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RESEARCH ARTICLE

Constructing a hierarchical network of prefixal *up* from a Construction Morphology perspective

Kim-Kristin Droste

Institut für Anglistik und Amerikanistik, Universität Osnabrück, Germany
Email: kim-kristin.droste@uni-osnabrueck.de

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Abstract

This article takes a usage-based Construction Morphology perspective to examine the polysemy of the locative prefixoid *up* in complex words such as *upstairs*, *upland*, *upheaval* and *uproot.* Drawing on a relational structure model of morphosemantics, it is argued that the prefixoid systematically approximates the functions of different syntactic categories in different complex words: *up* functions like a preposition (*upstairs*), adjective (*upland*), adverb (*upheaval*) and verb (*uproot*). These constructions consequently require bases of specific syntactic categories and differ in the ways in which the prefixoid semantically relates to the second element. These subschemas are investigated in detail using corpus data from the BNC, collostructional analysis and various productivity measures to analyze the selectional restrictions of the open slot of the constructions as well as the semantics of the complex words. This approach elegantly solves the question of category change and the difficulties in identifying the syntactic category of the base in complex words with locative prefixoids, providing an alternative to the righthand head rule.

Keywords: Construction Morphology; morphosemantics; prefixoids; word-formation; collostructional analysis

1. Introduction

This article presents a corpus study of *up* as a locative prefixoid from a usage-based Construction Morphology (Booij 2010) perspective. The present study expands Marchand's (1969: 109) claim that locative prefixoids function as different syntactic categories and relates this to a relational structure approach to morphosemantics (Gagné & Spalding 2015), proposing a hierarchical network model for the polysemy of complex words with *up.* I combine this structural reading of complex words with locative prefixoids with the Construction Morphology notion of constructional idiom (Booij 2010) to model surface generalizations encompassing the locative prefixoid *up* in words of all syntactic categories such as *upstairs*, *upland*, *upheaval* and *uproot.*

Locative prefixoids have only rarely been studied in detail, in particular *up.* The few exceptions commonly focus on prefix verbs alone and do not account for other syntactic categories (Scheible 2005; Schröder 2008, 2011; Kotowski 2021, 2023) or give only a broad

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overview of a group of prefixes (Marchand 1969; Lehrer 1995; Bauer *et al.* 2013). *Over* and *out* are considered the most productive locatives and have been subject to designated studies that also incorporate analyses of their semantics and selectional restrictions (Börger 2007; Kotowski 2021, 2023). Most notably, Lieber (2004) dedicates an entire chapter to providing a formalism for the semantics of locatives from an item-and-arrangement, morpheme-based and generative perspective and demonstrates the merit of such a model for *over-*. At the time of writing, no research has been carried out on the prefixoid *up* in all syntactic categories, let alone from a constructional perspective. In his study on verbal *out*-prefixation, Kotowski (2021: 84) concludes that constraint- rather than rule-based approaches such as Construction Morphology are promising starting points for the analysis of locative prefixoids. He emphasizes their capability of 'spelling out complex and idiosyncratic semantic information and offer the possibilities of fine-grained meaning differentiation, as well as creating networks of related interpretations via hierarchies of schematic lexeme formation rules' (Kotowski 2021: 84). Complex words with *up* are highly polysemous and cannot be accounted for by a single schema. Though *up* is not as productive as *out* or *over*, it serves well to exemplify how modeling a hierarchical network from a Construction Morphology perspective and accounting for its semantics by means of a relational structure approach can be a profitable approach for the analysis of such prefixoids.

First, taking into account all syntactic categories solves a well-known theoretical problem, namely the subcategorization of complex words with locative prefixoids based on their syntactic category. Where prefix verbs are considered alone, converted forms such as $upgrade_{V}$ and $upgrade_{N}$ would be overlooked. This argument is also brought forward by Scheible (2005: 185), who acknowledges that exclusively examining verbal prefixation disregards conversion and backformation. Categorization by syntactic category of the base such as proposed by the *Oxford English Dictionary* (*OED* n.d.) is similarly problematic since syntactic categories cannot always be unequivocally identified in complex words. Based on the righthand head rule (Williams 1981), bases of prefixations are often categorized by the syntactic category of the derivative. For example, Bauer *et al.* (2013: 342) categorize *coming* in *upcoming* as an adjective and *cropping* in *up-cropping* as a noun due to the syntactic categories of the respective complex word (see also Kotowski 2023: 120). Consequently, strict adherence to the righthand head rule would awkwardly classify the base in $upgrade_{V}$ and $upgrade_{N}$ as a verb and noun respectively. Obvious exceptions to this rule are frequently identified, e.g. in *to out-absurd someone* (Kotowski 2021: 63), unless prior conversion is assumed to maintain theoretical consistency. Therefore, the present analysis will subcategorize complex words with *up* based on their polysemous meanings rather than their syntactic category. As will be shown, this approach offers a more nuanced perspective on the syntactic category of the base and complex word.

Marchand accounts for the polysemy of locatives by proposing three 'preparticle types' based on the syntactic category of the locatives that roughly correspond to three groups of output categories (list adapted from Marchand 1969: 109):

I. Particle with 'adverbial force' in verbs (*outbid*), participials (*oncoming*, *downcast*), verbal and deverbal nouns (*outgoing*, *outlook*), as well as some adjectives (*overanxious*)
II. Particle with prepositional properties in adjectives or adverbs (*upstairs*) and some nouns (*afternoon*)
III. Particle with adjectival properties in nouns (*outhouse*) and adjectives (*intoed*)

Marchand (1969: 110) argues that verbal types (I) are derived from their particle verb counterparts. Prepositional combinations (II) are 'morphologically characterized by the absence of the article in situations where syntactic conditions would require it', e.g. *upstairs*

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from *up the stairs*, while the locatives in (III) are considered adjectives because some particles can be used as 'full adjectives' (Marchand 1969: 112).[1] As will be shown below, a constructionist approach is capable of providing an analysis of these complex words without relying on transformations. These schemas will be looked at in more detail below.

In combination with this structural reading, the constructional perspective proposed here contributes profitably to the debate about the status of words that have so far been termed prefixoids (see also Börger 2007; Hartmann 2019). Arguing that the semantics of prefixal *up* differ from its prepositional uses, Bauer *et al.* (2013: 340) treat *up* as a prefix. In contrast, Marchand uses the term 'locative particle' and refers to the resulting complex words as compounds due to the proposed syntactic category of the locative but mentions the possibility of classifying them as semi-prefixes (Marchand 1969: 108, 112). The notion of semi-prefix or prefixoid is capable of representing the ambiguous status of such morphemes when we view prefixations and compounds as being located on a continuum of autonomy and dependency on a schema (Tuggy 2005: 245–8).

Construction Morphology posits a structural interpretation of affixoids by making use of the notion of constructional idiom (Booij 2010: 73–6; Booij & Hüning 2014: 103). This is a morphological construction for complex words that contains at least one open slot for a base as well as at least one specified part. Being specified rather than a variable distinguishes the affixoid from compound elements and can account for bound meanings. In addition, the affixoid is co-indexed with the unbound word and bears syntactic category information, distinguishing it from affixes (Booij 2010: 57; Booij & Hüning 2014: 90). Based on Booij's (2010: 74) proposal for such a constructional idiom with *out*, we may posit the following schema for *up:*

(1) $[[\text{up}]_{\text{PFXi}}\ [\text{X}]_{\text{Yj}}]_{\text{Zk}} \longleftrightarrow [\text{SEM}_{\text{j}}$ with relation R to $\text{up}_{\text{i}}]_{\text{k}}$

The double arrow represents the interface between the formal and semantic side of the constructional idiom (Booij 2010: 14). Lowercase subscripts co-index elements from the form- to the meaning-side of the construction; uppercase subscripts indicate syntactic categories, here mainly substituted by placeholders. Due to the ambiguous status of the affixoid, Booij (2010: 74) classifies *out* as an adverb. For *up*, following Marchand's (1969) hypothesis about the syntactic categories of locative prefixoids, the syntactic category of the prefixoid will be specified in the subschemas, whereas the mother schema above will only bear the syntactic category label PFX (prefixoid). The syntactic category of the variable X (i.e. the base) and the complex word also remain unspecified in the mother schema to allow for specification in the daughter schemas. The meaning-side of the construction posited above does not specify the relation between the first and second element in tandem with Booij's (2010: 51) notation of an abstract compound construction, from which this constructional idiom inherits, and awaits further analysis.[2] Construction Morphology currently lacks an explicit morphosemantic theory, by convention relying on ad-hoc glosses to represent

[1] See Lieber (2004: 1) for a critique of Marchand's claim that an affix 'has no meaning in itself, it acquires meaning only in conjunction with the free morpheme which it transposes' (Marchand 1969: 215). Marchand's view is more compatible with a Construction Morphology account since it is a word-based rather than morpheme-based approach: Bound morphemes are specified parts of morphological constructions and do not carry meaning on their own (Booij 2010: 15).

