TLS
Proceedings of the 17th Texas Linguistic Society

The 17th Texas Linguistic Society was held on September 15–16, 2017, at the University of Texas at Austin. Presentations came from all areas of linguistics, but this year's conference placed a special focus on irregular morphology from across theoretical approaches.

Many thanks to our keynote speakers:

• Ruth Kramer (Georgetown University)
• Andrea Sims (The Ohio State University)
• David Quinto-Pozos (University of Texas at Austin)

Many thanks also to our supporters at the University of Texas at Austin:

• Department of Linguistics
• College of Liberal Arts
• Department of English
• Department of French and Italian Studies
• Department of Middle Eastern Studies
• Department of Slavic Studies

The 21 presenters and three keynotes had the opportunity to submit their presentations in written form to be included in these proceedings, and five chose to do so. Many thanks to our presenters and especially our proceedings-submitters; we hope this publication helps your research find an even wider audience.

More information about the conference, including a listing of all presentations and abstracts, can be found online at http://tls.ling.utexas.edu/2017tls/

Signed, the editors:
   Michael Everdell, Frances Cooley, Hammal Al Bulushi, Ambrocio Gutierrez Lorenzo, Lorena Orjuela, Santiago David Gualapuro Gualapuro

Table of Contents

The occurrence and structure of postmodifier in Nigerian English noun phrase

Mayowa Akinlotan
Vrije Universiteit Brussels (VUB)
University of Texas at Austin

Abstract

The present paper discusses the occurrence, structure, and complexity of the post modifier in the Nigerian English noun phrase (NP). The findings are then compared to similar patterns found in similar varieties of English like British, Ghanian, Singaporean, Honk Kong, etc. The paper shows how variables representing syntactic function, register, and weight shed light on specific contexts where we might or might not find postmodifier, clausal or phrasal postmodifier, simple or complex postmodifier. The paper also shows that the extent of variation among different varieties of English is dependent on variables crucial to the linguistics choices being investigated. For instance, in (1), post modifier is realized but not realized in (2).

(1)   My car which I just bought last week has been stolen
(2)   My car has been stolen

The NP in (1) is structurally complex because it realises a post modifier, 'which I just bought last week'. Whereas in (2), the NP (the car) lacks a postmodifier. In other words, the occurrence viz-a-viz non-occurrence of the postmodifier contributes to the structural and semantic complexity of the noun phrase, even though they occur in the same syntactic position (NPs in (1) and (2) occur in the subject position in the clause). Applying quantitative method on 8897 NPs, corpus findings indicate that postmodifier are more likely not to occur (61%) than occur (39%) within the NP structure. Further analyses on the realized postmodifier show that prepositional phrase (57%), rather than clause (32%) or adjective (9%) or adverbial (2%), is the most preferred postmodifier structural type. It is also shown that those realized postmodifier are more likely to be structured in two-to-four words (51%). Syntactic function is found to edge register in asserting influence and explaining different scenarios and contexts where we might or might not find postmodifier, together with its structural type and weight. In other words, register, which is reputed as a significant indicator of structural variation (Biber 2007, De Haan 1993, Schilk and Schaub 2016) is outweigh by syntactic function. The study further illustrates the structural simplification hypothesis in New Englishes by attesting that significant structural simplification is largely present in the postmodifier structure of the Nigerian English noun phrase.

Keywords: postmodifier, Nigerian English noun phrase, New Englishes, register, syntactic function and weight, structural simplification

1

1.0 Introduction

Several new varieties of English have empirically attested to the characteristic structural simplification hypothesis, but only little empirical evidence supporting the hypothesis has been provided, and more especially from the postmodifier structural constituent in Nigerian English noun phrase (Akinlotan et al 2017). The present study therefore contributes empirical evidence from the postmodification constituent in the noun phrase structure in Nigerian English, showing how postmodifier, together with relevant predictors, reflects the hypothesis. Given that the postmodification slot is a slot within the noun phrase structure that potentially can be as complex as an NP, then it is a perfect syntactic unit with which the tendency for structural simplification in new varieties of English can be measured. Together with variables representing syntactic function, register, and weight, three issues; (1.) occurrence/non-occurence, (2.) structural type, and (3.) structural weight, all of which insightfully relate to postmodifier, are comprehensively examined, in the light of structural complexity/simplicity. First, the occurrence/non-occurrence of a postmodifier within a NP signals structural complexity/simplicity. In (1), a postmodifier is realized but it is not realized in (2), which makes (2) simpler and shorter to (1).

(1)   My car which I just bought last week has been stolen
(2)   My car has been stolen

Secondly, the structural type of postmodifier (that is, choices among clause, prepositional phrase, adjective, and adverbial) also shows the extent to which complexity/simplicity is present. In (1) the postmodifier is a relative clause, rather than a prepositional phrase, adjective, or adverbial. Thirdly, the structural weight of postmodifier (i.e the measurement of the words length) is investigated, supporting findings in the structural type. In (1) the length is nine (9) words' length, which could be longer or shorter. These three phenomena are discussed in relation to three relevant variables representing register, syntactic function, and weight. In other words, these variables, which have been shown to be influential in structural choices (Schilk et al 2016, Akinlotan et al 2017, Brunner 2014, Biber et al 1998) will provide us with specific contexts where we might or might not find postmodifier, where we might or might not find simple or complex postmodifier, and where we might or might not find short/long (i.e. one, two, three, four, or longer) postmodifier. In addition to explicating the extent to which structural simplification is manifested by the postmodifier in Nigerian variety, specific scenarios explicating the nature of postmodifier in specific contexts in the variety will emerge, allowing specific comparisons and hypotheses for similar inner circle New Englishes.

2.0 Postmodifier and variables

2.1 Syntactic function

Several works, for examples Meunier 2000, Schilk et al 2016, Akinlotan et al 2017, have shown that the syntactic function a noun phrase performs within a clause structure influences its internal structure. Gisborne (2003) and Hudson-Ettle and Nilsson (2002) provided evidence about the relationship between syntactic positions and structure of the constituents of noun phrase within a clause structure. More specifically, Hudson-Ettle et al showed that premodifier complexity is influenced by the syntactic position occupied by the noun phrase that produces the premodifier. Furthermore, Schilk et al (2016) and Akinlotan et al (2017) showed that noun phrase at the subject position in a clause structure is structured simpler to noun phrase at other syntactic positions such as subject complement, preposition complement, direct object, etc. Following Gisborne (2003), Hudson-Ettle and Nilsson (2002), Schilk et al (2016) and Akinlotan et al (2017), it implies that a simplified noun phrase is one with fewer structural constituents. In other words, one or two structural elements (e.g. postmodifier) will not be realized in such simplified NP. Given that postmodifier is potentially the mostheaviest structural constituent, then subject noun phrase which, according to Akinlotan et al, is likely to be structured simpler, is likely to omit postmodifier. Therefore, on the basis of previous findings in Akinlotan et al, and Schilk et al, we expect that occurrence of postmodifier will be influenced by the syntactic position of the NP producing the postmodifier. More specifically, we expect postmodifier to occur infrequently in NPs at the subject position, while there is high frequency in NPs at other syntactic positions. Similarly, we expect simple postmodifier to associate with subject NPs, while complex postmodifier associates with NPs at other syntactic positions. Following this expectation, we can then expect that clausal

postmodifier will associate with non-subject NPs, while phrasal postmodifiers of any type (e.g. adjective, prepositional phrase) associate with subject NPs.

2.2 Register
Register, including its characteristics text type, and genre, has been established as an important variable in syntactic variation analyses, such as genitive alternation (Akinlotan 2016c, Rosenbach 2002), dative alternation (Bresnan et al 2007), particle placement (Gries 2003), noun phrase structures in new Englishes (Schilk et al 2016), definite article usages (Wahid 2013), and noun phrase complexity (Akinlotan et al 2017). Furthermore, Biber et al (1999), Halliday (1988), and Varantola (1984) have shown that register influences whether a noun phrase will realize a premodifier or not. Biber et al showed that academic text type, rather than non-academic text types such as literary works, is more likely to produce complex premodifier. In other words, non-academic texts are more likely to produce omit, and, when present, simple premodifier.

This pattern can be extended to postmodifier as well. Schilk et al (2016) and Akinlotan et al (2017) have shown that there is relationship between register and the likelihood of the occurrence of the different syntactic constituents (e.g. determiner, premodifier, postmodifier) in different varieties. In other words, the internal structure of NPs can be predicted on the basis of the texts that produce them. In Akinlotan et al (2017), postmodifier rarely occurs in interactional, literary, and student essays. Jucker (1992), who studied the internal structure of NPs in relation to text types (upmarket versus down market newspapers), found a significant relationship between the structure of NPs and the type of text that produces them. Jucker showed that up-market newspapers produce NP structural patterns that differ from those produce in down market newspaper. Specifically, down market newspapers produced more noun and names in prehead position than found in upmarket newspapers. Following previous studies, we expect a significant relationship between register and the occurrence, structural type, and complexity of postmodifier in our corpus. On the basis of previous findings, we expect higher occurrence of post modifier in academic texts than in other text types. In the same vein, we expect complex postmodifier (i.e of clausal type and of long length) to associate with media, academic, and popular texts. In other words, interactional, student, business, and literary texts are expected to associate with non-occurrence of postmodifier, and when occurred, should associate with simple postmodifier. More specifically, Biber (1999:578)'s assertion that the occurrence of postmodifier (and premodifier) is about the same frequency in media texts will be tested out in our corpus.

2.3 Syntactic weight
Syntactic weight has been found to be influential in different constructional choices and realizations. The overall structure (simple or complex) of a noun phrase has been found to be influenced by the syntactic weight/length of structural constituents or elements that make up the NP (Hawkins 1994, Bresnan et al. 2007, Wasow 1992, 2002). Akinlotan et al (2017) showed that the complexity of NPs in Nigerian English is influenced by the fact that certain structural constituents such as premodifier and/or postmodifier are likely to be omitted, or, where occurred, are structured simple. Therefore, the omission of a premodifier or a postmodifier constituent within a noun phrase structure will resultantly influence the overall weight of the NP that is produced. In other words, an NP that contains both premodifier and postmodifier at the same time will be heavier than NPs that do not or contain either. Therefore, the hypothesis of structural simplification in New Englishes can be explained in terms of syntactic weight of the overall NP, and also in terms of structural constituents.This suggests that the structural weight of (other) constituents making up a noun phrase can explain the presence and/or absence of a postmodifier. Hypothetically, and following Schilk et al (2016) and Akinlotan et al (2017) the weight of a postmodifier, if there is any, is likely to be influenced by the weight of a premodifier, or a complement, or even a head noun. This expectation will be tested out in our corpus data. Following findings in Barlage (2014), Schilk et al (2016), and Akinlotan et al (2017), we expect the weight in prehead slot to influence the presence/absence of a postmodifier. Where a postmodifier is present, the weight in the premodifier slot is expected to associate with the weight of the postmodifier. Since each constituent within the NP structure, especially the premodifier and post modifier slots, has potentially capacity for varying degree of syntactic weight, then we expect some kind of relationship between the length/weight of premodifier and postmodifier in our corpus data. For instance, Barlage found that the weight of a postmodifier contributes much more to the complexity of the overall NP than the weight of a premodifier does.

2.4 Occurrence/non-occurrence of postmodifier in varieties of English
Data on the distribution of postmodifier in varieties of English is scanty, Until Schilk et al. (2016), there was no work available showing specific distribution of the internal structure of noun phrase

3

in new varieties of English. The following distributions on the occurrence of the postmodifier in five different varieties of English are extracted from Schilk et al. who investigated the presence/absence of internal elements in NP in four different text type representing academic humanities, conversation, social letters, unscripted speeches. The syntactic functions of the NP, subject versus non-subject, are also accounted for. Schilk et al accounted for four levels of occurrence; (1) simple, which has neither premodifier nor postmodifier, (2) premodified, which has only a premodifier, (3) postmodified, which has only a postmodified, and (4) pre- and postmodified, which have premodifier and postmodified. In other words, (3) and (4) show presence/occurrence of postmodifier, while (1) and (2) show absence/non-occurrence of postmodifier. Following this interpretation, the following distributions on the occurrence and non-occurrence of postmodifier in five different varieties of English emerge. The five varieties of English represent Canadian (CAN), Hong Kong (HK), Indian (IND), Jamaican (JAM), and Singaporean (SIN).

Non-subject academic humanities

Occurrence	CAN		HK		IND		JAM		SIN
Postmodified	137	123		98		126		112	
Unpostmodified	114	95		147		109		130	

Subject academic humanities

Occurrence	CAN		HK		IND		JAM		SIN
Postmodified	35	46		47		58		52	
Unpostmodified	114	136		108		107		106	

Non-subject social letters

Occurrence	CAN		HK		IND		JAM		SIN
Postmodified	56	51		75		50		53	
Unpostmodified	176	165		179		160		170	

Subject social letters

Occurrence	CAN		HK		IND		JAM		SIN
Postmodified	14	9		13		13		15	
Unpostmodified	154	175		133		177		162	

3.0 Data selection and preliminary analyses

Noun phraseswere extracted from the 16 different text categoriesin the written component in the Nigerian section of the International Corpus of English (ICE). In order to compare results to other varieties, NPs from media and academic texts are also extracted from Ghanian and British varieties, using contemporary texts from BYU Corpus. Unlike ICE, BYU has a array of contemporary texts from a large number of varieties of English. Table 1 shows the proportion of NPs that were extracted from each category, and how these various 16 texts categories in the ICE-Nigeria are reconceptualised into 7 registers. For example, the table shows that editorial and reportage text types make up the media register, while exams and student essays make up the student register. Thescores in the table show the amount of NPs that each category produces. For examples, exams produce 710 NPs while humanities in popular register produces 280 NPs.Each text category contains different text materials from which I selected the first set of texts, which are identified accordingly. The selected texts are stated; AHum (1), ANsc (1), ASsc (1), ATec (1), Admin (1, 2, & 3), Business letter (1, 2, 3, & 4), Exams (1, 2, & 3), Novel (1 & 2), PopHum (1 & 2), Pop Natural Science (1), Pop Social Science (1 & 2), PTec (1 & 2), Reportage (1, 2, 3, 4, 5 & 6), Skills Hobbies (1, 2, 3, & 4), and Student essay (1, 2, &3). This implies that only the first text in Academic humanities, natural science, social science, and technical are used in the extraction process. Meanwhile, the first 6 texts are used in reportage category. The extraction procedure followed revised procedure in Akinlotan et al (2017) in which extracted NPs are those that are syntactically interchangeable. That is, they can be substituted in their respective syntactic positions by a noun or a pronoun. NPs that are combined (Biber et al., 1999), such as *ministers and ambassadors* in *the recently appointed ministers and ambassadorsof the Federal Republic of Nigeria*are identified as two constructions; (1) 'the recently appointed ministers of the Federal Republic of Nigeria' and (2) 'the recently appointed ambassadors of the Federal Republic of Nigeria'. Also, nominalised adjectives (Biber et al., 1999; Faragher et al. 2012), for examples, *the*

4

Nigerian, the sick, the rich, the masses, etc are extracted. As Table 1 shows, a total of 9352 NPs emerged.These 9352 NPs are subsequently annotated for their structures and different variables. First, different NP realizations are identified. A revision of Huddleston and Pullum (2002)'s NP theoretical framework of (D) (M) H C (M) (PD) are employed in identifying the NP structures. In the present study, (PD) is not recognized as an independent syntactic element, but as a semantic realization of a post modifier. In other words, our overarching NP framework is (D) (M) H C (M). Whether an NP is realized as D+H (the student), H+C+M (student of linguistics in year three), or as M+H+M (new President in old system) is identified. This classification allows a clear picture of the use (occurrence and non-occurrence) of the postmodifier, such that a distribution of postmodified and unpostmodified NPs emerge.

The syntactic functions the NP performs in the clause structure are identified. Eight syntactic functions, which follow from Akinlotan et al (2017), are identified. Table 2 shows syntactic functions and examples (Akinlotan 2017)[1] The weight of premodifier (preweight or prelength) and postmodifier (postweight or postlength) is measured by counting the word(s) that make them up. Once counted, they are categorised as P (postmodifier) or M (premodifier), which can be P1 (one-word postmodifier; e.g *downstairs*in *the room downstairs*), P2 (two-worded; e.g. *running away*in *the man running away*), P3 (three words; e.g. *beautiful African attire*in *the lady in beautiful African attire*),P4 (four words; *who spoke fifteen Nigerian languages* in*the teacher who spoke fifteen languages*), and so on. The same counting method is applied to the premodifier, as in M1 (e.g. the *large* room downstairs), and M2 (The *beautiful African* dress). In the counting method, prepositions, conjuctions, and determiners (except those that function as premodifiers, see Akinlotan 2017b) were excluded. Structural type of post modifier (postype) are also identified as clause (e.g. The man *who built the country* has died), adjectival (The money *available* is not enough), adverbial (The room *upstairs* is small), and prepositional phrase (The problem *with Nigeria political system*). Finally, NPs are also categorized on the basis of the registers that produce them. The NPs are then categorized into the seven registers aforementioned. Having completed the annotation, the independent effects of each variable and the emergent patterns of structural distributions are analyzed, using statistical methods of cross tabulation and chi square test. In other words, only the results of the independent behavior of the variables are presented in the present study.

4.0 Results
The independent effects of the variables representing register, syntactic function, and preweight are presented here. How the variables influence the use, structural types, and weight of postmodifieris shown. The distributions are followed by chi square test of independence, showing what kind of relationship exists between the predictors and the issues at hand. The results are presented in this order: a general description of the structural distribution, followed by the independent effects of the variables. On the basis of our revised NP framework, only eight structural realisations are possible when a post modifier is present. In other words, all these eight possible realisations are produced in our corpus, as can be seen in Table 4. However, there is significant difference in the distribution of these structural realisations. As can be seen, post modifier is most likely to co-occur with determiner (40%), whereas the presence of premodifier and complement seem to impact on the realisation of the postmodifier. As can be seen,post modifier is very much unlikely to occur as part of the most complex construction, such as D +M+H+C+M. Given the above scenario, it is then important to understand where we might or might not find post modifier on the basis of the syntactic functions, preweight, and registers that characterise them. These are important variables that make our analysis more precise.

4.2 Occurrence/non-occurrence of post modifier and its predictors
In this unit more precision about the occurrence and non-occurrence of the post modifier is sought on the basis of the syntactic functions the NP perform, the weight of the premodifier (preweight), and the register (i.e type of text) that produces them. Rather than a general statement, the following distributions will reveal the underlying pattern characterising the use of postmodifier in the Nigerian variety.

Table 5. Postmodifier occurrence and variables of register, syntactic function, and preweight.

	Postmodified NP		Unpostmodified NP		Total	
	n	%	n	%	n	%
REGISTER						

5

Academic	602	50	613	50	1215	100
Media	468	36	829	64	1297	100
Student	529	39	813	61	1342	100
Administrative	758	58	545	42	1303	100
Interactional	274	21	1002	79	1276	100
Literary	329	26	929	74	1258	100
Popular	472	39	734	61	1206	100
TOTAL	3432	39	5465	61	8897	100
SYNTACTIC FUNCTIONS						
Direct object	1074	91	109	9	1183	100
Indirect object	83	7	1138	93	1221	100
Object complement	13	4	357	96	370	100
Prepositional complement	851	97	28	3	879	100
Subject complement	479	33	962	67	1441	100
Apposition	54	2	2611	98	2665	100
Subject	795	78	222	22	1017	100
Adverbial	83	69	38	31	121	100
TOTAL	3432	39	5465	61	8897	100
PREWEIGHT						
M0	2110	37	3574	63	5684	100
M1	1143	41	1652	59	2795	100
M2	153	43	203	57	356	100
M3+	26	41	36	58	62	100
TOTAL	3432	39	5465	61	8897	100

4.2.1 Register and occurrence of post modifier

Previous studies have shown register as a powerful variable explaining structural variation (Biber et al 1999, Schaub 2016, Akinlotan et al 2017). As can be seen in Table 5,the relationship between register and occurrence of postmodifier is weak $\{\chi^2 (6) =516$ p<0.000}.However, the extent to which register explains the occurrence and/or non-occurrence of a post modifier within a noun phrase structure is still insightful. Media, student, interactional, literary, and popular registers are more likely to produce noun phrases without postmodifier (64%, 61%, 79%, 74%, and 61% respectively) than noun phrases with postmodifier (39%, 21%, 26%, and 39% respectively). On the other hand, administrative register is more likely to produce NPs with postmodifier (58%) than NPs without postmodifier (42%). Meanwhile the preference for a particular structural pattern does not emerge in academic register where the chance of producing NPs with postmodifier (50%) is just the same chance with producing NPs without postmodifier (50%).
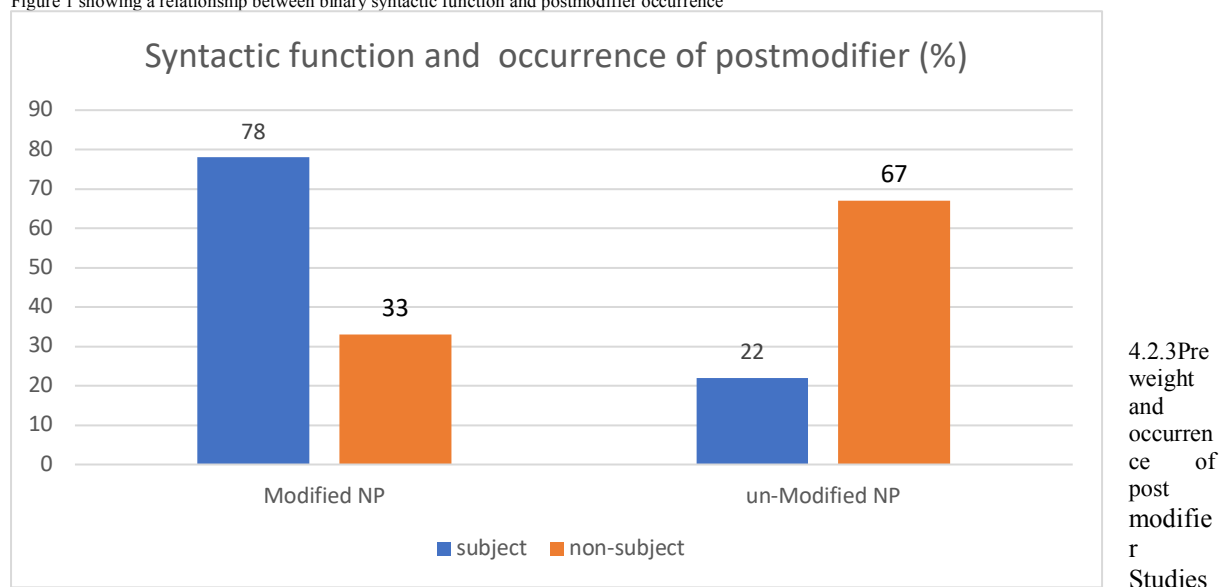
4.2.2 Syntactic functions and occurrence of post modifier

Akinlotan et al (2017), and Schilk et al (2016) have shown the important role that syntactic functions play in explaining structural variation viz-a-viz occurrence and non-occurrence of a constituent within a noun phrase structure. As Table 5 shows, the relationship between syntactic

6

functions and the occurrence of postmodifier is significant $\{\chi^2 (7) =5570\ p<0.000\}$; NPs at the indirect object, object complement, subject complement, and apposition positions are more likely to produce NPs without postmodifier (93%, 96%, 67%, and 98% respectively) than NPs with postmodifier (7%, 4%, 33%, and 2% respectively). Meanwhile, NPs at direct object, preposition complement, subject, and adverbial positions are more likely to produce NPs with postmodifier (91%, 97%, 78%, and 69% respectively) than NPs without postmodifier (9%, 3%, 22%, and 31% respectively). Unlike register, syntactic function appears to be stronger in explaining different scenarios where we might or might not find postmodifier within a noun phrase structure. Schilk et al (2016) shows how binary syntactic function can aptly present the influence of syntactic function on structural choices. Following this approach, a clearer picture of the strength of syntactic function emerges when a two-way dimension of subject versus non-subject syntactic positions is presented. Figure 1 shows a collapse of the eight syntactic functions into two syntactic functions; subject and non-subject NPs.

