# The Typological Factors Influencing the Selection of Relative Strategies

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*Abstract*—**This paper explores relative strategies of 62 languages and reinterprets the typological factors that influence the selection of relative strategies. On the whole, relative strategies in 62 languages strictly conform with Noun Phrase Accessibility Hierarchy (NPAH) and Filler-Gap Domain (FGD). Relative strategies are related to word order and language family/region. Influenced by the Primary Predicate Prominence Principle, SVO languages in Indo-European region prefer to use pronoun strategy for relativizing subject and direct object, while non-Indo-European SVO languages prefer to use gap strategy influenced by FGD. Under the influence of the Primary Predicate Prominence Principle and FGD, the gap strategy is preferred for SOV languages. In addition, relative strategies of Portuguese, Spanish, and Arabic depend on the speaker's intention.**

*Keywords*—**relative strategies, word order, language family/region, speaker's intention**

## I. INTRODUCTION

The relative clause consists of a noun or noun phrase (or empty) and a subordinate clause that modifies the noun. The noun is called the head and the subordinate clause is Relative Clause (RC) [1]. The process of producing a relative clause is called relativization. The strategies used in relativization are Relative Strategies (RS). Take this sentence "I like the girl [who$_{RS}$ is playing the piano]$_{RC}$" as an example. The head is "girl" and is co-indexed with "who" (RS), indicating "girl" is as subject in RC. Thus, this RC relativizes subject. Other grammatical elements that can be relativized also include direct object, indirect object/oblique, and genitive. RS in "[who$_{RS}$ is playing the piano]$_{RC}$" is relative pronoun.

Briefly, the classification of RS mainly goes through two stages. The concept of RS was formally proposed by Keenan and Comrie [2, 3]. Based on 49 languages and the criterion of "whether RS has case", they divided strategies into two categories, namely, [+Case] RS and [−Case] RS. [+Case] RS includes [+Case] relative pronouns and personal pronouns, such as Russian and Hebrew, while [−Case] RS includes [−Case] relative pronouns and gaps, like English and Burmese. The advantage of [+Case] RS is that which grammatical element is relativized can be clearly known through the case marker, for example, "kotoruju" in Russian represents the accusative, and means object is relativized. But it is necessary for [−Case] RS to combine the word order and head to make a judgment. Its advantage is that it can be co-indexed with head without morphological changes, and more economical. In addition, Comrie and Kuteva [4, 5] also found a special RS, namely the "non-reduction" strategy, which refers to the fact that the head appears as a full-fledged noun form in RS. Keenan and Comrie noticed gaps were used in many languages, but they did not systematically study this phenomenon.

Hawkins [6, 7] found that gaps may be universal, so he refined the gap strategy and replaced the previous "personal pronoun" with the "resupmtive pronoun". He divided the gap strategy into non-subcategorized gap and subcategorized gap. Subcategorization can be understood as words such as verbs and prepositions in RC can require the co-occurrence of the head. Both non-subcategorized gap and subcategorized gap lack form, only can be represented by "Ø" and the difference is that "a subcategorized gap is activated by a lexical co-occurrence, a nonsubcategorized gap by a phrase structure co-occurrence possibility sanctioned by general syntactic rules" [7]. For instance, in English "the car [he likes Ø$_{RS}$]$_{RC}$" and Chinese "[Ø$_{RS}$ shache (brake) huaile (is broken) de (participle)]$_{RC}$ che (car)" (the car whose brake is broken), only the verb "likes" can activate the object "car". Therefore, the former Ø is a subcategorized gap and the latter Ø is nonsubcategorized gap.

## II. LITERATURE REVIEW

In the past, there were only two factors that influence RS, namely, the difficulty of psychological processing and the type of RC. The difficulty of psychological processing refers to the degree of difficulty in relativizing subject, direct object, indirect object/oblique, and genitive. RC can be classified into different types based on different criteria, such as syntax and semantics.