[2] Phonetic information, which is a crucial element of the three-part description of a schema in the Parallel Architecture and Relational Morphology (Jackendoff 2002, 2013; Jackendoff & Audring 2020), is omitted here following the constructional representation in Booij (2010) for the sake of simplicity. Since *up* has no effect on the syllable structure of the following element (Bauer *et al.* 2013: 162), phonetic information is considered inherited from the individual elements of the constructions.

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the meanings of constructions in a bottom-up fashion – Booij (2013: 256) acknowledges that the 'semantic representation is a partially informal one'.

Crucially, the elements of a constructional idiom are defined as being related by a (semantic) 'relation R' (Booij 2010: 74), as noted above. A psycholinguistic underpinning of this theoretical approach is the relational structure model of morphosemantics and conceptual combination (e.g. Gagné & Shoben 1997; Gagné & Spalding 2015). Rather than combining semantic properties of the individual component parts, this approach specifies a semantic relation between them (Gagné & Shoben 1997: 72) by means of a relational gist structure (Gagné & Spalding 2015: 23). Possible relations for NN compounds are a locative 'in' relation (*mountain stream*), an 'about' relation (*mountain magazine*) (Gagné & Shoben 1997: 72) or a 'made of' relation (*stone squirrel*) (Gagné 2000: 385). Previous experience with different relational structures and the elements occurring in these structures determines the availability of different structures in conceptual combination (Gagné & Shoben 1997). This approach is supported by experimental evidence (Gagné & Shoben 1997; Gagné & Spalding 2011) and is perfectly compatible with a Construction Morphology account as the relational structure between the elements can be specified by the construction; the elements themselves are variables in open slots or specified parts of the construction.

Like the examples above, these gist-based relational structures are frequently expressed through syntactic structure. Gagné (2000) connects this relational structure model to earlier works on morphosemantics that compare the structure of compounds to syntactic structure: According to Teall (1892: 5, quoted in Gagné 2000: 366), complex words are formed 'by omitting minor or connecting parts of a full expression, and using only the principle elements in more or less arbitrary association and frequently in inverted order', e.g. *hat box* for 'box of hats' or *book cover* for 'cover of a book' (Gagné 2000: 366). In other words, 'relations may function during conceptual combination, much like syntactic structures function during sentence processing' (Gagné & Shoben 1997: 72). Construction Grammar and Morphology provide a suitable framework to account for this connection since a construction encompasses different levels of form and meaning in the linguistic sign; syntactic and morphological structure is thus considered to have meaning (see, e.g., Goldberg 1995). Other morphological frameworks likewise acknowledge the connection between syntactic and semantic selectional restrictions: 'to the extent that particular affixes select for particular syntactic categories of bases, they also show concomitant semantic selection' (Lieber 2004: 158; see also Plag 2004).

Since Gagné's relational structure model has only been applied to NN compounds and only provides relations for these structures, it is not directly applicable to the construction under investigation. However, the abovementioned analogy to syntactic structure enables a novel extension of the relational structure model to account for locative prefixoids. Marchand's (1969) typology can be applied to the construction at hand in conformity with Gagné *et al.*'s model by specifying new gist-based syntactic relational structures for constructional idioms with *up*. For example, to say that *up* in *upstairs* functions as a preposition is to say that this relational structure is one where *up* specifies a spatial relation of an entity to a path denoted by the nominal base. When *up* functions like an adjective in relation to nominal bases like *side*, this means that the prefixoid is a modifier denoting a property of the base. *Up* as an adverb modifying a verbal base (*uplifting*) specifies a direction of movement. Thus, Marchand's method of subcategorization is here proposed to express the relational structure describing the semantics of these complex words by referring to the syntactic categories that *up* assumes as a prefixoid as well as in isolation.

This article is structured as follows: after describing the data and methods employed in the present study, I revisit Marchand's classification of prefixoids and take an explorative approach using corpus data from the *British National Corpus* (BNC; 2001) and perform collexeme analyses to examine these subschemas. The aim of this method is to identify

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the lexemes that unify with the constructional idiom in order to formulate selectional restrictions of the base and describe the relation of *up* to the following element. I focus not only on the formal properties of the construction but also analyze semantic properties of prototypical and extended senses and calculate the productivity of the schemas. I conclude with a discussion of the advantages of a Construction Morphology approach and application of a relational structure model of morphosemantics to locative prefixoids.

2. Data and method

The usage-based approach taken here requires the use of corpus data to inductively draw conclusions based on a set of exemplars that is as large and balanced as possible. The data for the present analysis was retrieved from the BNC (2001), which contains 96,134,547 words from predominantly written sources of British English from the end of the twentieth century.[3] The corpus was accessed via Sketch Engine (n.d.; Sketch Engine: British National Corpus n.d.; Kilgarriff *et al.* 2014).

A search for words starting with *up* was conducted in the BNC.[4] False positives, i.e. types that are not instantiations of the construction and where the following element was not a recognizable word (e.g. *upper*, *Upton*), were identified by manual inspection and deleted. Orthographic variants with and without hyphen were counted as instantiations of the same type since hyphenation was found to be highly irregular (see Bauer *et al.* 2013: 55). Instances where the word is simultaneously an instantiation of the *up*-x construction and some other morphological construction, e.g. derived nouns (*upgradeability*) or adjectives (*uploadable*), were counted towards the same variable as the corresponding non-derived types (*grade, load*).

A collexeme analysis, part of the family of collostructional analyses (Stefanowitsch & Gries 2003), was conducted. This statistical test is the constructionist counterpart of a collocation analysis using a contingency table. However, instead of measuring the association strength between two words in syntagmatic relation, it measures the association strength between a lexeme and an open slot in a partly schematic construction. In this case, this measure describes the attraction of a base to the morphological construction. The advantage of this method over considering raw frequencies is that it takes into account the overall frequency of a word in a corpus (Gries 2012):

> Since collostructional analysis goes beyond raw frequencies of occurrence, it identifies not only the expressions which are frequent in particular constructions' slots; rather, it computes the degree of association between the collexeme and the collostruction, determining what in psychological research has become known as one of the strongest determinants of prototype formation, namely cue validity, in this case, of a particular collexeme for a particular construction. That is, collostructional analysis provides the analyst with those expressions which are highly characteristic of the construction's

[3] According to citation guidelines of the BNC, please note the following disclaimer: 'Data cited herein have been extracted from the British National Corpus, distributed by the University of Oxford on behalf of the BNC Consortium, accessed via Sketch Engine. All rights in the texts cited are reserved' (www.natcorp.ox.ac.uk).

[4] As a reviewer justifiably pointed out, it would be desirable to base the empirical part of the article on a larger database. However, my choice of the BNC is based on two arguments: (i) The identification of relative frequencies requires extensive manual cleaning of the data, which is only possible with a reliably-tagged and well-cleaned corpus like the BNC, in contrast to larger web corpora. (ii) The prototypes identified through collostructional analysis are likely also the prototypes in larger, balanced corpora; a larger corpus would likely only add more peripheral types.

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> semantics and which, therefore, are also relevant to the learner. (Stefanowitsch & Gries 2003: 237)

Collexemes occurring in the construction more often than expected are said to be attracted by the construction, those less often are said to be repelled. Ranking the variables according to their association strength reveals 'constructional semantic prototypes', based on which coherent clusters of meaning can be identified (Stefanowitsch & Gries 2005: 34), as these are the most strongly associated with the meaning of a construction (Stefanowitsch & Gries 2003: 228). This allows for the identification of semantic classes of variables that cluster around one or multiple central member(s), characterizing constraints on the construction's open slot, and enables a description of the meaning of the construction as a whole (Stefanowitsch & Gries 2003: 211).

