Frequency and Congruency: A New Perspective on Motion Verb and Path Expression Co-occurrence

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Proceedings of the 38th Pacific Asia Conference on
Language, Information and Computation (PACLIC 38)

Nathaniel Oco, Shirley N. Dita, Ariane Macalinga Borlongan, Jong-Bok Kim (eds.)

2024

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Abstract

This study re-examines the co-occurrence patterns of motion verbs and path expressions from a frequency-based perspective, complementing existing semantic-based approaches. By linking the properties of frequent verbs and GOAL, one of the notions of PATH, with the concepts of congruency and redundancy commonly found in language, I propose a new framework for explaining verb co-occurrence relations. The findings suggest a strong correlation between the individual characteristics of motion verbs and general tendencies.

1 Introduction

The notion of PATH is one of the most essential components in describing motion events. Talmy's (1985, 2000) theory of motion events classifies languages into satellite-framed and verb-framed languages based on which the elements in a clause lexicalize the notion of PATH (Talmy 1985, 2000). Satellite-framed languages include English, Estonian, and German. In these languages, as shown in the following examples, the notion of PATH is often lexicalized by elements such as prepositions, particles, or adverbs.

(1) a. Finally, he scowled and strode toward the scooter. (COCA 2005, FIC)
b. The dog trotted over and looked at us with smiling eyes. (COCA 2015, FIC)
c. I went to Istanbul in good faith. (COCA 2018, TV)
d. I'm glad we came here. (COCA 2003, NEWS)

There are some differences between researchers in the study of motion expressions. However, the notion of PATH can be divided into the following categories: SOURCE, TRAJECTORY, GOAL, DIRECTION, and DEIXIS (e.g., Talmy 2000). Regarding satellite-framed languages, a vast amount of research focuses on the relationship between these elements, which have been lexicalized as PATH, and verbs, in other words, what types of notions of PATH tend to co-occur with which verbs (e.g., Stefanowitsch and Rohde 2004, Papafragou 2010, Kopecka 2010, Guse 2022).

Furthermore, although this is not limited to motion expressions, there is an argument that languages exhibit a wide range of congruency and redundancy. It has been confirmed that there is congruency and redundancy in various areas. (Dahl 2004, Langacker 2008, Janda and Reynolds 2019). In addition, congruency and redundancy have been confirmed in various linguistic phenomena and studies have shown similar properties in motion expressions (Taremaa and Kopecka 2023). In this study, I discuss how this congruency and redundancy can also be seen in English motion expressions by exploring the relationship between verbs and satellites such as prepositions (e.g., *toward*), particles (e.g., *out*), and adverbs (e.g., *here*), that lexicalized the notion of PATH in English.

Unlike previous studies, this study includes *come* and *go*, which are unusual in English in that they do not lexicalize the manner of motion but DEIXIS. These two deictic verbs and 14 types of motion verbs are randomly selected from the Corpus of Contemporary American English (COCA). I also discuss the congruency of the meanings of these two different types of motion verbs and path expressions.

The remainder of this paper is organized as follows. Section 2 introduces previous research on the speed and granularity of the meanings of motion verbs and studies on the properties of DEIXIS in motion event descriptions. Section 3 describes the empirical method used in this study, and Section 4 presents the results. Section 5 discusses the properties seen between verbs and path expressions in motion expressions based on the results obtained

in Section 4. Section 6 summarizes this study.

2 Previous Studies

Research on motion expressions is ongoing in various languages. As mentioned above, most extant studies have focused on the relationship between motion verbs and path expressions, which has been verified using corpora and experimental methods. It has long been argued that, in motion events, humans tend to focus more on the endpoint than on the starting point when considering the notion of PATH (e.g., Ikegami 1987, Dirven and Verspoor 1998).

In the case of Estonian, a satellite-framed language, Taremma and Kopecka (2023) argued that speed of motion is essential if motion verbs are likely to co-occur with path expressions associated with GOAL. Incidentally, this is not the first study to focus on speed when studying motion expressions. Taremma and Kopeka (2022) demonstrated that verbs expressing fast movement occur more frequently than those expressing slow movements. In an Estonian corpus study, Taremma and Kopeka (2023) found that verbs expressing fast movement are more likely to co-occur with elements that lexicalize the notion of GOAL than verbs expressing slow movement. This study examines whether similar trends could be observed in other languages, that is, whether fast-moving verbs are likely to co-occur with path expressions, lexicalizing the notion of GOAL in English as it does in Estonian.

