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The Parallel Reduction Hypothesis in Grammaticalization Revisited: A Case of English Prepositions*

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Rhee, Seongha. 2003. The Parallel Reduction Hypothesis in Grammaticalization Revisited: A Case of English Prepositions. ***Discourse and Cognition*** **10.3, 187-205.** In grammaticalization studies some significant generalizations characterizing grammaticalization processes in various levels of grammar have been proposed. The parallel reduction hypothesis is one of such generalizations. This paper examines the hypothesis with English prepositions to examine if the hypothesis holds. Eighty English prepositions were divided into 5 groups by the differing degrees of use frequency, based on the assumption that more grammaticalized forms are more frequently used. Then the complexity was calculated at various levels such as phonology, morphosyntax, and semantics, and the figures were compared across these groups. A quantificational survey reveals that the group of the highest use frequency exhibits the highest level of reduction in form and of generalization in meaning, whereas the group of the lowest frequency shows the lowest level of reduction, thus supporting the parallel reduction hypothesis as a viable generalization of linguistic change phenomena displayed by English prepositions. **(Hankuk University of Foreign Studies · Stanford University)**

Key words: The parallel reduction hypothesis, form-meaning correlation, phonological reduction, mophosyntactic reduction, semantic generalization, grammaticalization.

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1. Introduction

Numerous principles and hypotheses have been proposed to explain diverse grammaticalization phenomena. One of them is the parallel reduction hypothesis proposed by Bybee, *et al.* (1994). The gist of this hypothesis, which hypothesizes that semantic reduction and phonological reduction occur in parallel, is also found as early as in Meillet (1948[1912]) who first coined the term 'grammaticalization', in Lehmann (1974), and in Bybee and Pagliuca (1985), among others. More recently, Bybee and her colleagues, through a systematic study on grammatical categories across 76 languages, presented the hypothesis with strongly supportive examples. Despite its intuitive validity, this time-old hypothesis has not always been thought of as such. Some are rather inclined to consider such parallelism a mere tendency accompanying changes. This research aims at validating this parallel reduction hypothesis with English prepositions. It is argued here that the claims made by the hypothesis are well-attested, if we are to view the grammaticalization phenomena holistically, i.e. as displayed by groups, rather than individually for each of the English prepositions, and that, therefore, this hypothesis is well qualified to be a grammaticalization principle.

2. Theoretical Background

The postulate of an isomorphism between significans and significatum of the language sign, or form-meaning correlation, has been an implicit cornerstone of the various conceptions of linguistics. Thus, Lehmann (1995 [1982]: 122) asserts that:

> The content and the expression of a sign are insolubly associated with each other. There is a far-reaching isomorphism between them which concerns not only properties of their constitution but also the quantitative aspect of their composition. There tends to be a correspondence between the size, or complexity, of the significans and that of the significatum.

In recent grammaticalization studies functional and semantic change in

constructions used with high frequency has been the focus of research, as shown in Bybee *et al.* (1994), Hopper and Traugott (2002 [1993]), Bybee and Hopper (2001a), among numerous others. Bybee and Hopper (2001b: 13), for example, say that phonological reduction and fusion in grammaticalization are paralleled by semantic generalization and functional shifts, an assertion essentially identical with the parallel reduction hypothesis. However, they add one more significant component to this principle, i.e. frequency, by saying that frequency is one of the factors that condition functional change, which will be paralleled by phonological reduction. To this effect, Bybee (2001) exemplifies the frequency effect with French liaison phenomena by showing that liaison alternations are maintained most consistently in constructions of high frequency of use and that frequency plays a role (even greater than syntactic constituency) in determining liaison. Likewise, according to Haiman (1994: 5) repetition conditions 'emancipation' and bleaching, where 'emancipation' refers to freeing a form from the primary motivation and making it available to serve a communicative function.

However, the significans-significatum isomorphism has not been free from controversy among linguists. Ronneberger-Sibold (1980: 239), for example, claims that the size of the significans (the "length") of a sign is not related to the size of its significatum but is determined by the frequency of use (as cited in Lehmann 1995[1982]: 122), thus refuting the idea that formal size and the semantic size of a linguistic sign bear direct correlation. Givón (1981) treats frequency and semantic generality as prerequisites of grammaticalization, but since they are presented as separate variables there seems to be no direct correlation assumed.

