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Functional and usage-based approaches to aphasia: the grammatical-lexical distinction and the role of frequency

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ABSTRACT

Background: Functional and usage-based theories of language are gaining increasing influence in linguistics. These theories understand language structure as underpinned by domain-general neurocognitive capacities and as shaped by usage patterns and the function of language as a means for communication. Accordingly, they entail an approach to aphasia which differs markedly from established ones based on formal theories.

Aims: Based on an outline of central claims in functional and usage-based theories, we aim to show how such theories can cast new light on aphasia.

Methods & Procedures: We focus on two strands of functional and usage-based aphasiological research: 1) research on frequency effects in aphasic speech, 2) and research on the grammatical-lexical distinction and its significance for the description of aphasic speech and the understanding of the causes of aphasia. We review available studies that fall within the two aforementioned strands of research, assessing their strengths and limitations.

Outcomes & Results: Usage-based methodologies are currently being developed that allow for fast quantification of the degree of formulaicity of a language sample and may thus be helpful in ascertaining the role of fossilized multiword expressions in aphasia. In line with central claims in usage-based linguistics, the first results of studies employing these methodologies have shown that frequency and collocation strength facilitate the retrieval of multiword expressions in a way that resembles the way in which lexical frequency facilitate retrieval of isolated words.

A recent functional and usage-based theory understands the grammatical-lexicon distinction as a means for prioritizing parts of complex linguistic messages. Defining grammatical items as items that are discursively secondary (background) and dependent on host items, this theory entails an account of grammatical deficits which bridges the gap between existing structure-oriented and processing-oriented accounts. The theory entails word-class general criteria that allow fine-grained classification of linguistic items as grammatical or lexical. Cross-linguistic studies of verb, pronoun and preposition production show that this classification is significant for the description of aphasic language.

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Conclusions: Functional and usage-based studies of aphasia are still sparse, but show promising results. This approach seems especially qualified for understanding 1) the neurocognitive causes of various types of aphasia, 2) the variability across languages, communicative settings (including tasks and modalities), groups of individuals and individuals, which is characteristic of aphasic speech, and 3) the link between aphasia symptoms and the basic need and challenge for people with aphasia: to remain a social being by communicating with other social beings.

1. Introduction

The idea that language disorders can inform linguistic theory is not new. Historically, it can be traced back to traditional language treaties from the nineteenth century and to prominent figures such as Baudouin de Courtenay and Ferdinand de Saussure (Fromkin, 2000). It was not though until the second half of the twentieth century that linguists started to pay close attention to the study of aphasia (Jakobson, 1956). The exhaustive study of aphasia helped language experts get further insights into controversial theoretical discussions, at the same time that structured theories of language allowed aphasiologists to provide more fine-grained descriptions of aphasic symptoms. By the 70's the relationship between linguistic theory and aphasia was already consolidated, as evidenced by the work of authors such as Blumstein (1973), Whitaker (1971), Zurif and Caramazza (1976) and Kean (1977), who helped build the bridge between neurology and linguistics standing up to this date.

In the 60's and 70's, when aphasiological research took off, linguistics was dominated by formal approaches to language, most prominently generative grammar (e.g., Transformational grammar, Chomsky, 1965; Government and Binding, 1981; Minimalist program, 1995). Ever since Blumstein (1973), also aphasiology has been dominated by formal approaches. For this reason, it is natural that not all linguistic theories are equally represented in the field.

