Semantic Prosody of Research Verbs: A Corpus-Informed Study

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Background: Synonymous words behave differently, and language users should be aware of the fact that though near-synonyms share similar denotational meanings, they require different collocates. Further, with specific collocates, they provoke a special affective meaning called *semantic prosody*. To give an example of this problematic area, researchers use a lot of reporting verbs that merely describe an opinion such as *argue*, *claim*, *believe*, etc. or state facts such as *find*, *confirm*, *cite*, etc. Such verbs cannot be used interchangeably as some novice researchers usually do when they discuss their findings or compare their results with others'.

Purpose: This study aimed at examining the semantic prosody of 24 research verbs commonly used by researchers. For this purpose, collocational behavior of nearly synonymous verbs was examined. Compared to previous studies, this study considered only adverbs co-occurring with such research verbs.

Methods: The researcher used the Directory Open Access Journals (DOAJ), which is of 2.6 billion words and 659,132 texts and focused on predicational adverbs that end in –ly. For the purpose of the study, adverbs with positive semantic prosody are those proving a stronger attitude towards the proposition, improving the quality, quantity, manner of a piece of information or its the relation to the topic or those suggesting a higher level of certainty.

Results: Investigating 24 research verbs related to *hypothesizing*, *reporting*, and *summarizing*, the researcher found that such verbs have different sets of collocates and thus distinct semantic prosodies. Results showed that 12 of the research verbs were positive (i.e., *quantify, argue, claim, suggest, state, mention, indicate, outline, summarize, encapsulate, recapitulate, and reveal*), whereas 12 verbs (i.e., *hypothesize, review, conclude, presume, posit, assume, theorize, speculate*, *note*, *report*, *find*, and *postulate*) were neutral.

Implications: The study has its own implications for writing instructors and researchers. Novice researchers should not use some research verbs interchangeably as they require different collocates of adverbs. Further, future research should address the relationship between word's etymology and semantic prosody as the present study showed that verbs derived from Latin (e.g., conclude, hypothesize, postulate, etc.) are neutral compared to those that are originally French.

Keywords: collocation, corpus linguistics, research verbs, semantic prosody, synonymy

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INTRODUCTION

Synonymous words behave differently, and language users should be aware of the fact that though near-synonyms share similar denotational meaning (Xiao & McEnery, 2006), they require different collocates. Further, with specific collocates, they provoke a special affective meaning called *semantic prosody* (Stubbs, 2002). Research in this area has

been popularized by corpus linguists who emphasize the precedence of use and frequency over meaning of individual words. With frequent use of collocates with node words, the latter will eventually adopt such collocates as their closest friends. Thus, only corpora, not pedagogists relying on intuition, can inform us about what is acceptable in terms of use (Xiao & McEnery, 2006); that is, which words should be used with which.

Corpus linguists found that some words are used with specific collocates by native speakers to give negative or positive meanings. Hence, language learners should be aware of such differences besides dictionary definitions. As noted by Scarcella (1984), objectivity and balanced argumentation mark native speakers' writing as opposed to nonnative learners of the language who tend to generalize and show subjectivity in their writing. Therefore, enough attention should be drawn to the use of words (mainly verbs) especially in scientific writing or academic prose as they tell a lot about writers' attitude. Jaroongkhongdach (2015) noted that reporting verbs (e.g., report, investigate, note, argue) are problematic for novice researchers and graduate students. Such researchers tend to use them in a factive manner to show their supportive attitude of others' conclusions. However, Jaroongkhongdach (2015) added that expert researchers viewed such verbs as factive or non-factive where in the latter no signal of approval or disapproval is given. In general, such verbs cannot be used interchangeably as each may require a different set of collocates and convey negative, positive, or neutral prosody (Bloch, 2010).

Semantic prosody has been investigated by Sinclair (1991), Louw (1993, 2000), Stubbs (1995, 1996, 2001a, 2001b), Bublitz (1996), Partington (1998), Hunston (2002), Schmitt and Carter (2004), Ünaldi (2013), Begagić (2013), and Xiao and McEnery (2006). Nevertheless, a few research papers (e.g., Hunston, 1995; Bloch, 2010; Ilchenko & Kramar, 2022) have examined semantic prosody of research verbs. However, such studies have focused on exploring co-texts or concordances of research verbs (e.g., Hunston, 1995; Bloch, 2010; Ilchenko & Kramar, 2022), co-occurring subjects and objects (Hunston, 1995), lexico-grammatical structures, or grammatical context (Hunston, 1995; Ilchenko & Kramar, 2022). None has investigated semantic prosody of research verbs in relation to co-occurring predicational adverbs though adverbs modify verbs and may denote writers' attitude towards a certain claim. Examining which adverbs collocate with which research verbs might help novice researchers in using the accurate adverb with the right research verb to communicate a specific attitude.

Research Objective

This study aimed at examining the semantic prosody of 24 research verbs commonly used by researchers. For this purpose, collocational behavior of nearly synonymous verbs was examined. In addition, focus was on conducting a corpus analysis of research verbs and their co-occurring adverbs. More specifically, lemmas (basic forms) of research verbs and their variants (the past form) in academic prose were investigated using three different corpora.

LITERATURE REVIEW

Collocation

Firth (1957) proposed the term *collocation* to refer to habitual co-occurrence of words. Thus, *food* collocates with *fast* but not *quick* though *fast* and *quick* express the same meaning. The same goes for *coffee* that collocates with *black* but not *brown*. A collocation is of two parts: the node word and the collocate. The node word is the one whose collocability (tendency to come with certain words) is being examined (Stubbs, 1996). In the previous examples, *food* and *coffee* are node words, whereas the rest are collocates.

Semantic Prosody and Near-synonymy

Stubbs (2002) observes that "there are always semantic relations between node and collocates, and among the collocates themselves" (p. 225). The type of collocational meaning that results from the interaction between a node and one of its typical collocates is called *semantic prosody* (Xiao & McEnery, 2006). Xiao and McEnery (2006) emphasized that the semantic prosody of a certain word is acquired through its typical collocates (i.e., nouns including subjects and objects) which can be one or more words and not only one adjacent word. The typical use of words determined by their collocates establishes to a greater extent their meaning. Researchers exploit such typicality to implicate some meaning. This exploitation is only possible if the associated semantic prosody is strong (Hunston, 1995).

Xiao and McEnery (2006) noted that a word may acquire a positive or negative meaning because of its typical collocates. Semantic prosody serves to express speakers' or writers' attitude (Louw, 2000). Louw (1993) argued that semantic prosodies associated with the majority of node words are negative. Additionally, Xiao and McEnery (2006) argued that with atypical collocates the word will continue to give its typical prosody. For example, though *cause* in *cause happiness* is used with happiness, it is still negative. It gives the impression that such happiness is impossible or undesirable since corpus investigation shows that *cause* is frequently used with *death*, *problem*, *damage*, *pain*, etc. (Xiao & McEnery, 2006).

Semantic prosody and collocational behavior are used to distinguish between words that are traditionally considered to be near synonyms (Xiao & McEnery, 2006). Near synonyms are words with similar denotational meaning (Partington, 1998). However, as reported by Tognini-Bonelli (2001), synonyms are not "collocationally interchangeable" (Xiao & McEnery, 2006, p. 108). Therefore, *powerful* cannot be used

in place of *strong* to describe *tea* (Tognini-Bonelli, 2001). According to Stubbs (1996), semantic prosodies can be positive (pleasant meaning), neutral, or negative (unpleasant meaning) corresponding to Partington's (2004) favourable, neutral, and unfavorable prosodies.

Research Verbs

Citing others' work is one way that helps authors promote their work (Hewings et al., 2010). Reporting verbs are important elements in any research (Jaroongkhongdach, 2015). They function to "to give credit to other researchers and to use their work in the cumulative construction of knowledge" (Charles, 2006, p. 320). In addition, they are utilized to report authors' claims or as indicators of their attitudes towards others' words (Hyland, 1999; Thompson & Ye, 1991). However, using reporting verbs effectively is problematic for novice researchers especially non-native English students such as Iranians (Yeganeh & Boghayeri, 2015), Malaysians (Manan & Noor, 2014), and Thais (Jogthong, 2001; Jirapanakorn, 2012). Further, Bloch (2010) and Pecorari (2008) reported that not using reporting verbs properly may result in readers' misinterpretation of writers' arguments. Hyland (2008) explained that such writers feel compelled to take "definite and self-assured positions" (p. 70). Additionally, Thompson and Ye (1991) and Bloch (2010) stated that non-native English students use fewer reporting verbs and of less variety compared to expert researchers. As noted by Pickard (1993), they use mainly *say* to introduce quotations. This denotes, as argued by Hyland (2002), students' inability to present sound discussions and convincing arguments. Other novice writers tend to cite others' work for the sake of citing them. On the other hand, expert researchers cite to synthesize relevant work, justify their claims, and give support to their argument (Mansourizadeh & Ahmad, 2011). To cite effectively, authors should use reporting verbs properly (Yeganeh & Boghayeri, 2015).

Types of Research Verbs

Previous research called verbs used in research as reporting verbs (Jaroongkhongdach, 2012; Hyland, 1999; Hyland, 2000a). However, arguments by (Thompson & Ye, 1991; Ziman, 1968) suggested that they should not be treated in a similar fashion because sometimes they refer to facts or simply opinions. Thompson and Ye (1991) differentiated between verbs that express the position of the writer (i.e., introducing 'averrals' or propositions given by the writer) or those that denote that of the author whose claims are being reported (i.e., attributions) or those accompanying the writer's interpretation of the issue. Hunston (2000) reported that young researchers should understand the difference between such verbs as this aids in establishing the importance of any claim to the research goal. Some citations or claims are consistent with the author's and some are inconsistent, flawed, or irrelevant (Ziman, 1968). Thus, authors should decide on the credibility of every claim and their attitude towards each (Hunston, 2000). Attitudes are either favorable or unfavorable (Bloch, 2010). Further, Hunston (1995) reported that attributions imply some evaluation by the attributor (i.e., the text's writer) because of the different interpretations an attribution can give. As for reporting verbs, they can be also factive or non-factive. Factive reporting verbs represent others' claims as facts, and non-factive ones give no clue of any attitude towards others' argument (Jaroongkhongdach, 2015).

