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Word-external properties in a typology of Modern English:
a comparison with German¹

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A large number of grammatical and lexical changes occurred in Middle and Early Modern English leading to the type of language we witness today. Other West Germanic languages were more conservative. This article focuses on some of the major contrasts between Modern English and German and proposes a new unifying generalization for them, going beyond Sapir's (1921) 'drift' and the comparative typology of Hawkins (1986, 1995). The contrasts involve a systematic expansion in *word-external properties* in English, whereby individual words carry less syntactic and semantic information in their grammatical and lexical representations and have become more reliant on neighboring words for the assignment of linguistic properties. Defining drift in this way captures more of the observed contrasts and subsumes counterexamples to earlier unifying generalizations. It also has implications for theories of real-time language processing and for the interface between linguistic typology and psycholinguistics.

Key words: English–German contrasts, historical drift, multi-word verbs, typology, word-external properties

1 Introduction

During the past 1,000 years the English language has undergone numerous morphological, syntactic and semantic changes that now distinguish it from its more conservative West Germanic relatives, such as German. Sapir (1921) talked of the 'drift' of English and proposed three interrelated changes. The first covered the loss of most inflectional morphology including case marking. The second was the fixing of SVO word order. The third, which he regarded as the most significant, was 'the drift towards the invariable word' (Sapir 1921: 168):

This striving for a simple, unnuanced correspondence between idea and word, as invariable as may be, is very strong in English. It accounts for a number of tendencies which at first sight seem unconnected. (Sapir 1921: 169)

¹ This article has benefited considerably from the comments made by two anonymous *ELL* reviewers and by *ELL* editor Bernd Kortmann. I am grateful to them for the time they invested in giving their feedback, which has greatly improved the article. I also received invaluable feedback from several people who gave me comments on an earlier version (in alphabetical order): Peter Culicover, Fernanda Ferreira, Luna Filipović, Florian Jaeger, Ed Keenan, Ekkehard König, Fritz Newmeyer, William O'Grady, Tamara Swaab and Tom Wasow. I thank them all. Useful feedback was also received from presentations to the Cognetwork Group at UC Berkeley and to the UC Davis Psycholinguistics Group in Fall 2016, and from students in advanced interdisciplinary seminars on linguistics-psycholinguistics-computational linguistics held at UC Davis in Spring 2016 and 2017. All remaining errors and shortcomings are very much my own.

These tendencies went beyond the loss of inflectional suffixes, and also of derivational affixes, and resulted in many invariable words and often in the loss of semantic oppositions that had been productive earlier. Sapir mentions *where* vs *whence* vs *whither* that have been reduced to *where* in Modern English. The corresponding forms of German (*wo* vs *woher* vs *wohin*) are still productive.

Hawkins (1986) developed Sapir's insights further by pointing to the greater ambiguity and vagueness of many other Modern English surface forms and structures compared with their German counterparts. Large numbers of words became ambiguous in syntactic category as a result of these inflectional losses, for example *run*, *play*, *hit* are both verbs and nouns. A greater range of semantic combinations of thematic roles came to be assigned to transitive clauses with NP–V–NP in addition to the prototypical Agent–Verb–Patient of *the boy hit the ball*. Raising and control ambiguities became possible for common surface structures.

As English drifted to shorter individual words with greater syntactic and semantic generality, it increased what Leisi (1967) called its '*Wortverband*', or word combinations. Major types included phrasal verbs (*take up a hobby*), prepositional verbs (*count on your father*), and light verb constructions with e.g. *take*, *make*, *give* and *put*. The light verb meaning of *make a mistake* is quite different from its more basic and literal meaning in *make a dress*. Similarly the meaning of *take* on its own is different from its meaning within the phrasal verb *take up*, as is the meaning of *count* from *count on*. Traugott & Trousdale (2013) talk of 'constructionalization' and describe the development of many new multi-word constructions like this in the history of English.

Sapir's discussion of drift covered only some of the major changes that took place in English, however. Attempts to formulate larger unifying generalizations for the contrasts with German (Hawkins 1986, 1995; Leisi 1967; and most recently Berg 2014) have also not accounted for certain changes or been faced with counterexamples (see e.g. Rohdenburg 1990; Kortmann & Meyer 1992; König & Gast 2012 in relation to Hawkins 1986, 1995). The present article proposes a new larger generalization that can unify major contrasts with German. It has greater coverage than my earlier proposals, and it avoids and subsumes previous counterexamples. It also links the key insight about the unique features of multi-word grammatical constructions to other changes in English that have taken place in compositional syntax as well, leading to contrasts with German.

The key distinction to be proposed will involve how many linguistic properties, syntactic, semantic and lexical, can be assigned to individual words considered in isolation, i.e. word-internally, as opposed to requiring access to neighboring words. All languages involve both word-internal and word-external properties, depending inter alia on the richness and complexity of their words and the degree of morphological synthesis within them (see Sapir 1921; Comrie 1989). What varies is the balance between the two, and the degree of the reliance that words have on one another for the assignment of grammatical and lexical properties such as basic syntactic category, theta-role and lexical meaning, in addition to any constructional idiosyncrasies. The

changes in English and major contrasts with German can be profitably viewed, I will argue, as systematic expansions in word-external properties.

The order of presentation is as follows. Section 2 summarizes major patterns in the English–German contrasts. Section 3 defines word-external property. Section 4 compares Modern English and German in more detail from this perspective. Section 5 considers the implications for psycholinguistics, especially parsing, and section 6 presents the conclusions of this study.

2 Patterns in the english–german contrasts 81

Hawkins (1986) laid out some of the major grammatical and lexical patterns that can be seen in the contrasts between Modern English and German, most of them the result of innovations in Middle and Early Modern English. A dozen of these can be summarized here as background to the present article.

- (1) Modern English has lost its case marking on NPs other than pronouns (*he* vs *him*, etc.). German retains Nominative/Accusative/ Dative productively on all NPs.
- (2) Subject and direct object now have fixed positions in English, pre- and post-verbal respectively, but not in German (*The boy beat the horse* corresponds to *Der Junge schlug das Pferd*, but *Das Pferd schlug der Junge* is also grammatical).
- (3) The position of finite and lexical verbs is regularly final in German, except when moved to second or first position in main clauses that lack an auxiliary, whereas English has no corresponding verb-final structures (*The boy will beat the horse* corresponds to *Der Junge wird das Pferd schlagen* with verb-final *schlagen*).
- (4) Subjects and objects in English transitive clauses have become ‘semantically diverse’, e.g. more thematic roles such as Locative, Instrumental and Theme can be assigned to subjects that are without parallel in Old English and Modern German (*My guitar broke a string*, *A pound once bought more goods*, *The book sold 10,000 copies* are all possible in Modern English but impossible in German, cf. e.g. **Das Buch verkaufte 10,000 Exemplare*).
- (5) Modern English verbs regularly have a broader set of selectional restrictions than their German counterparts (one can *break* both a branch and a rope in English, whereas German requires lexical differentiation, *brechen* for the former, *zerreißen* for the latter).
- (6) Modern English verbs also have a broader set of subcategorization frames, e.g. they are often both transitive and intransitive (*The roof seeped water* and *Water seeped through the roof*) whereas corresponding German verbs are one or the other (transitive **Die Decke sickerte Wasser* is ungrammatical in addition to the intransitive *Wasser sickerte durch die Decke*).
- (7) Modern English has a productive set of Subject-to-Subject Raising constructions with resulting structural ambiguity between raising and control interpretations (*Mary happened to win the prize* [raising], *Mary tried to win the prize* [control]). Such raisings are extremely limited in German while control structures are fully productive (*Maria versuchte, den Preis zu gewinnen*).
- (8) Modern English has a productive set of Subject-to-Object Raising constructions with resulting structural ambiguity again (*I believe the farmer to have killed the cow* [raising], *I persuaded the farmer to kill the cow* [control]). Such raisings are completely impossible in German (**Ich glaube den Bauern, die Kuh geschlachtet zu haben*) while control structures are fully productive.