Since the 80's, however, functional and usage-based approaches have gained increasing influence in linguistics as a challenge to formal approaches. Theories like Cognitive Grammar (e.g., Langacker, 1987, 1991), Role and Reference Grammar (e.g., Van Valin & LaPolla, 1997), Functional (Discourse) Grammar (e.g., Dik, 1997; Hengeveld & Mackenzie, 2008) and Construction Grammar (Croft, 2001; Goldberg, 1995; Tomasello, 2009) constitute an explicit contrast to (at least classical) generative grammar. The following positions are central to these theories (see Evans, 2014; Dąbrowska, 2015; Ibbotson & Tomasello, 2016 for recent overviews): 1) Grammar is not autonomous from semantic and pragmatic function. Languages are communication instruments, and all grammatical structure is functional, even "subject", which is understood as a marker of the most salient semantic participant role or as the thematic viewpoint of the clause. Syntax is in basic respects iconically motivated by function; for instance, constituency is a product of isomorphism between what belongs together semantically and what belongs together at the expression level. 2) Grammar is not autonomous from usage. It is presupposed by usage, but also shaped and maintained by usage. Accordingly, frequency of use plays a central role: grammatical structures are entrenched patterns of usage, and a wide

range of phenomena (for instance, the tendency for singular nouns to be shorter than plurals) are motivated by frequency patterns (singular nouns tend to be more frequent than plurals). 3) Synchronic grammar cannot be understood in isolation from diachronic development. Grammaticalization research shows that morphology is the result of agglutinated and possibly fused syntactic structures, which in turn are the result of diachronic fixation of word order (e.g., Hopper & Traugott, 2003; Lehmann, 2015), p. 4) Grammar is not a domain-specific module, but draws on domain-general neurocognitive capacities involved in social cognition, conceptualization, memory, and processing. Syntactic structures (e.g., actives and passives), are means for conceptual construal of reality (e.g., different perspectives on the same event). To the extent that the neural basis of grammar is localizable, this due to preferred localization rather than to innateness. 5) Grammatical structure is not universal (this is an old structuralist insight), but language- and even group- and person-specific. Not all languages have grammatical markers of tense, some syntactic categories are very rare (e.g., basic OS word order), and “subject” is not the same thing in different languages (in fact, for some languages, e.g., Acehnese, it makes little sense to talk about subjects; e.g., Van Valin & LaPolla, 1997: 250–274; Bakker & Siewierska, 2007). It does not make sense, then, to identify “subject” as a universal syntactic category, or to deal with crosslinguistic variation in terms of parameter setting. What is universal is phonetic and functional-conceptual “substance”. 6) Since grammar is not universal, the first-language acquisition is not an essentialistic matter of activating genetically planted seeds under a poverty of stimulus, but a matter of entrenching increasingly abstract constructions based on domain-general cognitive capacities for sequencing, intention reading and shared attention, among other things.

These theories entail an approach to aphasia which differs markedly from established ones. Only little work has been done so far within this approach, but it may cast new light on unresolved issues, such as the issue of accounting for the enormous variability attested across individuals, groups, languages and task types. In this article, we present an overview of the contribution of functional and usage-based linguistics to the study of aphasia, focusing on two areas of research. One area – to be dealt with in [Section 2](#) below – has to do with the role of frequency. This is an area where functional and usage-based linguistics present an immediate challenge to accounts based on Generative Grammar, as Generative Grammar has little place for frequency. The other area – to be discussed in [Section 3](#) – is constituted by recent research on the grammatical-lexical distinction. This area is the home ground of Generative Grammar. Functional and usage-based linguistics tend to conceive of grammatical and lexical items as related in terms of a continuum, and to downplay the distinction. [Section 4](#) is a brief summary.

2. Frequency in usage-based linguistics

The role of heuristic variables such as frequency, age of acquisition, imageability and word class or length, and the interconnections between these variables in language processing are widely debated topics in neuropsychological studies of language in general and in aphasiology in particular (Barry, Morrison, & Ellis, 1997; Bird, Franklin, & Howard, 2001; Brysbaert & Ellis, 2016; Caramazza & Zurif, 1976; Dell, 1990; Gentner, 1982; MacDonald, 2013; Morrison & Ellis, 1995; among many others). Functional and usage-based linguistics offer a straightforward way of anchoring these debates in linguistic theory.