Figure 1 showing a relationship between binary syntactic function and postmodifier occurrence

4.2.3 Preweight and occurrence of post modifier

Studies have shown that there is a relationship between syntactic weight and structural variation (Hawkins 1994, Wasow 2002, Akinlotan 2016c). Akinlotan et al (2017) showed that the weight in the premodifier slot of a noun phrase contributes to the overall NP complexity. As Table 5 shows, the relationship between the weight of the premodifier (preweight) and the occurrence of the post modifier is weak $\{\chi^2 (3) =14.62\ p<0.002\}$; irrespective of the type of the preweight (M0, M1, M2, and M3+), noun phrases are more likely to be realized without postmodifier (63%, 59%, 57%, 58% and 58% respectively). When the noun phrase contains one word of a premodifier (M1), the NP is very much likely torealize NP without postmodifier (59%). The M1 preweight preferential pattern is repeated for M0, M2, and M3 preweight which, respectively, return 63%, 57%, and 54% preferences for NPs without postmodifier. The expected pattern is a strong relationship between M3+ preweight and NPs without postmodifier. Also, expectation was for M0 preweight to have a strong relationship with unpostmodified NPs.

4.3Postmodifier structural type and its predictors
Having shown where we might find or not find a postmodifier within the NP structure, then it is important to move closer to showing the structural types of the postmodifiers that are used. Postmodifier can be realised as a clause, a preposition phrase, an adverb, and an infinitive. On the basis of syntactic function, register, and preweight, insight into the structural type of postmodifier occurring with the NPs is provided. Given that clausal postmodifier is, potentially, the possible most complex postmodifier, then a high frequency can attest to the nature of postmodifier complexity in our corpus. Results from Ghanaian and British varieties are presented first.

4.3.1 Postmodifier structural types in Ghanaian and British Englishes

Table 5 showing distribution in Ghanaian variety by syntactic function and register

	Clause		Phrase		Adjective		Adverb		Total	
	n	%	n	%	n	%	n	%	n	%
Subject	141	27	324	62	51	10	3	0	519	100
Non-subject	144	20	541	77	19	3	3	0	707	100

7

	Clause		Phrase		Adjective		Adverb		Total	
Total	285	23	865	71	70	6	6	0	1226	100

	Clause		Phrase		Adjective		Adverb		Total	
	n	%	n	%	n	%	n	%	n	%
Academic	121	18	507	76	34	5	3	0	665	100
Media	164	29	358	64	36	6	3	1	561	100
Total	285	23	865	71	70	6	6	0	1226	100

As can be seen, postmodifier is more likely to be realized as a prepositional phrase (71%) than as a clause (23%), or adjective (6%). Adverb is very much unlikely to occur as a postmodifier. Furthermore, clausal postmodifier is more likely to occur in media text than in academic text, a pattern that is similar to distribution of phrasal postmodifier. Meanwhile, while clausal postmodifier is more likely to occur in subject NPs, phrasal postmodifier is more likely to occur in non-subject NPs.

Table 6 showing distribution in British variety by syntactic function and register

	Clause		Phrase		Adjective		Adverb		Total	
	n	%	n	%	n	%	n	%	n	%
Subject	121	33	221	60	21	6	5	1	368	100
Non-subject	275	39	391	56	19	3	19	3	704	100
Total	396	37	612	57	40	4	24	2	1072	100

	Clause		Phrase		Adjective		Adverb		Total	
	n	%	n	%	n	%	n	%	n	%
Academic	144	23	456	74	4	1	12	2	616	100
Media	252	55	156	34	36	8	12	3	456	100
Total	396	37	612	57	40	4	24	2	1072	100

Although at varying degree, British variety behaves similar to Ghanaian in that phrasal postmodifier is more likely to be used (57%) than clausal postmodifier (37%0. However, clausal postmodifier is more likely to occur in British variety (37%) than in Ghanaian variety (23%), while phrasal postmodifier is more likely to occur in Ghanaian (71%0 than in British variety (57%). While phrasal postmodifier (64%) is more likely than clausal postmodifier (29%) to occur in Ghanaian media text, the opposite is the case in British variety where clausal postmodifier (55%) is more likely than phrasal postmodifier (57%) to occur in media texts.

In the following sections, results from Nigerian variety is presented, and compare to both Ghanaian and British varieties where obtainable. Table 6 shows distributions across variables representing register, weight, and syntactic function.

Table 6. Post type and variables of register, syntactic function, and preweight.

	Clause		Prephrase		Adjective		Adverbial		Total	
	n	%	n	%	n	%	n	%	n	%
REGISTER										
Academic	133	22	389	65	46	8	34	6	602	100
Media	169	36	220	47	79	17	0	0	468	100
Student	167	32	346	65	16	3	0	0	529	100
Administrative	214	28	471	62	48	6	25	2	758	100
Interactional	142	52	90	33	42	15	0	0	274	100
Literary	126	38	171	52	21	6	11	3	329	100
Popular	157	33	261	55	45	10	9	2	472	100

8

TOTAL	1108	32	1948	57	29	79	79	2	3432	100
SYNTACTIC FUNCTIONS										
Direct object	324	30	658	61	64	6	28	3	1074	100
Indirect object	59	71	24	29	0	0	0	0	83	100
Objectcomplement	8	61	5	38	0	0	0	0	13	100
Prepositional complement	283	33	474	56	68	8	26	3	851	100
Subject complement	198	41	239	50	29	6	13	3	479	100
Apposition	13	17	26	33	15	19	0	0	78	100
Subject	205	26	456	58	111	14	23	2	795	100
Adverbial	23	28	41	49	14	17	5	6	83	100
TOTAL	1113	32	1923	56	30	19	95	3	3432	100
PREWEIGT										
M0	661	31	1261	60	147	7	41	2	2110	100
M1	345	30	561	49	136	12	10	19	1143	100
M2	57	37	25	16	55	36	16	10	153	100
M3+	12	46	10	38	3	12	1	4	26	100
TOTAL	1075	31	1857	54	341	10	159	5	3432	100

4.3.1 Register and structural type of postmodifier

The strong influence of register explaining variation in different languages and varieties have been established in the literature. As can be seen in Table 6, the relationship between register and structural type of postmodifier is significant $\{\chi^2 (18) =257\ p<0.000\}$. Interactional register, unlike academic (65%) and student 65%), is more likely to use a clausal postmodifier than any other structural type. It is noteworthy that academic (22%) is very much unlikely to produce clausal postmodifier. Given that clause is potentially complex, one would have expected such complex writing like academic to show more (or most) preference for clausal postmodifier. On the other hand, academic and student (we had expected a significant variation between these two registers, given the different levels of proficiency exhibited in their writings, see Akinlotan 2016a) are the registers that are most likely to use prepositional phrase postmodifier. Administrative (62%) also follows academic and student in the choice for prepositional postmodifier. Furthermore, media (17%) and interactional (15%) are the registers with the most likelihood to produce adjectival postmodifier, while student register is very much unlikely to produce the adjectival postmodifier type. More insight is provided by the use of adverbial postmodifier among the registers. As can be seen, media (0%), student (0%), and interactional (0%) show a knockout representing a negative relationship between adverbial postmodifier and these text types. Meanwhile, academic (6%), unlike media (0%) student (0%), and interactional (0%), shows positive relationship with the use of adverbial postmodifier within a noun phrase structure. A number of similarities and dissimilarities emerge when distributions in Nigerian variety are compared to the distributions in Ghanaian and British varieties.

If we extract and sum up distributions from academic and media texts in Nigerian variety, the following scenarios emerge: clausal (28%), phrasal (57%), adjectival (12%), and adverbial (3%). This distribution thus implies that relationship between register and postmodifier structural type in Nigerian variety is comparable to Ghanaian and British varieties in different respects. In terms of preferential pattern, Nigerian variety is more similar to Ghanaian (clausal 23%, phrasal 71%, adjectival 6%, and adverb 0%) than British (37%, 57%, 4%, and 2% respectively) variety. Although phrasal postmodifier is more likely than clausal postmodifier to be used in both

9

Ghanaian and Nigerian varieties, some evidence of regional variation is present in the preferential difference between 71% and 57% respectively. On the other hand, while adverb postmodifier is very unlikely to occur in Ghanaian variety (0%), it is very likely to occur in Nigerian variety (3%) just as it is in British variety (3%). More specifically, academic texts across the three varieties behave very similarly. That is, phrasal postmodifier is more likely than clausal postmodifier to be used in academic text in Nigerian (65% versus 22%), Ghanaian (76% versus 18%), and British (74% versus 23%), with a small variation. Whereas media texts across the varieties show larger difference; clausal postmodifier is more likely than phrasal postmodifier to occur in media text (55% versus 34%), while the opposite is the case in both Ghanaian and Nigerian varieties. In these outer circle varieties, phrasal postmodifier is more likely than clausal postmodifier to be used.

4.3.2 Syntactic functions and structural type of postmodifier
The syntactic position that a noun phrase occupies within a clause structure influences its structure and that of its constituents like premodifier and postmodifier (Schilk et al 2016). Also, stiff competition between syntactic function and register influencing constructional choices has been shown (Akinlotan et al 2017). As Table 6 shows, there is significant relationship between syntactic function and structural type of postmodifier $\{\chi^2 (21) =173 \ p<0.000\}$; NPs at indirect object (71%) and object complement (61%) positions are very much likely to produce NPs with clausal postmodifier. Expectedly, subject NPs (26%), which are usually simple-structured, are very much unlikely to produce NP with clausal postmodifier.Rather than clausal postmodifier, subject NPs seem to prefer prepositional phrase postmodifier (58%). The same pattern is exhibited by appositive NPs in which prepositional phrase postmodifier is the most preferred choice of structural type. Rather than clausal postmodifier, NPs at direct object (61%), prepositional complement (56%), subject (58%), and adverb (49%) positions would also prefer prepositional phrase postmodifier. While appositive NPs are very much unlikely to use clausal postmodifier, they are the most likely NPs of all the registers under study to produce adjective as postmodifier (19%). Adverbial NPs (17%) also follow appositive, with subject NPs also showing some choices. It is important to note that NPs at indirect object and object complement, which are more than any other register in realizing clausal postmodifier (71% and 61% respectively), exhibit a negative relationship (0% versus 0%) with adjectival postmodifier.

In order to compare patterns in Nigerian variety to those of Ghanaian and British, distributions for syntactic functions other than subject function are collapsed and distributed as non-subject functions. In this way, equivalent scenarios emerge from Nigerian variety, allowing for easy comparison. With percentages of non-subject distributions in Nigerian variety as clausal (34%), pharasal (56%), adjective (19%), and adverb (3%), it thus shows that prefential pattern in Nigerian variety is more similar to British (39% clausal, 56% phrasal, 3% adjective, and 3% adverb) than Ghanaian variety (clausal 20%, 77% phrasal, 3% adjective, and 0% adverb). On the other hand, postmodifier choices in subject NPs are very much related across the three varieties (with clausal at 33%, 27%, and 26% respectively for British, Ghanaian, and Nigerian varieties). Furthermore, Nigerian and British show some similarities in context where Ghanian variety behaves differently. For instance, there is a knock out in the use of adverb as postmodifier in Ghanaian variety, while British and Nigerian varieties show similar prefential pattern. In other words, while adverb is very unlikely to be used as postmodifier in either subject or non-subject NPs in Ghanaian variety, it is likely, and about the same chance, to be used in both Nigerian and British varieties.

4.3.3 Preweight and structural type of post modifier
Previous findings have shown that there is relationship between syntactic weight and constructional choices (Hawkins 1994, Wasow 2002). As can be seen in Table 6, the relationship between preweight and structural type of postmodifier is significant $\{\chi^2 (9) =278.5 \ p< 0.000\}$; when there is no premodifier (M0), the postmodifier is very much likely to be realized as a prepositional phrase (60%). Meanwhile, prepositional phrase is very much unlikely to occur when there is premodifier of two-word length (M2). Where there is premodifier of two-word length (M2), postmodifier is more likely to be a clause (37%) or an adjective (36%) than to be a prepositional phrase. Some possibilities for complexity within the NP structure in our variety is shown by the fact that three or longer premodifier (M3+) is associated with the clausal postmodfier. In other words, M3+ is more likely to associate with clausal postmodifier (46%) than prepositional phrase (38%) or adjective (12%). Meanwhile, adjectival postmodifier is most likely to occur with an NP that has a two-word premodifier (M2). The same scenario is found with adverbial postmodifier, which is most likely to occur with two-word length premodifier (M2).

6.0 Conclusion

10

In this paper, three issues relating to postmodifier have been discussed; occurrence/non-occurrence, structural type, and postweight. Our corpus shows that NP in Nigerian English is more likely not to produce postmodifier (61%) than to produce (39%). In other words, the overall structure of the noun phrase is more likely to be simple structured, given that postmodifier contributes significantly to the overall complexity of a noun phrase. This result supports the structural simplification hypothesis in new varieties of English (Gorlach 1998, Schilk et al 2016, Akinlotan et al 2017). Furthermore, the paper shows where we might or might not find postmodifier, on the basis of three determinants representing register, syntactic function, and preweight, which have been established in the literature as relevant to the phenomenon at hand. Table 8 shows a detailed summary of the analyses, explicating how each predictor behaves in relation to occurrence/non-occurrence, structural type and structural weight of postmodifier. Among many other findings, Table 8 shows that administrative, literary and interactional registers, rather than academic and media, relate more with structural complexity than expected. As Table 6 and 7 show, administrative, literary, and interactional registers are, rather than academic and media, more likely to produce varying degree of complex postmodifiers (P5-P8, P9+).Furthermore, the predictors exert varying degree of influence across the three issues investigated, such that there are patterns that emerge from each issue. For the postmodifier occurrence, we can see a pattern in which NPs in Nigerian English is likely to omit postmodifiers, which ultimately impact on the NP complexity. As for cases where we might find a postmodifier, syntactic function appears the strongest predictor, followed by the register, and then weight. For instance, the percentage differences[2] in syntactic function (82%, 86%, 92%, 94%, 34%, 96%, 56%, 38%) are not only higher than those in register (0%, 28%, 22%, 16%, 55%, 48%, and 22%) but are also equally divided along postmodifier and unpostmodified NPs, which allow us to make specific statement about more specific context of postmodifier use. Meanwhile there is stiff competition between register and syntactic function in asserting influence on postmodifier structural choices. As Table 8 shows, the percentage difference between syntactic function and register is very close. Yet, there is a pattern that emerges; prepositional phrase is the most likely postmodifier structural type, while adjective and adverbial are always almost not preferred choices. As can be seen, it is noteworthy that complex premodifiers (M2, and M3) associate with clausal postmodifier. This suggests that there is still some sort of complexity present in the structural realizations in New Englishes.

Table 8. A summary of the performance of the predictors in the three issues discussed

	Occurrence			Structural Type					Structural Weight			
	PM	UPM		CL	PP	ADJ	ADV		P1	P2-P4	P5-P8	P9+
REGISTER												
Academic (0) (43, 57, 59) (35, 37, 48)	+	+		-	+	-	-		-	+	-	-
Media (28) (11, 30, 47) (37, 58, 62)	-	+		-	+	-	-		-	+	-	-

---

[2]These are numbers in bracket for each predictor. They are derived from deducting the highest distribution from the lowest/other scores. For instance, occurrence in academic returns 50% for postmodified and unpostmodified, which (50%-50%= 0%) returns 0%, while media (64%-36%) returns 28%. The next line of bracket contains percentage difference for structural type. For example, the percentage differences for academic, following the method above, returns 43% (65%-22%), 57%, (65%-8%), and 59% (65%-6%). The third line of bracket is for postweight percentage difference, which is derived from the same method. For example, student's percentage difference returns 12% (54%-42%), 52% (54%-2%), and 51% (54%-3%).

11

	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10
Student (22) (33, 62, 65) (12, 52, 51)	-	+	-	+	-	-	-	+	-	-
Administrative (10) (34, 56, 60) (26, 26)	+	-	-	+	-	-	+	+	-	-
Interactional (58) (19, 37, 52) (24, 25, 44)	-	+	+	-	-	-	-	+	-	-
Literary (48) (14, 46, 49) (38, 47, 51)	-	+	-	+	-	-	-	+	-	-
Popular (22) (22, 45, 53) (6, 29, 45)	-	+	-	+	-	-	-	+	-	-

SYNTACTIC FUNCTION

	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10
Direct object (82) (31, 55, 58) (34, 52, 59)	+	-	-	+	-	-	-	+	-	-
Indirect object (86) (42, 71, 71) (5, 47, 36)	-	+	+	-	-	-	+	-	-	-
Object complement (92) (23, 48, 53) (8, 54, 54)	-	+	+	-	-	-	+	-	-	-
Preposition complement (94) (23, 48, 53) (20, 53, 53)	+	-	-	+	-	-	-	+	-	-
Subject complement (34) (9, 44, 47) (27, 39, 51)	-	+	-	+	-	-	-	+	-	-
Apposition (96) (16, 14, 19) (31, 46, 51)	-	+	-	+	-	-	-	+	-	-
Subject (56) (32, 44, 56) (24, 52, 56)	+	-	-	+	-	-	-	+	-	-
Adverbial (38) (21, 32, 43) (13, 56, 56)	+	-	-	+	-	-	-	+	-	-

PREWEIGHT

	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10
M0 (26) (29, 53, 58) (22, 48, 53)	-	+	-	+	-	-	-	+	-	-
M1 (2) (19, 37, 40) (19, 38, 43)	-	+	-	+	-	-	-	+	-	-
M2 (14) (21, 01, 27) (41, 56, 55)	-	+	+	-	-	-	-	+	-	-
M3+ (17) (8, 34, 42) (30, 65, 65)	-	+	+	-	-	-	-	+	-	-

References

Aarts, F. 1971. 'On the distribution of noun-phrase types in English clause-structure.' *Lingua*,26, 281–93. doi: 10.1016/0024-3841(71)90013-1

12

Alo, Moses & Rajend Mesthrie. 2008. Nigerian English: morphology and syntax. In Rajend Mesthrie (ed.), Varieties of English. Africa, South and Southeast Asia, 323-339. Berlin: Mouton de Gruyter.

Anthony, L. 2014. AntConc (Version 3.4.3) [Computer Software]. Tokyo, Japan: Waseda University. Available from http://www.laurenceanthony.net/

Akinlotan, M. and Housen, A. 2017 'Noun phrase complexity in Nigerian English: Syntactic function and length outweigh genre in predicting noun phrase complexity', *English Today*, pp. 1–8. doi: 10.1017/S0266078416000626.

Akinlotan, Mayowa (2016a). The effects of structure and proficiency on determiner number (dis) agreement in Nigerian noun phrase'. In: Antonio Moreno Ortiz and Chantal Perez-Hernandez (Eds.), Proceedings of the CILC2016 8th International Conference on Corpus Linguistics. Malaga: Spanish Association for Corpus Linguistics, pp. 1-8. http://easychair.org/publications/paper/ (epic series in language and linguistics)

Akinlotan, M. 2016c 'Genitive alternation in New Englishes: the case of Nigerian English' *Token: A Journal of English Linguistics,* pp. 59-73, vol 5 (2) Jan Kochanowski University Press

Babalola, E. T.2010. *Nominal Group in Standard Nigerian and American English: A Systemic Linguistics Description*. Saarbrucken, Deutschland: Verlag Dr. Muller Aktiengesellschaft & Co. KG.

Behaghel, O. 1909. Beziehungen zwischen Umfang und Reihenfolge von Satzgliedern. *Indogermanische Forschungen, 25, 119-142*

Berlage, E. 2014. *Noun Phrase Complexity in English*. Cambridge: Cambridge University Press. doi: 10.1017/cbo9781139057684

Biber, Douglas, Stig Johansson, Geoffrey Leech, Susan Conrad, & Edward Finegan. 1999.*Longman Grammar of Spoken and Written English* (9th ed.). Harlow: Longman.

