

The Effect of Semantic Ambiguity on Concreteness Ratings

Mahdi Almajdoa, Jazan University, Saudi Arabia

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Abstract

This research was conducted to investigate how semantic ambiguity of words may influence concreteness ratings when words are presented to raters in isolation. To this end, a correlational analysis was conducted between semantic ambiguity based on Hoffman et al.'s (2013) *semantic diversity* measure (SemD) and the standard deviation values (SDs) of the concreteness ratings based on Brysbaert et al.'s (2013) database, for a subset of 2031 English words. It was predicted that as the ambiguity of words increases, the size of SDs of concreteness ratings for those words would also increase. In line with this prediction, a significant positive correlation was found between SemD and the SDs of concreteness ratings. This correlation suggests that ambiguous words tend to elicit more diverse ratings compared to less ambiguous words due possibly to the existence of various referents with different concreteness levels for the same word, influencing the raters' judgments of concreteness.

Keywords: Concreteness, Ambiguity, Semantic Diversity

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Introduction

Concreteness refers to the perceptibility of the things/objects that words refer to. To determine whether a word is concrete or abstract, a common approach is to ask native speakers to rate words in isolation by giving a value indicating the level of concreteness (e.g., 1=very abstract, 5=very concrete). Although some words can be unanimously rated as highly concrete (e.g., *bird*) or highly abstract (e.g., *belief*)¹, a great number of words can be rated differently depending on various factors typically overlooked – an issue that has received attention in a relatively small number of studies (e.g., Löhr, 2022; Pollock, 2018; Reijnierse, Burgers, Bolognesi, & Krennmayr, 2019).

One factor of interest in this paper is semantic ambiguity. It is a characteristic of words that are ambiguous when encountered out of context. For example, the word ‘*course*’ can have multiple meanings which may vary in the degree of concreteness such as a subject in a school, a part of meal, or the direction where something moves among many other senses and meanings. This type of ambiguity, which abounds in a substantial proportion of words in English, is usually referred to by two terms depending on the degree of relatedness between meanings. These terms are *polysemy*, a feature of words with many senses that usually share a core meaning, and *homonymy*, a feature of words that convey unrelated meanings (See Hurford, Heasley, & Smith, 2007 for more discussion and examples).

Despite the importance of this issue, the existing research on the potential effect of semantic ambiguity on concreteness ratings is sparse. In a recent paper, Löhr (2022) pointed out lexical ambiguity as a problem affecting the current concreteness ratings as lexical forms of words are rated rather than the concepts they refer to. Reijnierse et al. (2019) provided experimental evidence for the effect of polysemy in which they found that presenting polysemous words (e.g., *burden*) along with their definitions elicited different ratings depending on whether the definition was metaphorical or non-metaphorical.

The Current Study

This study aims to measure the relationship between semantic ambiguity and concreteness ratings. Of relevance to the current study is Brysbaert et al.’s (2013) database due to its size, as it provides norms for about 40,000 English words and phrases. In particular, the SDs of the concreteness norms in this database are the primary source of the dependent variable values in the present research as they indicate the degree of agreement among the raters. In one prominent critique of Brysbaert et al.’s database, Pollock (2018) argues that many words that are usually selected to serve as the ‘*abstract*’ items in previous experiments are not necessarily abstract, but words about which raters tend to disagree as indicated by the increased SD of almost every word in the middle of the scale – an observation that the researcher visually demonstrated by representing the data graphically. Pollock’s study was important as it drew attention to the fact that a large number of words in the current concreteness databases have diverse ratings. However, it remains unclear what factors have contributed to this variability. To contribute to the existing research in this area, the present study aims to examine the extent to which semantic ambiguity influences concreteness norms. The main prediction in this paper was that the ambiguity of words would correlate positively with the size of the SDs of the ratings of these words.

¹ According to Brysbaert, Warriner, and Kuperman (2013), ‘*bird*’ received an average of 5 and ‘*belief*’ received an average of 1.19. These words have low standard deviations (SD=0.00; SD=0.68 respectively), indicating a high level of agreement among raters.

Methods

To test the issue outlined above, a subset of 2031 highly frequent English words, along with the SDs of the concreteness ratings, was selected from Brysbaert et al.'s (2013) database. Next, these words were entered into the *South Carolina Psycholinguistic Metabase* (Gao, Shinkareva, & Desai, 2022) to extract semantic information for their semantic ambiguity. To obtain data about the ambiguity of these words, the *semantic diversity* (SemD) measure of Hoffman et al. (2013) was used (All words and data can be accessed online at <https://osf.io/2ubjf/>). SemD was developed as a corpus-based approach to determining the degree of ambiguity of words through calculating the number of contexts in which words appear; more ambiguous words tend to appear in more diverse contexts than less ambiguous words (See Table 1 for 6 examples from this database). Unlike previous studies which determined ambiguity based on criteria such as the number of meanings, how meanings are listed in a dictionary, or the relatedness between meanings as judged by native speakers (e.g., Rodd, Gaskell, & Marslen-Wilson, 2002), SemD is an objective measure that uses the diversity of the contexts in which words appear in as an index of ambiguity. For example, words such as *ability*, *absence*, and *year* are highly frequent words and appear in more diverse contexts than words such as *tectonics*, *phoneme*, and *goblins*, which seem to be more restricted to certain domains (i.e., geology, linguistics, and fairy tales).