-
- 120 (9) Modern English has a productive set of Tough Movement constructions with resulting
 121 structural ambiguity (*John is easy to please* [tough], *John is eager to please*
 122 [control]), such raisings being much more limited in German (e.g. there is no
 123 **Dieses Werkzeug ist gefährlich zu benutzen* corresponding to *This tool is dangerous*
 124 *to use*).
- 125 (10) Modern English has more WH-movement, e.g. more clause-external linking of fillers
 126 to gaps or subcategorizers in relative clauses (see Hawkins 1999, 2004) (*the book which*
 127 *you believe that you need* in which *book* and *which* are linked as direct object to the
 128 verb *need* has no grammatical counterpart in German, **das Buch, das du glaubst, dass*
 129 *du brauchst*).
- 130 (11) A great many verbs and nouns in Modern English have become category-
 131 ambiguous and require co-occurring articles or finite morphology and infinitival *to* for
 132 disambiguation (*I want the run vs to run*), whereas the richer morphosyntax of German
 133 means that predicates corresponding to *run, play, try* are regularly disambiguated (*Spiel*
 134 = N vs *spielen* = V for *play*).
- 135 (12) Numerous semantic distinctions have been eroded in the history of English as in
 136 *where/whither/whence*. Corresponding German WH-forms are still productive.
- 137 The comparative typology proposed by Hawkins (1986: 121–2) for these contrasts
 138 included the following generalization:
- 139 (13) There is greater ambiguity (and/or vagueness) of surface forms in English, i.e. greater
 140 collapsing of semantic distinctions and of different semantic types onto common
 141 surface forms. The result is more of a one-to-one mapping between form and meaning
 142 in German, with distinct forms carrying distinct meanings to a greater extent.
- 143 This is exemplified by the inflectional leveling in case marking (1), the part-of-
 144 speech ambiguities between nouns and verbs in (11), and the reduction in WH-
 145 word distinctions (*where/whither/whence*) in (12). The added semantic diversity of
 146 basic grammatical relations in (4) means that NP–V–NP transitive clauses can be
 147 mapped onto more thematic role combinations in Modern English than in German.
 148 The broader selectional restrictions in (5) mean that verbs like *break* have become
 149 vaguer and less specific in meaning with respect to the type of action they describe
 150 and compatible with more direct objects. The broader subcategorization frames for
 151 verbs like *seep* in (6) makes them compatible with more argument co-occurrence
 152 possibilities. The raising contrasts in (7), (8) and (9) produce structural ambiguities
 153 between raising and control, and sometimes full ambiguities as well when one and the
 154 same verb like *begin* is compatible with both interpretations, e.g. *John began to cough*
 155 (Perlmutter 1970).
- 156 Hawkins (1995, 2012) pointed out that Modern English has also increased its
 157 ‘temporary ambiguity’ structures and ‘garden paths’. Temporary ambiguity means
 158 that two or more grammatical analyses can be assigned to a string of words in online
 159 parsing, before subsequent material disambiguates. A garden path means that the first
 160 reading selected turns out to be wrong when later material is encountered, leading
 161 to backtracking and reanalysis. Some classic examples taken from Frazier (1985)
 162 are ***Bill knew the answer*** *was correct* and ***While Mary was reading the book*** *fell*
 163 *down*. The portions in bold are temporarily ambiguous and garden-path the hearer.

Frazier (1985) notes that none of these would be temporarily ambiguous if English possessed grammatical means to force the intended reading online, like an obligatory *that* complementizer (*Bill knew that the answer was correct*) or verb-final word order (*While Mary reading was, the book fell down* vs *While Mary the book reading was ...*).

Exactly such devices were present in earlier English and are still present in German. The German sentences corresponding to the unambiguous English ones are *Bill wusste, dass die Antwort richtig war* and *Während Maria las, fiel das Buch herunter* vs *Während Maria das Buch las, ...* respectively. Other contrasts listed in (1)–(12) also lead to frequent temporary ambiguities and garden paths in English. Subject-to-Subject Raising structures like *The noise ceased to get on his nerves* involve a temporary ambiguity and garden path with respect to whether the noise ceased altogether or only with respect to the event described in the infinitival VP (getting on his nerves). Subject-to-Object Raising structures like *I believe the farmer to have killed the cow* and expanded WH-movements (*the professor who I believe that you know*) also introduce temporary ambiguities and garden paths that are without counterparts in German.

These full and temporary ambiguities in Modern English require disambiguation in language use through following or preceding words, or through other contextual cues (see section 5.2 below). So too do the many ‘multi-word’ verbs of English that have expanded significantly since early Middle English. Claridge’s (2000) book *Multi-word Verbs in Early Modern English* gives a historical overview and a classification of the different types, in addition to a detailed empirical study of the *Lampeter Corpus* from 1640 to 1740. Her classification is summarized in table 1, with relevant examples and page references. Her Appendix lists almost 1,300 examples that she identified in the corpus using criteria summarized in the table.

One way of distinguishing type 1 phrasal verbs from type 2 prepositional verbs is through the permutability of the particle around full NP objects (*rent out a room* vs *rent a room out*). Prepositions have a fixed position before NP (*wait for my friend*). This doesn’t help with intransitive phrasal verbs like *fly away*, where any analysis of English faces the problem of distinguishing between particles, prepositions and adverbs (cf. Quirk *et al.* 1985). Claridge’s type 3 phrasal-prepositional verbs involve a combination of particle and preposition, *put up with* (e.g. *the noise*). Type 4 defines various verb–adjective combinations, including the transitive *break open*. Type 5, verbo-nominal combinations are often called ‘light’ verb constructions. Claridge subclassifies them into three groups: simple verb–noun units *take a walk* (I); verb–noun-preposition units *catch sight of* (II); and verb–prepositional phrase units like *take this into consideration* (III). Type 6 consists of verb–verb combinations.

German has retained a productive set of prefix verbs corresponding to those of Old English. It has no post-verbal particle placement alternations like *turn off the light* and *turn the light off*, though prefixes can alternate with clause-final particles when prefixes are separable and the finite verb moves to second or first position (Eisenberg 1999; Durrell 2011). German also has light verb constructions, but they are not as extensive as those of English. After comparing the light verbs *do*, *have*, *go*, *give*

Table 1. *Claridge’s (2000) Classification of multi-word verbs in Early Modern English*

1. <i>Phrasal verbs</i>
‘Verbs followed by a particle of an adverbial nature in a non-prepositional use’ (p. 39). Intransitive (<i>fly away</i>); Transitive (<i>rent out, take up</i>); see esp. pp. 45–56
2. <i>Prepositional verbs</i>
‘Verbs followed by a preposition in its clear prepositional use’ (p. 39). ‘Transitive’ in the sense that a following NP is required after Prep (<i>wait for, delight in</i>); see esp. pp. 56–66
3. <i>Phrasal-prepositional verbs</i>
‘Verbs followed by an adverbial particle (as in phrasal verbs) and a pure preposition’ (p. 40). Monotransitive (<i>put up with</i>); Ditransitive (<i>put N down to N</i>)
4. <i>Verb–adjective combinations</i>
‘Verbs followed by an adjective or a past participle’ (p. 40). Intransitive (<i>hold good</i>); Transitive (<i>break open</i>), including with final preposition (<i>fall short of</i>).
5. <i>Verbo-nominal combinations</i>
‘all combinations which contain a nominal element as a fixed part’ (p. 40). Group I simple verb-noun unit (<i>take a walk</i>); Group II verb-noun-preposition unit (<i>catch sight of</i>); Group III verb-prepositional phrase unit (<i>take N into consideration</i>); see esp. pp. 69–82.
6. <i>Verb–verb combinations</i>
‘Verbs followed by another verb in a form other than the past participle’ (p. 40). Infinitive (<i>let go</i>); a present participle (<i>send N packing</i>).