Therefore, there are differing positions of scholars with respect to the significans-significatum isomorphism: some claiming direct isomorphism between the two (as the proponents of the parallel reduction hypothesis); others acknowledging existence of the isomorphism but claiming its relevance to frequency; and still others refuting such isomorphism and instead claiming significans-frequency correlation.[1)]

1) As the first two positions are compatible, an argument in support of the hypothesis essentially involves proving existence of correlation between form and meaning.

2.1 The Parallel Reduction Hypothesis

Lehmann (1995 [1982]), discussing parameters of grammaticalization, focuses on the autonomy of the sign as an important concept of grammaticalization, noting that the autonomy of a sign is converse to its grammaticality, and that grammaticalization detracts from its autonomy. This leads him to establishing three parameters: weight, cohesion, and variability. Among these parameters, weight (constituted by integrity) is of special importance for our current purposes. Attrition of integrity comprises phonological attrition (= erosion) in form, and desemanticization in meaning.

Bybee *et al.* (1994: 107) state as to phonetic reduction (= phonological reduction):

> Phonetic reduction can be manifested in any of the segmental or suprasegmental features of the phonetic string. Loss of stress and reduction to a neutral tone are early indicators of reduction, and these are often accompanied by the shortening and reduction of vowels. Consonants can also reduce by shortening, voicing, or loss of secondary features, and both vowels and consonants in grammaticalizing material are subject to complete loss. The result of these processes is that grammaticalized material will be shorter in terms of the number of segments present.

Further, Bybee *et al.* (1994: 20) note the following two observations:

(1) a. There is a link between frequency of use and phonetic bulk such that more frequently used material, whether grammatical or lexical, tends to be shorter (phonologically reduced) relative to less often used material.
b. Grams are phonetically reduced relative to generalized lexical item, which in turn are reduced relative to more specific lexemes.

From these observations is born a hypothesis that states that semantic reduction is directly paralleled by phonetic reduction, called the parallel reduction hypothesis. As formulated by Bybee *et al.*, the hypothesis essentially claims that grammaticalization of form is concurrent with

grammaticalization of function, and with this regard Bybee *et al.* suggest that there might be a direct, or even causal, link between the two sides of reduction, that form and meaning covary in grammaticization, by saying that "the development of grammatical material is characterized by the dynamic coevolution of meaning and form" (Bybee *et al.* 1994: 20).

Since 'reduction' is inherently a processive notion, it is essential to establish a continuum on which forms may be plotted according to their varying degrees of reductive processes each form underwent. In order to establish that, this paper utilizes the relative use frequency. Even though use frequency was one of the key notions that motivated Bybee *et al.* (1994) to propose the parallel reduction principle as discussed above, the principle essentially refers to the paralleled reduction in form and meaning in the course of grammaticalization, and the frequency is a notion either irrelevant or only implicit in the hypothesis *per se*. This paper attempts to validate the parallel reduction hypothesis by comparing the bulks of phonological shape and the semantic complexity of English prepositions.

2.2 Methodological Issues

Since the parallel reduction hypothesis makes reference to form and meaning, its validation process might have to confine its scope to form and meaning only. However, for methodological reasons such restriction is inefficient as will be discussed below. A validation process may involve following procedures: selection of sufficient number of items, identifying grammaticalization trajectory of individual items, measuring the degree of grammaticalization, measuring the degree of phonological reduction, and measuring the degree of semantic reduction, to a brief discussion of each of which we now turn with reference to the methods used in this paper.

2.2.1 On Sample Items

The first issue for validation of the hypothesis involves selection of a sufficient number of items to be investigated. It has not yet been established in scholarship how large a research sample has to be in order to make a generalization meaningful. However, intuitively it is essential that a sample have a reasonable number of items to make an observation something more

than an isolated chance phenomenon. This paper chose 80 English prepositions currently used in modern English. OED lists 404 prepositions, to which the number of prepositions under discussion may seem too small. However, considering that any preposition that ranks below 80 in terms of use frequency is rarely, or nearly never, found in either spoken or written language, and that majority of the 404 prepositions listed therein are in fact obsolete now, this number may be said to represent practically all prepositions in use in contemporary English.

