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A Word-Based Approach to the So-Called Category-Changing Usage of the English Derivational Prefix *Out-*

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Abstract: One of the traditional observations about English derivational morphology is that prefixes behave differently from suffixes and are rather close to lexemes. A word-based analysis of prefixes based on this observation has been proposed, but it faces a challenge raised by the seemingly category-changing property of the comparative verb-forming prefix *out-*. This study aims to solve this problem in a framework that enriches the traditional generative word-based morphology with the concept of the Abstract Lexical Unit. In analyzing data, I pay attention to the degree semantics of comparative *out*-prefixed verbs and show that the so-called "denominal or deadjectival" *out*-verbs are produced as hyponyms of already existing *out*-verbs with sparse semantics. A pseudonym experiment demonstrates that this type of *out*-verb has a number/rank/action comparative interpretation, and the nouns or adjectives that occupy the head position further specify the object that is counted. The problematic type is related to its base word via head replacement rather than concatenative affixation. Drawing on these new perspective and observations, this paper shows that the traditional finding about the status of English prefixes can be maintained in a word-based approach.

Keywords: prefix; word-based morphology; concatenation vs. replacement; value specification; abstract lexical unit; generative lexicon; pseudonym experiment

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1. Introduction

1.1. The Debate over the Morphological Status of Prefixes

This paper is concerned with the morphological status of English prefixes and with certain challenges raised by the comparative prefix *out-* against current morphological theories. The morphological status of English prefixes has been a matter of debate since Marchand (1969). Marchand says that prefixes and suffixes are fundamentally different morphological objects and that prefixes are close to lexemes, that is, more word-like. In fact, he analyzes prefixation and compounding as a unitary process of "expansion", meaning that both the prefix and the first lexeme of a compound *expand* rather than *change* the head lexeme. Most evidently, neither changes the syntactic category of the head lexeme, as illustrated below.

(1) a. Compounding: steamboat, colorblind
b. Prefixation: rewrite, misdo
c. Suffixation: steamer, fatherhood

(Marchand 1969, pp. 11–13, 126, 209)

In (1a, b), compounds and prefixations are similar in the role of the lefthand item's addition of new information to the righthand head lexeme. A *steamboat* is a kind of *boat*, and *rewrite* is a kind of *write*. Unlike the expansions, *steamer* in (1c) is not a kind of *-er*.

Nagano (2013a, 2013b) develops Marchand's analysis in the framework of Beard's (1995) Lexeme-Morpheme-Base Morphology (LMBM) and proposes treating English prefixes as a kind of lexeme. There is solid empirical evidence for this move. Nagano (2011a, 2013a) shows that English prefixes, but not suffixes, are similar to lexemes in the following five points:

(2) (i) the ability to change the syntactic category of the lexemic base
(ii) syntactic atomicity
(iii) phonological heaviness
(iv) semantic diversity
(v) three properties related to the Separation Hypothesis (Beard 1995)

First, English prefixation is similar to compounding in that the combination of two objects does not affect the syntactic category, as mentioned in (1).[1] English derivational suffixation differs from prefixation and compounding in this respect; in most cases, English derivational suffixes change the syntactic category of the item they attach to. According to Plag's (2004, sct. 3) investigation, only 1 of the 34 derivational prefixes (*de-*) is category-changing, and only 6 of the 41 derivational suffixes are category-maintaining.

Second, many English prefixes possess the property of syntactic atomicity. For example, they allow coordination reduction, unlike suffixes: e.g., *super- and supra-national*, *anti-federalist and -nationalist (opinions)* (Kenesei 2007, p. 274). Moreover, unlike suffixes, prefixes allow for recursive attachments, as in *anti-anti-anti-missile*, *re-re-examine* (cf. Yuhara 2022, p. 6).

Third, English prefixes behave as phonological words by themselves and can bear a primary stress, as in *éx-áctor* (Nagano 2013a, p. 148), *óut-going line*, *óutpatient*.

Fourth, the meanings of prefixes are more specific and "lexical" than those of suffixes. English prefixes can be classified into several semantic groups: (i) quantity (e.g., *uni-*, *bi-*, *multi-*, *poly-*, *semi-*), (ii) locative (e.g., *circum-*, *counter-*, *endo-*, *inter-*, *trans-*), (iii) temporal (e.g., *ante-*, *pre-*, *post-*, *neo-*), and (iv) negation (e.g., *a(n)-*, *de-*, *dis-*, *in-*, *non-*, *un-*) (Plag 2003, pp. 98–99), but importantly, in each group, each item expresses its own meaning. Also, many prefixes do not fit into these groups (e.g., *mal-*, *mis-*, *pseudo-*, *co-*, *vice-*). The lack of synonymy is a dominant characteristic of lexemes. In contrast, English suffixes are widely synonymous, as Lieber (2016) suggests regarding verb-nominalizing suffixes.

Last but not least, English prefixes are close to lexemes in not showing the properties related to the Separation Hypothesis (Beard 1995). This hypothesis says that bound morphology should be seen as a purely morphophonological realization of a feature or features that a lexeme obtains in the process of derivation or inflection. It is also called the realizational view of morphology. Instances of this type of morphology are known to exhibit the following three properties: (i) zero morphemes, (ii) empty morphemes, and (iii) many-to-many mapping between form and meaning (Beard and Volpe 2005, pp. 190–91). English derivational suffixes exhibit these properties. First, suffixes can be realized without a phonological form (e.g., *read-er*, *cook-ø* (Nagano 2013a, p. 150)), i.e., a zero suffix. Additionally, they can be realized without any semantic content (e.g., *-al* in *syntact-ic-al* (Beard and Volpe 2005, p. 190)), i.e., an empty suffix. As the third property, suffixes often have more than one function (e.g., *annoy-ing* in *The annoy-ing* [Adj] *boy is annoy-ing* [V] *everyone* (Beard and Volpe 2005, p. 190)), while one and the same function can be realized with several suffixes (e.g., nominalization: *build<u>ing</u>*, *construct<u>ion</u>*, *develop<u>ment</u>*, *refus<u>al</u>* (Nagano 2013a, p. 150)). The mapping between form and meaning of prefixes, on the other hand, is one-to-one or one-to-many since the meanings expressed by prefixes are specific and polysemous as in the case of lexemes.

In sum, all the five points in (2) suggest that English prefixes display behaviors that are parallel to lexemes. That is, prefixes are word-like.

1.2. Challenges

The lexemic analysis of prefixes seems to be empirically and theoretically valid as a general picture of English prefixation. However, if we take a more focused look at the details of individual prefixes, it becomes clear that we need a more nuanced approach to the status of prefixes than Marchand's and Nagano's positions. Some prefixes seem to possess not only lexemic but also functional properties. Consider the prefix *out-*, for example. It has two usages: one is spatial, and the other is non-spatial.[2] Originating from the preposition *out*, the spatial *out-* in (3a) is word-like and adds a meaning of 'outside' or

'outward' to a base. Yet, based on this usage, it developed a grammaticalized, comparative usage in (3b). *Out*-verbs in this usage have meanings that are paraphrased by *-er/more than* comparative constructions. This study focuses on this type of *out*-verb.

(3) a. *spatial*: out-going line, outpatient, outside (*out*-words are Adj or N)
b. *comparative*: outrun, outswim, outjockey, outsmart (*out*-words are V)

On the surface of it, the second-to-last example in (3b), *outjockey*, should be analyzed in such a way that *out-* attaches to the noun *jockey* to derive the verb *outjockey*. Prefixes, such as *be-*, *de-*, *dis-*, *en-*, and *un-* also look like category-changing prefixes, deriving verbs like *befool*, *delouse*, *disbar*, *encage*, *unbottle*, and so forth. However, these so-called "category-changing" prefixes strictly adhere to the property in (2i) because they do not directly attach to nouns or adjectives but rather to denominal or deadjectival converted verbs (Nagano 2011b), as illustrated below.[3,4]

(4) a. $[\text{out-}[[\text{jockey}]_N]_V]_V$, $[\text{out-}[[\text{smart}]_A]_V]_V$
b. $[\text{be-}[[\text{fool}]_N]_V]_V$, $[\text{be-}[[\text{little}]_A]_V]_V$
c. $[\text{de-}[[\text{louse}]_N]_V]_V$
d. $[\text{dis-}[[\text{bar}]_N]_V]_V$
e. $[\text{en-}[[\text{cage}]_N]_V]_V$, $[\text{en-}[[\text{noble}]_A]_V]_V$
f. $[\text{un-}[[\text{bottle}]_N]_V]_V$ (Nagano 2011b, p. 62; the order of presentation changed)

In other words, all examples in (3) are category-maintaining and produce verbs from verbs. They are duly referred to as deverbal or "V-to-V" type. Below, *out*-verbs that seem denominal or deadjectival, but that are actually deverbal, are called the *outjockey* type and the *outsmart* type, respectively. *Out*-verbs that are unmistakably deverbal are called the *outrun* type.

What is truly problematic for the property in (2i) comes from Kotowski's (2021) corpus-based study. Nagano's (2011b) conversion analysis predicts that the elements on the right side of *out-* always have converted verbal forms, but there are comparative *out*-verbs that go against this prediction, as pointed out by Kotowski. For instance, the sentence in (5) contains such a problematic *out*-verb that we found in the *Oxford English Dictionary Online* (*OED Online* 2023).

(5) Some Dutch ladies, out-gutturaling even the Swiss themselves.

Like all the *out*-verbs in (3b), *out-guttural* has a comparative meaning of 'exceed in the amount or volume of gutturals.' However, unlike *outjockey*, it does not have a corresponding converted verb; at least in the same dictionary, there is no verb **to guttural*.[5,6] Below, the type illustrated in (5) or *out-guttural* type is referred to as "category-changing" or "denominal or deadjectival", but this practice should be understood as being done only for the sake of reference.

Summarizing, the prefix *out-* is not monolithic but possesses three usages: word-like, affixal and "category-changing" ones. This non-monolithic status is attributed to its historical development, roughly illustrated in Figure 1.

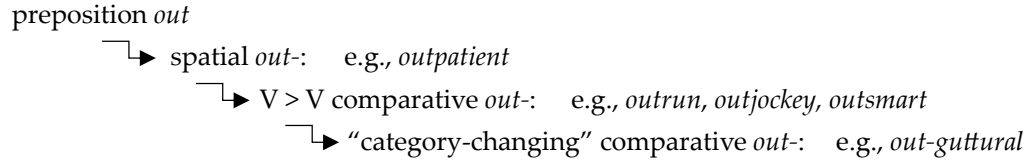


Figure 1. The source and development of the prefix *out-*.

Figure 1 indicates that the comparative verb-forming *out-* is subdivided into the V-to-V and the "category-changing" types.

Kotowski (2021, 2023) collapses these two types into a category-changing prefix, totally rejecting the conversion analysis.[7] However, such a step is questionable because it means sacrificing important generalizations in the face of exceptions. First, the conversion analysis

explains the majority of the data in which the prefix *out-* apparently attaches to a noun or an adjective, i.e., the *outjockey* and *outsmart* types. Second, the conversion analysis is supported by the Righthand Head Rule (RHR) (Williams 1981), the adherence to which is the dominant property of English morphology. Third, according to the conversion analysis, the *outjockey* and *outsmart* types are deverbal, so they can be produced with the same lexical entry of the prefix *out-* as used for the *outrun* type, as Nagano (2011b) shows. Fourth, the postulation of such a lexical entry is natural as an intermediate stage of the historical change from a preposition into a prefix, as illustrated in Figure 1.

This study aims to show that the problem can be solved without giving up the conversion analysis and its empirical and theoretical merits. As suggested above, the so-called "category-changing" usage of *out-* or the *out-guttural* type is exceptional and demands a separate treatment from the core types, i.e., *outrun*, *outjockey*, and *outsmart*. While the latter types are consistent with a morpheme-based view in which the prefix constitutes an independent lexical item, the new or exceptional type requires a word-based analysis.[8] It draws on a new observation concerning the input and output properties of the comparative *out*-prefixation. Certainly, the *out-guttural* type does not have a corresponding converted verb but does have corresponding *out*-verbs that are their hypernyms. This means, as will be elaborated in an upcoming section, that whereas the morphological analysis of the *outjockey* type is affix concatenation, the *out-guttural* type is related to the base *out*-verb via the replacement of a part of the base word with another. After considering these perspectives, we present a new word-formation rule of the comparative *out*-prefixation in a framework proposed by Namer and Jacquey (2003, 2013). Their word-based framework enriches the traditional word-based morphology (Aronoff 1976) with the unique concept of the *Abstract Lexical Unit* (*ALU*). Whether morphologically concatenative or replacement, the lexeme formation of the comparative verb-forming *out-* can be carried out in this framework.