However, in English, not all motion verbs that co-occur with prepositions or particles that lexicalize the notion of PATH are manner of motion verbs. The verbs *come* and *go*, which are deictic motion verbs, are unusual because they do not lexicalize the manner of motion. However, the fact that they do not lexicalize the manner of motion implies that these verbs are neutral regarding speed.

What types of path expressions do deictic motion verbs co-occur with? At this point, congruency and redundancy emerge. By including *come* and *go* as the objects of this research, other assertions made in other studies on the relationship between motion verbs and path expressions are plausible. This study also examines the granularity of verb meanings. One study that focuses on the granularity of the meanings expressed by motion verbs is Guse's (2022) study on German. Inspired by Tutton (2013), she demonstrates that, in German, if the granularity of the meanings expressed by motion verbs is low, such verbs tend to co-occur more with path expressions, lexicalizing the notion of GOAL. Let us now consider the case of English motion verbs. The meanings expressed by *come* and *go* are very low in granularity, whereas verbs such as *swagger* express meanings of very high granularity. Therefore, it can be predicted that *come* and *go* are more likely to co-occur with elements expressing the notion of GOAL than with other verbs, and verbs such as *swagger* are less likely to co-occur with elements expressing the notion of GOAL.

3 Methods

To confirm whether the congruency and redundancy mentioned above can also be seen in the motion verbs and various path expressions in English, this study compares the following five types of manners of motion verbs listed in (2a–2e). These are in Slobin et al.'s (2014: 717) list. The two deictic motion verbs are in (2f).

(2)
a. *walk*, *run* (basic level)
b. *amble*, *stroll*, *saunter* (variety of walking - relaxed)
c. *stride*, *sashay*, *swagger* (variety of walking - normal pace)
d. *scamper*, *scurry*, *scuttle* (rapid movement)
e. *jog*, *trot*, *sprint* (variety of running)
f. *come*, *go* (deictic motion)

Some of these verbs, such as *walk* and *run*, have a low granularity of meaning, whereas others, such as *amble*, *stroll*, and *saunter*, have a high granularity of meaning. Some verbs indicate different movement speeds, such as *stride*, *sashay*, and *swagger*, which are slower, and *jog*, *trot*, and *sprint*, which are faster. Therefore, I can ascertain whether congruency and redundancy in English movement expressions can be observed by investigating which of the 14 movement verb types tend to co-occur with which path expressions. As mentioned above, I also include *come* and *go*, which lexicalize the notion of DEIXIS. I extracted 100 examples of each verb from COCA that express physical movement. From these 1,600 examples, I examine the relationship between verbs and path expressions in English.

Python was used to search for the verbs mentioned above in the text versions of the COCA files to extract examples from the corpus. For instance, in the case of *swagger*, i) I searched for all oc-

currences of *swagger*, *swaggers*, *swaggering*, and *swaggered* in the corpus, and then, ii) after randomly reordering them, iii) extracted only those examples that included a verb that expressed physical movement. Therefore, all usages that did not express physical movement were manually excluded from this study.

In addition, to avoid factors such as mood and specific constructional characteristics as much as possible, only finite-form verbs were analyzed. Therefore, the following examples were excluded from the analysis.

(3) a. **Walk** up and down the beach looking for sea life, such as snails, crabs, and starfish. (COCA 2012, WEB)
b. (...) he **would have come** back if I had a biscuit. (COCA 2013, TV)
c. In a few seconds, Paul Mahon **came striding** toward the camp. (COCA 2007, FIC)
d. A line of altar boys entered from the sacristy in the rear, **ambling** into the center aisle (...) (COCA 1996, MAG)

In this study, I collected examples until reached 100 examples of path expressions, as I was focusing on path expressions in this study. In some cases, as in the following example, multiple path expressions may appear in a single clause.

(4) a. Correctional officers sprinted out across the turf toward two men attacking a third. (COCA 2014, FIC)
b. The thought was calm, but she shuddered as the beast scampered away through the rocks. (COCA 1992, FIC)

4 Results

Using the method described in Section 3, I collected the following data. First, let me examine how often each verb occurs with each type of path expression, as shown in Table 1. Second, I checked how often each verb co-occurred with each type of notion of PATH, as shown in Table 2.