Hyland (2000a) proposed a categorization of reporting verbs according to the type of activity they indicate. Such activities can be embodied by *research acts* (i.e., actions carried out in the research, e.g., discover), *discourse acts* (i.e., verbs verbally expressing cognitive or research activities, e.g., discuss), or *cognition acts* (i.e., verbs denoting mental processes, e.g., assume). More importantly, authentic texts of available corpora can inform researchers of which verb is used for which claim and for what stance (Bloch, 2010). As noted by Hyland (2000a), verbs referring to discourse acts are more common than others and especially in soft fields of knowledge that require speculation and interpretation and personal input. Hence, verbs of discourse acts such as *suggest* and *argue* followed by research verbs (e.g., find) are more common than others.

Thompson and Ye (1991), on the other hand, divided verbs according to the process they perform. The first group of verbs are known as *textual* verbs and they are used for verbal expressions (e.g., state, write). The second category includes *mental* verbs, and they are of mental processes (e.g., think, believe). The third group, however, are known as *research* verbs and they refer to research activities (e.g., find, demonstrate). Hyland's (2002) *discourse* and *cognition* verbs correspond to Thompson and Ye's *textual* and *mental* verb categories. Thompson and Ye (1991) also stated that there is a relationship between reporting verbs and evaluation or the position of the reporting writer towards the claims of a specific author.Thus, verbs can be factive (e.g., establish), counter-factive (e.g., overlook), or non-factive (e.g., find). Similarly, Thompson (1994) differentiated between verbs where the writer believes strongly in what the author states (e.g., acknowledge, admit, point out, etc.) and those that show some disagreement with the author (e.g., claim, purport, misinform).

By the same token, Francis et al. (1996) distinguished between *argue* verbs (i.e., concerned with writing and different forms of communication, e.g., argue, suggest, assert, point out), *think* verbs (i.e., describing the process of thinking, believing; knowing, understanding, hoping, fearing, e.g., think, assume, feel), *show* verbs (i.e., used to indicate a fact or a situation, e.g., show, demonstrate, reveal), and *find* verbs (i.e., concerned with coming to know, e.g., find, observe, discover, establish). According to Hyland (2002), ARGUE verbs are used more commonly in social science by native speakers, whereas FIND/SHOW verbs prevail in natural science.

Compared to previous research, this paper sheds light on three groups of frequent research verbs related to *hypothesizing*, *reporting*, and *summarizing* results. This classification roughly corresponds to some of the categorizing schemes mentioned above.

Previous Studies on Research Verbs and Semantic Prosody

Some studies (e.g., Sinclair, 1991; Louw, 1993, 2000; Stubbs, 1995, 1996, 2001a, 2001b; Bublitz, 1996; Partington, 1998; Hunston, 2002, Schmitt and Carter, 2004; Ünaldi, 2013; Begagić, 2013;and Xiao & McEnery, 2006) have examined semantic prosody and considered mainly verbs such as *make sense*, *provide*, *cause*, *happen*, *set in*, *occur*, *come about*, *take place*, etc. Previous research indicated that the majority of verbs explored in the literature were negative (e.g., Ünaldi, 2013; Partington, 2004; Sinclair; 1991; Stubbs, 2001) and that semantic prosody of words is closely linked to genre (Begagić, 2013). As for research verbs, a few research papers (e.g., Hunston, 1995; Bloch, 2010; Ilchenko & Kramar, 2022) have explored semantic prosody of such verbs.

Hunston (1995), for example, used the Bank of English to explore four verbs of attribution (i.e., verbs attributing statements to the writer of the text or to another author, e.g., *acknowledge*, *insist*, *claim*, and *argue*). As noted by Hunston (1995), attribution is used for hedging in research, introducing information that reflects that of the author's, highlighting a gap in research, transferring the responsibility of a claim, etc. The researcher considered word's co-text (i.e., the words surrounding a particular word) and found that *acknowledge* is used mainly in reluctant acceptance of an opponent's point of view. On the other hand, *insist* is typically used to contradict a previous statement. However, *claim* indicated neither acceptance nor rejection of a statement. As for *argue*, it is mainly associated with conflicts between the author and the writer. More importantly, with the first mention, *argue* was positively evaluated, but upon the second mention, the verb was negatively evaluated. Even if it is associated sometimes with positivity, the verb may carry some negativity. Hunston (1995) emphasized that her observation was not collocational and that she did not employ any statistical measure.

In another research, Bloch (2010) identified 27 research verbs (i.e., argue, assume, believe, claim, conclude, consider, demonstrate, describe, discuss, examine, explain, find, indicate, imply, mention, note, point out, predict, propose, prove, report, reveal, show, state, suggest, think) used commonly in research. The researcher used a corpus of research articles derived from *Science*, a group of journals that publish articles in different types of sciences. Search was not limited to the lemma (e.g., THINK) but covers wordforms such as *thinks* and *thought*.

Bloch (2010) has identified six categories of reporting verbs based on Swales' (1990) distinction. Two categories were relevant to the present study. For example, the fourth category examined in Bloch's (2010) was concerned with how writers use special verbs to denote their rhetorical attitude towards a claim. According to Hyland (2000b), an expression of attitude may include hedging, bolstering, toning up or toning down a claim. The assessment of the writer's attitude towards the truth of a claim is what Radden and Dirven (2007) called *epistemic modality*. The verbs *conclude*, *describe*, *examine*, *note*, *point out*, *report*, and *reveal* are always positive. Others are typically positive such as *consider*, *demonstrate*, *discuss*, *find*, *indicate*, *imply*, *predict*, *prove*, *show*, and *suggest*. As for *mention*, it can be equally positive or negative. It is used more commonly in learner corpora than in *Science* (Bloch, 2010). Regarding *explain*, *state*, and *claim*, 25-30% of their meaning is negative. *State* in specific is used to present a claim that will be criticized in subsequent sentences. This finding was in line with Latour's (1987) argument who claimed that the purpose of referring to previous research is to enhance the validity of a claim through citing literature that is consistent with the writer's claim. If there is some negativity, negativity stems out from negating the verb not from the verb (Bloch, 2010) itself. As for *argue*, 40% of its instances were positive.

Another similar category is about the strength of writer's attitude towards a claim or what Hyland (1998) termed *hedging*. Non-native speakers tend to state stronger claims compared to native ones (Hyland & Milton, 1997). Maintaining a moderate position seems to be very difficult for such writers (Bloch, 2010).Bloch (2010) found that 61% of the verbs were strong, whereas only 2% were weak, and 37% were considered moderate. The verbs *demonstrate*, *discuss*, *examine*, *report*, *reveal*, *show* were always strong. As for *conclude*, *consider*, *describe*, *explain*, *find*, *indicate*, *note*, *point out*, *predict*, and *state*, they were often strong. However, *argue*, *claim*, *imply*, *propose*, *suggest* were mainly weak. According to Hyland (2002a), *suggest* was used to reduce the writer's responsibility towards the certainty of a claim. However, this lowered level of responsibility can be still boosted by using a number of rhetorical devices. Since *suggest* and *indicate* are considered to be moderate, a positive expression of the claim can be made stronger through the use of adverbs (e.g., *strongly* for *suggest*).

In a recent study, Ilchenko and Kramar (2022) examined three reporting verbs (i.e., argue, claim, believe) in 40 journals of linguistics. They focused on their rhetorical and discursive functions. They found that *argue* and *claim* were more associated with Others, whereas *believe* was used more frequently with Self and was very common in concluding sections, research limitations, and suggestions for future research. Compared to *argue*, *claim* was followed by

refutations or simply reservations. Thus, *argue* and *claim* cannot be used interchangeably in contexts.

As shown above, previous research on semantic prosody of research verbs focused on a small number of research verbs (e.g., Hunston, 1995; Ilchenko & Kramar, 2022), used a smaller corpus (Ilchenko & Kramar, 2022), explored co-texts or concordances of research verbs (e.g., Hunston, 1995; Bloch, 2010; Ilchenko & Kramar, 2022), considered co-occurring subjects and objects (Hunston, 1995), or examined grammatical context (Hunston, 1995; Ilchenko & Kramar, 2022). Hence, what distinguishes the present study from previous ones is that the researcher made use of a bigger corpus, investigated 24 research verbs, and utilized the T-score and the MI to reach a conclusion about research verbs' collocational behavior. More importantly, the emphasis of the current study was on collocating predicational adverbs that could be used to express one's attitude towards a claim.

METHODOLOGY

Background

This paper explored the semantic prosodies of nearly synonymous verbs that are used typically to *hypothesize*, *report*, and *summarize* results. Such verbs are employed frequently in scientific writing. To examine verbs' collocates, researchers such as Greenbaum (1974) and Hoey (1991) argued that the term collocation should strictly describe statistically significant co-occurrence of words. Hence, Firth (1957) believed that our investigation of collocation should be quantitative. Therefore, many linguists have adopted the statistical approach to the study of collocation using different corpora (Halliday, 1966; Greenbaum, 1974; Sinclair, 1991; Hoey, 1991; Stubbs, 1995; Partington, 1998; McEnery & Wilson, 2001; Hunston, 2002). Thus, statistically significant co-occurrence of the collocational components (the *node* and the *collocate*) justifies collocates' inclusion as typical ones.

Data Collection Tools

In this study, the researcher used two different English corpora to decide on frequent research verbs: Sketch Engine for Language Learning (SkELL) and Corpus of Contemporary American English (COCA). SkELL consisted of one million words, whereas COCA consists of 250 million words collected between 1990 and 2015. SkELL is a recent project derived from Sketch Engine (an online corpus tool) and designed for language learners. Where COCA describes the American Variety, SkELL is mainly of British English. Data cannot be driven from one variety as the researcher is trying to extract generalizable data that can describe English in general. Further, the use of more than one corpus was necessary to verify the results and report only statistically significant findings that each corpus depicts. SkELL can provide concordances (i.e., alphabetical lists of key words used in a specific text) and information on typical collocates and synonyms (Thesaurus[1]; Baisa & Suchomel, 2014[2]). COCA can yield frequency information and help with identifying typical collocates, contexts of words, and concordances.