Hence, collostructional analysis is easily integrated into a usage-based account (Stefanowitsch 2013: 290), which assumes that frequent constructions, i.e. combinations of a schema with a base, form the basis for (analogical) extensions of the schema. For example, Bybee (2013), analyzing the high token frequency of *drive NP crazy*, argues that the prototypicality of this specific type facilitates the coinage of new types with similar meanings to *crazy*, e.g. *bananas* or *up the wall*: 'items with higher token frequency within the construction serve as central members of the categories that form for schematic slots within the construction. ... Extensions of the construction will be based on these central members' (Bybee 2013: 61). Conversely, selected examples of repelled and non-significantly attracted types will demonstrate that these deviate from the constructional semantic prototype. However, high-frequency types may also be entrenched as lexicalized chunks, not easily allowing for extension. This is a particular caveat when applying collostructional analyses to morphological constructions, requiring careful interpretation of the results.

The collexeme analysis was conducted in R using an open-source script developed by Susanne Flach (2021) with the log-likelihood value as the index of association strength, calculated by Dunning's (1993) log-likelihood coefficient. This is one of the most frequently used association measures (Flach 2015; Hartmann 2019) and regarded as more reliable than the χ^2 test in dealing with small frequencies (Stefanowitsch 2020: 227). This is especially relevant since the construction under investigation is relatively infrequent in comparison to constructions at the level of syntax, which collostructional analyses have mostly been applied to. Still, a simple collexeme analysis also yields valuable results for constructions with lower type frequencies since this analysis is mainly meant to provide a *ranking* of collexemes, i.e. bases (Gries 2012; 2015: 520).

The bottom right cell in the co-occurrence table, which lists the number of constructions of the same class in the corpus that could potentially occur in this slot, has been the subject of much debate due to its uncertain reference (see Bybee 2010: 98; Gries 2012; Schmid & Küchenhoff 2013: 541–4; Gries 2015; Küchenhoff & Schmid 2015: 545–6 for a discussion). The point of reference taken here is not the number of verbs in the corpus, as is convention in analyses about constructions on the level of syntax, but the size of the BNC, representing the level of morphological constructions.[5]

In order to compute the relative frequency of a variable in the construction, the overall frequency of the base in the BNC was determined. This includes the base in isolation as well as other complex words containing the base (for *upriver*, e.g. *river*, *riverbed*, *riverbank*). Variables were considered part of a polysemous category encompassing multiple syntactic categories (for *upgrade*, e.g. $grade_N$, $grade_V$). The search was adjusted to only show types

[5] The corpus size is cell 9, i.e. the sum total in the contingency table. Please see Stefanowitsch & Gries (2003: 218–19) for details.

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containing the base with a frequency equal or greater than 10 to discount marginal instantiations and reduce the results to a manageable size for manual examination.

The significance of productivity for the constructional status of a pattern is much debated. Though unproductive patterns are not considered constructions in some Construction Grammars (Kay 2013: 37–8), redundant and usage-based models (Hilpert 2019: 67–8; Delhem & Marty 2020: 30) argue that constructions can still be posited even if they lack productivity. Construction Morphology (Booij 2013: 258; Booij & Hüning 2014: 86) takes the same stance. Productivity is a crucial piece of information to be marked directly within the notational schema in related approaches like Relational Morphology (Jackendoff & Audring 2020: 41) since knowledge of whether a construction can be extended to new instances must be part of its mental representation. Since quantitative measures of morphological productivity are highly contested in the literature (Plag 1999: 5–35; Bauer 2005: 315–16; Schröder & Mühleisen 2010: 44), two measures will be calculated and subsequently compared. I will first determine the construction's potential productivity, which is calculated by dividing the hapax legomena of a schema by the number of its tokens (Baayen 2009: 902). The second measure to be calculated is the type-token ratio, calculated by dividing the number of types by the number of tokens (Goldberg 2019: 68). These ratios take into account the negative effect of highly frequent and entrenched types to the productivity of a schema. The schematicity or variability of the open slot, i.e. the range of words that are attested to unify with the construction, is another important factor in a construction's productivity as it may restrict potential new bases (Bybee 2010: 95). The selectional restrictions will be identified through a qualitative bottom-up semantic analysis of existing types since restrictions are very fine-grained and not made apparent through applying an already existing typology, though Levin's (1993) classification of verbs will be made use of where possible. Extended senses of the construction, which are instantiated by, e.g. conceptual metaphor or polysemy (Lakoff & Johnson 2003; Lehrer 2003; Bauer *et al.* 2013: 641), will similarly be identified in a bottom-up manner and related to the concrete senses of the construction through metaphor or polysemy links (Goldberg 1995: 72–81; Hilpert 2019: 57–65).

3. The *up*-x construction

3.1. Preliminary remarks

Marchand's classification of preparticle types can directly be applied to *up* but requires an additional schema to be able to account for all types. For the first mentioned schema, Marchand (1969: 112) argues that the prepositional type is derived from a periphrastic phrasal expression, e.g. *up the stairs* in case of *upstairs.* Bauer *et al.* (2013: 344), too, argue that these words 'are distributionally identical to prepositions or prepositional phrases'. However, from a constructionist perspective that favors surface generalizations (Goldberg 2006: 25), we may assume that speakers have stored a surface pattern that can be extended to new instantiations without having to assume derivations from periphrastic variants – some instantiations cannot be accounted for by derivation (*?up the breeze*). However, it is easily discernible that this subschema exclusively selects nouns for its open slot: In the periphrastic variant, *up* is the head of a prepositional phrase, which prototypically embeds noun phrases headed by a noun, the second element of the construction:[6]

(2) $[[\text{up}]_{\text{PREP}}\ [\text{X}]_{\text{N}}] \rightarrow$ *upstairs* (up_{Prep} *the stairs*$_{\text{N}}$)

[6] The syntactic category of the complex word will be specified below based on the corpus findings.

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The adjectival schema can easily be paraphrased, as well. Marchand (1969: 121) suggests that this type can be subdivided into two schemas where *up* assumes different meanings, namely 'upper' (*upside*) and, as an extension, 'going upward' (*uproad*). Here, *up* modifies a noun:

(3) $[[\text{up}]_{\text{ADJ}}\ [\text{X}]_{\text{N}}] \rightarrow$ *upside* (*upper*$_{\text{Adj}}$ *side*$_{\text{N}}$)

In the 'adverbial force' type, the prefixoid approximates the function of an adverb in relation to the following verb, similar to particle verbs:

(4) $[[\text{up}]_{\text{ADV}}\ [\text{X}]_{\text{V}}] \rightarrow$ *uplifting* (*to lift*$_{\text{V}}$ *upwards*$_{\text{Adv}}$)

A function of *up* that Marchand does not distinguish is its verbal function meaning 'raise', which is also attested in unbound uses (*up the ante*). When *up* functions as a verb, the variable must have a nominal predication and describe the entity that is being raised, similar to a direct object with THEME-semantics in a transitive construction:

(5) $[[\text{up}]_{\text{V}}\ [\text{X}]_{\text{N}}] \rightarrow$ *upgrade* (*to up*$_{\text{V}}$ 'raise' *the grade*$_{\text{N}}$)

The posited schemas also distinguish meaning:

(6) (a) The big man turned to her, briefly, and then started to run **upslope**, jumping from rock to rock, towards the line of Counsellors. (BNC F9X, written books and periodicals)
(b) Another photo showed that the aircraft had clipped off the tops of at least two tree [sic!] before it impacted the 50-deg. **upsloping** rock-encrusted mountainside. (BNC EWS, written books and periodicals)

(7) (a) An important rule when beating into a current flowing across the upwind leg is always to sail the tack that takes you **uptide** of the mark first. (BNC AT6, written books and periodicals)
(b) In those days, there existed no bridges across the River Thames above the old London Bridge and the ferry at Chiswick was much favoured because it was found that the Eyot broke the stream during **up-tide**. (BNC ALY, written books and periodicals)

The first examples are instantiations of the prepositional schema respectively: *upslope* (6a) and *uptide* (7a) construe the nouns as a path along which an entity moves. *Upsloping* (6b), as an instantiation of the adverbial schema, selects the verbal member of the polysemous category *slope*; *up-tide* (7b) is part of the adjectival schema since up functions like an attributive adjective to tide ('high tide').