The rest of this paper is structured as follows: Sections 2 and 3 closely examine the behaviors of the V-to-V comparative *out*-verbs and the so-called "category-changing" comparative *out*-verbs, respectively. In Section 3, I also discuss the results of a small introspective experiment that I performed using hypothetically coined *out*-verbs and show that the two types of comparative *out*-verbs are indeed formed by different word-formation processes. The processes are formally analyzed in Section 4. Section 5 summarizes the findings and clarifies future tasks.

2. The Deverbal *Out-*

As we saw in Section 1.2, *out-* in (3b) is an affix which attaches to a verb to derive a new verb. This section examines its affixal properties: the affix's base selection and the changes that the process of derivation brings to the base.

2.1. The Affix's Base Selection

The core base class of the affixal comparative *out-* is manner verbs. Bresnan (1982) suggests that the affixal comparative *out-* is a transitivizer. Consider the following examples.

(6) a. Fenster ran (quickly).
b. * Fenster outran (quickly).
c. Fenster outran Letitia. (Lieber 2005, p. 398)

In cases like those seen below, Bresnan (1982, pp. 168–70) suggests that the prefix attaches to intransitive usages.

(7) a. The centerfielder can outthrow the pitcher. (Fraser 1974, p. 30)
b. We often try to outdrink ??(our friends) (?? the beer).
(Kotowski 2021, p. 62; with slight modification)

If the base selection of the prefix *out-* was as simple as Bresnan's generalization, we could envision a realizational analysis in which the prefix is a transitivizing head, as Naya (2018) does (see note 5 for his analysis).[9] However, in my view, the argument structure is

not enough to capture the base-selectional properties of *out-*. As we will see throughout this paper, a reference to the lexical semantics is indispensable, and this is one of the main reasons why I aim for a word-based analysis INSIDE THE LEXICON. The following example suggests that we need a more sophisticated characterization:

(8) a. Cinderella scrubbed the floor.
b. Cinderella outscrubbed her stepsisters.
(Beavers and Koontz-Garboden 2012, p. 339)

What is common between *run* and *scrub* is that they are considered to be manner verbs in the framework of Rappaport Hovav and Levin (2010) and Levin and Rappaport Hovav (2013). Witness also:

(9) outdance, outeat, outlaugh, outread, outrun, outswim, outwalk, outwork...

All the relevant examples we saw up to this point belong to manner verbs.

In contrast, bona-fide result verbs seem to be poor inputs to *out*-prefixation (Kennedy 2012, p. 114; Beavers and Koontz-Garboden 2012, pp. 339–40; Tolskaya 2014, Paper 1, p. 38; Kotowski 2021, p. 77). First, compare (10a) with (10b):[10]

(10) a. John read us all to sleep/read herself blind.
b. * Jones dimmed/cooled/cleared the room empty. (Kennedy 2012, pp. 113–14)

(10a) is based on an agentive manner verb, while (10b) is based on a degree achievement verb, a typical result verb. The former verb class can be supplemented with a resultative secondary predicate, as in (10a); however, as shown in (10b), the latter class cannot. This contrast would be difficult to account for if *read* contained a result component.

Based on (10), compare (11a) with (11b):

(11) a. Jones outread/outate/outdrank Smith.
b. * Jones outcooled/outdimmed/outflattened Smith. (Kennedy 2012, p. 114)

In (11a), agentive manner verbs occur with *out-*, but the prefixation is not admitted of degree achievement verbs in (11b). This fact suggests that a crucial constraint on the prefixal base selection lies in verb lexical semantics, in whether the base verb contains a result component or not. More concretely, *out-* base-selects non-result verbs such as manner verbs. According to the Manner/Result Complementarity (Rappaport Hovav and Levin 2010; Levin and Rappaport Hovav 2013), manner verbs do not contain a result component.[11]

As we saw in (4), the apparently denominal or deadjectival *out*-verbs are in fact deverbal. Concretely, in the case of *outjockey* and *outsmart*, the prefix is attached to *to jockey* 'act in a manner of a jockey' and *to smart* 'act in a smart manner,' respectively.[12] Concerning the homogeneity between (3b) *outrun* and (4a) *outjockey*, it is important to observe that the above observation holds true for *out*-verbs based on converted verbs. As is widely acknowledged since Clark and Clark (1979) and Aronoff (1980), conversion verbs in English consist of diverse semantic classes, but the bifurcation between result and manner verbs is fairly clear. Thus, denominal examples such as *to ape* 'act as an ape,' *to Houdini* 'do as Houdini, imitate Houdini,' *to hammer* 'use a hammer,' and *to summer* 'spend summer' belong to manner verbs, while denominal examples such as *to shelve* 'to put (something) onto a shelf,' *to butter* 'provide (something) with butter,' and *to powder* 'change (something) into a state of powder' are result verbs. Concerning deadjectival verb formation, Nagano (2008, chp. 1) observes that, whereas suffixation always produces result verbs, such as *to flatten* (flat+*-en*), conversion produces either result or manner verbs depending on the base adjective. Thus, while *to dim* 'make/grow dim' seems to be limited to result readings (*OED Online* 2023), *to smart* is ambiguous between a result reading ('make smart') and a manner reading ('act in a smart manner').

Based on the above discussion, compare (12) with (13):

(12) *out*-+converted manner verbs
a. John outjockeyed/outsmarted Peter.
b. She out-Herods Herod on that occasion.
((12b) is taken from Kenkyusya 2002)

(13) *out*-+converted result verbs
*Jones outcooled/outdimmed Smith. (=(11b))

As expected, (12a) is accepted in the manner reading of *to smart*. That is, it says that John exceeded Peter in the degree to which his activity (whatever it is) is judged as smart. Similarly, in (12b), two people are compared on a scale associated with the manner component of *to Herod*. In the *OED Online* (2023), we observe further examples of the pattern *out-* + proper noun, such as *He . . . out-Miltons Milton in artifice of style*. Significantly, verb-forming conversion from proper nouns is highly productive among different subtypes in Clark and Clark (1979).

In sum, it seems safe to say that the Manner/Result Complementarity guides the base selection of the affixal *out-*. Strictly speaking, the affix selects non-result verbs rather than manner verbs. Thus, non-agentive emission verbs such as *shine* undergo *out*-prefixation because they do not have a result component:

(14) The lamp outshines the candle. (Bresnan 1982, p. 168)

As indicated below, measure verbs such as *to number*, *to rank*, *to weigh*, and *to pace* also occur with the same type of *out-*.

(15) a. Supporters outnumber detractors.
b. A major outranks a captain in the army.
c. The advantages of the plan outweighed its defects.
d. The champion will probably outweigh his opponent.
e. a company that has consistently outpaced the competition in sales
(Shogakukan Inc. 1994)

The non-manner-based group becomes significant in dealing with the so-called "category-changing" case in (5).

2.2. The Changes Caused by the Deverbal Out-

Next, we consider what kind of changes the derivational process of the affixal *out-* brings to the base manner verb. This prefix causes complex semantic changes. Although we do not delve into their details, the following observations are essential.

First, (16a) but not (16b) expresses meanings that are paraphrased by *-er/more than* comparative constructions such as (17).

(16) a. Fenster outran Letitia. (=(6c))
b. * Fenster ran Letitia. (Lieber 2005, p. 398; asterisk in the intended readings)

(17) a. Fenster ran **faster than** Letitia did.
b. Fenster ran **further than** Letitia did.

This means that the derivational process introduces the comparative semantics to the base verb.

Second, in (16a), the external and internal arguments bear the same theta role, the role of Agent. Witness the following contrast:

(18) We often try to outdrink {??(our friends)/(?? the beer)}. (=(7b), braces added)

In changing *drink* to *outdrink*, the original internal argument of the base verb cannot be inherited to the derived verb (Irube 1984; Yumoto 1997, 2005).

Furthermore, *out*-verbs cannot compare two different activities involving the same dimension.

(19) a. John ran/rapped fast. [Modification with a SPEED adverb]
b. ?? John is a fast runner and Kim is a fast rapper, but John outruns her every time. [On the reading that John runs and Kim raps]

(Kotowski 2021, p. 70)

The instance of *outrun* in (19b) is odd because in the intended reading, the speed of different activities, running and rapping, is compared. This is not possible in *out*-prefixation.

Last but not least, Kurafuji (2013) observes that *out*-verbs based on manner verbs refer to differential degrees. Below, (20a) and its paraphrase (20b) are parallel to (16) and (17) above, but the author further observes the contrast in (21).

(20) a. Mary outran Bill.
b. Mary ran faster than Bill did.
(21) a. * Mary outran Bill fast.
b. Mary outran Bill faster than Sue did.

(Kurafuji 2013, pp. 315–16)

Suppose that *out-* introduces "a contextually interpreted manner adverbial predicate Π" (Kurafuji 2013, p. 320) to the output verb, which is necessary to account for the appearance and selection of the adverbs in (17a, b) and (20b). Then, the contrast between (20a) and (21a) might suggest that the latter is ungrammatical due to semantic redundancy brought about by the co-occurrence of Π with *fast*. However, the grammaticality of (21b) indicates that the true explanation should be sought in the distinction between degrees and differentials. According to Kurafuji (2013, p. 316), (21b) is grammatical because two differential extents of speeds, objects of the same sort, are compared: the difference between Mary's speed and Bill's, and the difference between Sue's speed and Bill's. On the other hand, (21a) is ungrammatical because it inadequately compares an absolute degree (denoted by *fast*) with a differential extent (denoted by *outrun*).[13]

The above observations suggest that the derivation under discussion brings to the base verb (i) a contextually interpreted manner adverbial predicate Π, (ii) a second event (e_2) copied from the base event (e_1), (iii) a second argument (y) in addition to the base's argument (x), and (iv) the scale of the manner attribute defined by Π, on which e_1 and e_2 are degree-measured and compared.[14] Kurafuji (2013, p. 322) proposes a formal semantic representation of these pieces of information as "the definition of *out-*." I refrain from using it because in our word-based view, the four pieces of information are not carried by the affix per se but introduced by the derivational process. Additionally, Kurafuji (2013) does not discuss *out*-verbs based on non-manner verbs such as those in (15), which play a crucial role in deriving the "denominal or deadjectival" *out*-verbs, as I argue in the next section. On a more fundamental ground, I avoid formal semantic models based on the perspective put forth by Lieber (2020), which points out that when faced with data from derivational morphology, such semantic models face certain problems due to the absence of elements of conceptual semantics.

According to the Manner/Result Complementarity, result verbs do not possess a manner component. Instead, according to Kennedy (2012), their scale is associated with a "measure of change" function. Concerning why result verbs are poor inputs to *out*-prefixation, as in (11b), we assume that it is related to the fact that the measure of change function takes the internal argument as its measurandum (Kennedy 2012, p. 109). For example, in the sentence *John flattened a lawn*, the measurement of *a lawn* is necessary to decide how far the flattening change proceeded. However, it would become impossible under *out*-prefixation because this word formation does not inherit the base verb's internal argument, as we saw in (18).

2.3. Conversion and Out-Verbs

As mentioned in Section 1.2, for *outjockey*, *outsmart*, and many other examples, denominal/deadjectival manner verbs are available as their base materials, so that they are formed by attaching the prefix to these manner verbs. However, one may wonder whether the intermediate N/A-to-V conversion is necessary in a word-based approach. The "*out-* as

category-changer" view might appear preferable to the conversion analysis in that it is free from the cost of conversion.

Let us examine which of the two positions is more economical. The two approaches to the *outjockey* type are spelled out in (22). For the sake of convenience, I refer to the positions at issue using the italicized items as representations of relevant types.

(22) a. positing the same *out-* for *outjockey* and *out-guttural*
(the "*out-* as a category changer" analysis)
b. positing the same *out-* for *outrun* and *outjockey*
(the conversion analysis)

Actually, no difference exists between (22a) and (22b) in the amount of the cost to be paid. The category-changer analysis in (22a) may appear more economical because it does not posit the intermediate step of conversion, but there is a different price to pay in this analysis: the *outrun* type. If we take the analysis, we must multiply *out-* to address the deverbal *out-* SEPARATELY from the category-changing one. In contrast, the conversion analysis in (22b) does not force us to do so. Since we deal with the *outjockey* type in the same way as the *outrun* type, we do not have to postulate another *out-*: what we need to posit in this position is just the deverbal *out-*.