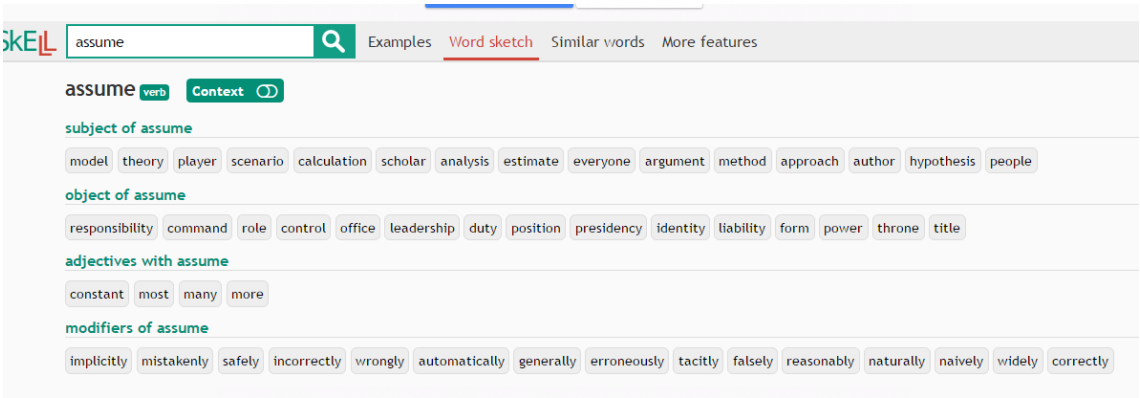
Since semantic prosody can affect texts and not merely phrases, investigation of relevant texts or genres is important. The researcher focused on verbs used frequently in scientific writing. Research verbs are typically used in academic journal articles. Choosing academic corpora such as the British Academic Written English Corpus (BAWE) did not yield significant results in terms of typical collocates. Hence the third corpus utilized was the Directory Open Access Journals (DOAJ) which is available in Sketch Engine, a corpus tool that includes about 500 different corpora. DOAJ consists of journal articles in various areas of knowledge such as medicine, science, technology, humanities, and social science. At the time of data collection, it includes 2.6 billion words and 659.132 documents.

To decide on the collocability of associated words, the researcher considered besides frequency, mutual information (MI), and t-score. Following Xiao and McEnery's (2006) suggestion, the minimum co-occurrence frequency of a collocate to a specific node word was set at three (for comparable corpora of one million words) and 20 for COCA. Mollin (2014), however, noted that for bigger corpora a word is considered a typical collocate if it occurs 50 times or more. Further, COCA and Sketch Engine support MI, a test that measures collocational strength (between a node word and a collocate) depending upon the occurrence of a collocate with a given word in various contexts (Xiao & McEnery, 2006).The researcher accepted a minimum MI score of 3 for a collocate to be considered so for a given node word. Besides MI, t-score, a measure of certainty or confidence, was useful to emphasize that there is an association. The t-score (significance threshold=2.57), as opposed to MI, is a more reliable measure since it accounts for frequencies of collocates. Thus, frequent collocates score very high on t-score. It is important to note that some combinations (e.g., proper names, technical terms, etc.) score high on MI but not on t-score. Thus, both measures were essential for the purpose of the study (Bartsch, 2004). In COCA and Sketch Engine, the span of a co-occurrence pattern was set four to the left and four to the right of the node word, a common setting to look for collocates. As for SkELL, the word-sketch feature (see figure 1) is very helpful in identifying typical collocates for a word based on their frequency and MI score (Baisa & Suchomel, 2014).

[1] Thesaurus. Com. (2017). Retrieved from http://www.thesaurus.com/

[2] Baisa, V., & Suchomel, V. (2014). SkELL: Web interface for English language learning. Retrieved from https://www.sketchengine.co.uk/wp-content/uploads/2015/05/SkELL-Web-Interface-for-English-Language-Learning.pdf

Figure 1
The word sketch of the verb assume as suggested by SkELL.



The Sampling Procedure of Research Verbs

Frequency and text category are important criteria for choosing potential research verbs. *Hypothesizing*, *reporting*, and *summarizing* verbs that are used very frequently in scientific writing were the focus of the present study. The researcher examined a number of research articles to collect a sufficient number of verbs. An online thesaurus (Thesaurus.com, 2017) and Oxford Online Dictionary[3] were used to identify the synonyms of each group of research verbs. Results were verified using SkELL.

It is important to note that exploring semantic prosody was not limited to lemmas of research verbs (the unmarked form, HYPOTHESIZE), but it included one more form which is the past (hypothesized). The basic form of research verbs and the past (denoting the present perfect tense and the past) are two frequent forms used in research. For example, the past and the present perfect are used for reviewing relevant literature, describing the selected procedure (involving past events), and reporting results. The present tense, however, is used commonly to present conclusions and discuss implications[4]. The Word Sketch Feature in Sketch Engine was used to search for research verbs. The basic form of the verb (i.e., the lemma, e.g., REVIEW) yielded results related to the past form (i.e., reviewed) and the present one (i.e., reviews, review, reviewing). Further, variation in spelling was considered. Thus, *hypothesize* and *hypothesise*, *theorize* and *theorise*, and *summarize* and *summarise* were included in research since researchers are allowed to use either form.

Data Collection

Xiao and McEnery (2006) noted that prosodic meaning is closely determined by word forms, contexts, and genres. Thus, this study examined research verbs with reference to scientific writing and two forms of verbs (the basic form and the past). Since the investigated items were verbs, attention was drawn to co-occurring *modifiers of verbs* (adverbs). Adverbs are used to answer questions starting with How/ When/Where/How much, and To what extent. Hence, objects (i.e., nouns) occurring with such verbs were not considered though each object may contribute a different meaning with each verb. More importantly, the evaluative meaning obtained from the collocating adverb is only partial since mainly adverbs, not subjects or objects, were examined in this study.

As mentioned above, the focus of the study was on predicational adverbs that end in –ly. Predicational adverbs (i.e., associated with gradable predicates) are divided into *manner* or *event* adverbials (i.e., how the event takes place) including *locative* or *temporal* adverbs, *subject-oriented* adverbs (i.e., identify properties of the noun in the subject position, e.g., accidentally, deliberately, etc.) which includes *mental-attitude* (e.g., reluctantly, willingly, etc.) and *agent-oriented* adverbs (e.g., wisely, rudely, etc.), and *speaker-oriented* adverbials which includes evaluative adverbs (e.g., expressing the attitude of the speaker towards the proposition, e.g., surprisingly, unfortunately, etc.), *speech act* adverbs (i.e., expressing an involved speech act, e.g., frankly, briefly, etc.), and *epistemic* adverbs (i.e., gradable modal adverbs, e.g., certainly, clearly, etc.; Ernst, 2002).Table 1 below is illustrative.

Such adverbs are used to present *writer-oriented* interaction with readers or what Hyland termed *stance*. Stance includes writer's attitudes towards a piece of information or how certain they are about its accuracy. As noted by Hyland (1999), stance can be represented by hedges (e.g., probably, generally), boosters (e.g., definitely), attitude markers (e.g., certainly), and self-mentions. Hedges are softening words that are used to illustrate writer's awareness of the

[3] Oxford Online Dictinary. (2017). Retrieved from https://en.oxforddictionaries.com/

[4] *APA manual (publication manual of the American Psychological Association)*. (2017). American Psychological Association.

Table 1
Types of Predicational Adverbs with Examples

Types	Sub-Types	Definitions with Examples
manner		denoting how the action is performed, e.g., loudly
event	locative	denoting where the event takes place, e.g., externally
	temporal	suggesting when an event takes place, e.g., recently, etc.
subject-oriented	mental-attitude	denoting "a state of mind experienced by the referent of the subject of the verb, e.g., reluctantly, calmly, willingly, anxiously, eagerly, frantically, absent-mindedly, gladly, sadly" (Ernst, 2002, p. 63)
	agent-oriented	showing that "an event is such as to judge its agent as an adjunct [i.e., adverbials, adjectivals, and relative clauses modifying a noun] with respect to the event, e.g., cleverly, stupidly, wisely, etc." (Ernst, 2002, p. 54)
speaker-oriented	evaluative	expressing the attitude of the speaker towards the proposition, e.g., surprisingly, unfortunately, etc.
	speech act	expressing an involved speech act, e.g., frankly, briefly, etc.
	epistemic	gradable modal adverbs, e.g., certainly, clearly, etc.

cooperative principle maxims. Boosters, on the other hand, are used to express certainty in what writers say. However, attitude markers illustrate one's affective attitude to the stated proposition. Affect includes surprise, agreement, importance, frustration, etc. Hyland (1999) reported that in research papers hedges are more common than other categories and such interactional markers or reporting structures are more frequent in 'soft' fields of knowledge such as philology, applied linguistics, sociology, etc. than in science papers because such fields are considered to be interpretative.

Hyland (2002) stated that reporting verbs should be used with care as they imply one's evaluation of the source author's claim. They can either approve reported authors' conclusions through factive verbs such as *show*, *solve*, etc. or use counter-factive verbs (e.g., fail, ignore) to show disapproval. Experienced researchers, however, prefer to use verbs with no attitudinal hint (e.g., find, identify). For the purpose of the study, verbs with a positive semantic prosody are those proving a stronger attitude towards the proposition, improving the quality, quantity, manner of a piece of information or its relation to the topic or suggesting a higher level of certainty (Bloch, 2010). This was initially determined by the frequency of verbs' collocates of adverbs and then by checking concordances for accompanying subjects.

RESULTS

In the present study, the researcher examined the semantic prosody of research verbs used frequently in research papers. Though previous research (Jaroongkhongdach, 2012; Bloch, 2010; Thompson & Ye, 1991; Hyland, 2002) treated all research verbs as reporting verbs, for the purpose of the study, research verbs can be defined as those used to hypothesize, report, and summarize results.

Results of the Sampling Procedure of Research Verbs

As mentioned above, the researcher divided research verbs into three categories (see Table 1) corresponding to the three main sections (where they are commonly found) in a typical research paper and as they are used by research writers. This division was meant to avoid any overlap in categories. Hence, *hypothesizing* verbs are used in the introductory part of research papers, whereas *summarizing* ones are found mainly in the concluding part. *Reporting* verbs, on the other hand, occur more frequently in the review of literature section and the discussion where researchers report results of others or compare theirs to others' findings. Thus, such verbs cannot be used interchangeably. They correspond roughly to Faber and Mairal's (1999) verbs of COGNITION (e.g., hypothesize, speculate, assume), SPEECH (e.g., note, mention, argue), and PERCEPTION (e.g., find), Thompson and Ye's (1991) mental (e.g., assume, speculate), textual (e.g., argue, claim), and research verbs (e.g., find, reveal, indicate), and Francis et al.'s (1996) ARGUE (e.g., argue, suggest), THINK (e.g., assume, posit), SHOW (e.g., reveal, indicate), and FIND verbs (e.g., find).

