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Verbhood and state/change of state lability across languages

Andrew Koontz-Garboden, University of Manchester, andrewkg@manchester.ac.uk

Emily Hanink, Indiana University, emhanink@iu.edu

Jens Hopperdietzel, University of Cologne, jens.hopperdietzel@uni-koeln.de

Colin Bannard, University of Manchester, colin.bannard@manchester.ac.uk

Margit Bowler, University of Manchester, margitbowler@gmail.com

Michael Everdell, Boston University, everdellm@gmail.com

Itamar Francez, University of Chicago, ifrancez@uchicago.edu

Kyle Jerro, San Diego State University, jerrokyle@gmail.com

Elise LeBovidge, University of Washington, eliseal@uw.edu

Stephen Nichols, University of Edinburgh, stephen.nichols@ed.ac.uk

Across languages, words with the meanings of adjectives in English (*property concept lexemes*; Thompson 1989) often have translational equivalents that are nominal or verbal instead (Dixon 1982). Regardless of category, all languages have ways of describing changes *into* property concept states, which generally bear some derivational relation to the word describing the state the change is into. This paper offers a study into the typology of property concept state/change-of-state derivation, showing that variation in the category of the state word correlates with differences in the nature of this derivation. In particular, we show on the basis of a statistical analysis of state/change-of-state derivation using data from the "Verbal Roots Across Languages" database that a lack of morphological marking from state to change of state (*lability*) is more likely when the simple state is verbal in category. We argue that this finding follows from the idea that only verbs can describe change-of-state events (even if not all verbs do), and implement this formally as the claim that only verbs can lexicalize relations between individuals and dynamic eventualities.

1 Introduction

Lexical categoryhood is one of the most important and vexed issues in linguistics, and has been examined in depth from typological, syntactic and semantic perspectives (Givón 1984; Croft 1991; Hengeveld 1992; Bhat 1994; Wetzer 1996; Stassen 1997; Croft 2001; Beck 2002; Baker 2003; Baker & Croft 2017; van Lier 2017, among others). A recurring theme of this research is whether lexical categories correspond to universal semantic categories. Traditionally, it has been proposed that major lexical categories correspond to notional categories, i.e. verbs (prototypically) describe (transient) actions, nouns (time-stable) things, and adjectives qualities or states (see e.g., Givón 1984, but similarly Langacker 1987). According to this view, lexical categories, at least prototypically, can then be defined by their lexical semantics. However, such ideas are often criticized for lack of clear articulation of key notions, as well as the ready availability of counterexamples (see e.g., Newmeyer 1998; Baker 2003; von Fintel & Matthewson 2008; Baker & Croft 2017): For example, stative verbs do not predicate actions, while some nouns describe events. Moreover, languages that have been argued to lack adjectives express qualities or states by other categories (cf. Dixon 1982). To the extent it is discussed, there is thus a general skepticism in the formal semantic literature about a universal semantic categorization of lexical categoryhood (von Fintel & Matthewson 2008: 152–153).

In what follows, we entertain a shift away from the search for a universal/one-to-one semantics underlying the categories. Instead, we look for constraints on the relation of meaning and category cross-linguistically (see Koontz-Garboden 2012; Francez & Koontz-Garboden 2017: Chapter 5). Our focus is on property concept lexemes, i.e. lexemes expressing the descriptive content of English adjectives. Crosslinguistically, property concept lexemes vary in their category and are often realized as nouns or verbs, as discussed extensively in the typological literature (Dixon 1982; Thompson 1989; Hengeveld 1992; Bhat 1994; Wetzer 1996; Stassen 1997; Beck 2002; Baker 2003). For instance, Hausa (Chadic) has a large set of nouns called in the descriptive literature 'abstract nouns of sensory quality' (Parsons 1955), which appear in possessive constructions in order to express the same kind of meaning that an English adjective does with copular predication, as shown in (1).

(1) a. Mun**à** **dà** ƙarfī.
        we.CONT with strength
        'We are strong.'   (Newman 2000: 224)
     b. Yārinyà tanà **dà** zōbĕ.
        girl   she.CONT with ring
        'The girl has a ring.'   (Newman 2000: 222)

Equally, there are languages like Tongan (Austronesian), in which many property concept lexemes are verbs, with these taking the same tense/aspect markers in predication as ordinary verbs, as shown by (2a,b):

(2)   a.   'Oku **loloa** ho   'ulu.
          IMP   long   your hair
          'Your hair is long.'   (Koontz-Garboden 2007: 117)

    b.   'Oku **lea**   'a   Pita.
          IMP   speak ABS Pita.
          'Pita speaks.'   (Churchward 1953: 37)

While examples like the Hausa in (1) have the same meaning as sentences headed by a property concept lexeme in other languages, their component parts are quite clearly different and have received little attention. Based on the fact that the nouns in such expressions have mass-type characteristics, Francez & Koontz-Garboden (2017) argue for a theory in which such nouns have non-atomic, mereologically ordered denotations, in the spirit of Link (1983). Such a theory, they argue, can capture a range of properties tied to expressions in which they appear, including their gradable characteristics. This kind of meaning is found with nominal property concept lexemes but not with adjectives (Francez & Koontz-Garboden 2017: Chapter 5), for reasons which Francez and Koontz-Garboden tie to the nature of adjectivehood.

This program can be seen as an extension of the semantic maps research program (see Haspelmath 2003 and Rakhilina et al. 2022 for a more recent overview and literature review from the past two decades of research), with the use of methods from model-theoretic semantics to articulate the meanings in the semantic map. What Francez and Koontz-Garboden do is to examine two different kinds of meaning—the ordinary predicative one and the abstract mass one—and consider what kinds of words these meanings are mapped to crosslinguistically, with the observation that not all categories of word have all kinds of meaning. In this paper, we extend this program by exploring whether we can learn anything about the lexical semantics of verbhood by contrasting verbal encoding of property concept lexemes with non-verbal encoding, and the kinds of meanings that are mapped to each across languages. In this respect, our work is also inspired by Croft (2001: 88), who examines part-of-speech-hood relative to meaning type in a semantic map-type fashion (even though his work pre-dates that term). For our part, we focus on the morphophonological relation between property concept lexemes and their corresponding change of state verbs. Cross-linguistically, this relation has been shown to vary, with some languages — including Tongan — not marking this contrast at all; for instance in (3), no (overt) change of state marking is present:

(3)   'Oku **loloa** vave ho   'ulu.
         IMP   long   fast   your hair
         'Your hair is quickly getting long.'   (Koontz-Garboden 2007: 117)

By conducting a typological study based on a balanced language sample, we demonstrate that there is a systematic difference in the derivational relationship of change-of-state verbs from

associated property concept lexemes that correlates with whether the source property concept is verbal in category. In particular, we show that the potential for state/change of state lability, as in Tongan above, correlates with a language having verbal property concept lexemes. Or, to put this in terms of semantic maps, the observation is that the superficially same verbal property concept words are found mapped to state and change of state meanings more often than the superficially same non-verbal ones. Our explanation of this pattern builds on the hypothesis that change of state lexemes can only be verbal across languages, irrespective of the lexical category of the state form. By identifying category change and inchoativization as two separate processes that can be marked by derivational morphology (cf. Štekauer et al. 2012), we expect the derivational relation between stative and change of state forms to more likely be marked in cases where the state form is non-verbal, since in non-verbal cases derivation of a change of state verb requires both a change in category as well as change in meaning, whereas derivation of a change of state verb from a stative verb requires only the latter. The fact that property concept verbs do indeed show more lability than non-verbal property concept lexemes in relation to their change of state counterparts, we argue, is indirect support for the thesis that only verbs can denote changes of state: because they are verbs already, they do not need to undergo category change in order to have a change of state denotation, thereby leading to a decreased liklihood of derivational marking in change of state derivation. We articulate this idea formally by suggesting that only verbs can lexicalize relations between individuals and dynamic eventualities, i.e., only verbs can denote sets of individual/event pairs, individual/individual/event triples, etc. Importantly, we take this constraint on lexical semantics/category mapping to be unidirectional: Not all verbs relate individuals to dynamic events, or even entail dynamicity in the first place, but only verbs can do so.

This paper is structured as follows: In section 2, we provide a brief overview of cross-linguistic variation in categoryhood in the context of property concept lexemes as well as of the morphophonological relation between simple states and their corresponding change of state forms, including equipollent, derivational, and labile relations. Based on previous observations in individual languages, we hypothesize on the basis of this discussion that state/change of state lability is more likely in cases where the property concept is a verb. To investigate this hypothesis systematically, we conduct a typological study using augmented data from the "Verbal Roots Across Languages" database which confirms a correlation between lability and verbhood; these results are discussed in Section 3. In Section 4, we explore the implications of this correlation for our understanding of the relation between meaning and categoryhood, suggesting that it lends evidence to our claim that only verbs are able to relate individuals to dynamic events. In section 5, we discuss some possible counterexamples from deverbal nouns and adjectives, highlighting the verbal core of these derived categories and showing how they are instead consistent with our claims. We then conclude in Section 6.

2 Property concept lexemes

As described above, the empirical focus of our study is on property concept lexemes, i.e. lexemes that express the descriptive content of English adjectives (Dixon 1982; Thompson 1989). This class includes the following (non-exhaustive) list of concepts which, according to Dixon fall into seven sub-classes.