Biber, Douglas et al. 1998. *Corpus Linguistics: Investigating Language Structure and Use*. Cambridge: CUP.

Bresnan, J., A. Cueni, T. Nikitina and R. H. Baayen 2007. Predicting the dative alternation. In: G. Bouma, I. Kramer and J. Zwarts (eds), *Cognitive foundations of interpretation, 69-94.* Amsterdam: Royal Netherlands Academy of Science

Brunner, T. 2014. 'Structural nativization, typology and complexity: Noun phrase structures in British, Kenyan and Singaporean English.' *English Language and Linguistics*, 18, 23–48. doi: 10.1017/S1360674313000269

Cayer, R., & Sacks, R. 1979. Oral and Written Discourse of Basic Writers: Similarities and Differences. Research in the Teaching of English, 13, 121-128.

Crystal, D. 2004 *Rediscover Grammar* (3rd ed.). Harlow, UK: Pearson Education.

De Haan, P. 1993. Sentence length in running text, in Souter, C. & E. Atwell (eds.), *Corpus-based computational linguistics*. 147-161. Amsterdam: Rodopi.

Gisborne, N. 2003. 'Relative clauses in Hong Kong English.' *World Englishes*,19, 357–71. doi: 10.1111/1467-971X.00184

Gorlach, M. 1998. 'Varieties of English world-wide: Where we stand.'*Links & Letters*, 5, 13-36.

Gries, S. Th. 2002 'Evidence in linguistics: Three approaches to genitives in English'. in: R.M. Brend, W.J. Sullivan and A.r. Lommel (eds.) *LACUS Forum XXVIII: What constitutes evidence in linguistics?* pp. 17-31. Fullerton, CA: LACUS.

Gries, S. Th. 2003. 'Multifactorial analysis in corpus linguistics: *A study of particle placement.* New York: Continuum Press.

Hawkins, J. A. 1994. *A performance theory of order and constituency.* Cambridge: Cambridge University Press.

Hillier, H. 2004. *Analysing Real Texts: Research Studies in Modern English Language*. Basingstoke, England: Palgrave MacMillan.

Huddleston, R. & Pullum, G. K. 2002. *The Cambridge Grammar of the English Language*. Cambridge: Cambridge University Press.

Hudson-Ettle, O. and T. Nilsson. 2002. 'Orality and noun phrase structure in registers of British and Kenya English.' *ICAME Journal* 26, 33-62

Jucker, A. H. 1992. *Social Stylistics: Syntactic Variation in British Newspapers.* Berlin: Mouton de Gruyter.

Kperogi, A. Farooq. 2015. Glocal English: The changing face and forms of Nigerian English in a global world. New York. Peter Lang Inc Publishers

Lamidi, Mufutau T. 2007. "The noun phrase structure in Nigerian English". *Studia Anglica Posnaniesia* 42:238-250

Meunier, Fanny. 2000. *A corpus linguistics approach to interlanguage grammar: noun phrase complexity in advanced learner writing*. Unpublished PhD dissertation, Université Catholique de Louvain, Louvain-la-Neuve.

13

Pastor, L. C. 2008. 'English complex noun phrase interpretation by Spanish learners.' *RESLA,* 21, 27-44. Online at

Rosenbach, A. 2002 *Genitive Variation in English. Conceptual Factors in Synchronic and Diachronic Studies*. Berlin: Mounton de Gruyter.

Rosenbach, A. 2005 'Animacy versus weight as determinants of grammatical variation in English' in: *Language* 81 (3), pp. 613-644

Schilk, M. and Schaub, S. 2016. 'Noun phrase complexity across varieties of English: Focus on syntactic function and text type.' *English World-Wide*,37(1), 58-85.

Tagliamonte, Sali & R. Harald Baayen. 2012. Models, forests, and trees of York English: Was/were variation as a case study for statistical practice. *Language Variation and Change*24(2). 135–178. doi:10.1017/S0954394512000129.

Wasow, T. 2002. *Postverbal Behavior.* Stanford, CA: CSLI Publications.

Wunder, Eva-Maria, Holger Voormann, and Ulrike Gut. 2010 "The ICE Nigeria corpus project: Creating an open, rich and accurate corpus." *ICAME Journal* 34: 78-88.

14

Vocabulary Learning Vs. Vocabulary Acquisition

Dr. Abraham Chang
Taylor University

Han Chang
Taylor University

Won Chang
Taylor University

Greta Kiers
Taylor University

Anna Meyer
Taylor University

Abstract

According to Ferdinand Saussure's model of the linguistic sign, the "language acquisition" that children experience involves the establishment of the "signified" in the child's mind. In contrast, adults experience "language learning" when introduced to a second language (L2). The "signified", already present, needs only to be linked to the new vocabulary. While previous studies support the use of graphic illustration in textbooks and multimedia as effective tools for learning L2 vocabulary among children (Moeller 2009), the same may not apply to the adult learner, although it is increasingly popular. The learner's age is a critical distinction.

To compare graphic and written approaches, a target group of beginner level Spanish students at XXXX University was evaluated for retention of new vocabulary following the use of both methods. Results indicate that the written method of instruction may be just as effective for adults, if not more, than the graphic. A significant finding is that notable positive benefits from using the illustrative approach were not evident. In conclusion, the effectiveness of

the written method has implications for the publication and the presentation of materials used for teaching foreign languages, and may benefit from further study.

1 Introduction

This study begins with a description of the approach to this project under the title 'Literature Review'. It includes a brief overview of research relevant to the acquisition of vocabulary in a second language, including the work of Noam Chomsky and Ferdinand de Saussure. It also examines the variety of ways that vocabulary can be represented in dictionaries, a common learning tool.

Following this, the details of the 'Research Procedure' are presented, including the formation and selection of vocabulary lists, the methods of presentation and testing, and the structure of the student groups involved. Next, the method of comparing the collected data is described and a summary of the 'Results' is provided in both written and graphic form.

The results from each group are analyzed separately at four distinct time periods and then combined to demonstrate an overall trend. With each stage of the project taken into account, the 'Conclusion' is presented and the significance of the findings is addressed as well as the potential for further investigation.

2 Literature Review

The theoretical framework of this study is informed by Ferdinand de Saussure's model of the linguistic sign, the ideas of Noam Chomsky, and various studies regarding modern dictionaries.

Saussure's Model of the Linguistic Sign

One of the principal linguistic schools of thought from which this study draws is that of Ferdinand de Saussure, a renowned Swiss linguist whose theories and teachings were foundational to modern linguistics. His recognition and fame is sourced principally from his work as a professor at the University of Geneva, of which his lecture notes were later compiled by his colleagues and published as a book entitled *Course in General Linguistics* (Encyclopedia Britannica). Although the book contains information regarding the entire science of linguistics, the specific concept which is applicable to this study is that of the linguistic sign. According to this theory a linguistic unit, or "sign", consists not of a thing and its name, but of a concept and a sound image. The concept is defined as the object or idea that is being communicated by the sound image, and the sound image is defined as the psychological imprint of a physical sound. One must note that the sound image is unique and separate from the physical sound itself. Saussure designates the word "signifier" for the sound image, and the word "signified" for the concept, while maintaining the word "sign" to refer to the whole created by the association between the sound image and concept (Saussure 1959).

One characteristic that Saussure attributes to the sign is that the association between the signifier and signified is arbitrary. This means that there is no intrinsic characteristic of the signified which necessitates the use of its specific signifier as opposed to any other signifier (Saussure 1959). Saussure also discusses how a sign can be identified and what gives it its value. He proposes that a sign is identified not by its positive content (i.e. what it is), but rather by its negative relation to other signs in the same language (i.e. what it is

not). It does not have any independent character, but is instead defined by its differences from other signs. A sign represents the same concept over and over again because it has a consistent relationship between the sign itself and the rest of the signs within that language (Bredin 1984). Some scholars question the accuracy of this manner of relationally identifying and assigning value to signs (Bredin 1984). However, other scholars defend Saussure's work (Harris 1983).

Saussure's model of the linguistic sign can be used in relation to both primary language acquisition and secondary language learning. There are many cognitive, environmental, and social factors that contribute to and affect the process of acquiring one's first language. As children learn, they "map" new meanings to words as they encounter them in social or environmental interactions (Rice 1989). When infants and toddlers are acquiring their first language, a fascinating process occurs around the age of two called "fast-mapping", in which children are able to learn and retain new words with very little exposure (Gershkoff-Stowe & Hahn 2007). Not much is known about how this process occurs, but in one study done on fast-mapping, researchers proposed that infants acquire concepts before acquiring the accompanying sound forms (Gershkoff-Stowe & Hahn 2007). It would be a logical step to apply Saussure's model by saying that when one *acquires* one's primary language, one simply links a new sound image to a preexisting or newly learned concept. This would differ from how one *learns* a second language. When learning a second language, one would link the new word (in the second language) to a pre-existing sound image (in the first language) that is already linked to a concept.

The Ideas of Noam Chomsky

American linguist Noam Chomsky put forth several ideas that greatly affected the field of second language acquisition study. One of these is the concept of what Chomsky calls the "Language Acquisition Device". He proposed that this device, which is innately present in a child's brain, allows them to develop intuitions about what is grammatically correct or incorrect in the acquisition of their first language. However, Chomsky is most well-known for Universal Grammar, which is the term he used for the idea that all human languages are governed by a series of abstract linguistic principles, and that these principles function differently in each language. While these principles are supposedly innately present in the brain of a child, they function differently depending on which language the child acquires first (Klee & Koike 2013).

Noam Chomsky's works and ideas might prompt one to question the acquisition of language (or a second language) for people of all ages, both children and adults. Does the Language Acquisition Device also serve in the acquisition of one's second language as an adult, and not just in one's primary language as a child? What kinds of similarities and differences are there in the acquisition of language between children and adults?

Research has been done that suggests that adult second language learners are much more dependent on their syntactic understanding than children are. The difference is primarily due to two reasons: (1) the development of the brain in adults and the deterioration of the language learning ability of the brain, while the brain of the child has yet to be fully lateralized; (2) there are fundamental differences between the two age groups when learning a new language. Children, when learning a new language, have the ultimate goal of socialization. Their need to talk, share their thoughts, and get others' attention are all strong motivators for children to learn the language. This is not so true for the adults, and the lack of these motivations may be an accompanying reason to why it is more difficult to learn a new language as an adult learner (Homstad 1987). These differences between the two age groups do not necessarily indicate that their language acquisition is different all together.

The two groups also have two important aspects in common when learning a new language: (1) individual variability, which is "their ability to perceive, conceptualize, store, and access information; and their motivations" (Rice 1989:150); (2) their learning environment. It is imperative that both children and adults get to hear and interact with the target language. Thus, different, variable, and, most importantly, effective teaching methods must be implemented for the acquisition of a second language.

Dictionaries and Second Language Acquisition

There is a wide variety of dictionaries available for use in many different learning situations. Specifically in the area of second language acquisition, the value of a particular dictionary depends on its ease of usability, its accuracy, its thoroughness, and its effectiveness in enhancing the learning process. One purpose of this research is to evaluate the advantages and disadvantages of different types of dictionaries, specifically graphic vs. written, in the context of an experimental study of new vocabulary acquisition.

A bilingual dictionary can be available in an alphabetical format with written headwords in one language and written definitions in the other. The headwords and written definitions are then displayed in the opposite languages. This format provides an efficient method of accessing the translation equivalents from either language, making bilingual dictionaries useful for both the active process of encoding (writing and speaking the second language) and the passive process of decoding (reading and understanding the second language) (Stark 2011).

Studies have shown that bilingual dictionaries have the advantage of effectively relating new language material with one's native language. This supports learner comprehension by providing contrasts between the two languages and their respective cultures as well as by providing psychological assurance in exploring the unknown (Lew & Adamska-Salaciak 2015). A further benefit is their ability to deal with anisomorphism, which is the "mismatch between a pair of languages due to their semantic, grammatical, and cultural differences" (Stark 2011:18). These qualities promote translation accuracy, enhance usability, and inspire confidence for the second language learner.

Bilingual dictionaries can be further supplemented by the use of images or illustrations. Traditionally, this has been done with children as the intended learning audience. There are some practical limitations for the use of images due to the increased need for space on the dictionary page and the higher cost for producing illustrations in color. Pictorial dictionaries are also more effective when representing concrete nouns and certain concepts which are easier to explain diagrammatically, but are less successful in demonstrating other word forms such as adverbs, verbs, and adjectives (Svensén 1993). For these reasons, a pictorial dictionary is more likely to be constructed around certain themes instead of alphabetically.

In a thematically arranged picture dictionary, "the user proceeds from the pictorial representation of the referent to its corresponding linguistic sign" (Stark 2011:122). Surveys of adult use of bilingual thematic dictionaries have shown that they are able to efficiently convey and clarify meaning and are helpful for remembering vocabulary. They have the unique ability to demonstrate vocabulary in particular contexts, which also aids in comprehension (Stark 2011). The quality, appearance, and placement of illustrations and their translation equivalents are factors which relate to the effectiveness of their use in a bilingual picture dictionary. A thematically arranged table of contents and bidirectional indices also contribute significantly to the ease of usability.

Effective vocabulary instruction utilizes a variety of explicit teaching methods. These can include the presentation of material in an organized manner that promotes the formation

of connections between first and second language vocabulary, encourages a deeper level of language processing, and leaves a lasting memory impression (Sökmen 1997). The bilingual thematic dictionary is a vital contributor to this learning process.

The authors of this study apply the ideas and research presented in this literature review in the following way: in the process of learning vocabulary with the written alphabetic dictionary, the learner simply associates the new phonic component of the second language with the preexisting word image of their first language, which triggers retrieval of the concept. This implies that one grasps the meaning of the new vocabulary via the phonic component of one's primary language. However, in the case of the visual dictionary, the learner is provided with a graphic referent, which establishes the concept of the word in their mind in place of the sound image. Thus, it could be said that the mental process that occurs when using the visual dictionary is somewhat similar to the process used when acquiring one's first language, while the mental process occurring when using a written dictionary is similar to that used when learning a second language. With that said, it might seem that textbooks and instructional material that use graphic vocabulary would be more helpful to the adult second language learner. However, the authors of this study propose that for language classes in which students are adults and for which there is a limited amount of time and resources, the use of the traditional written approach is still very useful and effective, if not more so, than the visual graphic approach.

3 Research Procedure

The first step in this study involved making lists of Spanish vocabulary in the three categories of nouns, verbs, and adjectives. Lists of 20-24 words were chosen to present to the students to evaluate their familiarity with them. Each student chose between 3 levels of familiarity:

       a.   I do not know this word.
       b.   I know this word. It means _____ (English translation).
       c.   I know this word and can use it in a sentence: _____.

These lists were carefully evaluated and any commonly-known words were eliminated from the final testing lists to guarantee minimal exposure to those words being used for evaluating learning.

The next step involved creating the vocabulary presentation for four classes of SPA 102, an introductory level of Spanish. A list of 30 containing 10 words from each category (adjectives, nouns, verbs) was chosen, and then divided into 2 sets (#1 and #2), so that each set contained 5 words from each category. Both sets were used to make 2 distinct power point presentations, one in which the vocabulary in Set #1 was displayed graphically and the vocabulary in Set #2 displayed orthographically in Spanish. The group of students who were shown this power point is labeled Group 1. In the second power point the opposite was true: Set #1 showed the written word and Set #2 showed the image of the word. The group of students who were shown this power point is Group 2.

The classes were divided into 2 groups, with each group containing two of the four classes of students. The classes were tested over a four-week period during the spring semester of 2016. The first group of students was taught 30 vocabulary words using the Group 1 power point and oral repetition. On those same days, the second group of students was taught using the Group 2 power point and oral repetition. Each image or word was displayed for 1 – 2 minutes to allow the students time to understand its meaning and practice the pronunciation.

Following this, the students were asked to complete a test. Each test paper had a list of the 10 adjectives, 10 nouns, and 10 verbs in Spanish to which the students had been exposed,

both graphically and orthographically. The tests for each group were exactly the same, while the teaching method used for the word lists was the opposite. The students filled in the blank following the Spanish word with the English counterpart, if it was known.

The second testing session was held the following week. Each group of students viewed the same vocabulary in the same manner as they had previously, with testing following a brief oral and visual review. Testing was repeated the following two weeks, each time without any review of the vocabulary or use of power point. The data acquired after each session was then compiled for further evaluation. Out of the 71 students enrolled in the four classes, 43 of them were present for all four testing sessions.

4 Results

Although the experiment was performed on Group 1 and Group 2 simultaneously, the results were analyzed separately for each respective group, treating them as two separate experiments. A paired samples t-test was performed for each group for Time 1 through 4. With regards to the mean of the paired differences for any given pair of variables, a negative mean indicates a better performance using the visual approach, and a positive mean indicates a better performance using the written approach. A significance level of .05 or smaller indicates significance. The following table shows an example of one of the tables used to organize the analyzed data:

Paired Variables	Mean (SD)	t-value	df	Significance (2-tailed)
Pair 1 (all words)	-0.321 (2.41)	-0.71	27	0.485
Pair 2 (adjectives)	-0.107 (1.45)	-0.39	27	0.699
Pair 3 (nouns)	0.357 (1.06)	1.78	27	0.086
Pair 4 (verbs)	-0.571 (0.96)	3.15	27	0.004
Note: All variable pairs assume the written method minus the visual method				

Table 1: Results of Paired Samples Test for Group 1 at Time 1.

In the compilation of results for Group 1 at Time 1-4, six of the paired differences achieved significance. Four of them were those for which the written approach was found to be more effective. It was also noted that for Time 3 and 4, when the students were not exposed to the words directly beforehand, the only paired differences that achieved significance were those for which the written approach was more effective. The results from Group 2 at Time 1-4 showed that eight of the paired differences achieved significance. Six of the eight were those for which the written approach was found to be more effective. Again, it was noted that for Time 3 and 4, when the students were not exposed to the words directly beforehand, the only paired differences that achieved significance were those for which the written approach was more effective.

Finally, the results from each group were combined into one large group and analyzed, disregarding the variation in the vocabulary words that were presented to each group. The following summary table shows the combined results for Group 1 and 2 at each testing session (Time 1-4):

Time 1	Mean difference	More effective pedagogy	Statistically significant?
Total	-.357	Visual	No
Adjectives	.411	Written	No
Nouns	-.214	Visual	No
Verbs	-.554	Visual	Yes
Time 2			
Total	.4138	Written	No
Adjectives	.4310	Written	Yes
Nouns	.1552	Written	No
Verbs	-.1930	Visual	No
Time 3			
Total	.783	Written	Yes
Adjectives	.5000	Written	Yes
Nouns	.1333	Written	No
Verbs	.1500	Written	No
Time 4			
Total	.917	Written	Yes
Adjectives	.467	Written	Yes
Nouns	.283	Written	Yes
Verbs	.167	Written	No

Table 2: Summary Table – Combined Groups at Time 1 through 4.

As can be seen above, six of the seven variable pairs that achieved significance were those for which the written approach was more successful. Again, the only pairs that achieved significance at times 3 and 4 were those for which the written approach was more successful.

The data was then compiled into individual graphs to show the mean number of questions correct over time for each group, without accounting for statistical significance. For both Group 1 and Group 2, it was noted that at other than Time 1, the Total mean # of questions correct was greater using the written method.

Figure 1 below shows a graph of the mean number of questions that were answered correctly by Groups 1 and 2 combined over the four different times. The graph shows the trends of the total words written, the total words visual, and the three different kinds of words, all in relation with one another. These are independent of statistical significance. Note that at other than Time 1, the total mean # of questions correct was greater using the written method.

Although much of the data does not exhibit significance, there are consistent trends that can be seen in those that do exhibit significance. In Group 1, Group 2, and the Combined Group, the only "Totals" (i.e. the difference of the means for the total # of questions correct) that achieved significance at any given time were those for which the written method was more effective. Additionally, although it does not account for significance, it is worth noting that in Figures 1, 2, and 3, the mean # of questions correct using the written method was almost always larger than that of the visual method for any given variable pair, and that the difference tended to increase at each Time.
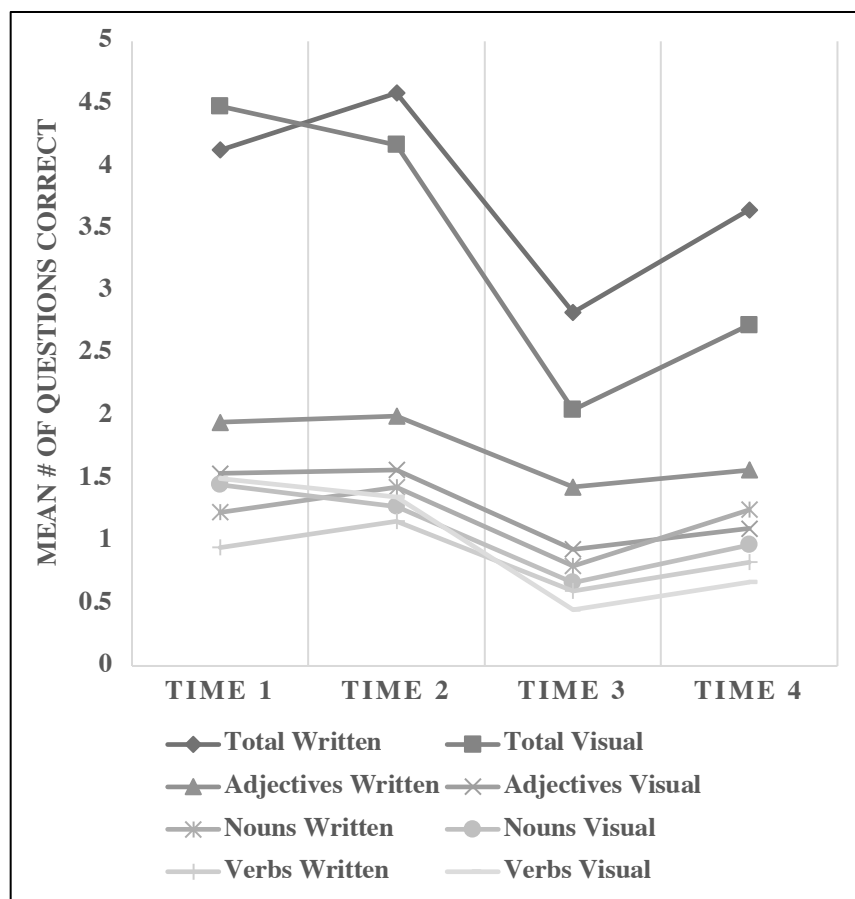
Figure 1: Groups 1 & 2 Combined – Mean # of Questions Correct at Time 1, 2, 3, 4.