Frequency of use plays a central role in such theories, as already mentioned. According to usage-based linguistics, language structure is a result of entrenched usage patterns, and entrenchment is a function of frequency and thus of experience. Diessel (2017) puts it this way: “as frequency strengthens the representation of linguistic elements in memory, it facilitates the activation and processing of words, categories, and constructions” (Diessel, 2017, p. 1). It follows from this view that lexical as well as grammatical structure may vary across registers, languages, contexts, groups of individuals and even across individuals, because the frequency of use may vary on these parameters. For instance, Dąbrowska has shown that the capacity for processing rare syntactic constructions correlates with the level of education (see Dąbrowska, 2015 for an overview and references). In usage-based linguistics this is seen as a natural consequence of the fact that highly educated people are more experienced with infrequent constructions; or in other words, infrequent constructions are more entrenched in highly educated people. This view of frequency is an example of a tendency in usage-based linguistics to emphasize heuristic and probabilistic factors in accounting for language structure. This contrasts sharply with the traditional emphasis on algorithmic factors in Generative Grammar (Caramazza & Zurif, 1976), where morphosyntactic rules are seen as central for sentence production and comprehension. Heuristic factors such as frequency and age of acquisition have only recently been put on the agenda in this approach in order to account for variation.

While functional and usage-based linguistics seems better equipped for qualifying the discussion of frequency and other heuristic factors, it has so far only made few direct contributions to the study of frequency in aphasia. A recent review of studies on probabilistic sentence-level deficits in usage-based studies of aphasia is found in Gahl and Menn (2016). The authors review a set of studies focusing on differences in language use potentially motivated by verb biases, mostly by effects due to argument structure (DeDe, 2012, 2013a, 2013b; Gahl, 2002; Gahl et al., 2003; Russo, Peach, & Shapiro, 1998). The review and reanalysis of these studies showed that the context of use interacts with verb biases (unaccusativity effects, transitive biases, actives vs. passives) in sentence comprehension. The more biased a form is (i.e., the more likely it is to appear, for instance, in its transitive form or in an active construction), the easier it is for people with aphasia. This highlights the relevance of both word and construction frequency. As for word frequency, Hatchard (2015) found that the relative frequency of singular vs. plural noun forms was correlated with errors in aphasic speech such that more frequent forms (whether singular or plural) were more likely to be produced correctly. As for construction frequency, Jap, Martínez-Ferreiro, and Bastiaanse (2016) found that persons with aphasia that speak Standard Indonesian do not have problems with passives to the same extent as that found in speakers of other languages. A likely reason for this is that passives are more frequent in Standard Indonesian and thus more entrenched in speakers of this language. Frequency does not explain everything, of course. Grammatical items are typically more frequent than lexical ones, but they are also typically more compromised in non-fluent aphasias; see Section 3 below).

For further details, the reader is referred to the 2016 special issue of *Aphasiology – Aphasia, Frequency and Language Processing* – which aimed at bringing together scholars of different backgrounds and, of special relevance for the present volume, of different linguistic traditions in order to discuss the role of frequency (Menn & Bastiaanse, 2016).

Usage-based approaches seem particularly well suited for understanding the presence of recurrent or repetitive utterances in the speech output of individuals with non-fluent aphasias.

The association of such utterances with non-fluent aphasia can be traced back to early studies of aphasia such as Code (1982), de Bleser and Poeck (1985) and Perkins (1994). It was speculated that individuals with aphasia, especially those with aphasias of the non-fluent type, had a tendency to overproduce holistic (or formulaic) sequences as a wild card to keep the communicative flow going. However, as pointed out by Menn and Bastiaanse (2016), the analysis of the incidence of such sequences in these early works suffered from a lack of systematic quantificational tools. Scholars taking a usage-based approach are currently working to remedy this situation, developing and using computer-assisted resources to automatically analyze frequency effects. One such resource is the *Frequency in Language Analysis Tool* (FLAT; Zimmerer & Wibrow, 2015; Zimmerer, Wibrow & Varley, 2016; Zimmerer, Newman, Thomson, Coleman, & Varley, 2018), a tool which determines the usage frequency of every word and word combination (up to three words). These tools are still far from being limitation free (e.g., transcriptions are needed and errors are difficult to quantify), but they allow for fast quantification of the degree of formulaicity of a language sample, and the outcomes can thus help untangle the role of fossilized multiword expressions in aphasia.

