

# Floating or Suggesting Ideas? A Large-Scale Contrastive Analysis of Metaphorical and Literal Verb–Object Constructions

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## Abstract

Metaphor is a pervasive feature of everyday language, enabling speakers to express abstract concepts in terms of more concrete domains. While prior work has extensively examined metaphors from cognitive and psycholinguistic perspectives, large-scale empirical comparisons between metaphorical and literal language remain limited, especially when they compete in conveying the same meaning. We address this gap through a systematic contrastive analysis of 297 near-synonymous English verb–object (VO) pairs (e.g., *float idea* vs. *suggest idea*) in approximately 2 million extracted corpus sentences, allowing us to examine their contextual usage. Using five established NLP tools – SEANCE, TAALES, TAASSC, TAACO and TAALED – we derive 2,293 metaphor-related cognitive and linguistic features capturing affective, lexical, syntactic, and discourse-level properties. We address two research questions: (i) whether these features consistently differ between metaphorical and literal language (**cross-pair analysis**), and (ii) whether individual VO pairs show strong internal divergence between their metaphorical and literal variants (**within-pair analysis**). Cross-pair results reveal robust global tendencies: literal contexts are associated with higher lexical frequency, stronger cohesion, and greater structural regularity, whereas metaphorical contexts show increased affective loading, imageability, lexical diversity, and constructional specificity. In contrast, within-pair analyses reveal substantial heterogeneity and most pairs display non-uniform directional effects across cognitive or linguistic dimensions. Our findings suggest that there is no single, consistent distributional pattern that consistently distinguishes metaphorical from literal language. Instead, the differences we observe are largely construction-specific. Overall, by combining large-scale data with a broad range of cognitive and linguistic features, this study offers a fine-grained understanding of the contrast between metaphorical and literal VO usages.

**Keywords:** metaphorical language, cognitive and linguistic empirical features, verb-object constructions

## 1. Introduction

Metaphor is a "necessary" language feature of everyday thought and communication that allows speakers to conceptualize abstract ideas in terms of more concrete domains (Ortony, 1975; Lakoff and Johnson, 1980; van den Broek, 1981; Schäffner, 2004, i.a.). While metaphor has been extensively studied in cognitive linguistics and psycholinguistics (Gibbs, 1989; Blasko, 1999; Giora, 2002; Glucksberg, 2003; Steen, 2004, i.a.), its empirical analysis in contrast to literal language use remains limited. For instance, *float the idea* and *suggest the idea* both convey the act of proposing an idea, but they differ in register, connotation, and metaphorical framing: *float the idea* employs a conceptual metaphor (IDEAS ARE OBJECTS IN MOTION), projecting an abstract act into a concrete physical domain (Lakoff and Johnson, 1980). In contrast, *suggest the idea* is literal and denotes the speech act directly. Pragmatically, the verb *float* conveys tentativeness or strategic intent, while *suggest* is more neutral and direct, and commonly used in formal and informal contexts (Cameron and Deignan, 2003; Shutova, 2010).

Understanding how metaphorical and literal ex-

pressions differ at scale is crucial not only for theoretical insights but also for practical applications such as machine translation, sentiment analysis, and information retrieval. In this paper, we fill this gap by conducting a large-scale, systematic analysis of metaphorical and literal language in contrast. We curate and analyze a dataset of approximately 2 million sentences containing semantically equivalent verb-object (VO) pairs, where one variant is metaphorical, e.g., *float idea*, and the other is literal, e.g., *suggest idea*. This paired design enables controlled comparison across usage contexts while holding the underlying meaning constant. Using a variety of NLP tools<sup>1</sup>, we automatically extract a wide range of over 2,200 features, allowing us to explore cognitive, distributional and structural differences between metaphorical and literal usages. We conduct a large-scale and thorough descriptive analysis of these contrasts along two axes: we identify (i) which cognitive and linguistic features systematically distinguish metaphorical from literal language across VO pairs (**cross-pair**), and (ii) which VO pairs are "most strongly metaphorical" or "most strongly literal" across features but **within-**

<sup>1</sup><https://www.linguisticanalysistools.org/>

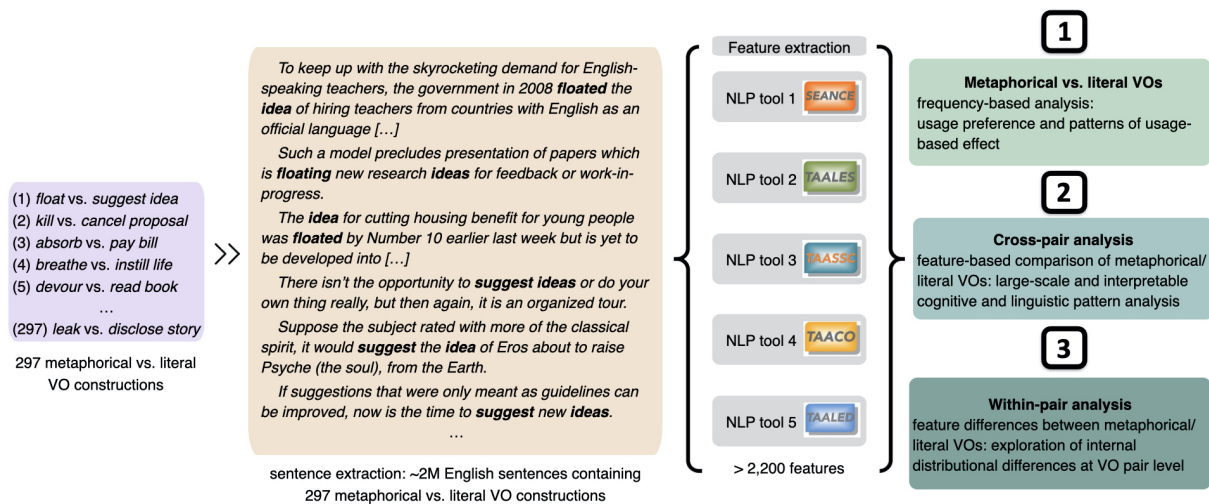


Figure 1: Pipeline of our approach: based on an existing set of metaphorical vs. literal VO pairs, we extract sentences containing these VOs. We then run five NLP tools on all sentences (masking the VO, see Section 3) to extract more than 2,200 cognitive and linguistic features in order to analyze the contrast between metaphorical and literal language usage from (i) a cross-pair and (ii) a within-pair perspective.