### A. Noun Phrase Accessibility Hierarchy

The psychological processing difficulty was originally set up in NPAH [2, 3]. NPAH refers to the degree of difficulty in relativizing a grammatical element, and it is universal to the world's languages. Since Comrie did not give specific data for "object of comparison" in all 49 languages, it was not included in NPAH. And NPAH was eventually revised to "subject > direct object > indirect object/oblique > genitive". NPAH only indicates that when these grammatical elements are relativized, the processing difficulty increases from left to right. However, it cannot accurately tell us which RS should be adopted or tend to be used when we relativize a grammatical element. Previous studies lack the complete and comprehensive large-scale RS, because they only investigated 49 languages, like the typological website (WALS) just covers RS of subject (166 languages) and oblique (112 languages). However, RS of direct object and genitive are unknown, and the way of labeling and the accuracy of RS data need to be improved.

### B. Filler-Gap Domain

The psychological processing difficulty was developed by FGD. The proposal of FGD was inspired by Chomsky's "strict subcategorization", and Hawkins found that in

psychological experiments [8, 9], when people read filler words (i.e., head), filler might be associated with gaps in RC. Until the experiment [10] proved that the correlation between fillers and gaps was predictable. Therefore, Hawkins argued that when the difficulty of relativization is low, people can easily associate fillers with gaps. But when the difficulty is high, fillers need to be retained in the working memory, and people need to associate filler with every gap, which leads to a high working memory load. Thus, the working efficiency is relatively low. Hawkins defines FGD in his book: "An FGD consists of the smallest set of terminal and non-terminal nodes dominated by the mother of a filler and on a connected path that must be accessed for gap identification and processing; all constituency relations and co-occurrence requirements holding between these nodes belong in the description of the FGD" [11]. The subcategorizor is a word or affix that can define thematic roles such as verb, preposition, and genitive mark. FGD selects the RS by comparing the total number of FGD/HPD (Head Pronoun Domain) and LD (Lexical Domain) words. HPD is essentially the same as FGD, but HPD is the domain containing relative pronoun/ resumptive pronoun. LD refers to the smallest set of terminal nodes (including associated syntactic and semantic features) that need to be processed when a lexically-listed property P is assigned to a lexical item L [11].

For instance, in the Chinese noun phrase "[wo (I) mai (buy) $\emptyset_{RS}$ de (participle)]$_{RC}$ che (car)" (the car which I bought), FGD/LD is from "wo" to "che", and the total number of words = FGD + LD = 4 + 4 = 8. If we use the resumptive pronoun in RC, i.e., "[wo mai ta (it) de]$_{RC}$ che", HPD is from "wo" to "che", and LD is from "wo" to "ta", the total number of words = HPD + LD = 5 + 3 = 8. In this case, we need to rely on two principles, Minimize Form (MiF) and Maximize On-Line Processing (MaOP), to exclude resumptive pronoun, so this noun phrase uses gap. MiF refers to the use of simplified forms of language to make it bear more linguistic values. MaOP refers to the human preference to assign as many linguistic values as possible to linguistic forms. And this prediction is consistent with the Chinese grammar. Usually, a smaller total number of words indicates its RS is preferred.

However, only three papers have verified the rationality and effectiveness of FGD [12–14]. They found that Chinese RC was consistent with NPAH with the explanation of FGD, but the classifier that occurs with the subject-extracted RC and the passive "BEI" that occurs with the object-extracted RC could not be explained by FGD.

### C. Types of RC

From the perspective of syntax, RC can be divided into 7 types: external RC, internal RC, free RC, adjoined RC, double-head RC, correlative RC, and paratactic RC. According to the semantic standard, RC can be divided into 4 types: restrictive RC, non-restrictive RC, kind-defining RC, amount/maximalizing RC.

Cinque argued that RS was not only related to the type of RC, but also related to the respective sizes of internal and external heads [15]. Specifically, Cinque proposed that all RC types are essentially derived from double-head RC through the syntactic operation of raising or matching [15]. The double-head can be divided into internal and external by the location. The size of external head determines the

association between RC and external head, which influences the selection of RS. The size of external head in participial RC is the smallest, and its RS is null pronoun (PRO). Similarly, the internal and external head in non-restrictive RC are both DP, and the internal head do not need to be deleted. Its RS such as relative pronoun/resumptive pronoun can be used, or PRO can be adopted, i.e., "a girl [PRO$_{RS}$ playing the piano]$_{RC}$ is so beautiful."

Cinque's theory could only explain that a certain type of RC would generate multiple types of RS, but it could not interpret the fact that the same RC type of different languages uses different RS. In addition, as to why there are multiple types of RC in the same language, this theory could not answer it.