Theoretically, we should avoid the multiplification of lexical items (or the devices) if possible. Discussing lexical ambiguity, McNally and Kennedy (2013, p. 248) point out that "[. . .] positing lexical ambiguities when they can be avoided is computationally undesirable, at least for parsing, as the multiplification of lexical entries can greatly (and unnecessarily) increase the number of parses that have to be considered in the analysis of any given sentence." If the same stance is adopted and used as a kind of evaluation metric, (22b) is superior to (22a).

One might object that the conversion analysis would also need to postulate a second type of *out-* to address the *out-guttural* type. In fact, it does not, as we will show in the subsequent section. What is required is the adoption of a word-based approach to morphology in which *out-* does not constitute an independent lexical item.

3. The So-Called "Denominal or Deadjectival" *Out-*

3.1. A Novel Observation

In Section 1.2, we saw that the *out-guttural* type presents a serious challenge to the lexemic analysis of prefixes. In Figure 1, I called this type so-called "category-changing" *out*-verbs. Below, I present a hitherto unnoticed observation about the nature of this type.

In addition to (5), repeated as (23a) below, I found another example of this type in (23b). The examples in (23c, d) were found by Kotowski (2021).

(23) a. Some Dutch ladies, **out-gutturaling** even the Swiss themselves. (=(5))
b. A beggar on horseback, with the retinue of three kings behind him, **outroyalling** royalty.
c. [. . .] he outboxed, outpointed and **outshowmanshipped** a long-reigning middleweight champion despite serious disadvantages in height [. . .]
d. Global big data competitors can **out-technology** you, but they can't **out-human** you.

((a, b) from the *OED Online* 2023; (c, d) from Kotowski 2021, p. 79, with slight modifications)

As pointed out by Bauer et al. (2013, p. 343) and Kotowski (2021, sct. 4.2), the bold-faced verbs are problematic for the analysis in (4). The conversion analysis cannot be applied to these *out*-verbs because the elements on the right side of *out-*, such as *technology*, are not listed as verbs in the *OED Online*.

Next, the following examples are based on converted verbs, but their interpretations are unexpected from what the conversion analysis predicts:

(24) a. There was old boy with 'a lifetime of badges' on his hat. Excuse me, but we have those too. (Step forward Lil Kemp who could **outbadge** him any day.)
b. The Trail Blazers can outscore (they're No. 3 in the league in points and the only team with six players averaging in double figures), outrebound (they're No. 4 in rebound margin), outdefend (they're No. 3 in the West in points allowed) and **outbench** opponents (their reserves have outscored 11 of 18 opponents).
(Kotowski 2021, p. 79)

Here, *to badge* 'to mark with a badge' and *to bench* 'to remove a sports player from a game' exist, but the problem is that the bold-faced verbs above involve a cardinality scale. That is, they make a comparison in terms of the number of badges and bench, respectively; *outbadge* in (24a), for instance, means 'to have more badges' (Kotowski 2021, p. 79). This reading is difficult to explain based on the said converted verb.

I agree with Kotowski (2021, sct. 4.2) in viewing (23) and (24) as problematic to the analysis in (4). However, I do not agree with his theoretical conclusion therefrom because in my observation, ALL THE PROBLEMATIC CASES CONSTITUTE A NATURAL CLASS THAT IS DEFINED BY ALREADY EXISTING, ESTABLISHED *out*-VERBS. What is missing in Kotowski (2021) is the observation that the problematic cases usually emerge based on well-established *out*-verbs of the type that we already saw in (15). To be specific, *out-guttural* in (23a) and *outbadge* in (24a) are closely related to *outrank* and *outnumber*, respectively, in the manner indicated below.

(25) a. outrank 'exceed in rank' *Hypernym*
b. out-guttural 'exceed in the rank of gutturals' *Hyponym*
(26) a. outnumber 'exceed in number' *Hypernym*
b. outbadge 'exceed in the number of badges' *Hyponym*

In the pair in (25), we observe that (b) is more specific than (a) in what is ranked. The same is true of the pair in (26); (26b) is more specific than (26a) about the number of what is under consideration. In other words, the so-called "denominal or deadjectival" *out*-verbs are produced as hyponyms of already existing, semantically sparse *out*-verbs containing measure verbs.

Semantically speaking, such hyponym creation is possible not only because measure verbs contain a variable. They are obviously related to relational nouns *number (of . . .)*, *rank (of . . .)*, and *weight (of . . .)*, and crucially, the latter's complement *(of . . .)* remains unspecified; that is, it remains as a variable inside the representations of the *out*-verbs in (15).[15] If so, the hypernym–hyponym relation in (25) and (26) can be captured as a FURTHER SPECIFICATION of such an empty slot. Because *outdo* also contains a highly semantically sparse verb, it also produces a hyponym:

(27) a. outdo 'be superior to in action or performance' *Hypernym*
b. out-technology 'be superior to in performance related to technology' *Hyponym*

Here, *technology* is a further specification to the variable contained in (27a). *The Oxford Dictionary of English* defines *outdo* as shown in (27a), providing an example such as below.

(28) The men tried to outdo each other in their generosity.
(Soanes and Stevenson 2005, underline added)

The occurrence of the underlined phrase supports my view that *outdo* itself is semantically sparse and contains a variable concerning the type of action or performance that will be taken into consideration in making a comparison.

In sum, the observation about the so-called "category-changing" *out*-verbs suggests that they are formed by a different word-formation process.

3.2. Pseudonym Experiment

If the analysis in Section 3.1 is on the right track, *out*-verbs with no corresponding base verb should have a meaning related to well-established *out*-verbs such as those in (15) and

(27a). To confirm this prediction, this section reports the results of a small introspective experiment using hypothetically coined *out*-verbs.

I designed *out*-pseudonyms based on the independent observation that non-lexicalized suffixed words usually do not undergo conversion (Nagano 2008, pp. 12–14). Thus, suffixed nouns/adjectives such as *natality*, *contagious*, and *contagion* are expected to severely resist conversion to verbs; indeed, we do not find converted verbs **to natality*, **to contagious*, or **to contagion* in the *OED Online*. If so, our analysis predicts that pseudonyms *out-natality*, *out-contagious*, and *out-contagion* should behave like the *out-guttural* type. As such, they should involve the number/rank/action comparative interpretation of the sort observed with the *out*-verbs in (15) and (27a). Concretely, witness the following experimental sentences containing the above *out*-pseudonyms:

(29) ⧫ The U.S. out-natalitied Japan in 2018.
(30) ⧫ The Delta variant of COVID-19 is assumed to {out-contagious/out-contagion} other variants.

(Togano 2022, p. 104)

The sign ⧫ indicates that the marked sentence is experimental. My analysis in Section 3.1 predicts that the verbs in (29) and (30) are each interpreted in the same way as (23), using the same process as (25).

To check this prediction, I presented the sentences in (29) and (30) to five native English speakers and asked if they could be accepted in the predicted readings. Three of the five informants accepted (29) under the intended meaning 'the natality (birthrate) of the U.S. in 2018 was higher than that of Japan.' The same three informants also accepted either or both *out-contagious* and *out-contagion* in (30) in the same type of interpretation, 'the Delta variant of COVID-19 is assumed to be more contagious than other variants.'[16] Since these readings can be seen as further specifications of the hidden variable in *outrank* with a meaning related to *natality/contagious/contagion*, it seems safe to say that the prediction stated above was empirically supported. Generally speaking, people are inclined to be resistant to novel linguistic expressions and new words that they have never heard; in that sense, the non-unanimous acceptability in my experiment was also something to be expected. What is important here is that such novel *out*-verbs can be accepted under the interpretation associated with the semantically sparse *out*-verbs such as *outnumber*, *outrank*, *outweigh*, and *outdo*.

Additionally, I tested whether the *outjockey* type allows for a similar interpretation. For example, take *outtongue* 'speak more loudly or more eloquently than' (*OED Online* 2023). Because this verb has the corresponding converted verb *to tongue*, it belongs to the V-to-V type of *out*-verbs. Yet, nothing prevents the production of *outtongue* via the hyponymization process employed in (26). The resulting *outtongue* should have an interpretation that compares the number of tongues.

To check this prediction, I asked the same five informants about the acceptability of the following sentence involving *outtongue*:

(31) ⧫ Lemurs outtongue other animals. (Togano 2022, p. 104)

The result was as follows: most of them accepted this sentence in the reading of 'speak more loudly or more eloquently than.' However, two of them additionally accepted it under the intended reading, that is, 'lemurs, an animal with two tongues, exceed other animals in the number of tongues.'[17] In my analysis, the latter interpretation indicates that *outtongue* is formed via the same word-formation process as the one that derives *outbadge* from *outnumber* in (26).

As a reversed yet parallel case, *outbadge* is polysemous. Compare (24a) with the following example:

(32) I went downtown to check out the crime scene, but the douche from the FBI **out-badged** me! (Kotowski 2021, p. 79)

The above sentence means 'a man with more authority than the other man showed his badge to him.' This interpretation is hard to explain with the process in (26). However, if we assume that the verb is of the *outrun*/*outjockey* type, i.e., it is produced via affix concatenation using the denominal converted verb *to badge* 'to show a badge,' it should compare two badging events. Since the *out(-)badge*s in (24a) and (32) are formed by different word-formation processes, it is natural that they have different meanings.

3.3. Lexical Hyponymy and Value Specification Analysis

The observations in Sections 3.1 and 3.2 are significant to make sense of the irregular semantic properties of the examples in (23) and (24). It reveals that the *out-guttural* type is in a hypernym–hyponym relationship with existing *out*-verbs with sparse semantics such as *outnumber*, *outrank*, and *outdo*. Consider the semantic relationship between *flower*, *rose*, and *tulip*. Although these nouns are not morphologically related, they are semantically related in such a way that *flower* is a hypernym of the other two floral names. The results of the pseudonym experiments reveal that the same semantic relationship holds between semantically sparse *out*-verbs such as *outnumber*, *outrank*, and *outgo*, and the *out-guttural* type. All the *out-guttural* type *out*-verbs in (29)–(31) as well as those in (23) and (24) are more specific than the *out*-verbs about the number, rank, or action of what is under consideration. *Out-guttural* in (23a) and *out-natality* in (29) have a more detailed interpretation than *outrank* in that they describe the type of rank, namely, the rank of guttural/natality, which is unspecified in *outrank*. In other words, *outrank* is a hypernym of the other *out*-verbs that describe an event of rank comparison such as *out-guttural*, *out-natality,* and *out-contagious*. Similarly, *outnumber* is a hypernym of *out*-verbs such as *outbadge* in (24a) and *outtongue* in (31). In addition, the relationship between the two types of *out*-verbs is the same as that between *flower* and *rose* in that both hypernyms and hyponyms belong to the same category. These common features indicate that the relationship is lexical hyponymy (Valera and Ruz 2020, p. 191).[18] Interestingly, Valera and Ruz (2020) attempt to associate a morphological relationship with a lexical semantic relationship, which is highly relevant to our current discussion. The reason is that unlike the relationship between *flower*:{*rose*, *tulip*}, the lexical hyponymy between *outrank*:*out-guttural* (for example) is morphologically supported by the common morphological schema of *out-X*.

What the *outrank*:*our-guttural* pair differs from the *flower*:*rose* pair is that it involves a morphological process. Since hyponymy is a type of semantic relationship, there is no morphological relationship between a hypernym and a hyponym. However, a semantic change in a hyponym can be morphologically marked. On this point, Valera and Ruz (2020) show that morphological processes can be established between members of a semantic relationship, taking the case of conversion as example. Their finding can be applied to the case of *out-guttural*. Presented with affixed words, an orthodox morphological analysis usually assumes that an affix is attached to a base. Of course, the manner-verb-based type discussed in Section 2 is morphologically related to their base manner verbs via AFFIX CONCATENATION: *run* → *out-run*, *to jockey* → *out-jockey*, etc. However, if our observation is correct, the *out-guttural* type is morphologically related to their base words via HEAD REPLACEMENT. The relevant examples in (23) and (24) involve the replacement of a part of the base word with another word, as follows:

(33) Base: out[rank] 'exceed in rank' *Hypernym*
↓
Derivative: out-[guttural] 'exceed in the rank **of gutturals**' *Hyponym*

(34) Base: out[number] 'exceed in number' *Hypernym*
↓
Derivative: out-[badge] 'exceed in the number **of badges**' *Hyponym*

(35) Base: out[do] 'be superior to in action or performance' *Hypernym*
↓
Derivative: out-[technology] 'be superior to in performance **related to technology**' *Hyponym*

In (33)–(35), the base is an already existing *out*-verb with sparse semantics. New *out*-verbs are derived by replacing the item that occupies the head position (Williams 1981), as indicated by the boxes and arrows. For example, *out-guttural* in (33) is derived from *outrank* by replacing its head *rank* with an adjective *guttural* specifying the type of rank.