The application of the FLAT to the speech output of fluent and non-fluent individuals (Zimmerer et al., 2018) has shown that high frequency and collocation strength (roughly corresponding to “words” transitional probability’ in Gahl and Menn (2016, p. 1363)) facilitate the retrieval of multiword expressions in a way that resembles the way in which lexical frequency facilitates retrieval of isolated words (DeDe, 2012; Gahl, 2002; Shewan & Canter, 1971). People with aphasia were found to have more difficulties producing sentences containing 2 and 3 word low-frequency sequences. Among the repertoire of expressions documented in Varley’s (1993) corpus, analyzed by Zimmerer et al. (2018), formulas such as *I don’t know*, *that’s right* and *can’t say*, produced as fossilized routines serving different communicative purposes, seem to be used as a compensatory mechanism in the event of language deficit.

This phenomenon, observed in both fluent and non-fluent individuals, is taken as evidence for the relevance of the role of usage in language processing. Widely used formulas become easier to (over) produce and understand (see Zimmerer, Dąbrowska & Varley (in prep.)) for a discussion of the empirical evidence from the perspective of Construction Grammar). If exposure and use have the potential to shape communicative capacities, there is ample room for individual (as well as cross-linguistic) variation. This may help to explain the individual, across-language or situation-induced variation widely reported in aphasia studies.

Zimmerer et al. (2018) focus on frequency alone. Still to be unraveled is the weight of an age of acquisition as a potential confound (see e.g., Arnon, McCauley, & Christiansen, 2017; Brysbaert & Ellis, 2016). Baayen, Milin, and Ramscar (2016) claim that (at least lexical) frequency interacts with a wide range of factors such as age of acquisition, valence, word length or semantic diversity. Given the ongoing debate about the impact of different psycholinguistic factors on language processing in non-brain-damaged speakers (NBDs) and different forms of brain damage, the issue is indeed worth being pursued in future studies.

3. The grammatical-lexical distinction in usage-based linguistics

The distinction between grammatical and lexical items represents a central link between aphasiology and linguistic theory, and as such it has a long tradition in aphasiology (see

e.g., Caramazza & Zurif, 1976; Kolk & Heeschen, 1992; Menn & Obler, 1990; Miceli, Silveri, Villa, & Caramazza, 1984; Miceli, Silveri, Romani, & Caramazza, 1989; Parisi & Pizzamiglio, 1970; Tissot, Mounin, & Lhermitte, 1973; among many others for instances of early studies). This distinction is presupposed by terms such as “agrammatism” and “grammatical impairment”, and by characterizations of the distinction between “non-fluent aphasia” (which often involve grammatical impairment) and “fluent ones” (which often involve lexical impairment). As a link between aphasiology and linguistic theory, the distinction presents at least two major problems, however. Both have to do with grammatical deficits, including agrammatism.

The first problem is that the distinction is a structural one, but even among researchers who assume a generative understanding of grammar, there is no agreement about whether the grammatical impairment is a structural phenomenon. Some maintain that it is, and see agrammatic symptoms as due to structural deficits pertaining to the tree structure (e.g., Friedmann, 2001; Friedmann & Grodzinsky, 1997). But the majority of aphasiologists argues that grammatical impairment is due to a processing deficit (Avrutin, 2000, 2006; Caplan & Hildebrandt, 1988; Haarmann & Kolk, 1991; Kolk & van Grunsven, 1985; Kolk & Weijts, 1996; Piñango, 2000), and this majority owes a precise account of the relationship between processing deficits and the structural distinction between grammatical and lexical items: why exactly are grammatical items affected by the processing deficit, and not lexical ones?

