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# Cognition in construction grammar: Connecting individual and community grammars

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**Abstract:** This paper examines, on the basis of a longitudinal corpus of 50 early modern authors, how change at the aggregate level of the community interacts with variation and change at the micro-level of the individual language user. In doing so, this study aims to address the methodological gap between collective change and entrenchment, that is, the gap between language as a social phenomenon and the cognitive processes responsible for the continuous reorganization of linguistic knowledge in individual speakers. Taking up the case of the prepositional passive, this study documents a strong community-wide increase in use that is accompanied by increasing schematicity. A comparison of the 50 authors reveals that regularities arising at the macro-level conceal highly complex and variable individual behavior, aspects of which may be explained by studying the larger (social) context in which these individuals operate (e. g., age cohorts, community of practice, biographical insights). Further analysis, focusing on how authors use the prepositional passive in unique and similar ways, elucidates the role of small individual biases in long-term change. Overall, it is demonstrated that language change is an emergent phenomenon that results from the complex interaction between individual speakers, who themselves may change their linguistic behavior to varying degrees.

**Keywords:** constructional change, individual variation, entrenchment, lifespan change, prepositional passive

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# 1 Introduction

*Now whatever has been done once that may certainly be done again.  
And nothing is more vain than to argue against experience. But this is certain;  
That some will hardly be persuaded by any Arguments to come off from their tastes immediately;  
but Reason will lie brooding on their Minds till it has hatch'd Conviction,  
and then they will be seen gladly to part with their tastes* (John Dennis, 1696)

What is new often meets with resistance, as Dennis observes in his preface to *Remarks on a Book entituled, Prince Arthur*. Yet, as time overcomes people's initial reluctance to change, many are seen to follow suit. This slow start, followed by a rapid rise (and often a levelling-off again), is a typical dynamic of adopter distributions (Rogers 1983), which have also informed the propagation of linguistic innovations (e. g., Kroch 1989; Labov 1994; Denison 2003; Blythe and Croft 2012). It is the latter type of change this paper is concerned with. More specifically, this paper addresses the methodological gap between collective change and entrenchment, that is, the gap between language as a social phenomenon and the cognitive processes responsible for the continuous reorganization of linguistic knowledge in individual speakers. The expansion of the prepositional passive in Early Modern English will serve as a case study.

Prepositional passives, i. e., passives of the type presented in (1), are a syntactic innovation of Middle English, but their main rise may be situated in Early Modern English, when they significantly increase in frequency and extend to more complex types, e. g., (2) (see Visser 1973; Denison 1981, Denison 1985, Denison 1993; Seoane 1999; Dreschler 2015).

- (1) a. They were laughed at.  
b. The problem has been dealt with.
- (2) a. They were cried out on.  
b. It has been taken care of.

Due to its lengthy expansion phase, the prepositional passive lends itself well to the study of longitudinal change in individuals and long-term conventionalization processes. While community-level changes (such as the rise of the prepositional passive) have been studied extensively, we still know little about how community change is reflected in the minds of individuals, who are arguably the agents through whom change proceeds. The distinction between cognitive and social processes of change is generally acknowledged (e. g., Fischer 2010: 182; Traugott and Trousdale 2013: 46; Baxter and Croft 2016; Noël 2016), but not usually operationalized. Within the family of usage-based and constructionist approaches,

the most detailed elaboration of the principles and processes involved is Schmid's (2015, 2020) Entrenchment-and-Conventionalization Model (EC-Model), which serves as a general theoretical framework to this paper (see Section 2).

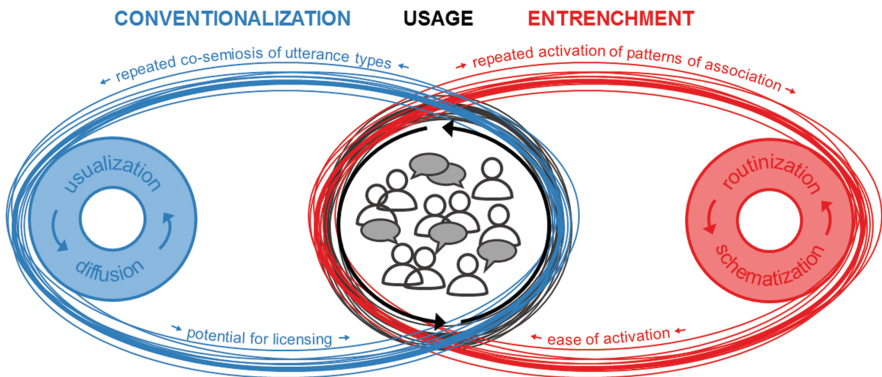
Despite significant theoretical advances in recent years, empirical work on idiolects in the context of linguistic change remains scarce (some recent exceptions include Bergs 2005; Nevalainen et al. 2011; Raumolin-Brunberg and Nurmi 2011; De Smet 2016; Petré and Van de Velde 2018; Anthonissen 2020; Neels this volume). The present contribution therefore seeks to further our knowledge about the possibility and scope of linguistic change in individuals and explicitly addresses its relation to community change. To this end, I examine the expansion of the prepositional passive in Early Modern English in 50 authors across 5 generations. As such, this contribution is one of the first quantitative and longitudinal studies to address the relationship between lifespan and community change in syntax.

The paper is structured as follows: Section 2 introduces the EC-Model and states the research questions. Next, I discuss the phenomenon of verb-preposition collocations and their occurrence in prepositional passives (Section 3). It is suggested that their relation is best captured as a probabilistic one, arising from the gradient nature of verb-preposition collocations and semantic fit with the passive construction. In Section 4, I introduce the EMMA and EM corpus (Petré et al. 2019) and explain how the corpus study was conducted. The findings, which focus on (a) the locus of change (inter- and/or intragenerational change) and (b) the role of entrenchment in long-term community change, are presented in Section 5. Among other things, it is demonstrated that language change is an emergent phenomenon that results from the complex interaction between individual speakers, who themselves may change their linguistic behavior to varying degrees. The results are indicative of a change that is driven by usualization and entrenchment, thus giving substance to the view that mere frequency shifts in individual or collective usage can lead to long-term change in a construction's usage profile (see Schmid 2020: §19.5). Section 6 concludes with a summary of the findings and their implications for the study of language and language change.

## 2 Theory and research questions

Constructionist and usage-based approaches to language generally subscribe to the view that “the structures of language emerge from interrelated patterns of experience, social interaction, and cognitive processes” (Beckner et al. 2009: 2). The Entrenchment-and-Conventionalization Model (EC-Model; Schmid 2015,

Schmid 2020) elaborates this idea, and will serve as the general theoretical framework against which the analyses in this paper are interpreted. The EC-Model consists of three main components: usage, entrenchment (cognitive processes shaping linguistic knowledge in individual speakers) and conventionalization (social processes shaping linguistic conventions in a speech community), as shown in Figure 1.



