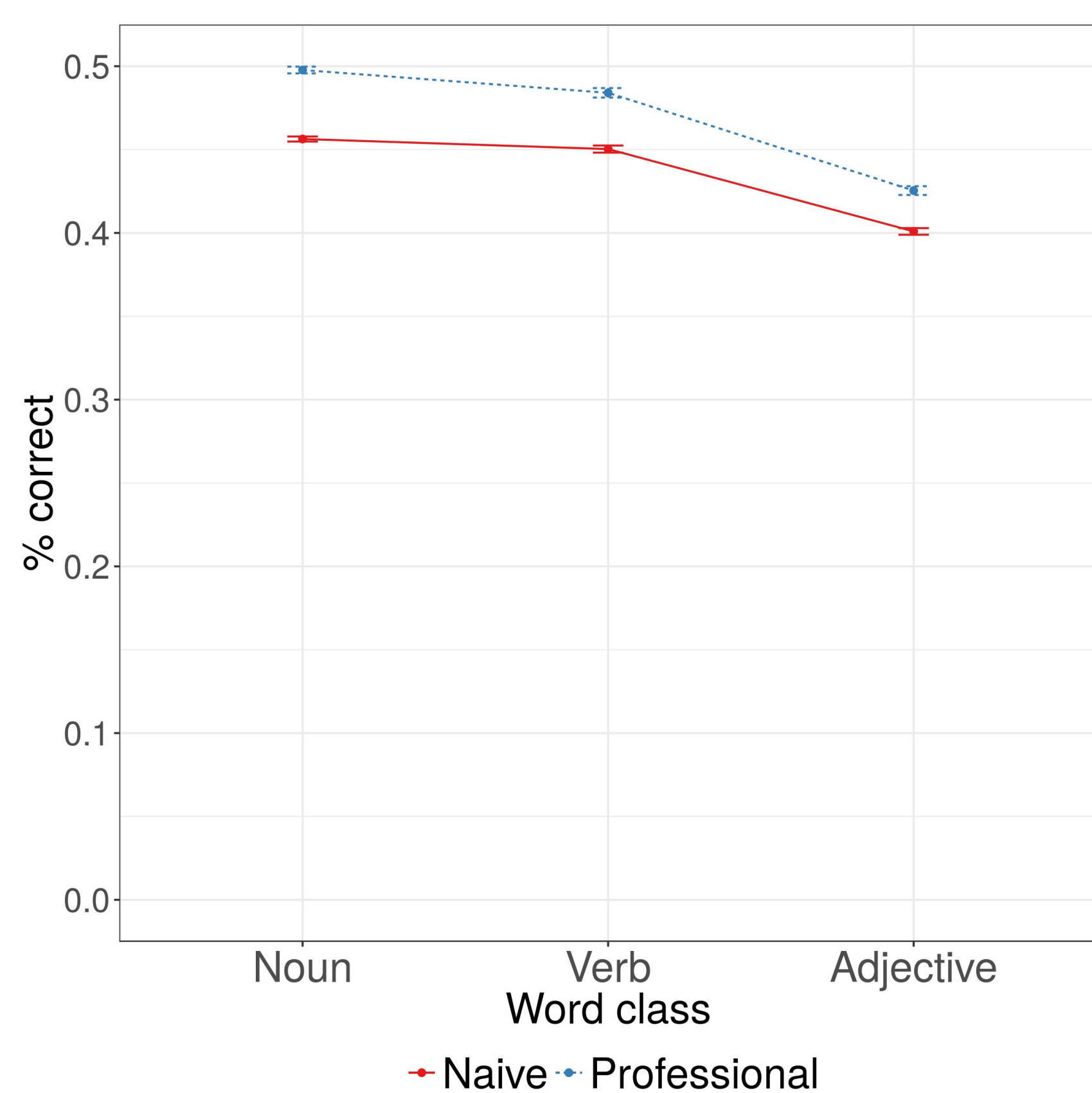
5. Experiment. Results. Misclassifications
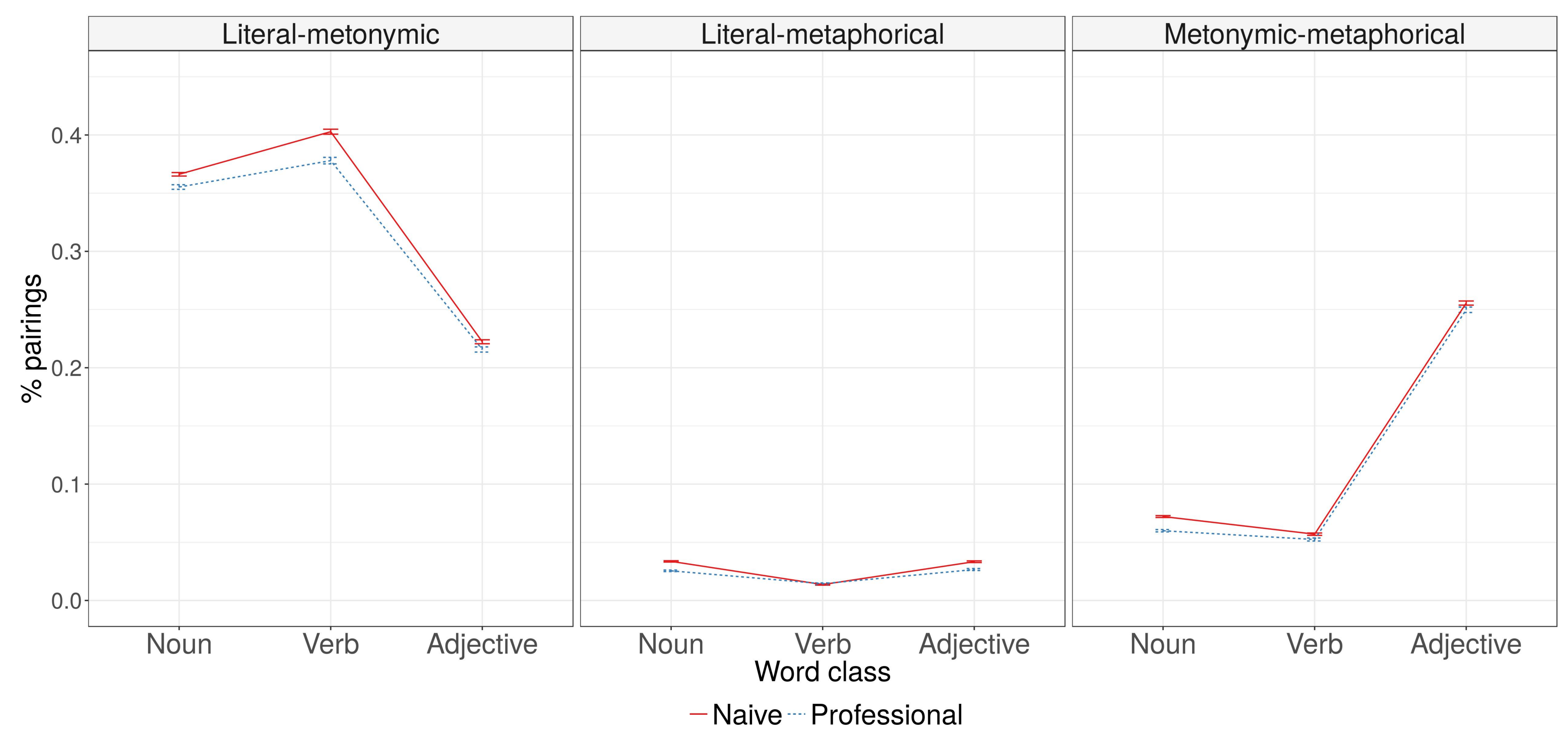
7. Conclusions