5 Conclusion

The trends shown in the results section suggest that in the recall of words using long term memory, the written method could be more effective for adult learners than the visual method over a longer period of time. The data does not show definitive evidence by which to conclude that the written method is indeed more effective than the visual method, as hypothesized, but neither does it show that the visual method is more effective than the written method, as may be popularly assumed. However, it does present a case for this research experiment to be repeated or for another research experiment of similar style to be done. This study was limited in that the sample size was fairly small (n=71). It would be worthwhile to perform the experiment again with a larger sample size.

The results of this study may have implications for textbook publishers, teachers, and students who are adult learners. Textbook publishers may want consider the enduring success of the traditional written approach in second language acquisition when deciding how to format their books and how many graphics to use. Teachers may want to consider this also when deciding what kind of activities to use to teach vocabulary to their students.

Lastly, adult learners may want to consider these results when deciding how to study on their own, and how to most effectively acquire new vocabulary in a second language.

References

Bisson, M. J., Heuven, W. J., Conklin, K., & Tunney, R. J. (2014). The role of repeated exposure to multimodal input in incidental acquisition of foreign language vocabulary. *Language Learning*, *64*(4), 855–877.

Bredin, H. (1984). Sign and value in Saussure. *Philosophy, 59*(227), 67-77.

Collins, J. (2009). The limits of conceivability: Logical cognitivism and the language faculty. *Synthese, 171*(1), 175-194.

De Saussure, F., & Baskin, W. (1959). Course in general linguistics (1915). *New York: Philosophical Library*.*[JL]*.

Ellis, R. (1993). The structural syllabus and second language acquisition. *Tesol Quarterly, 27*(1), 91-113.

Even, S. (2008). Moving in (to) imaginary worlds: Drama pedagogy for foreign language teaching and learning." *Die Unterrichtspraxis/Teaching German, 41*(2), 161-170.

Ferdinand de Saussure. (n.d.). In *Encyclopaedia Britannica Online*. Retrieved from https://www.britannica.com/biography/Ferdinand-de-Saussure

Gershkoff-Stowe, L, & Hahn, E. R. (2007). Fast mapping skills in the developing lexicon. *Journal of Speech, Language, and Hearing Research, 50*(3), 682-697.

Harris, W. V. (1983). On being sure of Saussure. *The Journal of Aesthetics and Art Criticism, 41*(4), 387-397.

Homstad, A. (1987). Neurolinguistic and psycholinguistic research on learning modes of older language learners: Classroom implications. *Hispania, 70*(2), 374–380.

Jones, L. (2004). Testing L2 vocabulary recognition and recall using pictorial and written test items. *Language Learning & Technology, 8*(3), 122-143.

Kellogg, G. S., & Howe, M. J. (1971). Using words and pictures in foreign language learning. *Alberta Journal of Educational Research, 17*(2), 89–94.

Koike, D. A., & Klee, C. (2013). *Lingüística aplicada: Adquisición del español como segunda lengua*. New York: Wiley.

Lew, R., & Adamska-Sałaciak, A. (2014). A case for bilingual learners' dictionaries. *ELT Journal, 69*(1), 47–57.

Mackey, A, & Sachs, R. (2012). Older learners in SLA research: A first look at working memory, feedback, and L2 development. *Language Learning*, *62*(3), 704–740.

Moeller, A. K, Ketsman, O., & Masmaliyeva, L. (2009). The essentials of vocabulary teaching: From theory to practice. *Faculty Publications: Department of Teaching, Learning and Teacher Education*: 171.

Newmeyer, F. J. (1994). A note on Chomsky on form and function. *Journal of Linguistics, 30*(1), 245–251.

Rice, M. L. (1989). Children's language acquisition. *American Psychologist, 44*(2), 149-156.

Sökmen, A. J. (1997). Current trends in teaching second language vocabulary. *Readings in Methodology, 152*.

Stark, M. (2011). *Bilingual thematic dictionaries* (Vol. 140). Walter de Gruyter.

Svensén, B. (1993). *Practical lexicography: Principles and methods of dictionary-making*. Oxford University Press.

Yang, F. C. O., & Wu, W. C. V. (2015). Using mixed-modality learning strategies via e-Learning for second language vocabulary acquisition. *Educational Technology & Society, 18*(3), 309–322.

More characters, longer speech:
Effects from orthographic complexity in Japanese

Shannon Grippando
University of Arizona[1]

ABSTRACT
Previous research found a significant correlation between the spelling of a sound and speech duration: all else being equal, the more letters in the orthographic representation of a sound, the longer the speech duration of sound of that sound (Brewer, 2008). For example, the coda /κ/ in click *is longer than the /κ/ in* tic*. This effect had previously only been studied in English, a language with an alphabet, and was described in terms of letter length. I investigate this effect in Japanese, a language with a logographic character-based orthography, through potentially analogous forms of* orthographic complexity *to English's letter length: 1) the number of pen strokes in a character and 2) the number of whole characters that compose a word. It was hypothesized that the higher the orthographic* complexity *of an orthographic form (pen strokes/characters), all else being equal, the longer the speech duration for that word. No significant effect was found for pen strokes on speech duration. However, two-character words were produced significantly longer than one-character words. These results show that the orthographic duration effect is not limited to languages with alphabetic systems. Thus far evidence suggests that whole, independent orthographic units (letters/character) can influence speech duration but not character-internal units (pen strokes).*

1 INTRODUCTION
1.1 Orthographic Effects on Speech Duration

According to interactive theories of language, distinct facets of language can influence one another (e.g. Dell 1986; Van Orden & Goldinger 1994). For example, orthographic representations have been shown to affect the perception of aurally presented-stimuli (Seidenberg & Tanenhaus, 1979). While the influence of orthography on speech perception has been studied extensively (Chéreau & Dumay 2007; Dijstra, et al. 1995; Halle et al. 2000; Morais et al. 1989; Perre et al., 2009; Slowiaczek et al. 2003; Taft & Hambly 1985; Ventura Kolinsky et al. 2001; Ziegler & Ferrand 1998), the extent to which orthographic information interacts with speech production is still contested. Some

studies argue that orthographic information can affect spoken language (Damien & Bowers, 2003; Rastle et al., 2011). Others contest that observed effects are not actually orthographically driven but a result of the task or memorization strategies (Alario, et al., 2003; Bi et al., 2009; Chen, et al., 2002; Roelfs, 2006).

      Most of these previous studies focused mainly on measures of reaction time and error rates. Brewer (2008) noted that these might be less than ideal metrics, arguing that naming latencies might be more informative of orthographic influence on lexical access than on actual production. In other words, while lexical access is an essential step in the production of speech, it is an early-stage process that is in itself separate from the physical articulation of words. Thus, Brewer turned her attention to measuring the spoken durations of sounds and words as a means to investigate orthographic effects on speech. She showed that the spoken duration of English segments is influenced by the number of letters in a segment's orthographic representation. For example, *tic*, *click*, and *clique* all contain word-final /κ/. However, /κ/ is orthographically represented by one, two, and three letters, respectively. Brewer discovered that the more letters in a sound's orthographic representation, the longer the speech duration of that sound. Each additional letter in a sound's representation resulted in a 9.5-28 ms durational increase in that sound. Additionally, there was an independent 36 ms durational increase across the entire word duration per letter. This effect was found in both behavioral experiments and from an analysis of a spoken corpus. Furthermore, this effect was independent of word frequency and spelling frequency.

      The fact that this effect appears in a spoken corpus analysis is strong evidence that these durational effects are not limited to tasks directly influenced by reading. However, durational effects are also initially absent in the production of non-words (*vip* versus *vipp*). However, when participants are trained on non-words, a word-lengthening effect appears[2]. Brewer argued that this is evidence that orthographic effects on speech duration are not akin to something like playing sheet music—each sound being played simply given the number of notes (letters) on a page. Rather, this effect demands that a word's orthographic representation must be stored in the mental lexicon.

1.2 Cross-Linguistic Speech Duration Effects

      Currently, durational speech effects correlated with orthography have only been reported in English, a language with an alphabetic orthography. Thus, this effect has understandably been interpreted as a letter effect: the more letters in an orthographic representation, all else being equal, the longer the speech duration. However, this specific interpretation necessarily excludes the possibility of durational orthographic effects in languages with orthographies other than alphabets. As the effect is explained for English, there is a correlation between discrete letters and sounds. The orthographic representation of the coda /κ/ in *tic* and *click* varies by exactly one letter. In turn, because "ck" contains more letters than "c", "ck" exhibits a longer /κ/ duration than "c".

      Similar distinctions between sounds and symbols become less clear-cut in other types of orthographies such as logographic character-based systems. Consider Japanese kanji characters. 目 (*eye*) and 芽 (*sprout*) are both pronounced /με/. Orthographically, there is no information in the composition of these characters that corresponds to their pronunciation, other than the whole character itself. Unlike many Chinese characters,

---

[2] While whole-word length differences were significant, segment length differences trended toward a positive pattern but were ultimately insignificant. This could have been because participants were not trained long enough on words. Rastle et al. (2011) used a much longer training period for their participants in a novel word-learning experiment and found orthographic influences on naming latencies from spelling consistency.

Japanese characters do not commonly have a transparent phonetic competent to aid in their pronunciation (see Townsend, 2011). No portion of these Japanese characters denotes the onset /μ/ nor does any other portion of the character denote the rime /ε/. For both characters, they are only as a whole /με/.

Yet 目 and 芽 are visually distinct characters. Even to those who are not literate in Japanese, 芽 probably appears "more complex" than 目. These characters differ not in the number of discrete but in the number of pen strokes contained in each character. There is a traditional number and order of pen strokes used in the formation of each Japanese character. For example *mouth* 口 (/κ∝τ∫ι/) is comprised of three strokes: first the left line is drawn, top to bottom; next the top and right lines are drawn in one stroke left to right, top to bottom; and finally the bottom line is draw from left to right. 目 and 芽 are composed of five and nine strokes, respectively. It is important to note that stroke order and stroke number are extremely salient in Japanese culture, with far more attention paid to them than letters' stroke number and order in English. Japanese dictionaries are in part organized by the number of strokes in a character, and children are instructed throughout grade school to create their kanji with care and attention to stroke order.

So 目 and 芽 vary orthographically but in a different manner than *tic* and *click*'s representation of /κ/. In order to effectively discuss and compare cross-orthographic differences such as these, I propose the use of the more general term *orthographic complexity* which I believe captures the relationship among orthographic representations such as "ck" versus "k" and 目 versus 芽. I define orthographic complexity as the differences among orthographic representations given a basic unit of orthographic complexity relative to an orthographic system. For example, if we define the basic unit of complexity as a letter for English's alphabet, then "ck" has a higher orthographic complexity (2) than "c" (1). Likewise, if we define the basic unit of complexity for Japanese characters as a pen stroke, 芽 (9) has a higher orthographic complexity than 目 (5). Though the orthographic systems differ, under orthographic complexity "ck" versus "k" and 芽 versus 目 share a relationship in that the former member of each pair has a higher orthographic complexity than the latter member, by the definitions of basic orthographic units given.

Reinterpreting the results of Brewer (2008) through orthographic complexity rather than letter effects opens the possibility for finding similar durational effects in languages with orthographic systems other than alphabets: all else being equal, an orthographic representation with higher orthographic complexity will have a longer speech duration than an orthographic representation with lower orthographic complexity. Thus, in order to find durational effects comparable to the effects found in English in a language without an alphabet, the proper basic unit of orthographic complexity must be defined.

Brewer (2008) is presented as evidence that the basic unit of orthographic complexity for English is the letter. But what would the basic unit of orthographic complexity be for a character-based orthography like Japanese kanji? As described above, one possibility could be the number of pen strokes in a single character, such as /me/ 目 (5) versus /με/ 芽 (9). This would be a more granular form of orthographic complexity than letters, but it is still transparent and homogeneous across the vast majority of the literate Japanese population.

Another possibility for a basic unit of orthographic complexity in Japanese could be whole characters. Japanese characters can represent one to several moras, so homophones can vary in the number of characters in their written representations. For example, 糊 *glue* (1 character) and 海苔 *seaweed* (2 characters) are both pronounced /νορι/. 糊 denotes both moras simultaneously, but in 海苔 the moras are split between the

characters: 海 /vo/ and 苔 /ρi/. This aspect of Japanese characters further sets them apart from the majority of Chinese characters. Most Chinese characters represent a single syllable. Exceptions exist, such as 圕 (*library)*, which denotes three syllables, but multisyllabic characters are far more common in Japanese than Chinese. Thus, a study focused in Japanese can also investigate a second form of orthographic complexity. Comparatively, number of characters as a measure of orthographic complexity is more similar to number of letters in English than number of strokes. Unlike strokes, characters are whole, independent orthographic units, like letters: each in isolation has orthographic, semantic, and phonological significance.

So Japanese allows us to effectively investigate two ends of the orthographic complexity spectrum: compositional internal strokes and independent characters. To the author's knowledge, neither of these have been studied in relation to speech duration effects correlated with orthography in a logographic system. Furthermore, speech duration effects have only been observed at the level of whole, individual orthographic units, and nothing smaller.

Finally, note that the examples used above for pen strokes and character are all heterographic homophones. Compared to English, Japanese has a wealth of these pairs. Brewer (2008) noted that heterographic homophones would be the ideal stimuli to test orthographic effects on speech duration given that the words are otherwise phonetically identical and so any observed effect must come from other external forces (frequency, orthography, etc.). However, the rarity of these pairs in English forced her to focus on heterographic representations of single sounds in mostly non-homophonous sets of words. Japanese on the other hand allows for much more control over stimuli in terms of homophonous pairs.

By reinterpreting durational speech effects correlated with orthography previously understood as letter effects through orthographic complexity, a general prediction can be made for observing durational speech effects in a language like Japanese with a character-based orthography: all else being equal, a representation with higher orthographic complexity will exhibit a longer speech duration than a representation with lower orthographic complexity. However, the appropriate measure of orthographic complexity in Japanese is not yet known. Two possible basic units of orthographic complexity have been proposed: 1) the number of pen strokes in single character; 2) the number of whole characters in a word. It should be noted once again that Brewer (2008) found independent durational effects for both individual phones and whole words. That is to say, given the words *click* and *clique*, the coda /κ/ in *clique* was longer than the coda /κ/ in *click*, but the whole-word duration of *clique* was also longer than the whole-word duration of *click*, independent of the durational increase from /κ/. Because pen strokes individually have no phonological correlation and characters represent moras rather than individual segments, the current study will focus its attention on whole-word durations.

2 METHODS

The current study investigates speech duration effects correlated with orthographic complexity in Japanese kanji characters. Two measures of complexity are tested to determine a basic unit of orthographic complexity in Japanese, if one exists: 1) number of pen strokes in an individual character; and 2) the number of whole characters in a single word. Stimuli consist of homophonous pairs of words that vary in one type of complexity. Whole-word durations are measured for each word and durations are compared between words in a pair. I test whether the more complex orthographic forms (higher stroke number or more characters) exhibited significantly longer speech durations than less complex orthographic forms, all else being equal.

2.1 Participants

Forty-two native Japanese speakers from Kobe City University of Foreign Studies participated in the experiment. Participants received compensation in the form of a 500-yen book voucher. The mean age of participants was 21 with a minimum age of 18 and a maximum age of 33. 37 participants were female and 5 were male.

2.2 Materials

Stimuli consisted of a total of 128 target items matched into 64 homophonous pairs varying in relative orthographic complexity (high/low). 96 items (48 pairs) were in the stroke condition in which items varied in the number of pen strokes used to traditionally create them, e.g. 白 (5) and 城 (9). 32 items (16 pairs) were in the character condition in which items varied in the number of characters used to form their orthographic representations, e.g. 糊 (1) and 海苔 (2). Number of strokes ranged from 3-18, with an average of 10.06 strokes across all items. All items in the character condition contained either 1 or 2 characters.

Filler items were added to lists, including 100 kanji words, 44 hiragana words (syllabary for native words) and 11 katakana words (syllabary for foreign words). These were added to give the experiment a ratio of graphemes (kanji, hiragana, katakana) similar to what is found in everyday reading (Nozaki & Shimizu, 2000). All target items began with vowels, fricatives, glides, or nasals. These particular sounds were chosen because their acoustic qualities lend to more accurate measurements compared to other sounds such as stops (e.g. /κ/, /τ/). These sounds have a relatively clear onset in a spectrogram, with a pattern of energy at specific frequencies for vowels and glides, energy at lower frequencies for nasals, and aperiodic noise for fricatives. All items ended in vowels.

Target items were matched in pitch-accent. Items within homophonous pairs were of the same length but word length varied across pairs. Items in the stroke condition ranged from 1-4 moras (average 2.8. Items in the character condition were all 2 moras.

Items were matched so that about half of the pairs had a low-relative-frequency/high-complexity to high-relative-frequency/low-complexity relationship, while the other half of pairs were high-relative-frequency/high-complexity to low-relative-frequency/low-complexity. This was done in an attempt to maintain some pre-analysis control for any durational effects from frequency (Jurafsky et al., 2000;Whalen, 1991). Frequency counts were also collected from the BCCWJ corpus (Maekawa, et al., 2014) and the Aozora Bunko (Nagano, 2012) and included in statistical models.

Items were pseudo-randomly arranged in a list so that no two words of the same homophonous pair appeared next to one another. The list was divided into two sections. Half of the homophonous pairs of words for each condition appeared together in a section (but never next to one another). The other half of the homophonous pairs were split between the sections. Lists were mirror images of each other. The first and final 4 words for each list were filler items and were not analyzed.

2.3 Procedure

Participants were tested individually in a quiet lab space at Kobe City University of Foreign Studies. They were seated in front of a 13" LCD display on which the stimuli were presented. Participants wore a microphone on their right ear. The microphone was connected to a Sound Devices MM-1 preamplifier. The preamplifier was connected to an H2next ZOOM recorder. Recorded files had a sampling rate of 44.1k.

The stimuli were displayed using DMDX (Forster & Forster, 2003) on Windows 10 OS. Items appeared individually and automatically. After the stimulus was displayed,

participants had 3500 ms to respond before the next stimulus was shown. Participants were told to remain silent if they did not know a word. If they did not know the correct pronunciation of a word (on-yomi versus kun-yomi or alternative pronunciations) they were told to say what came to mind first.

After the experiment, participants filled out a survey. They also reviewed a list of words from the experiment and self-reported words they were not familiar with. The entire procedure lasted no longer than 30 minutes.

3 RESULTS

Data from three participants was removed due to recording device malfunction and the data from three other participants was removed due to poor audio quality during recording. Six pairs of items from the stroke condition and four pairs of items from the character condition were removed due to high error rates, mismatched pitch accent, or devoicing.

Duration of words was measured manually in Praat (Boersma & Weenink, 2016). If a participant mispronounced a word, that word was removed from analysis. If a participant said a word with hesitation, the word was removed from analysis. Some words contained vowels that were in a devoicing environment. In Japanese, vowels such as /ɪ/ and /ɯ/ will be devoiced in certain circumstances. If a final vowel was devoiced, the word was removed. If a non-word-final vowel was devoiced, the other member of that homophonous pair was checked. If the words matched in devoicing, they were kept. If they differed, they were removed. Any words that had the other homophonous member of their pair removed were themselves also removed. All words that participants self-reported as not knowing were removed from the analysis.

Word-initial measurements were based on the first zero-crossing of a positive-going wave in the waveform for: initial vowels after the onset of formants in the spectrogram; fricatives after the onset of aperiodic noise in the spectrogram; nasals after the onset of nasal murmur in the spectrogram. All words ended in a vowel, so word-final measurements were based on the zero-crossing of the first positive-going wave in the waveform after the last clear striation in the spectrogram.

R (R Core Team, 2016) and lme4 (Bates et al., 2012) were used to perform mixed effect analyses of the relationship between orthographic complexity and speech duration. For the character number data, orthographic complexity and (log) word frequency were included in the model as fixed effects. Following guidelines from Barr et al. (2013), random intercepts were included for subjects and sets of homophone pairs, as well as by-subject and by-item random slopes for orthographic complexity and log word frequency. The stroke model was identical to the character model, except number of moras was included as a fixed factor and a by-subject random slope in the stroke model. Word-length was consistently two moras in the character data, but word-length varied in the stroke data. P-values were obtained by likelihood ratio tests of the full model with the effect in question against the model without the effect in question using analysis of variance with restricted maximum likelihood set to false.

For the character number data, frequency did not have a significant effect on duration ($p > 0.6$). Number of characters did have a significant effect on duration ($p < 0.025$), with 2-character words being produced about 14 ms longer than 1-character words. There was no significant interaction between orthographic complexity and frequency ($p > 0.4$). For the stroke number data, moras had a significant effect on duration ($p < 0.001$), with words with more moras of course being produced longer than words with fewer moras. Frequency did not have a significant effect on speech duration ($p > 0.3$). Number of strokes did not significantly affect speech duration ($p > 0.7$). See Table 1 and Figure 1 for results.