The second problem has to do with a mismatch between standard definitions of grammatical impairment and the main focus of the dominating linguistic theory, Generative Grammar. Grammatical impairment, including agrammatism, is standardly defined with reference to problems in the production of grammatical linguistic *items*, notably, affixes and grammatical words such as articles and auxiliaries (see Bastiaanse & Thompson, 2012; for a review). However, Generative Grammar is more interested in another aspect of grammar, *syntax*. Attempts to explicate the link between syntax and grammatical items often refer to “rule-governedness”, but to say that grammatical items are rule-governed is nothing but an unfalsifiable stipulation.

One consequence of the lack of interest in the item aspect of grammar is that word classes are in Generative Grammar often seen as homogeneous with respect to the grammatical-lexical distinction. For instance, pronouns are often seen as a grammatical word class (e.g., Harley, 2006: 77, p. 118), whereas prepositions are sometimes seen as grammatical (e.g., Chomsky, 1981; Harley, 2006), sometimes as lexical (e.g., Jackendoff, 1973); see Martínez-Ferreiro, Ishkhanyan, Rosell-Clari, and Boye (2018) for discussion. Aphasiological studies suggest otherwise. For instance, Friederici (1982) showed that preposition forms were differentially affected in aphasia according to whether they appeared in their “semantic or syntactic role”. A letter detection study of NBDs by Foucambert and Zuniga (2012) points in the same direction: prepositions cluster midway between grammatical words (complementizers and determiners) and lexical words (nouns, verbs, adjectives and adverbs). This makes perfect sense if the class of prepositions is taken to comprise both grammatical and lexical members.

In the absence of a linguistic theoretical anchor, studies of the distinction between grammatical and lexical items have been based on distributional criteria (see e.g., Stewart, 2015 on Spanish prepositions), on semantic criteria (Schwartz, Saffran, & Marin, 1980), or on criteria such as closed vs. open-class membership or obligatoriness

vs. optionality (e.g., Friederici, 1982). However, these criteria all present problems. Distributional criteria are often word-class specific and as such hard to derive from a general theory of the grammatical-lexical distinction. Semantic criteria are both hard to operationalize and to anchor in a theory of grammar. Open- vs. closed-class and obligatoriness vs. optionality distinctions are both theoretically and empirically dubious (cf. Boye & Bastiaanse, 2018). There is no theoretical link between grammatical status and closed-class membership or obligatoriness. Accordingly, it is easy to find empirical exceptions to the link. Latin praenomina constituted a closed class, and so do in some languages full verbs (e.g., Pawley, 2006), but no one would claim that names or full verbs are grammatical. Similarly, the English complementizer *that* is in many contexts optional. Yet, no one would claim that it is a lexical item.

To sum up, what is needed in order to anchor research on grammatical impairment in linguistics is a theory which 1) entails a set of operationalizable and word-class general criteria for distinguishing between grammatical and lexical items, and 2) enables us to link the structural distinction between grammatical and lexical items to processing, such that grammatical impairment can be accounted for as a result of processing deficits.

Functional and usage-based linguistics may not seem especially keen on providing such a theory. As mentioned, it tends to downplay the grammatical-lexical distinction, partly based on grammaticalization research, which has demonstrated a diachronic link between the two kinds of expressions, partly because it wants to emphasize disagreement with formal approaches in which the distinction has a central place. Indeed, Construction Grammar, which is perhaps currently the most influential theory within this approach, makes a point out of replacing Generative Grammar's dichotomy between syntactic rules (grammar) and a storage of items (lexicon) with a unified storage that encompasses everything from morphemes to complex syntactic constructions. There are certainly good arguments for doing so (e.g., from the first-language acquisition; e.g., Tomasello, 2009). However, the grammatical-lexical distinction becomes invisible to the extent that a review (Pulvermüller, Capelle, & Shtyrov, 2013) found little empirical neurolinguistics backup for Construction Grammar.