**pair.** Figure 1 provides a visual pipeline of our work study. In sum, our contributions are threefold:

- We present a large-scale, contrastive dataset of metaphorical and literal verb-object expressions in naturalistic English text.
- We conduct an empirical analysis of contextual feature-based differences between metaphorical and literal verb-object expressions.
- We shed light on the internal metaphorical-literal differences at the verb-object level.

By focusing on metaphorical and literal paraphrases with shared meaning, this work advances the computational study of figurative language beyond detection, offering a scalable and interpretable approach to metaphor-literal contrast. Our findings open new avenues for metaphor modeling and the injection of cognitive and linguistic knowledge, and it underlines the importance of metaphorical variation in language understanding tasks<sup>2</sup>.

## 2. Datasets and Linguistic Features

**VO Pairs** We downloaded the VOs from Piccirilli et al. (2024). They collected a set of 47 VOs from previous work (Mohammad et al., 2016; Shutova, 2010; Piccirilli and Schulte im Walde, 2021; Stowe et al., 2022), which they semi-automatically extended by collecting the most frequently observed shared direct objects of the corresponding verbs, resulting in a total of 297 metaphorical VOs and their corresponding literal paraphrases.

<sup>2</sup>All data and analysis files, including the full set of detailed outputs, are available in our repository at <https://github.com/priscapiccirilli/Met-Lit-Contrast>.

**VO Sentences** Piccirilli et al. (2024) extracted 1,691 English sentences containing this set of VO pairs. We thus use this publicly available dataset, VOLIMET<sup>3</sup>. However, since our goal is to analyze large amounts of natural language, we enlarge this dataset by automatically extracting all available English sentences containing the VOs from the ENCOW corpus (English CORpora from the Web, Schäfer and Bildhauer, 2012; Schäfer, 2015), where the object is the direct object of the verb. We extract the entire sentence regardless of its length or the distance between the verb and object, which allows us to capture contextual variations that are directly relevant to our features. ENCOW’s coverage of multiple writing styles, registers, domains and genres (e.g., blogs, news articles, academic texts), ensures that our analyses reflect natural language in general. Our combined datasets therefore contain close to 2M English sentences covering the whole set of 297 metaphorical vs. literal VOs. Appendix A.1 presents the full list of metaphorical and literal VOs and their sentence-level frequencies, reflecting how often each VO appears in context.

**Features** Critically, we enriched our dataset with a range of cognitive and linguistic features: they serve as a basis for quantitative analyses of relationships between metaphorical vs. literal language and these properties. We extracted a total of 2,293 features using publicly-available NLP tools<sup>4</sup> which provide measures that are at the core of contrasting metaphorical vs. literal language usage, i.e., these features are related to lexical sophistication

<sup>3</sup><https://github.com/priscapiccirilli/VOLIMET>

<sup>4</sup>SEANCE, TAALES, TAASSC, TAACO, TAALED

and diversity, text cohesion, syntactic complexity, and sentiment analysis (with integers in brackets referring to corresponding numbers of features):

**SEANCE** (1,271) assesses sentiment, emotion, and social cognition in texts using dictionaries and categories (Crossley et al., 2017).

**TAALES** (461) analyzes word frequency, range, concreteness, and psycholinguistic properties to assess lexical sophistication (Kyle and Crossley, 2015; Kyle et al., 2018).

**TAASSC** (355) examines syntactic structures to measure complexity and variety in sentence construction (Kyle, 2016).

**TAACO** (168) measures text cohesion using lexical overlap, connectives, and semantic similarity (Crossley et al., 2016, 2019).

**TAALED** (38) computes lexical diversity metrics like type-token ratio, MTLD (Measure of Textual Lexical Diversity), and HD-D (Hypergeometric Distribution D) to evaluate vocabulary variation (Kyle et al., 2021).

### 3. Comparison of Metaphorical and Literal Verb-Objects: Approach

For comparing metaphorical vs. literal VOs, this work addresses two research questions:

**RQ1** Are there consistent differences in **cognitive and linguistic feature patterns** between literal and metaphorical language (= **cross-pair**)?

**RQ2** Are there **specific VO pairs** showing a particularly strong contrast in cognitive and linguistic features between literal and metaphorical uses (= **within-pair**), and do we find systematic patterns for literal- vs. metaphor-dominant VO pairs?

**RQ1** To investigate how metaphorical and literal expressions differ in their contexts, we conducted pairwise comparisons of automatically extracted features across all sentences containing our 297 VOs. For each VO, we extracted contextual features using the NLP tools presented in Section 2. To avoid the introduction of lexical bias, we masked both the verb and the object in all sentences by replacing them with MASK placeholders. All sentences containing the same VO were grouped and processed together as a single input to each tool. This allowed us to derive aggregated feature representations at the VO level, based solely on the surrounding context across all occurrences of the VO, but independent of the lexical identity of the verb and object themselves. We then compared the feature scores between the metaphorical and literal variants of each pair, to investigate whether metaphorical sentences consistently differ from their literal counter-

parts along certain dimensions, e.g., whether they tend to exhibit higher emotional valence, lower cohesion, or greater syntactic complexity. We standardized all feature scores using z-score normalization to ensure comparability across scales.