	Low Complexity	High Complexity
Strokes	461	460
Characters	354	368

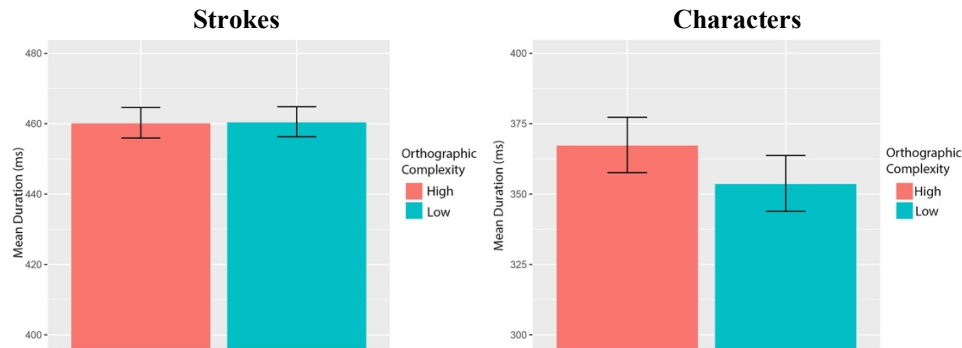*Table 1: Mean durations of words in milliseconds.*

Figure 1: Durational difference in ms in items that varied by stroke number (left) and character number (right).

In summary, no effect was found for the number of pen strokes in a character on speech duration. However, the number of characters in a whole word did have a significant positive effect on speech duration.

4 DISCUSSION

4.1 General Discussion

The goal of the current study was to investigate durational speech effects correlated with orthography in a language with a non-alphabetic orthography. Previous research found that the number of letters in an orthographic representation correlated with a longer speech duration in segment and whole-word duration (Brewer, 2008). These letter effects were reinterpreted in the current study through a more general definition of orthographic complexity: all else being equal, the higher the orthographic complexity of an orthographic representation, the longer the speech duration. This change in scope opens the possibility of discovering comparable durational effects in non-alphabetic orthographic systems. Japanese kanji characters were chosen as the focus of the current study because of their unique variation in orthographic complexity across two measures: 1) the number of pen strokes in a single character; and 2) the number of whole characters in a single word. To determine if either of these measures of orthographic complexity correlate with speech duration in a similar fashion as letters did in Brewer (2008), speech data of homophonous pairs of words varying in these levels of orthographic complexity were collected and compared. To the best of the author's knowledge, the results of the current study are the first to find durational effects correlated with orthography in a logographic system: more kanji characters in an orthographic representation of a word correlate to a longer speech duration, all else being equal. However, there was no significant effect of number of strokes in a single character on word duration.

The fact that a durational effect was found in Japanese at all is evidence that speech duration effects correlated with orthography, such as those found in Brewer (2008), are not limited to languages with alphabetic systems. An increase in pen strokes in a single

character was not a significant factor contributing to speech duration. However, the number of whole characters in a word was. Finding an effect for whole characters is more similar to the effect found for letters in English than the alternative of a pen stroke effect. In English, the number of whole, individual, independent orthographic units (letters) contributed to a longer speech duration. Characters, too, are individual, independent orthographic units in Japanese. Strokes, on the other hand, are more basic compositional units than characters, having no orthographic, phonological, or semantic significance in isolation. Strokes were proposed as a possible unit of orthographic complexity for Japanese because stroke order and stroke number are more salient in Japanese culture than letters' stroke number and order in Western cultures. It was thought that because of strokes' more transparent nature and practical use in Japanese culture (such as a means of organizing dictionaries), stroke number might contribute to durational speech effects. But despite their saliency, a higher number of strokes in a character did not correlate to an increase in speech duration. Researchers are split on the role that individual strokes play in character processing in Chinese characters. Some argue that strokes play a functional and fundamental role in character processing (Peng & Wang, 1997; Taft & Zhu, 1997) while others find no evidence for effects at the stroke level (Chen, 1996; Jim, 2008). The current study focused on Japanese rather than Chinese, but both languages use logographic characters sharing historical roots, with Japanese characters largely derived from Chinese characters. The lack of an effect for pen strokes in Japanese characters aligns with the previous studies that find no evidence for individual strokes playing a fundamental role in processing of characters in logographic orthographies.

So a pattern appears between the current study's findings and those of Brewer (2008) in the type of orthographic information that can contribute to durational speech effects. The available evidence points toward whole, discrete orthographic units contributing toward speech duration. Granted, Brewer (2008) did not test for effects from something like stroke number in English letters. However, as described earlier, the lack of stroke transparency in English and the non-homogeneity of letter composition across individuals' writing styles would make this a difficult task. The current study's lack of an effect for number of strokes in Japanese casts doubt on the likelihood of finding such an effect for letter stroke in English. Additional research would be needed to confirm this.

From the available evidence it would appear that in order to influence speech duration the unit of orthographic complexity must be at the level where it is distinguishable as a whole, independent orthographic entity to a reader. For instance, letters in English's alphabet are orthographically identifiable in isolation. Even when a letter represents several sounds ("x" for /κσ/), no sound at all ("e" in *phone*), or when several letters form a single sound ("sh" for /Σ/), competent English readers still count letters as their own individual and indivisible units. Evidence for this can be seen in how letters behave in language games like Scrabble and the alphabet song. But the individual strokes of for instance "x" (/ and \), for instance, have no significance in the orthographic system: / and \ in independence would be meaningless in an English word, and they never appear in isolation[3]. Furthermore, / does not represent the /k/ of "x" nor does \ represent /s/, or vice versa. "x", like all other English letters, is phonologically indivisible. Some English letters do indeed appear to be composed of other letters, such as "W" and "V", but two successive "V"'s do not denote a "W". These two letters are their own independent, whole, indivisible units, which happen to share visual similarity through historical circumstances. However, in *click*, "c" and "k" are both whole, independent orthographic units, and, thus, can apparently influence to speech duration because of this.

---

[3] Granted, they do have meaning as punctuation.

Likewise, Japanese characters are single, independent units. Japanese students are instructed to write each character in its own individual, equally-sized box no matter the character's shape or stroke number (which is physically present for beginners and imagined in most cases for spacing purposes for advanced writers). So a one-stroke character such as 一 *(one)* and a 29-stroke behemoth like 鬱 *(depression)* are treated equally in terms of spacing. Just as in English, strokes cannot stand independently of themselves and retain any orthographic significance, unless of course a certain combination of strokes forms another independent character (e.g. 白 *white* without the ' at the top is the separate character 日 *day*). Thus, because strokes are not whole, independent orthographic units, they do not influence speech duration.

However, further research is needed to confirm whether whole characters are indeed the basic unit of orthographic complexity in Japanese. One limitation of the current study was that only two forms of orthographic complexity were considered. But unlike letters, characters can be partially divisible into smaller components which are sometimes themselves independent units. For example, 蝗 is composed of 虫, 白, and 王 which are themselves all individual characters. As a part of another character, components form only a piece of the larger character, like a gestalt. Some researchers have found evidence suggesting that Chinese characters are visually processed at the component level (Law & Leung, 2000l Chen & Cherng, 2013). So components might prove to be a better measure of orthographic complexity than whole characters for Japanese. Future research should control for the number of components in characters.

4.2 Future Directions

Additional analyses are required to determine the locus of speech duration effects in Japanese words. Brewer (2008) found segment-level effects due to letter length. Due to the nature of grapheme-to-phoneme correspondences in Japanese, whole-word durations were focused on in the current study. But individual segments should be considered to determine whether certain segments (e.g. consonants, vowels, nasals, fricatives, etc.) are being targeted. Additionally, future experiments should be designed to control for the number of components in an orthographic form.

A question that remains from the current study's findings and those of Brewer (2008) is whether orthography is simply casually correlated with speech duration effects or the direct cause. In other words: are the observed durational speech a direct result of developed literacy skills? A means by which to attempt to answer this question would be to compare the speech patterns of literate adults to alliterate adults. If the effects found in literate adults are absent in the alliterate population, this would be evidence supporting literacy directly shaping speech patterns. Alternatively, it could be the case that young children are able to pick up on these durational cues from adults' speech and integrate them into their own speech even before they have developed any literacy skills. Indeed, there is evidence that preliterate children's speech mimics English spelling norms for gemination patterns from studies of children as young as 4 years old (Zamuner & Ohala, 1999). Orthography may reinforce these patterns, but they could potentially originally arise in an individual from acoustic cues.

However, there are several obstacles in attempting to answer this question. Ideally, one would compare the speech of two adult populations that are equal across all factors except for literacy, including socio-economic status, neurological development, etc. Procuring an adequate numbers of participants for two such populations is extremely difficult in the United States. In addition, many adults in the United States who might be functionally illiterate still have some exposure to literacy (Kutner et al., 2006). For instance, in the U.S. Department of Education's evaluation of literacy in the United States,

the lowest recognized literacy level of Below Basic (making up 12-16% of the population) includes simple literacy skills such as comprehending short texts.

A promising alternative might be to compare the speech patterns of literate adults to preliterate children. This would lose some control over similar neurological maturity and development but gain a level of quarantine from literacy exposure. The problem that arises here is the nature of English words. As noted in the introduction, Brewer (2008) experienced difficulty finding perfect homophone pairs for her stimuli. Where these are possible, words can be obscure such as *click* versus *clique*. It is doubtful that any preliterate child would know the word *clique*. However, a study in Japanese could resolve this issue. Japanese has a veritable wealth of heterographic homophones that are more readily known to preliterate children: /µe/ 目 *eye* versus /me/ 芽 *sprout*; /ηανα/ 花 *flower* versus /ηανα/ 鼻 *nose*; /Σιρο/ 白 *white* versus /Σιρο/ 城 *castle*; /νορι/ 糊 *glue* versus /νορι/ 海苔 *seaweed*. So the results of the current study finding a speech duration effect correlated with orthography in Japanese opens the door to the possibility of such a study that was previously exceptionally difficult to perform in English. Future research could consider this an approach to addressing the question of the origin and development of these speech patterns.

5 CONCLUSION

The current study found that Japanese words with two-character representations exhibited a significantly longer speech duration than words with one-character representations (14 ms on average). No effect was found for the number of pen strokes in a single character on speech duration. This result is presented as evidence that speech duration effects correlated with orthography, such as those reported in Brewer (2008), are not limited to letter effects found in alphabetic systems. Whole, independent characters appear to be able to influence speech duration in Japanese, but further research is needed to determine whether other forms of internal complexity such as components can influence speech as well.

REFERENCES

Alario, F. X., Perre, L., Castel, C., & Ziegler, J. C. (2007). The role of orthography in speech production revisited. *Cognition*, *102*(3), 464-475.

Barr, D. J., Levy, R., Scheepers, C., & Tily, H. J. (2013). Random effects structure for confirmatory hypothesis testing: Keep it maximal. *Journal of memory and language*, *68*(3), 255-278.

Bates, D., Maechler, M., Bolker, B., Walker, S. (2015). Fitting Linear Mixed-Effects Models Using lme4. Journal of Statistical Software, 67(1), 1-48.

Bi, Y., Wei, T., Janssen, N., & Han, Z. (2009). The contribution of orthography to spoken word production: Evidence from Mandarin Chinese. *Psychonomic Bulletin & Review*, *16*(3), 555-560.

Boersma, P., & Weenink, D. (2016). Praat: doing phonetics by computer (version 6.0.18). Retrieved May 23, 2016.

Brewer, J. B. (2008). *Phonetic Reflexes of Orthographic Characteristics in Lexical Representation*. ProQuest.

Chen, Y. P. (1996). What are the functional orthographic units in Chinese word recognition: The stroke or the stroke pattern?. *The Quarterly Journal of Experimental Psychology: Section A*, *49*(4), 1024-1043.

Chen, J. Y., Chen, T. M., & Dell, G. S. (2002). Word-form encoding in Mandarin Chinese as assessed by the implicit priming task. *Journal of Memory and Language*, *46*(4), 751-781.

Chen, J. Y., & Cherng, R. J. (2013). The proximate unit in Chinese handwritten character production. *Frontiers in psychology*, *4*, 517.

Chéreau, C., Gaskell, M. G., & Dumay, N. (2007). Reading spoken words: Orthographic effects in auditory priming. *Cognition*, *102*(3), 341-360.

Damian, M. F., & Bowers, J. S. (2003). Locus of semantic interference in picture-word interference tasks. *Psychonomic Bulletin & Review*, *10*(1), 111-117.

Dell, G. S. (1988). The retrieval of phonological forms in production: Tests of predictions from a connectionist model. *Journal of memory and language*,*27*(2), 124-142.

Dijkstra, T., Roelofs, A., & Fieuws, S. (1995). Orthographic effects on phoneme monitoring. *Canadian Journal of Experimental Psychology/Revue canadienne de psychologie experimentale*, *49*(2), 264.

Forster, K. I., & Forster, J. C. (2003). DMDX: A Windows display program with millisecond accuracy. Behavior Research Methods, Instruments, & Computers,35(1), 116-124.

Hallé, P. A., Chéreau, C., & Segui, J. (2000). Where is the/b/in "absurde"[apsyrd]? It is in French listeners' minds. *Journal of Memory and Language*, *43*(4), 618-639.

Han, Z., Zhang, Y., Shu, H., & Bi, Y. (2007). The orthographic buffer in writing Chinese characters: Evidence from a dysgraphic patient. *Cognitive neuropsychology*, *24*(4), 431-450.

Kutner, M., Greenburg, E., Jin, Y., & Paulsen, C. (2006). The Health Literacy of America's Adults: Results from the 2003 National Assessment of Adult Literacy. NCES 2006-483. *National Center for Education Statistics*.

Jurafsky, D., Bell, A., Gregory, M., & Raymond, W. D. (2001). Probabilistic relations between words: Evidence from reduction in lexical production. *Typological studies in language*, *45*, 229-254.

Jim, W. K., & 詹惠君. (2008). The size of processing unit of writing Chinese characters in normal primary students.

Law, S. P., & Leung, M. T. (2000). Structural representations of characters in Chinese writing: Evidence from a case of acquired dysgraphia. *Psychologia*.

Maekawa, K., Yamazaki, M., Ogiso, T., Maruyama, T., Ogura, H., Kashino, W., ... & Den, Y. (2014). Balanced corpus of contemporary written Japanese. *Language Resources and Evaluation*, *48*(2), 345-371.

Morais, J., Content, A., Cary, L., Mehler, J., & Segui, J. (1989). Syllabic segmentation and literacy. *Language and Cognitive Processes*, *4*(1), 57-67.

Nagano, Tomonori (2012). 青空文庫品詞別頻度表.

Nozaki, K. & Shimizu, Y. (2000). 新聞における漢字頻度特性の分析と NIE のための漢字学習表の開発. *日本教育工学雑誌*, *24*(2), 121-132.

Peng, D., & Wang, C. (1997). Basic processing unit of Chinese character recognition: Evidence from stroke number effect and radical number effect. *Acta Psychologica Sinica*.

Rastle, K., McCormick, S. F., Bayliss, L., & Davis, C. J. (2011). Orthography influences the perception and production of speech. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, *37*(6), 1588.

Roelofs, A. (2006). The influence of spelling on phonological encoding in word reading, object naming, and word generation. *Psychonomic bulletin & review*, *13*(1), 33-37.

Seidenberg, M. S., & Tanenhaus, M. K. (1979). Orthographic effects on rhyme monitoring. *Journal of Experimental Psychology: Human Learning and Memory*, *5*(6), 546.

Slowiaczek, L. M., Soltano, E. G., Wieting, S. J., & Bishop, K. L. (2003). An investigation of phonology and orthography in spoken-word recognition. *The Quarterly Journal of Experimental Psychology: Section A*, *56*(2), 233-262.

Taft, M., & Hambly, G. (1985). The influence of orthography on phonological representations in the lexicon. *Journal of Memory and Language*, *24*(3), 320-335.

Taft, M., & Zhu, X. (1997). Submorphemic processing in reading Chinese. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, *23*(3), 761.

Tanenhaus, M. K., Flanigan, H. P., & Seidenberg, M. S. (1980). Orthographic and phonological activation in auditory and visual word recognition. *Memory & Cognition*, *8*(6), 513-520.

Townsend, H. (2011). *Phonetic components in Japanese characters* (Doctoral dissertation).

Van Orden, G. C., & Goldinger, S. D. (1994). Interdependence of form and function in cognitive systems explains perception of printed words. *Journal of Experimental Psychology: Human Perception and Performance*, *20*(6), 1269.

Ventura, P., Kolinsky, R., Brito-Mendes, C., & Morais, J. (2001). Mental representations of the syllable internal structure are influenced by orthography. *Language and cognitive processes*, *16*(4), 393-418.

Whalen, D. H. (1991). Infrequent words are longer in duration than frequent words. *The Journal of the Acoustical Society of America*, *90*(4), 2311-2311.

Zamuner, T. S., & Ohala, D. K. (1999). Preliterate children's syllabification of intervocalic consonants. In *Proceedings of the 23rd Annual Boston Conference on Language Development* (pp. 753-763). Somerville, MA: Cascadilla Press.

Zhang, Q., & Damian, M. F. (2012). Effects of orthography on speech production in Chinese. *Journal of psycholinguistic research*, *41*(4), 267-283.

Ziegler, J. C., & Ferrand, L. (1998). Orthography shapes the perception of speech: The consistency effect in auditory word recognition. *Psychonomic Bulletin & Review*, *5*(4), 683-689.

Number and Gender Agreement in Saudi Arabic:
Morphology vs. Syntax[1]

Ruth Kramer
Georgetown University
rtk8@georgetown.edu

Lindley Winchester
Georgetown University
lw599@georgetown.edu

1 Introduction

In the Najdi and Urban Hijazi dialects of Saudi Arabic, non-human plural nouns trigger feminine singular agreement. For example, in (1), *kutuub* 'books' triggers feminine singular agreement on *kabiira* 'large.'

(1)   ʔal-kutuub   ʔal-kabiir-a   **[Najdi]**
        DEF-book.PL DEF-large-**F.SG**[2]
        'the large books'

Feminine singular agreement is unexpected in this context because *kitaab* 'book' is masculine in the singular and *kutuub* 'books' is morphologically plural.

In this paper, we focus on the unusual gender agreement in (1), which we will refer to as "gender switch." We use the term gender switch for when a noun in the plural has a different gender than what it has in the singular. This phenomenon is not uncommon cross-linguistically (see e.g., Heine 1982, Corbett 1991:156) and it automatically raises certain questions for analysis. Is it an odd type of syncretism in the morphology of gender agreement (cf. Farkas 1990 on Romanian)? Or is it a syntactic effect where the noun receives a new/second gender feature in the syntax when it is plural (cf. Lecarme 2002, Kramer 2015 on Somali)? How do we even tell the difference between a gender switch based on syncretism and a gender switch based on syntactic effects (cf. Harley 2008, Kramer to appear on distinguishing syncretisms from syntax generally)?

We argue that the Saudi Arabic gender (and number) switch is a syntactic effect because feminine singular agreement with non-human plural nouns triggers a particular semantic/pragmatic interpretation, namely, that of a non-individuated herd/clump. Assuming a standard Y-model of the grammar, if the gender switch were due to syncretism, it would happen too late in the derivation (post-syntactically) to affect the semantics. We show that a Distributed Morphology approach to syncretism correctly predicts that the gender switch must be syntactic. We conclude with an initial syntactic analysis of the gender switch in which feminine singular agreement is triggered by a phonologically null *n* with a herd/clump meaning, similar to direct pseudopartitives across languages (e.g., Hankamer and Mikkelsen 2008). Overall, the paper contributes to the description of Hijazi and Najdi (which are highly understudied compared to other Arabic dialects) and provides a new kind of evidence for distinguishing between syntactic and morphological phenomena.

The paper is structured as follows. In Section 2, we lay out the data on gender switch in Hijazi and Najdi in detail. In Section 3, we show how DM predicts that this gender switch should be syntactic, and then provide the empirical evidence that verifies this prediction. In Section 4, we suggest a preliminary analysis of these nouns and conclude.

2 Gender and Number in Najdi and Urban Hijazi

In this section, we present some basic information on Najdi and Urban Hijazi, describe their gender and number systems in terms of noun inflection and agreement, and present initial data on gender switch.

The Arabic dialects known as Najdi and Urban Hijazi are the two major dialects/dialect areas of Saudi Arabia (Prochazka 1988). Due to their similarity, they are sometimes referred to under the cover term 'Saudi Arabic' and we do so here when referring to both at once. Urban Hijazi (henceforth just 'Hijazi') is spoken in the cities of the western region of Saudi Arabia (Mecca, Medina, and Jeddah) while Najdi has a dialect area covering the central-eastern region of Saudi Arabia (including Riyadh and many bedouin dialects). All unattributed data in the paper was collected through elicitation with native speakers and the remainder was gathered from published grammars (Hijazi: Sieny 1978, Omar 1975; Najdi: Ingham 1994, Abboud 1964).

Nouns in these dialects have two genders (masculine and feminine) and three numbers (singular, dual, and plural) (Najdi: Ingham 1994:61-62, Hijazi: Sieny 1978:7-8). Neither the masculine gender nor singular number have a special affix, as exemplified by Najdi data in (2)ab. Feminine gender is overtly marked by the suffix *–ah/-t* or *–a,* as shown in (2)cd.

(2)	Masculine Sing. Nouns	Feminine Sing. Nouns	**[Najdi]**
	a. radʒaal 'man'	c. mar-ah 'person-F (woman)'	
	b. beet 'house'	d. dariiʃ-ah 'window-F'	
	(Ingham 1994:62)		

Dual number is inflected via suffixation of *-een*, as in (3).

(3)	Dual		**[Hijazi]**
	a. mdarris-een	'two male teachers'	
	b. mdarris-at-een	'two female teachers' (Sieny 1978:8)	

Plural number is inflected through suffixation or a combination of phonotactic changes, ablaut, and affixation. The former method, termed 'sound plurals,' mark masculine plurals with -iin and feminine plurals with -aat, as shown in (4).

(4)   Sound Plural   **[Hijazi]**
       a. mdarris   'teacher'
       b. mdarris-iin   'male teachers'
       c. mdarris-aat   'female teachers' (Sieny 1972:7)

The latter are termed 'broken plurals,' exemplified in (5).

