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A case for phonology in Cognitive Grammar: vowel reduction in Standard Southern British

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The present paper outlines how phonology can be dealt with from a usage-based Cognitive Grammar perspective by focusing on short vowel reduction in Standard Southern British (SSB). In particular, the paper proposes a way of accounting for this phenomenon by using concepts such as *cognitive schemas*, *schema interaction* and *categorising relationships*. The data considered in the study are word pairs extracted from *CUBE* dictionary. They were chosen based on three criteria, viz. word length (i.e. at least two syllables), derivational morphology and change in stress. This yielded pairs such as *posit – position* and *edit – edition*. The present contribution argues that (1) there is a place for phonology within Cognitive Grammar and (2) cognitive processes (e.g. schema formation, categorisation) can be used to account for phonological phenomena. Once these cognitive mechanisms are considered, phonological phenomena such as vowel reduction can be explained without recourse to rules or underlying representations, both concepts which are hard to motivate from a cognitive perspective.

Keywords: Cognitive Grammar, phonology, phonological theory, vowel reduction, Standard Southern British

1. Introduction

Phonology has long held a peripheral position in cognitive linguistics. This becomes evident if one considers the low number of articles per year that are published in one of the field's major journals, viz. *Cognitive Linguistics* (less than one; Nathan 2015: 252). A possible reason for this hesitancy to include phonology in the framework may be rooted in "a widespread misconception about the scope of Cognitive Linguistics in general" (Taylor 2002: 79), which, by interpreting the term 'cognitive' as 'semantic', puts semantics at its centre. This focus on meaning appears to be supported by Langacker himself (Langacker

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1987:12), who claims that "the symbolic nature of language follows [from] the centrality of meaning to virtually all linguistic concerns. Meaning is what language is all about". In this context, the marginal place of phonology within Cognitive Grammar (CG) is hardly surprising. Nevertheless, CG claims to be a comprehensive theory of language and as such, turning a blind eye to it constitutes a serious problem (Taylor 2002: 79).

Couched in the framework of CG, the present contribution proposes an analysis of the reduction of short vowels in British English (see Mittendorfer 2020 for a complete analysis). In particular, ways in which CG and its theoretical assumptions can be applied to the study of phonological phenomena will be explored. Based on proposals by Nesset (2006; 2008) and Kumashiro (2000), this contribution introduces a formalisation of cognitive mechanisms such as schema formation and categorising relationships and integrates them into a broader phonological framework. These concepts have been widely accepted as parts of general cognition (see Janda 2015). Consequently, by modelling these mechanisms, the present contribution hopes to offer an approach that is cognitively more plausible than competing accounts of vowel reduction. The variety of British English on which the data are based is called Standard Southern British (SSB), spoken by "university-educated young adults from the south of England" (Lindsey & Szigetvári 2013; see also Lindsey 2019).

The phonology of Standard Southern British is, as any other variety of English, characterised by vowel reduction. This means that in unstressed positions, the number of vowel contrasts is systematically reduced, i.e. SSB does not allow all possible vowels to emerge in stressless syllables. Since this phenomenon is rather pervasive in the languages of the world, it has been investigated from the perspectives of various theoretical frameworks, such as, for example, Generative Phonology (Chomsky & Halle 1991 [1968]), Optimality Theory (Crosswhite 2001) or Government Phonology (Pöchtrager 2018). However, despite the fact that vowel reduction has been studied extensively in various languages (especially in Romance and Slavic; see Barnes 2006), the term itself is defined only vaguely (Crosswhite 2001: 3). Definitions vary and range from "the wholesale deletion of unstressed vowels" (Crosswhite 2001: 3) to "non-neutralizing changes in the pronunciation of both stressed *and* unstressed vowels" [original emphasis] (Crosswhite 2001: 3). In the following, vowel reduction is defined as the neutralisation of "two or more [...] vowel qualities [...] in a stress-dependent fashion" (2001: 3).[1]

The present contribution is structured as follows. First, a brief overview of some of the most important concepts and theoretical foundations of CG is presented (section 2). This is followed by a discussion of how these concepts can be used to tackle phonological phenomena in section 3. The paper then moves to a quick review of some methodological aspects (section 4), before turning to the issue of vowel reduction in Standard Southern

1 An anonymous reviewer pointed out to me that the ambiguous use of the terminology might be due to the difference in syllable-timing (e.g. French) and stress-timing (e.g. English). They suggested that in French, a language in which word stress is non-existent, vowel reduction may be realised as vowel deletion. This seems indeed plausible and may be one of the reasons of the somewhat confusing use of the term *vowel reduction* in the literature.

British in section 5. That section also presents the data and outlines important generalisations that can be made on basis of the data set. Finally, section 6 offers an analysis of the reduction of short vowels in open syllables. Section 7 concludes.

2. Grammar as a network of categories

Cognitive Grammar is a usage-based model. As such, it puts central emphasis on language use. The content requirement posited by Langacker (1987: 53) makes this particularly evident:

(1) **CONTENT REQUIREMENT (CR)**
The only structures permitted in the grammar of a language [...] are (1) phonological, semantic or symbolic structures that actually occur in linguistic expressions; (2) schemas for such structures; and (3) categorizing relationships involving the elements in (1) and (2).

From the content requirement it follows that CG does not allow any underlying representations or empty elements lacking both phonological and semantic content. Nor does it allow any theoretical tools that only apply within one domain of linguistic structure, e.g. phonology, syntax (see Kumashiro 2000: 11). Consequently, the analysis proposed in this contribution requires a new way of thinking about phonology, since only (general) cognitive mechanisms that are not at odds with the CR can be employed by the analysis. The CR also underlies CG's maximalist and non-reductive approach to phonology. It is maximalist in the sense that every conventional linguistic unit (e.g. a word) is assumed to be contained in the mental grammar of speakers. Its non-reductive nature can be seen in the fact that CG does not reduce surface variety to a set of underlying representations but rather assumes all occurring expressions to play a role in the grammar (Kumashiro 2000: 13). It is from these expressions that constraints and generalisations are drawn in a bottom-up fashion.