We conducted two levels of analysis. First, to assess (1) **cross-pair feature distinctions**, we computed the mean difference and conducted a Wilcoxon signed-rank test for each feature across all aligned metaphorical-literal VO pairs. Features were classified based on both statistical significance and effect size. Specifically, we considered a feature **important** if it showed a statistically significant difference  $p < 0.05$  and a substantial effect size defined as a mean difference of  $\geq 1$  standard deviations following z-score normalization. Features that were statistically significant but had smaller effect sizes were labeled as **significant but small**, indicating a consistent trend without a strong magnitude. Features with non-significant differences  $p \geq 0.5$  were not considered further. We present the analyses and discussion in Sec. 4.2.

**RQ2** Second, we computed (2) **within-pair feature differences** to determine which VO pairs showed the largest divergence in their metaphorical vs. literal usages. For each aligned VO pair, we calculated both signed and absolute differences across all normalized feature scores. We then computed the mean absolute difference across features per pair, using this value as an indicator of overall metaphorical-literal divergence. VO pairs with a mean absolute difference  $\geq 1$  standard deviations were interpreted as **linguistically distinctive**; that is, their metaphorical and literal forms showed consistent contextual differences across multiple linguistic features. For these pairs, we also identified which features contributed most to the divergence, and whether the feature was higher in the literal or metaphorical variant. This analysis (Section 4.3) allows us to explore the extent to which individual VO pairs show systematic variation in their surrounding contexts, as captured by the tools, thereby complementing our global feature-level comparisons.

## 4. Analyses and Discussion

This section provides our analyses and discussions regarding our two research questions. These two main studies in Sections 4.2 and 4.3 are preceded by a frequency analysis (Section 4.1).

### 4.1. Metaphorical vs. Literal Preferences

**Frequency** Table 1 presents an overview of the distribution of literal and metaphorical sentences across our 297 VO pairs; in total, our dataset contains 2,058,787 sentences. In order to analyze

metaphorical versus literal usage preferences, we defined a metaphorical ratio  $MET_{ratio}$  for each VO pair and also for each verb:

$$MET_{ratio} = \frac{|MET|}{|MET|+|LIT|}$$

where  $|MET|$  and  $|LIT|$  denote the number of corpus occurrences of metaphorical and literal variants, respectively. We included only pairs and verbs with a total frequency  $> 10$  to avoid instability from rare items. Figures 2 and 3 display scatter plots of metaphorical vs. literal preferences against total verb frequencies on a logarithmic scale. These visualizations reveal both the overall distribution across our verbs and (VO) pairs along with their strong literal or metaphorical preferences, thus contextualizing the literal dominance observed in raw counts as a consequence of skewed frequency distributions (Table 1).

Category	Count
Total number of sentences	2,058,787
Sentences with literal VOs	1,724,892
Sentences with metaphorical VOs	333,895
Total number of VO pairs	297
VO pairs literal $>$ metaphorical	222
VO pairs metaphorical $>$ literal	75
VO pairs with equal frequency	0

Table 1: Distribution of literal and metaphorical sentences across VO pairs in the dataset. The table reports the total number of sentences per category and the number of VO pairs for which one usage predominates.

Due to the visual density of Figure 2, we report in Table 2 the 10 most (i) frequency-balanced, (ii) literal-dominant and (iii) metaphor-dominant VO pairs. Most targets (Figure 2) are concentrated towards the left side ( $ratio < 0.5$ ), indicating that literal usages (in green) tend to be more frequent overall for many VO pairs. As shown in Table 1, 222 of our VOs are literally dominant, such as *read article* (vs. *devour article*), *address need* (vs. *attack need*), *pay bill* (vs. *absorb bill*) (middle part of Table 2), compared to 75 VO pairs which are predominantly used metaphorically, i.e., cluster of orange points with a  $ratio > 0.5$ , such as *cast doubt* (vs. *cause doubt*), *kill bill* (vs. *cancel bill*), *break pattern* (vs. *end pattern*) (middle part of Table 2). The metaphorically-dominant VOs might represent expressions that are lexicalized in natural language (highly-conventionalized metaphors or *dead* metaphors) and behave similarly to idiomatic expressions (Lakoff and Johnson, 1980; Bowdle and Gentner, 2005). Table 2 further shows that literal-dominant VOs tend to exhibit larger absolute  $\text{Log}_2$  values, indicating a more pronounced

frequency imbalance than metaphor-dominant VOs, suggesting that literal usages often overwhelmingly outnumber their metaphorical counterparts, whereas metaphorical preferences are typically less extreme.

Points near the center ( $0.35 < ratio < 0.65$ ) indicate pairs where metaphorical and literal uses occur with roughly equal frequencies, e.g., *deflate* vs. *reduce currency*, *frame* vs. *pose idea*, *abuse* vs. *misuse product* (top part of Table 2). These balanced cases are particularly interesting for our further qualitative analysis, as they may indicate more flexible, context-dependent interpretation (Section 4.3).

Also, we observe a clear U-shaped pattern in the distribution of VO pairs in Figure 2: pairs that are strongly literal or strongly metaphorical are substantially more frequent than pairs with a balanced literal–metaphorical ratio (see lit. *read book* (upper left) and met. *cast doubt* (upper right) vs. lit. *practise profession* and met. *absorb experience* (middle). This pattern reflects a usage-based effect: highly frequent verb–object constructions become lexicalized, stabilizing either toward predominantly literal meanings or toward conventional metaphorical meanings. In contrast, low-frequency pairs show less semantic stabilization and therefore exhibit more variable usage, clustering near the center of the ratio scale.

Finally, an important insight from the verb-only plot (Figure 3) is that examining verbs independently of their objects can be misleading. While the verb–object *reduce currency* appears as a balanced phrase ( $ratio \geq 0.5$  and relatively low frequency) the verb *reduce* on its own, aggregated across all objects, is strongly literal (ratio close to 0) with a very high frequency. This finding highlights how crucial it is to consider the verb and its object as a unit, as verbs behave very differently in terms of their frequency and metaphoricity when considered with or without their objects.