More specifically, *guttural*, *badge*, and *technology* in (33)–(35) SPECIFY THE VALUE OF A VARIABLE IN ITS HYPERNYM. As briefly mentioned in Section 3.1, some *out*-verbs, such as those based on measure verbs, can afford further specification. For example, *outnumber* compares two things in terms of number and means that the former exceeds the latter. However, it does not contain the information regarding what is counted. Similarly, *outrank* does not specify in which rank one exceeds the other. *Badge* and *guttural* fill the slot inside the representation of their base and specify such information.

An anonymous reviewer pointed out that one might question the restrictiveness of the value specification analysis. At the same time, how can the "base" be identified? We believe that the value specification analysis is sufficiently restrictive because the number of the hypernym *out*-verbs is limited. The hypernyms we found are semantically related to relational nouns such as *number* and *rank* (see Section 3.1), so their count would be close to the number of relational nouns in the lexicon. In addition, whether an *out*-word has a variable noun like them can be a clue to identifying a hypernym.

Forming a new word by replacing a part of its base word with another in itself is not an uncommon operation. We find examples of head replacement not only in English but also in Japanese. The first obvious case is what Namiki (2005) calls novel compounds involving an English locative preposition borrowing. A couple of his examples are given below.

(36) [[Noun_1 + in] + Noun_2]

a. rinsu-in shanpū
rinse in shampoo
'shampoo with rinse in it, conditioning shampoo'

b. furūtsu-in sheiku
fruit in shake
'fruit shake'

c. takoyaki-in gyōza
octopus ball in Pot sticker
'pot sticker with an octopus ball in it'

(Namiki 2005, pp. 8–9; glosses and translations by Nagano and Shimada 2018, pp. 68–69)

In (36), the intermediating *in* is a borrowing from English. However, these compounds cannot be seen as produced from the "real" English preposition, which would yield an expression of the left-headed constituent structure [[*takoyaki*] [*in gyōza*]] in (36c), for example. Instead, the observed structure is the right-headed [[*takoyaki in*] [*gyōza*]], as indicated at the top of (36). Since *in* forms a constituent with the first noun (Noun_1) rather than the second one (Noun_2), Noun_1 and *in* may be displaced together, as in *gyōza takoyaki-in*. Based on this and other observations, Namiki argues that the novel compounds were produced by using the borrowed matter of *in* for the native item *iri*, an item that independently

produces binominal right-headed expressions such as *takoyaki-iri(-no) gyōza* (lit., octopus-ball-added(-GEN) pot sticker) 'pot sticker with an octopus ball in it.'[19] To put it in our terms, the expressions in (36) were produced via replacement based on already existing words: *takoyaki-iri* ~ *takoyaki-in*. Again, the item occupying the head position is replaced.

Another example is *abeno-masuku*, a new word which refers to masks the Second Abe Cabinet provided to Japanese people as a measure against COVID-19. This word appears to be analyzed as *Abe* + *no* + *masuku* (lit., Abe + GEN + mask) at first sight. However, *abeno-masuku* does not simply mean 'a mask related to the ex-P.M.,' which would be predicted from the affix concatenation analysis. Crucially, the meaning of the word includes a reference to *abeno-mikusu*, a set of economic measures taken by the Second Abe Cabinet.[20] Phonologically, *masuku* is very close to *mikusu*, and the genitive linker is common between the two expressions in question. These observations can be explained if *abeno-masuku* was produced based on *abeno-mikusu*, replacing the item of the latter's head position with *masuku*. If this is valid, *abeno-masuku* provides another active example of the replacement working on an already existing word.

Furthermore, replacement may occur in the non-head item of the base lexeme. Thus, according to the Shogakukan Inc. (2000–2002), Japanese word *ban-kara* (rough-collar) 'a rough and uncouth style' was produced based on an already existing lexeme, *hai-kara* (high-collar) 'fashionable foreign style.' The latter expression was a borrowing, but the former expression was produced by replacing its non-head part with another item.

To summarize Section 3, I presented novel observations about so-called "category-changing" *out*-verbs and proposed a value specification analysis for them. *Out*-verbs of this type have an interpretation associated with deverbal *out*-verbs with sparse semantics. They are formed not by attaching an affix to a verb but by replacing the head of its base with a noun or an adjective that specifies a variable in the representation of their base. To confirm the pervasiveness of this type of morphology, I discussed cases other than *out-*, all of which involve the replacement at the (non-)head position of an already existing word.

4. Formal Analysis of *Out*-Verbs

4.1. Formal Framework

Continuing the discussion in Section 1, Nagano (2013a, 2013b) analyzes prefixes of the first type in Figure 1 (spatial *out-*) by Beard's word-basedness, which is primarily concerned with the Separation Hypothesis. In this section, I address the second and third types in Figure 1 (the V-to-V comparative *out-* and the so-called "category-changing" comparative *out-*) based on the word-basedness of classic lexicalist theories, such as Jackendoff (1975) and Aronoff (1976), where the notion is more concerned with the dynamics of the lexicon and lexemes therein (Nagano 2019, sct. 1). Concretely, Aronoff defines *Word-Based Morphology* as follows:

(37) "All regular word-formation processes are word-based. A new word is formed by applying a regular rule to a single already existing word. Both the new word and the existing one are members of major lexical categories."

(Aronoff 1976, p. 21)

Notice that all the examples discussed in Sections 2 and 3 conform to this view. The *outrun/outjockey* type is word-based because the comparative *out-* attaches to existing manner verbs. Moreover, the *out-guttural* type is word-based because its base is an existing *out*-verb. In the literature, some counterexamples to the view in (37) are pointed out (Bauer 1979; Bauer et al. 2013, pp. 630–31), but it seems safe to say that it is valid as a general property of the native lexical stratum of Present-Day English (Kastovsky 2006, 2009).

Here, I adopt Namer and Jacquey's (2003, 2013) framework to model comparative *out*-verbs, for three reasons. First, its Generative Lexicon (GL)-style lexical representation smoothly accommodates our observations in Section 2. In GL, each lexeme is endowed with a rich, multi-level lexical representation that includes not only the syntactic category, phonology, and lexical semantics of the lexeme, but also its argument structure (AS),

event structure (ES), and qualia structure (QS) (Pustejovsky 1995).[21] Based on this basic assumption, scale structure (SS) is added by McNally and Kennedy (2013) to further enrich the lexical representation. The representations of these substructures, and in particular those of qualia structure enables the formalization of semantic changes caused by a word-formation process.

More importantly, the framework I adopt belongs to word-based morphology. Unlike many other GL-based studies, Namer and Jacquey are very conscious of morphological issues. Working within the French tradition of word-based morphology (Corbin 1987; among others), they begin their inquiry by considering the following two approaches to word formation:

(38) a. encoding the affixes themselves
b. setting up abstract parametrized lexical unit describing the outputs
(Namer and Jacquey 2013, p. 387)

The difference between (38a) and (38b) is crucial because affixes do not have an independent existence in word-based morphology (Booij 2012, p. 10). Word-based morphologists do not take the position in (38a) but treat affixes as parts of lexemes. The position in (38b) is Namer and Jacquey's way of doing so, and accounts for the third reason why we choose this particular framework.

The idea of the Abstract Lexical Unit, *ALU* for short, is unique in capturing Aronovian word-formation rules or the process of word formation as a type of word in the lexicon. *ALU* captures the common properties of derived words as an abstract parameterized word. In simple terms, it can be regarded as a template or a function for derivatives. It is a kind of lexeme in possessing information on sound, meaning, and syntax, but crucially, it differs from garden-variety lexemes in containing many variables. Concrete derived words are tokens that result from materializing such a parameterized word by saturating the variables through a unification with the base word. Figure 2 depicts the process of *ALU* materialization. In this figure, the success of unification is represented by the boxed indexes.

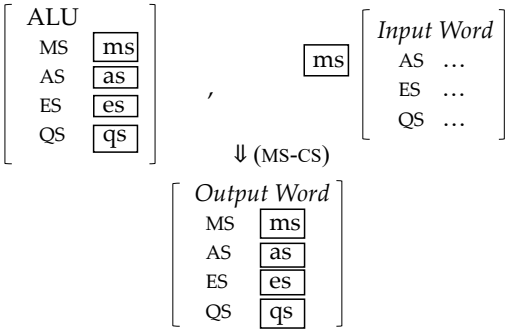


Figure 2. Composition schema (Namer and Jacquey 2013, p. 389).

The lexicon includes all the three words in Figure 2, *Input Word*, *ALU*, and *Output Word*, with the last being the result of unifying the first and the second through the MORPHOLOGICAL STRUCTURE COMPOSITION SCHEMA (abbreviated as MS-CS). In practice, the use of *ALU* renders bound morphology close to compounding, a combination of two lexemes. By adopting the information-based model that utilizes this type of formalization, we can not only present the inheritance of relevant features but also predict the compositional meaning of a derived verb. Furthermore, it enables us to analyze our data in conformity with the hypothesis in (37) because not only *Input Word* but also *ALU* counts as base material of word formation. Concretely, Namer and Jacquey (2013) deal with N-to-V and V-to-N conversion in French. Figure 3 shows how they analyze the process of *singe*$_{\mathrm{N}}$ 'monkey' $\rightarrow_{\mathrm{conv}}$*sing(er)*$_{\mathrm{V}}$ 'to behave as monkeys' in their *ALU* model. The three representations in the figure are *ALU* for N-to-V conversion ($[X_N]_V$), *Input Word* (*singe* 'monkey'), and *Output Word* (*sing*(*er*) 'to behave as monkeys').

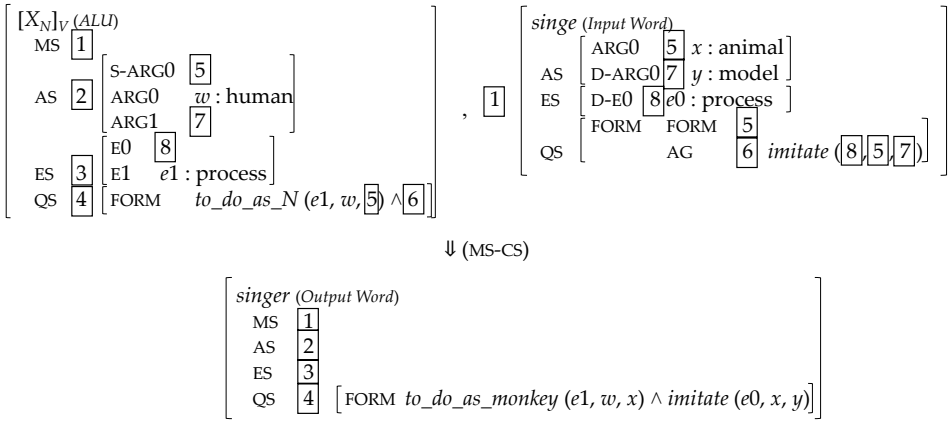


Figure 3. Conversion class -3-: $singe_{N} \rightarrow {}_{conv}sing(er)_{V}$ (based on Namer and Jacquey 2013, p. 399).

The three representations in Figure 3 contain boxed indexes. The numerical identity of such indexes across *ALU*, *Input Word*, and *Output Word* indicates the way pieces of lexical information are inherited during the process of word formation. When the *ALU* and the *Input Word* are unified, the relevant features of *singe* are propagated into the AS, ES, and QS of the *ALU*, as illustrated by the boxed indexes 5–8 in the *ALU*. They saturate the variables in the *ALU*, yielding the *Output Word sing(er)* with a meaning of 'behaving as monkeys' which inherits the pieces of information of the *ALU* and the *Input Word*.

Below, I first analyze the *outrun* and *outjockey* types (Section 4.2) and move on to the *out-guttural* type (Section 4.3).