207 and *make* in English and their equivalents in German, Berg (2014: 502) concludes
208 that ‘light verb + direct object constructions occur much less often in German than
209 in English’, and ‘Some English light verbs have no real counterpart in German.
210 By contrast, there are apparently no light verbs in German which lack an English
211 counterpart.’
212 Prepositional verbs, Claridge’s type 2, occur in German too (*warten auf jemanden*
213 ‘wait for someone’), as do verb–adjective combinations (type 4, e.g. *totschlagen* ‘beat
214 dead’), but not phrasal prepositional verbs (type 3, e.g. *put up with*). It remains to
215 be quantified for each of these types how extensive the multi-word verbs of German
216 are exactly compared with English. What is clear is that German is syntactically and
217 lexically more conservative than Modern English and has many fewer multi-word
218 verbs overall.

219 3 Word-external properties

220 The drift towards invariable words in English had one very general consequence.
221 Properties that were once inherent in a word, and assignable to it independently of
222 its linguistic context and on the basis of lexical and grammatical knowledge about
223 that word, were no longer so assignable. Instead, neighboring words have come
224 to play an increasing role in providing the information once contained in lexical
225 stems or inflectional and derivational affixes. A preceding determiner (*the play*)
226 or infinitival *to* (*to play*) now gives the information that the invariable *play* is a

noun or verb. Similarly, the directional element differentiating *where/whither/whence* must be supplied elsewhere in the sentence, by verbs such as *go* and *come*.

The inherent case value of inflectional suffixes was lost when these suffixes were lost, and corresponding cases must now be assigned to invariable nouns and noun phrases by reference to a following or preceding verb. Only pronouns in Modern English retain an inherent case; see (1). Derivatively, the thematic roles assigned to subjects and objects must also make reference to the verb in question and its precise semantics, and the range of these thematic role possibilities has expanded in English; see (4). Multi-word verbs fit into this picture of Modern English as a language in which individual words rely more on neighboring words. *Take* has a distinct meaning and syntax with the particle *up* (*take up a hobby*), with the preposition *on* (*take on a difficult assignment*) and as a light verb (*take effect*).

I propose the following definition:

(14) *Word-external property*

For A, B, distinct constituents (words or phrases) of an expression we say there is a *word-external property* P assigned to one or the other or to their combinatorial product iff (i) P is zero-specified or ambiguously or polysemously specified in the grammar or lexicon for the relevant A or B considered on its own, and (ii) the co-occurrence of A with B makes possible the assignment of P.

The prerequisite for a word-external property, given in (14i), is that this property must not be inherent or unambiguous in the grammar or lexical listing of the word or phrase in question and assignable independently of co-occurring words. (14) specifies two possible ways in which word-external properties are assigned. Either this property applies to A or B directly, e.g. a word is assigned syntactic category N or V which it does not convey unambiguously on its own, or it receives a particular lexical meaning by reference to a subject or object NP, or a theta-role by reference to the verb. Alternatively the property is more constructional in nature and applies to the combinatorial product of A with B (see Goldberg 1995, 2006 and Culicover & Jackendoff 2005 for general theoretical discussion of ‘constructions’). E.g. in *chew out* (*the students*) the presence of the particle *out* does not result in a different meaning being assigned to *chew* alone, but in the recognition of a multi-word unit *chew out* with a distinct meaning conveyed by that combination. For light verb constructions like *take effect* and *make amends*, light verb status can be assigned to V, but the constructional meaning must be assigned to the combination as a whole and not just to V.

What is implicit in (14) is that the actual assignment of these word-external properties is carried out in language use by a parser that accompanies the grammar and lexicon. The linguistic and comparative work presented in this article has numerous implications for language processing, and these will be spelled out in section 5. In the meantime I proceed on the basis of grammatical and lexical generalizations before considering the consequences, and some hypotheses, for psycholinguistics and experimental testing.

269 The general drift in the history of English, I propose, has been towards more word-
 270 external properties. This provides an improved unifying generalization for the major
 271 contrasts with German and is summarized in (15):

272 (15) Given the definition of word-external property in (14):

- 273 (i) There is now a larger set of properties P assigned word-externally in Modern
 274 English compared with German (and a smaller set P' assigned to individual
 275 words/phrases);
 276 (ii) these properties P being assignable to a larger set of words/phrases A and B through
 277 their co-occurrence.

278 Hawkins (2004) talked of one word being 'dependent' on another when discussing
 279 some of the data to be considered here. In this context I talk of word-external property
 280 assignments rather than dependencies in order to distinguish these multi-word patterns
 281 from dependencies in the grammatical sense, as pioneered by Tesnière (1959) and Hays
 282 (1964) in their Dependency Grammars. Such grammars have become widely used in
 283 psycholinguistics (see e.g. Gibson 1998, 2000) and in 'dependency treebanks', e.g.
 284 Gildea & Temperley (2010), Futrell, Mahowald & Gibson (2015).

285 Dependencies in grammars and treebanks cover a large number of links that
 286 hold between words (subject-of, object-of, complement of, adjunct modifier of
 287 head, specifier of, filler-gap dependency, and so on). The word-external property
 288 assignments of (14) define a partially overlapping but distinct set of relationships,
 289 based crucially on the amount of information inherent in individual words and
 290 phrases within their grammatical and lexical representations. The subject and object
 291 relations in English and in a rich case-marking language would be the same from
 292 the perspective of Dependency Grammar, whether the Nominative and Accusative are
 293 expressed overtly and unambiguously or not. But their morphosyntactic expression is
 294 crucial for the definition of word-external property here. Explicit and unambiguous
 295 case marking (as with pronouns *he* vs *him*) removes the need to access the verb,
 296 meaning that the pronoun is not dependent on it in our sense for assignment
 297 of case.

298 Consider a relevant case-marking alternation in Kannada, a Dravidian SOV
 299 language with morphological case marking on a Nominative–Accusative basis. Bhat
 300 (1991) points out that an Accusative-marked *pustaka-vannu* (book-ACC) can occur
 301 without case marking when it stands adjacent to the transitive verb, giving the
 302 structural alternation in (16).

- 303 (16) (a) Avanu ondu pustaka-vannu bareda. (Kannada)
 304 he (NOM) one book-ACC wrote
 'He wrote a book.'
 305 (b) Avanu ondu pustaka bareda.
 he (NOM) one book wrote

306 We can say that *pustaka* in (16b) receives Accusative case as a word-external
 307 property by accessing the following verb. Accusative case in (16a), by contrast, can
 308 be assigned without accessing the verb, based on its explicit form. Word-external

assignments of case depend on the degree of grammatical richness within a word, 309
therefore. 310

Similarly, there can be property assignments in our terms both from head to 311
dependent and from dependent to head. A verb (as head) can assign case and theta- 312
role to its subject and object dependents. Conversely, the appropriate lexical meaning is 313
assigned to an intransitive verb from its large polysemy range by accessing the subject 314
NP (compare the meanings of *ran* in *John ran/The water ran/The stocking ran/The 315
advertisement ran*), while an object NP selects the meaning of *ran* in *ran the race/ran 316
the water/ran the company/ran the ad*); cf. Keenan (1979). The precise properties 317
assigned in verb + particle and verb + preposition constructions also depend on 318
whether each component of the combination can be understood with the meaning it 319
has in isolation (*lift the child up* makes the same claim as *lift the child* and *the child 320
went up*; *chew the students out* does not make the same claim as *chew the students* or 321
the students went out; *John waited for his child* entails *John waited*, *John counted on 322
his child* does not entail *John counted*, and so on); see section 4.5. 323