## 4.2. Cross-Pair Analysis: Feature-based Comparison of Metaphorical and Literal VOs

In this section, we address our first research question: **Are there consistent differences in linguistic feature patterns between literal and metaphorical language (= across VOs)?**

**Affective Semantics (SEANCE)** We observed 550 features that are statistically significant (with small effect). Features more prominent in literal uses (309) reflect positive affect, institutional structure, cognitive competence, and goal-directedness (valence, work and role-related lexicons, means–end procedural frames), as in *"This*



Metaphorical	Literal	Met Count	Lit Count	Ratio	Log <sub>2</sub>
<i>Top 10 frequency-balanced VO Pairs</i>					
absorb concept	assimilate concept	89	65	0.58	0.45
absorb experience	assimilate experience	109	91	0.55	0.26
frame idea	pose idea	147	120	0.55	0.29
mount production	organise production	322	305	0.51	0.07
mount production	organize production	322	316	0.51	0.03
sow doubt	cause doubt	246	257	0.49	-0.06
kill deal	cancel deal	253	279	0.48	-0.14
deflate currency	reduce currency	24	50	0.48	-1.06
abuse product	misuse product	39	58	0.40	-0.57
twist situation	misinterpret situation	39	72	0.35	-0.88
<i>Top 10 VO pairs literal &lt; metaphor</i>					
breathe life	instill life	6,227	30	1.00	7.68
close case	finalize case	3,047	24	0.99	6.94
frame debate	pose debate	1,011	17	0.98	5.85
close case	finalise case	3,047	66	0.98	5.52
cast doubt	cause doubt	8,494	257	0.97	5.04
break pattern	end pattern	1,060	50	0.95	4.38
cloud mind	impair mind	534	30	0.95	4.11
kill bill	cancel bill	1,043	59	0.95	4.13
close deal	end deal	2,744	168	0.94	4.02
twist fact	misinterpret fact	599	47	0.93	3.66
<i>Top 10 VO pairs literal &gt; metaphor</i>					
deflate cost	reduce cost	12	51,650	0.00	-12.07
absorb bill	pay bill	10	30,364	0.00	-11.57
devour article	read article	22	55,121	0.00	-11.29
absorb tax	pay tax	20	30,911	0.00	-10.60
attack need	address need	20	20,487	0.00	-10.00
absorb fee	pay fee	45	43,490	0.00	-9.93
catch chance	get chance	67	55,978	0.00	-9.71
devour story	read story	23	17,990	0.00	-9.61
catch result	get result	47	36,573	0.00	-9.60
shipwreck career	ruin career	2	1,165	0.00	-9.19

Table 2: Top VO pairs across distributional profiles: (i) the 10 most frequency-balanced pairs, (ii) the 10 pairs where metaphorical usage is more frequent than their literal counterparts, and (iii) the 10 pairs where literal usage is more frequent. **Met Count** and **Lit Count** indicate the number of sentences in which the metaphorical and literal VO occur, respectively. **Ratio** corresponds to the proportion of metaphorical usage (cf. Figure 2). **Log<sub>2</sub>** represents the base-2 logarithm of the ratio between metaphorical and literal frequencies, capturing the direction and magnitude of the imbalance.

tern aligns with theories of metaphor as grounded in bodily and affective experience, often used to frame complex or disruptive states (Lakoff and Johnson, 1980; Gibbs, 2006). The contrast supports a broad cognitive distinction: literal language tends to encode structured and abstract functionality (*address question, reduce cost, suggest idea, understand meaning*) and institutional roles (*pay bill, organize conference*) (Turner, 1996; Boroditsky, 2000), while metaphor draws on vivid, sensorimotor grounding (*digest idea, grasp risk*) and emotionally charged semantics (*twist meaning, poison relationship*), of-

ten serving to make abstract concepts experientially accessible (Kövecses, 2010; Mohammad et al., 2016).

**Lexical Sophistication (TAALES)** Data containing literal VOs scored higher across a broad set of 147 frequency-, range-, and corpus-based features. They show higher word and n-gram frequencies across major corpora (SUBTLEXus, BNC, COCA), broader contextual range, greater overlap with academic wordlists, suggesting that literal expressions occur in more common, general-purpose, and infor-

mative contexts, rather than in emotive ones. We also observed higher scores on features for lexical decision times (e.g., LD\_Mean\_RT\_CW – average lexical decision reaction time), indicating that literal language is easier to recognize and process. In contrast, metaphorical expressions showed 73 features with higher scores on psycholinguistic dimensions such as imageability, concreteness, and meaningfulness (MRC norms), along with greater semantic richness (broader and more salient association strength, high LSA-based similarity). Notice, for example, the concrete, technical, and lexically familiar language used in the sentence "*It's the modifications to database permissions that **causes issues** with bbPress 2.2*" (lit. VO), whereas the sentence "*Mikey's stereotypes are holding him back and **coloring his judgement***" (met. VO) contains more abstract, highly imageable language, plus another conventionalized metaphorical expression (*smth. holding sb. back*). This contrast suggests that while literal language tends to rely on familiar, high-frequency lexical items optimized for ease of processing (Van Petten and Kutas, 1990; Dufau et al., 2015), metaphorical language engages more semantically rich, imageable, and conceptually salient terms (Bowdle and Gentner, 2005; Giora, 2002), potentially facilitating deeper conceptual associations and more nuanced interpretation.

**Syntactic Complexity (TAASSC)** Quite a few features (33) are statistically significant and with a large effect, especially in contexts containing metaphorical VOs (26 for metaphorical vs. 7 for literal contexts). Contexts of literal VOs showed higher variability in syntactic roles such as passive subjects, agents, and indirect objects, as in "*The care planning **system** in the home is currently being **improved***" (lit. VO), suggesting flexible role-filling within relatively stable constructions. In contrast, metaphorical contexts scored higher on a larger set of features, including type-token ratios and lemma/construction frequency across multiple registers (academic, news, magazine, fiction), reflecting broader lexical and constructional diversity. The pattern holds with 171 significant but small-effect features, where literal contexts show more structural variability (e.g., in syntactic dependencies and construction frequency dispersion), reinforcing their flexibility in grammatical realization (Fazly et al., 2009; Wierzba et al., 2023). Metaphorical contexts show a greater affinity for modifiers (e.g., possession, adverbs), and more conventionalized or lexically cohesive patterns (e.g., higher collexeme ratios, more frequent lemma-construction associations), suggesting semantic specificity and idiomatic usage (Gries and Stefanowitsch, 2004).