4.2. Out-*Verbs Based on Manner Verbs*

4.2.1. *Outrun*

Let us first analyze the data in Section 2. Starting with the *Input Word* level, (39) represents the lexical entry for *run*, the base agentive manner verb of *outrun*.[22] Based on Kurafuji (2013), we consider Π in the formal role of the QS to mean a contextually interpreted manner adverbial predicate.

(39)
$$\begin{bmatrix} run & & \\ \text{AS} & \begin{bmatrix}\text{ARG1} & x : \text{individual}\,[\text{agent}]\end{bmatrix} \\ \text{ES} & \begin{bmatrix}\text{E1} & e_1 : \text{process}\end{bmatrix} \\ \text{QS} & \begin{bmatrix}\text{FORMAL} & run\_act\ (e_1, x) \wedge run\_manner\ (\Pi)\end{bmatrix} \end{bmatrix}$$

Rappaport Hovav and Levin (2010, p. 25) suggest that the Lexical Conceptual Structure of a manner verb integrates the manner component as a modifier of a core predicate. Following this, and Namer and Jacquey's (2013, p. 399) analysis of denominal converted manner verbs such as *to ape* (though their data are in French), I represent the manner in the formal role, as indicated in (39).

Next, the *ALU* of *out*-verbs is set up. We already saw what kind of changes the derivational process brings to the base manner verb in Section 2.2. Concretely, the derivation under discussion brings to the base (i) a contextually interpreted manner adverbial predicate Π, (ii) a second event (e_2) copied from the base event (e_1), (iii) a second argument (y) in addition to the base's argument (x), and (iv) the scale of the manner attribute defined by Π, on which e_1 and e_2 are degree-measured and compared. These pieces of information are captured by the following *ALU*:

(40)

$$\left[\begin{array}{ll}
[out\text{-}X_V]_V & \\
\text{MS} & \left[\begin{array}{l} [\text{AS} \quad \text{ARG1} \quad x] \\ [\text{ES} \quad \text{E1} \quad e_1\text{: } \neg \text{ transition}] \\ [\text{QS} \quad \text{FORMAL} \quad V_act\ (e_1, x) \wedge V_manner\ (\Pi)] \end{array}\right] \\
\text{AS} & \left[\begin{array}{ll} \text{ARG1} & x \\ \text{ARG2} & y \end{array}\right] \\
\text{ES} & \left[\begin{array}{ll} \text{E1} & e_1 \\ \text{E2} & e_2 \\ \text{E3} & e_3 \\ \text{RESTR} & \text{E1} = \text{E2} \end{array}\right] \\
\text{QS} & \left[\begin{array}{ll} \text{FORMAL} & exceed_in_Ving\ (e_3, x, y) \wedge V_act\ (e_1, x) \wedge V_manner\ (\Pi) \\ \text{CONSTITUTIVE} & V\ (e_1, x) \wedge V\ (e_2, y) \end{array}\right] \\
\text{SS} & \left[\begin{array}{ll} \text{DIMENSION} & \Pi \\ \text{OP/CL} & [\,0\,,1) \\ \text{RESTR} & \text{measure function } f \text{ of } \Pi\ (e) \\ & \text{when } f\ (e_n) = d_n\,,\ d_1 > d_2 \end{array}\right]
\end{array}\right]$$

Let us check the items in (i–iv) above. Concerning (ii), the copied event e_2 is represented by E2 in the ES. The event of comparison between e_1 and e_2 is represented as e_3, which is represented in the constitutive role in QS. For (iii), the second argument participating in e_2 is represented as ARG2 in the AS. Items (i) and (iv) are represented in the SS of the *ALU*. The SS involves the measure function *f* of a contextually interpreted manner adverbial predicate Π that maps e_1 and e_2 into degrees d_1 and d_2, respectively. The existence of a difference between d_1 and d_2 is represented by the restriction $d_1 > d_2$. In (40), the shaded parts in the AS, ES, QS, and SS indicate the information inherited from base words. The values in these parts are thus determined by the *Input* features in the MS. Unshaded parts within these substructures, on the other hand, indicate the unique properties of *out*-words.

In positing the SS level, I develop Namer and Jacquey's (2013) original model by applying it to the types of data they have not thus far addressed: word-formation processes that involve scale structures (Kennedy and McNally 2005). As mentioned above, the addition of the SS level to the lexical representation is also proposed in their GL-based representation to address the degree reading of *well*. Such a reading is observed with it modifying a participial adjective, as in *a well loaded packing box* and *a well documented case*, for example (McNally and Kennedy 2013, p. 247). My analysis follows their analysis and applies it to degree-related items found in word formation.[23]

Returning to (39) and (40), we now have *Input* manner verbs as MS (for the basic morphological structure) and an *ALU* that describes the input and output properties of deverbal *out*-verbs. Concrete *out*-verbs, such as *outrun*, result from relating these two through the process of MS-CS. When a verb satisfies the requirements of the *ALU* $[out\text{-}X_V]_V$, i.e., when the *Input* is a manner verb such as *run*, the MS of the *ALU* unifies with the verb. The verb's features of AS, ES, and QS are then put into the substructures of the *ALU*. The MS-CS unifies (39) and (40) in the way depicted in Figure 2, yielding the following representation of a concrete *Output Word*:

(41)

$$\left[\begin{array}{ll}
outrun & \\
\text{MS} & \left[\begin{array}{l} [\text{AS} \quad \text{ARG1} \quad x] \\ [\text{ES} \quad \text{E1} \quad e_1\text{: process}] \\ [\text{QS} \quad \text{FORMAL} \quad run_act\ (e_1, x) \wedge run_manner\ (\Pi)] \end{array}\right] \\
\text{AS} & \left[\begin{array}{ll} \text{ARG1} & x \\ \text{ARG2} & y \end{array}\right] \\
\text{ES} & \left[\begin{array}{ll} \text{E1} & e_1 : \text{process} \\ \text{E2} & e_2 : \text{process} \\ \text{E3} & e_3 : \text{process} \end{array}\right] \\
\text{QS} & \left[\begin{array}{ll} \text{FORMAL} & exceed_in_running\ (e_3, x, y) \wedge run_act\ (e_1, x) \wedge\ run_manner\ (\Pi) \\ \text{CONSTITUTIVE} & run_act\ (e_1, x) \wedge run_act\ (e_2, y) \end{array}\right] \\
\text{SS} & \left[\begin{array}{ll} \text{DIMENSION} & \Pi \\ \text{OP/CL} & [\,0\,,1) \\ \text{RESTR} & \text{measure function } f \text{ of } \Pi\ (e) \\ & \text{when } f\ (e_n) = d_n\,,\ d_1 > d_2 \end{array}\right]
\end{array}\right]$$

In the same way as in the case of $singe_{\text{N}} \rightarrow {}_{\text{conv}}sing(er)_{\text{V}}$ shown in Figure 3, the *Input* features put into the MS percolate down to other components. In (41), the features represented

in ARG1, E1, and some parts in QS and SS are inherited from *run*. The other parts, such as ARG2, E2, E3, and some elements in QS and SS, denoting the comparative meaning of *out*-verbs, are inherited from the *ALU* in (40). *Outrun* thus has a meaning that combines 'to exceed in doing' and 'running.' The lexical entry in (41) captures the properties of *outrun* observed in Section 2. In this way, concrete *out*-verbs inherit lexical information from both the *ALU* and *Input Word*.

4.2.2. *Outbrave* and *Outjockey*

The same holds true for *out*-verbs based on the denominal and deadjectival converted manner verbs such as *outsmart*, *outbrave*, *outjockey*, and *out-Herod*. As we have seen in Section 2.3, positing the same type of *out-* for the *outrun* and the *outjockey* types in (22b), namely, positing the same *ALU* for the two types, is preferable. Under the conversion analysis (Section 1.2), we can analyze these *out*-verbs in the same way as *outrun* without positing a second *ALU* containing a category-changing function.

We start with the deadjectival type. The deadjectival converted verb *to brave* conveys a meaning of 'acting bravely,' as illustrated in (42):[24]

(42) Haunted With the young craving For doing and braving In the world's battle.
(*OED Online* 2023)

First, the *Input Word* representation of this conversion or the lexical entry of the base adjective *brave* is given below.

(43)
$$\begin{bmatrix} \textit{brave} & & \\ \text{AS} & \begin{bmatrix} \text{ARG1} & x \end{bmatrix} & \\ \text{ES} & \begin{bmatrix} \text{E1} & e_1 : \text{state} \end{bmatrix} & \\ \text{QS} & \begin{bmatrix} \text{FORMAL} & \textit{brave}\ (e_1, x) \end{bmatrix} & \\ \text{SS} & \begin{bmatrix} \text{DIMENSION} & \text{bravery} \\ \text{OP/CL} & (0, 1) \end{bmatrix} & \end{bmatrix}$$

For the *ALU* of deadjectival conversion $[X_A]_V$, we follow Namer and Jacquey's (2013) *ALU* of converted manner verbs presented in Figure 3:

(44)
$$\begin{bmatrix} [X_A]_V & & & \\ \text{MS} & \begin{bmatrix} \text{AS} & \begin{bmatrix} \text{ARG1} & x \end{bmatrix} \\ \text{ES} & \begin{bmatrix} \text{E1} & e_1 : \text{state} \end{bmatrix} \\ \text{QS} & \begin{bmatrix} \text{FORMAL} & A\ (e_1, x) \end{bmatrix} \\ \text{SS} & \begin{bmatrix} \text{DIM} \\ \text{OP/CL} \end{bmatrix} \end{bmatrix} & & \\ \text{AS} & \begin{bmatrix} \text{ARG1} & x \end{bmatrix} & & \\ \text{ES} & \begin{bmatrix} \text{E1} & e_1 : \text{state} \\ \text{E2} & e_2 : \text{process} \end{bmatrix} & & \\ \text{QS} & \begin{bmatrix} \text{FORMAL} & \textit{act\_in\_a\_A\_manner}\ (e_2, x, e_1) \end{bmatrix} & & \\ \text{SS} & \begin{bmatrix} \text{DIMENSION} & \text{A-ness} \\ \text{OP/CL} & [0, 1) \end{bmatrix} & & \end{bmatrix}$$

The QS representation expresses the meaning of acting in the manner related to the base adjective.

The converted verb is derived when the *Input Word* and the *ALU* are unified by MS-CS, in the same manner as that indicated in Figure 3. The lexical entry for *to brave* is represented in (45).

(45)

$$\begin{bmatrix} \textit{to brave} & & \\ \text{MS} & \begin{bmatrix} \text{AS} & \begin{bmatrix} \text{ARG1} & x \end{bmatrix} \\ \text{ES} & \begin{bmatrix} \text{E1} & e_1\text{: state} \end{bmatrix} \\ \text{QS} & \begin{bmatrix} \text{FORMAL} & \textit{brave}\ (e_1, x) \end{bmatrix} \\ \text{SS} & \begin{bmatrix} \text{DIM} & \text{bravery} \\ \text{OP/CL} & (0, 1) \end{bmatrix} \end{bmatrix} \\ \text{AS} & \begin{bmatrix} \text{ARG1} & x \\ \text{ARG2} & \end{bmatrix} \\ \text{ES} & \begin{bmatrix} \text{E1} & e_1 : \text{state} \\ \text{E2} & e_2 : \text{process} \end{bmatrix} \\ \text{QS} & \begin{bmatrix} \text{FORMAL} & \textit{act\_in\_a\_brave\_manner}\ (e_2, x, e_1) \end{bmatrix} \\ \text{SS} & \begin{bmatrix} \text{DIMENSION} & \text{bravery} \\ \text{OP/CL} & [0, 1) \end{bmatrix} \end{bmatrix}$$

It inherits the features of the *ALU* and the base adjective to have a meaning of acting in a brave manner. As an anonymous reviewer points out, the original adjective *brave* is now predicated of the manner of E2 rather than the subject argument.