(4)   Property concept meanings

      a. *Dimension*: large/big, small, short, long, deep, wide, tall/height
      b. *Age*: old, young
      c. *Value*: bad, good
      d. *Color*: white, black, red, green, blue, brown
      e. *Physical Property*: cool, cold, warm, hot, dirty, dry, wet, straight, hard/tough
      f. *Speed*: fast, slow
      g. *Human Propensity*: happy, sad, clever, stupid, angry

Both across and within languages, property concept lexemes can be realized as adjectives, nouns, or verbs. Further, property concept lexemes usually have derivationally related verbs that express a change into the respective state, independently of how they are categorized in their simple state. Below, we provide a brief typological overview of the lexical category of property concept lexemes, and their morphophonological relation to their respective change of state forms, showing that three directional types are attested: (i) equipollent, (ii) change of state derived from state, and (iii) labile.

2.1 Lexical category

We cannot do justice here to the richness of work on lexical categoryhood undertaken in prior work. For recent overview and literature review, see Baker & Croft (2017). Our goal in this section is instead simply to illustrate the kinds of differences in lexical category of property concept lexemes that has been observed which feed into our study. This literature has shown that property concept lexemes vary cross-linguistically according to their basic lexical category. In many well-studied languages, property concept lexemes typically belong to an adjectival class that has distinct morphosyntactic properties from both nominal and verbal categories.[1] In English

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[1] Our understanding of lexical categories is that they are *morphosyntactic* in nature (see e.g., Baker 2003 for discussion) albeit with lexical semantic correlations (see e.g., Croft 2001: 88), as discussed further below. Given that our goal is to understand such correlations better, it is important for our program to maintain morphosyntactic diagnostics in order to avoid circularity.

Contrary to the worry of an anonymous reviewer, we do not believe that our approach presupposes that lexical categories are innate, as in Baker (2003). This is a possibility, but they could equally be acquired by the child via sensitivity to their distribution (Reeder et al. 2013), with our observations and methodology still being consistent with such a finding.

for example, adjectival property concept lexemes such as *tall* cannot function as an independent predicate of a clause, but require the copula *be*.

(5)   a.   The child is tall.
        b.   *The child talls.

Adjectival property concept lexemes also differ from nominal predicates in that they cannot head a noun phrase, but only function as attributive modifiers.[2]

(6)   a.   the tall child
        b.   *the tall of the child

In other languages such as Hausa (Parsons 1955), Basaá (Bantu; Jenks et al. 2018), and Warlpiri (Pama–Nyungan; Bittner & Hale 1995), property concept lexemes are typically nominal. In contrast to adjectives, nominal property concept lexemes exhibit the morphosyntactic properties of other nouns in a given language. In Hausa for example ((7), repeated from (1)), nominal property concept lexemes such as *ƙarfī* 'strength' must therefore occur in possessive constructions as other nouns do (e.g., *zōbĕ* 'ring') when used predicatively.

(7)   Hausa

        a.   Mun**à**   **dà**   ƙarfī.
             we.CONT with strength
             'We are strong.'   (Newman 2000: 224)

        b.   Yārinyằ tan**à**   **dà**   zōbĕ.
             girl   she.CONT with ring
             'The girl has a ring.'   (Newman 2000: 222)

Finally, there are languages, including Tongan (Austronesian; Churchward 1953), Koasati (Muskogean; Kimball 1994), and Paumari (Arauan; Chapman & Salzer 1998) in which property

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[2] As an anonymous reviewer observes, there are contexts where, superficially, it appears that an adjective heads a noun phrase. For example, in Spanish, adjectives can be used on their own inside a noun phrase in contexts where the noun has been elided, which is made possible by a variety of circumstances including contextual support:

(i)   In front of a stand of oranges of different kinds:
        Dame pequeñas.
        give.me small.ones
        'Give me small ones.'   (Eguren 2010: 437)

That these are elliptical, however, is a claim supported by many observations, most notably that the adjective agrees in gender with the elided noun, *naranja* 'orange' in (i), which is feminine. See Eguren (2010) and references there for more discussion.

Similarly, Glass (2019) and McNally & de Swart (2015) have documented novel uses of nouns derived from adjectives in head position of an NP in English and Dutch respectively (e.g., *The old is never ordinary*). These are argued to be derived nouns, however, so again, a different phenomenon. See Glass (2019) and McNally & de Swart (2015) for discussion.

concept lexemes are typically lexicalized as stative verbs. In such languages, property concept lexemes appear in predicate position without a copula, as exemplified by Tongan below (see also Koontz-Garboden 2007).

(8)   Tongan

    a.   'Oku **loloa** ho   'ulu.
        IMP   long   your hair
        'Your hair is long.'   (Koontz-Garboden 2007: 117)

    b.   'Oku **lea**   'a   Pita.
        IMP   speak ABS Pita.
        'Pita speaks.'   (Churchward 1953: 37)

While some languages uniformly realize property concept meaning by lexemes of a single category, many other languages exhibit category splits with a subclass of property concepts being realized by lexemes of another category (see Dixon 1982 and Stassen 1997 for cross-linguistic tendencies; also van Lier 2017). In Daakaka (Oceanic, Austronesian) for example, property concept lexemes such as *mwelili* 'be small' are verbal, while others such as *bur* 'deaf' are adjectival, as indicated by the obligatory presence of the copula only in the latter (von Prince 2015).

(9)   Daakaka

    a.   Sini   ma   kekei.
        green.pigeon REAL small
        'The green pigeon is small'   (von Prince 2015: 259)

    b.   Vyanten ente mw=**i**   bur.
        person   DEM REAL=COP deaf
        'This person is deaf.'   (von Prince 2015: 131)

In addition, languages may exhibit multiple categorial strategies to realize the same property concept without a clear derivational relationship between the forms. Such a case can be observed in Édò (Benue-Congo, Niger-Congo) where property concepts like 'beautiful' can be realized by either verbal (10a) or adjectival lexemes (10b), which differ in their tonal pattern and their requirement to combine with the copula *ye* in predicate contexts (Baker & Stewart 1997).

(10)   Édò

    a.   Èmèrí mòsé.
        Mary beautiful
        'Mary is beautiful.'

    b.   Èmèrí *(**ye**) mòsè.
        Mary COP   beautiful
        'Mary is beautiful.'   (Baker & Stewart 1997: 33)

In summary, property concept lexemes can be lexicalized as various parts of speech — adjectives, nouns, or verbs — both within and across languages.

2.2 Direction of derivation between state and change of state

There is often morphology deriving a word describing a state into a word describing a change into that state (or vice versa; Koontz-Garboden 2005: 94–99). Depending on the kind of state (e.g., property concept state or result state), there are differences in the direction of such derivation (see Beavers et al. 2021 for a typologically robust demonstration). On the one hand, purely stative property concept lexemes like *red* tend to be unmarked, with the change of state verb derived. On the other hand, result states like *cracked*, which lexically entail a prior change into that state, tend to bear a different morphological relationship to the verb describing the change into the state, in the case of English with the result state adjective derived from the verb describing the change into the state the adjective describes.

(11)   a.   Kim's face will be **red**.
       b.   Kim's face will **redden**

(12)   a.   The vase will be **cracked**.
       b.   The vase will **crack**.

The present study focuses on property concept lexemes, which primarily show three different types of derivational relationship to their change of state forms across languages.[3]

The first derivational type is equipollent, in which both stative and change of state forms are derived from a common root.[4] In Ulwa (Misumalpan) for example, property concept roots like *sang-* take the suffix *-ka* in their stative form, which is replaced by the suffix *-da* in their (intransitive) change of state form (see also Doron 2003: 61 on templatic morphology in Hebrew).

(13)   Ulwa (Hale & Keyser 2002: 122–123; Koontz-Garboden 2009)

root	state	(intrans) COS	
sang–	sang-**ka**	sang-**da**	'green/blue'
yûh–	yûh-**ka**	yûh-**da**	'long, tall'

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[3] See Beavers et al. (2021) for discussion of the full typology. In this paper, as discussed below, we are interested in one particular pattern. We discuss the three most common patterns observed crosslinguistically by Beavers et al. (2021) immediately below for illustrative purposes.

Related to this, it should be noted that throughout the paper we follow Beavers et al. (2021) in using the term "property concept state" to refer to the meanings underpinning simple English adjectives (and translational equivalents), not stative predicates that are derivationally related. So, for example, the term covers the meaning underlying *red*, but not *reddened*, the latter labelled a "result state" by Beavers et al. (2021) and in the Verbal Roots database.

[4] The terms *equipollent* and *labile* (as used below) are drawn from and used as in Beavers et al. (2021), who adopted them from Haspelmath's (1993) work on the causative alternation, but extended the terms to cover derivational relationships between stative predicates and derivationally related change of state predicates.

In the second derivational type, the change of state form is derived from the simple state, such that the stative form is morphophonologically less marked than the change of state form. This pattern is familiar from property concept adjectives in English where change of state forms are commonly derived by the suffix *-en* (see Dixon 1982 for a discussion of change of state morphology in English).

(14)   English

	Adjective	(intrans) COS
a.	red	redd-**en**
b.	hard	hard-**en**

Cross-linguistically, the derivation of change of state forms from stative forms is not only found with adjectival property concept lexemes. Nominal property concept lexemes can also be derived into change of state verbs by designated morphology in some languages, as exemplified by Warlpiri. Here, the suffix *-jarri* verbalizes the nominal property concept lexemes and introduces change of state semantics (cf. Hale & Keyser 1998).