Based on Marchand's categorization and the fourth subschema suggested above, in figure 1 we assume a hierarchical network model of the *up*-x construction.

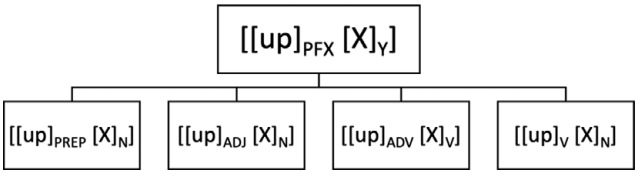


Figure 1. Hierarchical network model of the *up*-x construction

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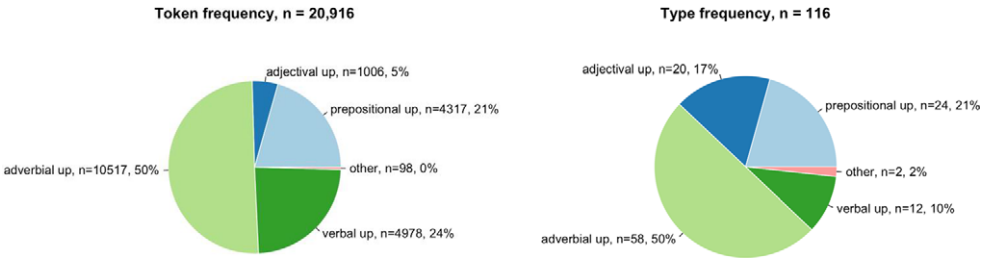


Figure 2. Distribution of tokens and types into the subschemas of the *up*-x constructional idiom

3.2. *Data extraction*

The search in the BNC for words starting with *up* yielded 263,046 tokens. After false positives and instances of unbound *up* were removed, 20,916 tokens remained. All tokens were then categorized into the four schemas given above by assessing which syntactic relational structure proposed by Marchand can account for their semantics, as shown in figure 2.

About half of the types and tokens found in the BNC instantiate the adverbial *up* subschema, accounting for prefix verbs (*uplift*) as well as verb-based nouns (*upheaval*, *upbringing*) and participles (*uplifting*, *upset*). Almost a quarter of the tokens and 10 percent of types are prefix verbs (*uproot*) and verb-based nouns (*upgrade*) of the verbal *up* subschema. The prepositional *up* subschema is instantiated by 21 percent of types and tokens, made up by mostly adjectives and adverbs (*upstairs*, *upriver*). The adjectival *up* subschema is the smallest of the four, made up by only 5 percent of the tokens but 17 percent of the types, which are mostly nouns (*upland*, *upside*). A total of 112 variables were found to unify with the constructional idiom, four of which occur in two schemas and have different meanings respectively.[7] Two types (*upmost, uptight*) with 98 tokens in total elude classification. I now discuss the four subschemas individually.

3.3. *Prepositional* up*: type* upstairs

This subschema is instantiated by 24 types, including 7 hapax legomena and 4,317 tokens in the BNC. Depending on their usage, instantiations of this subschema can function as adjectives (*upstairs bedroom*) or adverbs (*go upstairs*); some can also be used as nouns (*the upstairs*). Let us now turn to the nouns that are attested in this subschema and the strength with which they are attracted to the construction. Table 1 shows the frequency of each base in the corpus, its observed frequency in the *up*-x construction, its expected frequency in the construction if the collexeme were distributed equally in the corpus, the association (attraction or repulsion), the log-likelihood value indicating the collostructional strength as well as its significance.

Some of the most significantly attracted and repelled collexemes suffice to illustrate the meaning of this schema. *Stairs* is not only the word with the highest raw frequency but it is also the word with the highest collostructional strength. This is not surprising, considering that stairs are prototypically vertical. The prefixoid *up* specifies the direction of the path along this vertical axis. What follows is that the variable must code some vertical path. Other types of this kind include *uphill* and *upslope.*

Verticality gives rise to metaphorical extensions (see Goldberg 1995), here licensed by the GOOD IS UP metaphor (Lakoff & Johnson 2003: 18):

[7] In addition to *upslope* and *uptide* given in section 3.1, the other two types that occur twice are (a) *upbeat* 'cheerful' (adjectival *up*) and 'upward-directed beating' (adverbial (*up*); (b) *upsides* 'alongside' (prepositional *up*) and *upside* 'upper side/advantage' (adjectival *up*).

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Table 1. Results of the simple collexeme analysis for the prepositional *up* subschema

	Collexeme (base)	Corpus frequency	Observed frequency in construction	Expected frequency	Association	Collostr. strength (logl.)	Significance
1	stairs	9,430	2,633	2	attr	33,709.19	*****
2	stream	7,103	420	1.5	attr	3,923.08	*****
3	hill	12,264	365	2.6	attr	2,898.71	*****
4	market	45,936	274	9.8	attr	1,302.81	*****
5	stage	22,669	148	4.8	attr	728.77	*****
6	front	26,475	142	5.6	attr	645.19	*****
7	river	12,440	87	2.6	attr	439.79	*****
8	wind	11,767	52	2.5	attr	216.74	*****
9	town	23,362	41	5	attr	101.03	*****
10	field	27,768	30	5.9	attr	49.32	*****
11	slope	3,029	6	0.6	attr	16.06	****
12	state	63,784	29	13.6	attr	13.18	***
13	scale	12,872	8	2.7	attr	6.62	*
14	gradient	717	1	0.2	attr	2.07	ns
15	channel	6,745	3	1.4	attr	1.29	ns
16	breeze	1,564	1	0.3	attr	0.87	ns
17	country	52,539	14	11.2	attr	0.65	ns
18	dip	1,852	1	0.4	attr	0.65	ns
19	tide	2,545	1	0.5	attr	0.31	ns
20	valley	5,421	1	1.2	rep	0.02	ns
21	lake	5,441	1	1.2	rep	0.02	ns
22	sun	27,865	2	5.9	rep	3.52	ns
23	side	106,879	10	22.8	rep	9.08	**
24	water	46,087	1	9.8	rep	13.06	***

(8) Rover's management declared its intention to move all its cars **up-market**, perhaps to produce them in smaller volumes than in the days of Austin Rover, to charge higher prices and make more. (BNC A5H, written books and periodicals)

(9) Marketing will focus on what Americans call the '**upscale**' consumer: 'youthful, affluent, success and status-oriented'. (BNC B71, written books and periodicals)

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Similarly to entities with concrete elevation like *stairs* or *hill*, *market* (8) and *scale* (9) are understood as metaphorical vertical axes.[8] Here, *up* describes the direction along a vertical axis of quality where the topmost point denotes the highest possible quality. This can be a reference to a higher point along this vertical path (8) or the topmost point along this path (9).

In contrast, there are three types which also have a high degree of collostructional strength and do not describe a vertical but a horizontal path. First, in instantiations like *uptown*, *upcountry* or *upstate*, *up* means 'north', which is motivated by the way that cardinal directions are typically represented on maps.[9] Consequently, nouns that occur in this subschema are bounded (political) locations with an unambiguous north on maps. Second, in *upstream* and *upriver*, the uppermost point is not the northernmost point but the source – a point located upstream is therefore closer to the source and simultaneously at a higher altitude. However, because moving upstream does not necessarily entail vertical movement, moving upstream more directly entails horizontal movement against the current. Cruse (1986: 224) explains the experiential basis for this metaphor by arguing that 'the direction of the tractive force of the water is seen as analogous to the pull of gravity'. The same applies to currents of air: *upwind* and *upbreeze* do not entail an elevated source; moving *upwind* also means moving against the wind. This cluster therefore selects moving bodies of water or air with a current.