Now, the process of *out*-prefixation follows. Since *to brave* is a manner verb, (45) is matched with the MS of the *ALU* [*out*-X_V]$_V$ in (40). It is combined with the *ALU*. The *Output Word* inherits properties from both *to brave* and the *ALU* [*out*-X_V]$_V$. Its lexical entry can be represented as follows:

(46)

$$\begin{bmatrix} \textit{outbrave} & & \\ \text{MS} & \begin{bmatrix} \text{AS} & \begin{bmatrix} \text{ARG1} & x \\ \text{ARG2} & \end{bmatrix} \\ \text{ES} & \begin{bmatrix} \text{E1} & e_1 : \text{state} \\ \text{E2} & e_2 : \text{process} \end{bmatrix} \\ \text{QS} & \begin{bmatrix} \text{FORMAL} & \textit{act\_in\_a\_brave\_manner}\ (e_2, x, e_1) \end{bmatrix} \\ \text{SS} & \begin{bmatrix} \text{DIMENSION} & \text{bravery} \\ \text{OP/CL} & [0, 1) \end{bmatrix} \end{bmatrix} \\ \text{AS} & \begin{bmatrix} \text{ARG1} & x \\ \text{ARG2} & y \end{bmatrix} \\ \text{ES} & \begin{bmatrix} \text{E1} & e_1 : \text{state} \\ \text{E2} & e_2 : \text{process} \\ \text{E3} & e_3 : \text{process} \\ \text{E4} & e_4 : \text{process} \end{bmatrix} \\ \text{QS} & \begin{bmatrix} \text{FORMAL} & \textit{exceed\_in\_braving}\ (e_4, x, y) \wedge \textit{act\_in\_a\_brave\_manner}\ (e_2, x, e_1) \\ \text{CONSTITUTIVE} & \textit{act\_in\_a\_brave\_manner}\ (e_2, x, e_1) \wedge \textit{act\_in\_a\_brave\_manner}\ (e_3, y, e_1) \end{bmatrix} \\ \text{SS} & \begin{bmatrix} \text{DIMENSION} & \text{bravery} \\ \text{OP/CL} & [\,0\,,\,1) \\ \text{RESTR} & \text{measure function } f \text{ of bravery} \\ & \text{when } f\,(e_n) = d_n\,,\, d_1 > d_2 \end{bmatrix} \end{bmatrix}$$

The *Output Word* representation in (46) means that *outbrave* compares the actions by two individuals and means that one exceeds the other in the degree to which he or she acted in a brave way.

In our analysis, a degree interpretation comes from the *ALU* [*out*-X_V]$_V$. If so, *out*-verbs derived from denominal converted verbs should be allowed, even if the noun to be converted is incompatible with a gradable meaning. *Outjockey* and *out-Herod* are the examples of this kind. According to Morzycki (2012), nouns gradable in some sense can be modified with the *big* class adjectives or the *utter* class adjectives, as shown below:

(47) a. a {big/huge/major} {disaster/idiot/smoker/basketball fan}
b. # a {big/huge/major} {American/sportscar}

(48) a. an {utter/complete/absolute/outright} {disaster/idiot}
b. # an {utter/complete/absolute/outright} {smoker/basketball fan/American/sportscar}

(Morzycki 2012, pp. 192–94)

In (47b) and (48b), the nouns *American* and *sportscar* co-occur with neither *big* nor *utter*, suggesting that they have no degree reading. Turning to *Herod* and *jockey*, they show the same distributional pattern:

(49) # John is a {big/huge/major} Herod.
(50) # John is an {utter/complete/absolute/outright} {Herod/jockey}.

These nouns are thus not intrinsically gradable. Nevertheless, *out-jockey* and *out-Herod* are compatible with comparative interpretations, owing to the word-formation process with the *ALU* [*out-*X_V]$_V$.

Concretely, in the case of *outjockey*, the denominal converted verb *to jockey* 'act in a manner of a jockey' is derived first. (51) roughly represents its lexical entry.

(51)
$$\left[\begin{array}{ll} \textit{to jockey} & \\ \text{MS} & \left[\begin{array}{ll} \text{AS} & \left[\begin{array}{ll} \text{ARG1} & x\text{: human} \\ \text{D-ARG1} & y \end{array}\right] \\ \text{ES} & \left[\text{D-E1} \quad e_1\text{: process}\right] \\ \text{QS} & \left[\begin{array}{ll} \text{FORMAL} & \\ \text{TELIC} & \textit{pilot\_act}\,(e_1, x, y) \wedge \textit{skillful\_manner}\,(e_1) \end{array}\right] \end{array}\right] \\ \text{AS} & \left[\begin{array}{ll} \text{S-ARG1} & x \\ \text{ARG1} & w \\ \text{D-ARG1} & y \end{array}\right] \\ \text{ES} & \left[\begin{array}{ll} \text{E1} & e_1 : \text{process} \\ \text{E2} & e_2 : \text{process} \end{array}\right] \\ \text{QS} & \left[\text{FORMAL} \quad \textit{to\_do\_as\_jockey}\,(e_2, w, x) \wedge \textit{pilot\_act}\,(e_1, x, y) \wedge \textit{skillful\_manner}\,(e_1)\right] \\ \text{SS} & \left[\text{DIMENSION} \quad \text{skillfulness}\right] \end{array}\right]$$

It is reasonable to assume that the base noun of this converted verb has such QS | TELIC value as [*pilot_act* (e_1, x, y) ∧ *skillful_manner* (e_1)].[25] Through the *ALU* of conversion (see Figure 3), the derived verb *to jockey* inherits the qualia information, yielding an interpretation 'to ride a horse, to pilot.' A jockey's riding has the dimension of skillfulness, so it is specified in the SS. *To jockey* is then matched and combined with the *ALU* [*out-*X_V]$_V$, and *outjockey* with the representation in (52) is derived. It inherits properties from both *to jockey* and the *ALU* and thus has a meaning that can be paraphrased as 'doing something as skillfully as a jockey would do, and in a more skillful way than another.'

(52)
$$\left[\begin{array}{ll} \textit{outjockey} & \\ \text{MS} & \left[\begin{array}{ll} \text{AS} & \left[\begin{array}{ll} \text{S-ARG1} & x \\ \text{ARG1} & w \\ \text{D-ARG1} & y \end{array}\right] \\ \text{ES} & \left[\begin{array}{ll} \text{E1} & e_1 : \text{process} \\ \text{E2} & e_2 : \text{process} \end{array}\right] \\ \text{QS} & \left[\text{FORMAL} \quad \textit{to\_do\_as\_jockey}\,(e_2, w, x) \wedge \textit{pilot\_act}\,(e_1, x, y) \wedge \textit{skillful\_manner}\,(e_1)\right] \\ \text{SS} & \left[\text{DIMENSION} \quad \text{skillfulness}\right] \end{array}\right] \\ \text{AS} & \left[\begin{array}{ll} \text{S-ARG1} & x \\ \text{S-ARG2} & y \\ \text{ARG1} & w \\ \text{ARG2} & z \end{array}\right] \\ \text{ES} & \left[\begin{array}{ll} \text{E1} & e_1 : \text{process} \\ \text{E2} & e_2 : \text{process} \\ \text{E3} & e_3 : \text{process} \\ \text{E4} & e_4 : \text{process} \end{array}\right] \\ \text{QS} & \left[\begin{array}{ll} \text{FORMAL} & \textit{exceed\_in\_jockeying}\,(e_4, w, z) \wedge \textit{to\_do\_as\_jockey}\,(e_2, w, x) \wedge \textit{pilot\_act}\,(e_1, x, y) \wedge \textit{skillful\_manner}\,(e_1) \\ \text{CONSTITUTIVE} & \textit{to\_do\_as\_jockey}\,(e_2, w, x) \wedge \textit{pilot\_act}\,(e_1, x, y) \wedge \textit{skillful\_manner}\,(e_1) \\ & \quad \wedge \textit{to\_do\_as\_jockey}\,(e_3, z, x) \wedge \textit{pilot\_act}\,(e_1, x, y) \wedge \textit{skillful\_manner}\,(e_1) \end{array}\right] \\ \text{SS} & \left[\begin{array}{ll} \text{DIMENSION} & \text{skillfulness} \\ \text{OP/CL} & [\,0\,,\,1) \\ \text{RESTR} & \text{measure function } f \text{ of skillfulness} \\ & \text{when } f(e_n) = d_n,\ d_1 > d_2 \end{array}\right] \end{array}\right]$$

Similarly, in the formation of *out-Herod*, it inherits the QS representation that can be formalized as [*to do as Herod* (e_2, w, x) ∧ *do_act* (e_1, x) ∧ *do_manner* (e_1, x, y)] from its base verb *to Herod*. This representation in (53) partly originates from the noun *Herod*.

(53)
$$\left[\begin{array}{ll} \textit{to Herod} & \\ \text{MS} & \left[\begin{array}{ll} \text{AS} & \left[\begin{array}{ll} \text{ARG1} & x\text{: human} \\ \text{D-ARG1} & y\text{: model} \end{array}\right] \\ \text{ES} & \left[\text{D-E1} \quad e_1\text{ :process}\right] \\ \text{QS} & \left[\begin{array}{ll} \text{FORMAL} & x \\ \text{AGENTIVE} & \textit{do\_act}\,(e_1, x) \wedge \textit{do\_manner}\,(e_1, x, y) \end{array}\right] \end{array}\right] \\ \text{AS} & \left[\begin{array}{ll} \text{S-ARG1} & x \\ \text{ARG1} & w \\ \text{D-ARG1} & y \end{array}\right] \\ \text{ES} & \left[\begin{array}{ll} \text{E1} & e_1 : \text{process} \\ \text{E2} & e_2 : \text{process} \end{array}\right] \\ \text{QS} & \left[\text{FORMAL} \quad \textit{to\_do\_as\_Herod}\,(e_2, w, x) \wedge \textit{do\_act}\,(e_1, x) \wedge \textit{do\_manner}\,(e_1, x, y)\right] \\ \text{SS} & \left[\text{DIMENSION} \quad \Pi\right] \end{array}\right]$$

Out-Herod differs from *outbrave* and *outjockey* in that the dimension in its SS is determined by contexts, as in the case of *outrun*, although it is limited to something typical of Herod the Great, such as cruelty and evilness. The lexical entry for *out-Herod* can be represented as follows:

(54)

out-Herod			
MS	AS	S-ARG1	x
		ARG1	w
		D-ARG1	y
	ES	E1	e_1 : process
		E2	e_2 : process
	QS	FORMAL	*to_do_as_Herod* (e_2, w, x) ∧ *do_act* (e_1, x) ∧ *do_manner* (e_1, x, y)
	SS	DIMENSION	Π
AS		S-ARG1	x
		S-ARG2	y
		ARG1	w
		ARG2	z
ES		E1	e_1 : process
		E2	e_2 : process
		E3	e_3 : process
		E4	e_4 : process
QS		FORMAL	*exceed_in_doing* (e_4, w, z) ∧ *to_do_as_Herod* (e_2, w, x) ∧ *do_act* (e_1, x) ∧ *do_manner* (e_1, x, y)
		CONSTITUTIVE	*to_do_as_Herod* (e_2, w, x) ∧ *do_act* (e_1, x) ∧ *do_manner* (e_1, x, y) ∧ *to_do_as_Herod* (e_3, z, x) ∧ *do_act* (e_1, x) ∧ *do_manner* (e_1, x, y)
SS		DIMENSION	Π
		OP/CL	[0 , 1)
		RESTR	measure function f of Π (e) when $f(e_n) = d_n$, $d_1 > d_2$

The *Output Word* representation in (54) means that *out-Herod* compares actions by two individuals and expresses that one exceeds the other in the degree to which he or she acted in a cruel or evil way.

To summarize Section 4.2, I proposed a formal analysis of the comparative affixal *out-* in Namer and Jacquey's (2003, 2013) *ALU*-based framework. By adding the scale-structure level to their lexical representation, we can capture the properties of *out*-prefixation. I also showed that the same *ALU* can account for *out*-verbs involving conversion.

4.3. Out-Verbs Based on Other Out-Verbs

4.3.1. Utilizing Semantically Sparse Words as "Less Abstract" *ALU*

The next issue is the value specification in (33)–(35). Namer and Jacquey (2013, p. 388) claim that "ALUs are thus likely to represent any WF process", so their framework should be able to deal with not only the core type of *out*-verbs derived by affixation but also the "denominal or deadjectival" type formed via head replacement. Concretely, the *ALU*-based analysis can deal with the latter type by using the base words in (33)–(35), existing semantically sparse *out*-verbs such as *outnumber* and *outdo* (examples given in (15) and (27a)), as a kind of *ALU*. Using existing words as *ALU*s of new words is a new idea not found in Namer and Jacquey (2013), but it is certainly possible given that *ALU* is posited as a kind of lexeme.