As stated above, the researcher used an online thesaurus (Thesaurus.com, 2017), Oxford Online Dictionary, and SkELL to collect hypothesizing, reporting, and summarizing verbs after checking a few research articles. For example, for the *hypothesizing* group, *theorize, speculate, presume, presuppose, suppose, posit, postulate, deduce, ascertain, deduce, pinpoint, quantify, ponder, consider*, etc. were established as typical

synonyms. To minimize the number of verbs investigated, COCA with respect to typical text categories was checked.Table 4, 5, and 6 in the Appendix show the frequency score of each verb in five text categories (academic writing, spoken, fiction, magazine, and newspaper) along with its normalized frequency score (occurrence per million [opm]) because the size of each sub-corpus is not equal (i.e., academic writing [81 million words], spoken [85 million words], fiction [81 million words], magazine [86 million words], and newspaper [81 million words]) at the time of data collection.

Only frequent verbs in academic prose compared to other text categories were chosen. Hence, hypothesizing verbs were minimized to eight verbs: *posit*, *assume*, *hypothesize*, *theorize*, *speculate*, *postulate*, *presume* and *quantify*. They all contribute the meaning suggested by the dictionary "to assume by hypothesis" (Oxford Online Dictionary, 2017). As illustrated by Table 4 in the Appendix, some verbs were more common in the past such as *hypothesize, theorize, posit, presume,* and *postulate*.

The same procedure (see Table 5) was used to limit the number of reporting verbs, and hence the explored ones are 10: *note*, *argue*, *claim*, *report*, *suggest*, *state*, *indicate*, *reveal*, *find*, and *mention*. Some verbs were more common in other text types such as *report*, *state*, *find*, and *mention* which were more frequent in *spoken English*, *newspaper*, *magazine* and *fiction*, respectively. However, all potential verbs carry the meaning of "giving an account of something observed" (Oxford Online Dictionary, 2017).

As for summarizing verbs, Dictionary.com (2017)[5] stated that a summarizing verb expresses something in a concise manner. Along with corpus investigation, dictionaries and thesauri suggested six verbs: *outline*, *summarize, encapsulate, recapitulate, conclude*, and *review*. Table 6 in the Appendix is illustrative. Thus, the total number of investigated verbs is 24. Table 2 below lists the research verbs that were explored in the study.

Frequency of Research Verbs

Using the DOAJ as a corpus of journal articles, the researcher found that *reporting* verbs were more frequent than *hypothesizing* and *summarizing* ones (see Table 3 below). Moreover, of reporting verbs, *report* (i.e., of 1.894.821 occurrences), *suggest* (i.e., occurring 1.887.652 times), *indicate* (i.e., used 2.114.053 times), and *find* (i.e., of 2.998.375 hits) were the most frequently used by researchers. As for *hypothesizing* verbs, *assume* (i.e., of 654.082 hits), *quantify* (i.e., occurring 268.657 times), and *hypothesize* (i.e., of 127.631 occurrences) were more frequent than the rest. Regarding the summarizing group, the verbs *summarize* (i.e., used 228.208 times [203.439 times as summarize and 24.769 times as summarise]) and *outline* (i.e., of 83.316 hits) occurred more than any other summarizing verb.

Collocating Adverbs of Research Verbs

Hypothesizing Verbs

As for corpus analysis of hypothesizing verbs in relation to their accompanying adverbs, results showed that they were in general neutral. *Hypothesize* (freq=116.881) was mainly associated with *previously* (freq=725, MI=8.57, t-score=26.8), *initially* (freq=296, MI=9.72, t-score=17.18), *originally* (freq=191, MI=10.15, t-score=13.8), *recently* (freq=153, MI=7.5, t-score=12.3), and *specifically* (freq=53, MI=6.6, t-score=7.2). The same applied to *hypothesise* (freq=10.750) that was associated with *previously.* The verbs *posit* and *theorize* occurring 4.680 times (or theorise of 10,032 occurrences) were not associated with typical adverbs.

Regarding *speculate*, *postulate*, and *presume*, they suggest neither positive nor negative prosody. *Speculate* habitually occurred with *reasonably* (freq=66, MI=10.20, t-score=8.11) and *previously* (freq=174, MI=7.23, t-score=13.10), but *presume* with *generally* (freq=92, MI=8.60, t-score=9.5). Moreover, *postulate* collocated frequently with *originally* (freq=89, MI=10.3, t-score=9.4), *initially* (freq=79, MI=9.12, t-score=8.4), *previously* (freq=350, MI=8.8, t-score=18.6), and *recently* (freq=148, MI=8.8, t-score=12.3).

As for *assume*, it typically occurred with more than 40 adverbs and mainly with *implicitly* (freq=2230, MI=12.6, t-score=47.2), *generally* (freq=2963, MI=8.7, t-score=47.21), *safely* (freq=482, MI=10.7, t-score=21.9), *reasonably* (freq=597, MI=9.8, t-score=24.4), *simply* (freq=877, MI=8.4, t-score=29.5), *commonly* (freq=1101, MI=8.04, t-score=33.05), *initially* (freq=639, MI=8.01, t-score=25.18), and *typically. Quantify* is the only

Table 2

Hypothesizing, Reporting and Summarizing Verbs Used in Research Papers

Typical Sections	Category	Examples
Introduction	Hypothesizing	posit, assume, hypothesize, theorize, speculate, postulate, presume, quantify
Review of literature Discussion	Reporting	note, argue, claim, report, suggest, state, indicate, reveal, find, mention
Conclusion	Summarizing	outline, summarize, encapsulate, recapitulate, conclude, review

Table 3
Frequency of Hypothesizing, Reporting, and Summarizing Verbs Used in Research Papers

Research Verb	Frequency
Hypothesizing Verbs	
assume	654.082
quantify	268.657
hypothesize (-ise)	127.631
speculate	56.243
postulate	39.057
presume	19.841
theorize (-ise)	14.712
posit	10.911
Reporting Verbs	
find	2.998.375
indicate	2.114.053
report	1.894.821
suggest	1.887.652
reveal	777.019
note	564.024
mention	337.777
state	193.562
argue	148.594
claim	67.732
Summarizing Verbs	
conclude	314.762
summarize (-ise)	228.208
review	209.035
outline	83.316
encapsulate	27.667
recapitulate	12.329

verb in the hypothesizing group that suggested a positive meaning (see Figure 2 below). It was habitually used with *accurately* (freq=1604, MI=11.08, t-score=40.03), *objectively* (freq=335, MI=11.8, t-score=18.2), *reliably* (freq=407, MI=10.8, t-score=20.16), *precisely* (freq=550, MI=10.16, t-score=23.4), *rigorously* (freq=89, MI=9.8, t-score=10.5), etc. In addition, *quantify* was used commonly with domain adverbs such as *spectrophotometrically*, *densitometrically*, *colorimetrically*.

As for accompanying subjects, *assume*, *quantify*, *presume*, and *posit* occurred more commonly with inanimate subjects (e.g., theory, calculation, approach, method, hypothesis) as opposed to *hypothesize*, *speculate*, *postulate*, and *theorize* which were used more frequently with *investigator*, *researcher*, *author*, *theorist*, *scholar*, *colleague*, *subjects*, *economist*, *feminist*, etc. This suggests that the latter set of verbs are typical attribution verbs. Examples of concordance lines are the following.

1. Considering that the large-scale PEV data is not presently available, the **paper** reasonably *assumes* a residential community with one ten-thousandth of Texas population, and all houses in this community are equipped with the smart meters (Mathematical Problems in Engineering).
2. This **doctrine** simply *posits* that a contract cannot confer enforceable rights or impose obligations on persons who were not parties to it and have not furnished considerations (Australian Journal of Business and Management Research).
3. Relating biome productivity to the mean annual temperature, this **model** implicitly *presumes* a certain correlation between the climatic conditions of the growing season and those of the whole year (Carbon Balance and Management).
4. There are several theoretical **perspectives** that explicitly *posit* that human perceptual processes are supported by active prediction (PLoS ONE).

Reporting Verbs

Regarding reporting verbs, *note* was associated with more than 30 predicational adverbs including *previously* (freq=6354, MI=8.08, t-score=79.4), *explicitly* (freq=303, MI=7.1, t-score=17.2), *finally* (freq=237, MI=6.12, t-score=15.17), *specifically* (freq=334, MI=5.6, t-score=17.9), *recently* (freq=391, MI=5.2, t-score=19.2), etc. On the other hand, *argue* was mainly associated with positive predicational adverbs (see Figure 3 below) such as *convincingly* (freq=389, MI=14.2, t-score=19.7), *persuasively* (freq=144, MI=16.2, t-score=11.9),

rightly (freq=84, MI=12.3, t-score=9.1), *strongly* (freq=1360, MI=9.7, t-score=36.8), *forcefully* (freq=64, MI=13.4, t-score=7.9), *plausibly* (freq=57, MI=11.9, t-score=7.5), etc.

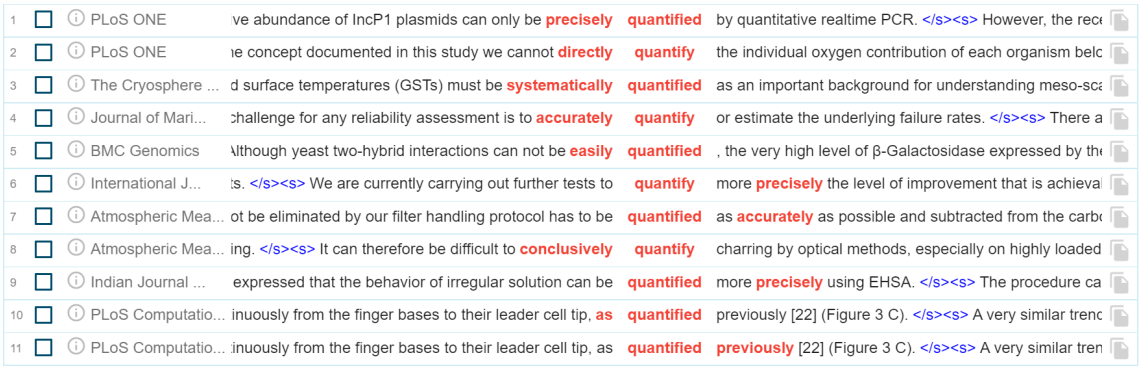
Similarly, *claim* was positive because it occurred frequently with *rightfully* (freq=31, MI=14.1, t-score=5.5), *confidently* (freq=39, MI=11.6, t-score=6.2), *legitimately* (freq=28, MI=13.1, t-score=5.2), *justly* (freq=22, MI=13.9, t-score=4.6), *rightly* (freq=27, MI=11.6, t-score=5.1), etc. *Report* habitually occurred with more than 40 predicational adverbs such as *previously* (freq=99546, MI=10.13, t-score=315.2), *recently* (freq=21183, MI=9.11, t-score=145.28), *commonly* (freq=5530, MI=7.6, t-score=73.9),=53.2), *widely* (freq=3031, MI=6.60, t-score=54.4), *consistently* (freq=2135, MI=7.6, t-score=45.9), *originally* (freq=1092, MI=7.1, t-score=32.8), etc., and hence it was coded neutral.