(5)   Broken Plural   **[Najdi]**
       a. ʃaajib 'old man'   → ʃiibaan 'old men'
       b. miʁtir 'light colored camel'   → maʁaatiir 'light colored camels'
       c. ħamuulah 'clan, lineage'   → ħamaajil 'clans, lineages'
       (Ingham 1994:61)

For gender/number agreement, we focus on Hijazi. In Hijazi, adjectives, demonstratives and verbs fully agree in gender and number[3] with their respective nouns, with two exceptions. First, there is no agreement in dual number; this plays a crucial role in Section 4 but we set it aside at the moment. Second, and more importantly, gender agreement is syncretic in the plural. For example, adjectives may only appear with either the masculine sound plural suffix or in broken plural form and never with the feminine sound plural suffix, as shown in Table 1 (whether the adjective takes sound or broken form is determined by the identity of the root). Note that the gray shaded cells in the tables are syncretic.

Table 1: Adjective gender/number inflection in Hijazi (Sieny 1978:13-15)

	Feminine	**Masculine**
Singular	-at	-∅
Plural	-iin / broken plural	

All other agreement targets behave the same as the adjectives with respect to gender/number agreement. This is shown for demonstratives and perfective verbs in Tables 2 and 3.

Table 2: Proximal demonstratives in Hijazi (Sieny 1978:33)

	Feminine	**Masculine**
Singular	haadi	haada
Plural	hadool(a)[4]	

Table 3: Perfective verbal agreement in Hijazi (Sieny 1978:21)

	Singular		**Plural**
1	-t		-na
2	-t	-ti	-tu
3	-∅	-at	-u

So far, Hijazi seems to have a fairly typical gender/number agreement system for a Semitic/Afroasiatic language (on the lack of dual agreement see e.g., Brustad 2000:45 on other Arabic dialects and Ritter 1995 on Hebrew; on gender being syncretic in the plural, see e.g., Kramer 2016 on Amharic). However, when verbs, adjectives, and demonstratives agree with plural non-human nouns, they take feminine singular agreement, an example of gender switch. For example, in (6)b, the broken plural *kilaab* 'dogs' triggers feminine singular agreement on the adjective *buni* 'brown', though *kɛlb* 'dog' is a masculine noun in the singular (6)a.

(6) a. ʔal-kɛlb   ʔal-buni   **[Najdi]**
         DEF-dog.M   DEF-brown.M
         'the brown dog'

     b. ʔal-kilaab   ʔal-buni-**ja**
         DEF-dog.PL   DEF-brown-**F.SG**
         'the brown dogs'

The same phenomenon occurs with sound plurals, as in (7). This example also illustrates that gender switch occurs with inanimate nouns as well (not just animal nouns like 'dog').

(7) a. ʔal-tˤawiil-a ʔal-ɣaali-ja   **[Najdi]**
         DEF-desk-F   DEF-expensive-F.SG
         'the expensive desk'

     b. ʔal-tˤawiil-aat   ʔal-ɣaali-**ja**
         DEF-desk-F.PL   DEF-expensive-**F.SG**
         'the expensive desks'

Gender switch is also possible on other agreement targets, not just adjectives. For example, in (8), there is feminine singular agreement on a demonstrative and in (9), there is feminine singular agreement on a verb.

(8) ʔal-karaasi   **di**   maksuur-**ah**   **[Hijazi]**
     DEF-chair.PL   **this.F.SG**   broken-**F.SG**
     'These chairs are broken.' (Sieny 1978:197)

(9) ʔal-kilaab   ʔal-buni-ja   raaħ-**at**   li[1]   ʔal-ʃaariʕ
     DEF-dog.PL   DEF-brown-F.SG   went-**F.SG**   PREP   DEF-street
     'The brown dogs went down the street.'

Having laid out the facts, we now turn to the analytical prediction made about gender switch in Saudi Arabic by a Distributed Morphology approach to syncretism.

3 Saudi Arabic Gender Switch is Syntactic

In this section, we first present the approach to syncretism taken in Distributed Morphology and apply it to basic gender/number agreement in Hijazi in Section 3.1. We then discuss how this approach predicts that the more complex data involving gender switch must be a syntactic effect, and provide confirming evidence for the prediction in Section 3.2

3.1 Syncretism in DM

A key assumption of Distributed Morphology is that the syntax manipulates feature bundles that lack morphophonology; these feature bundles are exponed post-syntactically by matching the syntactic feature bundles to Vocabulary Items (VI's; pieces of morphophonology). The matching process itself is called Vocabulary Insertion. To illustrate with a familiar example, French has three potential VI's to expone a definite determiner: *le* (masc. sg.), *la* (fem. sg.), and *les* (pl.). A feminine singular determiner has the syntactic feature bundle to the left in (10), with a category feature, definiteness feature, singular feature, and feminine feature (potentially among others). This feature bundle is most similar to the Vocabulary Item (10)a, which in fact matches the features perfectly, so *la* is inserted to expone this feature bundle.

(10)   Syntax   Potentially Insertable Vocabulary Items
       [D]   a. [D], [DEF], [-PL],[+FEM] ↔ la
       [DEF]   b. [D], [DEF], [-PL],[-FEM] ↔ le
       [-PL]
       [+FEM]

In DM, syncretism occurs when a Vocabulary Item expones fewer features than are in the syntactic feature bundle. This is referred to as the underspecification of the Vocabulary Item. For example, consider the feminine plural determiner in French in the left side of (11).

(11)   Syntax   Potentially Insertable Vocabulary Items
       [D]   a. [D], [DEF], [-PL],[+FEM] ↔ la
       [DEF]   b. [D], [DEF], [-PL],[-FEM] ↔ le
       [+PL]   c. [D], [DEF], [+PL] ↔ les
       [+FEM]

To expone this determiner, Vocabulary Item (11)c is inserted: although it does not match all the features in the feature bundle, it does not have any mismatches with the feature bundle. In particular, it will be inserted regardless of the gender feature on the plural definite determiner, so the French plural definite determiner is syncretic for gender.

Sometimes syncretisms hold across Vocabulary Items – so-called "metasyncretisms" (see e.g., Bobaljik 2002, Harley 2008). For example, as noted in Section 2, Hijazi gender is syncretic in the plural across all Vocabulary Items that express gender/number agreement: adjectives, demonstratives, verbs, etc. (In this way, Hijazi differs from French, which still distinguishes gender in the plural on, say, adjectives.) In an underspecification analysis of this syncretism, all the VI's for all the agreement targets in Hijazi would have to be arranged in a similar way to (11)a-c. This would describe the facts correctly, but it would not explain them (Harley 2008:257). In other words, it would be sheer coincidence that none of the agreement targets in Hijazi show gender distinctions in the plural.

To capture this missed generalization in DM, the operation Impoverishment is typically used (Bobaljik 2002, Harley 2008, Nevins 2011).[5] In DM, certain operations can operate over syntactic feature bundles before they are exponed (Halle and Marantz 1993, Embick and Noyer 2001, 2007, etc.). Impoverishment is one such operation, removing a feature

---

[5] There are a couple of additional solutions to this problem including brute-force ordering of VI's (see e.g., Halle 1997:427-8) and appealing to a feature hierarchy to determine VI Insertion.

from a syntactic feature bundle (Bonet 1991, Noyer 1998, Bobaljik 2002, Harley 2008, Nevins 2011). To capture the metasyncretism of gender in the plural in Hijazi, we propose the Impoverishment operation below that removes the gender feature from any feature bundle that has both number and gender features.

(12)   **Hijazi Gender/Number Impoverishment (obligatory)**
        [+PL]   →   [+PL]
        [+/-FEM]

This has the effect that no Vocabulary Item can be inserted to realize plural agreement which varies by gender. For example, a given proximal demonstrative in Hijazi would be composed of one of the feature bundles in (13), and exponed via one of the Vocabulary Items in (14).

(13)   Proximal Demonstrative Syntactic Feature Bundles
        a. [DEM],[PROXIMAL],[+F],[-PL]   = feminine singular
        b. [DEM],[PROXIMAL],[-F],[-PL]   = masculine singular
        c. [DEM],[PROXIMAL],[+F],[+PL]   = feminine plural
        d. [DEM],[PROXIMAL],[-F],[-PL]   = masculine plural

At PF, the Impoverishment rule in (12) applies, removing the gender features from syntactic feature bundles like those in (13)cd. During Vocabulary Insertion, a single Vocabulary Item that is underspecified for gender features, (14)c below, realizes both sets of feature bundles with *hadool(a)*.

(14)   Proximal Demonstrative Vocabulary Items
        a. [DEM],[PROXIMAL],[+F] ↔ haadi   = feminine singular
        b. [DEM],[PROXIMAL],[-F] ↔ haada   = masculine singular
        c. [DEM],[PROXIMAL],[PL] ↔ hadool(a)   = plural

Similar Impoverishment operations have been proposed for other languages where gender is syncretic in the plural, e.g., Russian (Bobaljik 2002), Coptic (Kramer 2016), and Amharic (Kramer to appear).

        Overall, DM uses underspecification to explain basic syncretisms and Impoverishment for metasyncretisms; an Impoverishment analysis captures the syncretic behavior of gender in plural agreement in Hijazi.

3.2 The Prediction

        We turn now to thinking through how to capture gender switch in Saudi Arabic. First, it is crucial to point out that any syncretism analysis of gender switch predicts that the 'switch' is to the default gender. To see this, let us take a hypothetical language L. L has masculine and feminine gender, and masculine is the default gender. Therefore, feminine VI's in L must each have a [+FEM] feature to keep them from being inserted as a default when the syntactic feature bundle has no gender features. Now, suppose that the two feature bundles in (15) are syncretic, i.e., they need to be realized using the same Vocabulary Item.

(15)   a. [D],[DEF],[-FEM],[-PL]   = masculine singular definite article
        b. [D],[DEF],[+FEM],[+PL]   = feminine plural definite article

If (15)b is Impoverished for gender, a feminine VI can never be inserted to expone it since it would not match any feminine VI in L, so it must be realized via a masculine VI (i.e., we see a switch to masculine, the default gender). If (15)b is not Impoverished, we must insert a VI that lacks both gender and number features so that it will match both feature bundles; and again, there will be a switch to the default gender (masculine). In DM, there are no operations that change the value of features in a syntactic feature bundle, so there is essentially no way to turn (15)b into a bundle like (15)a or vice versa.

Returning to Saudi Arabic, recall that the gender switch is to feminine singular for non-human plural nouns, as shown in (16).

(16) ʔal-karaasi   **di**   maksuur-**ah**   **[Hijazi]**
      DEF-chair.PL   **this.F.SG**   broken-**F.SG**
      'These chairs are broken.' (Sieny 1978:197)

In Saudi Arabic, feminine is not the default gender. This is demonstrated by the data in (17)-(21), which indicate that masculine is the default gender through agreement with nominals that lack gender features like certain quantifiers and wh-words, agreement resolution with coordinated conjuncts, and the default agreement found in VSO contexts.

(17) ʔaħad   b-ji-tkallam   **[Hijazi, Quantifier]**
      someone   PROG-**3MSG**-talk
      'Someone is talking.' (Omar 1975:128)

(18) maħad   ji-rudd   **[Hijazi, Quantifier]**
      nobody   **3MSG**-answer
      'Nobody answers.' (Omar 1975:128)

(19) ʔal-mutˤrib   wu ʔal-mutˤrib-ah maʕruuf-iin   hina **[Hij., Resolution]**
      the-singer.M and the-singer-F   well.known-**M.PL** here
      'The male singer and the female singer are well-known here.'
      (Sieny 1978:199)

(20) min ji-bi   j-ruuḥ   maʕ-kum   **[Najdi, wh-word]**
      who 3MSG-want **3MSG**-go with-you.PL
      'Who wants to go with you?' (Ingham 1994:153)

(21) daxal-∅   ʔal-beet   ħariim   tsiθiir-aaj[6] **[Najdi, VSO Default Agr]**
      entered-3**MSG** the-house woman.PL   many-F.PL
      'There entered the house many women.' (Ingham 1994:65)

Since feminine is not the default gender in Saudi Arabic, DM predicts that the gender switch to feminine in Saudi Arabic **cannot** be due to syncretism (even though the default number is singular, and thus the "number switch" could be morphological). There is no way to insert a feminine singular Vocabulary Item as a type of syncretic form for non-human plural nouns since feminine is not the default.

---

[6] The –aaj suffix may be a typo in Ingham 1994; -aat would be more typical.

This pushes the analysis of gender switch in a syntactic direction, and in fact, there is evidence that this prediction is correct and that gender switch in Saudi Arabic is a syntactic phenomenon. To see why, it is necessary to start with an additional key observation: grammars (and speakers) often note non-human plural nouns can also agree "normally," i.e., trigger plural agreement (Ingham 1994:64, Sieny 1978:197; Brustad 2000:52ff. on other dialects). This is shown by the plural agreement on the demonstrative in (22)b.

(22) a. kilaab-ak   haadi   **[Hijazi]**
          dog.PL-your   this.**F.SG**

      b. kilaab-ak   hadool
          dog.PL-your   this.**PL**

'these dogs of yours' (Sieny 1978:196, fn.2)

Though it has never been observed for Saudi Arabic (to the best of our knowledge) that there is a meaning difference between the two types of agreement, a fully articulated context reveals a difference of individuation between gender switch and normal agreement. To elucidate this semantic difference, we compared agreement strategies in contexts which require the individuation of nouns to contexts that require the grouping of nouns. These contexts paralleled to those used in Lotfi (2006). A Hijazi example of a grouping context is given in (23).

(23) Context: "I have cut up some spicy peppers, and I am frying them in a single frying pan. They are for a pepper sauce that I am making. Unfortunately, I step away from the stove for a moment and when I return, I notice:"

      a. **Feminine Singular Agreement**
          ʔal-falaafil   ʔanħarag-**at**   ʕala   ʔal-kaanuun
          DEF-pepper.PL   burned-3FSG   on   DEF-stove
          'The peppers burned on the stove.'

      b.   **Plural Agreement**
          #ʔal-falaafil   ʔanħarag-uu   ʕala   ʔal-kaanuun
          DEF-pepper.PL   burned-3PL   on   DEF-stove
          'The peppers burned on the stove.'

For the context given in (23), speakers preferred feminine singular agreement, as in (23)a, though the plural agreement in (23)b was still considered grammatical. This is in contrast to the Hijazi individuated context in (24).

(24) Context: I am a professional chef. I currently have three separate pans of peppers on my stove, all started at different times and for different pepper dishes. Unfortunately, I step away from the stove for 10 minutes, and when I return, I notice:

      a. **Feminine Singular Agreement**
          #ʔal-falaafil   ʔanħarag-**at**   ʕala   ʔal-kaanuun
          DEF-pepper.PL   burned-3FSG   on   DEF-stove
          'The peppers burned on the stove.'

b.   **Plural Agreement**
    ʔal-falaafil   ʔanħarag-uu   ʕala   ʔal-kaanuun
    DEF-pepper.PL   burned-3PL   on   DEF-stove
    'The peppers burned on the stove.'

In this context, the plural agreement in (24)b is preferable, especially if the speaker intends to express that all three dishes have burned. These facts indicate that gender switch has a semantic/pragmatic effect.

   More specifically, we suggest that gender switch, i.e., feminine singular agreement with non-human plural nouns, creates a kind of 'herd' interpretation of a plural entity, whereas plural agreement creates a 'distributed' interpretation , similar to semantic contrasts between singular and plural agreement on certain nouns in Persian (Lotfi 2006) and other dialects of Arabic (Brustad 2000, Acquaviva 2008, Ouwayda 2014). With feminine singular agreement, the individual members of the 'herd' are not differentiated, providing an impression of homogeneity. For example, in (23), all the peppers burned together and a single pepper dish was being made in a single frying pan, so feminine singular agreement is preferred. This differs from plural agreement, which has an 'individuated' interpretation. In these cases, the plural entity is composed of distinct individuals that can be differentiated, like in (24) where three separate pans of peppers for three separate pepper dishes have burned, even though this situation can still be described as 'the peppers burned.' The plural agreement thus leads to a separation effect of perceived heterogeneity.

   This semantic contrast between feminine singular agreement and plural agreement also manifests elsewhere in the language. For example, recall from Section 2 that there is no dual agreement in Saudi Arabic. Instead, what occurs is that dual nouns take plural agreement, as shown for the human noun 'girl' in (25) (Abboud 1964:75, Ingham 1994:62 for Najdi, Sieny 1978:197 for Hijazi).

(25)   ʔal-bint-een   ʔal-ħilw-iin   **[Hijazi]**
        DEF-girl-DUAL   DEF-pretty-**PL**
        'the two pretty girls' (Sieny 1978:197)

What happens with non-human dual nouns? Since their parts are easily individuated and two items do not make a 'herd' (cf. Brustad 2000:57), they should display plural agreement per the characterization of the semantic difference above. This prediction is borne out, as shown in (26) for the non-human dual noun 'pens'.

(26)   galam-een   dʒudud   **[Hijazi]**
        pen-DUAL   new.PL
   'two new pens' (Sieny 1978:197)

Another prediction involves coordinated non-human nouns. These should be similar to dual nouns in that two coordinated nouns do not suffice for a 'herd' interpretation; thus, coordinated non-human nouns should trigger plural agreement. . The data in (27) reveals this too is borne out, at least for Hijazi.

(27)   ʔal-kanab-ah   wu   ʔas-sariir   ʔal-dʒudud   **[Hijazi]**
        DEF-sofa-F.SG   and   DEF-bed   DEF-new.PL
        'the new sofa and bed' (Sieny 1978:198)

Overall, then, 'gender switch' has a semantic effect in Saudi Arabic: it signals that there is a 'herd' interpretation of the plural entity with which it agrees.[7]

This semantic effect indicates that the gender switch cannot be morphological. Assuming the typical "Y-model" for the grammar seen in (28), any PF processes like Vocabulary Insertion occur after the derivation has been sent to LF and thus cannot affect the interpretation of the structure.

(28)   **Syntax**

Morphology:
PF Operations including
Vocabulary Insertion

           PF   **LF**
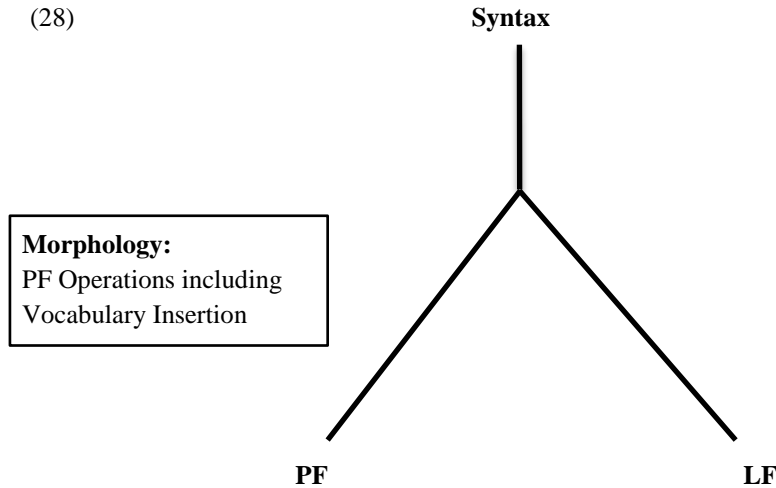
If gender switch were just morphological, then a non-human noun with feminine singular agreement and a non-human noun with plural agreement would look identical to LF and thus the semantic difference between them would remain unexplained.

Overall, then, this section demonstrated how a DM approach to syncretism predicts that the Saudi Arabic gender shift cannot be morphological, and this prediction is borne out by empirical evidence. The gender shift is associated with certain semantic effects (a 'herd' interpretation') and thus cannot occur as late as PF.

4. Steps towards an Analysis and Conclusion

If the gender shift takes place in the syntax, the natural next question is: how does it work? Where do the feminine and singular features come from and how are they interpreted as a 'herd'? In this section, we sketch out one possible way to analyze the switch that would explain most of the effects. We then conclude with a brief recap and some open questions.
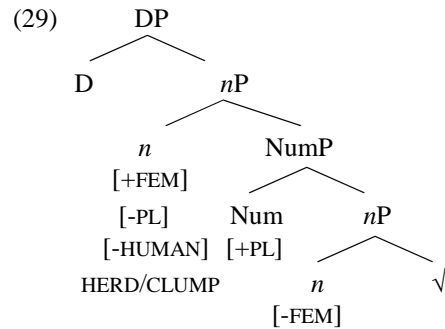
---

[7] Hijazi consultants judged feminine singular agreement to be impossible with human nouns, even in a 'herd' context. As for Najdi, the consultants and Ingham 1994 are in conflict. As in Hijazi, the Najdi consultants dislike feminine singular agreement for human plural nouns. However, Ingham states that feminine singular agreement is grammatical in these cases (Ingham 1994:63-64). This may be because Ingham used bedouin dialects for some data collection, whereas our consultants are from urban areas. See Section 4.1 for further discussion of the restriction of feminine singular agreement to non-human nouns.

4.1 A Pseudopartitive Approach

To explain why the features relevant to gender shift appear to be active in the syntax, it is perhaps most natural to assume that there is a head in these non-human plural nouns which bears these features (feminine gender, singular number, a 'herd' interpretation). Assuming that gender features are generally on *n* and number features are generally on Num, this results in the structure in (29) for a masculine plural non-human noun (like e.g., 'books' in (1)), where the head with the gender-switch-related features is labeled as *n*.

(29)

```
              DP
            /    \
          D        nP
                 /    \
               n       NumP
            [+FEM]    /      \
             [-PL]  Num        nP
           [-HUMAN][+PL]      /   \
         HERD/CLUMP         n       √
                          [-FEM]
```

We hypothesize that the head that introduces these features is a *n* for multiple reasons. First, it has a feminine gender feature and an animacy feature ([-HUMAN]) since feminine singular agreement is restricted to non-humans (at least in Hijazi; see fn. 7); these features are located on *n* across languages (Kramer 2015). Also, it is well-established that the highest gender feature determines the gender of the whole *n*P (Kramer 2009, 2015, Steriopolo and Wiltschko 2010, de Belder 2011). It is also common for there to be multiple *n*'s within a DP (e.g., in denominal nouns). Finally, in terms of interpretation, this head can be potentially understood as a true 'light noun' with the meaning 'herd/clump.' The distribution of *n* HERD/CLUMP would be easily restricted: it selects for Num[+PL].