Notice finally in this section that languages can make morpheme-external property 324
assignments within a word, as well as word-external assignments, by extending the 325
definition in (14). Morphemes can show more or less reliance on the morphemes 326
they combine with. Consider inflectional *-s* in English. When combined with a 327
morpheme or morpheme combination of syntactic category N, it is assigned the 328
property Plural (*boys*, *builders*). When combined with V it receives 3rd Person + 329
Singular (*eats*). (When *-s* is a clitic and attaches to a whole NP, it is Possessive, *the 330
boy's*). Similarly, derivational *-er* in English when added to V yields Agentive Noun 331
(*builder*), when added to Adj it is Comparative (*smaller*). These can be considered 332
property assignments to morphemes by reference to the morphemes they combine 333
with. Contrast these with the agglutinative Turkish *adam-lar-dan* where *adam* is 334
recognizable as the lexical noun ‘man’, *-lar* is consistently plural, and *-dan* is 335
consistently ablative case, i.e. regardless of the word-internal combination. 336

4 Illustrating and extending the unifying generalization 337

In this section how the comparative generalization of (15) applies to the English– 338
German contrasts considered hitherto will be shown in more detail and extended to 339
further instances. 340

4.1 Theta-role assignments 341

Non-pronominal NP subjects and objects in Modern English receive their cases, 342
Nominative and Accusative (or non-Nominative), as word-external properties by 343
accessing the verb, looking right and left respectively. Theta-roles are also assigned by 344
accessing the verb or whole VP. In a large empirical study, Rohdenburg (1974) showed 345
just how varied the semantic combinations of theta-roles have become in transitive 346
clauses with NP-V-NP in Modern English. These include Instrumental subjects, *A few 347*

348 *years ago a pfennig would buy two or three pins*, Locatives, *The roof of the tunnel was*
 349 *seeping water* and *This tent sleeps four*, and Themes, *The book sold 10,000 copies*.
 350 Literal translations of these into German are all ungrammatical, cf. **Vor einigen*
 351 *Jahren kaufte ein Pfennig zwei bis drei Stecknadeln*, **Die Tunneldecke sickerte Wasser*,
 352 **Dieses Zelt schläft vier*, and **Das Buch verkaufte 10,000 Exemplare* respectively.

353 Instead German uses prepositional phrases for these non-agentive roles, and this
 354 is an option that is still productive in English too, resulting in structural alternations
 355 that are without German parallels. This is illustrated in (17) from Rohdenburg (1974)
 356 in which the (a) sentence gives the (italicized) Locative subject in English, the (b)
 357 sentence is the most natural German translation using an (italicized) PP (with the
 358 Nominative subject in capitals), and (c) is a literal translation into English of (b):

- 360 (17) (a) *The roof of the tunnel* was seeping water.
 361 (b) *Durch die Tunneldecke* sickerte WASSER (durch).
 362 (c) WATER seeped *through the tunnel roof*.

363 Levin (1993) gives a systematic account of alternating co-occurrence frames like
 364 this for large numbers of verb classes in Modern English. Particularly extreme cases
 365 are those discussed also by Berg (2014) in which a passive-type meaning with a Patient
 366 subject can be assigned to an active verb, as well as to the subject of a passive verb, and
 367 to the object of the active verb, as shown for *screen* in (18a), (b) and (c) respectively:

- 368 (18) (a) The new film screens next week at the Odeon.
 370 (b) The new film is being screened next week at the Odeon.
 371 (c) The Odeon is screening the new film next week.

372 The Patient or Theme role can now be assigned to more NPs (pre-verbal subjects and
 373 post-verbal objects) by reference to more verb types (active and passive). Patient theta-
 374 role assignments to active verbs as in (18a) are completely unattested in German (Berg
 375 2014). More generally, these examples show that a greater range of theta-roles (i.e.
 376 the P properties in (15i)) can be assigned to more subject and object NPs in English
 377 by reference to more verbs and VPs (see (15ii)). German does not have this range of
 378 word-external theta-role assignments.

379 Interestingly, theta-role assignments have continued to expand in Modern English,
 380 and more ‘ambitransitivity’ (Berg 2014) is now seen e.g. in technological contexts
 381 (*This information will display on your screen*, *Wait while Windows 98 installs on your*
 382 *computer*; see Fan 2008; Fritz Newmeyer p.c.).

383 4.2 Syntactic category ambiguities and word class selections

384 I pointed out in (11) that English words have quantifiably more ambiguities between
 385 different parts of speech compared with German and often rely on preceding articles
 386 (*the play*) and infinitival *to* (*to play*) for their noun and verb status. These categories are
 387 reminiscent of the articles and particles of Polynesian languages like Tongan and Maori
 388 that disambiguate between general word classes (Broschart 1997). German regularly

keeps word classes separate in its word-internal morphology, which means that these categories are not assigned word-externally.

A striking case of category ambiguity in English can be seen in verbs with the suffix *-ing*. There are numerous deverbal categories and grammatical meanings here that are systematically disambiguated by their sister words and phrases. König & Gast (2012: 72–7) distinguish ‘deverbal adjective’ (*This is very amusing*), ‘adverbial participle’ (*Walking along the river, I saw a crane*), ‘gerundive nominal’ (*Not reading poetry impoverishes your life*), ‘non-finite relative clause’ (*the guy talking to George*), ‘action nominalization’ (*No reading of poetry is good enough for Mary*) and ‘deverbal preposition’ (*concerning your recent proposal*), in addition to the ‘progressive aspect’ on verbs (*I am not talking to you*). The derived syntactic categories and meanings of verb + *ing* are word-external properties in our terms, looking left or right to the words and phrases on the basis of which the relevant deverbal category can be assigned. German has no such systematic ambiguity in its translation equivalents for these and employs distinct forms and structures for the expression of these meanings (see König & Gast 2012).

Consider now the auxiliary verbs of English, and let us assume a key change proposed for them in Early Modern English by Lightfoot (1979) (without committing ourselves to many of the other details in that work; see Warner 1983 for critique): syntactic auxiliaries became differentiated from lexical verbs and were generated by a new PS-rule,

Aux → Tense (Modal)

distinct from the rule generating nonfinite and lexical verbs ($VP \rightarrow V \dots$). This new auxiliary rule introduced the Tense category that led to *do* Support in sentences with Tense separated from V by e.g. negation (*John does not like carrots*). It also provided a distinct dominating node for the future auxiliary *will*, the modal auxiliaries *can*, *may*, *must*, *might*, etc., and also for finite perfective *have* (*John has eaten carrots*), passive *be* (*the carrots were eaten*) and progressive *be* (*John is eating carrots*).

This differentiation of auxiliaries from lexical verbs had a sweeping set of consequences, among them the fact that modals could no longer function as main verbs taking direct objects, as they still can in German, *Ich kann Dänisch* (literally ‘I can Danish’, i.e. ‘I can speak Danish’). Similarly, the future *will* regularly contrasts with the present tense in German (*Fritz will buy a newspaper tomorrow* vs *Fritz kauft morgen eine Zeitung*, literally ‘Fritz buys a newspaper tomorrow’) and introduced a systematic distinction between present and future tense into English. The obligatory progressive in *Fritz is reading now* is another example where the more ambiguous present tense is generally used in German (*Fritz liest jetzt*, literally ‘Fritz reads now’). This disambiguation in English goes against the grain of so many other changes in its history, which had the reverse effect of collapsing syntactic and semantic distinctions.

The auxiliary system of English provides a productive set of counterexamples, therefore, to the comparative generalization for English and German proposed in

Hawkins (1986) and summarized in section 2 to the effect that it is generally German that makes more explicit distinctions in surface forms and has less ambiguity and more semantic transparency (see Rohdenburg 1990, 1992; Kortmann & Meyer 1992; König & Gast 2012). It also goes against Sapir's (1921) drifts involving the loss of semantic and syntactic distinctions in English, and against a generalization proposed in Berg (2014) about English having 'softer' and 'more permeable' boundaries for its syntactic, morphological and semantic categories compared with German (see Berg 2014: 499–500 for discussion and recognition of this counterexample).

It is significant now to point out that these changes in the English auxiliary system are no longer counterexamples to the comparative generalization proposed here. For they involve the same expanded use of neighboring words for disambiguation and property selections, both syntactic and semantic. The addition of the new Aux rule created a whole extra layer of word class ambiguity that did not exist before.