The content requirement has fundamental effects on the way grammar is conceptualised. According to Langacker (1991: 263–264), grammar is defined as "a structured inventory of conventional linguistic units", which contains all concrete expression, i.e. *instantiations*, and every generalisation, i.e. *schemas*, abstracted from these concrete expressions (Kumashiro & Kumashiro 2006: 80). The mentioning of the adjective *structured* in the above quote implies another important notion of CG: the assumption that language is organised in complex, overlapping networks of different elements (Langacker 2010: 108). A simple example of such a network-like structure is outlined in Figure 1 below:

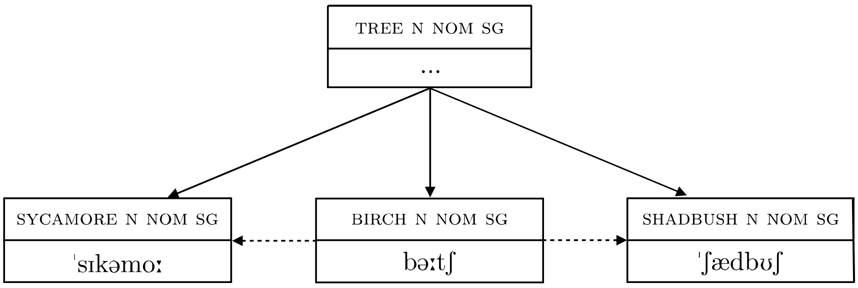

Figure 1 Grammar as a network of categories (based on Nesset 2008: 12)[2]

The boxes in Figure 1 represent so-called cognitive schemas, which are defined as "the commonalities that [emerge] from distinct structures when one abstracts away from their points of difference [...]" (Langacker 2000: 4). In other words, schemas are what different structures have in common. The upper portion of a schema always contains the semantic component of each unit, while the lower portion states the phonological form (Nesset 2008: 11–12).[3] If both a semantic and phonological component are specified, a schema corresponds to what is generally known as a Saussurean sign. Consider Figure 1 again: speakers, for instance, experience many different utterances, including different expressions for trees (see Nesset 2008). On the basis of their experience with instances, they may abstract a schema that summarises what all of those utterances have in common, i.e. that all instances refer to a particular kind of tree. This information is captured in the general top schema TREE in Figure 1.[4] Since the mental grammar includes every concrete expression (see CR in section 2), Figure 1 also gives low level schemas for each type of tree (SYCAMORE, BIRCH and SHADBUSH respectively). As a result, a network-like structure showing how the different schemas are related to each other emerges. It is worth emphasising that, because all schemas are generalisations over actual occurrences, they cannot be independent from the units they are abstracted from (see Bybee 2001).

The discussion so far has emphasised the fact that schemas enter into network-like structures in the mental grammar of language users. Instead of existing in an empty space, the schemas in Figure 1 are connected to each other by categorising relationships, which are conventionally symbolised by means of arrows. Two different types of such relationships need to be distinguished (Langacker 1987: 371; see also Langacker 2000: 4). First, there are so-called *instantiations*. These are represented by solid arrows and characterise a relation

[2] The feature NOM is included in the semantic poles of Figure 1. Full noun phrases are not marked for either nominative or accusative, but the distinction emerges with respect to pronouns (e.g. He hit the man vs. The man hit him) (Keizer 2015: 195).

[3] The phonological form does not represent sound in the real world. Rather, it should be understood as an "auditory image" (Langacker 1987: 79), or, in other words, a mental concept that summarises all the different (phonetic) realisations of a particular word (see Nesset 2008: 12 for a discussion).

[4] Since "no salient phonological properties [...] recur in all the names of" trees (Nesset 2008: 13), the phonological pole of the top schema is not specified any further.

between a general and a more specific schema. The formula A → B captures relations of this type. The more specific schema B instantiates (or elaborates) a general schema A (Langacker 2000: 4). Figure 1, for instance, shows three relatively specific schemas for three different kinds of tree, each of which instantiates the more general TREE schema. While every birch is categorised as a tree, the reverse is not true. Hence, the top schema is connected to each of the bottom schemas by means of a solid arrow. Second, there are also categorising relationships termed *extension*. Extensions describe a relation between two similar schemas that are nevertheless conflicting to some degree and therefore not entirely compatible (Langacker,1987: 371; see also Langacker 2000: 4). This is captured by the formula [A] → (B). In this formula, (B) does not elaborate [A]. However, (B) is sufficiently similar to [A] to be categorised by it despite the fact they are conflicting. This type of relation is exemplified in Figure 1 as well. Dashed arrows range from the BIRCH schema to the SYCAMORE and SHADBUSH schemas respectively. While birches are rather prototypical trees, shadbushes or sycamores are less so. The notion of prototype is crucial in extension relations. Extensions typically involve a prototypical member of a category against which less prototypical members of the same category are compared (see Nesset 2008; see also Rosch 1978 for a summary of experiments on prototype theory). Both instantiations and extension will prove critical in the analysis of vowel reduction in SSB in later sections of this contribution. However, before an analysis can be presented, the foundations of the phonological framework, in which the subsequent analysis is couched, need to be outlined.

3. Key concepts in CG phonology

3.1 First- and second-order schemas

The phonological framework employed in the present contribution heavily relies on the concept of first- and second-order schemas, which help to capture generalisations over (morpho)phonological alternations (see Nesset 2008: 20). Figure 2 below illustrates these notions with the example of a hypothetical language in which the reduced vowel [ɪ] occurs in unstressed position after palatalised consonants. It furthermore demonstrates how two first-order schemas (left) combine into a single second-order schema (right):

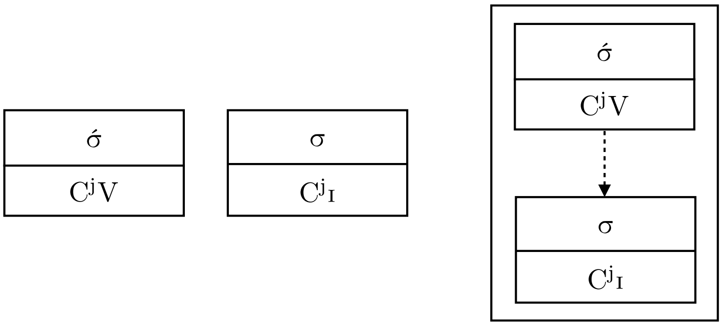

Figure 2 First- and second-order schemas exemplified

First-order schemas capture generalisations over actually occurring utterances. Figure 2 shows that speakers of the above-mentioned hypothetical language have formed two first-order schemas for vowel quality in stressed and unstressed syllables. In stressed syllables, no restrictions as to the quality of vowels in palatalised contexts applies (symbolised by schematic V). In unstressed syllables, however, the vowel inventory is restricted to [ɪ] only. Language users are exposed to large amounts of linguistic data, which they need to organise and categorise in their mental grammar (see Pierrehumbert 2001), and first-order schemas do exactly that. They categorise various realisations of the same unit into one category (or schema). Nesset (2006: 56) further suggests that speakers compare stressed and unstressed syllables and relate them by forming categorising relationships between them (Nesset 2006: 56). This is illustrated by the second-order schema in Figure 2 (right). If alternations in vowel quality between stressed and unstressed syllables occur systematically, larger schemas capturing these relationships may be formed (Nesset 2006: 56). Thus, second-order schemas should be understood as "schemas over schemas that are connected via categorizing relationships" (Nesset 2008: 19). Put differently, two first-order schemas that are partly compatible are related to each other by an extension relationship. At this point, it should be emphasised that it is highly plausible that schemas figure prominently in language processing (see Rosch 1978; Goudbeek et al. 2017). They have been accepted as part of general cognition (see Janda 2015) and thus constitute an important aspect of how humans make sense of the world around them. In contrast, rules and underlying representations, while clearly useful analytical tools, lack this independent cognitive motivation.