Recently, however, a functional and usage-based theory of the grammatical-lexical distinction has been proposed, the ProGram theory (Boye & Harder, 2012). This theory is functional and usage-based in that it accounts for the distinction in terms of conventionalized communicative functions. It is based on the fact that complex mental input requires prioritization: just as we do not attend to all students in the classroom at the same time, we do not pay the same degree of attention to all morphemes, words or phrases in a sentence. The ProGram theory defines the grammatical-lexical distinction as a conventionalized means for prioritizing parts of complex linguistic messages: by convention, lexical items have the potential to be discursively primary, i.e., to express the main (foreground) point of a message; in contrast, grammatical items are by convention discursively secondary (background) (in corrective contexts these conventions can be overridden, as in: *I said I DID brush my teeth*). These definitions entail that grammatical items are dependent on combination with lexical items with respect to which they can be secondary (for instance, auxiliaries require full verbs); in contrast, lexical items can sometimes stand alone (as in: *Fire!*).

The ProGram theory is a theory of linguistic structure, not a theory of processing or of the neurocognitive basis of grammar. But it has implications for such theories, and it makes

possible a more precise account of grammatical deficits as a result of processing deficits. The theory suggests that there may be two – possibly coexisting – reasons for grammatical deficits (Boye et al., [Sbm.](#)). Firstly, it entails that damage to neurocognitive capacities for combining simple information units into complex wholes would affect grammatical items, as these dependent on combination with lexical hosts. Secondly, it entails that grammatical items are less crucial for communicative purposes (they are by convention discursively secondary) than lexical ones, and it thus predicts that reduced resources can be concentrated on lexical items at the cost of grammatical ones in order to minimize negative communicative effects. In other words, the theory goes hand in hand with theories that link grammatical deficits to resource reduction (Kolk & Heeschen, [1992](#), and Caplan et al., [2007](#)) in that it provides a motivation why exactly grammatical items, and not lexical ones, would be compromised in response to some sorts of resource reduction.

The theory also entails three criteria for distinguishing grammatical and lexical items. Given that only lexical items have the conventional potential to express the main point of an utterance, only these items can be a) focalized, e.g., by means of clefting, focus particles or stress, b) addressed in the subsequent discourse, and c) elaborated on through modification. Grammatical items cannot be focalized, addressed or modified outside corrective contexts (for a detailed discussion see Boye & Harder, [2012](#); Messerschmidt, Boye, Overmark, Kristensen, & Harder, [2018](#)). In some cases, the resulting classification of linguistic items into grammatical and lexical classes overlaps with existing classifications. However, contrary to those, a classification based on the above criteria is both theoretically anchored and word-class general.

A growing number of cross-linguistic empirical studies support the ProGram theory. Because grammatical items are by convention discursively secondary, they attract less attention in language perception than lexical items (Vinther, Boye, & Kristensen, [2014](#); Christensen et al., [Sbm.](#)). Because grammatical items have an extra dependency (i.e., they require combination with lexical items), they are associated with longer reaction times and error rates than lexical ones (e.g., Lange, Messerschmidt, & Boye, [2018](#); Lange et al., [2017](#)). Of particular relevance to aphasiology, some of these studies show that classifications based on the ProGram theory are significant for the description of grammatical impairment. Below we present these studies, dealing first with studies of verbs, then studies of prepositions, and finally studies of pronouns.¹

3.1 Verbs

Boye and Bastiaanse ([2018](#)) and Messerschmidt et al. ([2018](#)) provide evidence of a dissociation between grammatical and lexical verbs as classified following the ProGram criteria. This classification is uncontroversial in that it overlaps with traditional classifications of verbs into auxiliaries (grammatical) and full verbs (lexical) widely addressed in early aphasia research (see e.g., Edwards & Bastiaanse, [1998](#); Goodglass, Christiansen, & Gallagher, [1993](#); Jonkers, [1993](#); Lapointe, [1985](#); Saffran, Berndt, & Schwartz, [1989](#); Vermeulen & Bastiaanse, [1984](#); Zingeser & Berndt, [1988](#); among many others). More controversially, however, the ProGram theory entails that the category of (Dutch) modal verbs has both lexical and grammatical members.