Consequently, the fact that *water* is repelled by this constructional schema is not unexpected. The only instantiation in the BNC is from a poem:

(10) and the blackness // Breaks to gold: was that it? // Yes: and I am that salmon // You saw, swimming **upwater** // And as gold as the Word is // In Love, and fire, and water // There is only the source (BNC B1C, written books and periodicals)

Even creative instantiations often comply with the constraints of a schema.[10] Gathering from the context, *upwater* can be read as *upriver*. However, *water* is a mass noun that does not profile a source or current. The construction coerces *water* into a topographical interpretation as a moving body of water; concrete vertical movement such as movement from the ground to the surface of the water is not expressed.

The third extension of this schema that does not code verticality is instantiated by types like *upstage* and *up-field.* In *upstage*, the top of the stage is construed as the point farthest away from the audience. This is motivated because the horizon – and, in this case, the back of a stage from the perspective of the audience – appear farther up:

(11) When I came on stage, the piano had been turned round the other way. The lid opened **upstage** so all the sound was thrown up the back wall. (BNC CAS, written books and periodicals)

(12) Under the new system the centre-half's only occasion for going **up-field** was to force the attack to make up goals lost. (BNC B0L, written books and periodicals)

[8] Metaphor links were only posited where prepositional *up* designates a metaphorical axis. Metaphorical uses of the entire instantiation, e.g. *uphill battle*, are manifold but retain the concrete vertical sense of *up.*

[9] Some of these examples also have other, less compositional meanings. *Uptown*, as a reviewer pointed out, also means 'residential area'.

[10] Following Construction Morphology (Booij 2010: 89), cognitive grammar (Langacker 1987: 477) and usage-based theory (Bybee 2013: 59), no distinction is made between analogy and morphological productivity or, in other words, patterns of coining and constructions as assumed by some Construction Grammars (Fillmore 1997; Kay 2013). Creative coinages are therefore not discarded; no difference is made between 'plain' and 'expressive' morphology (Zwicky & Pullum 1987). Instead, following Plag (1999: 13–14), I assume that even coinages produced for a certain effect make use of productive word-formation processes or schemas.

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Whereas the only possible perspective of *upstage* (11) is that of the audience, the perspective of *up-field* (12), where *field* designates a playing field, is less fixed. It is typically that of the speaker, i.e. the audience or commentator, or the moving entity, i.e. the players on the field. Movement *up-field* entails movement towards the opponent's half of the playing field and therefore farther away from the subject's point of origin. *Uplake* is also an instantiation of this cluster, though repelled. This can be accounted for by the fact that a lake does not have any natural perspective to take, unlike *stage* or *field.* Here, *up* simply denotes a point farther away from the point of origin, which is understood through the context. Like with *upwater*, the base is coerced to fit the semantics of the construction.

Unlike the other types, *upstage* is also attested as a verb in the sense of 'steal the show', accounting for its high token frequency and high degree of collostructional strength. The verbal meaning is diachronically related to 'up the stage', since, according to the *OED*, it originally meant '[t]o move upstage of (another actor), forcing him to face away from the audience'. Synchronically, however, the verb is likely accessed whole by speakers and not fully compositional, mirrored by the fact that verbal use of this subschema is not attested for other types in the BNC.

Upfront and *upsides* are, despite the high frequency of the former, cases that are not sufficiently compositional. While formulating the periphrastic variant is not possible, their categorization as prepositional types is supported by the fact that they can be roughly paraphrased by the preposition *at* where the second elements act as reference points.

Based on the prototype *upstairs*, we can now posit the following schema with a prototypical meaning and meaning extensions, where each extension has its own constraints and selects variables from distinct semantic clusters:

(13) $[[\text{up}]_{\text{PREP}}\ [\text{X}]_{\text{Nj}}]_{\text{k}} \longleftrightarrow [\text{higher along SEM}_{\text{j}}]_{\text{k}}$ (*upstairs*)
- (a) $[[\text{up}]_{\text{PREP}}\ [\text{X}]_{\text{Nj}}]_{\text{ADJ/ADVk}} \longleftrightarrow [\text{better along SEM}_{\text{j}}]_{\text{k}}$ (*upscale*)
- (b) $[[\text{up}]_{\text{PREP}}\ [\text{X}]_{\text{Nj}}]_{\text{ADJ/ADVk}} \longleftrightarrow [\text{farther north in SEM}_{\text{j}}]_{\text{k}}$ (*uptown*)
- (c) $[[\text{up}]_{\text{PREP}}\ [\text{X}]_{\text{Nj}}]_{\text{ADJ/ADVk}} \longleftrightarrow [\text{farther to the source of SEM}_{\text{j}}]_{\text{k}}$ (*upstream*)
- (d) $[[\text{up}]_{\text{PREP}}\ [\text{X}]_{\text{Nj}}]_{\text{ADJ/ADVk}} \longleftrightarrow [\text{farther away in SEM}_{\text{j}}]_{\text{k}}$ (*upstage*)

Note that the syntactic category of the complex word is not identical to the syntactic category of the base, contrary to the predictions of the righthand head rule, but is specified independently. Constraints on the word class of the base emerge based on the assumed word class of the prefixoid or, in other words, the relational structure of the subschema. The prepositional subschema requires a nominal base for the reasons described above. Corpus data show that the complex words instantiating this subschema are mainly adjectives and adverbs. While distinct groups of output syntactic categories can be assigned to each of the subschemas (see Marchand's original classification in section 1), they do not preclude idiosyncratic uses or conversions – for example, *upstairs* is often found in nominal and *upstage* in verbal uses.

3.4. *Adjectival* up*: type* upland

The adjectival *up* subschema is composed of 20 types, 7 of which are hapax legomena, and 1,006 tokens in total (see table 2). The relatively large number of low-frequency types can be taken as an indicator of a high degree of productivity, which will be examined below.

Upland, the instantiation with the highest token frequency and the highest degree of attraction, is an instantiation where *up* means 'upper' (Marchand 1969: 121) and describes lands of high altitude (14). The same applies to the highly attracted *upside*, which designates the upper side of some entity, though most often used metaphorically as 'advantage, positive side' or in combination with *down.*

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Table 2. Results of the simple collexeme analysis for the adjectival *up* subschema

	Collexeme (base)	Corpus frequency	Observed frequency in construction	Expected frequency	Association	Collostr. strength (logl.)	Significance
1	land	48,064	609	10.4	attr	3,786.69	*****
2	beat	11,906	110	2.6	attr	612.90	*****
3	side	106,879	190	23.1	attr	468.63	*****
4	draught	933	14	0.2	attr	91.35	*****
5	tempo	11,782	18	2.5	attr	39.54	*****
6	light	38,719	30	8.4	attr	33.39	*****
7	escalator	135	2	0	attr	13.00	***
8	goods	371	1	0.1	attr	3.21	ns
9	penalty	3,797	2	0.8	attr	1.21	ns
10	bullet	1,253	1	0.3	attr	1.16	ns
11	tide	2,545	1	0.5	attr	0.30	ns
12	pipe	6,690	2	1.4	attr	0.19	ns
13	problem	57,104	10	12.3	rep	0.47	ns
14	branch	9,139	1	2	rep	0.59	ns
15	wave	10,873	1	2.3	rep	0.99	ns
16	current	23,608	2	5.1	rep	2.46	ns
17	level	41,402	1	8.9	rep	11.51	***
18	line	62,824	1	13.6	rep	19.94	*****
19	man	149,540	2	32.3	rep	49.54	*****
20	time	226,720	8	49	rep	53.07	*****

The question may arise why *upland* is not an instantiation of the *upstairs* subschema, considering that *land* also denotes a location. Two examples – one from the BNC and one from the *Timestamped JSI Web Corpus 2014–2021* (Sketch Engine: Timestamped JSI Web Corpus n.d.; Bušta *et al.* 2017) – illustrate this:

(14) Will he bring home to Ministers on the continent the fact that the headage basis would prove devastating for hill and **upland** farmers in the United Kingdom and will he do everything possible to make those Ministers see our point of view? (BNC HHV, written miscellaneous)

(15) According to him, attention is given to the high risk communities and council areas as the agency and its stakeholders spread the warning message and need for those in flood plain/prone areas to relocate **up-land** to safer ground. (JSI 6181586615)

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In the BNC, *upland* (14) is not attested in the sense of moving 'up the land'. In contrast, *up-land* (15) indeed makes reference to a path toward some higher part of the land and is attested in low frequencies in bigger corpora. We may consider this instantiation of the prepositional *up* schema evidence of its availability and the fact that *land* loosely fits the constraints of this schema. However, low frequencies are to be expected since *land* neither clearly encodes elevation like *hill*, licensing vertical movement, or is a clearly bounded (political) territory like *country*, licensing the north-interpretation.