First- and second-order schemas are equivalent to what has been termed *product-oriented* and *source-oriented generalisations* in earlier work on usage-based phonology. Product-oriented generalisations, i.e. first-order schemas, "[generalize] over forms of a specific category, but [do] not specify how to derive that category from some other" (Bybee 2001: 126). In other words, they do not relate the structures to any underlying source. In Figure 2 above, the first-order schemas are only generalisations over vowel quality in stressed and unstressed syllables. They do not state that the source of a reduced vowel is a full vowel. This stands in contrast to source-oriented generalisations, which, in Generative Phonology, apply a particular rule to some source to create well-formed surface structures (Nesset 2008: 20). In CG, second-order schemas allow for source-oriented generalisations to be captured without having to rely on underlying representations or rule formalisms. In Figure 2, a schematic full vowel in stressed syllables is taken as the source and connected to its reduced counterpart in unstressed syllables by means of categorising relationships.[5] Moreover, the formation of first- and second-order schemas is strictly directional (Bybee & Slobin 1982: 288). Before establishing source-oriented generalisations (i.e. second-order schemas), speakers must have formed product-oriented generalisations (i.e. first-order schemas). In other words, first-order schemas always precede second-order schemas.

3.2 Schema interaction and well-formedness principles

A crucial aspect of CG is the interaction of schemas in the mental grammar of speakers. Its basic idea runs as follows: Based on the schema inventory speakers abstract from language use, they may actualise an array of different candidate expressions. These candidates compete against each other for well-formedness with the most well-formed candidate being chosen as the winner. The framework outlined here models how the candidate set is constructed and how CG may solve the resulting competition. For expositional purposes, the theoretical aspects of schema interaction will be discussed by means of a simple hypothetical example. In the previous section, a hypothetical language was introduced to illustrate the concept of first- and second-order schemas. Remember that in that language, a full vowel in stressed syllables alternates with [ɪ] in unstressed syllables when directly preceded by a palatalised consonant. Now imagine that in the same language, stressed full vowels alternate with unstressed [ə] in all other contexts, i.e. it is the elsewhere case.[6] This relatively simple reduction pattern can be captured by two second-order schemas. These are given in Figure 3 below:

5 While the directional arrows in second-order schemas may be misleading, they do not imply any change in structure. Instead, they express regular alternations between two actually occurring units (e.g. the vowel quality in stressed and unstressed positions in morphologically related words) and are therefore ‘static’ and ‘non-directional, rather than ‘processual’ and ‘directional’. Thus, they radically differ from traditional SPE rules of the format A → B\ X_Y.

6 This reduction pattern is not entirely hypothetical. It is a simplified version of the reduction phenomena that can be observed in Russian. For a CG account of Russian vowel reduction, see Mittendorfer (2020).

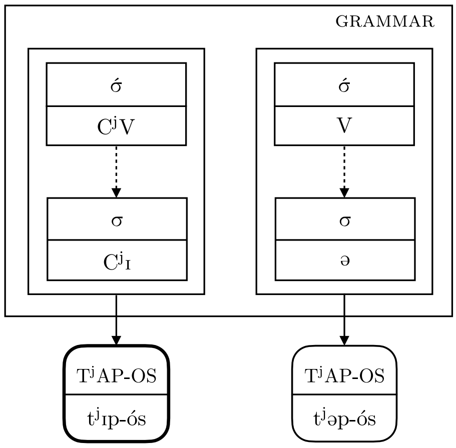

Figure 3 Schema interaction exemplified

The mental grammar in Figure 3 contains two different second-order schemas, which capture the patterns found in this language. The schema on the left expresses the V – [ɪ] alternation, while the right schema generalises over the elsewhere case (V – [ə]). Assume that the lexicon of this language contains the word t^j*ap* and a stressed suffix *-ós*. In principle, speakers have several different options of how to pronounce t^j*após*. In this example, I will focus on two of these options, i.e. the choice of reduced vowel ([ə] or [ɪ]). Assuming speakers hold the two relevant schemas in their mental grammar, two candidate expressions can reasonably be given (round boxes). Candidates should be considered possible alternative realisations of a linguistic unit (Nesset 2008: 14). The theory does not limit the candidate set in any way. It is potentially infinite and may also contain structures in conflict with the grammatical rules of a particular language.[7] This, however, is not at odds with the CR. Notice that the candidates in Figure 3 are given outside the mental grammar. Since the CR only applies to structures within the grammar, it does not prohibit the actualisation of ungrammatical candidate expressions (Nesset 2008: 14).

The competition between candidates raises the question as to how the most well-formed, i.e. attested, candidate is chosen. In the process of candidate evaluation, language users compare each expression to the schemas in their mental grammar (Nesset 2008: 15). In Figure 3, each of the candidates elaborates one schema. The left-hand expression shows the reduced vowel [ɪ] and is consequently categorised by the schema capturing this alternation. The right-hand expression, on the other hand, exhibits a different reduction strategy, showing [ə] in unstressed position. Thus, the schema capturing the elsewhere case categorises this candidate. However, there is a crucial difference in terms of the status of each of the two schemas. While the V – [ɪ] schema in Figure 3 specifies the context in which this alternation takes place, i.e. C^j_, the V – [ə] schema does not do so. The latter schema captures the elsewhere case and is, therefore, necessarily less specific. In cases like this, the notion of

[7] This is reminiscent of Optimality Theory. For a brief discussion of the similarities and differences between OT and the framework proposed in this contribution, see Mittendorfer (2020).

conceptual overlap (Langacker 1999: 106) decides on the winner of the competition. Langacker (1999: 106) explains the concept as follows:

> *[One] factor [in how such competitions can be resolved] is the amount of overlap between the target and a potential categorizing structure. We can reasonably assume that the sharing of features is what enables the target to stimulate members of the activation set in the first place, and that the degree of stimulation is roughly proportional to the number of features shared. [L]ower-level Schemas, i.e. structures with greater specificity, have a built-in advantage in the competition with respect to higher-level Schemas. Other things being equal, the finer-grained detail of a low-level schema affords it a larger number of features potentially shared by the target.*

Both candidates agree with their respective schemas in terms of vowel quality. However, the candidate [tʲɪpós] additionally fits the contextual requirements that the more specific V – [ɪ] schema imposes on it. Therefore, it conceptually overlaps with its schema to a higher degree and is chosen as the winner.[8]