Based on the semi-spontaneous speech of Dutch- and Danish-speaking individuals with agrammatism and match controls, Boye and Bastiaanse ([2018](#)) and Messerschmidt

et al. (2018) compare the grammatical and lexical variants of homophonous verb forms (e.g., grammatical Dutch *hebben* “have” + participle vs. lexical *hebben* “have” + NP) and homophonous modal verb forms, and investigate the general distribution of grammatical and lexical variants in connected discourse. Overall, informants with agrammatic aphasia produced a reduced proportion of grammatical forms in comparison to control participants both in the comparison of minimal pairs (Boye & Bastiaanse, 2018) and in the analysis of across the board production (Messerschmidt et al., 2018).

3.2. Prepositions

Messerschmidt et al.’s (2018) and Martínez-Ferreiro et al. (2018) made a distinction between grammatical and lexical Danish and Spanish prepositions based on the modification criterion entailed by the ProGram theory, and applied it to the analysis of semi-spontaneous speech samples of individuals with fluent and non-fluent aphasias. Unlike the distinction between grammatical and lexical verbs, the distinction between grammatical and lexical prepositions is still rather controversial (see Mardale, 2011; for discussion). The classifications in Messerschmidt et al.’s (2018) and Martínez-Ferreiro et al. (2018) differ from those applied in the majority of the previously existing studies supporting a distinction between grammatical and lexical prepositions (e.g., Bastiaanse & Bennis, 2018; Bennis, Prins, & Vermeulen, 1983; Friederici, 1982; Froud, 2001; Grodzinsky, 1988). But differences are not restricted to methodological issues. Whereas earlier works tend to focus on a subset of prepositions, Martínez-Ferreiro et al. (2018) include an exhaustive analysis of all Spanish prepositions.

The study of a Danish speaking informant with agrammatism and a matched control reported by Messerschmidt et al. (2018) showed that the proportion of grammatical to lexical prepositions was significantly lower in the speech of the participant with brain damage than in the speech of the non-brain-damaged (NBD) control. Similarly, Martínez-Ferreiro et al. (2018) found that NBD controls produced more grammatical prepositions than individuals with non-fluent aphasias, while there was no difference for prepositions classified as lexical. The opposite pattern was found for individuals with fluent aphasias: whereas no differences were found for grammatical prepositions, NBDs produced a significantly higher number of lexical prepositions.

3.3. Pronouns

Two recent studies of French and Spanish (Ishkhanyan, Sahraoui, Harder, Mogensen, & Boye, 2017; Martínez-Ferreiro et al., 2018) have explored the distinction between grammatical and lexical pronouns based on the focalization criterion entailed by the ProGram theory. From early on, there have been several attempts to explain difficulties processing pronouns across different languages (e.g., Lonzi & Luzzatti, 1993; Miceli & Mazzucchi, 1990; Miceli et al., 1989; Nespoulous et al., 1988). But the enormous variability in the experimental outcomes has led to little agreement among authors (Devers, Martínez-Ferreiro, & Arslan, 2018). As in the case of prepositions, parts of these differences are due to differences in the approaches (including theoretical framework and experimental tasks) as well as in the conditions tested. In their usage-based analysis, Ishkhanyan et al. (2017) found that French

Table 1. The grammatical-lexical distinction: ProGram.

		Grammatical forms	Lexical forms
Verbs	Boye and Bastiaanse (2018)	Non-fluent IWAs < NBDs	–
	Messerschmidt et al. (2018)	Non-fluent IWA < NBDs	–
Prepositions	Messerschmidt et al. (2018)	Non-fluent IWA < NBDs	Non-fluent IWA > NBDs
	Martínez-Ferreiro et al. (2018)	Non-fluent IWAs < NBDs	Non-fluent IWAs = NBDs
		Fluent IWA = NBDs	Fluent IWAs < NBDs
Pronouns	Ishkhanyan et al. (2017)	Non-fluent IWAs < NBDs	–
	Martínez-Ferreiro et al. (2018)	Non-fluent IWA = NBDs	Non-fluent IWA > NBDs
		Fluent IWAs = NBDs	Fluent IWAs > NBDs

IWA: Individuals with aphasia; NBDs: Non-brain-damaged individuals. Bold indicates unpredicted results.

pronouns classified as grammatical were more compromised in the agrammatic speech samples analyzed than pronouns classified as lexical.