**Figure 1:** The EC-Model (adapted from Schmid 2020: §1.2).

At the center of this model of language are usage events, which set into motion the cycles of conventionalization and entrenchment. The feedback loops symbolize how conventions and individual linguistic knowledge are established and sustained by virtue of repetition in communicative acts, and mutually influence each other: “If usage events are repeated in identical or similar ways, as indicated by the bundle of black circles in the middle, the recurrent aspects become conventionalized as utterance types such as words or patterns in the community and as entrenched patterns of associations in the minds of individual speakers” (Schmid 2020: §1.2). Conventionalization and entrenchment are in turn conducive to repeated usage because with increasing conventionalization comes greater potential to license usage events in the speech community and increasing entrenchment facilitates activation in individual speakers (Schmid 2020: Ch. 1).

Conventionalization subsumes processes of usualization and diffusion, which reflect degrees of conventionality in terms of how often a particular pattern is used as an agreed-upon means to achieve a particular communicative goal (usualization) and the spread of a pattern in the community (diffusion). Entrenchment is defined as the continuous adaptation of individual linguistic knowledge as a function of usage in social interactions. The major processes involved are

routinization and schematization, which strengthen patterns of associations in speakers' minds depending on frequency and variability of recurrent expressions or patterns (ranging from lexically filled or fixed to fully variable).

By depicting the trade-off between cognitive processes and social demands, the EC-Model also sheds light on the question of lifespan change. The model predicts that constructional change across the lifespan is possible, but that the nature of it will be determined by the interaction of the various processes involved. For instance, as Petré and Van de Velde (2018) have shown for the grammaticalization of *be going to*, a high degree of entrenchment of the older pattern in older language users may constrain their adoption of the innovative pattern, whereas the younger generation, having been exposed to both patterns, might not exploit the innovative pattern to the fullest as usage is constrained by what is conventionalized.

The present study sets out to gain further insight into the relation between collective change and entrenchment by investigating longitudinal data from 50 interconnected individuals (see Section 4) during the expansion of the prepositional passive in Early Modern English. The analysis is guided by two main research questions, the results of which are discussed in Sections 5.1 and 5.2 respectively:

- RQ1. Where does change reside? Does linguistic change only occur between generations or does it also take place during the lifetimes of individual speakers?
- RQ2. What is the role of entrenchment processes in long-term change?

The first part of the analysis (Section 5.1) examines the role of individuals in the emergence of community change and aims to establish whether change is merely a function of a changing population (generational change) or also of lifespan change (intragenerational change). Further analysis (Section 5.2) links the results of RQ1 to usage-based theory by examining the cognitive and linguistic effects of repeated usage. More specifically, it investigates the effects of type repetition (entrenchment and conventionalization of the prepositional passive schema) and token repetition (entrenchment and conventionalization of verb-preposition combinations).

### **3 Verb-preposition sequences: Reanalysis, entrenchment and constructional semantics**

Nearly all treatments of the prepositional passive rely on the notion of reanalysis of verb-preposition (V-P) combinations to explain its occurrence. Reanalysis is

traditionally defined as a “change in the structure of an expression or class of expressions that does not involve any immediate or intrinsic modification of its surface manifestation” (Langacker 1977: 58). While the specifics of theoretical treatments may differ substantially, there are a number of characteristics that have come to be widely accepted. In particular, it is assumed that reanalysis operates syntagmatically and takes place when an alternative grammatical structure is assigned to an existing representation. Reanalysis presupposes surface ambiguity (underdeterminedness) in the input structure, proceeds abruptly and is covert, though changes in surface structure may manifest later when the construction behaves in ways that are only reconcilable with the new structure (see Harris and Campbell 1995; Langacker 1977; Timberlake 1977; Hopper and Traugott 2003; Lehmann 2004; Traugott and Trousdale 2010).

The occurrence of the prepositional passive is often adduced as evidence (i. e., as a formal manifestation) that rebracketing has taken place (e. g., Denison 1981: 219; Inada 1981: 121, 128; Quirk et al. 1985: 1164; Seoane 1999: 125; Goh 2000: 127; Brinton and Traugott 2005: 126). That is, the occurrence of the prepositional passive presupposes and signifies reanalysis of the V-P collocation, whereby constituent boundaries shift from (3a) to (3b) and the V-P unit behaves as if it were an ordinary transitive verb, eligible for passivization.

- (3) a. [[insist]<sub>V</sub> [on [something]<sub>NP</sub>]<sub>PP</sub>]<sub>VP</sub>  
 b. [[insist on]<sub>V</sub> [something]<sub>NP</sub>]<sub>VP</sub>

The reanalysis claim is substantiated by a number of observations attesting to the V-P's unit-like status. One finding is that passivable V-P combinations can often be substituted by single verb equivalents, e. g., *look into*, *account for* and *take advantage of* mean *investigate*, *explain* and *exploit*, respectively. They commonly, but not always, have fixed prepositions (e. g., *deal with*) and it is normally impossible to insert other material into the V-P sequence, as demonstrated in (4).

- (4) \*This matter must be looked very carefully into. (van Riemsdijk 1978: 222)

While reanalysis appears to be an intuitive notion, pertinent concerns have been expressed by Fischer (2008) and De Smet (2009), who view reanalysis as an epiphenomenon of more basic cognitive mechanisms. Following this line of thought, I will argue that the expansion of the prepositional passive can be more elegantly explained in a usage-based framework, in particular by appealing to processes of entrenchment.

In line with Schmid (2017, 2020: Pt. III), entrenchment is here understood as a cover term for various cognitive processes that operate on linguistic associations in the minds of individual speakers. These processes (including routinization and schematization) are mainly determined by frequency of usage (e. g., token and type repetition) and are subject to social processes (what is conventionalized in a speech community). If we relate this to our case study, V-P collocations can be conceived of as syntagmatically associated units, that is, “processing units or chunks – sequences of words [...] that have been used often enough to be accessed together” (Bybee 2013: 51). If this may seem like rephrasing reanalysis, recall that reanalysis proceeds abruptly and is leap-like in nature, whereas entrenchment involves the shifting of weights in a speaker’s associative network. This has important implications. It means that the status of V-P sequences is not fixed: V-P combinations may be more or less unit-like, they may or may not be compositional, and their degree of entrenchment may vary across individuals and across time. While we may distil some coarser categories in terms of fixedness and idiomacity, ranging from prepositional verbs to adjunct-like sequences (see Hoffmann 2011: 65–75; Yáñez-Bouza 2015: 38–55), these categories are fuzzy, so that a single V-P sequence may represent a prepositional verb in one utterance (e. g., *arrive at a solution*), and a combination of verb plus adjunct in another (*arrive at* in its literal meaning ‘to reach a place’). This cline of fixedness correlates to some extent with the acceptability of V-P combinations in the prepositional passive, insofar as fixed collocations such as *deal with* and *insist on* are more frequently attested in the prepositional passive than combinations like *sleep in* or *go to*.

However, entrenchment is only part of the picture; whether a specific V-P sequence can be passivized, let alone used productively in the prepositional passive, is also contingent on its semantic fit with the construction.<sup>1</sup> Compare *consist of* and *sleep in*. The former is a highly conventionalized/entrenched string, yet is not found in the prepositional passive because the event structure of the verb is incompatible with the semantics of the passive construction (cf. Goldberg’s [1995] Semantic Coherence Principle). Conversely, a combination like *sleep in* that is not fixed (cf. *sleep near/under/on/...*) and usually indicates an intransitive activity, may be licensed in the passive if the passive subject is conceived of as being particularly affected by the action or otherwise salient enough to compete for a topicalized position in the clause. Thus, a hotel guest who finds a messy bed when entering her room may say something like *This bed*

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1 Several other and related semantic-pragmatic factors have been related to the acceptability of prepositional passives (see, e. g., Riddle et al. 1977; Couper-Kuhlen 1979; Riddle and Sheintuch 1983; Thornburg 1985; Takami 1992), but they fall outside the scope of this paper.