**Lexical Cohesion (TAACO)** Metaphorical and literal language is also contrastive with regards to cohesion patterns. Among features showing significant and large effects, literal contexts score higher on measures such as lexical density, repetition of content and pronoun lemmas, suggesting stronger local cohesion and referential continuity. In contrast, metaphorical contexts show higher type-token ratios across a wide range of grammatical categories (e.g., nouns, verbs, adjectives, adverbs) and n-gram windows (bigram/trigram lemma TTR), indicating greater lexical diversity and a broader distribution of lexical items across the discourse. For features with significant but small effects, contexts of literal VOs again show more consistent adjacent overlap across a variety of part-of-speech categories, as well as higher semantic similarity (e.g., Word2Vec, LSA) between adjacent segments. These suggest stronger sequential cohesion and thematic persistence. In contrast, metaphorical expressions scored higher on MATTR (Moving-Average Type-Token Ratio variant) and showed slightly more binary overlap for content and function words, as well as increased use of temporal and oppositional discourse markers and a higher pronoun-to-noun ratio, pointing to a more fragmented but stylistically varied cohesion profile. This pattern aligns with previous findings from TAASSC and TAALES: literal language favors consistency, repetition, and higher cohesion at both the lexical and discourse levels, while metaphorical language tends to exhibit greater lexical and constructional variety (Halliday and Hasan, 1976).

**Lexical Diversity (TAALED)** Similarly to the other tools, we observed significantly higher counts of tokens, types, and lexical density measures for literal contexts, suggesting a denser and more informationally rich lexical structure. Also, literal contexts present moderate variation in word types (i.e., more varied vocabulary) within a relatively stable lexical range (i.e., within a coherent and semantically cohesive set of words). In contrast, contexts of metaphorical VOs scored higher on alternative type-token ratio measures, indicating a greater variety of word types, especially for function words. These findings, supported by smaller effects in measure like MATTR, MSTTR (Mean Segmental Type-Token Ratio), and MTLT (Measure of Textual Lexical Diversity), which provide length-controlled estimates of vocabulary variation, suggest that metaphorical language uses a more diverse and flexible vocabulary, particularly through varied use of function words that enforce cohesion and style (Kimmel, 2010; Piccirilli and Schulte Im Walde, 2022).



Figure 4: Tool-level aggregation of distributional dominance for 93 clearly-distinctive VO pairs (mean absolute difference  $\geq 1$  standard deviations in at least three tools, detailed methodology explained in Sections 3 and 4.3). Feature-level contrasts were collapsed into tool-level directional judgments (literal-dominant in green vs. metaphor-dominant in orange) for VO pairs meeting the distinctiveness criterion in at least three tools. VO pairs are sorted top to bottom from mostly literal-dominant to mostly metaphor-dominant. For example, the VO pair *instill idea vs. breathe idea* behaves significantly more "metaphorical-like" across features of four tools (SEANCE, TAACO, TAALES and TAASSC), i.e., the metaphorical variant *breathe idea* introduces robust distributional differences detectable across linguistic features (structurally, lexically, discourse-wise, etc.) Sections 3 and 4.2 describe the linguistic aspects captures by the tools.

### 4.3. Within-Pair Analysis: Feature Differences between Metaphorical and Literal VOs

In Section 4.2, we took a **cross-pair** approach and looked at the overall contrast between metaphorical vs. literal VOs (= all metaphorical VOs vs. all literal VOs). In contrast, we now zoom into the contrast **within-pair**, that is to say we focus on each individual VO pair (e.g., *float idea vs. suggest idea*) and all the respective sentences the VOs appear in. Our goal is to determine whether our near-synonymous literal and metaphorical VOs show substantial internal differences, and whether such differences are systematic across pairs or rather pair-specific. We are therefore addressing our second research question: **Among the most distinctive VO pairs, which ones – if any – stand out for showing especially strong contrasts in linguistic features between their literal and metaphorical uses?**

**Feature-level differences** For each VO pair and each feature, we computed the **signed standardized difference**:

$$signed\_diff = z_{metaphor} - z_{literal}$$

where z-scores were obtained using a single StandardScaler fitted on the combined literal and metaphorical data to ensure a shared reference

distribution. Positive values indicate higher feature values for the metaphorical variant, while negative values indicate higher values for the literal variant. We also computed the **absolute difference**  $|signed\_diff|$  capturing magnitude differences irrespective of direction.

**Aggregation across features:** For each VO pair, we then computed the **mean absolute difference** across all features to quantify the overall distinctiveness of each pair, as well as the **mean signed difference** across features, capturing the overall directional bias (literal-dominant vs. metaphor-dominant). VO pairs were then classified as **clearly distinctive** if their mean absolute difference equalled or exceeded a threshold of 1 standard deviations. This threshold identifies pairs whose literal and metaphorical realizations differ substantially across all features. For each pair, we report: the (i) mean absolute difference, (ii) features (across tools) exceeding the defined threshold, and (iii) direction of dominance (literal vs. metaphorical) This step does not assume that all features move in the same direction; rather, it quantifies the overall degree of distributional divergence between the two variants. Finally, we can compute the directional classification. We define as **literal-dominant** the pairs with a negative mean signed difference and **metaphor-dominant** the ones with a positive

mean signed difference. Again, this classification reflects aggregate tendencies across all features. A metaphor-dominant pair does not imply that every feature is higher in the metaphorical variant, but that the balance of standardized feature differences favors that variant.

