A Study of Three Variants of Gerund Construction from the Contrastive Perspective of Social and Natural Academic Abstracts on Construction Grammar Theory[1]

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Abstract

English gerund construction is a system composed of 3 variants, including "Gerund + ø", "Gerund + of + NP", and "Gerund + NP". The noun and verb attributes of the 3 variants are recursive, and in theory their frequencies vary regularly in different styles. An abstract is placed before the beginning of an academic papers, which has the basic characteristics of conciseness and generalization, and has special requirements for the use of gerunds. The purpose of this study was to empirically explore the system of gerund construction in abstracts of natural science and social science papers, and to specifically explore the inherent characteristics of noun and verb properties of the 3 variants. For this purpose, two corpora were constructed, one is about abstracts of natural science papers, and the other is about abstracts of social science papers. Finally, the results of chi-square test showed that there was no significant difference in the frequencies of the 3 variants in the abstracts of natural science and social science papers, and the two corpora can be studied as a whole. In the combined corpus, there were significant differences in the frequencies of the 3 gerund variants. The frequencies of these 3 variants and their gerund properties showed a recursive change.

Keywords: gerund construction, gerund variants, Construction Grammar, nominalization, gerund system

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1. Introduction

In the corpus study of gerund construction, the previous research method was to collect data and compare differences in the use of gerund construction between Chinese and foreign styles, which can provide references for the teaching of English writing in Chinese universities (see Slade, 2000; Stotesbury, 2003; Sun & Cong, 2005). But the use of gerund construction between social sciences and natural sciences was neglected, which belongs to a dimension of this kind of research, and this dimension should be a variable that must be considered in group studies. Besides, previous analysis of chi-square test results showed that there were some deficiencies in the guiding role of language function (Chen & Xiong, 2010; Halliday, 1994; Martin, 1992). Goldberg (2003) points out that construction is a pairing of formal features and functions. Construction Grammar theory emphasizes the unity of function and form, and function includes semantic function and pragmatic function.

The study of gerund construction is only a branch of nominalization studies; to be more precise, it is one of the main research directions of verb nominalization. But as a kind of nominalization, gerund construction has the same function as other nominalization structures in a discourse. The purpose of a gerund is to make a verb have the nature of a noun, and realize the function of a noun in a given environment, so as to create a nominal context for discourse (Heyvaert, 2003; Hopper & Thompson, 1984; Langacker, 1991; Malchukov, 2006). The study of verb nominalization originated from structuralism. Most previous research analyzed the different structures of nominalization at grammatical level, which failed to reach unity in the interpretation of syntactic structure and semantic features. This is mainly because structuralism ignored the internal meaning of structures. One of the most obvious shortcomings is that gerund structure was taken as the starting point of study, and the direct relationship between gerund structure characteristics and corpus data was established. But the results of a chi-square test cannot explain gerund variants just according to grammar, but also fails to touch the real meaning of corpus data analysis. Although gerund structure is a kind of verb nominalization, it differs significantly from other verb nominalization structures (Biber, Johansson, Leech, Conrad, & Finegan, 1999; Quirk, Greenbaum, Geoffrey, & Svartvik, 1985). Other nominalization suffixes of verbs have symbolic meanings (e.g., *-tion*, *-sion*, *-age*, etc.), which are easy to identify. However, the structure of gerund nominalization can also be used as the present participle, noun, and adjective suffixes, which could cause confusion in the use of suffixes (e.g., "interesting" and "interpreting"). Therefore, in order to make the research object clearer, gerund construction is the only object considered in this study and the main structure of verb nominalization. On the basis of corpus resources, the study of the 3 gerund variants should learn from previous research and take into accounts both semantics and structure. In this respect, the theory of Construction Grammar provides a theoretical starting point and foothold for the contrastive study of gerund variants in natural and social science abstracts.