2.2.2 On Measuring Degrees of Grammaticalization

The next issue is directly relevant to the previous procedure: measuring the degree of grammaticalization, ideally for each item, so that they can be plotted on a continuum depending on the respective degree of grammaticalization. Since the notion of measurement by definition involves quantification, there should be methods to assign numerical values for each item according to relevant parameters. In addition, there should be an established continuum on which each item is plotted. In order to do so, each item must be identified in terms of its 'lexicalness' or 'grammaticalness'. However, this method cannot be applied to the current research, because the items involved in this research all belong to the same grammatical category of prepositions, and the investigation is synchronic in nature. Therefore, the items involved cannot be placed on the continuum of the categories which extends from the lexical category on the one end to the grammatical category on the other, along which the grammaticalizing items exhibit decategorialization as they move toward the grammaticalization extreme. (Hopper 1991; Hopper and Traugott 2002[1993]).[2)]

This procedure of measuring degrees of grammaticalization, in its ideal form—ideal at least for the sake of accuracy—, should involve identifying grammaticalization trajectories of individual items by tracing diachronic change of each individual item from the beginning of the grammaticalization

2) See, however, Lehmann (1995 [1982]), Matsumoto (1998), and Rhee (2002) for discussion of different status of individual prepositions and postpositions, which motivates the distinction of primary and secondary, or simplex and complex adpositions. See also Bolinger (1971) and O'Dowd (1998) for fluid categorial issue, where they proposed a category 'adprep', the intermediate category between prepositions and particles.

process up until now or any set time.

However, this apparently simple procedure is extremely hard, and often impossible, to apply to empirical research, largely because of time required to perform the immense task, and also partly, but more seriously in actual research, because there are items of which no such trajectory can be identified for various reasons. Especially in case of English prepositions, many of them have been used as prepositions throughout the recorded history and their paths before reaching the preposition category from their respective lexical sources still remain opaque. For these reasons, unable to undertake an enterprise of such magnitude, this paper did not adopt this method, but instead it is based on synchronic manifestations of each item. We grouped the target items according to the current use frequency. What is implicit in this method is that the most frequently used forms are those that are grammaticalized to the highest degree. This assumption is by no means unusual. For example, Hopper and Traugott (2002: 106 [1993: 103]) state that "the more frequently a form occurs in text, the more grammatical it is assumed to be. Frequency demonstrates a kind of generalization in use patterns." Likewise, a similar method of grouping items and comparing inter-group differences as adopted here has been attested. In their seminal work, Bybee *et al.* (1994), in investigating futures, perfectives, etc., also resort to a similar method, i.e. grouping the 'grams' along the grammaticalization path by way of semantic age (thus, coining the terms, 'perfage' and 'futage') and comparing the quantified inter-group data, instead of tracing individual item's grammaticalization trajectory.

2.2.3 On Measuring Phonological Reduction

Another issue is measuring the degree of phonological reduction. This can be done relatively easily by means of identifying the loss of phonetic substance of an item either in its articulatory gesture or its phonetic features. This procedure, however, can be complicated in quantifying such phenomena, because it unavoidably involves assigning numerical values to phonetic substances or features in a principled way. The degree of complexity of this task can become even higher if we take into consideration the phonological environment in assigning the values of the phonetic substances of an item, because articulatory phonotactic components

shall assign differential values to identical phonetic segments depending on their occurring environments. For example, Jurafsky *et al.* (2001) propose the Probabilistic Reduction Hypothesis, in which sound reduction is greatly influenced by the expectability of cooccurring words. Unable to undertake such a dynamic task for technical reasons, this paper uses a method that calculates the features in a non-dynamic way, i.e. assigning different values simply depending on the natural classes of the sounds concerned.[3)]

2.2.4 On Measuring Semantic Reduction

Another procedure in validating the hypothesis involves measuring the degree of semantic reduction. In order to measure the degree of reduction we must establish ways of quantifying semantic contents, which should be a challenging task. Lehmann (1978), in discussing measuring semantic complexity, suggests that semantic complexity be equated with semantic specificity, and that we measure the specificity by using semantic representations in a predicate-calculus-type notation. However, since we deal with prepositions only, a predicate-calculus-type analysis would not produce any fruitful results.[4)] In this paper we are compelled to use a different measurement method, i.e. using the number of significations as listed in the dictionary and quantified perception of English speakers (see 3.3 for more discussion).

2.3 Previous Research

One of the early works addressing the issue of parallel reduction is Pagliuca (1976), in which 323 extant words with the prefix *pre-* listed in the Shorter Oxford English Dictionary were analyzed. This prefix is listed as occurring with four different vowel qualities, represented as [iy], [i], [ɨ], and [ɛ]. For each prefix, Pagliuca recorded information about the vowel quality, the frequency of use in texts of each word with the prefix (as reported in

3) This method is largely similar to one used by Bybee *et al.* (1994).