Table 1. Examples of words with different semantic diversity levels

	Words	SemD
<i>High</i>	<i>ability</i>	2.06
	<i>absence</i>	2.16
	<i>year</i>	2.24
<i>Low</i>	<i>tectonics</i>	0.49
	<i>phoneme</i>	0.45
	<i>goblins</i>	0.39

Results

There were two variables in this research: SemD, which reflects the semantic ambiguity of the selected words, and the SDs of the concreteness ratings based on a group of native speakers of English, which reflect the degree of agreement among the participants who rated the words in Brysbaert's Database. To test the main prediction in this study, a Pearson correlation analysis was performed to see whether a significant correlation can be detected between the two variables. In line with this hypothesis, a significant positive correlation was obtained, $r=.32$, $n=2031$, $p<.001$, with more ambiguous words, according to Hoffman's measure, eliciting more variable ratings (See Figure 1). The data were analysed and plotted using RStudio (Version 4.0.5).

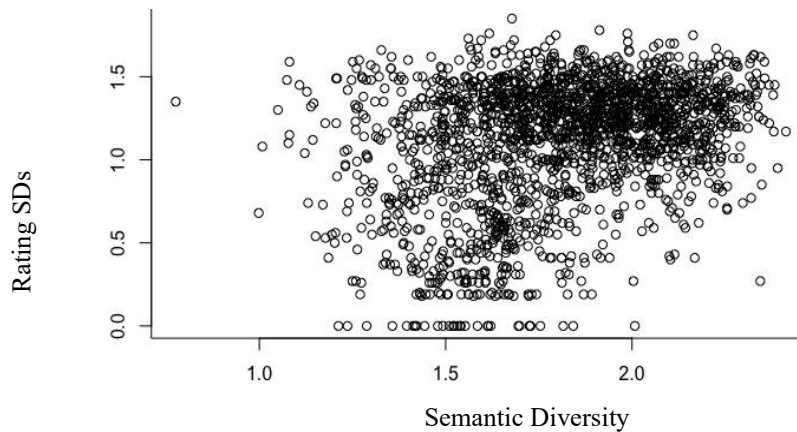


Figure 1. The correlation between concreteness SDs and semantic ambiguity for 2031 English words.

Discussion and Conclusion

This small study was an attempt to gain a more understanding of some of the factors that may influence the agreement among human subjects when judging whether a word is concrete or abstract. The focus was on the potential effect of the semantic ambiguity of words – a variable that has not been adequately taken into account when building a concreteness normative database. The study utilized secondary data from mega-studies available online to gain more insights into how availability of words in diverse contexts can inform us of the (dis)agreement among raters, which is reflected by the SDs of these ratings obtained for these words. The results showed that as ambiguity increases, the size of the SDs increases as well.

This positive correlation indicates that ambiguous words tend to elicit more diverse ratings compared to less ambiguous words due possibly to the existence of various meanings with different concreteness levels for the same word, influencing the raters' judgments of concreteness. The research adds more evidence to the existing studies that reported effects for semantic variables on the way raters judge the concreteness of words (e.g., Reijniere et al., 2019). Such observation is also similar to translation ambiguity reported in some normative studies where a large class of words in the source language tend to elicit multiple translations in the target language (e.g., Prior, MacWhinney, & Kroll, 2007; Tokowicz, Kroll, De Groot, & Van Hell, 2002). In those studies, it was found that the number of translations produced by raters is determined by the degree of ambiguity of the lexical form of the word in the source language.

This observation also opens the door for more research in this field using more complex designs to understand potentially confounding variables that may undermine the reliability of the current databases, thereby enhancing the validity of these databases. One possible explanation for why increased ambiguity leads to more diverse ratings is that when a word is presented in isolation for rating, the diverse usage of this word affects the judgements of participants differently depending on their recent experiences with the word or the first meaning that comes to mind. It is recommended here that a qualitative analysis is incorporated into these studies in which some raters are interviewed to find out some of the reasons behind their ratings.

In conclusion, this research aimed to examine whether the ambiguous nature of words, a phenomenon that abounds in a large number of words in English, can contribute to the presence

of diverse ratings in the current concreteness norms of the Brysbaert concreteness database where these norms were obtained for the words out of context. This approach is currently the most commonly used method for building concreteness normative databases. Using a subset of 2031 English words, a correlational analysis revealed that when ambiguity increased, the degree of disagreement among raters increased, implying that the polysemous nature of words is a possible factor influencing how human subjects judge whether a word is concrete or abstract.

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Contact email: malmajdoa@jazanu.edu.sa