Given the high dimensionality of the overall feature space ( $> 2,000$  features across the five NLP tools we use), visualizing feature-level contrasts per distinctive VO pair separately for each tool proved to be difficult to interpret. As a result, to improve readability and interpretability, while assessing robustness of our approach, we identified VO pairs that met our two distinctiveness criterion: (1) a mean absolute difference  $\geq 1$  standard deviations (2) in at least three of the five tools. For each tool, VO pairs were further classified as literal-dominant or metaphor-dominant based on the mean signed standardized difference across features.

We present in Figure 4 the aggregations of feature-level contrasts into tool-level directional judgments (literal-dominant in green vs. metaphor-dominant in orange), allowing us to assess whether metaphor–literal asymmetries persist across our independent linguistic feature set. We observe a lot of heterogeneity: according to our strict criteria, 93 VO pairs proved to be clearly distinctive, with only a subset of VO pairs actually showing consistent dominance patterns across tools. (i) Seven VOs are literal-dominant across tools (green rows), such as *forget vs. drown problem*, *organize vs. mount event*, *attract vs. suck worker*. (ii) Six VOs are mostly metaphor-dominant (orange rows), such as *instill vs. breathe idea*, *understand vs. grasp meaning*, *disclose vs. leak document*. (iii) The rest of them – 80 VOs – actually show mixed patterns, where no consistent directional bias emerges. These mixed VOs are neither literal nor metaphor dominant, e.g., *manage vs. juggle project*, *address vs. attack topic*, meaning that different linguistic dimensions pull in different directions. For example, consider the VO pair *pay bill vs. absorb bill*: the metaphorical variant *absorb bill* is on average dominant across TAACO and TAASSC, for which features related to lexical cohesion and syntactic complexity, respectively, scored higher than for its literal counterpart *pay bill*. On the contrary, features measuring affective semantics (SEANCE), lexical sophistication (TAALES) and lexical diversity (TAALED) are pulling towards the literal variant *pay bill*.

Our analysis suggests that metaphor–literal differences do not follow stable, recurring linguistic patterns. Instead, distributional asymmetries are pair-specific, with each VO pair showing its own pattern of divergence. Moreover, directional patterns are not consistent even across contrasts involving the same literal–metaphorical verb pair. For instance, the contrast between *instill* and *breathe*

is literal-dominant in combination with the direct object *spirit*, but mostly metaphor-dominant with *idea*. This finding indicates that distributional asymmetries are once again (as mentioned in Section 4.1) not verb-driven but construction-specific: the unit of divergence is the verb–object pairing rather than the lexical verb itself.

## 5. Conclusion

This study provides a large-scale, feature-based comparison of metaphorical and literal verb–object constructions in natural English sentences. Leveraging nearly two million corpus instances and over 2,200 linguistic features derived from five complementary NLP tools, we investigated both cross-pair and within-pair patterns of divergence.

At the **cross-pair** level, metaphorical and literal language show consistent distributional tendencies. Literal contexts are characterized by higher lexical frequency, stronger local cohesion, and more structurally regular patterns, suggesting stability, informativeness, and easier processing. In contrast, metaphorical contexts display greater affective intensity, sensorimotor grounding, lexical diversity, and constructional specificity, aligning with theoretical accounts that view metaphor as experientially grounded and semantically enriching.

In contrast, our **within-pair** analyses reveal that the cross-pair tendencies do not translate into uniform pair-level behavior. Although a subset of VO pairs shows strong and robust divergence (literal or metaphorical dominant), most pairs present mixed dominance patterns across linguistic dimensions. Moreover, contrasts are construction-specific rather than verb-driven: the same verb may pattern differently depending on its object, indicating that metaphoricity emerges at the level of the verb–object construction pairing rather than the lexical verb alone.

Our findings have both theoretical and methodological implications. Theoretically, they challenge the assumption of stable linguistic signatures of metaphoricity and instead support a usage-based, construction-sensitive view of figurative language. Methodologically, our results demonstrate the value of aggregating multidimensional feature profiles while preserving pair-level granularity. Future work may extend this approach to cross-linguistic settings, translation studies, and predictive modeling, further integrating linguistic theory with large-scale computational analysis. As a matter of fact, our follow-up study makes use of the extracted linguistic features and the knowledge learned from this work as input to machine learning models in order to observe the important features for predicting metaphorical vs. literal language.

## 6. Limitations

Several limitations should be acknowledged. First, our analysis is restricted to the English language, and the patterns observed in this work may not generalize to other languages with different morphological, syntactic, or metaphorical conventions, especially given the fact that the NLP tools we used are built on and for the English language. Second, although the corpus covers multiple genres (e.g., fiction, academic, web), it represents a single source, and corpus-specific distributional biases cannot be ruled out. Third, our dataset comprises 297 verb–object pairs, which, even though systematically constructed, cannot be considered fully representative of metaphorical or literal language as a whole. Finally, the very large number of extracted features ( $> 2,000$ ) made it necessary to aggregate and enforce thresholding procedures to ensure readability and interpretability: while this multidimensional approach enables broad coverage, it may also obscure more fine-grained effects at the level of individual features or verb-object features.