Construction Grammar emphasizes the combination of syntactic structure and meaning (Goldberg, 2006), and classifies a unit based on the minimal combination of grammar and meaning, which is convenient for the classification of the 3 variants according to their pairings

of formal features and meanings. In the academic papers of natural and social sciences, differences in the use of gerund construction may not be caused by different structural features, but may be closely related to the functional and semantic features of the 3 gerund variants. Therefore, in order to understand the functions of gerund construction, it is necessary to conduct a corpus-based empirical study. This study of gerund constructions in academic abstracts can provide practical methods for the teaching of academic writing and improve the standardization of the use of gerund constructions in academic writing.

2. Literature Review

Previous corpus studies have shown that verb nominalization occurs most frequently among all types of nominalization, that is why we can find abundant verb nominalization resources in corpus. The "-ing" structure is not only the suffix of nominalization, but also one of the most common suffixes of verbs, adjectives, and nouns (Quirk et al., 1985). It has produced a dilemma in the study of part-of-speech uncertainty. Thus researchers must rely on corpus resources to search for abundant linguistic evidence. It is of great significance to study the nominalization of verbs. Yang (2006) examined the specific functions of nominalization, including gerund constructions in different styles, but did not specifically explore the 3 variants of gerund construction. Fonteyn (2015) examined the development of the gerund system from the perspective of diachronic research and divided it into two categories (i.e., nominal gerund and verb gerund) according to the origin of the gerund constructions. Although the results have far-reaching implications for future research, it ignores the changes in the degree of materialization and regularity of gerund variants (e.g., students' learning vs. the learning of students). In order to further study the gerund system, absolute dichotomy is indeed too broad.

Gerund constructions can be further classified according to Construction Grammar. Lees (1960) classified the gerund into action gerund construction and factive gerund construction, and further classified factive construction into fact-referent construction and action-referent construction, but action-referent gerund construction can also take a subject to indicate a fact. Therefore, this method is not perfect and cannot be used as the basis of corpus research. From the perspective of Construction Grammar, construction must have a meaning basis. Langacker (2004) divided gerund constructions into type nominalization (e.g., our *understanding* of the individual differences) and instance nominalization (e.g., our *understanding* the individual differences). But instance nominalization still reflects verb characteristics in subordinate clauses, and should not be gerund construction (Heyvaert, 2008). Lin (2014) further studied the method of classifying type and instance constructions based on corpus analysis, and proposed 3 variants of gerund construction according to part of speech, namely, "Gerund + ø", "Gerund + of + NP", and "Gerund + NP". "Gerund + ø" construction refers to a single gerund structure (e.g., pragmatic *strengthening* is argued to capture the distribution). "Gerund + of + NP" refers to the fixed structure that gerund derived from preposition "of" (e.g., the prototypical iconic *sequencing* of the participants in a causal chain). "Gerund + NP" construction refers to a gerund directly followed by the original object (e.g., *placing* the subject,

which is a typical topic). This classification provides a feasible method for corpus retrieval and establishes a standard gerund system. In the practice of corpus study, the 3 gerund variants can be screened by wildcard search, which improves the accuracy and efficiency of retrieval.

Kranich (2006) constructed two corpora to study the evolution of gerund construction from a diachronic perspective and took the time factor into consideration. However, to study the characteristics of gerunds in modern academic abstracts, it is necessary to control diachronic factors (e.g., Jespersen, 1940; Miller, 2002). The abstracts of corpora constructed in the present study were all academic papers of about the past five years, so as to objectively analyze the characteristics of gerund construction.

The study of gerund construction originated from structuralism and generative grammar and summed up the grammatical forms of gerund construction. Functional linguistics pays more attention to the textual function of gerund construction. Previous studies have yielded fruitful results, but there is no consensus on the grammatical classification and semantic features of gerund structures. The reason is that previous studies neglected the relationship between grammatical structures and internal semantic features. Cognitive grammar advocates constructing research from the conceptual level of grammatical categories and describing the semantic attributes of grammatical representation by interpreting the process of conceptualization.

3. Research Questions

1) Are there any significant differences in the use of the 3 gerund variants between NSC (Natural Science Corpus of Academic Abstracts) and SSC (Social Science Corpus of Academic Abstracts)?