(15)   Warlpiri (Hale & Keyser 1998: 93)

	Noun	(intrans) COS	
a.	wiri	wiri-**jarri-**	'big'
b.	maju	maju-**jarri-**	'bad'

Change of state forms of verbal property concept lexemes may also be morphologically marked. This is the case in Yup'ik (Eskimo-Aleut), where change of state verbs are formed by the suffix *-li*:

(16)   Yup'ik (Jacobson 2012: 747, 262)

	Verb	(intrans) COS	
a.	manig	manig-**li-**	'smooth'
b.	neqnirqe	neqnirqe-**li-**	'sweet'

Wá:šiw, as discussed in §4, has verbal property concept lexemes that behave similarly. The derivation of change of state forms from stative property concept lexemes with overt morphology thus appears to be insensitive to the lexical category of the source property concept lexeme.[5]

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[5] An anonymous reviewer raises the intriguing question what the compositional analysis of the root/state/change of state derivations is in cases like those seen in Ulwa, Warlpiri and Yup'ik. For Ulwa, the root/state derivation has been discussed in detail by Koontz-Garboden & Francez (2010); Francez & Koontz-Garboden (2016; 2017), with Ulwa change of state verbs discussed by Koontz-Garboden (2009). How precisely the former and the latter discussions link up is outstanding. In the cases of Warlpiri and Yup'ik, we agree with the reviewer that this is an interesting question, though it is one that is beyond the scope of this paper to answer. What is important is simply the derivational relations, which are clear from the morphology, even if the details of the compositional analysis must remain outstanding, at least for now for Warlpiri and Yup'ik.

The final derivational type is labile, in which there is no morphophonological difference between state and change of state forms.[6] We have already seen this state of affairs in Tongan ((2a), (3) above), in which property concept lexemes like *loloa* 'long' exhibit the same form in both stative and change of state contexts:

(17)   Tongan

    a. 'Oku ***loloa*** ho   'ulu.

        IMP long your hair

        'Your hair is long.'

    b. 'Oku ***loloa*** vave ho   'ulu.

        IMP long fast your hair

        'Your hair is quickly **getting** long.'

This pattern has been noted in the typological and descriptive literature, usually with the differences in meaning observed in the context of different aspectual marking on the polysemous word (e.g., Bybee et al. 1994: 75–76; Tatevosov 2002: 340ff.; Talmy 1985: 92; Smith 1997: 70; Wetzer 1996: 189; and Chung & Timberlake 1985: 217).

> Applied to states, closure implies a complete change of state, specifically inception rather than cessation. Thus, languages that have a morphological category (traditionally called perfective) to specify closure for processes often use the same category to signal inception of a state.
>
>   (Chung & Timberlake 1985: 217)

State/change of state lability has been observed in several unrelated languages, including Mandarin (Sino-Tibetan; Tham 2013), Paraguayan Guarani (Tupi-Guarani; Califa 2018), and Gã (Kwa; Campbell 2022):

(18)   Mandarin

    a. malu hen kuan

        road very wide

        'The road is very wide.'

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[6] This might, in at least some languages, not be derivation at all, but this is a separate issue; see Koontz-Garboden 2005; 2007; Matthewson et al. 2015 and discussion in §6.

An anonymous reviewer questions whether *labile* is the best label to use in the cases we use it for, suggesting that in Jakobsonean markedness terms, what we call labile cases are really a special case of equipollent ones, and further remarking that *flexible* (as in Rijkhoff & van Lier 2013) would have been a better label. We sympathize with the reviewer's concerns, but given that *labile* is the term used by Beavers et al. (2021) and for the cases we study in the Verbal Roots database which our empirical study has used as a point of departure, we believe it would cause confusion for any future work building on ours to change the term and therefore continue to use *labile* in spite of these concerns.

    b.   malu kuan-**le**
        road wide-PERF
        'The road widened.'   (Tham 2013: 653)

(19)   Paraguayan Guarani

    a.   Ko'a tomate pytã
        DET   tomato red
        'The tomato is red.'   (Califa 2018: 82)

    b.   Ko'a tomate pytã-**na**
        DET   tomato red-PERF
        'The tomato reddened.'   (Califa 2018: 83)

(20)   Gã

    a.   Bl̀òdó=!ɛ̀   wá
        bread=DEF hard
        'The bread is hard.'   (Campbell 2022: 11)

    b.   Bl̀òdó=!ɛ̀   **é**-wà
        bread=DEF PERF-hard
        'The bread became hard.'   (Campbell 2022: 10)

A reviewer notes that while the Tongan state/change of state pairs show identical aspectual marking, the ones in (18)–(20) show differences. Whether the difference is tied to aspectual marking, as suggested for Niuean by Matthewson et al. (2015) or to broader context requiring state change, as suggested for Tongan by Koontz-Garboden (2007) is a matter of current debate. See Smith et al. (2024) for recent discussion. Our goal here is simply to examine lability and category, and the resolution of this debate does not, therefore, impact on our observations below.

    In summary, we observe three different types of derivational relationship between state and associated change of state crosslinguistically: equipollent, change of state derived from stative form, and labile.

2.3 A correlation?

The preliminary cross-linguistic picture based on languages discussed immediately above suggests that lability correlates with verbal category of property concept lexemes; adjectival and nominal property concepts instead appear to be less likely to be labile. From these preliminary observations, we arrive at the following hypothesis:[7]

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[7] A reviewer objects to use of the term *labile* to describe derivational relations, suggesting it should be used only to describe lexemes themselves. While we sympathize, we follow the terminological conventions already established in the Verbal Roots database.

(21)   **Hypothesis**

Property concept state/change of state derivational relations are more likely to be labile when the state is verbal than when the state is adjectival or nominal in category.

If this hypothesis is supported by further investigation, it requires explanation. To preview, we show that it is indeed supported and argue that it is explained by the lexical semantic underpinnings of verbhood as the only category of word that can lexicalize relations between individuals and dynamic events, and therefore the only category of word that can lexicalize relations between individuals and change of state events. Any non-verbal property concept state (e.g., adjective, noun) therefore has to undergo category change in the derivation of a change of state predicate from it. Because both the introduction of change of state meaning and category change can be (separately) morphologically marked, and because derivation of a change of state requires only the introduction of the change meaning component, but not necessarily category change, state/change of state derivational relations are more likely to be labile when the property concept state is a verb than when it is a non-verb, because in the verbal case there is only one operation to potentially be morphologically marked, whereas in the non-verbal case, there are two, given the necessity of verbal derivation in order to lexicalize change of state meaning.

3 Typological study

To investigate this hypothesis in a more systematic way, we conducted a typological study based on two underlying considerations. Firstly, we look at a set of lexemes describing particular property concept states and their derivation into words describing the associated change of state across a representative set of languages. Secondly, we recognize that the issue we are interested in is not one of languages writ large, but rather individual lexemes, some of which might show overt derivation, as with (22), and some not, as with (23), in any particular language.

(22)   a.   The metal was flat.
       b.   The metal flatt-**en**-ed.

(23)   a.   The road was narrow.
       b.   The road narrow-ed.

That is to say, we recognize that what we are engaged in is an exercise in lexical typology, as articulated by, for example, Koptjevskaja-Tamm et al. (2015). With this background and these caveats in mind, in the remainder of this section we discuss the data we drew on, how we coded it, and then report the descriptive results, along with a statistical analysis to test whether patterns in the observed distribution deviate significantly from chance.

3.1 Data

In order to test the hypothesis, we draw on the database "Verbal Roots Across Languages" (https://verbal-roots.la.utexas.edu). This database was designed to systematically investigate the morphological derivational relationship between stative lexemes and their semantically related change of state lexemes crosslinguistically (see Beavers et al. 2021 for details). It includes information on 88 languages of the WALS 100 language list (Dryer & Haspelmath 2013), mostly representing the areas and families of the WALS 100, covering 72 root meanings. For the study reported here, we have examined the property concept meanings listed in (24):

(24)   Property concept meanings data collection based on Verbal Roots database
a.   *Dimension*: large/big/enlarge, small/shrink/shrunken, short/shorten, long/lengthen, deep/deepen, wide/widen, tall/height/heighten
b.   *Age*: old/aged/age
c.   *Value*: bad/worsen/worse, good/improve/improved
d.   *Color*: white/whiten, black/blacken, red/redden, green/make green, blue/make blue, brown/make brown
e.   *Physical Property*: cool/cool, cold/make cold, warm/warm, hot/heat up, dirty/dirty, dry/dry, wet/wetted, straight/straighten, hard/harden (tough/toughen), soft/soften, tight/tighten, clear/clear, clean/clean, smooth/smooth, sharp/sharpen, sweet/sweeten, weak/weaken, strong/strengthen
f.   *Speed*: fast/speed up, slow/slow down
g.   *Human Propensity*: angry/anger, calm/calmed, scared/scared (frightened/frighten), sick/sicken, sad/sadden (depressed/depress), hurt/hurt, tired/tire, embarrassed/embarrass, entertained/entertain, surprised/surprise, worried/worry, pleased/please

For the purposes of the present study, what is important to know about the database is that for each root meaning in (24) in each of the database's languages, it lists state/change of state pairs, along with any underlying root for languages in which these are derived from a bound root.[8] The database contains 3365 entries like these with data of some kind (i.e., paradigms where not all cells are empty) based on property concept roots. The database website has a search function which allows for the searching of entries according to the direction of derivation between pairs, so that for example, we can extract all state/change of state pairs, henceforth called paradigms, that are related equipollently, where the latter is derived from the former, or crucially for the purposes of our study, in a labile fashion. From these 3365 paradigms, we extracted all property concepts in all languages in which there was at least one entry where state and intransitive change

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[8] The database also lists derivationally related forms with causative change of state and result state meanings, though we do not consider these here. See fn. 9 for further discussion of the causative and Beavers et al. (2021) for further details on all aspects of the database, or indeed the database website itself.

of state showed a labile direction of derivation to one another.[9] It is important to highlight that the database treats lability, as do we, as based entirely on superficial morphological form. So, for example, while some might assume for English that there is zero morphology relating e.g., adjectival state *dry* and verbal change of state *dry*, these are treated by the database as showing a labile relationship to one another, and are included in our sample. The 41 languages included by this criterion and from which paradigms were therefore extracted are listed in the Appendix. If a language had even a single paradigm in which state and change of state showed a labile relationship, we have included in our study all entries from that language that have non-empty cells. So, to take an example, there is one paradigm in the Verbal Roots database for Paumarí that shows lability: *ihamahiki* is listed with the stative meaning 'be angry' and the change of state meaning 'get angry'. We therefore looked up in Chapman & Salzer (1998: 347) the lexical category for *ihamahiki*, which was listed as verb. Furthemore, because there was this one entry from Paumarí showing lability, we included in our analysis all other paradigms in the Verbal Roots database, looking up the lexical category for the property concept word in the remaining thirty two property concept state/inchoative paradigms.