Conceptual overlap will prove crucial in the analysis to follow. Nevertheless, on its own the notion is not sufficient. What is needed is a more rigorous mechanism by which competitions are resolved. Such a proposal is given by Kumashiro (2000: 25), who, based on Langacker (1991), provides four principles, which determine the well-formedness of candidates. These are given in (2) below:

(2) **WELL-FORMEDNESS PRINCIPLES (WFP)** (Kumashiro 2000: 25)

a. ACCESS

When a given candidate expression is assessed relative to a certain subpart of the grammar, i.e. a function, categorizing units (from the network representing the subpart) that are schematic to, or are elaborated by, the expression are activated and sanction the expression.

b. ACTIVATION

The total 'activation', i.e. conventional motivation/sanction, of a candidate expression is the sum of the activation values obtained from all of the categorizing units. Each such value correlates positively with the expression's 'distance' from the unit, i.e. how far it diverges from its categorizing unit by elaboration.

c. UNIQUENESS

When there are multiple candidate expressions, all but the one with the highest activation value are deactivated.

d. WELL-FORMEDNESS

The degree of well-formedness of a candidate expression correlates with its final activation value.

[8] Within generative frameworks, such situations have typically been dealt with by the *Elsewhere Condition* (see Kiparsky 1982), which guarantees that more specific rules prevail over general rules.

The first principle in (2a) formalises the construction of the candidate set. Each categorising unit in the mental grammar sanctions a candidate expression outside the mental grammar. Thus, the candidate expressions in Figure 3 are not arbitrarily chosen, since in the hypothetical example two schemas in the grammar were postulated. The second principle in (2b) is responsible for the selection of the winner. Each candidate expression receives an activation value from the schemas, or categorising units, by which it is categorised. The higher this activation value is, the more likely a particular expression is activated, i.e. realised. The activation value increases with an increase in the number of schemas a candidate instantiates. Conceptual overlap further adds to the total activation value of an expression. It should be stressed that phrases such as *high* or *low activation value* are always relative and depend on the activation values of other expressions in the competition. The principle in (2c) assures that only the candidate exhibiting the highest activation value, i.e. the most well-formed expression, is realised. All other expressions are consequently deactivated.[9] The final principle in (2d) emphasises the notion of gradience in linguistic well-formedness, which positively correlates with the activation value of an expression (strictly speaking, principle (2d) is not relevant for vowel reduction as described here, but see Section 6.2.1 for some comments on its usefulness).

4. Methodological aspects

4.1 Choice of dictionary and transcription symbols

The data was collected from *CUBE: Current British English searchable transcriptions* (Lindsey & Szigetvári 2013).[10] This dictionary uses a transcription system that deviates from classical RP in several aspects. Since the data will be presented in its original form, Table 1 below lists the new (vowel) symbols alongside their RP equivalents (in grey) for comparison. The symbols for consonants remain the same:

[9] It is worth pointing out that UNIQUENESS should not be regarded an absolute principle (Kumashiro 2000: 25). Cases can be found where two alternative pronunciations exist (e.g. garage /ˈɡarɪdʒ/ vs. /ˈɡarɑː(d)ʒ/).

[10] See http://cube.elte.hu/index.pl (last accessed 10. Jan. 2021)

Table 1 Transcription system for vowels in SSB (based on Lindsey 2019: 146)

short vowels			long vowels								
			long monophthongs			diphthongs					
KIT	ɪ		NEAR	ɪː	ɪə	FLEECE	ɪj	ɪː			
DRESS	ɛ	e	SQUARE	ɛː	eə	FACE	ɛj	eɪ			
LOT	ɔ	ɒ	THOUGHT	oː	ɔː	CHOICE	oj	ɔɪ			
TRAP	a	æ	PALM	ɑː		PRICE	ɑj	aɪ	MOUTH	aw	aʊ
FOOT	ɵ	ʊ	(CURE	ɵː	ʊə)				GOOSE	ʉw	uː
STRUT	ʌ		NURSE	əː	ɜː				GOAT	əw	əʊ
comm*a* ə											

It becomes clear in Figure 1 that all vowels except for /ɪ ʌ ɑː/ differ in SSB. These changes were made to reflect contemporary shifts in the pronunciation. Note that CURE is given in brackets, as SSB exhibits a tendency to merge this vowel with the vowel in THOUGHT (e.g. pour /póː/; see Lindsey 2019 for a discussion of the transcription system).

4.2 Type of data collected

Three factors, viz. word length, derivational morphology and change in the stress pattern, guided the data collection process. Thus, word pairs were chosen in which at least one member fit the length criteria: it had to have at least two syllables. A crucial factor governing the choice of derivative was that it had to follow a different stress pattern than the base. Thus, the choice of affixes was based on the distinction between stress-neutral and stress-shifting affixes (Giegerich 1999). Moreover, truncated forms such as *edit* (from *edition*) were taken into the data set as well if they fulfilled the necessary criteria (word length, derivational morphology and change in stress pattern). This approach yielded word pairs such as, for instance, *posit – position* and *edit – edition*. Using pairs of morphologically related words allowed for observing alternations in vowel quality without having to resort to concepts such as underlying representations.[11] It is important to understand that the direction of derivation does not matter in this approach. Rather, it is the relationship between stressed and unstressed syllables in morphologically related words that is at stake here.

[11] A reviewer suggested that this approach might be considered a caveat, i.e. it forces one to stick to opportune data. However, vowel reduction in the present paper is not understood as a processual phenomenon, but as a systematic (and static) relation between stressed and unstressed syllables in morphologically related words. In generative work, vowel reduction is typically understood as a process that maps underlying (full) vowels to reduced vowels on the surface. Since CG only accepts 'surface' structures, i.e. actually-occurring expressions, an approach like this is not viable. This should not be considered a caveat, but a strength of the approach, as it does not assume an underlying, cognitively hard to motivate level of linguistic structure.

5. Reduction of short vowels in SSB: the data

As a stress-timed language, English systematically neutralises vowel qualities in unstressed positions (see Crosswhite 2001). Cross-linguistically, positional neutralisation comes in two manners: *prominence-reducing* and *contrast-enhancing vowel reduction* (Crosswhite 2001: 21). The former, also known as *centripetal reduction*, refers to a type of reduction that reduces the prominence of vowels in unstressed positions, i.e. reduced vowels are in a more central position in the vowel space (e.g. in Romance languages; Harris & Lindsey 2000: 190). In contrast, the latter enhances vowel contrasts in unstressed syllables by moving reduced vowels to the corners of the vowel space (e.g. in Russian). This pattern is also termed *centrifugal reduction* (Harris & Lindsey 2000: 190). However, it is important to understand that these two patterns should be seen as extremes on a scale. It has been noted that particularly languages which exhibit prominence-reducing reduction are also frequently characterised by contrast-enhancing reduction (see Harris and Lindsey 2000: 190; see also Harris 2005).