As shown in Table 2, the English data obtained for this study also show a clear co-occurrence with the notion of GOAL (e.g., Ikegami 1987, Dirven and Verspoor 1998). When the rate of co-occurrence with the path expression lexicalizing the notion of GOAL was compared with the rate of co-occurrence with the path expression lexicalizing the notion of SOURCE, a statistically significant difference was confirmed (χ^2 =91.351, df=1, p <.001). Therefore, goal bias in physical movement expressions in English was also demonstrated.

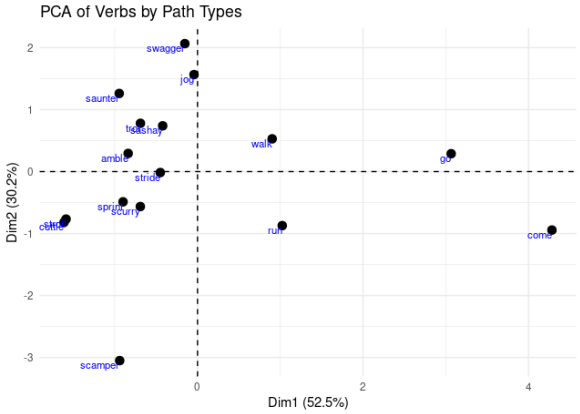

Figure 1: Results of the analysis of motion verbs using PCA

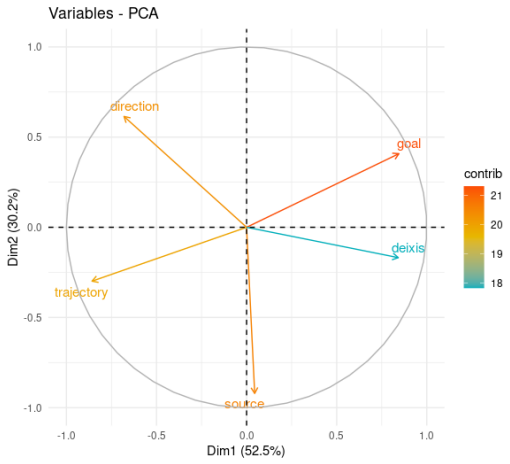

Figure 2: Contribution of each notion of PATH

Next, I examine the relationship between GOAL and SOURCE, as well as the relationship between other notions of PATH and verbs. Principal component analysis (PCA) was performed on the obtained data. The results are shown in Figures 1 and 2.

The results of this analysis grouped verbs such as *walk*, *run*, *come*, and *go*, which have high co-occurrence rates with GOAL (e.g., *into* and *to*) and directional expressions (e.g., *down* and *toward*). I notice that *run*, which expresses fast movement, is in the same group as *walk*, which expresses slow movement, as well as *come* and *go*, which are deictic motion verbs with no specification of speed. In other words, the results of this study show that the claim that verbs lexicalizing fast movements tend to co-occur with path expressions associated with

Verbs	**Examples**	**Path expressions**	**The notion of PATH**
walk	Ralph walked forward a couple of steps.	*forwards*	DIRECTION
...	...	...	...
sashay	Sarah sashayed to the mirror.	*to*	GOAL
sashay	(...) I sashayed through the doors into the lobby.	*through*, *into*	TRAJECTORY, GOAL
...	...	...	...
come	I come from Europe.	*from*	SOURCE
...	...	...	...
go	And he went there and (...) lost his life.	*there*	DEIXIS
...	...	...	...

Table 1: Sentences extracted from COCA that indicate physical movement

Verbs	**SOURCE**	**TRAJECTORY**	**GOAL**	**DIRECTION**	**DEIXIS**	$\sum$
walk	13	13	42	32	0	100
run	21	10	37	31	1	100
amble	13	20	28	39	0	100
stroll	12	34	23	31	0	100
saunter	11	15	28	46	0	100
stride	15	18	30	37	0	100
sashay	11	18	31	39	1	100
swagger	8	11	36	45	0	100
scamper	28	23	19	30	0	100
scurry	17	20	27	36	0	100
scuttle	18	23	19	40	0	100
jog	9	13	35	42	1	100
trot	13	15	29	43	0	100
sprint	19	16	24	41	0	100
come	17	1	41	23	18	100
go	15	3	51	26	5	100

Table 2: 16 motion verbs and co-occurrence path expressions

the notion of GOAL cannot be confirmed, at least for English.