The structure in (29) is very similar to the dominant analysis of direct pseudopartitives (see e.g., Löbel 1989, van Riemsdijk 1998, Stavrou 2003, Alexiadou, Haegeman & Stavrou 2007, Hankamer and Mikkelsen 2008, Keenan 2013, Grestenberger 2015). Direct pseudopartitives contain two adjacent nouns with no intervening preposition or genitive case marker, as shown for Danish below.

(30)   en gruppe turist-er   **[Danish]**
        a group tourist-PL
        'a group of tourists' (Hankamer and Mikkelsen 2008:318)

The first noun (*gruppe*) is referred to as N1 and it is often analyzed as a light noun/*n*. The second noun (*turister*), referred to as N2, is contained in a nominal projection smaller than DP; for us, this is a NumP since it has number morphology (e.g., a plural suffix in (30)). N1 and N2 together are contained in a single extended projection, a DP – so the result is a structure that is nearly identical to (29), modulo certain non-essential details.[8]

---

[8] Cf. Grestenberger 2015, who proposes a very similar structure but with φP instead of NumP.

(31)

```
                    DP
                  /    \
                D       nP
                en    /    \
                    n        NumP
                  gruppe    /    \
                          Num      nP
                          -er    /    \
                               n      √TURIST⁹
```

The near-identical structure of (29) and (31) strongly indicates that the analysis of direct pseudopartitives and Saudi Arabic non-human nouns should be meaningfully connected.

In addition to the same syntactic structure, direct pseudopartitives and Saudi Arabic non-human plural nouns have some additional compelling similarities. For example, in both direct pseudopartitives and Saudi Arabic non-human nouns, the N1 controls gender agreement. We have seen above many examples of the Saudi Arabic non-human nouns triggering feminine agreement, and (32) is a pseudopartitive example from Danish where the common gender noun *spand* 'bucket' controls agreement on the determiner.

(32)   en/*et   spand   vand   **[Danish]**
         INDEF.COM/INDEF.NEUT   bucket.COM   water.NEU
         'a bucket of water' (Hankamer and Mikkelsen 2008:326)

Also, in the direct pseudopartitive literature, it has been reported that plural agreement is possible with pseudopartitives, under conditions that remain obscure (see e.g., Stavrou 2003, Alexiadou, Haegeman, and Stavrou 2007, Hankamer and Mikkelsen 2008). This corresponds with the fact that plural agreement with a non-human plural noun in a 'herd' context (e.g., (23)) is "not preferred" but not terrible, either.

Finally, and perhaps most interestingly, there is a subtype of N1 attested in direct pseudopartitives across languages called a "collective noun," as exemplified for Dutch in (33).

(33)   een **kudde** olifanten   **[Dutch]**
         a   **herd** elephants
         'a herd of elephants' (van Riemsdijk 1998:13)

This seems like the exact meaning needed for the Saudi Arabic facts, although Saudi Arabic would have a more limited inventory of *n*'s than most languages with direct pseudopartitives (perhaps because they are phonologically null). The noun for 'group' in Saudi Arabic is in fact feminine singular, as seen in (34).

(34)   mad͡ʒmuʕ-a sˤaɣir-a   **[Hijazi]**
         group-F.SG   small-F.SG
         'a small group'

---

⁹ *Turist* might be a deverbal noun (or –*ist* is a *n* that combines with a root) but we abstract away from this.

Thus, it might be that 'group' is present in the structure in (29) and elided, which has in fact been independently proposed in the pseudopartitive literature (Keenan 2013) as an analysis of English pseudopartitives like *a pleasant ~~GROUP~~ three days in Philadelphia*.

So, we conclude that (29) seems like a promising analysis of the Saudi Arabic gender shift. It captures the contours of the phenomenon well and allows for a productive new cross-linguistic connection to direct pseudopartitives.[10]

4.2 Conclusion

To recap, in this paper, we have investigated how non-human plural nouns in Hijazi and Najdi can trigger feminine singular agreement, i.e., how they undergo gender switch. Since feminine is not the default gender, we discussed how Distributed Morphology predicts this gender switch is syntactic. This prediction is borne out: the semantic effect of the gender switch demonstrates that it happens before PF in the syntax. We have also suggested that the structure of these non-human plural nouns is highly reminiscent of direct pseudopartitives and the pursuit of this new connection is the next step for this research.

Another next step would be to address similar effects in other dialects of Arabic (see e.g., Belnap 1991, 1999, Brustad 2000). Moreover, in Modern Standard Arabic, non-human nouns **always** trigger feminine singular agreement (see Belnap and Shabaneh 1992, Kihm 2005, Alghamdi 2015, Fassi Fehri 1988, to appear). Also, in many dialects, plural **human** nouns can trigger feminine singular agreement if they are interpreted collectively (see e.g., Fassi Fehri 2016ab on Modern Standard Arabic, Ouwayda 2014 on Lebanese Arabic, Dali and Mathieu 2016 on Tunisian Arabic). Future work will hopefully develop an analysis of the complex, related patterns of gender switch across all the Arabic dialects.

References

Abboud, Peter. 1964. The syntax of Najdi Arabic. Doctoral dissertation, University of Texas, Austin.

Acquaviva, Paolo. 2008. *Lexical Plurals*. Oxford: Oxford University Press.

Alexiadou, Artemis, Liliane Haegeman and Melita Stavrou. 2007. *Noun Phrase in the Generative Perspective*. New York: Mouton.

Alghamdi, Abdullah S. 2015. From root to nunation: the morphology of Arabic nouns. Doctoral dissertation, University of New South Wales.

Belnap, R. Kirk. 1991. Grammatical agreement variation in Cairene Arabic. Doctoral dissertation, University of Pennsylvania.

Belnap, R. Kirk. 1999. A new perspective on the history of Arabic variation in marking agreement with plural heads. *Folia Linguistica* 33. 169-185.

Belnap, R. Kirk and Osama Shabaneh. 1992. Variable agreement and nonhuman plurals in Classical and Modern Standard Arabic. In Ellen Broselow, Mushira Eid, and John

---

[10] Fassi Fehri (to appear: fn. 14) briefly suggests that gender switch in Arabic dialects for non-human nouns should be accounted for via a similar structure to (29) but where the key head is Group, not *n*. We submit that *n* is a better choice since there is independent evidence that all the relevant features already occur on *n*'s across languages. Moreover, calling this head Group dilutes the connection to pseudopartitives since the relevant head seems noun-related in, say, Germanic languages (e.g., *spand* 'bucket' and *gruppe* 'group' in Danish), and not a functional head.

McCarthy, eds. *Perspectives on Arabic Linguistics IV.* Amsterdam: Benjamins. 245-262.

Bobaljik, Jonathan David. 2002. Syncretism without paradigms: remarks on Williams 1981, 1994. In Geert Booij and Jaap van Marle, eds. *Yearbook of Morphology 2001.* Dordrecht: Foris. 53-85.

Bonet, Eulalia. 1991. Morphology after syntax: pronominal clitics in Romance. Doctoral dissertation, Massachusetts Institute of Technology.

Brustad, Kristen. 2000. *The Syntax of Spoken Arabic: A Comparative Study of Moroccan, Egyptian, Syrian, and Kuwaiti Dialects.* Washington, D.C.: Georgetown University Press.

Corbett, Greville. 1991. *Gender.* Cambridge: CUP.

Dali, Myriam and Éric Mathieu. Les pluriels internes féminins de l'arabe tunisien. *Lingvisticæ Investigationes* 39. 253-271.

De Belder, Marijke. 2011. A morphosyntactic decomposition of countability in Germanic. *Journal of Comparative Germanic Linguistics* 14. 173-202.

Embick, David and Rolf Noyer. 2001. Movement operations after syntax. *Linguistic Inquiry* 32. 555-595.

Embick, David and Rolf Noyer. 2007. Distributed morphology and the syntax/morphology interface. In Gillian Ramchand and Charles Reiss, eds. *The Oxford Handbook of Linguistic Interfaces.* Oxford: OUP. 289-324.

Farkas, Donka. 1990. Two cases of underspecification in morphology. *Linguistic Inquiry* 22. 27-62.

Fassi Fehri, Abdelkader. 1988. Agreement in Arabic, binding and coherence. In Michael Barlow and Charles A. Ferguson, eds. *Agreement in Natural Language: Approaches, Theories, Descriptions.* Stanford: CSLI. 107-158.

Fassi Fehri, Abdelkader. 2016a. Semantic gender diversity and its architecture in the grammar of Arabic. *Brill's Journal of Afroasiatic Languages and Linguistics* 8. 154-199.

Fassi Fehri, Abdelkader. 2016b. New roles for Gender: Evidence from Arabic, Semitic, Berber, and Romance. Ms., Mohamed V University of Rabat.

Fassi Fehri, Abdelkader. To appear. Multiple facets of constructional Arabic Gender and 'functional universalism' in the DP. In Éric Mathieu, Myriam Dali, and Gita Zareikar, eds., *Gender and Noun Classification.* Oxford: OUP.

Grestenberger, Laura. 2015. Number marking in German measure phrases and the structure of pseudo-partitives. *Journal of Comparative Germanic Linguistics* 18. 93-138.

Halle, Morris. 1997. Distributed morphology: impoverishment and fission. In Benjamin Bruening, et al., eds. *MIT Working Papers in Linguistics 30: Papers at the Interface.* Cambridge: MITWPL. 425-449.

Halle, Morris and Alec Marantz. 1993. Distributed morphology and the pieces of inflection. In Ken Hale and Samuel Jay Keyser, eds. *The View from Building 20*. Cambridge: MIT Press. 111-176.

Hankamer, Jorge and Line Mikkelsen. 2008. Definiteness marking and the structure of Danish pseudopartitives. *Journal of Linguistics* 44. 317-346.

Harley, Heidi. 2008. When is a syncretism more than a syncretism? Impoverishment, metasyncretism and underspecification. In Daniel Harbour, David Adger and Susana Béjar, eds. *Phi Theory*: Oxford: OUP. 251-294.

Heine, Bernd. 1982. African noun class systems. In H. Seiler and C. Lehmann, eds. *Apprehension: Das Sprachliche Erfassen von Gegnständen* I: *Bereich und Ordnung der Phänomene*. Tübingen: Narr. 189-216.

Ingham, Bruce. 1994. *Najdi Arabic: Central Arabian.* Amsterdam: Benjamins.

Keenan, Caitlin. 2013. 'A pleasant three days in Philadelphia:' arguments for a pseudopartitive analysis. *University of Pennsylvania Working Papers in Linguistics* 19. 87-96.

Kihm, Alain. 2005. L'accord dans le groupe nominale en sémitique. *Faits de Langues* 26. 147-169. .

Kramer, Ruth. 2009. Definite markers, phi-features, and agreement: a morphosyntactic investigation of the Amharic DP. Doctoral dissertation, UC Santa Cruz.

Kramer, Ruth. 2015. *The Morphosyntax of Gender.* Oxford Studies in Theoretical Linguistics 58. Oxford: Oxford University Press.

Kramer, Ruth. 2016. Syncretism in Paradigm Function Morphology and Distributed Morphology. In Daniel Siddiqi and Heidi Harley, eds. *Morphological Metatheory* Amsterdam: Benjamins. 95-120.

Kramer, Ruth. To appear. A novel kind of gender syncretism. In Éric Mathieu, Myriam Dali, and Gita Zareikar, eds., *Gender and Noun Classification.* Oxford: OUP.

Lecarme, Jacqueline. 2002. Gender "polarity:" theoretical aspects of Somali nominal morphology. In Paul Boucher and Marc Plénat, eds. *Many Morphologies.* Somerville, Massachusetts: Cascadilla Press. 109-141.

Löbel, Elisabeth. 1989. Q as a functional category. In Christa Bhatt et al., eds., *Syntactic Phrase Structure Phenomena in Noun Phrases and Sentences*. Amsterdam: Benjamins. 133-158.

Lotfi, Ahmad R. 2006. Agreement in Persian. *Linguistik Online* 29. 123-141.

Nevins, Andrew. 2011. Marked targets versus marked triggers and impoverishment of the dual. *Linguistic Inquiry* 42. 413-444.

Noyer, Rolf. 1998. Impoverishment theory and morphosyntactic markedness. In Steven G. LaPointe, Diane K. Brentari, and Patrick M. Farrell, eds. *Morphology and its Relation to Phonology and Syntax.* Stanford, CA: CSLI. 264-285.

Omar, Margaret K. 1975. *Saudi Arabic, Urban Hijazi Dialect: Basic Course.* Washington, DC.

Ouwayda, Sarah. 2014. Where number lies: plural marking, numerals, and the collective-distributive distinction. Doctoral dissertation, University of Southern California.

Prochazka, Theodore. 1998. *Saudi Arabian Dialects.* New York: Routledge.

van Riemsdijk, Henk. 1998. Categorial feature magnetism: the endocentricity and distribution of projections. *Journal of Comparative Germanic Linguistics* 2. 1-48.

Ritter, Elizabeth. 1995. On the syntactic category of pronouns and agreement. *Natural Language and Linguistic Theory* 13. 405-443.

Sieny, Mahmoud Esma'il. 1978. *The Syntax of Urban Hijazi Arabic.* London: Longman.

Stavrou, Melita. 2003. Semi-lexical nouns, classifiers and the interpretation(s) of the pseudopartitive construction. In M. Coene and Y. D'Hulst eds. *From NP to DP*. Amsterdam: Benjamins. 329-354.

Steriopolo, Olga and Martina Wiltschko. 2010. Distributed GENDER hypothesis. In G. Zybatow et al., eds. *Formal Studies in Slavic Linguistics: Proceedings of the Formal Description of Slavic Languages 7.5.* New York: Peter Lang GmbH. 155-172.

Weak Crossover in Chinese—now you see it, now you don't

Jun Lyu
Stony Brook University
jun.lyu@stonybrook.edu

Abstract

Ever since Huang and Li (1996), the topic of weak crossover (WCO) in Chinese has never received enough attention probably because Chinese as a wh-in-situ language was taken to be subject to the same set of constraints on WCO as English. The only difference was thought to be the level at which theses constraints operate. However, this observation is partial because WCO can be bled in overt wh-movement constructions in Chinese (Liu, 2013). In this study, we aim to investigate the mechanism that explains the absence of WCO. Through two offline experiments, we examined three hypotheses in the literature that aim to explain the absence of WCO cross-linguistically. The experimental results suggested that a typological account in the spirit of Bresnan (1994, 1998) can best explain the WCO phenomenon in Chinese, in contrast with the weakest crossover account adopted by Liu (2013) or the A-scrambling account.

1 Introduction

Weak crossover (WCO) occurs when the *wh*-operator moves from the underlying base position to spec-CP and locally A'-binds two variables at the same time. This ban on simultaneous local binding of two variables by the same operator is called the Bijection Principle (BP, Koopman & Sportiche, 1982), which states that there must be a bijective (one-to-one) relation between the binder and the bindee. For example, in (1a), *who* crossed the co-indexed pronoun from an A-position to an A'-position, giving rise to WCO effect.

(1)   a.   *Who_i did his_i teacher scold t_i?
       b. Who_i t_i scolded his_i teacher?

However, this bijective relation between operators and variables is not inviolable. There are two situations where surjective (more than one) binding is also possible. First, Reinhart (1983) argues that for a trace and a pronoun to have bound readings, the pronoun must be locally A-bound by the trace which in turn must be A'-bound by the wh-operator. This

general observation can explain why (1b), as opposed to (1a), is grammatical. In (1b), the trace c-commands the pronoun and is itself bound by the wh-operator.

The second exception to the BP is when the two variables are both overt or covert. This constraint is called the Parallelism Constraint on Operator Binding (PCOB) which requires the two variables to be symmetrical in [αpronominal] values (Safir, 1984). This principle can explain the acceptability of sentences (2a-b) involving resumptive pronouns in (2a) and parasitic gap construction in (2b):

(2)　a. Do you remember the guy$_i$ who everyone who knew him$_i$ hated his$_i$ attitude?
　　　b. Which report$_i$ did you file t$_i$ without reading e$_i$?

Despite their success in explaining the English data, a closer look at WCO cross-linguistically seems to suggest otherwise. In this paper, we will focus on Chinese, a wh-in-situ language.

What is interesting about Chinese is that, in the literature, there seems to be an asymmetry in WCO effect between wh-in-situ on the one hand and overt wh-movement on the other. For an example from each configuration, see (3) and (4), respectively.

(3)　a. *[$_{RC}$ xihuan **ta$_i$**　DE]　　ren　　　kandao-le **shei$_i$**?
　　　　　like　　him COMP　person　　see-ASP　　who
　　　"Who is it such that the person that saw him also likes him?"
　　　a'. LF: **Shei$_i$** [[$_{RC}$ …**ta$_i$**…] … **t$_i$**]

(4)　a. **Na-wei　　baoan$_i$** [Zhang nüshi [zai mianshi **t$_i$** zhihou] cai luqu-le　　　**ta$_i$**]?
　　　　which-CL guard　Mrs. Zhang　at interview　after　　FOC employ-ASP him
　　　b. **Na-wei　　baoan$_i$** [Zhang nüshi [zai mianshi **ta$_i$**　zhihou] cai luqu-le　　**t$_i$**]?
　　　　which-CL guard　　Mrs. Zhang at　interview him after　　FOC employ-ASP
　　　"Which guard is it such that only after interviewing him did Mrs. Z hire him?"

In the wh-in-situ example (3a), Huang and Li (1996) argued that the unavailability of bound reading for the pronoun is due to WCO in LF as shown in (3a'). The covert movement of wh-phrase to an A'-position violates bijection, hence the ungrammaticality. However, in the overt movement configurations (4a-b), surprisingly, the WCO effect evaporates[1] (Liu, 2013). This is unexpected given the principles mentioned so far, either BP, PCOB, or c-command based constraint à la Reinhart. To explain the bleeding of WCO, we need to turn our attention to some other theories.

This article is organized as follows. In the next section, we will look at three hypotheses in the literature that show promise in accounting for the absence of WCO. Then in Section 3, we will report two offline experiments to empirically test these hypotheses using Chinese data which is rarely mentioned in the literature. Section 4 summarizes the findings and concludes the article.

2　Competing hypotheses
2.1 A-scrambling account
It is generally observed that A-movement bleeds WCO, as shown in (5). Sentence (5) respects neither bijection or parallelism of pronominal features. Nor does the trace c-

---

[1] An attentive reader may spot a violation of adjunct island in (4a). In Chinese, islands can be crossed if a focus sensitive particle or modal is present (Zhang, 2009).

commands the pronoun. However, the co-indexation reading is fine. Thus, one way to account for absence of WCO in overt wh-movement in Chinese is to propose that the wh-movement is actually A-scrambling.

(5) Every girl$_i$ seems to her$_i$ father [t$_i$ to be beautiful].

The A-scrambling account was first proposed by Mahajan (1990) to explain the absence of WCO in Hindi and was subsequently invoked to explain relevant facts in Japanese as well (Saito, 1992; Ueyama, 1999). For an example in Hindi and Japanese respectively, see (6a-b) and (7a-b):

Hindi (Mahajan, 1990):
(6) a. ***Uskii$_i$** bahin   **kis-ko$_i$**   pyaar   kartii   thii?
           his   sister-NOM who-ACC love   do-ASP-f be-PAST-f
     b. **Kis-ko$_i$**   **uskii$_i$** bahin   **t** pyaar   kartii   thii?
        who-ACC his   sister-NOM   love   do-ASP-f be-PAST-f
     "Who$_i$ did his$_i$ sister love?"

Japanese (Saito, 1992):
(7) a. *[**Soitu$_i$**-no hahaoya]-ga   **dare$_i$**-o   aisiteiru no?
           guy-GEN mother   NOM   who-ACC love-ASP Q
     b. ?**Dare$_i$**-o   [**Soitu$_i$**-no hahaoya]-ga   **t$_i$** aisiteiru no?
          Who-ACC guy-GEN mother   NOM   love-ASP Q
     "Who$_i$ does his$_i$ mother love?"

Examples (6a) and (7a) are wh-in-situ configurations whereas (6b) and (7b) have scrambled wh-phrases. Consistent with the A-scrambling account, bound reading of pronouns is impossible in wh-in-situ sentences in Hindi and Japanese as such configurations violate the BP. Scrambling the wh-operator to an A-position makes pronominal binding possible. The merit of this hypothesis is that it preserves the conventional syntactic constraints while being able to explain the absence of WCO in scrambling languages. Now the question is that whether there is any evidence to support such a claim in Chinese. On the surface, it seems that there is.

To see whether the landing site for the wh-phrase in Chinese is indeed an A-position, we can apply Binding Principle A. If the displaced wh-phrase can bind a reflexive which is located in the subject position, then the landing site is an A-position as Binding Principle only applies to A-relations. As shown in (8), binding is indeed possible.

(8) Na-ge nanren [ziji-de   laopo gen qita   nanren pao-le]?
    Which man   self-GEN wife with other man   elope-ASP
    "Which man is it such that his wife eloped with another man?"

However, it is controversial in the literature whether Chinese *ziji* ('self') is an anaphor or a logophor. The notion of logophor was first proposed by Clemens (1975) to distinguish two morphologically distinct classes of pronouns in African languages. Different from a regular pronoun, a logophoric pronoun/reflexive econveys the speakers' intention, attitude, emotion, and temporal-spatial location (Sells, 1987). Drawing on Sell's theoretical framework, Huang and Liu (2001) argued that there is sufficient evidence to support a logophoric analysis of Chinese *ziji*. However, such a position was not unchallenged (Pan,

2001; Chen, 2009). Instead of dwelling on a controversial topic which lacks consensus, we suggest that we focus on the A/A'-distinction. If A'-movement (in LF) cannot bleed WCO, then it must be the case that wh-movement in Chinese is A-movement. We will address this issue in Section 3.