Specifically, *do* is now syntactically ambiguous between Aux and V (*John does not like the movie* and *John does his homework* respectively). There is also an additional Emphasis property added when *do* immediately precedes V, *John does like the movie*, i.e. this is a semantic word-external property assignment, just as selection of the appropriate word class is a syntactic word-external property.

Will is also ambiguous between Aux (*I will sing*) and V (*He willed it to happen*), with N a lexical possibility as well (*my last will and testament*). Disambiguation proceeds through word-external property assignments, looking right or left to the relevant categories on which these assignments depend. The lexical *can* is syntactically an Aux of the subtype M or Modal. It is no longer a V in English, but it can be a noun (*a can*). *Might* is similar: an Aux or an N (*his great might*). So is *must*. *May* is an Aux or the proper name for a month.

Finite *have* in Modern English is assigned the properties Aux and Perfective when it precedes a past participle (*has seen*), but it is assigned V and the relevant lexical semantics (involving possession) when it precedes a direct object NP (*John has a house*). Likewise the verb *be* can be Aux or V (*Mary is singing* and *Mary is a teacher* respectively), and with the former the semantic property Progressive is assigned when Aux immediately precedes a verb in *-ing*. Passive is assigned when *be* precedes a past participle (*Mary was seen*).

The point about these auxiliaries of Modern English is that although the grammar now systematically differentiates Aux from V, with new tense and aspect distinctions and also a new division of labor between the original modals and periphrastic modals such as *be able to* generated under VP, and although this is at first sight hard to reconcile with the many other changes in the grammar and lexicon that involved a general loss of surface distinctions, yet when all this is viewed from the perspective of the present article we see the very same pattern as before. The actual words generated under Aux have become even more ambiguous than they were, and they rely to a greater extent on the assignment of word-external properties that disambiguate their syntactic category status and lead to related syntactic and semantic properties being assigned when neighboring words are accessed.

4.3 Property assignments in fixed word orders and their directionality 473

Sapir (1921) had the insight that the new fixed SVO word order of Middle English was intimately connected with the loss of case inflections on nouns. The verb now serves as a fixed anchor between subjects and objects. The perspective of the present article leads to a more general hypothesis about fixed word order. The loss of word order freedom and the conventionalization of typologically consistent ordering patterns (Hawkins 1983; Dryer 1992) appears to be intimately linked to the extent to which languages rely on neighboring words and phrases for assigning properties that are not inherent or unambiguous within individual words. When case marking is removed, there is a property assignment by reference to the verb (recall the fixed adjacency of the direct object to the verb in the Kannada (16b)). Fixed word order is correlated, I propose, with the number of word-external properties that must be assigned. When individual words are less explicit and rich in content, and word-external access is needed, an associated parser has to know where to look, rapidly and correctly, in order to assign the properties that are missing from the words themselves. And this makes it advantageous to have fixed and consistent positions for these words so that the parser can readily find one while processing the other (see further section 5.1).

Cross-linguistic support for this comes from Hengeveld *et al.*'s (2004) study of word order in the noun phrase. They found that languages with more ambiguous word classes (like Polynesian; see Broschart 1997) had more fixed word orders. For example, languages with lexically general predicates and without a separate productive Adjective category generally position their semantic adjectives in a fixed order consistent with the basic head ordering of the language, following the head noun in VO languages (like Samoan) and preceding it in OV languages (e.g. Quechua). In our terms, assigning Adjective or noun-modifier status to a general predicate within an NP is a word-external property, looking left to the nominal head in Samoan, and looking right in Quechua. And crucially, whereas languages with general predicates and undifferentiated adjectives typically have fixed NP order, those with a differentiated class of adjectives, permitting this property to be assigned independently of access to the noun, have variable positioning and frequently order their adjectives in a way that is at variance with the general head ordering typology of the language (e.g. basic NAdj orders in Basque and Abkhaz orders co-occurring with OV, these languages having differentiated adjectives, and Arapesh AdjNAdj co-occurring with VO, again with differentiated adjectives); see Hawkins (2014: 132–5) for a summary.

4.4 Word-external properties in more complex environments containing A or B 507

The assignment of a theta-role to a subject NP can proceed rapidly when the verb follows immediately. *Ran* assigns Agent in *The girl ran*, and *fell* assigns Patient in *The girl fell*. On other occasions the theta-role property requires access to the whole VP. *This tent sleeps* is unprocessable without the following ... *four*, whereupon the Locative theta-role can be assigned to the subject (section 4.1). Even for Agents and

513 Patients accessing the verb alone may not be enough. Contrast *The soldiers fell upon*
 514 *hard times* (Patient subject) and *The soldiers fell upon their enemy* (Agent), where the
 515 intended sense of *fell upon* and the corresponding theta-role of the subject is not made
 516 clear until the final N (*times* vs *enemy*). We can say that a word-external property
 517 P assigned to a subject, which is normally possible by reference to the verb alone,
 518 requires access in these examples to a more complex environment (VP) containing the
 519 verb and extending to its postverbal PP and NP.

520 Word-external properties requiring access to categories in more complex
 521 environments have systematically increased in English. Raising constructions are
 522 extremely limited in German (see (7)–(9) and Hawkins 1986: 75–84). Raising
 523 examples like *The girl appears to have fallen* vs *The girl appears to have run* show
 524 that Modern English has expanded the distance between matrix subject and theta-role
 525 assigner (*fallen* vs *run*). Disambiguation and polysemy reduction for these verbs also
 526 proceeds over larger structural distances: compare *The girl appears to have run badly*
 527 with *The stocking appears to have run badly*, in which resolution of the intended sense
 528 of *run* requires access to the (raised) subject in the higher clause. Compare also *John is*
 529 *easy to help* with *John is easy to hurt*, where different theta-roles are assigned to *John*
 530 by reference to *help* (Benefactive) vs *hurt* (Patient) within an embedded environment
 531 containing these verbs, and even within unbounded movement environments such as
 532 *This boy is easy for me to persuade Bill to help* (Postal 1974).

533 Modern English has similarly expanded the structural environments in which
 534 properties are assigned in WH-movement structures (see (10) above and Hawkins
 535 1986: 87–106). WH-questions like *What package did he come in order to pick up?*
 536 in which *What package* is linked to the infinitival verb *pick up* in an embedded adjunct
 537 purpose clause are grammatical in English, but corresponding sentences in German
 538 are ungrammatical. A theta-role is assigned to *What package* here by accessing *pick*
 539 *up*, and similarly selection and assignment of the appropriate sense of *pick up* from
 540 its large polysemy range requires access to *What package*. The A and B categories in
 541 these word-external property assignments occur in larger domains of processing than
 542 in German (see further Hawkins 1999, 2004). Modern English is also one of those rare
 543 languages that allows Preposition Stranding, e.g. *Who did you go to the movies with?*,
 544 in which the precise interpretation of the initial *Who* must remain unspecified until
 545 the distant subcategorizing preposition *with* is encountered, and this latter must in turn
 546 look to the distant WH-word for its governed NP. German uses only local ‘pied-piped’
 547 structures here corresponding to *With whom did you go to the movies?*

548 The word-external properties assigned in these expanded movement structures of
 549 Modern English are made to more words or phrases by reference to other words or
 550 phrases in more complex environments, in accordance with (15).