*has been slept in!* In Dutch, which has to some extent retained the prefixal system, this state of affairs may be described by using the transitive verb *beslapen* ‘to sleep in/on’, consisting of the prefix *be-* and the verb stem *slaap* ‘sleep’. In other words, the likelihood with which V-P combinations occur in the passive is also dependent on their resemblance to transitive verbs, i. e., their semantic coherence with the argument structure evoked by passive constructions.

In this brief overview I have argued for a dynamic view of V-P collocations. On this view, V-P sequences become entrenched as patterns of associations in the minds of individual language users as a function of repeated usage in social interactions, which in turn triggers their conventionalization in the speech community (see Figure 1). Such patterns of associations may vary between speakers as well as within speakers across time. Passivization of V-P sequences furthermore requires that they denote thematic relations that are compatible with those evoked by the passive construction. In underscoring the gradient nature of V-P collocations and the importance of semantic coherence, the present account offers a natural and cognitively plausible explanation for the existing variation and gradualness with which the prepositional passive spread to new V-P types in Early Modern English.

## 4 Data and methodology

The present study draws on a large-scale longitudinal corpus to explore the dynamics of cognitive and social processes in ongoing change. The data come from the corpus of *Early Modern Multiloquent Authors* (EMMA), which was designed specifically for the quantitative study of intra- and intergenerational change (for details, see Petr  et al. 2019). It comprises all the written works of fifty of the most prolific English writers born in the seventeenth century, mostly taken from the London-based elite. In selecting authors, we strove to include authors who in addition to being connected to London society exhibited social, political, and stylistic connections to other individuals in the selection. At the aggregate level, the authors are divided into five generations. To ensure comparability across generations, we aimed at an analogous distribution of the different main genres within each generation.

For the purposes of this study, I made a principled selection of the available texts in EMMA, resulting in a 17-million-word sample (about 1/5 of EMMA’s full size). Each author’s active writing career was divided into five-year periods (starting from the earliest text) and for each period a sample of ca. 50,000



words was compiled, whenever possible consisting of a couple of texts across those five years rather than one large text.<sup>2</sup> Across periods, I aimed for a relatively constant genre distribution. This sample of EMMA, called EM for *EMMA Medium*, is fully compatible with EMMA (indices of the data points are co-referential) and can be used as a stand-alone corpus. Table 1 provides an overview of EM with the respective word counts and instances of the prepositional passive per author.

**Table 1:** Sample size per author and generation in EM.

<b>Id</b>	<b>Author</b>	<b>Corpus size</b>	<b>Instances</b>
101	Heylyn, Peter (1599–1662)	350,793	135
102	Prynne, William (1600–1669)	470,377	110
103	Davenant, Sir William (1606–1668)	339,677	45
104	Fuller, Thomas (1607–1661)	275,026	66
105	Milton, John (1608–1674)	307,695	54
106	Taylor, Jeremy (1613–1667)	303,512	107
107	More, Henry (1614–1687)	523,626	166
109	Baxter, Richard (1615–1691)	437,055	100
110	Owen, John (1616–1683)	419,860	253
111	L'Estrange, Roger (1616–1704)	388,806	150
	<i>Total generation 1</i>	<i>3,816,427</i>	<i>1,186</i>
201	Boyle, Roger (1621–1679)	207,933	29
202	Pierce, Thomas (1622–1691)	280,524	78
204	Fox, George (1624–1691)	327,434	94
205	Boyle, Robert (1627–1691)	545,636	351
206	Swinnock, George (1627–1673)	302,282	38
207	Bunyan, John (1628–1688)	326,086	108
208	Flavell, John (1630–1691)	283,271	40
209	Tillotson, John (1630–1694)	257,053	71
210	Dryden, John (1631–1700)	387,254	40
211	Cavendish, Margaret (1623–1673)	229,557	27
215	Phillips, John (1631–1706)	339,492	112
	<i>Total generation 2</i>	<i>3,486,522</i>	<i>988</i>
301	Stillingfleet, Edward (1635–1699)	396,347	173
302	Whitehead, George (1637–1724)	462,586	183
303	Whitby, Daniel (1638–1726)	589,336	146
305	Mather, Increase (1639–1723)	583,093	292

(continued)

<sup>2</sup> Deviations were allowed for when the material was not available in those periods or if the author wrote relatively few, but large works. In the latter case, I generally included more words per period by selecting parts of the larger work to make up for distributional gaps.

Table 1: (continued)

<b>Id</b>	<b>Author</b>	<b>Corpus size</b>	<b>Instances</b>
306	Sherlock, William (1641–1701)	305,775	51
307	Keach, Benjamin (1640–1704)	316,099	70
308	Crouch, Nathaniel (1640–1725)	257,346	104
310	Behn, Aphra (1640–1689)	262,050	40
311	Crowne, John (1641–1712)	305,929	29
312	Burnet, Gilbert (1643–1715)	435,477	251
313	Salmon, William (1644–1713)	329,378	57
314	Penn, William (1644–1718)	325,747	84
	<i>Total generation 3</i>	<i>4,569,163</i>	<i>1,480</i>
401	D'Urfey, Thomas (1653–1723)	344,231	30
402	Wake, William (1657–1737)	269,423	118
403	Dennis, John (1657–1734)	373,283	78
404	Dunton, John (1659–1733)	300,466	116
405	Defoe, Daniel (1660–1731)	455,245	249
406	Mather, Cotton (1663–1728)	448,243	271
407	Harris, John (1666–1719)	219,963	63
408	Swift, Jonathan (1667–1745)	290,647	108
409	Whiston, William (1667–1752)	335,742	175
410	Ward, Edward 'Ned' (1667–1731)	316,906	37
	<i>Total generation 4</i>	<i>3,354,149</i>	<i>1,245</i>
501	Cibber, Colley (1671–1757)	423,960	69
502	Steele, Richard (1672–1729)	255,384	90
503	Addison, Joseph (1672–1719)	257,840	107
504	Oldmixon, John (1673–1742)	336,473	157
505	Clarke, Samuel (1675–1729)	229,619	99
506	Hoadly, Benjamin (1676–1761)	328,077	198
508	Jacob, Giles (1686–1744)	250,293	82
	<i>Total generation 5</i>	<i>2,081,646</i>	<i>802</i>
	<b>Total</b>	<b>17,307,907</b>	<b>5,701</b>

The corpus was queried by means of regular expressions. Because the corpus is not parsed (nor POS-tagged) and the prepositional passive might occur with a wide range of verb-preposition combinations, a generic pattern (high recall, low precision) had to be used: a form of the verb *be* followed by a word that ends in *-d*, *-t* or *-n* (i. e., a possible participle) within a three-word-window and a preposition (one of 35 different prepositions)<sup>3</sup> with up to three words in between (in order to also retrieve complex prepositional passives). Separate queries were conducted for irregular

<sup>3</sup> The list of prepositions is based on Couper-Kuhlen's (1979) index of prepositional verbs and Visser's (1973: 2120–2133) list of early prepositional passives.

participles (e. g., *made, done, -ung, -unk*, etc.). After manual inspection for false positives (the bulk of the examined hits) and analyzing the remaining relevant instances, every verb type found in the prepositional passive (542 types) was queried for separately without a form of *be* to also retrieve instances of conjunction, where auxiliary verb and participle might be far apart. As Table 1 shows, the final dataset includes 5,701 instances, which were coded for a number of semantic and formal variables. In this paper, however, I will concentrate primarily on meta-linguistic variables relating to the individuals, the generations and the time of writing.