Notice that Namer and Jacquey (2013) do not mention how abstract an *ALU* should be. Considering the widely shared view that lexicality/functionality is not an either–or property, it is natural to assume that the abstractness of *ALU* is a matter of degree. Then, lexemes with fewer variables than (40) may function as a "less abstract" lexical unit in the process. Indeed, in Section 3, I pointed out that the so-called "category-changing" *out*-verbs in (23) and (24) are all hyponyms of semantically sparse *out*-verbs such as (15). In addition, I pointed out that such hyponymization is possible not only because the verbs in (15) are well established in the lexicon but also because THEY CONTAIN A VARIABLE. In other words, they can be utilized as "less abstract" *ALU*s in Namer and Jacquey's formal framework. The two types under discussion differ only in how many variables an *ALU* has and whether the variables inside are open or closed (cf. Jackendoff and Audring 2020, p. 41).

The proposal of using existing *out*-verbs as *ALU* of the "denominal or deadjectival" type of *out*-verbs is preferable in the number of *ALU*s we set up. As we saw in Section 2.3, we should avoid the multiplification of lexical items if possible. If we revive "*out-* as

category-changer" view in (22a), we have to posit more *ALU*s than the present proposal: the *ALU* [*out-*X_V]$_V$ for the V-to-V type and the ones [*out-*X_N]$_V$ and [*out-*X_A]$_V$, for the "category-changing" types. In contrast, my analysis based on the conversion analysis in (22b) can handle the *out-guttural* type without positing another *ALU*; we just need to posit the *ALU* [*out-*X_V]$_V$.

4.3.2. *Outbadge*, *Out-Guttural*, and *Out-Technology*

The head replacement process in (33)–(35) is formalized as the unification of the lexical representations of *outnumber* (as the *ALU*) and *badge* (as the *Input Word*) through the MS-CS. It yields *outbadge* as the *Output Word*. The process is roughly depicted in Figure 4.

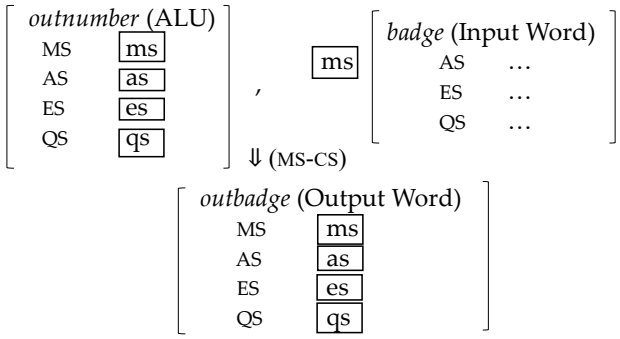


Figure 4. Word-formation process of *outbadge*.

While the lexical representation of *outnumber* contains relational noun *number (of...)*, the latter's complement (*of...*) remains unspecified, that is, it remains as a variable. Using this as an *ALU*, another lexeme *badge* is introduced as an *Input Word* to it. Further specification of the empty slot of the former leads to the *Output Word* and the hypernym–hyponym relation we observed in (25) and (26).

First, *outnumber* and other well-established *out*-verbs in (15) are produced from the following measure verbs.

(55) a. The town numbers twenty thousand inhabitants.
b. Princes rank above marquises.
c. How many pounds do you weigh?

(Kenkyusya 2002)

Since these verbs do not contain a result component, their representations, such as (56) below, can be an *Input Word* to (40), yielding the *Output Word* in (57).

(56)
$$\begin{bmatrix} \textit{number} & & \\ \text{AS} & \begin{bmatrix} \text{ARG1} & x \\ \text{D-ARG1} & y : \text{number} \\ \text{D-ARG2} & z : \text{class} \end{bmatrix} & \\ \text{ES} & \begin{bmatrix} \text{E1} & e_1 : \text{state} \end{bmatrix} & \\ \text{QS} & \begin{bmatrix} \text{FORMAL} & \textit{have\_number}(y)\textit{\_of\_}z\textit{\_state}\ (e_1, x) \end{bmatrix} & \\ \text{SS} & \begin{bmatrix} \text{DIMENSION:} & \text{cardinality} \\ \text{OP/CL} & [0, 1) \\ f_{number}\ (x) = d & \end{bmatrix} & \end{bmatrix}$$

(57)
$$\begin{bmatrix} \textit{outnumber} & & \\ \text{MS} & \begin{bmatrix} \text{AS} & \begin{bmatrix} \text{ARG1} & x \\ \text{D-ARG1} & y : \text{number} \\ \text{D-ARG2} & z : \text{class} \end{bmatrix} \\ & \text{ES} \quad \begin{bmatrix} \text{E1} & e_1 : \text{state} \end{bmatrix} \\ & \text{QS} \quad \begin{bmatrix} \text{FORMAL} & \textit{have\_number(y)\_of\_z\_state}\ (e_1, x) \end{bmatrix} \\ & \text{SS} \quad \begin{bmatrix} \text{DIMENSION:} & \text{cardinality} \\ \text{OP/CL} & [0, 1) \\ f_{number}\ (x) = d & \end{bmatrix} \end{bmatrix} \\ \text{AS} & \begin{bmatrix} \text{ARG1} & x \\ \text{ARG2} & w \\ \text{D-ARG1} & y : \text{number} \\ \text{D-ARG2} & z : \text{class} \end{bmatrix} \\ \text{ES} & \begin{bmatrix} \text{E1} & e_1 : \text{state} \\ \text{E2} & e_2 : \text{state} \\ \text{E3} & e_3 : \text{state} \end{bmatrix} \\ \text{QS} & \begin{bmatrix} \text{FORMAL} & \textit{exceed\_in\_doing}\ (e_3, x, w) \wedge \textit{have\_number(y)\_of\_z\_state}\ (e_1, x) \\ \text{CONSTITUTIVE} & \textit{have\_number(y)\_of\_z\_state}\ (e_1, x) \wedge \textit{have\_number(y)\_of\_z\_state}\ (e_2, w) \end{bmatrix} \\ \text{SS} & \begin{bmatrix} \text{DIMENSION} & \text{cardinality} \\ \text{OP/CL} & [\,0\,,\,1) \\ \text{RESTR} & \text{measure function } f \quad \text{when } f_{number}\ (x) = d_1 \text{ and } f_{number}\ (y) = d_2,\ d_1 > d_2 \end{bmatrix} \end{bmatrix}$$

Regarding the above derivation from *to number* to *outnumber*, two points are worth mentioning. As the most important point, the representation in (57) contains the relational noun *number*, as an inheritance from (56). This hidden nominal component allows for further specification as to the object that is counted, which is the *z* argument of the QS level.[26] Second, the above process indicates that when the *Input Word* itself contains a measure function, as shown in the SS level in (56), it preempts the measure function provided by the *ALU* in (40).

Since the representation in (57) contains a variable, it can be utilized as the *ALU* of another word formation. This is precisely the point we argued for in Section 4.3.1. In this analysis, (57) functions as the *ALU* and unifies with *badge* as the *Input Word*, yielding *outbadge*. The lexical entries for *badge* and *outbadge* are represented as in (58) and (59), respectively:

(58)
$$\begin{bmatrix} \textit{badge} & & \\ \text{AS} & \begin{bmatrix} \text{ARG1} & x \end{bmatrix} \\ \text{QS} & \begin{bmatrix} \text{FORMAL} & \textit{badge}\ (x) \\ \text{TELIC} & \textit{have}\ (e, y, x) \end{bmatrix} \end{bmatrix}$$

(59)
$$\begin{bmatrix} \textit{outbadge} & & \\ \text{MS} & \begin{bmatrix} \text{AS} & \begin{bmatrix} \text{ARG1} & x \\ \text{D-ARG1} & y : \text{number} \\ \text{D-ARG2} & z : \text{class} \end{bmatrix} \\ & \text{ES} \quad \begin{bmatrix} \text{E1} & e_1 : \text{state} \end{bmatrix} \\ & \text{QS} \quad \begin{bmatrix} \text{FORMAL} & \textit{have\_number(y)\_of\_z\_state}\ (e_1, x) \end{bmatrix} \\ & \text{SS} \quad \begin{bmatrix} \text{DIMENSION:} & \text{cardinality} \\ \text{OP/CL} & [0, 1) \\ f_{number}\ (x) = d & \end{bmatrix} \end{bmatrix} \\ \text{AS} & \begin{bmatrix} \text{ARG1} & x \\ \text{ARG2} & w \\ \text{D-ARG1} & y : \text{number} \\ \text{D-ARG2} & z : \text{class} \end{bmatrix} \\ \text{ES} & \begin{bmatrix} \text{E1} & e_1 : \text{state} \\ \text{E2} & e_2 : \text{state} \\ \text{E3} & e_3 : \text{state} \end{bmatrix} \\ \text{QS} & \begin{bmatrix} \text{FORMAL} & \textit{exceed\_in\_doing}\ (e_3, x, w) \wedge \textit{have\_number(y)\_of\_}\mathbf{badges}\textit{\_state}\ (e_1, x) \\ \text{CONSTITUTIVE} & \textit{have\_number(y)\_of\_}\mathbf{badges}\textit{\_state}\ (e_1, x) \wedge \textit{have\_number(y)\_of\_}\mathbf{badges}\textit{\_state}\ (e_2, w) \end{bmatrix} \\ \text{SS} & \begin{bmatrix} \text{DIMENSION} & \text{cardinality} \\ \text{OP/CL} & [\,0\,,\,1) \\ \text{RESTR} & \text{measure function } f \quad \text{when } f_{number}\ (x) = d_1 \text{ and } f_{number}\ (y) = d_2,\ d_1 > d_2 \end{bmatrix} \end{bmatrix}$$

Outbadge is expected to have a meaning related to the comparison of two badging events like the one in (32), since an *out*-verb is basically formed by affix concatenation and *badge* has a converted verb form. However, in some contexts where the number of badges is focused, this interpretation is rejected and *outbadge* is considered to be formed by head

replacement. In such cases, the lexical entry of *outnumber* affords further specification and the QS values of *badge* in (58) are related to a possessive interpretation. This leads to the production of *outbadge* with the representation of (59) by the further specification of the QS level of (57) with *badge* in (58). The newly introduced information is represented in boldface in (59). As a result, *outbadge* has the meaning of exceeding another person in the number of badges, as observed in (24a).

The similar examples in (33) and (35) are analyzed in the same way. In the case of *out-guttural*, the existing *out*-verb *outrank* is used as an *ALU* and unifies with *guttural* as the *Input Word*. The adjective further specifies the QS information of *outrank*, which changes (60a) to (60b) below.

(60) a. QS: FORMAL *exceed_in_doing* (e_3, *x*, *w*) ∧ *have_rank* (*y*) *of_z_ state* (e_1, *x*)
CONSTITUTIVE *have_rank* (*y*)*_of_z_state* (e_1, *x*) ∧ *have_ rank* (*y*)*_of_z_state* (e_2, *w*)
b. QS: FORMAL *exceed_in_doing* (e_3, *x*, *w*) ∧ *have_rank* (*y*) *of_**gutturals**_state* (e_1, *x*)
CONSTITUTIVE *have_rank* (*y*)*_of_**gutturals**_state* (e_1, *x*) ∧ *have_ rank* (*y*)*_of_**gutturals**_state* (e_2, *w*)

As to *out-technology*, its word-formation base is *outdo*, as I argued based on (27) and (28). Below, (61a) and (61b) represent the QS information of *outdo* and *out-technology*, respectively.

(61) a. QS: FORMAL *exceed_in_doing* (e_3, *x*, *w*) ∧ *do_an_action* (*y*)*_related_to_z* (e_1, *x*)
CONSTITUTIVE *do_an_action* (*y*)*_related_to_z* (e_1, *x*) ∧ *do_an_action* (*y*)*_related_to_z* (e_2, *y*)
b. QS: FORMAL *exceed_in_doing* (e_3, *x*, *w*) ∧ *do_an_action* (*y*)*_**related_to_technology*** (e_1, *x*)
CONSTITUTIVE *do_an_action* (*y*)*_**related_to_technology*** (e_1, *x*) ∧ *do_an_action* (*y*)*_**related_to_technology*** (e_2, *w*)

In these cases, the adjective and noun introduced as *Input Words* to the *ALU* of the replacement also fill the variables in the *ALU*s.