Table 2 below shows the reduction patterns for short vowels that were identified in SSB. For each full vowel – reduced vowel pair, two examples are given. Additionally, the last two word pairs for each short vowel show no alternation in vowel quality:

Table 2 Reduction patterns in SSB

	ɔ – ə			**a – ə**	
pɔ́zɪt	–	pəzíʃən	rápɪd	–	rəpídətɪj
əbɔ́lɪʃ	–	ábəlíʃən	ád	–	ədíʃən
tɔ́ksɪk	–	tɔksísətɪj	káptɪv	–	kaptívətɪj
hɔ́stɑjl	–	hɔstílətɪj	áktɪv	–	aktívətɪj
	ɛ – ə/ɪ			**ʌ – ə**	
əpɛ́lət	–	ápəlɛ́jʃən	kʌ́rɪʤ	–	kərɛ́jʤəs
sɛgmɛ́nt	–	sɛ́gməntɛ́jʃən[12]	kənsʌ́lt	–	kɔ́nsəltɛ́jʃən
ɛ́dɪt	–	ɪdíʃən	abdʌ́kt	–	ábdʌktíj
trɛ́pɪd	–	trɪpídɪtɪj	pʌ́blɪk	–	pʌblísətɪj
fɛ́stɪv	–	fɛstívətɪj			
ɪkspɛ́kt	–	ɛ́kspɛktɛ́jʃən			
	ɪ			**ɵ**	
áktɪv	–	aktívətɪj	fɵl	–	fɵlfíl

Two important observations can be made regarding from the data in Table 2. First, full vowels are by no means restricted to stressed syllables in SSB. For all six short vowels, word pairs were found that do not show any alternations in vowel quality despite a change in the stress pattern. Second, those pairs in which vowel quality does alternate between stressed and unstressed syllables indicate that SSB predominantly conforms to a centripetal pattern, i.e. reduced vowels are more central. There is one systematic exception to this tendency, however, viz. the pattern shown by /ɛ/. The vowel /ɛ/ in stressed syllables seems to alternate with both [ə] and [ɪ] in unstressed syllables. This is consistent with Harris & Lindsey (2000) and Harris (2005), who suggest that languages with a predominantly prominence-reducing reduction pattern also exhibit contrast-enhancing reduction. One general aspect of the data in Table 2 remains to be discussed: not enough data was found for the vowels /ɪ/ and /ɵ/ to make any substantial claims. However, I assume that neither of these vowels shows any stress-induced alternation in vowel quality. This assumption is firmly based on cross-linguistic tendencies. In a variety of languages, such as Russian, Brazilian Portuguese (Pöchtrager 2018) or Eastern Catalan (Harris 2005) both /ɪ/ and /ɵ/ resist reduction in unstressed syllables. Moreover, this view is further supported by Crosswhite (2001: 205), who argues for the existence of two distinct patterns in English: one that exhibits reduction

12 Syllables closed by sonorants are an exception to the generalisations outlined here, as they do allow reduced vowels (Burzio 1994: 115). This may be due to the high sonority of sonorants, which enables them to stand on their own more readily than other consonants (i.e. they can be syllabic).

of all vowels to [ə] and one that preserves /ɪ/ and /ɵ/ in unstressed syllables. The data suggests that SSB (unlike General American) is a variety of English that belongs to the latter group.

The word pairs in Table 2 suggest that a change in the stress pattern alone cannot account for the observed alternations in vowel quality. After all, full vowels are found both in stressed and unstressed syllables. The relevant generalisation can be established by looking at the syllable structure of the data in Table 2: alternations only occur in open syllables. This is supported by several authors, such as Burzio (1994: 112–126), Fudge (1984: 200), Marchand (1969: 222–225), who argue that vowel reduction generally applies in open syllables, while it is blocked in closed syllables. Consider the following four examples taken from Table 2 (syllable boundaries are indicated by '.'):

(3) Vowel reduction in open syllables

a. pɔ́.zɪt	–	pə.zí.ʃən
b. rá.pɪd	–	rə.pí.də.tɪj
c. hɔ́s.tɑjl	–	hɔs.tí.lə.tɪj[13]
d. káp.tɪv	–	kap.tí.və.tɪj

The examples in (3a-b) both have an open first syllable. Accordingly, the derivative exhibits a reduced vowel word-initially. In contrast, the examples in (3c-d) clearly begin with a closed syllable and consequently no change in the quality of the vowel occurs in the derivative. It is important to understand that this can be explained on phonetic grounds. Burzio (1994: 114-115) argues that the different behaviour of open and closed syllables is natural in so far as consonants "can in general be articulated only as transitions between openings and closures of the vocal tract, hence in this sense needing a vocalic 'support'" (see also Burzio 2007). A reduced vowel in the nucleus of a closed syllable (VC.C) does not sufficiently support its coda consonant and is thus phonetically less natural. However, no such restriction exists for open syllables. Any consonant that follows the nucleus is syllabified into the onset of the next syllable, the nucleus of which gives the needed vocalic support (1994: 115).[14]

The above-made generalisation is useful, but not exhaustive. A look at Table 2 shows that the alternations found for /ɛ/ cannot yet be fully explained, since [ɪ] similarly occurs in open unstressed syllables. Consider the examples in (4), in which a clear context governs the choice of the reduced vowel in the second word of each pair:

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13 The cluster sC is taken to be heterosyllabic. A full argument supporting this decision cannot be given here, but see Goad (2012) for a study on the syllabification of s-clusters.

14 This is supported cross-linguistically (Burzio 1994: 115). Similar phenomena can also be found in French (see Jacobs 1989) and Palestinian Arabic (see Halle & Kenstowicz 1991).

(4) Sub-pattern for /ɛ/

a. ɛ́.dɪt	–	ɪ.dí.ʃən
b. trɛ́.pɪd	–	trɪ.pí.dɪ.tɪj
c. ə.pɛ́.lət	–	á.pə.lɛ́j.ʃən
d. sɛg.mɛ́nt	–	sɛ́g.mən.tɛ́j.ʃən

The examples in (4a-b) show that /ɛ/ alternates with [ɪ] only in word-initial syllables. In all other contexts, /ɛ/ alternates with [ə] (examples (4c-d)). Despite the fact that only a limited number of word pairs were found for the /ɛ/ - [ə] alternation, none of them shows a specific phonotactic context that may trigger the alternation (i.e. it is the elsewhere case). By contrast, alternations between /ɛ/ - [ɪ] are almost exclusively restricted to word-initial positions. Word pairs not given in Table 2 that follow this pattern are, for instance, *explain – explanation*, *expect – expectation*, *reveal – revelation* or *present – presentation*.