However, the results support the claim made by Guse (2022) that verbs with low semantic granularity tend to co-occur with path expressions lexicalizing GOAL. From Table 2 and Figure 1, verbs with a high degree of granularity of meaning (e.g., *saunter*, *stroll*, *sashay*) tend to co-occur with path expressions associated with TRAJECTORY.

In addition, the results of this study show whether congruency or redundancy exists in motion expressions. Deictic motion verbs are more likely to co-occur with the *here* and *there* than other motion verbs. It can be seen that verbs describing the manner of movement seldom co-occur with *here* or *there*. Still, deictic motion verbs, particularly *come*, co-occur overwhelmingly with deictic path expressions.

5 General Discussion

Based on the results in the previous section, I discuss here the relationship between verb meanings and path expressions in English motion expressions, particularly the relationship between the granularity of verb meanings and path expressions and the properties of congruency and redundancy in the language.

However, before proceeding, I would like to introduce a new concept: the Weber–Fechner law. This law is not limited to language but describes a widespread property of the relationship between stimulus intensity and recognition: the perception of new stimulus changes based on the intensity of the original stimulus. Therefore, the Weber–Fechner law can also be applied to language. According to this law, a strong stimulus indicates a high frequency. In other words, if a word or expression is common and is seen or heard frequently, it will be a weak stimulus for many people, and they will hardly pay attention to it when they come into contact with it. For example, the expression *Good morning!* is an expression that few people pay attention to when they hear it. However, the *Top of the morning to you!* is an expression that most people pay attention to.

According to the Weber–Fechner law, the relationship between stimuli and recognition is expressed by the following equation:

$$\frac{\Delta f}{f} = constant \quad (1)$$

Verbs	Frequency	Logarithm
go	3,546,732	6.55
come	1,802,158	6.26
run	465,066	5.67
walk	253,671	5.40
stroll	6,473	3.81
stride	5,493	3.74
sprint	4,170	3.62
jog	4,090	3.61
trot	4,042	3.61
scurry	2,872	3.46
scuttle	1,690	3.23
amble	1,313	3.12
saunter	1,208	3.08
scamper	1,194	3.08
sashay	317	2.50
swagger	278	2.44

Table 3: Frequency and logarithm of each motion verb in COCA

For example, this means that the intensity of a stimulus for an expression that has been heard 100 times before is the same as that of a stimulus for an expression that has been heard 1,000 and is heard ten times before.

According to the Weber–Fechner law, the granularity of a word's meaning is inversely related to its frequency. In other words, when the frequency of a word is low, the granularity of its meaning is considered high. When the frequency of a word is high, the granularity of its meaning is low. Applying the Weber–Fechner law to the granularity of meaning makes it possible to quantify the meaning of English motion verbs and consider them as objective indices. Although not limited to those expressing physical movement, the following table shows the frequency of the 16 motion verbs in COCA and the logarithms considered in this study.

I examined whether there was any correlation between the logarithm of the frequency of these verbs and the frequency with which they occur with path expressions lexicalizing GOAL. The results are shown in Figure 3.

The high correlation coefficient (r = .73) indicates that there no major problem in relating the granularity of the meaning of the motion verbs to the frequency of the words. Incidentally, Taremaa and Kopecka (2022) also pointed out that high-frequency motion verbs tend to co-occur with path expressions that lexicalize the notion of GOAL.

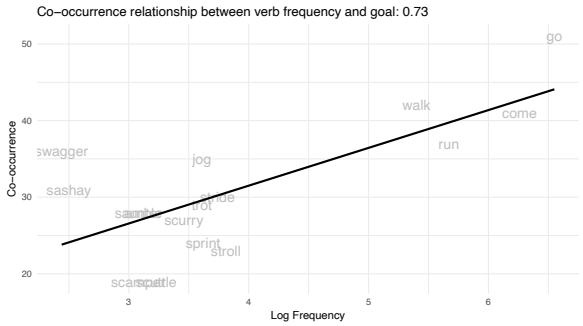

Figure 3: Frequency of each motion verb and co-occurrence with GOAL

Why are words with high frequency, that is, words with a low granularity of meaning, more likely to co-occur with path expressions that lexicalize GOAL? This is due to our tendency to focus on the endpoints of movement when recognizing motion events (Dirven and Verspoor 1998). When people or objects move, we tend to focus on the endpoint rather than the starting point. This was demonstrated by Lukusta and Landau (2005) through psychological experiments. In other words, for us, the default PATH in motion event is the notion of GOAL rather than the notion of SOURCE.