While the major part of the results section draws on this dataset, a smaller part of the analysis, presented in Section 5.2.2, zooms in on the entrenchment of V-P combinations that occur in the prepositional passive to establish how usage intensity in the active relates to usage intensity in the prepositional passive. For this study, all the active forms of V-P combinations that occur in the prepositional passive were retrieved based on regular expressions that combine individual verb stems with the possible endings followed by the relevant preposition. The hits were then manually inspected so that only relevant instances of the V-P occurrence are retained. Irrelevant examples include, but are not limited to, nominal uses (e. g., *the accounts of that time* for a query with ACCOUNT OF), *to*-infinitival uses (e. g., *I have written to let you know* for a query with WRITE TO) and agent or instrumental *by*-phrases (e. g., *this may most times be done by inspection* for a query with DO BY). For reasons of feasibility, this additional study was restricted to generations 1 and 2 (21 authors, 395 different V-P combinations queried for), yielding a total of 27,732 active instances.

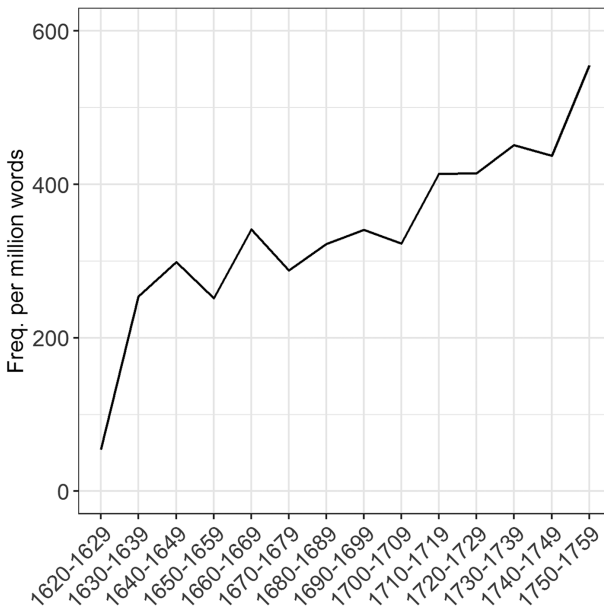
## 5 Results and discussion

### 5.1 Individuals and the emergence of community change

By examining the role of individuals in long-term linguistic change, this section seeks to advance our understanding of how micro- and macro-systems interact. Unlike previous work on the prepositional passive, developments at the aggregate level are enriched by insights from cohort effects (five generations of speakers) and individual agents in the system, whose linguistic trajectories are traced longitudinally over a median career of 40 years.

At the aggregate level of the community, results from the EM corpus corroborate previous claims of the prepositional passive's rapid spread in Early

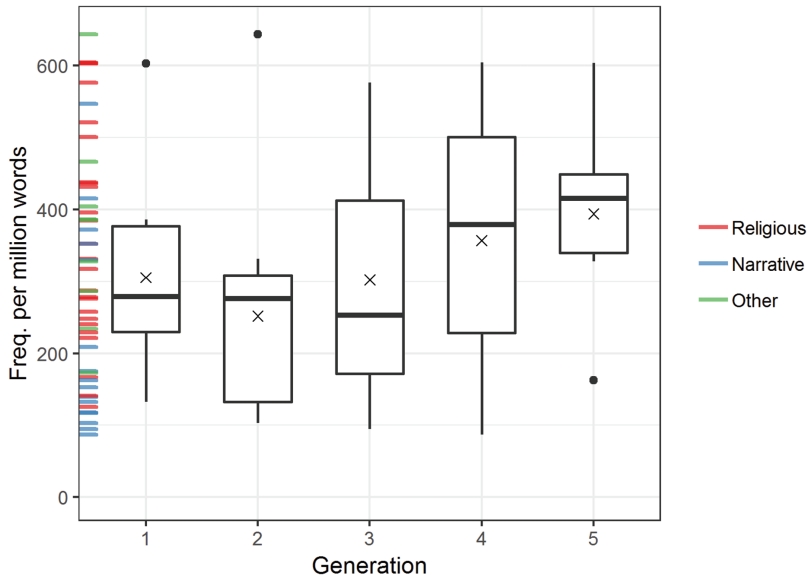
Modern English (Visser 1973; Dreschler 2015). This is illustrated in Figure 2, which traces the normalized frequency of the prepositional passive over a period of roughly 140 years.



**Figure 2:** Normalized frequency at the aggregate community level.

The community trend is straightforward and in line with the results of previous, smaller-scale corpus studies. I can therefore immediately turn to the main interest of this study: how do ongoing community change (as evidenced in Figure 2) and individual behavior intersect? Figure 3 is a boxplot of the distribution of normalized frequencies per generational cohort, where each data point (symbolized by a rug on the y-axis) represents the normalized frequency of one author, color-coded by this author's primary genre. An x-symbol was added to represent the generational average.

Focusing on the individual data points (indicated by the colored rugs), we can observe a large amount of individual variation: authors' normalized frequencies represent a cline spanning a relatively wide range, where the author with the highest normalized frequency uses the construction seven times more often than the author with the lowest normalized frequency. The color of the rugs classifies authors according to their prototypical genre, distinguishing two



**Figure 3:** Distribution of normalized frequencies per generation.

primary groups (narrative and religious authors) and a mixed bag (other) with authors that do not fit these two categories. While the division is a rather crude one, it appears that narrative authors tend to use the prepositional passive less frequently, presumably because the passive construction in general is less prevalent in narrative genres (see Francis and Kučera 1982: 554).

Several insights can be gleaned from the frequency distribution per generation. Although each generation contains authors at the outer and middle ranges of the frequency cline, averaging their frequencies reveals a clear pattern: successive generations of writers advance the frequency of the prepositional passive beyond that of the earlier-born cohort (with the exception of generation 1). This cohort effect is in line with Labov's (2007: 346) incrementation model of change, extending its validity from morphophonological to syntactic change. A more refined picture of this generational change emerges from the distribution of individual values across the five generations. The boxplot shows that the median values are more or less stable between generations 1 and 3. A large leap in frequency occurs between generations 3 and 4, followed by a smaller increase in generation 5. Comparing these results with the range of variability per generation, we may conclude that the strongest growth in the prepositional passive (the leap between generations 3 and 4) occurred when interspeaker variability was at its greatest. This finding may be related to previous work by Nevalainen

et al. (2011) and Fonteyn (2017), whose case studies on linguistic alternations also show a correlation between variability and change, with higher inter-speaker variation during the acceleration (mid-range) of the change.