551 4.5 Multi-word verbs

552 The phrasal verbs of Modern English generally replaced earlier prefix verbs with
 553 prefixes such as *for-* (*forniman* ‘carry off’), *tō-* (*tōbreca* ‘break up’), *ā-* (*ālecgan* ‘lay

down'), *of-* (*offerian* 'carry off) and *ūt-* (*ūtgān* 'go out'). Some of these were to survive 554
in e.g. *outlive* and *overcome*, some in contrasting pairs such as *overtake* and *take over*. 555
But the decline in prefix verbs was extensive and it is generally agreed by historians 556
of English that the phrasal verbs can be dated to Early Middle English (Denison 1981; 557
Hiltunen 1983; Claridge 2000; Brinton & Traugott 2005). For prepositional verbs 558
and verbo-nominal types (see table 1) Claridge (2000: 89, 94) points out that their 559
historical expansion was similar to that of phrasal verbs. As noted in section 2, multi- 560
word verbs are much less extensive in German (see Berg 2014), though this remains 561
to be quantified for the different subtypes defined in Claridge (2000). 562

What we see in this systematic expansion of multi-word verbs in English is 563
increasing exploitation of neighboring words to provide properties to sister words and 564
to whole combinations. 565

Consider Claridge's type 5 verbo-nominal combinations Group 1 exemplified by 566
take a walk. Common examples listed in her Appendix are *take* (*take care*, *take effect*), 567
make (*make amends*, *make an escape*), *give* (*give battle*, *give offence*), *do* (*do harm*), 568
plus numerous combinations with less frequent verbs, e.g. *cast a look*, *keep pace*, *pick* 569
a quarrel. Light verbs rely crucially on their following N or NP for the assignment of 570
a meaning to the combination. Very few retain a more literal meaning that could be 571
assigned out of context, and most do not entail corresponding sentences in which the 572
pronoun *something* replaces the following NP. *Mary made a dress* entails *Mary made* 573
something, but *Mary made an escape* does not entail *Mary made something*, nor does 574
Mary made amends. *Mary took a walk* does not entail *Mary took something*. In short, 575
a basic and literal meaning can be assigned to *make* in *Mary made a dress*, which 576
includes the general meaning of *make* in *Mary made something*, but this is not usually 577
possible for light verbs. 578

Claridge's verbo-nominal Group II in type 5 exemplified by *catch sight of* has a 579
similar set of light verbs listed in her Appendix including *take* (*take care of*), *make* 580
(*make mention of*), and *give* (*give rise to*), also *have* (*have need of*), *put* (*put an end to*) 581
and *set* (*set fire to*). Her Group III includes *take into consideration*, *put to death* and *set* 582
on fire. As with Group I, the meanings of most light verbs in Groups II and III require 583
access to the following N, NP or PP. 584

Consider next prepositional verbs, Claridge's type 2 in table 1. Examples from her 585
Appendix include *wait for*, *aspire to*, *dispense with*, *engage in*, *launch into*. What is 586
significant about most of these is that either the verb needs access to the preposition 587
for a meaning assignment, or the preposition needs access to the verb, or both. We can 588
make this more precise using the entailment tests proposed in Hawkins (2000: 242), 589
which are similar to those just illustrated for light verbs. 590

(19) **Verb Entailment Test:** does the meaning assigned to V require access to a following 591
PP or is a sentence entailed with V alone? E.g. *The man waited for his son* entails *The* 592
man waited; *The man counted on his son* does not entail *The man counted*. 593

(20) **Pro-Verb Entailment Test:** does a PP require that particular V for its interpretation or 594
can V be replaced by some general Pro-verb? E.g. *The boy played on the playground* 595

596 entails *The boy did something on the playground*, but *The boy depended on his father*
 597 does not entail *The boy did something on his father*!

598 If V needs access to a following preposition by the test in (19), or a preposition to
 599 the V by the test in (20), then we are dealing with a word-external property assignment
 600 made to the combination of A with B (see the definition in (14)).

601 Hawkins (2000) examined permutable sequences of two PPs following V in a
 602 written corpus of fiction and non-fiction texts comprising 394 such sequences. A
 603 majority of these (211, or 54 percent) could be shown to involve a property assignment
 604 to either the verb, or the preposition or both. Their lexical meanings could not be
 605 assigned without accessing the other. This shows how commonplace these lexical
 606 assignments have become to the combinations in question.

607 The phrasal verbs of Claridge's Appendix, type 1, are her largest group. Many of
 608 the 'intransitive phrasal verbs' have compositional semantics, like *fly away*, and do not
 609 need lexical listing. But she also gives numerous transitive ones including *cast off*, *rent*
 610 *out*, *put up* and *win over*, most of which do require lexical listing and/or analysis as a
 611 construction.

612 Lohse *et al.* (2004) proposed entailment tests distinguishing among phrasal verbs
 613 that do or do not involve word-external property assignments. *John rented the*
 614 *apartment out* entails *John rented the apartment* (without the particle) but it does
 615 not entail *The apartment WAS out* or *The apartment WENT out* (with some alternative
 616 semantically general verb like BE or GO used as a predicate). *Rent* is accordingly
 617 classified as an independent verb, not requiring word-external access for its lexical
 618 meaning, and *out* as a dependent particle requiring access to the verb. *John turned the*
 619 *light off*, by contrast, entails *the light WENT off*, but not *John turned the light*, making
 620 the particle independent of the verb while the verb needs access to the particle for
 621 its interpretation. In *John lifted the child up*, both *John lifted the child* and *the child*
 622 *WENT up* are entailed, making both verb and particle independent of each other, while
 623 in *John carried out the plan* neither entailment goes through and both need access to
 624 the other. Empirically over three-quarters of the 1684 verb–particle sequences in their
 625 corpus had a verb that required access to the particle, or a particle requiring access
 626 to the verb, indicating again how extensive word-external property assignments have
 627 become in these Modern English word combinations.

628 4.6 Verb co-occurrences and selectional restrictions

629 Leisi (1975) examined many basic lexical verbs of English and German and argued
 630 that those of English exhibit a greater reliance on accompanying direct objects for their
 631 precise semantics. Verbs like *break X*, *shoot X*, *put on X*, *paint X* are compatible with
 632 many different kinds of breaking (brittle and non-brittle objects), of shooting (human
 633 and animal), of putting on (different types of clothing) and of painting (affected
 634 and effected objects), and the selection of the appropriate meaning relies crucially
 635 on the following X. In German separate verbs are regularly used for these different

activities in combination with different objects, i.e. these German verbs have less polysemy and ambiguity. Leisi's key insight was that the '*Wortinhalt*' or semantic content of verbs depends on their *Wortverband* with the following X to a greater extent in Modern English than it does in German. In our terms, English verbs are semantically more general and polysemous than their German counterparts and require more word-external access for lexical property assignments, providing further support for (15).

Plank (1984) has confirmed this in an examination of some fifteen semantic areas. English *break* applies to brittle objects like bones and branches, but also to ropes, strings and tendons. German *brechen* and *zerbrechen* apply only to the former. For non-brittle things other verbs have to be used like *zerreißen*. Corresponding to *shoot* in English, German has both *schießen* and *erschießen*. *Schiessen* is used for animals hunted for sport or food and evokes the game-hunting sense of *shoot*. But if the victim is human (or a pet animal) then *erschießen* is used. English *shoot* covers both types of victims and events.

German verbs also differentiate regularly between effected objects (where the object is brought into existence by the action described in the predicate) and affected objects (where the object exists in advance of the action described in the predicate). *Paint a picture* involves the creation of an object and is effected, but in *paint the wall* the wall generally exists already and is affected. English uses *paint* for both. German has *malen* for pictures, but *streichen* (or *anmalen* or *bemalen*) for affected objects like walls. A particularly striking set of contrasts can be seen in verbs for putting on clothes. English uses *put on* for just about any item of clothing and personal adornment, a coat, gloves, shoes, a hat, a crown, jewelry, a tie, a belt, a necklace, a brooch, and so on, whereas German employs numerous verbs that distinguish between the different types of putting-on-activities, often in a semantically transparent way (see Plank 1984 and Hawkins 1986: 28–35).

Plank (1984: 331) summarizes by observing that it is regularly the case that 'two or more verbs in German ... correspond to a single English verb lacking the object-oriented meaning component found with its German counterparts'. Alternatively, English and German may have verbs with similar object-agreement requirements, but English 'may have additional, and perhaps more commonly used, verbs which neutralize this object-oriented meaning opposition', as with *put on*. These 'object-oriented meaning components' of German verbs are inherent in the verbs themselves and in their selectional restrictions (Chomsky 1965). For English many of these semantic properties are assigned word-externally by accessing accompanying NPs.