While the database is in most ways well-suited for our objectives, there is a key way in which it is not: it does not include lexical category information. Because such information is crucial to investigate our hypothesis, category information was extracted for each state in each of the paradigms meeting the above criteria from one of the original sources listed in a manner described in the Appendix. Entries for which it was impossible to find a categorization were excluded, as were a small number of other cases described in the appendix (where, for one reason or another, we could not make a conclusion about the category of the state despite there being some information).[10] There were a few entries for which it was clear that the state was one of two

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[9] A reviewer observes that we "consider the simple stative PC term and the corresponding inchoative [intransitive change of state], and ignore the causative." The reviewer continues: "but it's also known that some languages employ either anticausative or suppletive relationships between the causative and inchoative change of state terms. In those cases, then, it could be that the stative is labile with the causative and not the inchoative, since the inchoative is either derived from the causative or is an unrelated suppletive form." The database has 33 such cases, relatively few compared to the 246 state/inchoative labile cases (see **Table 1** and **Table 2**).

The difference between the states and the inchoatives is in a single semantic variable—change of state. The state/causative difference, however, introduces additional confounds: (i) they are transitive, rather than intransitive, and (ii) their external arguments are likely thematically heterogeneous within the set of verbs for any language and across languages. Morphology and syntax are known to be sensitive to both (i) and (ii), and integration of them therefore introduces complications which would require more thorough theoretical and statistical consideration than is possible here. We have opted to control for these factors and therefore leave out the causatives in this study. While their exclusion likely makes no statistical difference (given their paucity), even if it did, while it would raise questions as to why, it would not change the observation that for state/inchoative pairs there is indeed a result. We therefore believe that while they represent an interesting area for expansion of the work here, their exclusion causes no harm.

[10] The database also includes "hypothetical" entries, forms that are deduced to exist in a particular form, given the existence of a particular rule of grammar discussed in a grammar or dictionary. See Beavers et al. 2021: 462, fn. 22 for discussion of these forms. Like Beavers et al., we have not included them in our study.

categories (see **Table 2**), but it was not clear which. We have coded these separately, giving each of them two different codings. We integrate these into the analysis with the benefit of a statistical procedure described in §3.2.

With all of these considerations in mind, after the categorization procedure, and collapsing the equipollent and derived patterns into "non-labile", the exercise yields the distribution of raw data in **Table 1** for those entries that had a single categorization, and **Table 2** for those few that had two. Leaving the data in **Table 2** to the side for the time being, the data in **Table 1** do seem to suggest, at least superficially, that verbhood does favor lability, as only 19% of nominal cases and 19% of adjectival cases are labile, while 52% of verbal cases are. In the section that follows, we explore whether this apparent unequal distribution of lability across categories deviates significantly from what could occur by chance.

	noun	**adjective**	**verb**	**total**
labile	3	51	190	244
non-labile	13	219	177	409
total	**16**	**270**	**367**	**653**
lability	19%	19%	52%	37%

Table 1: Lability in state/COS by category of the state.

	noun/ adjective	**adjective/ verb**	**verb/ noun**	**total**
labile	0	2	0	2
non-labile	19	2	2	23
total	**19**	**4**	**2**	**25**
lability	0%	50%	0%	8%

Table 2: Lability in state/COS by category of the state (source discrepancies).

3.2 Analysis & results

Our analysis was preregistered with the Open Science Framework (https://osf.io/pdnzb/?view_only=bb2fcae6a7d14ea19a676759c50e45c0). We fit a Bayesian mixed effects logistic regression model to the data compiled as above with labile (1) and non-labile (0) as the outcome variable. The category of the property concept state was included as a fixed effect, and language included as a random effect on both the intercept and this slope (allowing us to interpret any observed effect

of category as generalisable across language). The model was fitted using STAN via *brms* (Bürkner 2017). A weakly informative prior was employed for the effects of category (normal distribution with a mean of 0 and a standard deviation of 20). The default LKJ prior with shape parameter 1 was used for the random effects. As in a small number of cases multiple categories were reported, our estimates are made by collapsing together 4000 iterations for each of 20 versions of the dataset (a single category was chosen for each of the ambiguous datapoints in each).
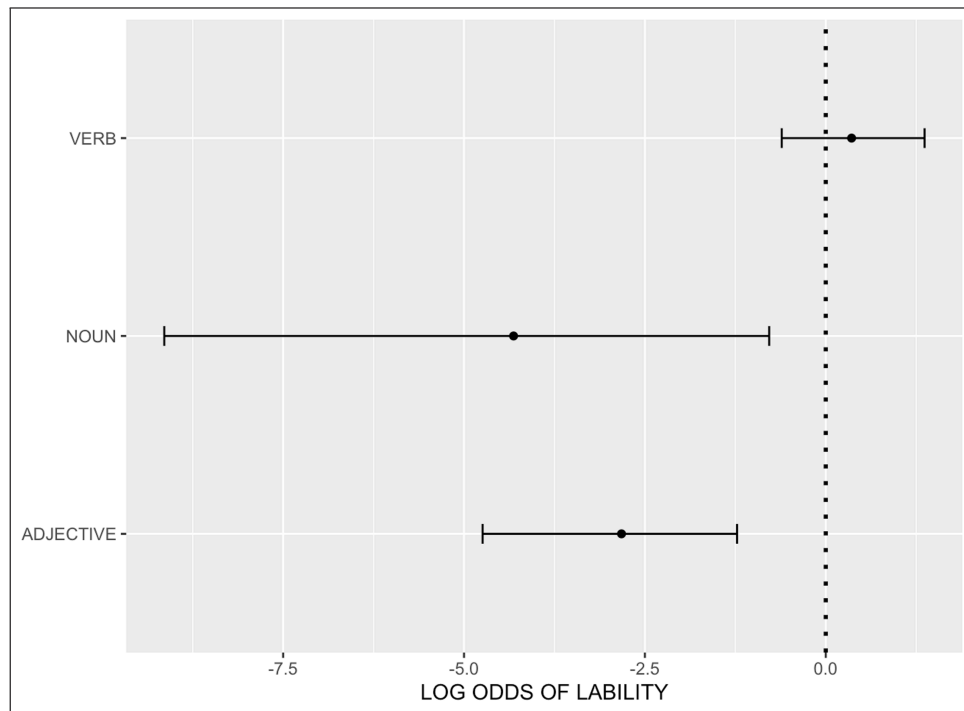
Figure 1: The log odds of lability for each category (verbal, nominal, adjectival) with 90% credible intervals.

Figure 1 shows the estimated log odds of lability for each category (verb, noun, adjective). The dot for each category represents the best estimate for the log odds of lability. The bars represent the uncertainty around this estimate: they represent the range in which the value falls with 90% probability. Since the best estimate for adjectives and nouns falls outside the interval for verbs, we can say that there is < 0.05 probability that their log odds of lability are as high as that of verbs. We can therefore conclude that the data support the generalization in (25):[11]

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[11] A reviewer asks about correlations between lability and observations made in previous literature. In fact, further investigation has shown that amongst Dixon (1982) classes, there are differences in likelihood of being a verb or a non-verb that are tied to his classes, something that Dixon (1982) already conjectured in his work. This, given our observations here, will be tied to lability. The links to Dixon (1982) are not exactly as Dixon conjectured, however, and laying all of this out goes beyond the scope of this paper. See Bannard et al. (2023).

(25)   **Generalization**

For a given state $[\![\phi]\!]$ and a change into that state $[\![\psi]\!]$,

ϕ and ψ are significantly more likely to show a labile derivation if ϕ is a verb.

4 Discussion and implications

We now turn to a discussion of why state to change of state derivation should be sensitive to category in this way. Our explanation of this sensitivity has two parts: First, change of state meanings are dynamic and therefore necessarily verbal; second, both category change and derivation of change of state from state can be marked by phonologically overt derivation. We begin with some discussion of key assumptions and sketch out how the explanation works, following this with further empirical support, justification and explanation by showing just how change of state and category change are found as separate morphologically marked derivational operations crosslinguistically.

4.1 Some assumptions and explanation

We believe the asymmetry in morphological behavior between verbs on the one hand and non-verbs on the other follows from relatively uncontroversial, but non-trivial, assumptions about the lexical semantics of nouns, adjectives, and verbs. We start from the assumption of a model with a domain that includes a variety of different sorts of e-type objects. The foundation is ordinary atomic individuals, assumed as part of any model since Montague (1973). As motivated by the semantics of mass nouns due to Link (1983), we assume there are also mereologically ordered portions (which perhaps includes pluralities, though nothing rests on that here). Finally, we assume there are also Davidsonian objects (Davidson 1967), i.e., states and events, which are standardly assumed to stand in some mereological ordering to one another (Champollion 2017: 27). We assume that states and events differ in that the former are not dynamic, while the latter are. A key consequence of this is that states can have temporal traces that are a single moment of time, while events have temporal traces that are minimally intervals of at least two moments, as a minimum of two moments is what is required for a change to occur, as discussed at length by Dowty (1979: 166ff). It is therefore no surprise that the truth of sentences headed by stative predicates can be evaluated at a single moment of time, while the truth of sentences headed by eventive predicates can only be evaluated at intervals larger than a single moment (ibid.). Many of the celebrated state/event linguistic diagnostics laid out by Dowty (1979: 55–56), such as ability to occur in the progressive construction and truth at a single moment in the English present tense, can be tied to this temporal property. This also presupposes the existence (again standard) of times, and an ordering of them relative to one another. The simple model that these assumptions give rise to is summarized in (26).