The 'upper' subschema has a variety of metaphorical extensions. For instance, *uptempo* and *uptime* are licensed by HEIGHTENED ACTIVITY IS UP (Lee 2001: 36). The repulsion of *time* may be due to the fact that *uptime* is a technical term used in programming. This metaphor or, alternatively, HAPPY IS UP, may also account for the highly attracted *upbeat*. *Uplevel* is licensed by GOOD IS UP where levels are construed as grades on a vertical scale.

The second subschema that Marchand (1969: 121) notes, the 'upwards' schema, is connected to the 'upper' schema by a polysemous relation where the endpoint of the path is related to the path itself (Börger 2007: 63). Instead of specifying an 'upper' part of an entity, *up* here describes an upward-directed entity. This subschema is instantiated by, amongst others, *up-draught* (16), *uplight* (17) and *up-escalator* (18). Though superficially similar to *upstairs*, *up-escalator* refers to an escalator going upwards, *up* here specifying a property of the base, rather than a higher floor of a building, construing the escalator as a path. Similar to the 'upper' schema, the nouns that unify with this subschema are very heterogeneous and do not allow for a delimitation of a semantic class for this open slot, resulting in high semantic variability. The similarities they share is that they are nouns that describe entities that extend in space and whose orientation can vary:

(16) So the black-backed gulls wait for them in the air in front of the cliffs, wheeling and circling on the **up-draught** created as the wind, blowing in from the sea, is deflected upwards. (BNC F9F, written books and periodicals)

(17) A good mixture of **uplights** and downlights supplemented by spot and reading lights will give a particularly warm and interesting atmosphere to a room. (BNC HGW, written books and periodicals)

(18) As I ride the **up-escalator**, I see that the down-escalator is out of service. (BNC A2L, written books and periodicals)

We can now posit the following schema with meaning extensions:

(19) $[[up]_{ADJ}\ [X]_{Nj}]_{Nk} \longleftrightarrow [\text{upper SEM}_j]_k$ (*upland*)
a. $[[up]_{ADJ}\ [X]_{Nj}]_{Nk} \longleftrightarrow [\text{heightened SEM}_j]_k$ (*uptempo*)
b. $[[up]_{ADJ}\ [X]_{Nj}]_{Nk} \longleftrightarrow [\text{better SEM}_j]_k$ (*uplevel*)
c. $[[up]_{ADJ}\ [X]_{Nj}]_{Nk} \longleftrightarrow [\text{upward-oriented SEM}_j]_k$ (*up-draught*)

3.5. Adverbial up*: types* upheave *and* upset

The last type that Marchand identifies, which he terms 'adverbial force' and assigns to verb-related syntactic categories, makes up 50 percent of the overall type and token frequency of the construction. This cluster includes verbs, verbal nouns, deverbal impersonal and personal nouns, as well as past and present participial adjectives

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Table 3. Results of the simple collexeme analysis for the adverbial *up* subschema (types where verbal use only is attested)

	Collexeme (base)	Corpus frequency	Observed frequency in construction	Expected frequency	Association	Collostr. strength (logl.)	Significance
1	set	70,089	3,580	15.1	attr	32,838.53	*****
2	hold	74,972	1,144	16.2	attr	7,564.62	*****
3	right	121,561	1,284	26.3	attr	7,563.59	*****
4	holster	517	369	0.1	attr	5,616.17	*****
5	lift	11,275	552	2.4	attr	4,929.89	*****
6	heave	16,404	470	3.5	attr	3,685.15	*****
7	rise	35,855	432	7.7	attr	2,639.48	*****
8	turn	93,114	445	20.1	attr	1,916.73	*****
9	braid	354	29	0.1	attr	289.02	*****
10	start	77,039	85	16.6	attr	140.76	*****
11	raise	21,595	34	4.7	attr	76.46	*****
12	haul	2,452	11	0.5	attr	45.84	*****
13	regulate	11,640	14	2.5	attr	25.12	*****
14	load	8,979	11	1.9	attr	20.07	*****
15	link	16,821	5	3.6	attr	0.46	ns
16	ski	2,348	1	0.5	attr	0.37	ns
17	chat	2,750	1	0.6	attr	0.23	ns
18	build	52,624	5	11.4	rep	4.53	*

(Marchand 1969: 109). It is also the only subschema that selects verbs for its open slot. In the BNC, it consists of 58 types, 11 of which are hapax legomena, with 10,517 tokens (see table 3).

Marchand (1969: 109) only classifies those words as participial adjectives and verbal and deverbal nouns where the corresponding verbal use is not attested, such as *downcast*, *oncoming* and *outlook.* In the present article, too, nouns and participles that exist alongside a verb are considered part of the type 'verb', such as $upload_{V}$, $upload_{N}$ and $uploading_{N}$. This type is closely related to particle verbs: Marchand (1969: 110) claims that participial adjectives as well as verb-related nouns are transposed particle verbs and Bauer *et al.* (2013: 442) argue that participial adjectives are created through inversion: For example, particle verbs in relative clauses (*knees that are raised up*) are easily rephrased as participial adjectives with prefixal up (*upraised knees*). I will only consider instantiations that also occur in verbal use (e.g. *I upraise my knees*) for the collostructional analysis to warrant a semantic analysis that is as little contaminated by particle verbs as possible. Though a constructionist account rejects derivations and focuses on surface forms (Goldberg 2006: 25), an analysis in

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terms of overlapping paradigms forming the same participial adjectives may indeed be possible and remains a topic for future research.[11]

Two polysemous subschemas become apparent, the first instantiated by the highly attracted *upset*, the second by *upheave* and *uplift.* The latter is the most semantically transparent despite its lower collostructional strengths. The collexeme that best exemplifies the semantics of this subschema is *heave*, which occurs predominantly in the derived noun *upheaval* but is also attested in verbal use. *Heave* can be classified as coding the cause of some motion without specifying a direction (Levin 1993: 136) and relates 'to the exertion of a force' (Levin 1993: 137). The direction of movement – an upward path – is specified by the first part of the construction. Both the verb *heave* as well as the meaning component of *up* involve physical effort for upward movement against the forces of gravity. Transitive and intransitive verbs of inherently directed motion like *lift* or *rise* (Levin 1993: 114, 264) can also unify with this construction. Like Scheible (2005: 191) notes, verbs that contradict the upward path specified by the prefixoid cannot unify with this construction (e.g. **uplower*).

Thus, we can posit a subschema where the base codes the means of upward movement:

(20) $[[\text{up}]_{\text{ADV}}\ [\text{X}]_{\text{Vj}}]_{\text{Vk}} \longleftrightarrow [\text{move upward by MOVE-MEANS}_{\text{i}}]_{\text{k}}$

This accounts for the attraction of *hold*, which describes 'prolonged contact with an entity' (Levin 1993: 145). The construction profiles a meaning of *hold* that includes an exertion of force against the forces of gravity, like the prototypical variable *heave.* In other words, an entity is held or sustained against an inverse force – gravity or social forces – though not moved upward.

The repelled variable in this subschema, *build*, as well as the least attracted collexeme *chat* do not describe upward movement, which may be taken as a reason for their lack of attraction to the constructional schema. In *upchat*, *up* approximates the meaning of 'approach'. This type also exists as a particle verb (*chat up*). The classification of *upbuild* into the group of verbs must be taken with a grain of salt since the only occurrence in verbal use is a biblical quote:

(21) '[...] we are to grow up in every way into him who is the Head, into Christ from whom the whole body, joined and knit together by every joint with which it is supplied, when each part is working properly, makes bodily growth and **upbuilds** itself in love'. (Eph. 4.15–16). (BNC B05, written miscellaneous)

The other exemplars of this type are verbal nouns and present participial adjectives. However, *build* as a verb of creation (Levin 1993: 174) can readily be construed as the means of upward movement of the constructed entity.