4) However, Lehmann states that "the empirical correlate of the semantic complexity of a word thus calculated [i.e., by predicate-calculus] is its amount of information, as determined by checking it in a frequency dictionary" (1978: 83) and acknowledges the existence of a direct relationship between the frequency and the semantic complexity.

Thorndike and Lorge 1944), and whether or not the meaning of the word with the prefix was a predictable sum of the meaning of the base plus the meaning of the prefix. Pagliuca found that there is a strong relationship between the vowel quality and the frequency of the word, and the vowel quality and the semantic predictability of the word, as shown in (2).

(2) Correlation of vowel quality, frequency and semantic predictability in *pre-* words (as cited in Bybee 1985: 90)

Vowel Quality	Frequency	% of Words with Predictable Meaning	Examples
[iy]	05.74	74.76	predecease
[i]	02.54	59.52	predestine
[ɨ]	49.80	03.30	prediction
[ɛ]	81.32	02.89	preface

From the above we can see that the phonological shape (i.e., vowel quality), use frequency, and semantic predictability are closely related. This is an excellent example of tripartite correlation among form, meaning, and frequency.

In a more extensive work, Bybee *et al.* (1994) present analyses in which perfective grams are classified in five subgroups, Perfage 1 through Perfage 5, and future grams are classified into four subgroups, Futage 1 through Futage 4, depending on their semantic ages, and they show that "the correlation between shortness and perfage is highly significant, supporting the prediction that semantic reduction and phonetic reduction work in tandem" (p. 110), and that they "found significant relationships between form and meaning due to grammaticalization" (p. 279).

3. English Prepositions

3.1 Research Design

This research investigates 80 English prepositions out of 404 English prepositions in OED (Oxford English Dictionary, 2nd Edition). The selection is based on their respective token frequency in Johansson and Hofland

(1989),[5] and they are classified into 5 gradient groups (Groups A-E), also based on their frequency.[6] Each member of each group was investigated in terms of their semantic, morpho-syntactic, and phonological make-up. To determine the semantic contents, semantic designations in dictionaries and perceived semantic complexity servery were used. To determine morpho-syntactic contents, morpho-syntactic transparency and morpho-syntactic complexity are measured. To determine the phonological content their phonological complexity in terms of vowel and consonant organization, and its phonological reducibility are considered.

The members of the 5 groups and their frequency counts in Johansson and Hofland (1989) are as follows:

(3)

Group	Members (number)	Frequency Range (actual range)
A	of, in, to, for, with, on, by, at, from, as (10)	Above 2,000 (2805-35324)
B	into, about, after, like, between, over, through, without, under, against (10)	500-2,000 (575-1,658)
C	before, upon, within, among, behind, across, above, since, along, down, until, near, round, beyond, outside, around, off (17)	100-500 (116-488)
D	below, up, except, beside, beneath, past, amongst, till, concerning, owing, opposite, besides, via, onto, toward, unto, alongside, notwithstanding, nearer (19)	10-100 (11-99)
E	amid, considering, aboard, underneath, amidst, pending, out, versus, touching, minus, vis-a-vis, nearest, afore, onward, aside, atop, inward, together, while, ahead, midway, abroad, withstanding, back (24)	Below 10 (0-9)

5) Johansson and Hofland (1989) is a frequency analysis of English vocabulary based on the LOB Corpus (the Lancaster-Oslo/Bergen Corpus), which is a million-word collection of present-day British English written texts. It is the British counterpart of the Brown Corpus, identical in source text characteristics and sampling principles (Johansson and Hofland 1989: 1; For comparisons of these two corpora see pages 15-25).

6) Grouping the prepositions into 5 groups is an arbitrary decision and so are the boundaries between the groups. Especially Group A, comprised of 10 members, show great internal frequency ranges: e.g., the highest frequency preposition *of* accounts for 35,324 tokens while the lowest frequency *as* accounts for only 2,805. However, the intergroup boundaries are generally drawn along great frequency differences between two adjacent prepositions.

As pointed out in 2.2.2, Group A is considered one whose members are grammaticalized to the highest extent, and Group E the lowest extent, with others in between the two.[7]

3.2 Formal Make-Up

3.2.1 Phonological Shortness

For measurement of phonological complexity, some of the basic guidelines were adopted from Bybee *et al.* (1994: 108), but also certain features are newly taken into consideration. The measurement guidelines for phonological bulk are as shown in (4), and the values assigned are as in (5).[8]

(4) a. The size measurement is based on the number of vowels and consonants.
b. Since the length is a temporal measure, vowels are considered longer than consonants. Long vowels are counted to be longer than the short vowel, but not as long as two vowels. Glides are counted as consonants.
c. In order to have the statistical figures represent "shortness" of the items, the values are given in the negative, deducting from a given value 10.