(26) The domain: different sorts of e-type objects

    a. Ordinary individuals

    b. Mereologically ordered portions (sets of which are the denotations of mass nouns)

    c. events ($=$ dynamic eventualities)

    d. states ($=$ stative eventualities)

    e. times

With this as background, we now articulate some assumptions about the meanings of words in different categories which we believe are common and widespread, but not generally articulated, and from which we believe our crosslinguistic observations regarding lability follow. Nouns, we assume, denote sets of entities of any sort. There are obviously those that denote sets of ordinary individuals, e.g., *dog, cat, computer, house*. There are those that denote sets of (ordered) portions, such as mass nouns like e.g., *water, strength*. Some denote sets of (ordered) events, such as nouns like *exam* (see §5.1 for references and discussion). Finally, there are nouns with a variety of sorts of entity in their denotation, nouns such as *thing*, for example. The idea that common nouns denote sets of some sort or another is assumed since at least Montague (1973) and is the foundation of work on generalized quantifier theory (Barwise & Cooper 1981), and much work in formal semantics more generally. There are differing views on what adjectives denote. While some have argued they denote contextually-sensitive sets of individuals (Kamp 1975; Klein 1980) others have argued they denote degree relations (Cresswell 1977; von Stechow 1984; Heim 1985) or measure functions (Kennedy 1997). Alternatively, others have argued for a view incorporating Davidsonian states, so that they denote, for example, sets of stative eventualities (Wellwood 2015; 2019). While these views all differ significantly in their substance and to some degree in predictions they make, distinguishing between them is not important for the claims we want to make. What is important for us is simply that on no theory do adjectives relate individuals to *dynamic* eventualities (which we will claim is only possible for verbs). Finally, what the denotations of verbs is depends on one's theoretical starting point and views about the nature of the syntax/semantics interface. Some kind of event semantics seems by now orthodoxy in the syntax/semantics interface literature. But the exact kind impacts on what kind of meaning verbs have. On the standard Davidsonian view (Davidson 1967) verbs denote relations between individuals and events. In the modern syntactic literature dating to Kratzer (1996), the external argument is treated in a neo-Davidsonian fashion, while the internal argument remains a lexical argument of the verb, making some verbs denote sets of events (unergatives) and others denote relations between individuals and events (transitives, unaccusatives). Lurking behind this discussion, and we believe behind much work in formal semantics generally, is the assumption that there are certain kinds of meanings that only words of particular categories can have. While we believe there are many meaning/category pairings, one crucial to us here is (27):

(27)   Only verbs can lexicalize relations between individuals and dynamic eventualities.

More explicitly, couched in a standard Davidsonian theory, the assumption is that only verbs can denote individual/event pairs (intransitive eventive verbs), individual/individual/ event triples (transitive eventive verbs), or individual/individual/individual/event 4-tuples (ditransitive eventive verbs). Although we use the term *lexicalize* in (27), this is for expository convenience, and it is important to note that our claim is not tied to any particular theory of the syntax/semantics interface, including a lexicalist one. That is to say, we use this term loosely. On a lexicalist theory, we intend it as standardly assumed, to cover the denotations of words in the lexicon. On a non-lexicalist theory such as Distributed Morphology, the force of (27) holds of categorization of acategorial roots, so the idea is that roots that relate individuals to dynamic eventualities can only have as their first categorizing functional head v, as opposed to a or n.[12]

We assume that constraints on lexical semantics/categorial mapping of the kind in (27), and crucially (27) itself, are unidirectional. Our claim is that there is a particular kind of meaning that can only be lexicalized as a verb, and can never be lexicalized as a word of any other category. The fact that it is unidirectional, however, entails that verbs can have other meanings as well, as indeed they do, as with, for example, stative verbs. To put it slightly differently, our claim is not that verbhood entails dynamicity, but rather that dynamicity entails verbhood. As discussed below, this idea plays an important role in the understanding of the distribution of lability across categories and languages that we have observed above.

4.2 Inchoativization and category change

There are two separate processes that occur when a change of state verb is derived from a noun or an adjective, which are often conceptually lumped together. The first of these is inchoativization— a change in meaning from state to change of state. The second, in the event that the stative predicate is non-verbal, is category change, namely from a noun or an adjective to a verb.

Crucially, we know that these two processes are independent of one another, among other reasons because there exist inchoatives that are overtly derived from (stative) property concept verbs. Such a derivation is found in Wá·šiw (also spelled Washo, Washoe; Hokan/isolate,

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[12] It is worth highlighting that on a fully neo-Davidsonian theory (see Champollion 2015: 35–36 for overview and references), where all arguments are severed, depending on the nature of assumptions about the syntax/semantics interface, (27) might be true, but vacuously so. On a non-lexicalist theory, where one or more arguments is introduced as part of categorization (via e.g., v), this would not be the case, as (27) would govern what the meaning of the merged root+categorizer constituent can be, and if categorizers were adding arguments, then there would be substantive predictions about what v could add and what n and a could not, as discussed already above. But on a lexicalist theory where all verbs lexically denote sets of events, it would indeed hold only vacuously. This potential loss of crosslinguistic generalization about the semantics of categoryhood could be considered going forward in crosstheory comparison.

USA), where all property concept lexemes are verbs (see Hanink & Koontz-Garboden 2021), and where some change of state predicates are derived from them with the suffix *–etiʔ* (Jacobsen 1964):

(28)   a.   baŋáya wa-yák'aš-i
           outside STAT-be.warm-IND
           'It's warm outside.'
      b.   baŋáya wa-yák'aš-**étiʔ**-i
           outside STAT-be.warm-**INCH**-IND
           'It's getting warm outside.'   (Washo Archive)[13]

(29)   a.   di-Lóyaw-i
           1-be.mad-IND
           'I'm angry'
      b.   di-Lóyaw-**étiʔ**-i
           1-be.mad-**INCH**-IND
           'I got angry'   (Washo Archive)

In the above examples, no category change is necessary to form the change of state expression, as the simple state is already verbal. What these data point to, then, is that inchoativization can happen independently from category change; the two are not necessarily tied up together.

More acutely, there are cases in Wá·šiw where we see overt verbalization prior to – and thus separately from – inchoativization. This state of affairs is found with bound property concept roots, which must be verbalized by the suffix *–iʔ* (Jacobsen 1964; Hanink & Koontz-Garboden 2021) prior to inchoativization. Here we find that the inchoativizing suffix *–étiʔ* appears outside the verbalizing morphology:[14]

(30)   a.   dewdíʔiš ʔilc'ác'im-**iʔ**-i
           tree   3.green-**VBL**-IND
           'The tree is green'
      b.   dewdíʔiš ʔilc'ác'im-**iʔ-étiʔ**-i
           tree   3.green-**VBL-INCH**-IND
           'The tree is getting green'   (Washo Archive)

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[13] These examples are available online at https://washo.uchicago.edu.

[14] A reviewer raises the question what the distribution of roots like that for *green* in (30) is outside of property concept words. In the general case, there are three classes of property concept roots in Washo, and they have different morphosyntactic distributions, which suggest variation in their root meanings, even though all Wá·šiw property concept *words* are verbs with the same kind of meaning. See Hanink & Koontz-Garboden (2023) for detailed discussion.

What these data show is that category change and inchoativization are two separate processes at play in derivation from state to change of state.[15] We argue in the remainder of this section that this is what explains the predominance of labile derivational relations with verbal property concept lexemes, and the lack thereof with nouns and adjectives.

Our argument is as follows. Change of state is dynamic (if not necessarily temporally so; Sweetser 1997; Gawron 2009; Koontz-Garboden 2010; Deo et al. 2013), and can therefore only be expressed verbally. It therefore follows that if a single lexeme is going to have both a state and a change of state sense, it can only be a verb, since a noun or an adjective cannot have a change of state meaning. If a property concept lexeme is a noun or an adjective, therefore, to derive a word with change of state meaning from it, both inchoativization *and* category change are implicated—two processes that can be marked independently by morphology, as seen above. As already stated, by contrast, category change is not implicated in the derivation of a word with change of state meaning from verbal property concept lexemes; only inchoativization is. Given that category changing derivations and inchoativization can both be morphologically marked, it follows that change of state verbs derived from verbal property concept lexemes are less likely to be morphologically marked, since they only undergo inchoativization, rather than both inchoativization and category change.[16] To put it more simply, with nominal or adjectival property concepts there are two possible reasons for morphological marking in COS derivation, while with verbal property concepts, there is only one, thereby increasing the likelihood of marking/decreasing the likelihood of lability of the former relative to the latter.[17] That we therefore observe in **Table 1** (and in the statistical analysis tied

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[15] See also Štekauer et al. (2012) on the morphological marking of category changing derivations.