2) If there are differences, what is the tendency in the use of the 3 gerund variants?

4. Method

This study adopted statistical analysis of a corpus-based on Construction Grammar, taking into account both gerund form and semantics. Construction Grammar regards the gerund as a unity of structure and meaning, and the semantic unit of concept is realized by the corresponding variant of gerund construction. So to speak, the 3 gerund variants must have some differences in meaning. Since then, the classification of syntactic structures has provided a method for contrasting and analyzing the semantic tendency of structure variants. The corpus resources provided a wealth of evidence for qualitative analysis. First of all, a descriptive data table was drawn, and then the chi-square test was used to analyze the use tendency of the 3 variants.

4.1 Instruments

4.1.1 Corpus

All resources were collected from the abstracts of academic papers, and the Elsevier database

provides more than 1,100 kinds of electronic academic journals available for selection. As a corpus for the study of gerund variants, abstract research can avoid many external factors in other aspects because the functions of the gerund coincide well with the nature of academic abstracts (e.g., formality, objectivity, and generality, etc.). All the papers collected were published after 2010. The comparable corpora based on natural and social sciences were established. Each corpus collected 100 abstracts, and each corpus contained more than 15,000 words.

4.1.2 Controlled factors

There were the 3 main factors that may be related to the design of this study, and their possible effects must be taken into account. In the process of corpus construction, the disciplines and the authority of journals must be limited. In order to ensure the uniformity and standardization of the use of English, the nationality of the author must be American or British. Natural sciences included mathematics, physics, and chemistry. Social sciences were mainly concerned with linguistics and foreign language education. The selected journals were all international core journals, and the impact factors were higher than 0.8. The abstracts of the academic papers should not be less than 100 words. Therefore, the reliability and validity of the corpus were guaranteed.

4.2 Data collection

The two corpora of this study belong to a small-scale corpus, suitable for screening target gerund variants using Antconc3.2.0. These two corpora can be directly imported into Antconc3.2.0, and the 3 target gerund variants can be screened respectively. The first step was to retrieve the frequency of "Gerund + of +NP" through the Wildcard search function built-in Antconc3.2.0, and exclude the nouns with the suffix "-ing". The search formula was "*ing of *". The next step was then to retrieve all gerund variants through the function of the Wildcard search, and count the frequencies of "Gerund + NP" and "Gerund + ø" variants in the "Concordance" window. Search formula was "*ing *". At the same time, nouns, present participles, and adjectives were excluded. The final results were plotted as a descriptive data table (see Table 1 below).

Table 1. The frequency description of the 3 gerund variants

Corpus	Gerund variants			Sum
	Gerund + ø (F)	Gerund + of +NP (F)	Gerund + NP (F)	
NSC	12 (15.79%)	13 (17.11%)	51 (67.11%)	76
SSC	26 (19.26%)	28 (20.74%)	81 (60%)	135

Note. The "F" in the table indicates the frequency of such a variant.

As shown in Table 1, in each corpus the frequencies of the 3 variants were different, and there was an increasing tendency from "Gerund + ø" to "Gerund + of + NP", then to "Gerund +

NP". At the same time, the frequency of SSC was always higher than that of NSC, regardless of the sum or variables.

4.3 Results

The test for goodness-of-fit can be used to test the significant differences of lexical and linguistic features in the corpus. The independent test can be used to test the significant differences of lexical and linguistic features between 2 corpora (Woods, Fetcher, & Hughes, 1986). The chi-square test was performed with SPSS 21. The chi-square test in this study consisted of 2 English abstract corpora named respectively as NSC and SSC. In each corpus, Antconc 3.2.0 was used to calculate the frequency of each gerund variant, and the chi-square test was used to test the differences. The purpose of the chi-square test was, on the one hand, to test whether there were significant differences in the frequencies of the 3 gerund variants in each corpus; on the other hand, to test whether there were significant differences in the frequencies of the 3 gerund variants between NSC and SSC.