Having established that generational change is instrumental in the rise of the prepositional passive, we will now seek to determine whether generational change is accompanied by lifespan change. Even though usage-based constructionist theories in principle subscribe to the claim that speakers continue to adapt as their linguistic knowledge is reshaped by experience (Petré and Anthonissen this volume), empirical studies of longitudinal change within individuals are scarce, particularly in the domain of syntax (see Anthonissen and Petré 2019 for an overview). With a per-author corpus size of ca. 350 k words and 114 attestations on average, EM provides us with reasonably robust lifetime data. The authors' lifespan developments of normalized frequency are plotted in Figure 4 (note that the first number of the author ID represents the generation to which the author belongs). Data points that are unconnected are considered to be less robust because the corpus size for these age ranges is below 25,000 words. The color legend indicates the rate of change as computed by taking the first and last robust periodical value. For a small group of authors with widely fluctuating usage across the lifespan (e. g., 101, 308, 402, 508) this approach is not ideal, but for the others it gives us a reliable indication of the general trend.

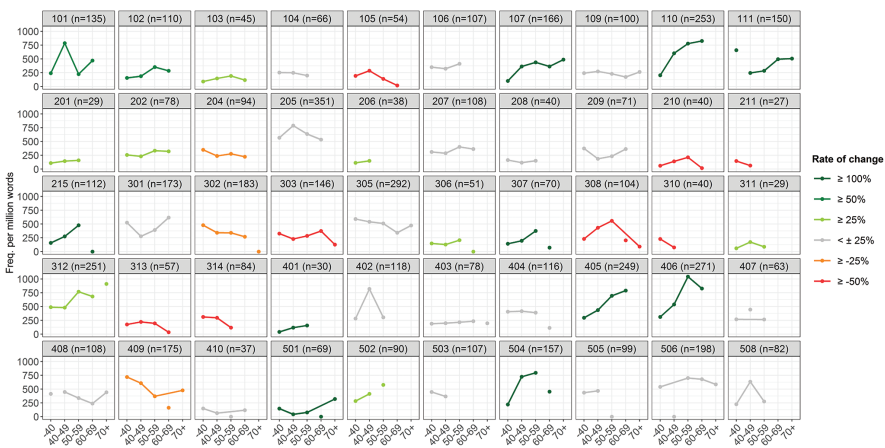


Figure 4: Normalized frequency across the lifespan.

Figure 4 demonstrates that there is quite some inter- and intra-individual variability. 19 authors are more or less stable (i. e., their rate of change is less than  $\pm 25\%$ ), 3 show a moderate downward trend, 8 authors show a strong

decline (more than -50%), 10 a moderately strong increase and another 10 an extreme increase (more than + 100%). The authors in green (40% of all authors) may be presumed to accommodate to the community change going on at the time. For 3 authors with a + 100% increase (307, 401, 501) the trend is based on comparatively few tokens; these authors start out with frequencies that are generally lower than the other authors in their generation and catch up during their lives. The remaining ‘extreme increasers’ (107, 110, 111, 215, 405, 406, 504) reveal a different pattern, combining high frequency (as compared with other authors in their generation) and a very steep increase. In other words, this group of 7 are among the top adopters of the construction within their respective generations. The findings presented here are vaguely reminiscent of Dąbrowska’s experimental work, which shows that only 10 to 20% of speakers need to be sensitive to a particular linguistic rule to sustain statistical regularities at the aggregate level (Dąbrowska this volume). In a similar vein, only a minority of EM authors show an extreme lifespan increase, yet most of them appear to be at the forefront of the larger community change.

Developments that appear to go against the community trend or show large fluctuations are harder to make sense of. Sometimes such developments can be explained by scrutinizing important life events such as periods of social isolation or intensive contact with members of another cohort (see, for instance, the case of Margaret Cavendish discussed in Petré et al. 2019). In the present case, biographical information sheds light on the patterns found for Crouch (308), Dryden (210), Fox (204), Whitehead (302) and Penn (314). The apparent lack of structure in Crouch’s longitudinal data might be related to his reputation as a “hack writer” (Mayer 1994: 395), whose histories have been described as “a necessary corrective or via media between patchwork antiquarianism and largely plagiarized histories” (Vandrei 2018: 67). Crouch’s plagiarism might have skewed the normalized frequencies for some parts of his life, leading to the non-monotonic pattern found in Figure 4. While this in itself does not make a particularly strong case, it is likely meaningful given that Crouch’s deviant behavior is recurrent across case studies examined as part of the *Mind-Bending Grammars* project (Petré 2015–.)

The second example concerns John Dryden (210), who is notoriously known for his aversion to stranded prepositions. Söderlind (1951: 26) quotes a 1672 essay in which Dryden criticizes Ben Johnson for using end-placed prepositions and admits that he himself “ha[d] but lately observed [this fault] in [his] own writings”. Evidence for self-corrections in revised editions can be found as early as 1668 (Yáñez-Bouza 2015: 157–158). This means that by the time Dryden was about 40 years of age, he was well aware of the increased use of preposition stranding. It is quite plausible that Dryden’s aversion to stranded prepositions affected his use of the prepositional passive, which would in part explain his

low overall frequency. At the same time, stranding patterns (including prepositional passives) were already conventionalized (and therefore passively entrenched) to such an extent that Dryden did not fully succeed in erasing them from his own language use.

Finally, Fox (204), Whitehead (302) and Penn (314) do not only exhibit comparable aggregated frequencies, but also a similar decline. Rather than being a side-effect of professional practice (Crouch) or normative language awareness (Dryden), these authors' comparable usage patterns might derive from their social identity and concurrent linguistic practice. Fox, Whitehead and Penn are part of a small, close-knit community of nonconformists, the *Religious Society of Friends* or Quaker movement, which was founded in the mid-seventeenth century by Fox. Their close connections are demonstrated in the EMMA social network plots provided by Petré et al. (2019: 102–103), where these three authors are clustered both in real life (live social network) and in the citation network. The early Quakers are known for their policy of “linguistic divergence”, i. e., their distinctive ways of speaking, which fostered group identity and called into question established norms (Birch 1995: 39). While there is no reason to assume that the Quakers viewed the prepositional passive as socially indexed, their in-sync lifespan development is remarkable all the same. They also show a couple of distinctive lexical preferences in the use of the prepositional passive, most notably *do by* (or *do to/unto*), as in *do as you would be done by*. This collocation features in each Quaker's individual top 10 of frequently used prepositional passives, accounting for 41% of all the instances of the *do by* prepositional passive in EM. Fox and Whitehead are furthermore the only two authors in the corpus who form prepositional passives with the complex phrases *make a prey (up)on* and *turn away from*.

In sum, the findings have shown that both generational and lifespan change are instrumental in the community-wide increase of the prepositional passive. They also illustrate how variation arises from speakers' unique personal histories, and that variation in usage is correlated with change. That is, the strongest growth in frequency occurred in generations with comparatively high interspeaker variability.