[16] An anonymous reviewer raises the question whether abstract analyses involving zero morphology would alter the logic of the argument. We do not believe that they would. The empirical observation is that there is less overt morphological marking on change of state verbs when they are derived from verbal property concept lexemes than when they are derived from non-verbal ones. For analyses involving zero morphology to impact on the argument, it would have to be the case that zero morphology is more common with verbal property concept lexemes than with non-verbal ones. We agree that analyses can be conjured up in which, for example, a functional head introducing inchoativization is realized as null in some particular language in the context of verbal property concept lexemes but not in the context of non-verbal ones. But such an analysis would beg the question why in unrelated languages null morphology is more likely to be found in such contexts, and would ultimately make this crosslinguistic observation a morphophonological accident, since null is simply a particular phonological shape, and since, given the arbitrariness of the sign, the same phonological shape in a morpheme with the same meaning in many unrelated languages can only be accidental. It is a premise of linguistic typology that correlations across a suitably large sample of languages such as we have in this paper are not accidents, but rather explananda.

[17] A reviewer asks whether any hypotheses can be formulated for the labile type with nouns and adjectives. In view of our claims here, we can conjecture that nominal and adjectival lability must be morphologically accidental. I.e., there must be category change, from non-verb to verb in the derivation of a change of state, which just happens to be morphologically unmarked. Given the relative rarity of lability in these contexts, as per **Table 1**, this seems plausible.

to it in **Figure 1**) more labile relations among verbs than among non-verbs (adjectives and nouns) is consistent with this logic. If, by contrast, we had observed more labile relations with non-verbal predicates than with verbal ones, this would have been inconsistent with our claims.

In summary, because only verbs can relate individuals to dynamic eventualities, category change is a necessity in deriving change of state verbs from underlying nominal and adjectival property concept lexemes, leading to an increased likelihood of morphological marking relative to derivation of a change of state verb from a property concept verb. Before concluding, we turn in the next section to address some potential counterexamples to the claim underpinning this explanation.

5 Potential counterexamples: deverbal nouns and adjectives

One obvious set of potential counterexamples to the claim that only verbs may relate individuals to dynamic eventualities comes from derived categories. In this section, we demonstrate the potential problem and then lay out why these constructions are in fact unproblematic for, and in fact consistent with, our claim.

5.1 Derived nouns

At first glance, derived nouns can appear to relate individuals to a dynamic event. If this were the case, it would counterexemplify the claim that only verbs are able to do so. There are many different kinds of nominalizations (see Grimshaw 1990; Zucchi 1993; Alexiadou 2001 for overviews); here we focus on three types that have featured prominently in the literature in order to demonstrate they are not true counterexamples.

We begin with the deverbal construction known as acc(usative)-*ing* nominalizations. The potential problem can be demonstrated by considering the nominalization within the bracketed material in (31). Here, it appears that the nominal itself relates a patient (*the wall*) as well as an agent (*Kim*) to a punching event, apparently contrary to our claim that only verbs can relate individuals and dynamic events in this way:

(31)   [Kim's punching the wall] was rather unexpected.

Indeed, this type of nominalization shows robust argument structure. For example, removal of the direct object (the punchee) in (31) results in ungrammaticality (32a), as does removing the agent (32b). This behavior appears to suggest that this type of nominalization is capable of relating individuals to a dynamic eventuality in the same way that verbs can.

(32)   a. *The news reported Kim's punching.[18]

        b. *The news reported (the) punching the wall.

However, it is a widely accepted generalization that only nominalizations that are derived from verbs display argument structure in this way (Grimshaw 1990; Zucchi 1993; Alexiadou & Grimshaw 2008; cf. Borer 2013). To dispel the concern that this construction is a counterexample, it is sufficient to show the category of any word that lexicalizes a meaning where dynamic eventualities are related to individuals is verb, as opposed to noun. To state the case more specifically to this empirical backdrop, if we can show that a nominalization, whatever meaning it might have, is *derived* from a verb with the relevant meaning, then it is the verb's meaning that matters for (27), not the noun's, since whatever meaning the nominalization has, it does not have it in virtue of lexicalization, but rather from (morphological or syntactic) derivation.

In fact, there is a widely accepted analysis due to Harley (2009) that has it that precisely this is the case. Building on Kratzer (1996) (and Abney 1987), Harley proposes that nominalization in the acc-*ing* construction occurs high in the structure: after the verb takes its internal argument(s) and combines with Voice, as schematized in the structure in (33). This accounts for, among other things, accusative case licensing, the obligatoriness of the direct object, and the ability for an agent to appear. Fundamentally then, we are dealing with a verb taking its subcategorized arguments as usual, with the entire structure being nominalized at a higher position.

(33)

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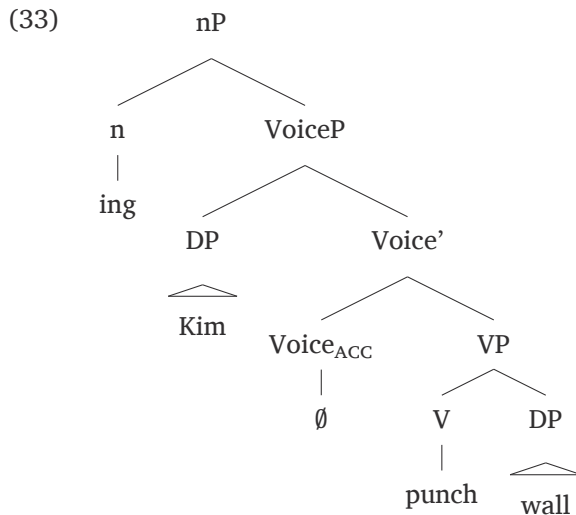
[18] This sentence is acceptable on the reading where Kim is the patient. As observed by a reviewer, it also seems to be acceptable on a semelfactive/object drop-type reading, as with *Muhammad Ali's punching last night was amazing.* Object drop entails changes to a verb's argument structure (see e.g., Dowty 1979: 308; Levin 1993: 33) and we presume this feeds nominalization in a case like this. Crucially, as above, if the verb does not undergo such an operation, the internal argument is required.

In (34) we show the denotations of the key projections of the structure in (33). This derivation shows that it is indeed a verbal projection that relates the object to an event (34b) before a subject argument is introduced (by Voice) (34d).

(34) a. $[\![\text{punch}]\!] = \lambda x \lambda e.\text{punching'}(e)\ \&\ \text{patient'}(e, x)$
      b. $[\![\text{VP}]\!] = \lambda e.\text{punching'}(e)\ \&\ \text{patient'}(e,\text{wall'})$
      c. $[\![\text{Voice}]\!] = \lambda x \lambda e.\text{agent'}(x, e)$
      d. $[\![\text{Voice'}]\!] = \lambda x \lambda e.\text{agent'}(x, e)\ \&\ \text{patient'}(e,\text{wall'})$ (by event identification)
      e. $[\![\text{VoiceP}]\!] = \lambda e.\text{agent'}(\text{Kim'}, e)\ \&\ \text{punching'}(e)\ \&\ \text{patient'}(e,\text{wall'})$
      f. $[\![\text{--ing}]\!] = \lambda P.P$
      g. $[\![\text{nP}]\!] = \lambda e.\text{agent'}(\text{Kim'}, e)\ \&\ \text{punching'}(e)\ \&\ \text{patient'}(e,\text{wall'})$

We now turn to another deverbal construction that makes use of the same suffix: 'of'-*ing* nominalizations, as in (35).

(35) [Kim's/the punching of the wall] was rather unexpected.

This type of nominalization shows some argument structure as well, albeit limited to *internal* arguments. While both constructions involve the nominalizer -*ing*, the above cited works have argued that the two types of nominalization involve different heights of attachment of -*ing*, with *of*-ing attaching at the level of the VP only, thus excluding the potential for an agent-introducing Voice layer to be included in the nominalization. For structural reasons, 'of'-*ing* then differs from acc-*ing* in that the apparent 'subject' in the former is not truly an external argument as it is in (33), but a possessor. That this is the case can be diagnosed by available non-argument readings: unlike agent interpretations, the possessive relation is well-known to be contextually conditioned, as Harley (2009: 324) has observed in the context of just this kind of nominalization, and as shown by data like (36):

(36) *Context: Kim and Sandy's mother owns a movie theater and promises them each all the proceeds of one showing of The Missing Link. Neither Kim nor Sandy is responsible for any aspect of the presentation of the film.*
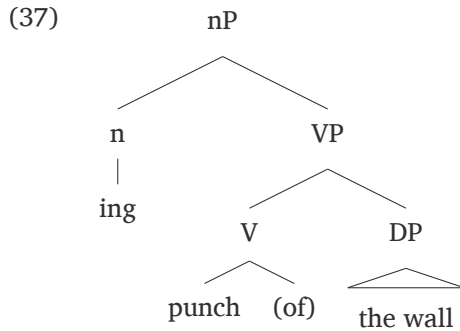
Kim's showing of the film took in more money.

Harley's (2009) proposed structure for of-*ing* nominalizations is schematized in (37), in which nominalization applies at a lower level than in acc-*ing* nominals, but still at a point after the core verb has selected its internal argument(s).[19]

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[19] What forces *of* insertion in this case? The idea is that Voice is responsible for introducing the external argument and assigning accusative case (Burzio's generalization). Since Voice is absent, *of* must be inserted for case-theoretic reasons (see Harley 2009). (If you don't assume a severed external argument, then whatever derives Burzio's generalization should extend to the requirement for *of* as well.)