The results of the chi-square test for goodness-of-fit showed that there were significant differences; that is to say, the frequencies of the 3 gerund variants were significantly different in each corpus of the natural and social sciences. However, the results of the chi-square independent test indicated that the frequencies of the 3 gerund variants were significantly different between the social sciences and natural sciences.

4.3.1 The 3 gerund variants between SSC and NSC

From Table 2 below, the null hypothesis was that there was no significant difference between the SSC and NSC. When the significance level was $p = 0.05$, the critical value of the chi-square was $X^2_{0.05}$ (2) = 5.99; the final results of the chi-square independent test was $p = 0.592$, $X^2 = 1.048$. Obviously, $p > 0.05$, and $X^2 < 5.99$, so the H_0 was accepted, which indicated that there was not statistically difference in the frequencies of the 3 gerund variants between SSC and NSC.

Table 2. The results of chi-square test

Corpus	The chi-square test		
	Value	df	Sig. (2-sided)
In the SSC	43.244	2	<.001
In the NSC	39.026	2	<.001
SSC vs. NSC	1.048	2	0.592

Note. 0 cells (0%) have an expected count less than 5; the significance level was p = 0.05

4.3.2 The 3 gerund variants in each corpus

However, by contrasting the frequencies of the 3 gerund variants in each corpus, the results of the chi-square independent test was totally different (see Table 2 above). The null hypothesis was that there was no significant differences among the 3 variants in each corpus. In SSC, when

the significance level was $p = 0.05$, the critical value of the chi-square was $X^2_{0.05}$ (2) = 5.99; the actual result of the chi-square test was $p < 0.001$, $X^2 = 43.244$. Obviously, $p < 0.05$, and $X^2 > 5.99$, so the H0 was rejected, and which indicated that there were significant differences in the frequencies of the 3 gerund variants in SSC. In NSC, when the significance level was $p = 0.05$, the critical value of the chi-square test was $X^2_{0.05}$ (2) = 5.99; the actual result of the chi-square test was $p < 0.001$, $X^2 = 39.026$. Obviously, $p < 0.05$, and $X^2 > 5.99$, so the H_0 was rejected too, and which showed that there were significant differences in the frequencies of the 3 gerund variants in NSC.

4.3.3 The tendency of the 3 gerund variants in each corpus

The frequencies of the 3 gerund variants in each corpus increased gradually, and the frequencies of the 3 variants were significantly different. The results indicated that the 3 gerund variants formed a system, which proved Lin's point of view (2014) again. The 3 gerund variants did not exist in isolation, and the prototype member was "Gerund + ø" variant, they formed a system with sequence.

"Gerund + ø" is the prototype construction of the other 2 gerund variants, and gerund is often used as the central term of the materialization. In the case of "Gerund + of + NP" variant, because of the limitations of particular semantic components, it is still necessary to borrow the preposition "of" to lead out the gerund. It can be seen that the variant still depends on the semantic structure of the original verb. In contrast to "Gerund + ø", the nature of verb is enhanced. The "Gerund + NP" variant is obviously stronger in the verb expressions of the semantic components. The materialization is incomplete, and the semantic nature of the verb is the strongest of the 3 gerund variants. The 3 gerund variants were classified (see Table 3 below). The most common variant of the gerund structures is "Gerund + NP" variant, and its verb nature is the strongest. As a gerund structure, the "Gerund + NP" variant still retains the features of the verb-object clauses, and it contributes to the generality, formality, and objectivity of the whole discourse (Chen, 2003; Du, 2010). The "Gerund + ø" variant with the strongest noun nature is the complete verb nominalization of these 3 variants. In writing, the frequent use of "Gerund + ø" may complicate the whole discourse. In fact, the highest frequency among the 3 gerund variants also testifies to the tendency of native English speakers.

Table 3. The tendency of the 3 gerund variants

Gerund variants	Corpora		Part of speech
	SSC	NSC	
Gerund + ø	26	12	nouns
Gerund + of +NP	28	13	
Gerund + NP	81	51	verbs

Note. The column "part of speech" is used to indicate the direction of change of parts of speech in the 3 gerund variants.