Literal and metonymic senses of polysemous nouns and verbs are semantically related, share many similar contexts, and thus might be stored in the unified lexical representation in the mental lexicon. In contrast, metaphorical senses are perceived as unrelated, share fewer contexts, and are more likely to have distinct representations.

The conclusions concerning nouns and verbs do not extend to the polysemy of adjectives. In adjectives, metonymic senses significantly overlap with literal senses on the one hand and metaphorical senses on the other, which was not found in either nouns or verbs.

People with linguistic backgrounds perform more like experts than people without linguistic backgrounds, but both groups still share principal patterns of sense classification.

6. Corpus analysis. Cosine similarity

We took our experimental stimuli with literal, metonymic, and metaphorical senses and measured the semantic similarities between all pairs of phrases of the three types. **(1)** We built context vectors: given the phrase 'wooden bridge', vectors for words 'wooden' and 'bridge' were averaged to form a single context vector of the same dimensionality. **(2)** We calculated the cosine similarity (a scalar value) between the two context vectors (e.g. 'wooden bridge' and 'wooden architecture'). **(3)** For each word of a particular word class we took all pairs of phrases with any two types of senses and calculated the cosine similarity between each pair. **(4)** We took the global average between the two types of senses for a particular word class. In this way, we obtained the semantic similarity between literal and metonymic, literal and metaphorical, metonymic and metaphorical senses for three word classes: nouns, verbs, and adjectives.