Some of the most attracted collexemes, i.e. *upset*, *upturn* and *upright*, instantiate a polysemous extension of this subschema that does not entail upward movement:

(22) 'She doesn't always have to **upset** the table, though, when she is there, does she?' (BNC A0D, written books and periodicals)

Upset, upturned and uprighted entities do not experience vertical movement per se. Instead, only a part of the entity, here the legs of the table (22), are moved upward, resulting in the rotation of the entity. We can thus posit a polysemous extension of the kind pars pro toto:

[11] Examples of types that do not occur in verbal use in the BNC are *upbringing*$_{\text{N}}$, *upcoming*$_{\text{present part}}$ and *upswept*$_{\text{past part}}$. Categorization into the same schema is warranted since (i) these types instantiate the MOVE-MEANS pattern and (ii) are attested as verbs in larger corpora.

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Table 4. Results of the simple collexeme analysis for the verbal *up* subschema

	Collexeme (base)	Corpus frequency	Observed frequency in construction	Expected frequency	Association	Collostr. strength (logl.)	Significance
1	date	27,159	2,892	5.9	attr	30,828.79	*****
2	grade	16,169	1,667	3.5	attr	17,550.88	*****
3	root	6,491	209	1.4	attr	1,685.30	*****
4	rate	34,662	110	7.5	attr	386.92	*****
5	end	77,440	79	16.7	attr	120.93	*****
6	specification	2,099	3	0.5	attr	6.25	*
7	skill	15,111	7	3.3	attr	3.21	ns
8	skirt	3,001	1	0.6	attr	0.16	ns
9	hook	3,144	1	0.7	attr	0.13	ns
10	size	16,519	4	3.6	attr	0.05	ns
11	seat	12,825	1	2.8	rep	1.50	ns
12	value	41,785	4	9	rep	3.55	ns

(23) $[[\text{up}]_{\text{ADV}}\ [\text{X}]_{\text{Vj}}]_{\text{Vk}} \longleftrightarrow [\text{rotate by MOVE-MEANS}_{\text{j}}]_{\text{k}}$

The highly attracted *upset* exhibits limited compositionality and is primarily used metaphorically. The subschema's opacity is reflected in its low variability and small number of high-frequency types, hindering the creation of new forms. This illustrates the challenge for collostructional analyses of morphological constructions: despite its strong association, *upset* is a poor central member or constructional semantic prototype based on which the schema can be extended, let alone sufficiently described.

3.6. *Verbal* up*: type* uproot

The fourth subschema comprises 12 types, 3 of which are hapax legomena, and 4,978 tokens in total (see table 4). It was argued above that *up* has verbal properties while the second element functions as a direct object with THEME-semantics. Indeed, in cases where the second element may be a conversion, only the meaning of the nominal counterpart seems to be referred to. For example, the *OED* suggests that *grade* in *upgrade* is a noun. Similarly, as Marchand (1969: 121) argues, *upend* originates from the phrase 'up end', meaning 'turn the end upwards'.[12] Let us now turn to their collostructional strengths.

The most attracted collexeme with a non-metaphorical meaning is *root*, which lends itself well to illustrate the semantics of this subschema:

(24) She had already spent an hour weeding and was determined to **uproot** a particularly tough dandelion. (BNC HA7, written books and periodicals)

[12] Note that these verbs do not have particle verb counterparts. Where particle verb variants are possible (e.g. *end up*, *size up*), meanings differ substantially from their prefixed counterpart.

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Though often used metaphorically, *uproot* has the concrete sense of 'raising the roots (of a plant)' (24). Despite the fact that both schemas output verbs, participials and verbal and deverbal nouns, the difference between the adverbial and verbal *up* schemas is that in the former, the variable describes the means of an upward movement whereas the variable in the latter describes the affected entity that experiences upward movement.

Metaphor links within this construction are licensed by, amongst others, *upgrade*, which is strongly attracted by the construction. The *OED* even defines *upgrade* along the lines of the schema proposed here, as '[t]o raise (something, esp. equipment or facilities) from one grade to another'. The fact that a higher grade is equated with higher quality is licensed by the metaphor GOOD IS UP, which construes improvement as an upward movement. The same applies to *upskill*, *uprate* and *upvalue.* Similarly, *upsize* is licensed by MORE IS UP.

Having claimed that the variable is the entity being raised and has object-like status, the fact that some output verbs themselves allow for a direct object requires an explanation. Take, for instance, *uproot* (24). Here, the roots are a part of the uprooted dandelion. This also accounts for the attraction of *upend*, where the variable inherently codes a part of an unspecified whole. We can assume that the entity being raised prototypically describes a part of the direct object affected by the action. This is similar in metaphorical extensions, which are often motivated by their source domain, here physical entities: Variables in metaphorical instantiations like *upgrade* describe a characteristic or quality of the affected entity.

Update, though with the highest degree of attraction, does not align with this schema and is not fully compositional. The *OED* relates *update* to 'up to date'. As a non-transformational account, Construction Morphology does not posit a derivation from *up to date* to *update.* Its categorization into this subschema is merited only due to the lexical category of the base and semantic interpretation of the complex word; it is the date that is affected by some action coded by *up.*

Upskirt, which is not highly attracted to the construction, is also an especially interesting case and can be argued to have the potential to belong to multiple schemas. The single occurrence attested in the BNC is an instantiation of the *uproot* pattern:

(25) So when the wind blows and the rain descends, as it has this week, you are not only **upskirted** and damp, but you feel guilty too. (BNC A4U, written books and periodicals)

Here, being *upskirted* denotes the action of one's skirt being raised by the wind; *up* has the non-metaphorical meaning 'raise', like in *uproot.* This example differs from modern uses of *upskirt* as the practice of taking photographs under clothing as a form of sexual harassment (26). This meaning of *upskirt* is an instantiation of the *upstairs* schema:

(26) A 'Peeping Tom' who secretly took **upskirt** snaps of women on a subway train will not be prosecuted because a legal loophole means he has not broken the law. (JSI 164990921)

This instantiation can be paraphrased by 'up the skirt'; the skirt acts as a vertical path along which the entity moves. The different subschemas of the *up*-x construction where the prefixoid functions like different syntactic categories can therefore select from the same semantic clusters of words but require different semantic relations between the prefixoid and the second element.

Taking these results into account, we can posit the following schema with metaphorical extensions:

(27) $[[\text{up}]_V\ [X]_{Nj}]_{Vk} \longleftrightarrow [\text{raise SEM}_j]_k$ (*uproot*)
(a) $[[\text{up}]_V\ [X]_{Nj}]_{Vk} \longleftrightarrow [\text{improve SEM}_j]_k$ (*upgrade*)
(b) $[[\text{up}]_V\ [X]_{Nj}]_{Vk} \longleftrightarrow [\text{increase SEM}_j]_k$ (*upsize*)

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Table 5. Productivity measures of the subschemas in comparison

Subschema	Types	Tokens	Hapax legomena	Type–token ratio	Potential productivity
prepositional *up*	24	4,317	7	0.00556	0.00162
adjectival *up*	20	1,006	7	0.01982	0.00696
adverbial *up*	58	10,517	11	0.00551	0.00105
verbal *up*	12	4,978	3	0.00241	0.00060

4. Productivity

Quantitative measures of productivity can give a good estimation of the extensibility of the subschemas, as seen in table 5 and figure 3.

Quantitative measures of productivity cannot be compared with similar measures from different corpora, nor are there thresholds that would enable us to deem a subschema productive. Nonetheless, both quantitative measures used in the present study show the same tendency and can readily be accounted for by the semantic clusters identified above: the adjectival *up* subschema is the most productive of the four despite its relatively low type frequency. As was shown above, this subschema has a high variability as it selects from a heterogeneous group of nouns that can be imagined as a loose semantic cluster with high schematicity. This confirms the claim made by Marchand (1969: 112) that word-formation with *up* in adjectival functions is fairly productive.