## 5.2 Cognitive and linguistic effects of repeated usage

Now that it has been established that the general increase in the use of the prepositional passive emerges not only from change between but also within



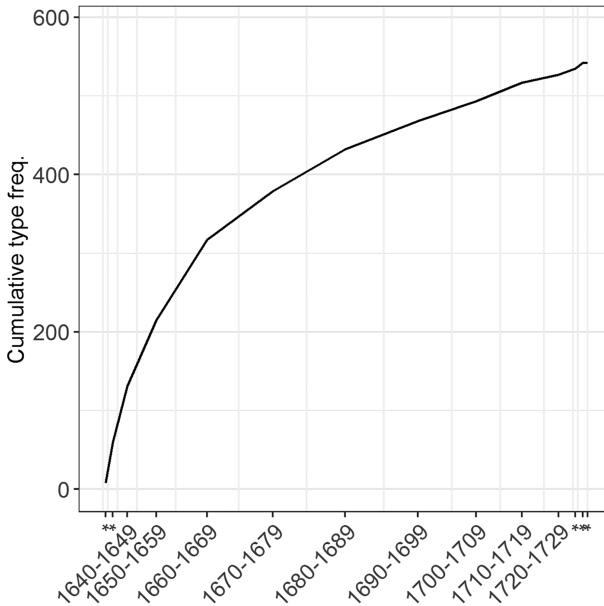
generations (i. e., during the lifetimes of some speakers), this section further examines the role of entrenchment and conventionalization processes in constructional change. More specifically, I will focus on frequency effects relating to the interaction between a construction and the lexical items it collocates with. Drawing on Schmid's (2017: 11–12) survey of entrenchment processes, I will discuss the two major repetition-related determinants involved in the use of the prepositional passive: (a) type repetition (affecting entrenchment and conventionalization of the prepositional passive schema) and (b) token repetition (affecting entrenchment and conventionalization of V-P combinations).

### 5.2.1 Type repetition

By the seventeenth century the prepositional passive was well established and occurred with a wide range of V-P collocations. We may thus assume that EMMA authors acquired a variable prepositional passive schema in childhood, though individual degrees of abstraction and lexical preferences are likely to vary. An important factor, not only for the emergence of this mental schema in language acquisition, but also of its representation and use in adulthood, is type repetition, i. e., repeated use of a variable schema. Type repetition is associated with a number of cognitive and linguistic effects, most notably the (cognitive) strengthening of the variable schema and (linguistic) productivity (see Schmid 2017; for another illustration of individual productivity, see De Smet this volume).

The verbal slot is traditionally regarded as the main determinant of syntactic productivity, which is here understood in terms of a construction's extensibility, i. e., its "ability to attract new or existing lexical items" (Barðdal 2008: 1). At the communal level, the prepositional passive continues to expand to new verb-preposition combinations, as demonstrated by the cumulative type frequency in Figure 5.

Each periodical mark in Figure 5 represents the sum of previously attested types and types first occurring in that period. Because larger corpus parts provide more opportunity for a higher number of types (yet not in a linear way), the width of the individual periods (marked off by light-grey vertical gridlines) is adjusted so as to represent their proportional size. The difference between two intervals marks the number of new types. The resulting curve as well as the wide range of attested types (542) including 197 hapax legomena verify that the early modern prepositional passive was used productively and still had plenty of potential for expansion. It follows that, at least at the collective level, the quantitative frequency change discussed in Section 5.1 is accompanied by a qualitative change (expansion to new types).



**Figure 5:** Cumulative type frequency at the community level.

But does this collective generalization in usage reflect cognitive schematization? A comparison of type-token ratios (TTRs) between individuals and generations is inevitably deceptive because we are dealing with variable corpus sizes and token frequencies which relate to type frequency in a non-linear way. We can, however, determine whether there is a schematicity/productivity increase during the lifetime by comparing a given author's initial and later usage. This was achieved by sorting each EMMA author's instances chronologically and dividing them into two equal groups to keep token frequency constant: the first half of attested instances were assigned to group A, the second half to B. Next, I computed and compared TTRs for each author's A- and B-instances. The results show that there are no meaningful TTR differences in individuals' lifetimes, that is, authors' later usage of the construction (B instances) is not substantially more varied than their usage in the first half of instances (A instances). Only 4 authors show a TTR difference of more than  $\pm 10\%$  (with  $-12.5\%$  as the max. change), but given these authors' low overall frequency of the construction this difference is negligible too. In sum, the lifespan stability of TTRs indicates that there is no major qualitative shift in individual usage. This is not at odds with the emergence of such a change at the community level; in fact, as I will demonstrate

below, collective expansion likely results from variability in individual type repetition (reflecting similar yet slightly different schemas).

Three additional observations about individual-level behavior are relevant to the prepositional passive's increased productivity. First, while TTRs remain fairly stable, the A/B-divide does not always neatly correspond to the authors' career halves. For example, authors with a strong frequency increase across the lifespan produce roughly the same number of different types in A and B, but these types are skewed diachronically in that B represents a much shorter period. Second, speakers do not reach their full range of different V-P combinations in the first half of instances (A); each author's B-part entails types not attested in their A-part. Combined with the communal frequency effect described in Section 5.1, these distributions increase type variability within the speech community across time.

The third and final individual-level observation further strengthens this effect. A closer look at speakers' lexical preferences (their top 10s of most frequently used V-P combinations in the prepositional passive) reveals an interesting pattern. While individuals have common shared types such as *look (up)on*, *speak of*, *agree (up)on* and *make use of*, we can also distil a number of idiosyncratic patterns, i. e., individually entrenched patterns that have not diffused to larger parts of the speech community. Table 2 gives an overview of the most distinctive patterns. These were defined as those V-P combinations that (a) belong to the V-P combinations that are the most entrenched in an individual author's usage (i. e., they are in the author's top 10 of most frequently used collocations in the prepositional passive, occurring at least 4 times in the individual corpus) and (b) account for more than 50% of the attestations of that collocation in the whole data set (% of EM total). For example, Taylor exhibits a preference for prepositional passives with *succeed to*, *succeed in* and *prescribe (un)to* that is unique in the EM corpus.

Small individual biases in the way the prepositional passive schema is represented and used sustain and increase the variability of the construction in the speech community, which facilitates its extension to novel expressions and leads to a diachronic shift in its usage profile.