Plank's and Leisi's generalization for English and German has been corroborated for the semantic area of cutting and breaking in an experimental study in which native speakers of various languages described video clips depicting a wide variety of these actions (Majid *et al.* 2007). The issue they addressed was how speakers partition the different types of cutting and breaking actions based on the verbs available to them. Four Germanic languages were compared in this paper, English, German, Dutch and Swedish, and the greater semantic generality of English was confirmed.

English verbs have also generalized their syntactic subcategorization frames. Berg (2014) gives sample figures suggesting that over half of Modern English verbs are ‘ambitransitive’, i.e. ambiguous between transitive and intransitive, like *obey* (*you have to learn to obey* vs ... *obey your parents*), and that there are two or three times more such verbs than are found in German. For these the accompanying NPs need to be consulted in order to ascertain which subcategorization frame is intended, and we are dealing with a word-external property again.

5 Psycholinguistic implications

The last section presented what is in effect a descriptive linguistic generalization for major English–German contrasts in terms of word-external properties. This proposal has clear implications for the psycholinguistic mechanisms that operate in online processing, as speakers and hearers make the relevant property assignments in real-time, activating and supplementing their grammatical and lexical representations for individual words and phrases. In this section we consider some of these implications. Many of these contrasts have not been studied experimentally, but there are some findings that are very suggestive, and it is my hope that the linguistic patterns described here will encourage further experimentation. A fuller understanding of their online processing will lead to an improved explanation for the comparative typology than can be offered on the basis of grammatical and lexical patterns alone. I first present a preliminary general hypothesis regarding competing efficiencies in language processing for the contrasts we have seen (section 5.1), before outlining issues for testing in online experiments (section 5.2).

5.1 Competing efficiencies

Some recent experimental work on multi-word verbs is very revealing. In a series of online psycholinguistic and neurolinguistic studies of light verb constructions in both English and German, Wittenberg and colleagues have shown that they are associated with higher processing demands compared with matched verbs with literal meanings (Wittenberg & Pinango 2011; Wittenberg, Paczynski, Wiese, Jackendoff & Kuperberg 2014; Wittenberg, Jackendoff, Kuperberg, Paczynski, Snedeker & Wiese 2014). The constructions with non-literal interpretations of *make*, *take* and *give*, and requiring word-external access and property assignments as defined here were harder to process than their literal counterparts, despite being more frequent. For example, there were longer reaction times when making a cross-modal lexical decision after light verb constructions than after their non-light counterparts. The authors argue that light verb constructions are harder to process because of their more complex argument structure, and they propose a ‘co-event’ analysis for them in semantic interpretation.

Further relevant experimental work on multi-word verbs has been reported in Gonnerman & Hayes’ (2005) study of verb–particle processing. They found that online decision latencies and self-paced reading times were significantly longer for phrasal

verbs requiring word-external properties as defined here, i.e. for those in which either the verb or the particle required access to the other for assignment of its lexical meaning (by the entailment tests of Lohse *et al.* 2004; see section 4.5). Similarly, experimental support for extra processing demands in V–PP sequences such as *count on my father*, in which either verb or preposition required access to the other (by the entailment tests of (19) and (20)), is given in Marblestone (2007). She found evidence for greater difficulty in sentence construction and repetition tasks when V and P involved word-external properties, especially when task demands were increased through their non-adjacency.

Corpus data support these experimental findings of extra task demands in processing word-external properties. For light verb constructions like *take X into account* Wasow (1997, 2002) found that 60 percent were shifted to *take into account X* in his corpus, putting the verb adjacent to the PP on which its light verb interpretation depends, compared with just 15 percent of shifts when *take* was interpreted literally in *take X to the library*. The much greater frequency of these ‘Heavy NP Shifts’ away from basic V–NP–PP order and into a position that gives the light verb a smaller Lexical Combination Domain (Hawkins 2004) supports their proposed greater processing difficulty in the Wittenberg *et al.* experiments.

For the V–PP–PP sequences in Hawkins’ (2000) data, almost three-quarters (73 percent) of those with one independent PP and one requiring word-external access placed the latter adjacent to the verb, making the domain for lexical-semantic processing smaller and suggesting that the processing of *count on* is indeed more demanding than that of *play on*, which the Marblestone (2007) experimental study has now confirmed. For PPs requiring such access that were also shorter (in word length) than the independent PP, the adjacency rate to V in the corpus was even higher at 96 percent, on account of the additional short-before-long preference (reducing Phrasal Combination Domains in Hawkins 2004), again matching Marblestone’s findings. The particles of phrasal verbs that were not independently processable (e.g. *look up the number*) also resulted in significantly more adjacency to the verb compared with independent particles (*lift the child up*) in the corpus data of Lohse *et al.* (2004), matching their greater processing difficulty in the experiments of Gonnerman & Hayes (2005).

Word-external properties appear to require more processing effort, therefore, than corresponding structures with word-internal properties, and they prefer tighter adjacency between interlinked words in order to keep processing domains as short as possible. If this result can be replicated in further experimental studies, we will have an explanation for many phenomena involving linear ordering that have been observed in grammars and cross-linguistic variation conventions. It will explain why word-external case assignment to a direct object in SOV languages like Kannada (see (16b) above) only takes place when that object is immediately adjacent to its verb; why zero-marked dependents (e.g. relative clauses without relativizers, complement clauses without complementizers) generally stand closer to their heads than explicitly marked ones (Hawkins 2003); why complements are closer to their verbs than adjuncts (Hawkins

2001); and numerous other cases of adjacency (Hawkins 2004, 2014). We would also have support for the fixed word order hypothesis given in section 4.3 above, whereby more word-external processing demands result in fixed and consistent orderings. More controlled experiments manipulating alternating structures of all these types are now needed, along the lines of the Wittenberg *et al.* studies.

On the other hand, Sapir's drift to invariable words in English has clearly made processing easier in some respects, plausibly offsetting some of these added costs from word-external processing. Specifically, English has reduced the size and complexity of its words and increased their syntactic and semantic generality. Having fewer phonemes and morphemes to process, fewer and more general semantic properties to assign, and more frequently used shorter forms, makes processing easier according to the Minimize Forms principle of Hawkins (2004, 2014). A larger viewing window is then required, however, for property assignments beyond the word itself. In addition, when word-external processing must look forward to later categories in the parse string there will be delays in the assignment of correct properties, temporary ambiguities and frequent garden paths, recall section 2.

Modern English is often inefficient according to the principle of Maximize Online Processing proposed in Hawkins (2004, 2014), therefore, which asserts that there is a preference for selecting and arranging linguistic forms so as to provide the earliest possible online access to as much of the ultimate syntactic and semantic representation as possible. Modern English has also extended many parsing domains, both forward-looking and backward-looking ones, the most extreme cases being the complex environments containing categories A or B summarized in section 4.4. These changes result in less minimal domains for processing (Hawkins 2004, 2014), but as I have said Modern English does have more minimal forms (though see further section 5.2).

Conversely, languages with syntactically and semantically richer and more complex words, and with fewer word-external properties like German will have the reverse efficiencies and inefficiencies to those of Modern English. Their longer and more explicit words do not minimize forms, but German does have more minimal domains of processing in many structures and more maximal online processing. Richer and more explicit words result in faster and more error-free online processing at each word. The kind of trade-off I am suggesting here in processing advantages and disadvantages is in the spirit of competing motivation theories; see MacWhinney *et al.* (2014) for an interdisciplinary synthesis.