The prepositional *up* subschema, though with a slightly higher type frequency, is less than half as productive. The nouns that are selected by this subschema are less heterogeneous and more semantically similar since they must code a location, resulting in smaller semantic variability. Bauer *et al.*'s (2013: 344) argument in favor of the productivity of prefixal *up* with 'topographical nouns' is mirrored in the results of this subschema having a medium degree of productivity relative to the other subschemas – this schema can be extended, but only within the schema's tight selectional restrictions. This is a case in point for theories arguing that

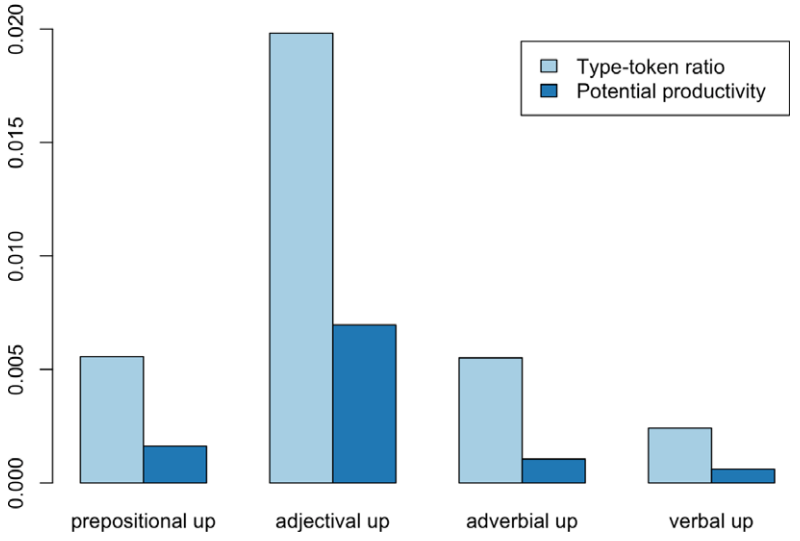


Figure 3. Type–token ratio and potential productivity of the subschemas

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schemas are productive when the category of existing and possible bases is relatively well defined (Bybee 2010: 69), even if their type frequency is relatively low (Barðdal 2008). To illustrate, the category of bases of bounded political territories (*uptown*, *upstate*) is relatively small but is easily extensible using semantically similar nouns (e.g. *up-province*, JSI 208780758). This form of productivity arising from schemas with high semantic coherence and low type frequency is often termed analogy (Barðdal 2008: 38; Bybee 2010: 69).

The adverbial *up* subschema is approximately as productive as the prepositional *up* subschema. It may be only moderately productive due to its relation to particle verbs, blocking the formation of prefixed verbs, which must remain subject for future research. As was described above, it selects verbs that can be construed as encoding a means of movement, making this class relatively open. As predicted by Barðdal (2008: 38), relatively open schemas with a high type frequency like the given subschema may be equally as productive as schemas with a lower type frequency and a higher degree of semantic coherence, like the prepositional *up* subschema.

Finally, as was to be expected, the least productive subschema is the verbal *up* subschema, which only has twelve types and a high token frequency per type, resulting in low variability.

5. Conclusion and outlook

As this article has shown, the locative prefixoid *up* has a wide array of idiosyncrasies that remain undetected when examined only in the context of prefix verbs. By carefully teasing apart constructional schemas with different morphosemantics and identifying polysemous and metaphorical meaning extensions of verticality, we can determine clusters of words whose properties allow unification with the construction.

Collostructional analyses have primarily been applied to syntactic rather than morphological constructions. A limitation of this method to complex words is that these are often not fully compositional when compositionality is defined as 'the degree of predictability of the meaning of the whole from the meaning of the component parts' (Bybee 2010: 45) rather than the mere recognition of its component parts. Marslen-Wilson *et al.* (1994: 21) show that in cross-modal repetition priming tasks, synchronic semantic transparency between stem and prefixation is a prerequisite for priming and is therefore necessary to posit a link between collexeme and construction. Non-compositional types (e.g. *upstage*) may be stored as monomorphemic words and may not contribute to the schema's productivity. High-frequency types, often ranked highly in collostructional analyses, may also be entrenched and accessed as lexicalized chunks, interfering with their being central members. Hence, a qualitative interpretation of the results and identification of possible constructional semantic prototypes is crucial. Even though collostructional analysis, particularly when applied to morphological constructions, faces challenges regarding the non-compositionality of highly attracted types, it remains an established method in constructionist research (see Hartmann 2019 for an application to morphological constructions; more recently Van Goethem & Norde 2020; Hartmann & Willich 2024) despite the harsh criticism it has faced (e.g. Bybee 2010; Schmid & Küchenhoff 2013; Küchenhoff & Schmid 2015; see rebuttals in Gries 2012; 2015). While ranking the types by simple frequency of occurrence, which is often cited as a preferable alternative (e.g. Bybee 2010), would also yield possibly non-compositional prototypes, considering expected frequencies of bases aligns with cognitive linguistic principles such as conditional probabilities and associative learning measures (Gries 2012: 496). Ultimately, rather than claiming to describe psychological reality, the method aims to provide statistical support for a theoretical model informed by insights from cognitive and usage-based linguistics, such as frequency effects. Further psycholinguistic research is

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needed to address the compositionality of the *up*-x construction as well as the implications of this shortcoming for collostructional analyses in general.

As was shown by the instantiations potentially belonging to multiple subschemas, like *upland* and *upskirt*, the subschemas do not select from distinct semantic clusters but rather refer to distinct semantic components from their bases. This type of coercion has its limits, though, and this phenomenon is not very frequent in the data (see also Kawaletz & Plag 2015 for a discussion of how different polysemous meanings of derivatives select for a different pool of bases). Nonetheless, as suggested by a usage-based exemplar model (Bybee 2010: 88, 90), it is more profitable to account for the meaning of the subschemas as well as the selectional restrictions of the base in fuzzy clusters of meanings built around one or multiple central members rather than a single abstract meaning.

A constructional perspective on locative prefixoids has distinct advantages over derivational models. From a theoretical point of view, word-based approaches allow for the definition of properties of open slots of a subschema based on existing instantiations without positing a rule that is by definition productive (Jackendoff & Audring 2020: 32–3). In the present analysis, for instance, this allows us to define selectional restrictions for the verbal *up* subschema even without the existence of many novel coinages.

In addition, by combining the structural interpretation of prefixoids as specified parts of constructional idioms with Marchand's (1969) reading of prefixoids as functioning as different syntactic categories and relating this to a relational structure approach to morphosemantics, this article can profitably contribute to the question raised by, amongst others, Bauer *et al.* as to whether locative prefixoids are category-changing in adjectival premodifiers like *extra-household activities* (Bauer *et al.* 2013: 338) or *upstairs bedroom* (see also Kotowski 2021). It was shown that positing category change of the variable based on prefixation patterns or the righthand head rule or having to account for category change in $upgrade_{V}$ and $upgrade_{N}$ is not necessary. Though these models make correct predictions for the regular cases, it is a fundamental idea of Construction Grammar to posit a construction that is powerful enough to account for the exceptional, peripheral cases; the regular cases automatically follow (Fillmore 1985; Fillmore *et al.* 1988). Instead, we can acknowledge the necessity of a base of a certain syntactic category by referring to the syntactic relational structure between the elements. In the *up*-x construction, we can specify the syntactic category of the second element independently of the syntactic category of the complex word. More precisely, constraints on the word class of the base and likely output categories arise based on the semantic relational structure of the relevant subschema of the construction. Contrary to the assumptions of the righthand head rule, which emerges as too simplistic, there is a more complex interplay between the word class of output and base.

The interdependency of unbound and bound uses of *up*, where properties pertaining to semantics and syntactic category of the former recur in the latter, provide an interesting perspective on the discussion on the status of affixoids. By assuming that the syntactic category of the prefixoid determines the syntactic category of the following element based on semantics and by comparing morphological patterns to syntactic structures, we can also bridge the gap between morphology and syntax. While these similarities may be considered transformations and, in consequence, 'a syntactic problem' (Marchand 1969: 112), Construction Morphology can propose surface representations for these cases. In the future, the factors determining the choice between the constructional idiom and its periphrastic counterpart should be investigated in more detail. This applies not only to the alternation of prefix and particle verbs (*uplift*, *lift up*) but likewise to the other subschemas (e.g. *upstairs*, *up the stairs*). An approach focusing on alternations would provide a promising avenue for further research that would shed light not only on the constructions individually but also on the complex relations between them.

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