More controversial are the results in Martínez-Ferreiro et al. (2018). In an analysis of semi-spontaneous speech samples from three groups of Spanish-speaking informants – participants with fluent aphasia, participants with non-fluent aphasia and NBDs – the authors found no significant problems with grammatical pronouns. However, there was an observable overuse of lexical subject pronouns in both aphasia groups as a consequence of the avoidance of prototypical Spanish “pro-drop” structures in contexts where discourse constraints allowed subject pronoun dropping, the preferred option in the NBD group.

A summary of findings by language is found in Table 1.

Based on the results available so far, we can conclude that within the categories of pronouns, prepositions and verbs, members classified as grammatical based on the ProGram criteria are more severely affected in non-fluent aphasia than members classified as lexical. These neurolinguistic data support Boye and Harder (2012) usage-based theory of grammar. Although prepositions classified as lexical were found to be more severely affected than grammatical ones in fluent deficits, the scarcity of data from fluent informants prevents us from drawing generalizations for this group so far. As in the case of frequency effects, further research is still needed, but the adoption of an approach that allows the application of a fixed set of criteria across both word classes and languages seems promising and may contribute to an account of part of the variability of previously existing results. Given that individual words (and/or morphemes) and not entire word classes are subject to scrutiny, the ProGram may help unravel the common core behind differences between existing experimental results that are due to language-specific morphosyntactic and phonological issues.

4. Usage-based approaches in aphasia research

Functional and usage-based linguistics represent an understanding of language which differs markedly from that associated with formal theories in general and Generative Grammar in particular. The emergence of approaches to aphasia based on this type of linguistics may cast new light on unanswered questions as well on well-established facts. Firstly, with its rejection of innateness and Universal Grammar and with its insistence that language structure is shaped by experience and usage, and thus by heuristic factors such as frequency, it predicts diversity across languages, communicative settings (including tasks and modalities), groups of individuals and individuals. This makes it a good candidate for an account of the variability that is consistently reported in aphasiological studies.

Secondly, with its rejection of autonomy and its claim that language structure is function-based – formed as a means for communication – functional and usage-based linguistics represents an intuitively appealing way of understanding aphasia symptoms in light of the most urgent need and challenge for people with aphasia: the need and challenge of remaining a social being by communicating with other social beings. For instance, the idea that the grammatical-lexical distinction is a means for prioritizing linguistic information, such that grammatical items are secondary, straightforwardly predicts that the production of grammatical items would be given low priority in certain instances of resource reduction.

Thirdly, with its insistence that grammar is not a domain-specific capacity, but supported by domain-general neurocognitive capacities, functional and usage-based linguistics are an obvious place to start looking for interrelations between aphasia symptoms and other symptoms associated with brain damage (Christiansen, Kelly, Shillcock, & Greenfield, 2010; Zimmerer, Cowell, & Varley, 2014). For example, if the basic properties of grammatical items are their secondary status and their dependency on combination with other items, it is natural to expect that such items are underpinned by neurocognitive structures that also support language-external prioritization and combination.

In some respects, functional and usage-based approaches to aphasia represent a challenge to established approaches. The emphasis on heuristic factors such as frequency, discussed in Section 2, is a case in point. So far, research on such factors has concentrated on lexical items (including fixed expressions). It remains to be seen whether the explanatory power of these factors extends into the grammar of aphasic speech. In other respects, these approaches can be seen not only as challenges, but also as further developments of and new perspectives on established accounts. The ProGram theory discussed in Section 3 adopts the well-established distinction between grammatical and lexical items, but understands this distinction in a new way, which provides new insights and raises new questions pertaining to aphasia.

Note

1. Note that in none of these studies were the classification of aphasia types based on criteria that include the items studied. Aphasia classification systems are based on traditional categorizations of what grammar is, which differ substantially from the categorization entailed by Boye and Harder (2012) ProGram theory.

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