When applying the Weber–Fechner law, the granularity of meaning of these default path expressions is low. In other words, for the proposed concepts of SOURCE, TRAJECTORY, GOAL, DIRECTION, and DEIXIS, the default concept of GOAL can be considered the path concept with the lowest granularity of meaning. Therefore, from the viewpoint of congruency and redundancy, it is reasonable that *come*, *go*, and *walk*, which have the lowest granularity of meaning among motion verbs, co-occur with path expressions associated with GOAL, which has the lowest granularity of meaning among the PATH concepts.

I would also like to mention the unique properties of venitive deictic motion verbs based on the data obtained in this study, referring to studies of the deictic motion verbs in other languages. For instance, Matsumoto et al. (2017) used an experimental approach to investigate interesting properties of venitive deictic motion verbs in English, Japanese, and Thai. They reported that these verbs are more likely to be used when interacting with the speaker rather than only moving in the speaker's direction (cf. Enfield 2003). This property of these verbs was not sufficiently described by Fillmore (1971). It is interesting that such interactional behavior plays an important role when the movement in the speaker's direction is expressed by a verb but not by prepositional phrases such as *toward(s) me*.

This study confirms that *come* and *go* are more likely to co-occur with deictic path expressions such as *here* and *there* than with verbs that lexicalize manner of motion. In particular, I found that *here* often co-occurs with venitive deictic motion verb, *come*. How many instances in my study did *come* co-occur with prepositional phrases, such as *toward(s) me*? There is only one such example, as shown in (5).

(5) Across the field a cat **was coming** toward me and so I picked up a big 7 or 8 foot long stick and made myself as big as I could.
(COCA 2012, WEB)

This study shows that congruency is crucial for English motion expressions. It implies that verbs with similar properties and path expressions tend to co-occur. Applying this to the fact that the verb *come* and the prepositional phrase *toward(s) me* are difficult to co-occur suggests that the unique properties are lexicalized in *here* and cannot be paraphrased to other prepositional phrases.

6 Conclusions

This study was inspired by the recent research on motion verbs that has focused on the semantic properties of verbs. By reconsidering these properties in terms of frequency, I was able to provide a new perspective on motion verbs and path expressions. In particular, by linking the properties of frequent verbs and the default GOAL in the notion of PATH with the properties of congruency and redundancy, which are common in language, this study provides a plausible explanation for the co-occurrence relationship of verbs.

The notion of GOAL, the default in our cognition of motion events, is the one to which our attention is strongly directed and often stated. Stefanowitsch and Rohde (2004) also pointed out that *escape* is more likely to co-occur with SOURCE. Nevertheless, among the motion verbs considered in this study, *scamper* is more likely to co-occur with SOURCE than with GOAL, as the following example shows.

Among the motion verbs in this study, *scamper* is more likely to co-occur with path expressions lexicalizing SOURCE than GOAL, per the following example.

(6) a. He **scampers** out of the room, impatient now for the completion of our evening ritual. (COCA, 2009 FIC)
b. Bunny **scampered** out of the pool in her bikini. (COCA 2010, FIC)

While it is essential to focus on such individual cases and clarify the characteristics of each verb, it is also necessary to define language's general properties and tendencies. Although this study is limited to a survey of only 16 intransitive motion verbs, it revealed at least a critical trend in English motion events description.

This study has two limitations. The first is the number of verbs investigated. English has a vast number of motion verbs. For example, Levin (1993: 265–266) lists more than 100 verbs in English. However, the number of verbs expressing physical movement is not very large. For example, the verb *goosestep*, listed by Levin (1993: 265), has only three hits even in COCA, a corpus containing over 100 million words. However, a close examination of the properties of as many words as possible could identify facts that were not revealed in this study.

Furthermore, the fact that the deictic motion verbs *come* and *go* are likely to co-occur with path expressions such as *here* and *there* and that there is congruency in English motion expressions suggest that it may be necessary to analyze their co-occurrence with pronouns.