Suggest, which is also a frequent research verb, was positive occurring more frequently with *strongly* (freq=24351, MI=10.6, t-score=155.94), *previously* (freq=6338, MI=7.4, t-score=79.14), *clearly* (freq=2813, MI=7.5, t-score=52.7), etc. By the same token, *state* was of favorable prosody (see Figure 5 below) since it occurred habitually with *explicitly* (freq=2772, MI=11.2, t-score=52.6), *clearly* (freq=3163, MI=9.2, t-score=56.1), *previously* (freq=4256, MI=8.4, t-score=65.04), *specifically* (freq=536, MI=7.2, t-score=22.9), *simply* (freq=568, MI=7.9, t-score=23.7), *precisely* (freq=212, MI=7.6, t-score=14.4), *correctly* (freq=164, MI=6.8, t-score=12.6), etc.

Similarly, *indicate* was of positive associative meaning since it commonly occurred with *clearly* (freq=17253, MI=9.8, t-score=131.2), *strongly* (freq=4047, MI=7.7, t-score=63.3), *possibly* (freq=1790, MI=7.5, t-score=42.08), *previously* (freq=1775, MI=5.2, t-score=41.04), etc. Further, *reveal* was also of positive meaning (see Figure 6 below) used habitually with *clearly* (freq=2874, MI=8.5, t-score=53.4), *consistently* (freq=350, MI=7.3, t-score=18.5), *recently* (freq=646, MI=6.3, t-score=25.10), *potentially* (freq=273, MI=5.6, t-score=16.20), *previously* (freq=537, MI=4.8, t-score=22.3), *significantly* (freq=840, MI=4.6, t-score=27.8), etc.

Figure 2

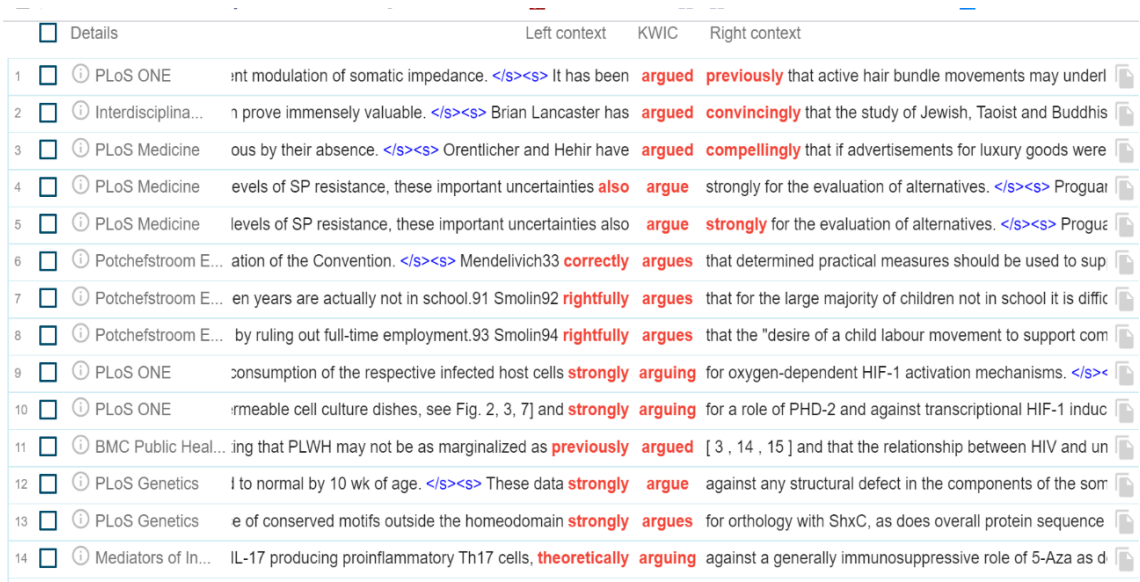
Concordance lines of the verb quantify.



1	PLoS ONE	ve abundance of IncP1 plasmids can only be **precisely**	**quantified**	by quantitative realtime PCR. </s><s> However, the rec
2	PLoS ONE	ıe concept documented in this study we cannot **directly**	**quantify**	the individual oxygen contribution of each organism belc
3	The Cryosphere ...	d surface temperatures (GSTs) must be **systematically**	**quantified**	as an important background for understanding meso-sc
4	Journal of Mari...	challenge for any reliability assessment is to **accurately**	**quantify**	or estimate the underlying failure rates. </s><s> There a
5	BMC Genomics	Although yeast two-hybrid interactions can not be **easily**	**quantified**	, the very high level of β-Galactosidase expressed by th
6	International J...	ts. </s><s> We are currently carrying out further tests to	**quantify**	more **precisely** the level of improvement that is achieva
7	Atmospheric Mea...	ot be eliminated by our filter handling protocol has to be	**quantified**	as **accurately** as possible and subtracted from the carb
8	Atmospheric Mea...	ing. </s><s> It can therefore be difficult to **conclusively**	**quantify**	charring by optical methods, especially on highly loaded
9	Indian Journal ...	expressed that the behavior of irregular solution can be	**quantified**	more **precisely** using EHSA. </s><s> The procedure ca
10	PLoS Computatio...	inuously from the finger bases to their leader cell tip, **as**	**quantified**	previously [22] (Figure 3 C). </s><s> A very similar trenc
11	PLoS Computatio...	inuously from the finger bases to their leader cell tip, as	**quantified**	**previously** [22] (Figure 3 C). </s><s> A very similar tren

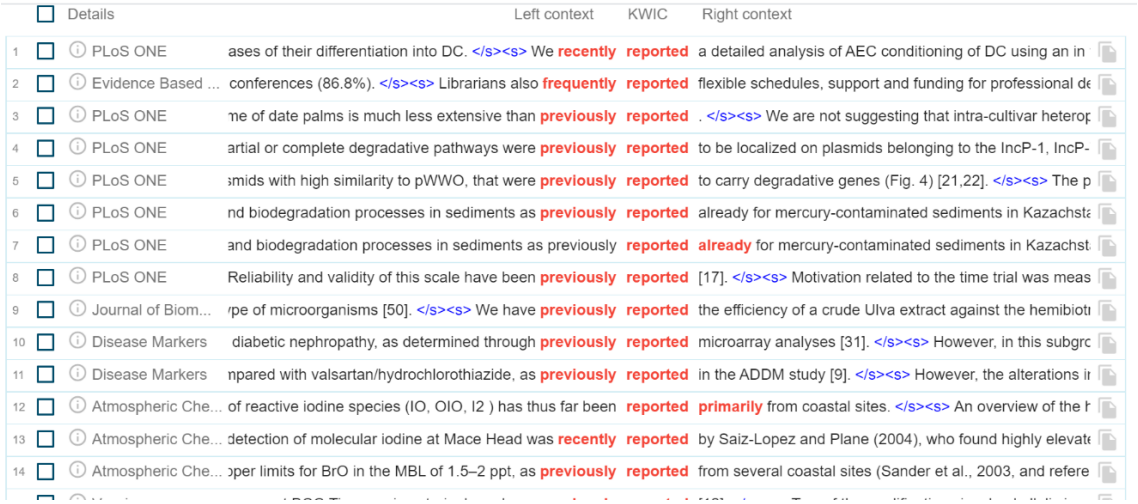
Figure 3

Concordance lines of the verb argue.



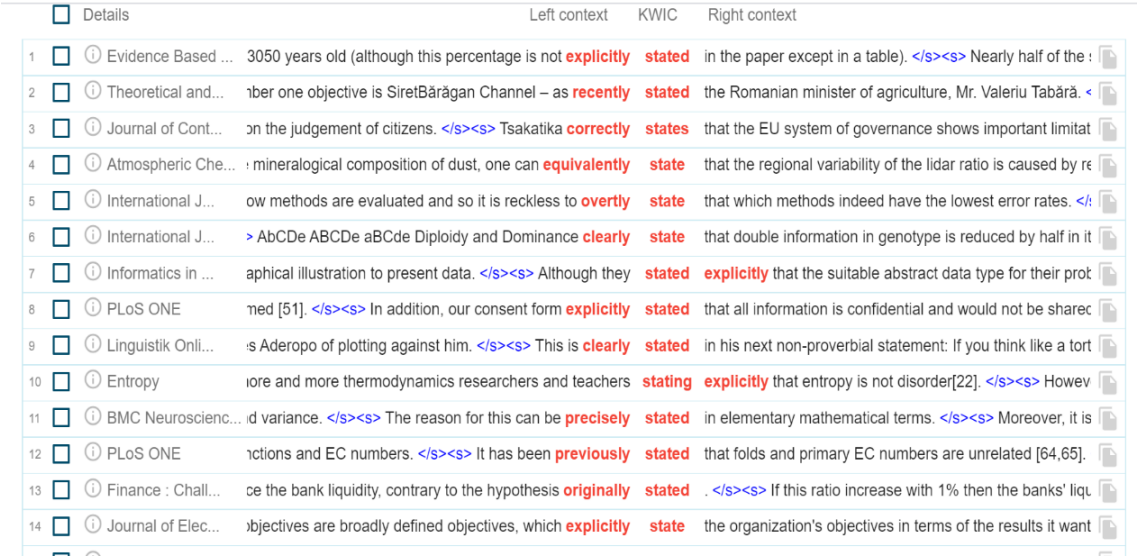
	Details	Left context	KWIC	Right context
1	PLoS ONE	ınt modulation of somatic impedance. </s><s> It has been	**argued**	**previously** that active hair bundle movements may underl
2	Interdisciplina...	ı prove immensely valuable. </s><s> Brian Lancaster has	**argued**	**convincingly** that the study of Jewish, Taoist and Buddhis
3	PLoS Medicine	ous by their absence. </s><s> Orentlicher and Hehir have	**argued**	**compellingly** that if advertisements for luxury goods were
4	PLoS Medicine	evels of SP resistance, these important uncertainties **also**	**argue**	strongly for the evaluation of alternatives. </s><s> Proguar
5	PLoS Medicine	levels of SP resistance, these important uncertainties also	**argue**	**strongly** for the evaluation of alternatives. </s><s> Progua
6	Potchefstroom E...	ation of the Convention. </s><s> Mendelivich33 **correctly**	**argues**	that determined practical measures should be used to sup
7	Potchefstroom E...	en years are actually not in school.91 Smolin92 **rightfully**	**argues**	that for the large majority of children not in school it is diffic
8	Potchefstroom E...	by ruling out full-time employment.93 Smolin94 **rightfully**	**argues**	that the "desire of a child labour movement to support com
9	PLoS ONE	consumption of the respective infected host cells **strongly**	**arguing**	for oxygen-dependent HIF-1 activation mechanisms. </s><
10	PLoS ONE	rmeable cell culture dishes, see Fig. 2, 3, 7] and **strongly**	**arguing**	for a role of PHD-2 and against transcriptional HIF-1 induc
11	BMC Public Heal...	ing that PLWH may not be as marginalized as **previously**	**argued**	[3 , 14 , 15] and that the relationship between HIV and un
12	PLoS Genetics	l to normal by 10 wk of age. </s><s> These data **strongly**	**argue**	against any structural defect in the components of the som
13	PLoS Genetics	e of conserved motifs outside the homeodomain **strongly**	**argues**	for orthology with ShxC, as does overall protein sequence
14	Mediators of In...	IL-17 producing proinflammatory Th17 cells, **theoretically**	**arguing**	against a generally immunosuppressive role of 5-Aza as d