(37)

```
              nP
            /    \
           n      VP
           |     /  \
          ing   V    DP
              /  \    /\
         punch (of) the wall
```

As above, (38) offers a line-by-line derivation of (37), showing that the structure is derived from a verb that relates individuals to events, whatever the meanings at the nodes derived from it:

(38)　a.　$[\![\text{punch}]\!] = \lambda x \lambda e.\text{punching'}(e)$ & patient'(e,x)

　　　b.　$[\![\text{VP}]\!] = \lambda e.\text{punching'}(e)$ & patient'$(e,\text{the wall'})$

　　　c.　$[\![\text{–ing}]\!] = \lambda P.P$

　　　d.　$[\![\text{nP}]\!] = \lambda e.\text{punching'}(e)$ & patient'$(e,\text{the wall'})$

At the level of nominalization (38d), the meaning is a set of events that can then be related to a possessor, the source of the non-argument possessor in such examples, and the key to capturing the non-argument reading in contexts like (36). Adopting for example Barker's (1995) theory of nominal possession, a possessor can compose with the nP as follows, making the whole NP denote the set of punching of the wall events that stand in some abstract possessor relation (π) to Kim.[20]

(39)　a.　$[\![\text{Poss}]\!] = \lambda P \lambda x \lambda y.\pi(x,y)$ & $P(y)$

　　　b.　$[\![\textit{Kim's punching of the wall}]\!] = \lambda y.\pi(\text{Kim'},y)$ & punching of the wall'(y)

In summary, in both types of deverbal *-ing* nominalizations, it is the underlying verb that relates the object to an event, not the nominal itself. For reasons of space we do not address complex event nominalizations (e.g., *examination of the patients*), but similar arguments apply there, as well (see Grimshaw 1990; Alexiadou 2001; Alexiadou & Grimshaw 2008).

　　Finally, we turn to a type of nominalization that is typically taken not to be derived from a verbal source: result nouns such as *exam* in (40).[21]

(40)　Kim's exam

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[20] Alternatively, as a reviewer points out, some theories of nominal possession have it that nouns take their own arguments (Vikner & Jensen 2002; Beavers et al. 2008). On such theories, given that the nominalization is derived from a verb with the relevant meaning, the analysis is still consistent with (27).

[21] We believe that nouns zero-related to unergatives, such as (a) *swim, jog, walk* behave identically to *exam*, as discussed here, and can be given the same analysis (see also Alexiadou 2001).

Result nouns such as this lack the verbal properties that their corresponding verbs (and deverbal nominalizations) do. For example, they do not allow *by*-phrases as passives (41b) or complex event nominalizations do (41c):

(41)   a.   *Kim's exam by the doctor.
         b.   Kim was examined by the doctor.
         c.   Kim's examination by the doctor.

Since they are not deverbal (cf. Harley 2009; Borer 2013; Iordăchioaia 2020), could result nouns then be a true counterexample to the claim that nouns cannot relate individuals to events? After all, *Kim* in (40) does stand in some relation to *exam*. Like the 'of' –*ing* nominalizations of the type illustrated in (36), this nominalization type does not license true argument structure. Compare for example the felicity of the internal argument in complex event nominalization in (42a) to the result noun in (42b): internal arguments are not possible in result nominalizations.

(42)   a.   The doctor's examination of Kim
         b. ??The doctor's exam of Kim

As for the would-be external argument in this construction, we find a similar state of affairs to 'of'-*ing* nominals in that that they also allow for contextually conditioned possessor readings, as already mentioned, and illustrated in (36). For instance, in (43a), Kim can be the examiner, the examined, someone who wrote the exam, etc., while in (43b) and (43c), Kim can only be the examiner (cf. Grimshaw 1990: 48).

(43)   a.   Kim's exam lasted an hour.
         b.   Kim examined Sandy.
         c.   Kim's examination of Sandy.

The plausible relation is therefore again, possessive, as illustrated in (44), drawing on the kind of analysis of possessive NPs as above.[22]

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[22] Supposing an analysis of possessive NPs like that in fn. 20, where possessive nouns take their own arguments (Vikner & Jensen 2002; Beavers et al. 2008), there could appear superficially to be a problem for (27) with these nouns. An alternative view, consistent with such a theory, however, would be that for a small class of possible exceptions (at least in the context of such an analysis), as a reviewer points out, these could be genuine exceptions that have come about by lexical drift, particularly given that nouns like this tend to have zero-related verbs (e.g., $swim_{N/V}$, $jog_{N/V}$, $giggle_{N/V}$, $laugh_{N/V}$, etc). As the reviewer observes, for such words, the OED attests the verbal cases before the nominal ones, which might suggest the nouns are actually deverbal, or at least were at some point, supporting the idea of lexical drift. This points to a broader point about the right way of viewing (27), whether this is a case of drift or not, which is that it should be viewed as predicting, in the reviewer's words "gross patterns of lexicalization" rather than "universally governing literally every single word in every language". This is reminiscent of Dowty's (1979: Chapter 6) view of lexical rules as well as how he views his theory about how thematic proto-roles interact with argument selection (Dowty 1991: 604–605).

(44)   a. ⟦*exam*⟧ $= \lambda e.$exam'(e)
        b. ⟦*Kim's exam*⟧ $= \lambda y.\pi($Kim'$, y)$ & exam'(y)

In summary, result nouns do not pose a challenge to (27); at the level of nominalization, we believe the meaning is a set of events (that can be related to a possessor).

While various types of verb-related noun appear superficially like they could be counterexamples to (27), they are either derived from verbs that have the kind of meaning in question, or, we believe, don't have the kind of meaning that would challenge (27) in the first place.

5.2 Derived adjectives

Another potential counterexample that we briefly address comes from deverbal adjectives, which are of adjectival category but likewise appear at first glance to relate an individual to a dynamic event (Kratzer 2000). For example, in (45b), the promoted subject *door* is related to an opening event:

(45)   a. The door was open.
        b. The door was open-ed.

Parallel to the case of *-ing* nominalizations above, it is widely accepted that deverbal adjectives like (45b) that appear to relate a dynamic event to an individual are derived from a verbal core. Similarly to result nouns on the other hand, there are apparently deverbal adjectives that can be shown not to relate an individual to an event in the same way (Embick 2004; Alexiadou & Anagnostopoulou 2008; Alexiadou et al. 2015; cf. Beavers et al. 2021).

Such a case has been claimed to exist in Greek, in which there are two distinct kinds of (agreeing) adjectival morphology: *-menos* and *-tos* (Alexiadou & Anagnostopoulou 2008; but see Anagnostopoulou 2016 and references therein for a more complex picture and discussion). As (46) shows, adjectivalizations formed with the suffix *-menos* permit an agentive *by*-phrase, while those formed with *-tos* do not.

(46)   Greek deverbal adjectives (Alexiadou & Anagnostopoulou 2008: 35)
        a. Ta   keftefakia ine tiganis-**mena** (apo tin   Maria)
            ART meatballs are fry-**ADJ**   by   ART Mary
            'The meatballs are fried by Mary.'
        b. Ta   keftefakia ine tiganis-**ta** (*apo tin   Maria)
            ART meatballs are fry-**ADJ**   by   ART Mary.
            'The meatballs are fried (*by Mary).'

While detailed discussion is beyond the scope of this paper, the two types of adjectivalizations are distinguishable by a variety of diagnostics that lend support to the idea that those showing argument structure (with *-menos*) do so only because they are deverbal, much like ACC *–ing* nominalizations above. The suffix *-tos* as in (46) on the other hand reflects a structure and meaning more like result nouns, and does not involve relation of individuals and dynamic events. See Alexiadou & Anagnostopoulou (2008) for further discussion.

Consequently, like the nominalizations discussed above, neither type of deverbal adjective constitutes a counterexample to our claim about the kind of meaning exclusive to verbs and verbal projections. Again, the claim is that such adjectives, if they do introduce a relation to their argument, do so only at a point in the relevant structure where a verb or verbal projection can do it, and if they do not show a relation (as with *–tos*), then they do not threaten the claim in the first place.

6 Conclusion

We have shown in this paper by way of a typological study, drawing on a version of the 'Verbal Roots Across Languages' database augmented with category information, that the derivation of a change of state verb from a property concept lexeme is more likely to be morphologically marked when the property concept lexeme is a noun or an adjective compared to when it is a verb. We have argued that these facts follow from what we believe is a reasonable, possibly common, but non-trivial assumption about the mapping between verbal categories and lexical semantics: that only verbs lexicalize relations between ordinary individuals and dynamic events. The facts about state/change of state derivational marking follow from this assumption, we argue, because not only the introduction of change of state meaning, but also category changes can be marked by derivational morphology. If changes of state can only be verbs, then the derivation of one from a nominal or an adjectival property concept lexeme will necessarily involve a category change, a derivation which commonly attracts marking. By contrast, if a property concept lexeme is a verb, a change in category need not take place, thereby removing one possible source of derivational marking in the derivation of a change of state verb from them. We believe it is precisely this that is responsible for increasing the incidence of lability amongst verbal property concept state/change of state pairs as compared to nominal and adjectival ones in our typological sample.

Several issues remain outstanding. The first is how precisely to analyze the labile pattern. Analytical options include null morphology, coercion (Koontz-Garboden 2007), as well as a multiple sources analysis (Matthewson et al. 2015). As Matthewson et al. (2015) suggest as well, the right analysis may well vary from one language to another. Better understanding the landscape of lability will therefore require further detailed investigation on individual languages, of a kind recently undertaken by Smith et al. (2024) and Hopperdietzel (2024). A second outstanding issue is whether our observations entail crosslinguistic variation in the lexical semantics of property

concept lexemes, and how that might interact with other established variation in their lexical semantics (e.g., built on degrees, Beck et al. 2010; Bochnak 2015; Bowler 2016 or qualities, Francez & Koontz-Garboden 2017). This issue is intertwined with the analysis of lability—if at least some labile cases require a different kind of lexical semantics for property concept verbs than for adjectives and nouns, then there may be a case for variation. We anticipate exploration of this issue, and the lability issue on which it depends, to shed further light on the nature of crosslinguistic variation in lexical semantics.