## 5.2.2 Token repetition

Another factor that is relevant to the prepositional passive is the repetition of specific verb-preposition combinations. At the constructional level, token repetition of prepositional verbs affects the paradigmatic associations of the verbal

**Table 2:** Idiosyncratic lexical preferences in the use of the prepositional passive.

<b>Id</b>	<b>Author</b>	<b>V-P combination</b>	<b>Indiv./Corpus freq.</b>	<b>% of EM total</b>
102	Prynne	<i>bow (un)to</i>	7/10	70%
106	Taylor	<i>succeed (un)to</i>	7/7	100%
		<i>succeed in</i>	5/5	100%
		<i>prescribe (un)to</i>	4/4	100%
107	More	<i>glance at</i>	8/11	73%
109	Baxter	<i>make light of</i>	11/19	58%
110	Owen	<i>believe in</i>	9/14	64%
204	Fox	<i>make a prey (up)on</i>	6/8	75%
		<i>turn away from</i>	7/8	88%
		<i>cry against</i>	6/6	100%
205	Boyle	<i>press (up)on</i>	10/14	71%
302	Whitehead	<i>deal by</i>	4/5	80%
		<i>stand by</i>	4/4	100%
307	Keach	<i>tread (up)on</i>	9/14	64%
403	Dennis	<i>lie with(al)</i>	4/5	80%
406	Mather	<i>tremble at</i>	8/13	62%
409	Whiston	<i>allow for</i>	6/8	75%
		<i>attest (un)to</i>	6/6	100%
505	Clarke	<i>act (up)on</i>	9/13	69%
		<i>argue with(al)</i>	5/7	71%

slot and may lead to preferential selection of specific lexemes by individual authors, a development which was touched upon in the previous section because of its relation to type repetition and variability at the community level. This section homes in on how token repetition impacts on the syntagmatic associations of individual verb-preposition sequences, and how this relates to their occurrence in the prepositional passive.

The main domain-general cognitive abilities involved in the linear association of strings are chunking and automatization; linguistic effects include fusion, the emergence of collocations, loss of compositionality (lexicalization) and tightening of internal syntagmatic bonds (see Schmid 2017). This bears directly on the theoretical discussion in Section 3, where it was argued that two factors predict the occurrence of verb-preposition sequences in the prepositional passive: degree of entrenchment (frequency of V-P co-occurrence) and semantics (compatibility with the passive construction). Recall that entrenchment is non-discrete: while many verb-preposition collocations come to be perceived as units, some degree of compositionality may still be preserved and a single V-P combination may have more or less unit-like uses (e. g., *arrive at a*

*solution* vs. *arrive at the station*). Here I take collocation proper (i. e., frequency of co-occurrence) as the basic requirement for the entrenchment of the V-P string and use this as a gradient measure in a quantitative study on usage intensity of V-P combinations. In particular, this analysis seeks to determine to what extent the frequency with which V and P co-occur in the active (roughly, entrenchment/conventionalization of a V-P combination) affects their frequency in the prepositional passive. Linear regression is used to model this relation. The ensuing discussion will highlight the interaction with verb semantics.

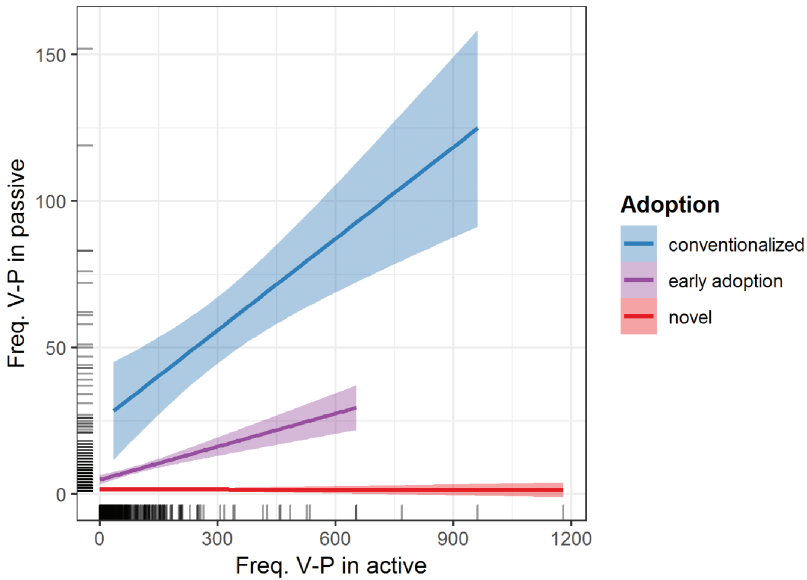
The data set for this supplementary study is limited to the attestations of the prepositional passive in generations 1 and 2, but adds another 27,732 data points representing the active instances of the attested V-P combinations in these two generations (see Section 4).<sup>4</sup> This provides a large enough data set to examine the question at hand. I will focus on the resulting frequency effects in the speech community. Note that aggregated token frequencies are by no means a one-to-one fit with individual entrenchment (strength of cognitive associations), but they do show which V-P combinations are likely to become entrenched in individuals because usage in the speech community increases the likelihood of activation and association in individual minds (see Figure 1).

The following variables describe aspects of the V-P combination in the corpus sample. `TOKENFREQ_PPP` is the dependent variable and represents the token frequency of a particular V-P combination in the prepositional passive (aggregated across authors). The independent variables are `TOKENFREQ_ACTIVE` (for token frequency in the active, aggregated across authors) and `ADOPTION`, which represents the degree of diffusion in the prepositional passive (the number of authors who use a particular V-P combination in the prepositional passive). `ADOPTION` has three levels: `NOVEL` (only 1 author uses this item in the prepositional passive), `EARLY` (fewer than half of the authors in the sample use this item) and `CONVENTIONALIZED` (more than half of the authors in the sample use this item). The linear regression then models the frequency of a given V-P combination in the prepositional passive as predicted by its usage intensity in the active and adoption rate in the prepositional passive. The results are presented in Figure 6 and Table 3.

The results confirm that the frequency of a V-P combination in the prepositional passive (`TOKENFREQ_PPP`) is predicted by the general frequency with which V and P co-occur (`TOKENFREQ_ACTIVE`), provided that its use in the prepositional passive has spread to a critical number of speakers

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<sup>4</sup> The lemma queries used to retrieve all active instances also yield reduced prepositional passives (i. e., prepositional passives without *be*), which have been annotated in the process and are included in this supplementary study.



**Figure 6:** Aggregated data: token frequency of V-P combinations in the prepositional passive predicted by active frequency, grouped by degree of diffusion in the prepositional passive.

**Table 3:** Regression estimates: token frequency of V-P combination in the prepositional passive predicted by its frequency in the active, the degree of diffusion and possible interaction effects.

	Estimate	Std. Error	t-value	p-value
(Intercept)	24.78	2.70	9.19	< 0.001 (***)
TOKENFREQ_ACTIVE	0.10	0.01	14.64	< 0.001 (***)
ADOPTION_EARLY	-19.87	2.80	-7.10	< 0.001 (***)
ADOPTION_NOVEL	-23.28	2.76	-8.45	< 0.001 (***)
TOKENFREQ_ACTIVE:ADOPTION_EARLY	-0.07	0.01	-7.04	< 0.001 (***)
TOKENFREQ_ACTIVE:ADOPTION_NOVEL	-0.10	0.01	-11.88	< 0.001 (***)

$R^2 = 0.75$ , Adj.  $R^2 = 0.75$ ,  $p < 0.001$

(CONVENTIONALIZED). The positive correlation is significantly weakened in the interaction with EARLY ADOPTION and disappears when only one author uses the V-P sequence in the passive (NOVEL). This suggests a gradual effect of TOKENFREQ\_ACTIVE on V-P collocations that are adopted by more than one speaker in the prepositional passive (EARLY ADOPTION and

CONVENTIONALIZED). By contrast, the case of V-P combinations whose occurrence in the passive is restricted to a single author (NOVEL) appears to be qualitatively different, as no effect of `TOKENFREQ_ACTIVE` is found. Overall, the most successfully used lexical sequences in the prepositional passive are those that score high on the two dimensions of conventionalization in the EC-Model: usualization (they are established ways of expressing a particular concept, as evidenced by frequency) and diffusion (many speakers use the collocation in the prepositional passive).