Figure 4
Concordance lines of the verb report.



	Details	Left context	KWIC	Right context
1	PLoS ONE	ases of their differentiation into DC. </s><s> We	recently reported	a detailed analysis of AEC conditioning of DC using an in
2	Evidence Based ...	conferences (86.8%). </s><s> Librarians also	frequently reported	flexible schedules, support and funding for professional de
3	PLoS ONE	ne of date palms is much less extensive than	previously reported	. </s><s> We are not suggesting that intra-cultivar heterop
4	PLoS ONE	artial or complete degradative pathways were	previously reported	to be localized on plasmids belonging to the IncP-1, IncP-
5	PLoS ONE	smids with high similarity to pWWO, that were	previously reported	to carry degradative genes (Fig. 4) [21,22]. </s><s> The p
6	PLoS ONE	nd biodegradation processes in sediments as	previously reported	already for mercury-contaminated sediments in Kazachsta
7	PLoS ONE	and biodegradation processes in sediments as previously	reported	already for mercury-contaminated sediments in Kazachst
8	PLoS ONE	Reliability and validity of this scale have been	previously reported	[17]. </s><s> Motivation related to the time trial was meas
9	Journal of Biom...	pe of microorganisms [50]. </s><s> We have	previously reported	the efficiency of a crude Ulva extract against the hemibioti
10	Disease Markers	diabetic nephropathy, as determined through	previously reported	microarray analyses [31]. </s><s> However, in this subgrc
11	Disease Markers	npared with valsartan/hydrochlorothiazide, as	previously reported	in the ADDM study [9]. </s><s> However, the alterations ir
12	Atmospheric Che...	of reactive iodine species (IO, OIO, I2) has thus far been	reported	primarily from coastal sites. </s><s> An overview of the h
13	Atmospheric Che...	detection of molecular iodine at Mace Head was	recently reported	by Saiz-Lopez and Plane (2004), who found highly elevate
14	Atmospheric Che...	oper limits for BrO in the MBL of 1.5–2 ppt, as	previously reported	from several coastal sites (Sander et al., 2003, and refere

Figure 5
Concordance lines of the verb state.



	Details	Left context	KWIC	Right context
1	Evidence Based ...	3050 years old (although this percentage is not	explicitly stated	in the paper except in a table). </s><s> Nearly half of the s
2	Theoretical and...	nber one objective is SiretBărăgan Channel – as	recently stated	the Romanian minister of agriculture, Mr. Valeriu Tabără. <
3	Journal of Cont...	on the judgement of citizens. </s><s> Tsakatika	correctly states	that the EU system of governance shows important limitat
4	Atmospheric Che...	mineralogical composition of dust, one can	equivalently state	that the regional variability of the lidar ratio is caused by re
5	International J...	ow methods are evaluated and so it is reckless to	overtly state	that which methods indeed have the lowest error rates. </s
6	International J...	> AbCDe ABCDe aBCde Diploidy and Dominance	clearly state	that double information in genotype is reduced by half in it
7	Informatics in ...	aphical illustration to present data. </s><s> Although they	stated	explicitly that the suitable abstract data type for their prot
8	PLoS ONE	ned [51]. </s><s> In addition, our consent form	explicitly stated	that all information is confidential and would not be sharec
9	Linguistik Onli...	s Aderopo of plotting against him. </s><s> This is	clearly stated	in his next non-proverbial statement: If you think like a tort
10	Entropy	ore and more thermodynamics researchers and teachers	stating	explicitly that entropy is not disorder[22]. </s><s> Howev
11	BMC Neuroscienc...	d variance. </s><s> The reason for this can be	precisely stated	in elementary mathematical terms. </s><s> Moreover, it is
12	PLoS ONE	nctions and EC numbers. </s><s> It has been	previously stated	that folds and primary EC numbers are unrelated [64,65].
13	Finance : Chall...	ce the bank liquidity, contrary to the hypothesis	originally stated	. </s><s> If this ratio increase with 1% then the banks' liqu
14	Journal of Elec...	bjectives are broadly defined objectives, which	explicitly state	the organization's objectives in terms of the results it want

Nevertheless, *find* (freq=2.998.375) was used frequently with more than 40 predicational adverbs including *commonly* (freq=9979, MI=8.5, t-score=99.6), *previously* (freq=8824, MI=6.6, t-score=92.9), *recently* (freq=4484, MI=6.8, t-score=66.3), *exclusively* (freq=2825, MI=8.3, t-score=52.9), *typically* (freq=3600, MI=7.1, t-score=59.5), *mainly* (freq=4630, MI=6.4, t-score=67.2), *consistently* (freq=2517, MI=7.9, t-score=49.9), etc. Also, *mention* collocated more with *previously* (freq=22684, MI=9.4, t-score=150.4), *briefly* (freq=1215, MI=9.2, t-score=34.7), *explicitly* (freq=1287, MI=8.8, t-score=35.7), *specifically* (freq=956, MI=6.7, t-score=30.6), *commonly* (freq=363, MI=5.2, t-score=18.5), etc., and apparently *mention* was of positive meaning. The above-advanced analysis showed that seven of the ten reporting verbs were positive (argue, clam, suggest, state, indicate, reveal and mention), whereas the rest were neutral (note, report, find).

In general, reporting verbs such as *claim*, *argue*, *find*, *mention*, *report*, and *note* were used more frequently with animate subjects such as *author*, *scholar*, *researcher*, *respondent*, *informant*, *customer*, *interviewee*, *participant*, *patient*, *woman*, *investigator* as opposed to *indicate*, *suggest*, *reveal*, and *state* which were utilized more commonly with *result*, *line*, *bar*, *datum*, *finding*, *study*, *analysis*, *evidence*, etc. The following are examples of concordance lines with reporting verbs and their common subjects and adverbs.

Figure 6
Concordance lines of the verb reveal.

	Details	Left context	KWIC	Right context
1	PLoS ONE	analyze the oxygen profiles above the irregular interface,	revealed	strongly reduced net photosynthesis and dark respiratio
2	International J...	o the final year in the institution. </s><s> This will surely	reveal	more interesting patterns. </s><s> With all these observa
3	International J...	)iverse features on mobility and relay range deliberately	reveals	that the, Relay Station (RS) can be grouped up into three
4	ISRN Neurology	males. </s><s> Planned comparisons between quartiles	revealed	significantly lower 5-HIAA and HVA levels of patients in
5	EPJ Web of Conf...	],[35]). </s><s> The magnetic nature of CVs is generally	revealed	by the detection of coherent pulsations in the optical and
6	BioMed Research...	:planation for this perceived heterogeneity was probably	revealed	by a recent study in which bone marrow biopsy samples i
7	PLoS ONE	The association of PLC-c with the H2O2 stress has been	revealed	previously , as there is a direct evidence to support the c
8	Genetika	ıth coeffi- </s> <s> cient analysis undoubtedly	revealed	more importance of leaf water content, especially in the p
9	Journal of Libr...	> Daily life must be regarded as the social totality vividly	revealed	from the inside. </s><s> Hence, we can find that the faça
10	PLoS ONE	ınically-loaded joint tissues [46], the current work clearly	reveals	that T-VSCC plays a direct role in cellular events associa
11	Clinical and De...	)llows. </s><s> (1) In the BP group, DIF most frequently	reveals	linear deposits of IgG and C3 at the dermoepidermal junc
12	PLoS ONE	correct number of built-in communities is systematically	revealed	, in all instances, by a sudden drop of some of the persist
13	Gastroenterolog...	sa. </s><s> These two methods are even able to clearly	reveal	the localization, appearance, degree of mesenteric infiltra
14	PLoS Genetics	ing a silver staining procedure: active caspase 3 staining	revealed	intensely stained neuronal profiles (Figure 6C, 6D). </s>

1. These **results** clearly *indicate* significant variability between regions, with sites in the Middle East and India (triangles and hexagram) having much lower lidar ratios and higher refractive indices than sites in the Sahel (squares), which in turn have lower lidar ratios and higher refractive indices than the sole site in the Sahara desert (Atmospheric Chemistry and Physics Discussions).
2. All these **experiments** had *clearly* revealed that the A-M system is uninvolved mechanically in tension generation. (International Journal of Molecular Sciences)
3. The **paper** *briefly* reviews main types of Virtual Learning Environments and analyses the use of VLEs in Lithuania (Informatics in Education).