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## A. Supplementary Materials

### A.1. Met vs. Lit Verb-Object Pairs

Table 3: Metaphorical vs. Literal Verb–Object Pairs with Corpus Frequencies (N=297)

<b>Metaphorical VO</b>	<b>Literal VO</b>	<b>Met Count</b>	<b>Lit Count</b>
absorb knowledge	assimilate knowledge	354	190
absorb information	assimilate information	1,154	511
absorb idea	assimilate idea	369	141
absorb culture	assimilate culture	308	127
absorb material	assimilate material	382	85
absorb lesson	assimilate lesson	366	50
absorb fact	assimilate fact	166	57
absorb content	assimilate content	177	50
absorb experience	assimilate experience	109	91
absorb concept	assimilate concept	89	65
absorb thought	assimilate thought	86	28
absorb cost	pay cost	1,226	16,540
absorb fee	pay fee	45	43,490
absorb bill	pay bill	10	30,364
absorb tax	pay tax	20	30,911
absorb debt	pay debt	61	21,344
absorb interest	pay interest	178	9,713
absorb expense	pay expense	40	5,774
abuse alcohol	misuse alcohol	525	208
abuse drug	misuse drug	947	335
abuse substance	misuse substance	175	97
abuse medication	misuse medication	70	23
abuse product	misuse product	39	58
attack problem	address problem	1,707	35,477
attack issue	address issue	239	79,175
attack need	address need	20	20,487
attack question	address question	114	21,778
attack challenge	address challenge	83	11,541
attack point	address point	232	4,098
attack situation	address situation	45	3,465
attack topic	address topic	22	4,066
attack change	address change	54	3,579
attack cause	address cause	155	3,094
attack matter	address matter	49	3,451
boost economy	improve economy	4,687	2,755
boost service	improve service	177	16,003
boost system	improve system	1,829	6,837
boost situation	improve situation	16	6,316
boost process	improve process	98	5,235
boost education	improve education	87	3,837
boost work	improve work	80	3,424
boost business	improve business	871	1,910
boost result	improve result	211	2,630
boost number	improve number	1,749	710
break agreement	end agreement	1,225	329
break cycle	end cycle	4,193	647
break relationship	end relationship	1,318	2,321
break contract	end contract	1,571	590
break marriage	end marriage	694	1,094
break process	end process	945	523
break pattern	end pattern	1,060	50
breathe life	instill life	6,227	30
breathe sense	instill sense	25	1,074
breathe confidence	instill confidence	30	1,144

<b>Metaphorical VO</b>	<b>Literal VO</b>	<b>Met Count</b>	<b>Lit Count</b>
breathe value	instill value	26	659
breathe spirit	instill spirit	391	128
breathe love	instill love	66	308
breathe hope	instill hope	47	133
breathe idea	instill idea	16	134
breathe passion	instill passion	16	96
buy story	believe story	724	1,823
buy word	believe word	125	2,997
buy lie	believe lie	260	1,805
cast doubt	cause doubt	8,494	257
cast issue	cause issue	98	6,530
cast fear	cause fear	282	1,365
catch disease	get disease	1,201	2,662
catch idea	get idea	201	52,090
catch chance	get chance	67	55,978
catch information	get information	72	36,240
catch result	get result	47	36,573
catch message	get message	134	27,705
catch point	get point	147	23,962
catch call	get call	43	20,692
catch problem	get problem	594	14,694
catch opportunity	get opportunity	54	13,177
close investigation	end investigation	504	124
close season	end season	1,037	2,805
close deal	end deal	2,744	168
close case	end case	3,047	240
close debate	end debate	601	762
close operation	end operation	643	309
close story	end story	122	903
close deal	finalise deal	2,744	424
close case	finalise case	3,047	66
close plan	finalise plan	98	825
close arrangement	finalise arrangement	27	367
close agreement	finalise agreement	65	293
close project	finalise project	381	64
close deal	finalize deal	2,744	468
close case	finalize case	3,047	24
close plan	finalize plan	98	867
close arrangement	finalize arrangement	27	156
close agreement	finalize agreement	65	438
close project	finalize project	381	86
cloud memory	impair memory	77	297
cloud ability	impair ability	39	1,977
cloud judgement	impair judgement	778	244
cloud judgment	impair judgment	702	376
cloud mind	impair mind	534	30
cloud vision	impair vision	335	424
cloud thinking	impair thinking	114	48
cloud perception	impair perception	85	43
cloud understanding	impair understanding	70	27
color judgement	affect judgement	12	301
color decision	affect decision	36	3,236
color choice	affect choice	10	1,555
color perception	affect perception	145	1,279
color experience	affect experience	77	1,222
color interpretation	affect interpretation	38	498

<b>Metaphorical VO</b>	<b>Literal VO</b>	<b>Met Count</b>	<b>Lit Count</b>
colour judgement	affect judgement	69	301
colour decision	affect decision	32	3,236
colour choice	affect choice	22	1,555
colour perception	affect perception	135	1,279
colour experience	affect experience	55	1,222
colour interpretation	affect interpretation	29	498
deflate economy	reduce economy	71	181
deflate cost	reduce cost	12	51,650
deflate price	reduce price	63	6,766
deflate value	reduce value	58	4,430
deflate supply	reduce supply	12	1,784
deflate wage	reduce wage	23	1,130
deflate market	reduce market	15	199
deflate currency	reduce currency	24	26
devour book	read book	587	104,728
devour article	read article	22	55,121
devour story	read story	23	17,990
devour page	read page	37	10,667
devour novel	read novel	77	8,517
devour information	read information	58	6,787
devour chapter	read chapter	21	6,345
devour news	read news	15	4,480
digest information	comprehend information	496	124
digest meaning	comprehend meaning	18	352
digest material	comprehend material	192	113
digest fact	comprehend fact	83	139
digest text	comprehend text	21	217
digest concept	comprehend concept	30	190
digest idea	comprehend idea	60	172
digest word	comprehend word	52	174
digest content	comprehend content	154	49
digest situation	comprehend situation	12	115
digest message	comprehend message	49	87
disown past	reject past	17	67
disown idea	reject idea	14	7,519
disown policy	reject policy	9	567
disown responsibility	reject responsibility	37	125
drop price	reduce price	2,439	6,766
drop cost	reduce cost	218	51,650
drop rate	reduce rate	817	15,826
drop temperature	reduce temperature	357	2,077
drown trouble	forget trouble	9	268
drown pain	forget pain	29	414
drown problem	forget problem	16	423
drown feeling	forget feeling	16	373
dull appetite	decrease appetite	21	240
dull pain	decrease pain	315	384
dull sense	decrease sense	316	54
dull noise	decrease noise	11	72
dull feeling	decrease feeling	23	58
find excuse	make excuse	2,374	9,643
find way	make way	149,262	42,972
find connection	make connection	3,155	29,720
float idea	suggest idea	1,798	3,386
float theory	suggest theory	108	383
float concept	suggest concept	48	316