2.2 Weakest crossover

In their seminal work on crossover, Lasnik and Stowell (1991) argued that parasitic gaps, tough-movement and topicalization constructions form a distinct class called weakest crossover construction. The main idea is that the trace is left behind not by a wh-phrase but by a null operator (OP). According to their account, OP is exempt from WCO effect as it is not a true quantifier. To illustrate this with an example, we will use tough-movement (examples from Lasnik & Stowell, 1991: 696), shown here in (9) and (10):

(9) This book$_i$ was too obscene [OP$_i$ [to have its$_i$ author publish t$_i$].
(10) Which boy$_j$ [t$_j$ will be easy [OP$_i$ [PRO to persuade his$_i$ boss to vouch for t$_i$]]]?

Tough-movement is literally "tough" if we take the antecedent to be base-generated inside the embedded clause since it can acquire a case in the lower position already. However, following Chomsky (1977; 1981), Lasnik and Stowell assumed that what moves out of the lower position is an OP. They further proposed that OP is different from true quantifiers in that it does not range over a nonsingleton set, which sets it apart from wh-phrases and existential/universal quantifiers. As to how the matrix subject (i.e., "this book"/ "which boy") can bind the pronoun and the trace, they hypothesized that, as long as the subject (or its trace) A-binds OP, the property of binding can be transferred from OP to the subject by a late rule of Predication (Lasnik & Stowell, 1991: 714).

Appealing to this theoretical framework, Liu (2013) concluded that overt wh-movement construction as shown in (4a-b) in Chinese is also a case of weakest crossover. Adopting the analysis of weakest crossover, sentence (4a-b) should thus exhibit the following structures, repeated here as (11a-b):

(11)   a. Which guard$_i$ [**OP$_i$** [Mrs. Zhang [at meeting **t$_i$** after] FOC employed **him$_i$**]]?
       b. Which guard$_i$ [**OP$_i$** [Mrs. Zhang [at meeting **him$_i$** after] FOC employed **t$_i$**]]?
       "Which guard is it such that only after interviewing him did Mrs. Z hire him?"

It should be noted that the validity of such an account rests on the fact that there is a gap position from which OP moves away. But in WCO configurations where there is no overt gap, this hypothesis is no longer applicable or should predict ungrammaticality.

2.3 Typological account

Drawing on languages of different typological lineages, Bresnan (1994, 1998) proposed two constraints in governing WCO effect, a syntactic rank constraint and a linear precedence constraint. Setting aside the technical details, the former essentially dictates that the grammatical function of the operator must not be lower than that of its variables on the grammatical function hierarchy (SUB>OBJ>OBL…). The latter dictates that the operator must precede its variables. Importantly, each constraint is violable. Different languages assign different weights to these two constraints. In Bresnan (1994), it is argued that English needs to satisfy both to be well-formed, as shown in contrastive sentences in (12) and (13) (examples from Bresnan, 1994: 11-13):

(12)	a. *Which suspect$_i$ did his$_i$ mother visit t$_i$ on the night of the murder?
	b. Which suspect$_i$ t$_i$ was visited by his$_i$ mother?
(13)	a. *As academic adviser to the women's college, it was my responsibility to talk about her$_i$ coursework with every student$_i$.
	b. As academic adviser to the women's college, it was my responsibility to talk with every student$_i$ about her$_i$ coursework.

Contrast in (12) shows the presence of the syntactic rank constraint and contrast in (13) shows the presence of linear precedence constraint. In (12a), the grammatical function of the wh-operator is OBJ whereas its pronominal variable sits in a subject, a violation of syntactic rank; in (13a), although the ordering of double objects in English is flexible (e.g. "talk about my homework with me"/ "talk about with me about my homework"), the unavailability of binding in (13a) can be explained assuming a linear precedence constraint. Thus, in this framework, English has to satisfy both constraints.

However, not every language behaves like English. In a WCO typology in Bresnan (1998: 21), Korean and German only need to satisfy either one of the constraints whereas Malayalam and Hindi strictly require that linear precedence relation be met. Chichewa, on the other hand, strictly observes syntactic rank constraint. Adopting this perspective, based on contrast between (3) and (4a-b), it seems that linear order constraint must be strictly satisfied in Chinese.

2.4 Disentangling the hypotheses
Now the question is, how do we tease apart these hypotheses? To do that, we need to manipulate structures with both A'-movement and A-movement so that clear predictions can be made for the A-scrambling account. We also need to have constructions in which either a gap is available or unavailable to (dis-)allow the movement of an OP. Finally, we need to manipulate the linear order of wh-operator and its variables while keeping their grammatical functions constant. To meet the above requirements, we can compare the following set of conditions shown in (14a-d):

(14)	a. Which guard$_i$ [Mrs. Zhang [at meeting **t$_i$** after] FOC employed **him$_i$**]?
	b. Which guard$_i$ [Mrs. Zhang [at meeting **him$_i$** after] FOC employed **t$_i$**]?
	c. Mrs. Zhang [at meeting **which guard$_i$** after] FOC employed **him$_i$**?
	d. Mrs. Zhang [at meeting **him$_i$** after] FOC employed which **guard$_i$**?

What is nice about (14c) and (14d) is that they not only form the in-situ (A'-movement) counterparts to the overt movement constructions in (14a-b), they also form a minimal pair between themselves so that linear order alone is different. Recall that Huang and Li's example in Section 1, repeated here as (15), is also wh-in-situ but is ambiguous with regard to which principle is violated. This is because the ungrammaticality could be due to two possibilities: (i) violation of bijection in LF; (ii) violation of linear precedence. Thus, to tease apart these two possibilities, we need to vary (ii) but keep (i) constant. Sentence (14c) enables us to do exactly that. Both (14c) and (14d) violate bijection, but only in the former is the linear precedence constraint satisfied.

(15)	a. *[$_{RC}$ xihuan **ta$_i$**	DE]	ren	kandao-le **shei$_i$**?
		like	him COMP	person	see-ASP	who
	"Who is it such that the person that saw him also likes him?"

In the next section, we will report two offline experiments in an attempt to verify the three hypotheses mentioned above.

3 Experiments

3.1 Research questions
The present study aims to investigate the following issues:
- Is there an asymmetry in WCO effect in Chinese such that WCO can be bled in overt but not covert wh-movement constructions?
- What is the binding pattern for each of the conditions in (14)? Is there any difference between conditions that can receive bound pronominal readings?
- Which of the hypotheses can best account for the presence/absence of WCO effect in Chinese?

3.2 Experiment 1
Experiment 1 used a forced choice task to directly probe the interpretation preference of the pronoun by Chinese speakers. In particular, we are interested to see (i) which of the conditions in (14) can bleed WCO effect so that a bound reading of pronouns is allowed, and (ii) for those conditions that can bleed WCO in (14), is there any difference among them?

3.2.1 Methodology
In this experiment, factors Wh-movement type (overt/covert) and Trace position (left/right to pronoun) were full crossed to yield a 2x2 factorial design. Wh-type is crossed to introduce A-/A'-movement distinction and Trace position was introduced to not only control for linear order in covert constructions but also to test for the potential Leftness Condition (Chomsky, 1977) which is found to be very robust in English (Bianchi, 2001). An example set is listed in (14a-d), repeated here as (16a-d) in Chinese:

(16) *Overt/Left:*
  a. **哪位 保安** 张女士 在会见 **t** 之后 才 录取了 **他**?
     Which guard [Mrs. Zhang [at meeting t after] FOC employed him]
  Overt/Right:
  b. **哪位 保安** 张女士 在会见 **他** 之后 才 录取了 **t**?
     Which guard [Mrs. Zhang [at meeting him after] FOC employed t]
  Covert/Left:
  c. 张女士 在会见 **哪位 保安** 之后 才 录取了 **他**?
     Mrs. Zhang [at meeting which guard after] FOC employed him
  Covert/Right:
  d. 张女士 在会见 **他** 之后 才 录取了 **哪位 保安**?
     Mrs. Zhang [at meeting him after] FOC employed which guard
     "Which guard is it such that only after interviewing him did Mrs. Z hire him?"

A total of 16 sets of 4-tuple items were constructed alongside 16. Half of the wh-phrases were male in gender paired with a gender congruent pronoun (e.g. "guard" and "him"), and the other half switched the gender congruency pattern (e.g. "nurse" and "her"). The target items and the fillers were distributed into four lists in a Latin square fashion and were subsequently pseudorandomized such that no two target items appeared in succession. The

participants' task was to answer "who does *him/her* refer to?" by selecting one of the two choices: (i) *some X_i that Y verbed t_i* (e.g. "some guard that Mrs. Z met") and (ii) *a person not mentioned in the context*. The stimuli were presented on Qualtrics, a web-based software. Twenty-five Chinese native speakers from two universities in Beijing and Shanghai participated in the current study.

3.2.2 Predictions

Given the target conditions, we make the following predictions for each of the hypotheses. First, the A-scrambling account predicts that only overt wh-movement can bleed WCO, but not covert movement in LF which undergo A'-movement (Huang, 1982). Thus, pronouns in (16a-b) should be able to receive a bound reading whereas pronouns in (16c-d) cannot. Next, the weakest crossover hypothesis makes similar predictions as only (16a-b) contain gaps to accommodate the movement of an OP. Conditions (16c-d) cannot have an OP and thus does not allow a bound reading. Therefore, both A-scrambling and weakest crossover accounts expect a significant main effect of Wh-movement type. Finally, the typological account predicts that, except for (16d), all the other conditions should be able to allow bound reading assuming that only linear order must to be respected in Chinese. In other words, we should expect a significant interaction under the typological account.

3.2.3 Results

To analyze the categorical data, we fitted a mixed-effect logistic regression using the lme4 function in R, with Wh-movement type and Trace position as fixed effects and intercepts for participants and items as random effects. The random slope was not included as the model failed to converge. Using R, we coded all the answers that allowed bound pronominal readings to '1' and those that suggested non-bound readings to '0'.

The results for the percentage of bound reading are shown in Fig. 1. First, we ran chi-square tests of goodness of fit to see whether there is a preference for bound reading. Chi-square test results showed that for overt wh-movement there was a significant bias for bound reading in both Overt/Left (χ^2=70.04, *p*<.000) and Overt/Right configurations (χ^2=57.04, *p*<.000). As for the covert movement, only Covert/Left condition showed a significant bias for bound reading (χ^2=42.67, *p*<.000). The Covert/Right condition on the other hand showed a strong bias for *non-bound* reading (χ^2=50.04, p<.000). Thus, the chi-square tests revealed that WCO effect does not exist for conditions (16a-c) but exists for (16d) in which the bound reading was very difficult, if not impossible.

Next, we ran the mixed-effect logit regression to look for potential differences among conditions. Both main effects and their interactions were found to be significant (*p*s<.000). Pairwise comparison suggests that no bound reading difference exists between the two overt movement structures (*p*=0.30) but there is a significant leftness effect between Covert/Left and Covert/Right structures (*p*<.000). Finally, no statistical difference was observed among the first three conditions that bleed WCO (*p*s>.05).
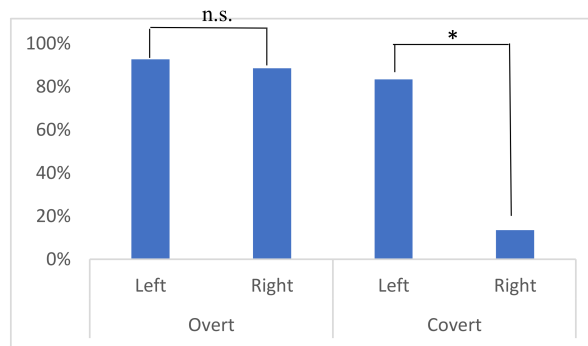
Fig. 1. Percentages of pronominal bound reading

3.2.4 Discussion

Statistical results indicated that WCO is absent for the first three configurations but not for the last one. This is incongruent with both A-scrambling and OP movement but matches the predictions of the typological account. However, the data showed that occasionally bound reading was also possible for Covert/Right configuration (13.5% of the data). This is unexpected under the typological account which predicts non-availability of pronominal variable binding at all.

There are two possibilities for this unexpected pattern: (i) random errors induced by inattention or fatigue on the part of the participants; (ii) intervention of pragmatics. As to the first possibility, since in Covert/Right configuration choosing a bound reading is more taxing than a non-bound reading—as the bound reading is encoded as a relative clause in the choice—we would expect an inattentive or tired participant to choose the latter rather than the former. To rule out (i), a chi-square test was run again, setting the expected value of bound reading to zero percent. The statistical result suggests that 13.5% was not chance error ($p<.000$). Therefore, we think pragmatic intervention is a more plausible explanation.

Therefore, we argue that the second possibility is more likely. For example, even if (16d) does not allow a bound reading, it is nevertheless pragmatically felicitous to associate the person just employed with the person who just went through an interview. Pragmatic consideration is particularly likely with the present task in which the participants were not informed of the well-formedness of the sentences in advance. It is possible that the more the participants try to make sense of the sentence when infelicity appears, the more likely they will choose the bound reading even if the syntactic constraint does not allow it. In other words, pragmatics may occasionally override syntax.

To prevent the participants to dwell on the pragmatic felicity of the target sentences by forcing them to make a choice, in Experiment 2, we used a grammaticality judgment task as a more natural alternative.

3.3 Experiment 2

In this experiment, we switched to a more natural task where the participants were required to judge the naturalness of the sentence. Slightly different from Experiment 1, we also manipulated gender (mis-)match in this experiment. Factors in Exp. 1 are all preserved in Exp. 2. For example, adding gender manipulation to (16a) in Exp. 1 gives us the following two Gender Match/Mismatch conditions in (17a-b):

(17)   *Overt/Left/Match*
     a. **哪位 保安/护士**   张女士   在 会见 **t** 之后 才 录取了 **他**?
       Which guard/nurse [Mrs. Zhang [at meeting t after] FOC employed him]

     Overt/Left/Mismatch
     b. **哪位 保安/护士**   张女士   在 会见 **他** 之后 才 录取了 **t**?
       Which guard/nurse [Mrs. Zhang [at meeting him after] FOC employed t]

The logic behind such a design is that a gender mismatch penalty should emerge if a bound pronoun mismatches in gender with its binder. If, on the other hand, there is no gender mismatch penalty, this suggests that no bound reading is available. Thus, this experiment taps into the subconscious grammatical knowledge of the Chinese native speakers without forcing them to focus excessively on the pragmatic felicity.

3.3.1 Methodology
Three factors were fully crossed, Wh-movement type, Trace position, and Gender congruency. The participants were required to judge the "naturalness" of the sentence based on a 1-7 Likert scale. Thirty-two sets of 8-tuple items were created and distributed into 8 presentation lists using Latin square. The target items were then pseudorandomized with 52 fillers in each list. All of the stimuli were presented on Qualtrics. Twenty-eight Chinese native speakers from a local university in Guangdong participated in this experiment. None of them had participated in Exp. 1.

3.3.2 Predictions
Both A-scrambling and weakest crossover accounts predict an interaction of Wh-movement type and Gender congruency such that gender mismatch penalty should only appear in overt wh-movement but not in covert wh-movement. The typological account, on the other hand, predicts a three-way interaction such that trace position in covert movement configurations also matters as it predicts WCO effect (i.e. absence of gender mismatch effect) in the Covert/Right condition.

3.3.3 Results
A mixed-effect linear regression was used with Wh-movement type, Trace position, and Gender congruency as fixed effects and slopes and intercepts for both subjects and items as random effects. The statistical results are summarized in Table 1 and visualized in Fig. 2.

    The statistical results showed that there was a three-way interaction of all the main effects. For overt wh-movement, only a main effect of Gender was found to be marginally significant (t=-1.92, p=0.055), suggesting that pronouns in overt structures were treated as variables by Chinese natives; for covert wh-movement, main effects of Trace position, Gender, and their interactions were found to be significant (ts>2). Pairwise comparison suggests that Gender only impacted Covert/Left condition (t=-4.24), but not Covert/Right (t=-0.49). In other words, in wh-in-situ configurations, pronouns can be bound only when the wh-operator precedes the pronoun. Combining the overt and overt wh-movement data together, we also found a main effect of Wh-type suggesting that Overt movement was overall less acceptable than Covert movement (p<.05). But subsequent analyses suggested that the difference only exists between the over wh-movement types and the Covert/Left construction (ps<.05).

Table 1. Summary of statistical results in Exp. 2

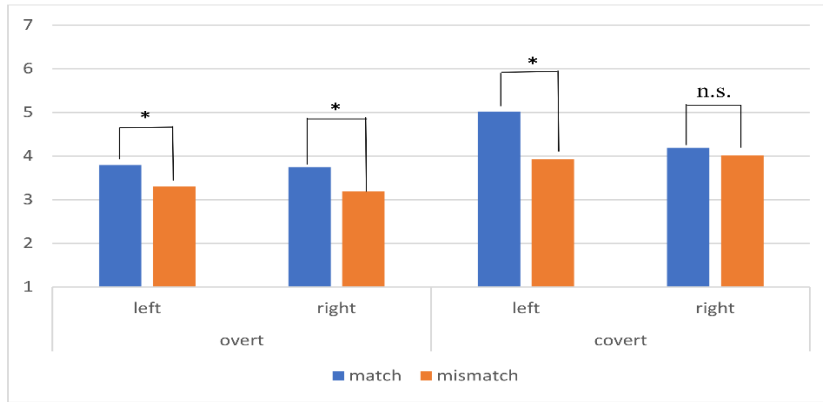| Wh-movement type	Trace position	Match	Mismatch	t-value
Overt	Left	3.79	3.30	**-2.35**
	Right	3.74	3.19	**-3.16**
Covert	Left	5.02	3.93	**-5.17**
	Right	4.18	4.01	-0.62

Fig. 2. Mean scores for target conditions in Exp. 2.

3.3.4 Discussion
In Experiment 2, we replicated the main findings in Experiment 1. The gender mismatch effect was found for all conditions except for the Covert/Right configuration, a result supporting the typological account and inconsistent with the predictions of either A-scrambling or OP movement accounts. Furthermore, overt movement did not increase the probability of pronominal binding as can be seen in Fig. 2, a fact further undermining the A-scrambling account.

However, what is unexpected in this experiment is the main effect of Wh-movement type, which is present between the overt movement constructions and the Covert/Left construction. This means that moving wh-phrases out of a clause incurs extra penalty. Furthermore, the mean scores for the overt conditions in Table 1 seems to suggest that their grammatical status is marginal, different from the judgment of Liu (2013) who argued that such sentences are fully grammatical. The marginal status of these sentences could be due to a number of reasons, such as the absence of relevant prosody which licenses the overt wh-movement, the extra processing cost associated with the complex structures in overt-movement, the low frequency of such configurations, or all of these factors. We leave this issue open at this point. The important finding from this experiment is that while overtly moving the wh-operator can bleed WCO effect, it comes at a cost.

4. Conclusion
The present study has looked at the phenomenon of WCO bleeding in Chinese through a forced choice task and a grammaticality judgment task. Three major findings were found. First, contrary to the conventional wisdom which forbids simultaneous binding of two

variables by one operator, in Chinese such binding is allowed. Second, the A-scrambling account and the weakest crossover account are incongruent with the experimental results. Third, contrary to Liu (2013), bleeding of WCO effect in overt movement of wh-phrase incurs extra processing cost and should best be considered as marginal. Overall, the present study supports the typological account which requires that linear precedence constraint must be respected in Chinese.

References

Bresnan, J. 1994. Linear order vs. syntactic rank: Evidence from weak crossover. In K. Beals, J. Denton, B. Knippen, L. Melnar, H. Suzuki & E. Zeinfeld (eds.), the *13th Proceedings of Chicago Linguistics Society*, 57-89. Chicago, IL.

Bresnan, J. 1998. Morphology competes with syntax: Explaining typological variation in weak crossover effects. In P. Barbosa et al. (eds.), *Is the Best Good Enough?*, 59–92. MIT Press, Cambridge, MA.

Chen, H.-Y. Logophoricity and ziji. 2009. In Y. Xiao. (ed.), Proceedings of the 21st North American Conference on Chinese Linguistics, Vol. 2, 464-481. Smithfield, RI.

Clemens, G. N. 1975. The logophoric pronoun in Ewe: Its role in discourse", *Journal of West African Languages* 2, 141-177.

Huang, C.-T. J. (1982). *Logical Relations in Chinese and the Theory of Grammar*. Unpublished Ph.D. dissertation, MIT.

Huang, C.-T. J. & Y.-H. A. Li. 1996. Recent generative studies in Chinese syntax. In C.-T. J. Huang & Y.-H. A. Li (eds.), *New Horizons in Chinese Linguistics*, 49-95. Kluwer Academic Publishers.

Koopman, H. and D. Sportiche. 1982. Variables and the Bijection Principle. T*he Linguistic Review* 2, 139-160.

Lasnik, H. & Stowell, T. 1991. Weakest crossover. *Linguistic Inquiry* 22(4), 687-720.

Liu, C.-M. L. 2013. Mandarin parasitic gaps. In H. A. Bacovcin et al. (eds.), *University of Pennsylvania Working Papers in Linguistics*, Vol. 19: Iss. 1, Article 13. Philadelphia, PA.

Mahajan, A. 1990. *The A/A-Bar Distinction and Movement Theory*. PhD dissertation, MIT.

Pan, H. 2001. Why the Blocking Effect? In P. Cole, G. Hermon & C.-T. J. Huang (eds.), *Long-Distance Reflexives*, vol.33 of *Syntax and Semantics*, 279-316. New York: Academic Press.

Reinhart, T. 1983. Coreference and bound anaphora: A restatement of the anaphora questions. *Linguistics and Philosophy* 6, 47-88.

Safir, K. 1984. Multiple variable binding. *Linguistic Inquiry* 15(4), 603-638.

Saito, M. 1992. Long Distance Scrambling in Japanese. *Journal of East Asian Linguistics* 1, 69-118.

Sells, P. 1987. Aspects of logophoricity. *Linguistic Inquiry* 18(3), 445-480.

Ueyama, A. 1999. Two types of scrambling constructions in Japanese. In A. Barss. & T. Langendoen (eds.), *Anaphora: A Reference Guide.* Blackwell, Cambridge.