6. A CG Analysis

6.1 The schemas

The alternation in vowel quality of stressed and unstressed syllables in morphologically related words depends, as was outlined above, on syllable structure. Moreover, at the beginning of this contribution, I emphasised a fundamental aspect of the theory, viz. the formation of cognitive schemas on the grounds of language users' experience with language. It can reasonably be assumed then that speakers subconsciously recognise the patterns in their language and abstract those patterns to cognitive schemas. Following this line of reasoning, it becomes evident that two different kinds of schemas are needed in the analysis of vowel reduction in SSB. First, the analysis has to consider the influence of open and closed syllables. In other words, schemas are needed that generalise over syllable structure. Second, since these do not capture the alternation in vowel quality, another set of schemas, i.e. reduction schemas, are required. In section 2 it was argued that schemas do not exist in an empty space in the mental grammar, but form network-like structures. Syllable structure and vowel quality are intrinsically related to each other. The following proposes that syllable and reduction schemas enter into such a network. Before going into the details of this interaction, however, each type of schema will be introduced separately.

Two schemas capturing open and closed syllables are illustrated in Figure 4 below. These schemas are given in a maximally templatic way as first-order schemas. They do not specify any of the elements that could potentially occur in any of the positions. Rather, they only specify whether the syllable is open (a) or closed by some consonant (b):[15]

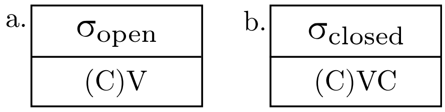


Figure 4 (First-order) syllable schemas

It was discussed earlier that first-order schemas are abstracted from actually occurring utterances in a bottom-up fashion. Language users encounter random sound sequences and prosodically structure them into syllables that are either open or closed. Put another way, they generalise over individual syllables and sounds and create the schematic templates given in Figure 4.

The second kind of schema needed in an analysis of vowel reduction are reduction schemas. These capture the alternation in vowel quality in morphologically related words. The data presented in the previous section shows that all mid-low vowels, i.e. /ɔ a ɛ ʌ/, alternate with [ə] in unstressed positions. An exception is the vowel /ɛ/, which, additionally, alternates with [ɪ]. Since the alternation in vowel quality between stressed and unstressed syllables is highly systematic, speakers form second-order schemas that capture this systematicity. They are given in Figure 5 below:

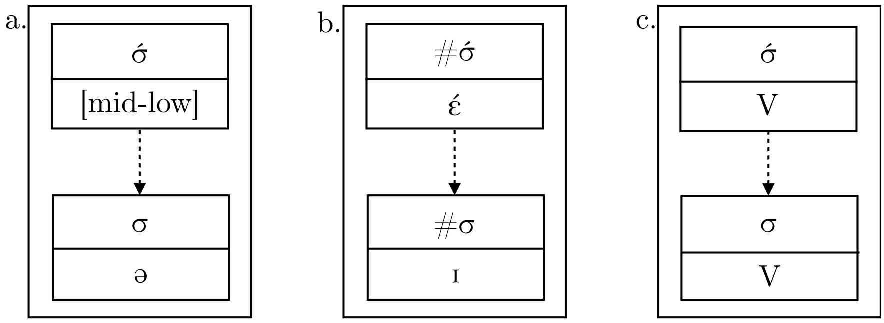


Figure 5 (Second-order) reduction schemas

Figure 5 shows three different reduction schemas. The schema in Figure 5a specifies that all mid-low vowels alternate with [ə]. The second-order schema in Figure 5b captures the specific alternation between /ɛ/ – [ɪ]. Notice that this schema is more specific than the schema given in Figure 5a. It defines a certain context in which the /ɛ/ – [ɪ] alternation can be found,

15 There are many sub-patterns to the general syllable schemas shown in Figure 4 (e.g. particular onset or coda clusters; s-clusters, etc.). These can be considered extensions from the prototypical syllable schemas and thus could be expressed in second-order schemas. Since no analysis of words containing complex clusters will be presented in the following, however, simple first-order schemas suffice.

viz. word-initial syllables. Schema specificity has played an important role in the discussion of the theoretical framework in section 3 and will figure prominently in the analysis to follow. The final second-order schema, i.e. Figure 5c, generalises over syllables in which the vowel quality does not change, i.e. in which no alternation takes place. A final aspect of Figure 5 deserves some attention: the second-order schemas are blind to syllable structure. They only capture alternations in vowel quality between stressed and unstressed syllables. The fact that the alternation only occurs in open syllables[16] is expressed by the interaction of the first-order schemas in Figure 4 with the second-order schemas in Figure 5. All these schemas enter into a network and together they trigger the change in vowel quality. This will be proposed formally in the following section.

6.2 Schema interaction in open syllables

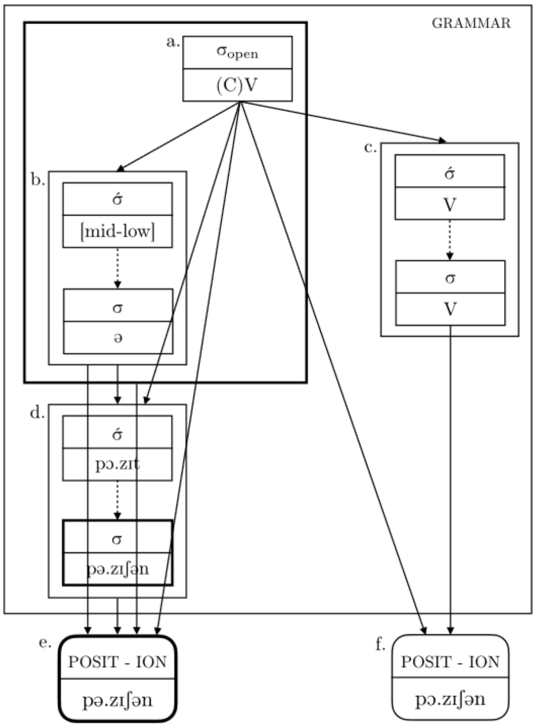
6.2.1 Reduction of mid-low vowels

The reduction of mid-low vowels will be discussed first. To account for this phenomenon, a subset of the schemas in Figure 4 and Figure 5 need to be considered. Since vowel quality critically depends on syllable structure, the first-order schema in Figure 4a is needed. This syllabic schema enters into a network with the reduction schemas proposed in Figure 5. The reduction schemas needed at this point are those given in Figure 5a and Figure 5c. The schema in Figure 5b can be ignored for the moment. A case in which this schema becomes relevant will be discussed in the following section. The diagram in (5) below shows an analysis for the word-pair *posit* /pɔ́zɪt/ – *position* /pəzíʃən/.[17]

[16] See Mittendorfer (2020) for an analysis of syllables closed by sonorants.

[17] Remember that arrows are used to indicate categorising relationships (see section 2). A solid arrow ranging from schema A to schema B states that schema B elaborates, or instantiates, schema A, while a dashed arrow in a second-order schema relates two similar, but not entirely compatible first-order schemas.