(5)

Consonant		Vowel	
Single Consonant	-1.0	Monophthong	-2.0
Glide	-1.0	Diphthong	-3.0
Omissible Consonant	-0.5	Long Vowel	-3.0
Post-Vocalic Retroflex	-0.5	Schwa	-1.0

7) We strongly believe that the general line-up of these five subgroups correctly represents differing degrees of grammaticalization of the group members collectively. However, it should be borne in mind that this tabulation does not guarantee that any one member from a group is more grammaticalized than any one member from a lower group.

8) I thank Tae-Yeoub Jang for his carefully checking these criteria to see if they are viable from phonetic/phonological perspectives.

A calculation of the average values of the phonological shortness based on the phonological complexity of the members in each group yields the following result.

(6) Phonological Shortness Values

Group	Shortness Value
Group A	6.80
Group B	3.75
Group C	3.65
Group D	2.58
Group E	2.48

We can see in the above table that the higher the use frequency of items (i.e. according to our interpretation, the higher the degree of grammaticalization), the shorter their phonological bulk is. This is in line with the expectations from the parallel reduction hypothesis.

3.2.2 Morphosyntactic Shortness

To determine the morphosyntactic shortness, we adopt a similar conversion method from morphosyntactic complexity. The values for each preposition are assigned according to the following guidelines as shown in (7).

(7) a. If an item contains no identifiable morpheme other than itself, it is given the value -0.
b. If an item contains an identifiable inflectional morpheme, it is given the value -2 for each inflectional morpheme.
c. If an item contains an identifiable bound derivational morpheme, it is given the value -3 for each bound derivational morpheme.
d. If an item contains an identifiable free derivational morpheme in addition to the stem, it is given the value -4 for each free derivational morpheme.
e. If an item contains, in addition to the stem, a morpheme that does not belong to either an inflectional or a derivational category, it is given the value -1 for each such morpheme.[9]

f. In order to convert the complexity into shortness, each item is given a default value 10 from which the above values are subtracted.

After applying the above criteria to the five groups of the prepositions, a calculation of average values for each group yields the result as shown in (8).

(8) Morphosyntactic Shortness Values

Group	Shortness Value
Group A	10.00
Group B	8.90
Group C	8.82
Group D	8.11
Group E	8.08

In the above, we can see that morphosyntactic simplicity decreases in the direction of [Group A → Group E] along the frequency continuum, which perfectly conforms to the general expectation.

3.3 Semantic Make-Up

Now we turn to semantic properties of the prepositions under discussion. In order to determine the semantic generality, two methods are resorted to. One is the use of dictionaries, and the other is the use of a survey.

3.3.1 Semantic Generality in Dictionaries

To determine the semantic generality in dictionaries, a historical dictionary and a contemporary dictionary are used to count the number of semantic designations for each entry. For a historical dictionary, *The New Shorter Oxford English Dictionary* (1993) was used. For a contemporary

9) The prepositions containing morphemes in this category are treated differently from those that do not have them, in recognition of their being formally complex. However, they are given a low value because they are often synchronically opaque and thus are not considered too complex. Most of these cases are either *be*-derivatives and *a*-derivatives.

dictionary, *The Random House Dictionary of the English Language* (1987) was used. The use of a historical dictionary may reflect the paths of semantic extension, thus showing semantic richness and generality, even though some designations developed *en route* may have become obsolete now. The use of a contemporary dictionary is adopted because a sheer number of semantic designations in a historical dictionary may skew the statistics and not appropriately represent the synchronic states of semantic encoding. Since counting the number of semantic designations is a mechanical work and the size of each individualized designation may not be comparable to each other among them, thus unable to represent the relative amount of semanticity as a whole, this method may be open to criticism. However, measuring semanticity should be an immense task involving lots of philosophical questions. With this potential problem in mind, this study gives the lexicographers the benefit of doubt with full credit to their ways of semantic classification.