Summarizing Verbs

As for summarizing verbs, starting with *conclude* (occurring 314.762 times), it collocated with *safely* (freq=286, MI=11.4, t-score=16.9), *finally* (freq=435, MI=9.2, t-score=20.8), *easily*,(freq=427, MI=7.7, t-score=17.9), *recently* (freq=323, MI=7.2, t-score=17.8), *generally* (freq=231, MI=6.5, t-score=15.03), etc.However, *outline* was positive collocating with *briefly* (freq=1156, MI=12.13, t-score=33.9), *clearly* (freq=514, MI=8.2, t-score=22.5), *previously* (freq=977, MI=7.9, t-score=31.12), etc. Likewise, *summarize* was used habitually with *briefly* (freq=2773, MI=12.8, t-score=52.6), *succinctly* (freq=88, MI=12.8, t-score=9.3), *concisely* (freq=71, MI=13.19, t-score=8.4), *shortly* (freq=128, MI=9.6, t-score=11.2), etc., and thus it was positive.

As for *review* (used 209.035 times), it occurred frequently with more than 30 adverbs including *briefly* (freq=3759, MI=11.9, t-score=61.2), *retrospectively* (freq=2160, MI=13.01, t-score=46.4), *critically* (freq=1953, MI=11.4, t-score=44.1), etc.On the other hand, *recapitulate* was of positive meaning since it is used with *faithfully* (freq=282, MI=16.2, t-score=16.7), *accurately* (freq=175, MI=10.9, t-score=13.2),-*fully* (freq=295, MI=10.3, t-score=17.16), *briefly* (freq=63, MI=10.5, t-score=7.9), etc.Similarly, *encapsulate* was of pleasant meaning used mostly with *efficiently* (freq=94, MI=10.3, t-score=9.6), *successfully* (freq=138, MI=10.1, t-score=11.7), *completely* (freq=111, MI=9.30, t-score=10.5), *fully* (freq=91, MI=8.9, t-score=9.5), etc. The above detailed account of summarizing verbs showed that summarizing verbs were essentially positive (outline, summarize, encapsulate, and recapitulate). However, *conclude* and *review* were neutral.

Regarding co-occurring subjects, all summarizing verbs occurred more frequently with inanimate subjects (e.g., table, diagram, chart, article, literature, paper, section, chapter, enhancer) except for *conclude* that was employed equally with *author*, *investigator*, *researcher*, *colleague*, *expert*, etc. as well as with *summary*, *survey*, *literature*, etc. This finding suggests that summarizing verbs were not commonly used for attribution or evaluation. The following lines are illustrative.

1. This **paper** briefly *reviewed* the botanical, traditional, phytochemical, pharmacological and conservation related aspects of this plant (Journal of Costal Life Medicine).
2. As a result, it is difficult for current **models** to accurately *recapitulate* all of the pathological features associated with IMR (PLoS ONE)

DISCUSSION

This study surveyed the collocational and prosodic behaviors of 24 research verbs (hypothesizing, reporting, and summarizing verbs) besides their frequency information. Results showed that *reporting* verbs were more frequent than others and that *find*, *suggest*, *report*, *indicate* were more commonly used in scientific writing. This finding has been emphasized earlier by Hyland (2000a) who noted that verbs referring to discourse acts (e.g., suggest) and those known

as research verbs (e.g., find) are more common than others. More importantly, results revealed that 12 of the research verbs are positive (quantify, argue, claim, suggest, state, indicate, outline, summarize, encapsulate, recapitulate, mention, and reveal), 12 (review, conclude, find, report, note, posit, assume, presume, hypothesize, theorize, speculate and postulate) are neutral. As opposed to Louw's (1993) argument, semantic prosody is not essentially negative since the researcher found that none of the explored node verbs are negative. This conclusion also reflected Hyland's (2002) who noted that when writers adopt a position towards authors' claims, the position is either neutral or positive. Hyland (1998) explained that if a specific writer wishes to express a negative evaluation of author's viewpoint, this is accomplished not through reporting verbs as this is considered a face-threatening act in academic writing and may result in paper's rejection by publishers.

As emphasized by previous studies, words that are considered near-synonyms do not sometimes convey the same semantic prosody as they frequently occur with different collocates. Such differences in semantic preferences illustrate the fact that such words should not be used substitutably by researchers. As reported by Louw (2000), research verbs tell a lot about writers' attitudes. For example, *argue* was mainly positive and proves a stronger point discussed, whereas *note* is of neutral meaning suggesting that the writer's argument needs some further investigation. In addition, *hypothesize* and *assume* are near synonyms (can be used interchangeably) since they express the same affective meaning, but not *summarize* and *conclude*. Thus, the new differentiating criterion for near synonyms is semantic prosody. Another dimension of prosody (besides formality) should be considered to distinguish between words.

Such findings confirmed Bloch's (2010) who noted that the verbs *reveal*, *indicate*, *suggest*, *mention* were used to show that the writer's attitude is positive towards a claim. Further, as *mention* was used frequently by learners more than researchers (Bloch, 2010), the present paper found its frequency in fiction. In terms of the strength in attitude expressed by writers, the study reflected results of Bloch (2010). Thus, *reveal* was strong since it collocates with *clearly* and *significantly*. Similarly, *indicate* was associated with strong claims because it was used commonly with *clearly* and *strongly*. Additionally, *state* was of favorable meaning because it was associated with *clearly*, *specifically*, *explicitly*, etc. As for *argue*, *claim*, and *suggest*, Bloch (2010) explained that such verbs are generally weaker than others. Further, Hunston (1995) reported that *argue* and *claim* in specific are mainly associated with conflicts and disagreements. Hence, *argue*, *claim*, and *suggest* need to be associated with hedges of adverbs that suggest strength in attitude. The same finding has been emphasized by Ilchenko and Kramar (2022) who noted that *argue* was frequently used with hedges. Thus, results showed that *argue* was commonly found with *convincingly*, *strongly*, *persuasively*, *plausibly*, etc. and *claim* with *confidently*, *justly*, *rightfully*, etc. As for *suggest*, the researcher found that its typical collocate is *strongly* (freq=24,351). As reported by Hyland (2002a), *suggest* was used to reduce the writer's responsibility towards the certainty of a claim. However, this lowered level of responsibility can be still boosted by using a number of rhetorical devices. For Hyland (2002a), *suggest* and *indicate* were considered to be moderate. A positive expression of the claim can be made stronger through the use of adverbs (e.g., *strongly* for *suggest*).

Compared to *show*, *prove*, and *demonstrate*, which were used to show agreement with a previous statement, *indicate* and *suggest* are hedges that allow for some evaluative space (Thompson & Ye, 1991) where the writer becomes obliged to present a contrasting view. The two verbs have almost the same collocates of adverbs (i.e., clearly, strongly, possibly, previously, collectively, consistently, indirectly, actually). As reported by Hyland (2002), *suggest* is commonly found in philosophy, sociology, applied linguistics, marketing, and similar fields of interpretation and speculation.

Hyland (2002) argued that *find* is a non-factive verb. Hence, the researcher found no preferred collocates that signaled a specific attitude. Thus, according to Hyland (2002), *find* is typically used by researchers in physics, applied linguistics, and marketing. Therefore, typical collocates were *frequently*, *commonly*, *previously*, *recently*, *typically*, etc. Such non-factive verbs are commonly found in science and engineering as they indicate impartiality that characterizes hard knowledge fields where writers acknowledge previous research without corrupting it with their personal stand (Hyland, 2002).

As a cognitive verb, *speculate* is a verb that embodies a tentative view towards a reported claim. Thus, findings illustrated that *speculate* collocates with *tentatively*, *cautiously*, and *initially*. In addition, the researcher found that *postulate* and *hypothesize* are discourse verbs that indicate tentative attitude. Thus, they are of neutral prosody collocating with *initially*, *tentatively*, and *originally*. Though *suggest* belongs to the same category, it shows more of positive semantic prosody since it collocates with *strongly* and *clearly*.

Findings also showed that *report* is neutral, and this confirmed Hyland's (2002) statement that *report* is a discourse verb used frequently by researchers to pass information without interpretation besides *state* and *summarize*. Hyland (2002) mentioned that *report* is used more frequently in biology and mechanical engineering. As for *note*, *argue*, and *claim*, they are positive except for *note*. Hyland (2002) called such verbs assurance discourse verbs used by researchers to bolster their argument. Hence, results indicated that *claim* collocates with *rightfully*, *rightly*, *legitimately*, *falsely*, *confidently* and *argue* with *convincingly*, *persuasively*, *rightly*, *strongly*, *forcefully*, and *plausibly*. More importantly, as found by Hyland (2002), *argue* and *claim* are more commonly used in philosophy and *argue* in specific is frequent in sociology, applied linguistics, and marketing. Nevertheless, *note*

is more frequent in sociology. Hyland (2002) argued that writers' evaluative stance is more evident in soft domains of knowledge which is supported by using adverbs (e.g., correctly, rightly) with such reporting verbs. In this way, writers firmly align themselves with a specific position. Writers are ought to present existing literature in a convincing manner for their readers. Thus, research verbs commonly used in soft domains of knowledge are positive (e.g., argue, claim, reveal, indicate, suggest) and occur more frequently with *rightly*, *strongly*, etc.

Moreover, this corpus investigation showed that *previously* is a common collocate for almost every research verb (state, suggest, indicate, reveal, find, mention, conclude, outline, summarize, and review). *Previously* is a temporal discourse marker that can function globally (i.e., connecting the writer's argument to others') and locally (i.e., linking the writer's argument to what has been mentioned earlier in the same article; Sarda et al., 2014). Because of its dual function, it is the most typical adverb for many research verbs.

Implications

Pedagogically, language teachers including L2 writing instructors should draw students' attention to the fact that verbs may tell a lot about one's attitude, and hence *find* and *report* are neutral in general, whereas *argue* and *claim* are of favorable prosody. Thus, they cannot be taught as synonyms in class. Moreover, *mention* is positive in academic writing, and further research should explore its prosody in fiction as it is more frequent in the latter genre. Additionally, researchers will benefit a lot from the present study since it informs them about which verbs are emotionally loaded with positivity (e.g., argue, claim), and hence they should be avoided at all costs in hard science in which one should show impartial attitude typical of scientific writing as opposed to soft science.