A semantic analysis sheds light on the V-P sequences that most strongly deviate from the general correlation. At one end of the spectrum, we find V-P combinations that are unique or only marginally productive in the prepositional passive (frequency  $\leq 7$ ), yet have a high overall frequency of co-occurrence ( $\geq 250$ ): *come (un)to*, *go (un)to*, *enter into*, *walk in*, *fall (up)on*, *depend (up)on*, *stand (up)on*. These are principally verbs of physical activity where the prepositional phrase invokes the thematic role of goal or location rather than patient (see also Hoffmann 2011). It is therefore improbable that they will come to be used productively in the prepositional passive; only in figurative uses with a lower degree of compositionality and stronger resemblance to simplex transitive verbs (e. g., 5) is their compatibility with the passive construction, and hence their appearance in prepositional passives, more likely.

- (5) *Were such an Association **entred into**, and bravely supported, Jacobitism would quickly learn to Despair* (k050367000, Daniel Defoe, 1717)

But even those expressions that come to be used primarily in a metaphorical sense (such as *depend (up)on*) might resist frequent passivization because they tend to relate something about a topical agent, which is most naturally expressed by means of an active construction. Related to this is the finding that active and passive voice constructions have distinctive semantic preferences; verbs distinctive for the active voice tend to encode stative relations, while those in the passive tend to express “actions with a salient and relatively permanent end-state” (Gries and Stefanowitsch 2004: 109).

Conversely, there are a number of V-P sequences which are more frequent in the passive ( $\geq 7$ ) than would be expected based on their low frequency in the active ( $\leq 25$ ): *evil-speak of*, *do by*, *connive at*, *conclude (up)on*, *contend about*, *spit (up)on*, *glance at*, *succeed (un)to*, *turn away from*. This group is more mixed. One set of expressions (*do by*, *glance at*, *succeed (un)to*, *turn away from*) was previously singled out as being idiosyncratic (see Table 2) or distinctive of a particular group of speakers (i. e., the Quakers, see Section 5.1). These speakers are likely to have routinized lower-level constructions of the passivized V-P

sequence, as evidenced by, for instance, the frequent use of longer strings such as *do as you would be done by* and *is/are to be turned away from*. The other group of verbs seem to be particularly compatible with the functional traits of the passive construction. In expressions conveying a negative evaluation (*evil-speak of*, *spit (up)on*, *turn away from*), the passive subject is emotionally affected and therefore expresses a relation that is prototypically associated with the passive construction (see Quirk et al. [1985: 1164–1165] on affectedness and Gries and Stefanowitsch [2004] on the different collostructional profiles of actives and passives). Other V-P sequences are less clearly associated with affectedness (*connive at*, *contend about*, *conclude (up)on*), but also characterize a state of affairs in which the patient might be more salient than the agent and hence competes for topicality.

Overall, the results in this section demonstrate the complex interaction between entrenchment, conventionalization and semantics. Token repetition drives both the entrenchment and conventionalization cycle, but whether a specific V-P sequence will come to be used productively in the passive is ultimately determined by its match with the construction's semantics.

## 6 Conclusion

In a 2003 paper on language change, Denison (2003: 61) wondered: “does an individual’s usage change as he or she gets older, or is overall change through time in a language merely a function of changes in the population, with older speakers becoming inactive and dying, and younger speakers continually entering the community?” Until recently, the answers to these questions were out of reach to researchers in linguistics (especially for low-frequency phenomena), as longitudinal data of individual speakers and their respective communities are hard to come by. The newly-established EMMA corpus and its medium-sized companion EM (Petré et al. 2019) provide one of the first large-scale resources to help tackle these questions. The present study has focused on the connection between individual and community change. These dynamics were investigated by means of a diachronic study of a change in progress: the expansion of the prepositional passive in Early Modern English. Individual- and community-level aspects of this change were studied for a community of fifty authors across five generations belonging to the seventeenth-century London elite. In particular, the study set out to probe the locus of change (RQ1) and the role of entrenchment, i. e., cognitive processes, in long-term community change (RQ2).



The first part of the analysis (RQ1, Section 5.1) documents the community-wide increase in the use of the prepositional passive and shows that both generational and lifespan change contribute to this macro-level change. By scrutinizing individual behavior in real time, this study aimed to advance our understanding of the extent and nature of individual variation, and the possibility of lifespan change. The findings, which report substantial heterogeneity in a speaker-based comparison, make it abundantly clear that collective trends say little about individual cognition. Some aspects of individuals' behavior can be explained by means of biographical insights, other aspects by studying group dynamics (e. g., age cohort, community of practice). As such, the results illustrate how variation and systematicity arise from speakers' unique and shared experiences. Variation and change were shown to be correlated: the strongest growth in frequency occurred in generations with comparatively high interspeaker variability. The longitudinal data add to a growing body of research which indicates that constructional change is not strictly limited to first language acquisition (Petré and Van de Velde 2018; Anthonissen and Petré 2019; Anthonissen 2020): twenty out of fifty authors showed a considerable lifespan increase in line with the communal trend. Ten of those (i. e., 20% of the community) exhibited an extreme increase of more than + 100%. Interestingly, most of these authors were among the top adopters of the construction within their respective generations and were considered the leaders of the larger community change. Whether this particular correlation constitutes more than a coincidence would be an interesting topic for further research.

The second part of the analysis (RQ2, Section 5.2) investigates in more detail the cognitive and linguistic effects of repeated usage, in particular type and token repetition. Type repetition relates to linguistic productivity and the cognitive process of schematization. At the collective level, the prepositional passive was shown to be highly productive. An examination of speakers' type distributions did not yield clear indications of a qualitative lifespan change, yet did suggest that speakers may have different representations of the prepositional passive schema. These individual differences promote variability, and hence productivity, of the construction at the aggregate level of language. The final section studied the effect of token repetition of verb-preposition strings on their usage frequency in the prepositional passive. The positive effect of frequency of co-occurrence is confirmed, though the relation is shown to be somewhat more complex. Community-related aspects (degree of diffusion in the speech community) and construction-specific aspects (compatibility with the passive's semantics) co-determine whether a specific verb-preposition sequence is used productively in the prepositional passive.

To return to Denison's questions raised at the beginning of this section, we may conclude that language change originates in the complex interaction of individual and social processes. Most of the time, these components are studied separately and the answers we find will be determined by the perspective we take. Exploring the language of individuals offers rich context, but leads to increasing complexity. When language is viewed as a social phenomenon, regularities emerge, on the basis of which we can make predictions. However, such macro-level descriptions are a simplified version of reality. By studying individuals in their larger contexts, at various levels of abstraction, the present study has taken initial steps to explore the interaction between the various components of a complex adaptive system. Needless to say, much more work needs to be done. With the many-to-many relationships that exist in a system as complex as language, we inevitably find ourselves like the blind men describing an elephant. However, by combining different aspects and methodologies, we are starting to connect the pieces.

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