Finally, we have argued that our observations follow from a constraint on the interface between lexical category and lexical semantics, namely that only verbs lexicalize relations between ordinary individuals and dynamic events. But it remains very much an outstanding question quite why this should be the case. For a similar observation about the lexical semantics of adjectives—that they cannot have a kind of abstract mass-type meaning that nouns can have—Francez & Koontz-Garboden (2017: Chapter 5) argued that it followed from the nature of adjectives as adnominal modifiers, and the kinds of meanings that would result from the modification of a noun by the kind of meaning unattested with adjectives. In relation to the constraint on verbs we have observed here, we have not made any such proposal. Future work should examine precisely what it is about the syntax/semantics interface of not only verbhood, but also of adjectivehood and nounhood, that might make our observed constraint follow as a consequence.

Appendix: Data Collection Methodology

Each cell in the paradigm of the "Verbal Roots Across Languages" (https://verbal-roots.la.utexas.edu) database was already coded for its derivational relation to other cells. This coding and a search mechanism on the website allow us to extract all instances in which the property concept lexeme and the derivationally related (intransitive) change of state predicate are labile, i.e., where the same form describes both senses. Since the original coding of data in the database did not include lexical category for the property concept lexeme, which is required in order to investigate our hypothesis, we extracted all property concept lexemes in all languages in which there was at least one labile paradigm, and sought to find its category in the original descriptive sources listed in the database. We found labile paradigms in the languages in (47) (see **Table 3** for a full list of languages included in this study):

(47)   Acholi, Anejom̃, Barasano, Basque, Berber (Middle Atlas), Burmese, Burushaski, Chamorro, Chuckchi, Cree (Plains), English, Guaraní, Gújjolaay Eegima, Hausa, Indonesian, Kakataibo, Kannada, Kinyarwanda, Koasati, Koiari, Korean, Kwoma, Lakhota, Malagasy, Mandarin, Mapudungun, Mixtec (Chalcatongo), Mocovi, Oromo (Harar), Otomi, Parumarí, Quechua (Huallaga), Sango, Tagalog, Thai, Tiwi, Turkish, Vietnamese, Yagua, Yoruba, Zulu.

We followed the following general procedure in assigning a category to the stative members of the paradigms extracted by the procedure above:

- In the general case, we aimed to return to the original source the paradigm was drawn from in the database.

- If this was not possible, and there was another source used for the language in question in the database (e.g., for the inchoative or causative form associated with the language), we tried to access that source to see if it was listed there, and if so, took data from that source.

- In a small number of cases, multiple sources were listed, and in a small number of those, the sources conflicted. We deal with these (as described in §3) by running two separate analyses, one for each categorization, to see if the conflict in categorization makes a difference.

- In three cases, we drew on sources which were not listed in the database, but were in the bibliography for the language's entry on WALS: Cree (Anderson 1975), Kwoma (Kooyers 1975), Paumarí (Chapman & Derbyshire 1991).

- Finally, the following classes of data have been excluded from consideration:

  - Paradigms for which the sources in the database and in the bibliography on WALS did not give lexical categories or were inaccessible: Otomi, Vietnamese.

– We excluded stative/inchoative pairs for which the lexical category was unclear: Chamorro

– We excluded stative/inchoative pairs if either one of the data points was listed in the database as hypothetical (on which see Beavers et al. 2021: 462, fn. 22).

– We excluded paradigms for which either the state or the inchoative is missing from the database (cf. Califa 2020 for potential gaps in dictionaries).

Language	Language Family	ISO-639-3 Code	Labile
Acholi	Nilotic, Eastern Sudanic	ach	yes
Alamblak	Sepik Hill, Sepik	abk	no
Anejom	Oceanic, Austronesian	aof	yes
Barasano	Tucanoan	bar	yes
Bariai	Oceanic, Austronesian	bai	no
Basque	Basque	eus	yes
Burmese	Burmese-Lolo, Sino-Tibetan	mya	no
Burushaski	Burushaski	bqs	yes
Carib	Cariban	car	no
Chalcatongo Mixtec	Mixtecan, Oto-Manguean	cmc	yes
Chamorro	Chamorro, Austronesian	cha	yes*
Chukchi	Chukotko-Kamchatkan	chuk	yes
Copainalá Zoque	Mixe-Zoque	zoq	no
Daga	Dagan	dga	no
Egyptian Arabic	Semitic, Afro-Asiatic	arz	no
English	Germanic, Indo-European	eng	yes
Fijian	Oceanic, Austronesian	fij	no
Finnish	Finnic, Uralic	fin	no
French	Romance, Indo-European	fra	no
Georgian	Kartvelian	kat	no
German	Germanic, Indo-European	deu	no
Gooniyandi	Bunuban	gni	no
Guaraní	Tupi-Guaraní, Tupian	grn	yes
Gújjolaay Eegimaa	Bak, Niger-Congo	ggn	yes
Harar Oromo	Cushitic, Afro-Asiatic	jrr	yes
Hausa	West Chadic, Afro-Asiatic	hau	yes

(Contd.)

Language	Language Family	ISO-639-3 Code	Labile
Hawaiian	Oceanic, Austronesian	haw	no
Hindi	Indic, Indo-European	hin	no
Hopi	Hopi, Uto-Aztecan	hop	no
Huallaga Quechua	Quechuan	quh	yes
Indonesian	Malayo-Sumbawan, Austronesian	ind	yes
Jakaltek	Mayan	jak	no
Japanese	Japanese	jpn	no
Kakataibo	Cashibo-Cacataibo, Panoan	kac	yes
Kannada	Dravidian	kan	yes
Karok	Karok	kar	no
Kayardild	Tangkic, Tangkic	kyd	no
Kewa	Engan, Trans-New Guinea	kwe	no
Khalkha	Mongolic, Altaic	khk	no
Khoekhoe	Khoe-Kwadi	khoe	no
Kinyarwanda	Bantoid, Niger-Congo	kin	yes
Kiowa	Kiowa-Tanoan	kiw	no
Koasati	Muskogean	kos	yes
Koiari	Koiarian, Trans-New Guinea	koi	yes
Korean	Korean	kor	yes
Koyraboro Senni	Songhay	koy	no
Kutenai	Kutenai	kut	no
Kwoma	Middle Sepik, Sepik	kwo	yes
Lakhota	Core Siouan, Siouan	lak	yes
Lezgian	Lezgic, Nakh-Daghestanian	lez	no
Lower Grand Valley Dani	Dani, Trans-New Guinea	dan	no
Malagasy	Barito, Austronesian	mlg	yes
Mandarin	Chinese, Sino-Tibetan	cmn	yes
Mapudungun/Mapuche	Araucanian	arn	yes
Martuthunira	Pama-Nyungan	mth	no
Meithei	Kuki-Chin, Sino-Tibetan	mni	no
Mezquital Otomí	Otomian, Oto-Manguean	oto	yes*
Middle Atlas Berber	Berber, Afro-Asiatic	mta	yes

(Contd.)

Language	Language Family	ISO-639-3 Code	Labile
Minica Huitoto	Huitoto, Huitotoan	hue	no
Modern Greek	Greek, Indo-European	ell	no
Modern Hebrew	Semitic, Afro-Asiatic	heb	no
Mocoví	South Guaicuran, Guaicuran	moc	yes
Murrinh-Patha	Murrinh-Patha, Southern Daly	mpa	no
Navajo	Athapaskan, Na-Dene	nav	no
Oksapmin	Oksapmin	oks	no
Oneida	Iroquoian	one	no
Paiwan	Paiwan, Austronesian	pwn	no
Paumarí	Arauan	pum	yes
Persian	Iranian, Indo-European	pes	no
Pintupi	Pama-Nyungan	pnt	no
Plains Cree	Algonquian, Algic	cre	yes
Rama	Rama, Chibchan	ram	no
Russian	Slavic, Indo-European	rus	no
Sango	Ubangi, Niger-Congo	sag	yes
Spanish	Romance, Indo-European	spa	no
Swahili	Bantoid, Niger-Congo	swa	no
Tagalog	Austronesian	tgl	yes
Tenango Tzeltal	Mayan	tzl	no
Thai	Kam-Tai, Tai-Kadai	tha	yes
Tiwi	Tiwian	tiw	yes
Turkish	Turkic, Altaic	tur	yes
Vietnamese	Viet-Muong, Austro-Asiatic	vie	yes*
Warao	Warao	war	no
Yagua	Peba-Yaguan	yag	yes
Yaqui	Cahita, Uto-Aztecan	yaq	no
Yoruba	Defoid, Niger-Congo	yor	yes
Yup'ik	Eskimo, Eskimo-Aleut	ypk	no
Zulu	Bantoid, Niger-Congo	zul	yes

Table 3: List of labile and non-labile languages (with language family and ISO-code) included in this study, based on the Verbal-Roots-across-Languages database (* = languages where we were unable to identify a source; see Appendix for detailed description.).

Abbreviations

ABS = absolutive, ADJ = adjectivizer, ART = article, CONT = continuous, COP = copula, DEF = definite, DEM = demonstrative, DET = determiner, IMP = imperfective, INCH = inchoative, IND = independent moood, PERF = perfective, REAL = realis, STAT = static, VBL = verbalizer.

Data availability

The preregistration materials, along with the data and analysis code, can be found at https://osf.io/pdnzb/?view_only=bb2fcae6a7d14ea19a676759c50e45c0.

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Competing interests

The authors have no competing interests to declare.

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