<b>Metaphorical VO</b>	<b>Literal VO</b>	<b>Met Count</b>	<b>Lit Count</b>
flood market	saturate market	2,989	1,167
follow profession	practice profession	228	610
follow religion	practice religion	1,371	2,125
follow activity	practice activity	824	230
follow profession	practise profession	228	266
follow religion	practise religion	1,371	537
follow activity	practise activity	824	72
frame question	pose question	1,553	18,561
frame problem	pose problem	570	12,804
frame challenge	pose challenge	97	9,544
frame issue	pose issue	1,574	945
frame debate	pose debate	1,011	17
frame concern	pose concern	49	588
frame argument	pose argument	535	117
frame idea	pose idea	147	120
frame hypothesis	pose hypothesis	102	56
fuel debate	stimulate debate	595	1,351
fuel growth	stimulate growth	1,929	4,940
fuel economy	stimulate economy	733	4,359
fuel interest	stimulate interest	437	2,354
fuel discussion	stimulate discussion	149	1,821
fuel demand	stimulate demand	553	1,262
fuel activity	stimulate activity	154	1,487
fuel imagination	stimulate imagination	214	775
fuel creativity	stimulate creativity	112	473
fuel conversation	stimulate conversation	57	385
grasp meaning	understand meaning	802	5,927
grasp concept	understand concept	2,149	9,262
grasp issue	understand issue	284	8,076
grasp point	understand point	531	6,359
grasp problem	understand problem	188	6,464
grasp situation	understand situation	220	3,935
grasp reason	understand reason	59	4,449
grasp language	understand language	87	4,220
grasp idea	understand idea	913	2,688
grasp risk	understand risk	23	3,262
grasp question	understand question	30	3,016
juggle job	manage job	353	425
juggle project	manage project	149	7,242
juggle work	manage work	389	1,291
juggle life	manage life	234	1,136
juggle career	manage career	168	578
juggle school	manage school	38	825
kill proposal	cancel proposal	156	24
kill project	cancel project	517	1,284
kill bill	cancel bill	1043	59
kill program	cancel program	403	934
kill process	cancel process	813	124
kill agreement	cancel agreement	20	717
kill deal	cancel deal	253	279
leak report	disclose report	330	280
leak information	disclose information	2,977	13,122
leak document	disclose document	884	603
leak story	disclose story	361	56
mount production	organise production	322	305
mount event	organise event	49	14,000

<b>Metaphorical VO</b>	<b>Literal VO</b>	<b>Met Count</b>	<b>Lit Count</b>
mount campaign	organise campaign	2,288	1,007
mount conference	organise conference	19	3,384
mount exhibition	organise exhibition	765	885
mount demonstration	organise demonstration	96	1,286
mount protest	organise protest	237	1,455
mount production	organize production	322	316
mount event	organize event	49	5,955
mount campaign	organize campaign	2,288	1,197
mount conference	organize conference	19	2,947
mount exhibition	organize exhibition	765	1,229
mount demonstration	organize demonstration	96	1,050
mount protest	organize protest	237	1,552
poison mind	corrupt mind	596	402
poison system	corrupt system	148	556
poison process	corrupt process	31	343
poison soul	corrupt soul	88	188
poison relationship	corrupt relationship	141	48
pour money	invest money	2,383	10,003
pour fortune	invest fortune	20	134
push drug	sell drug	311	3,680
recapture feeling	recall feeling	63	245
recapture memory	recall memory	34	1,112
recapture moment	recall moment	55	961
recapture experience	recall experience	43	887
shake confidence	damage confidence	870	440
shake foundation	damage foundation	1,124	138
shape result	determine result	100	1,125
shape life	determine life	3,737	848
shape outcome	determine outcome	451	3,472
shape success	determine success	104	2,795
shape strategy	determine strategy	724	1,061
shipwreck career	ruin career	2	1,165
sow doubt	cause doubt	246	257
sow death	cause death	44	18,023
sow confusion	cause confusion	345	7,077
sow chaos	cause chaos	76	2,622
sow conflict	cause conflict	18	2,110
sow panic	cause panic	33	1,808
sow fear	cause fear	133	1,365
sow violence	cause violence	22	930
sow uncertainty	cause uncertainty	11	591
sow terror	cause terror	85	252
sow hatred	cause hatred	68	181
stir excitement	cause excitement	113	766
stir confusion	cause confusion	22	7,077
stir reaction	cause reaction	94	3,894
stir feeling	cause feeling	530	1,357
stir emotion	cause emotion	1,009	227
suck worker	attract worker	12	690
suck talent	attract talent	31	1,693
tackle question	address question	2,250	21,778
tackle issue	address issue	11,995	79,175
tackle problem	address problem	15,180	35,477
tackle concern	address concern	299	17,506
tackle challenge	address challenge	3,352	11,541
tackle situation	address situation	533	3,465

<b>Metaphorical VO</b>	<b>Literal VO</b>	<b>Met Count</b>	<b>Lit Count</b>
tackle point	address point	111	4,098
tackle crisis	address crisis	1,322	2,491
tackle matter	address matter	347	3,451
tackle inequality	address inequality	1,445	1543
tackle task	address task	1,017	396
taste freedom	experience freedom	145	594
taste pain	experience pain	21	5,984
taste life	experience life	130	3,837
taste joy	experience joy	102	2,071
throw remark	make remark	72	13,467
throw comment	make comment	282	47,768
twist word	misinterpret word	876	187
twist fact	misinterpret fact	599	47
twist meaning	misinterpret meaning	218	109
twist comment	misinterpret comment	37	148
twist situation	misinterpret situation	39	72
twist information	misinterpret information	28	114
twist message	misinterpret message	46	101
wear smile	have smile	876	5,975