Limitations of the Study

The present corpus investigation was limited to the old version of COCA which was of 250 million words collected between 1990 and 2015. Hence, the new genres (webpages, blogs, TV series) added in 2020 were not considered. Additionally, co-texts for each verb were not examined because Sketch Engine allows only 150 to 185 words of context for each verb. Additionally, some sentences were removed from context which makes it difficult for the researcher to decide whether the attributor was refuting or supporting an earlier argument.

More importantly, as noted above, the researcher focused on predicational adverbs that end in -ly and can be used to express one's attitude towards a claim. Selecting predicational adverbs implied that quantificational adverbs such as *always* and *frequently* were not examined besides domain adverbs such as *medically*, *mathematically*, *physically*, etc. Additionally, focus adverbs (e.g., only), adverbials introducing new participants to discourse (e.g., For George, with a hammer, etc.), and *almost* were not considered in the present study.

CONCLUSION

The present study examined the semantic prosody of 24 synonymous research verbs (related to hypothesizing, reporting, and summarizing results) which are established in the dictionary as near synonyms since they share the same denotational meaning. However, the researcher found that such verbs have different sets of collocating adverbs, as suggested by the DOAJ, and thus distinct semantic prosodies. Indeed, research verbs convey either neutral or positive prosodies, but they have never become associated with negative meanings. Hence, results showed that 12 of the research verbs were positive (i.e., quantify, argue, claim, suggest, state, mention, indicate, outline, summarize, encapsulate, recapitulate and reveal), whereas 12 verbs (i.e., hypothesize, review, conclude, presume, posit, assume, theorize, speculate, note, report, find, and postulate) were neutral. This is mainly attributed to the fact that expert writers follow the norm in scientific writing and only boost their argument in fields that require interpretation and justification. However, the obtained results cannot be generalized to all research verbs used in all disciplines since the researcher did not examine verbs in terms of surrounding words and grammatical structure. Nonetheless, this study is of significant implications for researchers, language instructors, and learners.

More specifically, future research should address semantic prosody of research verbs as they are found in their extensive co-texts and used in scientific writing. Context may reveal some disagreement or refutations in which one can attribute such negativity to the research verb in question. Thus, more attention should be paid to verbs of attribution (e.g., argue, claim, etc.) since the researcher found that there are verbs that are commonly employed to introduce different types of propositions such as *summarize*, *outline*, *mention*, *review*, etc., but they are utilized more frequently with inanimate subjects.

Additionally, future research should address semantic prosody of research verbs using learner corpora. Previous research emphasized that students of non-native speakers should be aware of how verbs are used conventionally by expert researchers to communicate their argument more effectively. Moreover, further research can explore which collocates are used in which disciplines as some studies emphasized that expert researchers in soft fields of knowledge used reporting verbs differently from those of hard knowledge domains.

Furthermore, future research should investigate the relationship between word's history and semantic prosody. The

present study showed that verbs derived from Latin (e.g., conclude, posit, note, assume, hypothesize, postulate) are basically neutral compared to those taken from French (e.g., argue, claim, state, mention, reveal). Based on this, any further research should relate such areas to extensions of meaning and diachronic and synchronic studies of meaning.

DECLARATION OF COMPETING INTEREST

None declared.

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APPENDIX

Table 4

The Sampling Procedure for Hypothesizing Verbs

Verb / TextCategory	Academic Writing	Spoken	Fiction	Magazine	Newspaper
Size	**81 million Words (opm)**	**85 million Words (opm)**	**81 million Words (opm)**	**86 million Words (opm)**	**81 million Words (opm)**
hypothesize	371	18	16	54	8
hypothesized	2.594	19	27	88	17
hypothesizing	51	4	9	19	3
hypothesizes	72	0	8	55	3
Total	3,088 (38,1)	41 (0,5)	50 (0,6)	216 (2,5)	31 (0,3)
posit	418	38	21	80	23
posited	644	16	38	88	41
positing	183	6	12	25	8
posits	594	13	17	121	38
Total	1,839 (22,7)	73 (0,9)	88 (1,08)	314 (3,6)	110 (1,3)
ponder	373 (4,6)	142 (1,7)	352 (4,3)	493 (5,7)	471 (5,8)
consider	17.526	7990	4.730	14.508	10.943
considered	23,904	9,012	7,833	10,034	11,875
Total	41,430 (511,4)	17,002 (209,9)	12,563 (155,09)	24,542 (285,3)	22,818 (28,2)
assume	6123	4550	2509	3.799	2330
assumed	6,038	1,197	3,551	2,716	1,721
assuming	2,469	1,513	1,304	1,635	1,189
assumes	2,095	298	304	837	511
Total	16,725 (206,4)	7,558 (93,3)	7,668 (94,6)	8,987 (104,5)	5,751 (71)
conceptualize	472 (5,8)	21 (0,2)	14 (0,17)	46 (0,53)	13 (0,16)
ascertain	994 (12,2)	139 (1,6)	135 (1,6)	124 (1,4)	83 (1,02)
expect	7.013 (86,5)	12.719 (157,02)	7.241 (89,3)	10.788 (125,4)	11.035 (136,23)
ascertain	994 (12,2)	139 (1,6)	135 (1,6)	124 (1,4)	83 (1,02)
expect	7.013 (86,5)	12.719 (157,02)	7.241 (89,3)	10.788 (125,4)	11.035 (136,23)
elucidate	400	8	18	56	15
postulate	277	14	22	65	19
postulated	522	9	24	78	22
postulating	59	1	6	10	5
postulates	264	9	17	45	6
Total	1,122 (13,8)	31 (0,3)	69 (0,8)	198 (2,4)	52 (0,6)
think	26.677 (329,3)	413.902 (5,109,9)	111.874 (1,381,1)	67.017 (7779,2)	76.889 (949,2)
suppose	1.760 (21,7	3.652 (45,08)	8.871 (109,5)	1.882 (21,8)	938 (11,5)
theorize	220	41	35	136	65
theorized	366	47	64	187	85
theorizing	578	13	36	79	24
theorizes	62	13	4	123	49
Total	1,226 (15,1))	114 (1,4)	139 (1,7)	525 (6,4)	223 (2,7)
presume	426	540	433	264	158
presumed	1,310	337	487	488	405
presuming	98	72	58	58	46
presumes	259	67	37	93	56
Total	2,093 (25,8)	1,016 (12,5)	1,015 (12,5)	903 (11,1)	665 (8,2)

Verb / TextCategory	Academic Writing	Spoken	Fiction	Magazine	Newspaper
predicate	134 (1,6)	75 (0,9)	20 (0,2)	14 (0,1)	10 (0,1)
presuppose	173 (2,1)	10 (0,1)	5 (0,06)	30 (0,3)	10 (0,1)
speculate	823	851	302	600	496
speculated	520	157	308	413	401
speculating	105	320	184	150	127
speculates	147	34	22	335	119
Total	1595 (19,6)	1362 (16,8)	816 (10,07)	1498 (17,4)	1143 (14,1)
quantify	787	162	29	241	242
quantified	531	26	15	93	41
quantifying	288	7	5	46	25
quantifies	96	1	0	17	5
Total	1,702 (21,0)	196 (2,4)	49 (0,6)	397 (4,6)	276 (3,4)
conjecture	289 (3,5)	106 (1,3)	159 (1,9)	186 (2,1)	89 (1,09)
contemplate	510 (6,2)	273 (3,3)	474 (5,8)	515 (5,9)	340 (4,19)

Table 5

The Sampling Procedure for Reporting Verbs

Verb / Text Category	Academic Writing	Spoken	Fiction	Magazine	Newspaper
Size	**81 million Words (opm)**	**85 million Words (opm)**	**81 million Words (opm)**	**86 million Words (opm)**	**81 million Words (opm)**
note	148.888 (1,838,1)	6.604 (77,6)	8.550 (105,5)	9.518 (110,6)	7.888 (97,3)
argue	62.288 (768,9)	4.826 (56,7)	2.406 (29,703)	3.912 (45,4)	4.476 (55,2)
claim	84.616 (1,044)	5.563 (65,44)	3.457 (42,67)	7.312 (85,02)	6.660 (82,22)
report	204.224 (2,521,2)	208.024 (2,44)	46,712 (576,6)	122,960 (1,429,7)	193,568 (2,389,7)
suggest	148.000 (1,827)	5,158 (60,6)	2,364 (29,18)	7,405 (86,104)	4,827 (59,5)
state	704.144 (8,693,1)	493,504 (5,8)	102,608 (1,266,7)	394,160 (4,583,2)	959.064 (11,840,2)
find	222.480 (2,746,6)	420,104 (4,9)	407,224 (5,027,4)	442.952 (5,150,6)	297,864 (3,677,3)
indicate	106.464 (1,314)	2.010 (23,6)	1.046 (12,9)	3.319 (38,5)	2.054 (25,3)
reveal	40.895 (504,8)	1.976 (23,2)	3.779 (46,6)	4.373 (50,8)	2.045 (25,2)
mention	32.208 (397,6)	37,248 (438,2)	46.640 (5,758)	39,552 (459,9)	36,064 (445,2)

Table 6

The Sampling Procedure for Summarizing Verbs

Verb / Text Category	Academic Writing	Spoken	Fiction	Magazine	Newspaper
Size	**81 million Words (opm)**	**85 million Words (opm)**	**81 million Words (opm)**	**86 million Words (opm)**	**81 million Words (opm)**
sum up	1,288 (15,9)	1,323 (15,5)	469 (5,7)	959 (11,15)	686 (8,4)
outline	13,144 (162,2)	3,688 (43,3)	9,304 (114,8)	8,104 (94,23)	4,032 (49,7)
outlined	19,928 (246,02)	5,200 (61,17)	4,528 (55,90)	5,488 (63,81)	5,992 (73,9)
summarize	7,592 (93,7)	1,488 (17,5)	608 (7,50)	1,152 (13,3)	520 (6,4)
encapsulate	720 (8,8)	208 (2,4)	88 (1,08)	320 (3,7)	184 (2,2)

Verb / Text Category	Academic Writing	Spoken	Fiction	Magazine	Newspaper
condense	824 (10,3)	264 (3,10)	416 (5,1)	1,056 (12,2)	232 (2,8)
recapitulate	440 (5,4)	56 (0,6)	56 (0.6)	96 (1,11)	56 (0,6)
conclude	25,904 (319,8)	7,192 (84,6)	3,080 (38,02)	8,624 (100,2)	7,352 (90,7)
review	193,112 (2,384,09)	37,656 (443,01)	20,456 (252,5)	49,216 (572,27)	67,168 (829,23)