Acknowledgment

This study was supported by JSPS KAKENHI (Grant Number 20K13069).

References

Dahl, O. 2004. *The growth and maintenance of linguistic complexity*. Amsterdam: John Benjamins Publishing Company.

Dirven, R. & M. Verspoor. 1998. *Cognitive exploration of language and linguistics* (Cognitive Linguistics in Practice 1). Amsterdam: John Benjamins Publishing Company.

Enfield, N. J. 2003. Demonstratives in space and interaction: Data from Lao speakers and implications for semantic analysis. *Language, 79*, 82–117.

Fillmore, C. J. 1971. *Santa Cruz lectures on deixis*. [Pulished in 1997 as *Lectures in deixis*]. Stanford, CA: CSLI Publications.

Guse, L. 2022. Source-Goal asymmetry in German: A corpus study comparing intentional and non-intentional motion events. L. Sarda & B. Fagard (eds.) *Neglected aspects of motion-event description: Deixis, asymmetries, constructions*, 173–185. Amsterdam/Philadelphia: John Benjamins Publishing Company.

Ikegami, Y. 1987. 'Source' versus 'Goal': A case of linguistic dissymmetry. In R. Dirven & G. Radden (eds.), *Concepts of case* (Studien Zur Englischen Grammatik 4), 122–146. Tübingen: Narr.

Janda, L. A. & R. Reynolds. 2019. Construal vs. redundancy: Russian aspect in context. *Cognitive Linguistics, 30*, 467–497.

Kopecka, A. 2010. Motion events in Polish: Lexicalization patterns and the description of manner. In V. Hasko & R. Perelmutter (eds.) *New approaches to Slavic verbs of motion* (Studies in Language Companion Series 115), 225–246. Amsterdam/Philadelphia: John Benjamins Publishing Company.

Langacker, R. 2008. *Cognitive grammar*. Oxford: Oxford University Press.

Levin, B. 1993. *English verb classes and alternations: A preliminary investigation*. Chicago and London: The University of Chicago Press.

Lukusta, L. & B. Landau. 2005. Starting at the end: The importance of goals in spatial language. *Cognition, 96*. 1–33.

Matsumoto, Y., K. Akita & K. Takahashi. 2017. The functional nature of deictic verbs and the coding patterns of Deixis: An experimental study in English, Japanese, and Thai. In Iraide Ibarretxe-Antuñano (ed.), *Motion and Space across Language*, 95–122. Amsterdam/Philadelphia: John Benjamins Publishing Company.

Papafragou, A. 2010. Source-goal asymmetries in motion event representation: Implications for language production and comprehension. *Cognitive Science, 34*, 1064–1092.

Slobin, D. I., I. Ibarretxe-Antuñano, A. Kopecka & A. Majid. 2014. Manners of human gait: A crosslinguistic event-naming study. *Cognitive Linguistics 25*. 701–741.

Stefanowitsch, Anatol & Ada Rohde. 2004. The goal bias in the encoding of motion events. In Günter Radden & Klaus-Uwe Panther (eds.), *Studies in linguistic motivation* (Cognitive Linguistics Research 28), 249–267. Berlin/New York: Mouton de Gruyter.

Talmy, Leonard. (1985) Lexicalization patterns: Semantic structure in lexical forms. In Timothy Sopen (ed.), *Language typology and syntactic description: Vol. 3. Grammatical categories and the lexicon*, 1st ed., 57–149. Cambridge University Press.

Talmy, L. 2000. *Toward a cognitive semantics, Volume II: Typology and process in concept structuring*. Cambridge, MA/London, England: The MIT Press.

Taremma, P & Kopecka, A. 2022. Manner of motion in Estonian: A descriptive account of speed. *Studies in Language, 47*, 32–78.

Taremma, P & Kopecka, A. 2023. Speed and space: Semantic asymmetries in motion descriptions in Estonian. *Cognitive Linguistics, 34*, 35–66.

Tutton, M. 2013. Granularity, space, and motion-framed location. In M. Vulchanova & E. van der Zee (eds.), *Motion encoding in language and space*, 149–165. Oxford: Oxford University Press.

Online Corpus

Corpus of Contemporary American English. https://www.english-corpora.org/coca/ [accessed August 2024].