When a dictionary does not list an item under the category of prepositions, the item is not counted, instead of counting it as 0 in order to avoid statistical skewing.[10] The statistical result of this quantification is as shown in (9):

(9) Number of Semantic Designations in Dictionaries

Group	*The Shorter OED* (Historical Dictionary)	*The Random House* (Contemporary Dictionary)
Group A	21.67	16.70
Group B	12.70	11.60
Group C	5.00	6.88
Group D	3.47	2.94
Group E	1.61	1.71

The above table well illustrates that the semantic generality decreases

10) Such prepositions that are absent in either one of them are *owing, nearer, nearest, onward, aside, inward, together, ahead, midway, abroad, withstanding,* and *back.* It is interesting to note that all these belong to Groups D and E, where the degree of grammaticalization is low. This is indicative of the fact that certain forms are being reinterpreted as prepositions and that it only happens with the groups whose grammaticalization is to a small extent.

either from the panchronic perspective (from the historical dictionary that lists both synchronic and diachronic semantics), and the synchronic perspective (from the contemporary dictionary).

3.3.2 Perceived Semantic Generality

The other method adopted here is a survey of perceived semantic generality. Two groups were formed depending on their primary languages; one whose members speak English non-natively, and the other whose members speak English natively. Each group is composed of three subjects. For each group, the three subjects are asked to assign value 1 to 3, depending on how "complex" the uses of each preposition is; how diverse the meanings are; and how hard it is to pinpoint its specific meaning.[11] Here, the question used refers to "complexity", since 'semantic generality' may be a misleading concept for the subjects, and functional complexity correlates with semantic generality. The assigned values are averaged and then converted to a scale of up to 100. The result is as follows:

(10) Perceived Semantic Generality by Non-Native Speakers

Group	Perceived Semantic Generality
Group A	100.00
Group B	76.67
Group C	66.02
Group D	47.04
Group E	41.33

From the above, we can see again that the average perceived semantic generality by the non-native speakers decreases consistently as it proceeds from Group A to Group E.

Likewise, a similar survey with native English speakers brought forth the

11) I thank Jong-pyo Lee, Bok-soon Kim, and Ji-in Kim of the non-native group for their participation in this survey. These subjects are graduate students of English linguistics major at Hankuk University of Foreign Studies, Korea. Thanks also go to Daniel Wood Mackle, Linda M. Kim, and Katherine Rebecca Barraclough of the native group who are graduate students at Stanford University, U.S.A.

following result.

(11) Perceived Semantic Generality by Native Speakers

Group	Perceived Semantic Generality
Group A	88.90
Group B	63.35
Group C	57.54
Group D	47.35
Group E	44.89

The above results, though not identical with the non-native speakers' judgments, largely conform to the general pattern of the semantic generality highest with Group A and lowest with Group E, gradually decreasing in that direction.[12] This is also consonant with our prediction and lends support to the parallel reduction hypothesis.

4. Conclusion

This study employed a set of measurement methods to evaluate the parallel reduction hypothesis, to determine if formal changes and semantic changes occur in parallel. To determine the degree of grammaticalization we formed 5 sub-groups of English prepositions depending on their use frequency assuming that the most highly used items are grammaticalized most. The results of the tests in preceding sections can be summarized as in the following table:

12) Overall differences come with Groups A, B, and C, for which the native speakers assigned considerably lower values than the non-native speakers did. The greatest difference is with Group A that the native speakers' generality rating (88.90) is significantly lower than the non-native speakers' rating (100.00). If such difference is not attributable to rating mistakes, what causes such a difference between the two different language groups may constitute an interesting research topic.

(12) Form-Meaning Correlation

Group	Form		Meaning			
	Phonological Shortness	Morpho-syntactic Shortness	Semantic Designations		Perceived Generality	
			Historical	Contemporary	Non-Natives	Natives
A	6.80	10.00	21.67	16.70	100.00	88.90
B	3.75	8.90	12.70	11.60	76.67	63.35
C	3.65	8.82	5.00	6.88	66.02	57.54
D	2.58	8.11	3.47	2.94	47.04	47.35
E	2.48	8.08	1.61	1.71	41.33	44.89

As seen in the above, a comprehensive set of measurements lends a strong support to the parallel reduction hypothesis, i.e., Group A shows the highest level of reduction in all parameters and Group E shows the lowest, with all intermediate categories largely conforming to the gradual decrease pattern moving downward, thus confirming two important tenets of grammaticalization studies: (i) that grammaticalization consistently proceeds toward the reduction in form and meaning, and (ii) that the reductions in these two apparently-independent planes in fact go hand in hand.

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