5. Discussion

5.1 The differences in the use of the 3 gerund variants between NSC and SSC

According to the result of the chi-square independent test, there were no significant differences in the frequencies of the 3 gerund variants between social science and natural science. However, when seen from another aspect, the results of chi-square test for goodness-of-fit showed that there were significant differences in each corpus, that is to say, the frequencies of the 3 gerund variants differed significantly in each corpus of natural and social sciences. It has to be considered that the corpora of this study only involved abstracts of the academic papers. The results of chi-square test did not reflect the use of the gerunds in a whole paper. It is possible that the tendency of gerund variance is quite different in other parts of academic papers.

5.2 The tendency of the 3 gerund variants in a unified corpus

The results of the chi-square independent test have demonstrated that there was no significant difference in frequency between SSC and NSC. In other words, there was no difference in the use of the 3 variants in abstracts of social sciences and natural sciences by native English speakers, which also proved that previous corpus comparative studies had high credibility, and had the reference for the construction of corpora in the future. So NSC and SSC can be unified as a larger corpus. In the gerund construction system, the 3 variants have a gradually change in the parts of speech. Among them, the noun nature of the "Gerund + ø" variant is the strongest, but the verb nature is the weakest; the "Gerund + of + NP" variant has moderate degree of verb and noun nature; the "Gerund + NP" variant has the weakest noun nature, but the verb nature is the strongest. In order to further analyze the system of the 3 gerund variants, it is assumed that the "Gerund + of + NP" variant with a moderate degree of verb and noun nature was the original construction, and was represented by the sign "="; the "Gerund + ø" variant indicated the noun nature tendency of semantics, and was represented by the sign "-"; the "Gerund + NP" variant indicated the verb nature tendency of semantics, and was represented by the sign "+" (see Table 4 below). Since the chi-square test had proved that there was no significant difference of the 3 gerund variants between the natural science corpus and the social science corpus, the resources of these 2 corpora can be analyzed in a unified corpus way.

Table 4. The tendency of the 3 gerund variants in a unified corpus

Corpus		Gerund variants		
		Gerund + ø	Gerund + of +NP	Gerund + NP
		-	=	+
SSC & NSC	Frequency	38	41	132
	Utilization rate	0.18	0.19	0.63
	Use tendency		+0.0021	

Note. "utilization rate" = "frequency" of each variant / the sum of frequencies of the 3 variants; "use tendency" = ("utilization rate" of "Gerund + NP") - ("utilization rate" of "Gerund + ø") / the sum of frequencies of the 3 variants.

According to the corpus statistics, the frequency of the "Gerund + NP" construction with the strongest verb nature was the highest. The stronger verb nature of the variant, the higher its frequency, which indicated that the variant of the "Gerund + NP" was most frequently used. The conclusion was that gerund construction had a tendency to return to the nature of a verb ("Use tendency" > 0). This tendency to use gerund variants was a common phenomenon in both natural and social sciences.

The nature of verbs is a prerequisite for the use of gerunds. That is to say, the choice of gerunds is initially influenced by the verb nature. In the gerund system, the stronger the noun nature, the heavier the burden of getting rid of the verb nature (e.g., our *understanding* of individual differences). However, the gerund variant with a stronger verb nature can almost inherit the semantic and grammatical use of the original verb (e.g., *understanding* individual differences). This study attempts to observe the evolution of the gerund construction from the prototype of "V+NP". The first construction is "Gerund + NP", which is the strongest verb semantic type. Its syntactic structure is the same as that of the verb-object construction, and the grammatical change of original landmark is not considered in actual use. The second is the construction of "Gerund + of + NP". "Gerund" is always placed in the position of the noun. When it gets rid of the restriction of verb nature, the subject of the gerund is introduced by the preposition "of". Finally, "Gerund + ø" construction is the weakest variant of verb nature, but it has the strongest degree of materialization. From the cognitive perspective, the frequencies of the 3 variants in gerund system vary regularly and accord with the cognitive process (Achard, 1998; Guo, 2010; Haiman, 1985; Wen, 2002).