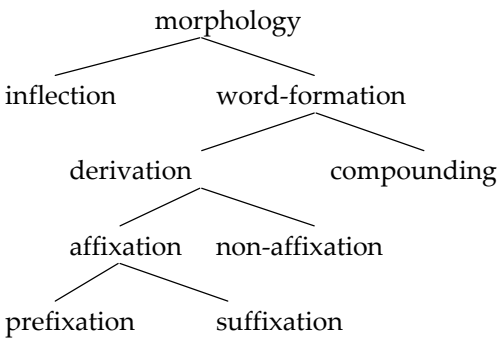
To summarize Section 4, the formal analyses proposed in Sections 4.2 and 4.3 together constitute a coherent analysis of the two types of *out*-verbs examined in Sections 2 and 3. The two types are formed by different word-formation processes, but in each case, *Output Words* are produced based on two existing lexemes, an *ALU* and an *Input Word*, in conformity with the principle of Word-Based Morphology in (37).

5. Concluding Remarks

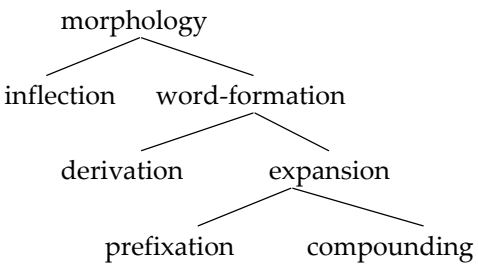
This paper has addressed the issue of the status of prefixes in morphology. Returning to Section 1, English derivational prefixes are known to behave differently from derivational suffixes, which poses a question regarding the standard view that prefixes and suffixes belong to the same type of affixational word formation, as illustrated in (62a).

(62)

a. The form-based view



b. The function-based view



((a) from (Plag 2003, p. 17), (b) from (Nagano 2011a, p. 92))

In (62a), prefixes and suffixes constitute the same type of morphological object, that is, affixes. However, the five points in (2) suggest an alternative system, in which prefixation should be grouped with compounding rather than with suffixation. As depicted in (62b), prefixation and compounding constitute a higher class of "expansion", while suffixation constitutes a solo type of derivational morphology. Marchand's (1969) view in (62b) captures the functional similarity between prefixes and lexemes in word formation, meaning that both the prefix and the first lexeme of a compound *expand* rather than *change* the head lexeme.

Adopting the view in (62b), this paper pointed out its theoretical and empirical challenges and showed that they can be handled in a word-based morphological framework. While the spatial *out-* (e.g., (3a)) indeed behaves like a lexeme, the comparative *out-* (e.g., (3b)) does not; moreover, a recent observation revealed that the latter may engender examples that apparently refuse the lexemic analysis of prefixes (e.g., (5)). How can we deal with the latter two types of *out-* in the same theoretical framework as the one proven appropriate for the first type? My conclusion is that the answer to this research question lies in the Word-Based Morphology hypothesis as defined in (37). By positing *ALU*s in the lexicon, the affixational prefixation that produces (3b) can be analyzed as a combination of two lexemes in the lexicon. Moreover, the *ALU*-based analysis can be extended to the so-called "category-changing" type such as (5) in the form of value specification.

To use Marchand's terms, the formation by the spatial type of *out-* is similar to lexical compounding in that the prefix itself behaves like the first constituent of garden-variety lexical compounds. The affixal comparative *out-* can be smoothly fitted into the expansion view in (62b) if we regard the effects of this word formation as an abstract lexeme. Moreover, the "category-changing" type of comparative *out*-verbs can be said to be similar to lexical compounding in combining two existing lexemes, differing from usual compounds in the abstractness of their components.

It should be made clear that my way of setting up the word-formation rule differs from that of Kotowski (2023, sct. 4). He also adopts a word-based morphological framework. As with the *ALU*-based analysis, base words in his analysis combine with an underspecified lexical entry, called a lexeme formation rule, to yield derivatives. In these points, the analysis in Section 4 is similar to his, but there is a difference between the analyses: whether one adopts the conversion analysis or not. My analysis is based on the conversion analysis not only because the issue of the so-called "category-changing" prefixes has already been settled, as mentioned in Section 1.2, but also because reviving the "*out-* as category changer" view renders the word-formation rule uneconomical. It would mean that the Kotowski's lexeme formation rule for the comparative *out-* has to bear the extra function of determining the category of output words.

In my investigation, several questions cropped up. First, we need to determine which *out*-verbs with the sparse semantics can be utilized as a base of value specification. The analysis of *out*-verbs I proposed in this paper predicts that the "denominal or deadjectival" *out*-verbs that are based on *outweigh* in (15c, d) and *outpace* in (15e) can also appear, but I have not found them yet. I leave the missing piece for future research. The second issue concerns my extension of Namer and Jacquey's (2003, 2013) proposal to the type of word formation involving scale structure. My *ALU*-based analysis can be applied to other types of morphologically complex words, such as *over-X*, *under-X*, *well-X*, and *half-X*, whose first element also has the degree semantics. If this analysis can offer a unified analysis of such morphologically complex words, it further supports the word-based view. As a third issue, a further investigation of word-basedness is needed. Beard's (1995) word-basedness is primarily concerned with the Separation Hypothesis, but the word-basedness of classic lexicalist theories, such as those by Jackendoff (1975) and Aronoff (1976), is more concerned with the dynamics of the lexicon and lexemes therein. These two perspectives are consistent with each other within lexicalist frameworks, but their relationship is worth further examination. Hopefully, these issues can be addressed in future research and can contribute to further advancing the theoretical investigation of English morphology.

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Abbreviations

The following abbreviations are used in this article:

ALU	Abstract Lexical Unit
AS	Argument structure
ES	Event Structure
GL	Generative Lexicon
MS	Morphological Structure
MS-CS	Morphological Structure Composition Schema
QS	Qualia Structure
SS	Scale Structure

Notes

1 As pointed out by an anonymous reviewer, prefixes are category-changing in some languages. I confine the discussion on prefix–suffix asymmetry to the case of English.

2 The two types of *out-* should be treated as different prefixes, at least synchronically.

3 A note about a possible concern about the so-called Myer's Generalization. This generalization is related to the possiblity of further overt *suffixation* to converted verbs, so it is irrelevant to the prefixation to converted verbs. In addition, the generalization itself needs to be reconsidered, as suggested by Nagano (2008, pp. 16–18).

4 Even in the word-based morphology, we should assume that the base of the *out*-verbs in (4a) is a converted verb. The reason is provided in Section 2.3.

5 Realizational morphological analyses which do not adopt the "*out-* as category-changer" view, such as Naya's (2018) alternative realization analysis, also face the problem that fails to explain this type of *out*-verbs. Adopting Emonds' (2005) morphosyntactic framework, he argues that the comparative *out-* realizes the same features as the inflectional word-form *better*. According to him, the feature complex of *out-*, [BETTER], first occurs in the postverbal position and it is realized in the preverbal position after Spell-Out. The feature complex is realized with the bound form *out-* (pp. 64–65). In the present context, the problem is that it does not seem to be able to address the marginal type in (5) exactly because there is no verb (**to guttural*) on which the alternative realization of [BETTER] should occur.

6 As an anonymous reviewer points out, it should be noted that possible words are not necessarily listed in dictionaries. I recognize the limitation, but regard words which are not listed in dictionaries as non-existing words, assuming that "the word-list of some large reference work (or set of reference works) is equivalent to the set of existing words" (Bauer 2001, p. 35).

7 See Bauer et al. (2013, pp. 343–44, 635), Ahn (2022), and Kotowski (2023) for other recent studies that consider *out-* to have the category-changing ability.

[8] Neither the morpheme- nor the word-based model can fully cover all morphological phenomena in their purest forms and so some morphologists (e.g., Lieber 1992; Plag 1999; Haspelmath 2002; Nagano 2008) propose a "hybrid" model in which the former and the latter address concatenative and non-concatenative processes, respectively. Given the fact that English morphology is basically morpheme-based, I adopt Nagano's (2008) hybrid model that gives importance to the morpheme-based model.

[9] I have greatly benefited from discussions with Ryohei Naya.

[10] Verbs that are basically regarded as result verbs can undergo *out*-prefixation if they lexicalize the manner meaning component. *Kill* is a typical example of result verbs, as the anonymous reviewer of *English Linguistics* notes, but *out-* can attach to it.

(i) John outkilled Fred.
'John killed more people or animals than Fred did.'
'John killed people better than Fred did.' (my own informant check)

Usuki (2015, pp. 278–86) and Levin and Rappaport Hovav (2013) claim that some verbs can lexicalize either manner or result meaning components. For example, *to cut* is basically a result verb, but it lexicalizes the manner component when its result component "drops out" (Levin and Rappaport Hovav 2013, p. 57). I consider that the root is combined with the manner meaning component in (i) and other similar examples given in Kotowski (2021, p. 77).

[11] Beavers and Koontz-Garboden (2012) take *out*-prefixation as a diagnostic for the Manner/Result Complementarity.

[12] The deadjectival verb *to smart* here is a newer converted verb different from the homophonous yet non-conversion verb meaning 'to sting, to be upset.'

[13] Specifically, (21a) compares the difference between Mary's speed and Bill's denoted by *outrun* with the contextually given standard value of fastness. It is impossible to make a comparison between ontologically different objects (Kurafuji 2013, pp. 326–27).

[14] I thank a reviewer of *English Linguistics* for a comment that greatly helped me elucidate the last point.

[15] I thank Takane Ito and Ryohei Naya for this observation.

[16] I conducted an additional survey with another native informant and obtained further data for my analysis. He judged *out-*pseudonyms such as *out-safety* and *out-GDP* as accepted as well as *out-natality* in the intended meaning 'exceed in the rank of safety/GDP.'

[17] The informant who cooperated the additional survey also accepted (31) in the number comparative reading. He and one of the five informants judged that the following example is possible as well.

(i) ♦ Chameleons outtongue other animals.
'Chameleons have a longer tongue than other animals.' (Togano 2022, p. 104)

According to one of the informants, *outtongue* can be interpreted in the sense of either (31) and (i), depending on the context. In either case, the meaning of *outtongue* is limited to a meaning that involves the number/rank interpretation.

[18] Comments from an anonymous reviewer greatly helped me make this point clearer.

[19] Namiki (2005, p. 12) provides the following structural analysis in which *iri* in (i)(a) is replaced by with *in* (i)(b).

(i) a. $[_N\ [_N\ [_N$ rinsu$][_N\ [_V$ iri$]]]\ [_N$ shampū$]]$
b. $[_N\ [_{N^*}\ [_N$ rinsu$]\ [_P$ in$]]\ [_N$ shampū$]]$ (Namiki 2005, p. 12, translations mine)

[20] *Abeno-mikusu* is formed from *ekonomikusu* 'economics' via the process of blending. As an anonymous reviewer points out, it is named after *Reaganomics* (economic policies promoted by U.S. president Ronald Reagan).

[21] Qualia structure represents "different modes of predication possible with a lexical item" (Pustejovsky 1995, p. 58). It consists of the following four roles: FORMAL, CONSTITUTIVE, TELIC, and AGENTIVE.

[22] I consider the first lines from the top (e.g., *run*, *[out-X_V]$_V$*) to contain phonological as well as categorial information in the following representations of lexemes and *ALU*s. *Out*-prefixation does not shift the primary stress of a word; the primary stress of a comparative *out*-verbs lies in the base verb and the second stress in the prefix (e.g., *òutrún*, *òutnúmber*). I leave the details of the phonological section for future research.

[23] I follow McNally and Kennedy (2013) for the basic formal representations (dimension and scale type) in the SS. Round or square brackets of a scale structure mean that the side(s) of the scale is open or closed, respectively. Thus, (0,1) represents an open scale and [0,1) a partially closed scale.

[24] I do not take up *outsmart* as an example of deadjectival cases here, as it is not as straightforward as *outbrave* in that the result verb usage of the converted verb *to smart* is more foregrounded than its manner verb usage. (Note again that the verb *to smart* is distinct from the homophonous verb related to the physical pain. See also note 12.) Although *to smart* as described in the *OED Online* (2023) is primarily a result verb, my informant agreed that *outsmart* compares activities of two people, not the degree of smartness. According to him, the sentence *John outsmarted Peter* in (12a) means that John acted in a smarter way than Peter did. We interpret this observation as corraborative evidence for the point we made of *outtongue* and *outbadge* in Section 3.2, that *out*-verbs may be produced via hyponymization even when converted verbs exist.

[25] The detailed comments provided by an anonymous reviewer greatly helped me improve the formal representations. I followed the suggestions about the QS | TELIC reprentations of the the noun *jockey*.

[26] The *z* argument is realized as the complement argument in the base measure verbs. In the case of (55a), it corresponds to the inhabitant.

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