(5) Vowel reduction in open syllables



The diagram in (5) illustrates the network-like structure into which the different schemas enter. The syllable schema in (5a) interacts with both reduction schemas in (5b) and (5c). The bold box around the schemas in (5a) and (5b) indicates the close relationship between vowel reduction and syllable structure. In other words, it captures the generalisation that stress-dependent alternations in the quality of vowels occurs in open, but not in closed syllables. Moreover, the diagram in (5) shows that the two reduction schemas in (5b) and (5c) are in competition against each other. The conventionalised linguistic unit (5d) cannot instantiate both of these schemas. It either has a reduced vowel or a full vowel and can consequently only be categorised by one of them. Further, it is important to note that the schema in (5b) is graphically positioned lower than its competing schema in (5c). A schema's lower position in the diagram is associated with its cognitive distance to a particular candidate. Thus, (5b)'s position relative to (5c) indicates that it is the more specific schema of the two and, therefore, closer in cognitive distance to the candidate expression. The linguistic unit is given in the second-order schema (5d). This low-level schema relates the two phonological poles of *posit – position*. More specifically, the stressed syllable in the first and the unstressed syllable in the second word of the pair are compared and connected using categorising relationships. The lower first-order schema in (5d) is given in bold to emphasise that linguistic units add activation value to one of the candidate expressions.[18]

[18] Following the theoretical framework discussed in section 2, it is assumed that linguistic units are part of speakers' mental grammar. However, they are, strictly speaking, not necessary to solve the competition

There are two candidate expression given in (5), viz. (5e) and (5f). The sanctioning of these is not arbitrary, but results from the WFP ACCESS, i.e. candidates are actualised by the schema network in the mental grammar. The first candidate expression (5e) is actualised with a reduced vowel [ə] in the first syllable. It instantiates both the syllable schema in (5a) and the reduction schema in (5b). Additionally, an arrow ranges from the linguistic unit in (5d) to the candidate in (5e), which shows that the candidate is further categorised by this unit. On the other hand, the candidate in (5f) is actualised with a full vowel in the word-initial syllable. It is connected by means of categorising relationships to the syllable schema in (5a) and the second reduction schema in (5c). While only two competing expressions are given in (5), the set of candidates is theoretically infinite. For instance, adding a schema for closed syllables (Figure 4b) to the diagram in (5) results in two additional, wrongly syllabified candidate expressions. The analysis does, in principle, not change with this addition. The only difference is the increase in complexity of the schema network. Not all logically possible candidates will be given in the following. Two or three alternatives should suffice to illustrate how schema interaction predicts the correct winning candidate.

Competitions between candidate expressions are resolved by comparing the candidates to the different schemas in the mental grammar. The WFPs discussed in section 3 are necessary in this process, as they "[determine] the well-formedness of [a candidate expression]" (Kumashiro 2000: 24). The second WFP ACTIVATION is crucial in the evaluation process, as it is the principle that helps calculating the total activation value of each candidate. Each schema that categorises a candidate expression increases its activation value. It is important to understand that cognitive distance negatively correlates with activation values. The greater the cognitive distance between a candidate and its schema, the lower the activation value contributed by this relationship. Conversely, the shorter this distance, the higher the activation value (Kumashiro 2000: 25). Furthermore, a negative correlation also exists between the cognitive distance of a candidate and its schema and the degree of conceptual overlap. An increase in the distance implies a decrease in the degree of conceptual overlap. Thus, if the cognitive distance between a candidate expression and some schema is small, they conceptually overlap to a high degree. As a consequence, candidates cognitively close to their respective schemas gain a higher amount of activation value than candidates which are less close to their schemas.

The selection of the winning candidate in (5) involves calculating the total activation of each expression (5e) and (5f). First, the diagram in (5) shows that the candidate in (5e) instantiates two schemas, viz. (5a) and (5b). Thus, it obtains activation value from both of them. Moreover, the graphical position of the schema (5b) suggests a small cognitive distance to (5e). This is justified on the grounds of the upper first-order schema, which specifies that only mid-low vowels are categorised by it (as opposed to a schematic V in

between candidate expressions. The unit in (5d) is only given for expositional reasons and will be left out in the second analysis presented in this contribution.

schema (5c)). Furthermore, the bold box around the syllable schema (5a) and the reduction schema (5b), illustrating the close relationship between vowel reduction and syllable structure, contribute additional activation value to the candidate in (5e). Additional activation value is obtained by the linguistic unit in (5d), particularly by its bottom first-order schema. To sum up, the candidate expression in (5e) receives its total activation value from (a) each categorising unit individually, (b) the close relationship between the schemas (5a-b), (c) conceptually overlapping with (5b) to a relatively high degree, and (d) the linguistic unit in (5d). Second, the candidate expression in (5f) only instantiates two schemas, viz. (5a) and (5c). Furthermore, the cognitive distance between the candidate (5f) and its schema (5c) is greater, i.e. (5c) is less specific. Comparing each candidate to the categorising relationships clearly shows that the total activation value of (5f) is lower than that of (5e). Once the winning candidate (5e) (in bold), i.e. the candidate with the highest activation value (and thus the most well-formed one), is selected, the grammar ensures the deactivation of the remaining candidates (WFP UNIQUENESS).

At this point, some comments are due on the final WFP WELL-FORMEDNESS. It has not yet been discussed in detail as it is, strictly speaking, not needed in the selection of the winning candidate. However, it does make predictions as to the degree of well-formedness of a candidate expression. Irrespective of whether an expression is selected as the winner, a candidate that obtains a high amount of activation value can be considered more well-formed than a candidate obtaining a low total activation. The assumption that actualised, but not phonetically realised candidates differ with respect to their activation values has interesting implications for language change. The WFP UNIQUENESS should not be understood as an absolute principle (see footnote 9), meaning that in some cases, two different candidate expressions may be realised in a language. If two candidates are realised, the model outlined in this contribution predicts that, should no other factors intervene, the candidate which obtains a higher total activation value, i.e. the more well-formed candidate, wins this competition in the long run. The losing candidate, on the other hand, will be dropped by speakers of that language and consequently lost. This prediction, however, will not be dealt with any further in this contribution.[19]

6.2.2 The sub-pattern for /ɛ/

The analysis in (5) above is a maximally general analysis. It captures the behaviour of all short mid-low vowels in SSB. However, it inaccurately predicts the patterns found for the vowel /ɛ/, since it has no means of accounting for the alternation between [ə] and [ɪ]. To capture this fact of the phonology of SSB, an additional schema has to be added to the diagram in (5), viz. Figure 5b. This is illustrated in (6) below using the word-pair *edit* /ɛ́dɪt/ – *edition* /ɪdíʃən/:

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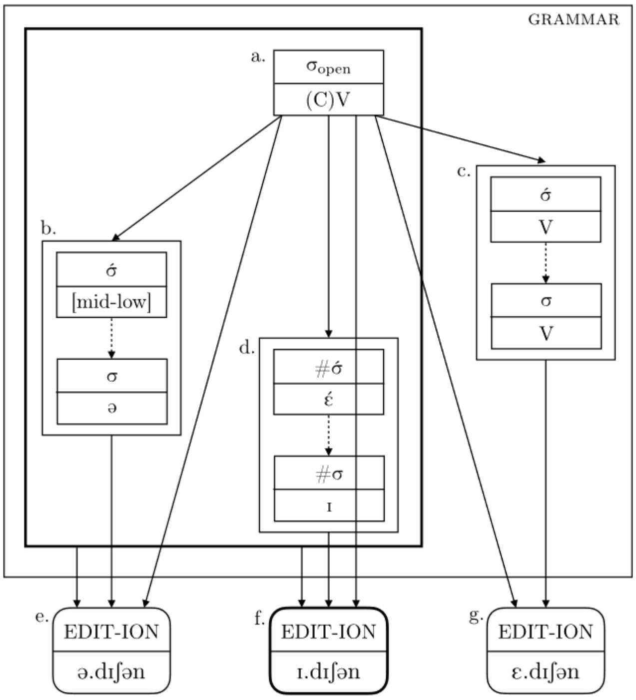
[19] This remains to be researched in future work. To my knowledge, there has not yet been any investigation of language change and acquisition following an approach similar to the one outlined here.

(6) Sub-pattern /ɛ/



The diagram in (6) is in many respects identical to the analysis in (5). The second-order schemas in (6a-c) have already been introduced in the previous section. The schema in (6d) captures the fact that /ɛ/ alternates with [ɪ] rather than [ə] in word-initial position. Arrows are again used to indicate categorising relationships between schemas or schemas and candidate expressions. Furthermore, the bold box around (6a-b) and (6d) is justified by the close relationship between the observed vowel alternations and syllable structure. A conventional linguistic unit is not given in (6) anymore (see Section 6.2.1).

The diagram in (6) includes three different candidate expressions (6e-g), which are actualised by their respective categorising units. The first candidate (6e) is categorised by two schemas, viz. the syllable schema in (6a) and the reduction schema in (6b). As a consequence, the first syllable of this candidate is actualised with the vowel [ə]. Turning to the second candidate (6f), it can be seen that this expression actualises the syllable schema in (6a) as well as the reduction schema in (6d). It follows that this candidate is licensed with [ɪ] in its word-initial syllable. The last candidate expression (6g) is actualised with a full vowel in its first syllable based on the schemas it instantiates, viz. (6a) and (6c). Moreover, it is important to understand that all reduction schemas in (6) compete against each other. The schema in (6d), being the most specific schema (note that it determines the context of the alternation), is graphically represented in the lowest position.

The selection of the most well-formed candidate runs as follows. The principle ACCESS (2a) motivates the actualisation of the candidate expressions (6e-g). The second principle

ACTIVATION (2b) accounts for the calculation of the activation value of all candidates. Starting with the first candidate (6e), it can be seen that it is categorised by two schemas (6a-b), from which it obtains activation value. The second candidate expression (6f) also obtains activation value from two schemas, viz. (6a) and (6c). Since (6c) is a relatively specific schema, the expression (6f) conceptually overlaps with it to a high degree, which, put differently, implies a close cognitive distance. Consequently, this adds additional activation value to (6f). Both candidates (6e-f) also obtain activation value from the bold box, i.e. the close relationship between the syllable schema and each reduction schema. Note, however, that the activation values obtained by (6e-f) are not equal, since (6f) instantiates the more specific schema (6d). Thus, (6f) can be considered more well-formed than (6e). The final candidate (6g) obtains activation value from the syllable schema (6a) and the schema in (6c). As indicated by its graphical position in (6), the schema (6c) is the most general reduction schema. Accordingly, the cognitive distance between the schema in (6c) and its candidate expression in (6g) is relatively great, which implies only a limited degree of conceptual overlap. The candidates can now be ranked with respect to their well-formedness with (6f) being the most-well-formed and (6g) the least well-formed candidate (see principle (2d) WELL-FORMEDNESS). The principle UNIQUENESS (2c) ensures the deactivation of all but the most-well-formed candidate. The model thus correctly predicts the winning candidate (6f) (given in bold).

7. Conclusion

This contribution proposed an analysis of short vowel reduction in Standard Southern British (SSB) from the perspective of Cognitive Grammar. The approach presented is non-reductive and maximalist and thus prohibits a number of traditional phonological concepts, such as Underlying Representations or phonological rules (see content requirement in section 2). To respect these aspects of CG, pairs of morphologically related words in which one member shows a different stress pattern were collected. In many, but not all the data, a comparison of these word pairs revealed a change in vowel quality. The data suggests that short vowel reduction in SSB depends on syllable structure: stressed full vowels in open syllables show a strong tendency to alternate with unstressed reduced vowel. On the other hand, the vowel quality in closed syllables seems to be stable. This finding is largely supported by what other authors have found for RP and other English varieties (see Burzio 1994; Fudge 1984; Marchand 1969).

The theoretical framework used in this contribution employs cognitive schemas to capture generalisations in the data. It has been argued that simple product-oriented generalisations, i.e. first-order schemas, enter into bigger second-order schemas to express systematic phonological alternations between morphologically related words. Moreover, it has been shown that first- and second-order schemas do not exist in a vacuum. Instead, they build complex networks and interact with, but also conflict with one another. Such schema networks are assumed to give rise to a number of candidate expressions, which compete for well-formedness. As was shown, the competition arising from conflicting schemas and their respective candidates can be resolved by a set of four well-formedness principles, which calculate the total activation value of each expression. The candidate showing the highest amount of activation, i.e. the most well-formed candidate, is selected as the winner of the competition. Furthermore, it is crucial to understand that the concepts employed in the analysis are not purely theoretical. Neither are they limited to phonological phenomena or linguistic cognition. Rather, schema formation and categorisation relationships have widely been accepted to constitute aspects of general cognition (see Janda 2015).

Phonological work has long held a subordinate role within Cognitive Linguistics at large and Cognitive Grammar in particular. Another objective of the present contribution was therefore to make a case for including phonology in cognitive linguistic approaches. However, the study presented in this paper is theoretical. In fact, a lack of empirical hypothesis testing is characteristic of cognitive linguistics in general (Dąbrowska 2016: 483). Research into empirical testing, particularly into how schemas are formed and used by speakers, would further support the development of a more cognitively oriented phonology. Nevertheless, the present contribution as explored possible ways of including phonology in Cognitive Grammar. It has been shown that CG, despite its focus on semantics, provides all that is needed for a theory of phonology.

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