5.2 *Relevant issues in online processing*

The verb is known to play a central role in parsing. It activates alternative co-occurrence frames online (see e.g. Tanenhaus & Carlson 1989; Melinger *et al.* 2009) and these alternatives are ultimately what lead to temporary ambiguities and garden paths in a verb-early language like English (section 2). But what exactly happens online with verb–preposition and particle verb constructions (*count on my son* and

take up a new hobby), and with highly polysemous verbs (*run, break, put on*)? Do we get a preference for more frequent and more predictable assignments at the verb (e.g. in favor of physical *run* rather than the management run in *run the company*)? Or is some minimally specified general meaning first assigned to *break* and *put on*, leaving more specific interpretations until following objects are encountered? If so, what about the light verbs (*have, take, make*) that have almost no general meaning in common across all their lexical entries? Is there a preference for assigning the literal and non-light interpretation first and is this part of the greater processing difficulty for these structures found by Wittenberg and her colleagues, in addition to their co-event semantics? What about a verb like *count* that is so different in its mathematical and relying-on senses that no lowest common denominator is possible for its different uses in an early parse?

In all these cases we need to know whether the multiple meanings and co-occurrence possibilities of verbs are held active prior to disambiguation, whether the parser commits to a contextual or default interpretation, or whether it adopts a wait-and-see approach and looks ahead without overloading working memory. Swinney (1979) found evidence for different lexical meanings of ambiguous words being momentarily activated, even when one interpretation was more frequent, or when context restricted the interpretation. More recently Shetreet *et al.* (2016) have shown that alternative argument structure and co-occurrence frames for a verb are activated at the verb, even when disambiguating information regarding these arguments precedes the verb. Ambiguities can increase processing load and require more processing effort, therefore, and the more minimal words of English may be adding to processing effort in some respects while reducing it in others. Even though fewer phonological and morphological units need to be recognized and many meanings have become more general and frequently used, more possible interpretations are initially activated and may be held active. More experimental research is needed on the precise processing benefits and costs of the more minimal words of English compared with less minimal alternatives.

More generally, for all the forward-looking property assignments discussed in this article we need to understand exactly how and when the relevant properties are actually assigned online. Much work in psycholinguistics and neurolinguistics has been concerned with identifying the various factors that lead to preferred meanings and structural assignments prior to their subsequent confirmation or elimination later in the parse string. These factors include frequency effects, pragmatic context, real-world knowledge, structural simplicity, grammatical and semantic preferences such as ‘prominence hierarchies’ for argument selections favoring Agent over Patient, good-enough parsing, also entropy and probability-based predictive processing. The reader is referred to Frazier (1979, 1985), Ferreira (2003), Ferreira *et al.* (2013), Marslen-Wilson & Tyler (1980), MacDonald *et al.* (1994), Patson & Ferreira (2009), Gibson (1998, 2000), Bornkessel & Schlesewsky (2006), Levy (2008) and Hale (2001) for a small but representative sample of work exemplifying these different factors, and to Traxler (2011) for a general overview. The preferences resulting

845 from these various factors may succeed in speeding up processing on numerous
 846 occasions, e.g. when an Agent is assigned prior to the verb, or when the basic
 847 and frequent physical motion sense of transitive *run* is assigned prior to accessing
 848 *the race*.

849 Early preferences are often wrong, however, when a Patient theta-role or other less
 850 expected theta-role is subsequently required by the verb (Bornkessel & Schlesewsky
 851 2006), or when *run* combines with *the company* and receives the less expected and
 852 less frequent sense of ‘manage’ (section 4.6). Sometimes one general factor (e.g.
 853 frequency or structural simplicity) is at variance with another (pragmatic context)
 854 (see MacDonald *et al.* 1994), leading to a weaker, or no clear online preference. In
 855 any case since word-external properties as defined here go beyond the grammatical
 856 and lexical knowledge associated with individual words, one word must always
 857 be accessed when parsing another whenever a word-external property is defined
 858 between them, if only to confirm any properties assigned by general preferences, or
 859 to disconfirm them when they are incompatible with later material, resulting in a
 860 garden path. General parsing preferences of this sort interact with many of the word-
 861 external properties defined here, therefore, in ways that need to be further clarified
 862 experimentally.

863 Also relevant in this context is the relationship between parsing and language
 864 production (see Levelt 1989; Kempen *et al.* 2012; MacDonald 2013). Word-external
 865 properties assigned in parsing must also be an integral part of production mechanisms,
 866 since they shape production as well as comprehension, both corpus data (Hawkins
 867 2000; Lohse *et al.* 2004) and experimental production data (Gonnerman & Hayes
 868 2005; Marblestone 2007). There are arguably factors unique to production that have
 869 shaped grammars and language change (see Bybee 2006, also Himmelmann 2014
 870 and McDaniel *et al.* 2015), but there are also many processing principles shared by
 871 both speakers and hearers (see especially Kempen *et al.* 2012). There is still unclarity
 872 over the extent to which speakers’ and hearers’ needs overlap. Research on parsing
 873 is more advanced than production, so I have chosen to focus more on parsing in this
 874 context.

875 6 Conclusions

876 I have argued for a new unifying generalization for the major contrasts between
 877 Modern English and German summarized in sections 2 and 4, specifically for one
 878 that incorporates the notion of a word-external property defined in (14). The drift of
 879 English has involved more properties P being assigned word-externally to a larger set
 880 of words and phrases A and B by reference to one another (15). The psycholinguistic
 881 implications of this linguistic generalization were spelled out in section 5, along with
 882 questions and issues for further testing.

883 This contrastive generalization unifies many grammatical and lexical changes that
 884 introduced greater ambiguity and generality, and it can also account for those that led
 885 to more differentiation in grammatical forms and their meanings (section 4.2). Many

words and phrases lost their inherent properties as word-external property assignments increased, both in lexically listed non-compositional combinations of multi-word verbs and in their more compositional counterparts (section 4.5), and in other compositional combinations as well summarized throughout section 4. A new general theory of fixed word order has been proposed going beyond Sapir's SVO explanation (section 4.3).

More generally, we see in this distribution of changes and contrasts within West Germanic a typological continuum from independently processable words at one end to those at the other that rely on neighboring words for properties as diverse as case and theta-role (sections 4.1 and 4.4), syntactic category (section 4.2), basic lexical meanings (sections 4.5 and 4.6), and selectional restrictions and subcategorization properties of verbs (section 4.6). We have also seen more constructions with idiosyncratic properties in Modern English throughout section 4 (cf. also Traugott & Trousdale 2013), but as I have stressed, this is just the tip of an iceberg consisting of many fully compositional word-external property assignments as well.

A possible explanation for this typology has appealed to competing efficiencies (section 5.1). Minimal surface forms with fewer phonemes and morphemes and with more general semantic properties and greater frequency of usage require less processing effort in significant respects than richer and more complex words, and they benefit from the co-occurrence of sister words and phrases and their properties, albeit in computationally demanding ways. Richer words with more word-internal properties, by contrast, permit more rapid and error-free online processing, with fewer word-external property assignments, but they involve more processing at and within each word. Both language types may be as efficient as they can be (Hawkins 2004, 2014), but their respective efficiencies cannot be satisfied at the same time. Whether this kind of explanation is ultimately viable will require more psycholinguistic research on the issues raised in section 5.2.

Modern English is near the word-external end of this typological continuum, and it contrasts sharply with closely related West Germanic languages. Interestingly, the North Germanic languages Danish, Norwegian and Swedish are much more like Modern English in structural and lexical features that are associated with word-external property assignments. They all share inflectional reductions, phrasal verbs, light verbs, auxiliary verbs, raising constructions, more WH-movements, preposition stranding, and many other features that are laid out in detail in Emonds & Faarlund (2014). It is quite plausible to suggest that the Scandinavian settlers in the Danelaw had a strong influence on Anglo-Saxon and Middle English as a consequence of extensive bilingualism. There may have been a language contact, social trigger for this shift of English towards more word-external property assignments, therefore, with the largely lexical borrowings from Norman French added later as Norman French of the political elite became widely used by Anglo-Norse speakers (see further Trudgill 2016). Considerations of space preclude a fuller discussion of this important social and language contact aspect of the typology of Modern English, for which the grammatical and psycholinguistic aspects discussed here may be of some relevance.

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