The 3 variants share some common features. The most basic feature is that the original trajector and landmark are adjusted appropriately. Structurally, the syntactic structures of the 3 gerund variants are more concise by selective omission of the original trajector or landmark. From the perspective of semantics, gerund construction pays more attention to materialization.

5.3 Construction grammar's interpretation of this tendency

Construction Grammar holds that construction is an organized and rational category. Typical members have typical syntactic and semantic features. The characteristics of typical and atypical constructions are often slightly different, but some of the syntactic and semantic features of atypical construction can be derived from the typical construction. The syntactic and semantic features of "Gerund + ø" are deeply matched with typical nouns. "Gerund + ø" is a typical construction of verbal nominalization. When noun modifiers enter such constructions, they are placed in front of gerunds as a typical noun to help gerunds realize their concrete functions. In the construction of "Gerund + of + NP", noun modifiers are mostly not prepositioned, but the phrase guided by "of" is placed behind the headword. Langacker (2004) thinks that the preposition "of" represents a relationship between gerund and the original landmark. After the verb is materialized, it can no longer be used directly with a trajector or landmark. Langacker (ibid) believes that trajector and landmark appearing in a discourse as contextual elements should be regarded as event participants, so as to help the head noun become a background,

which cannot be placed in front of the head noun and can only be replaced by other forms of syntax. In other words, the insertion of the preposition "of" forms the "Gerund + of + NP" construction. Therefore, because of the increase of conceptual meaning, the "Gerund + of + NP" construction is more complex in grammatical form than that of the typical "Gerund + ø". The noun phrase "of + NP" makes the construction a background, and helps readers understand the specific events mentioned in the gerund construction (e.g., *developing of* the country).

Verbs can be followed by the grammatical mark "-ing" to realize the materialization process, providing the possibility for them to enter in the "Gerund + ø" and "Gerund + NP" constructions. But if "Gerund + of + NP" construction receives a semantic component restriction, the verb is still inseparable from the original participants of events, and the construction requires that grammatical form to serve as the framework of semantic expression, resulting in a slight change in the composition, and the structure of "Gerund + of + NP" is formed.

The "Gerund + NP" construction is an intermediate structure between verb and restricted clause. Because of the existence of an original verb landmark, the function of "Gerund + NP" construction tends to have verb nature, which shows that its materialization is not thorough enough. But if there is no tense and voice in a clause, which could be added the grammatical mark "-ing". And the grammatical function of the noun phrase is assumed in the external form, so it can be integrated into "Gerund + NP" construction.

6. Conclusion

Based on Construction Grammar theory, this study analyzed the consistency between gerund structure and conceptual organization, and discussed how the semantic features of gerund variants interact with syntactic structure, formed a system of gerund construction. The corpus analysis in this study also showed that there was no significant difference in the frequencies of the 3 gerund variants between social sciences and natural sciences. It provided a reference for the future research in corpora. The analysis of the gerund system from the view of cognition provided methodological guidance for education. English native speakers use the "Gerund + NP" construction as much as possible to improve the overall effect of discourse expression, which reveals that English learning in China should pay attention to the use of the "Gerund + NP" construction.

The realization of gerund textual function depends on the appropriate use of the 3 variants. In the English writing course of social sciences and natural sciences, teachers should strengthen the practice of gerund construction. Positive transfer easily occurs between constructions with similar syntactic and semantic components (Singley & Anderson, 1989). The "Gerund + NP" construction is close to the "V + NP" structure in form and meaning, which easily triggers learners' psychological positive transfer. Therefore, the "Gerund + NP" construction can be used as the initial stage of gerund teaching. Subsequently, the teaching of "Gerund + of + NP" and "Gerund + ø" is carried out in turn. The syntactic structures of

"Gerund + of + NP" and "Gerund + ø" are quite different, but the semantic components are similar to that of "V + NP". Therefore, it is possible to guide learners' positive transfer from "Gerund + NP" to "Gerund + of + NP".

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