## III. RESEARCH METHODS

This paper investigates the RS of external RC in 62 languages. Common word order types of the world language are SVO, SOV, and VSO. Compared to previous researches, this paper improves the balance of language family/region and the number of languages, and all 62 languages were re-examined. At the same time, this paper selects representative languages in every branch of world's nine language families, as shown below (the figure in brackets indicates the number of languages).

Indo-European (13): English, German, Swedish, French, Spanish, Portuguese, Irish, Welsh, Lithuanian, Czech, Russian, Hindi, Bengali.

Sino-Tibetan (10): Mandarin Chinese, Jin, Southern Min, Tibetan, Naxi, Burmese, Thai, Sui, Miao, Yao.

Altaic (9): Turkish, Uygur, Mongolian, Daur, Manchu, Ewenki, Oroqen, Japanese and Korean.

Semito-Hamitic (8): Arabic, Hebrew, Tamashek, Somali, Oromo, Hausa, Nandi, Gude.

Uralic (3): Finnish, Hungarian, Nenets.

Caucasian (3): Georgian, Chechen, Kabardian.

Austro-Asiatic (6): Vietnamese, Wa, Khmer, Blang, Korku, Bhumij.

Austronesian (7): Indonesian, Dupaningan Agta, Tagalog, Fijian, Maori, Chamorro, Tetun Dili.

Dravidian (3): Tamil, Malayalam, Kannada.

After excluding the three special languages of Mandarin Chinese (SVO/SOV), and Hungarian (SVO/SOV) and Fijian (VSO/VOS), there are 24 SVO languages, 10 VSO languages, and 25 SOV languages. All language samples are from related literature of RC at home and abroad, including dictionaries and grammar references of languages, grammar monographs, dictionaries, handbooks, and other records of dialects, and native speakers.

This paper mainly uses the quantitative and qualitative methods. The quantitative method focuses on whether RS is correlated with the word order and language family/region by comparing the language number. And then this paper can qualitatively study the RS under each factor as far as possible to ensure the scientificity and credibility of the research conclusions.

Furthermore, this paper also uses the description and interpretation methods. This paper first describes the cross-language performance of RS, and then combines the theories of typology and syntax to explain the RS under two main factors, i.e., word order and language family/region.

## IV. FINDINGS AND DISCUSSION

### A. Cross-Language Performance of RS

In 62 languages, the RS used in relativizing subject, direct object, indirect object/oblique, and genitive are shown in Table 1, with the figure in brackets representing the number of languages. It should be noted that "G", "RaP" and "RsP" are abbreviated forms of gap, relative pronoun, and resumptive pronoun, respectively.

Table 1. RS in relativizing different grammatical elements

| Subject | Direct Object | Indirect Object/Oblique | Genitive |
|---|---|---|---|
| G (34) | G (34) | G (20) | G (12) |
| RaP (16) | RaP (14) | RaP (18) | RaP (15) |
| G/Rap (7) | G/RaP (9) | G/RaP (5) | G/RaP (4) |
| G/RsP (4) | G/RsP (3) | G/RsP (6) | G/RsP (5) |
| RaP/RsP (1) | RaP/RsP (1) | RaP/RsP (2) | RaP/RsP (1) |
| | RsP (1) | RsP (3) | RsP (6) |
| | | | G/Rap/RsP (1) |

As can be seen from Table 1, with the increase of relativizing difficulty, gaps are less favored, pronouns are more favored, and RS is gradually diversified. In the RS in relativizing subject and direct object, the gap is the most preferred, followed by the relative pronoun. But in the RS of indirect object/oblique and genitive, the pronoun is the most preferred, followed by the gap. The two showed completely opposed preferences.

From the perspective of the optionality, there are four pairs of options in total: G/Rap, G/RsP, RaP/RsP, and G/RaP/RsP. According to the number of languages, relative pronouns tend to form a pair of options with gaps, as in English, but rarely with resumptive pronouns, such as Arabic. This phenomenon indicates that gaps and pronouns are complementary. When a subcategorized/non-subcategorized gap has formed a pair of options with relative pronoun or resumptive pronoun, it usually does not continue to supplement RS with another pronoun. Only Georgian can choose the "G/RaP/RsP" as RS when relativizing grammatical elements.

What's more, in many languages, indirect object-extracted RC, oblique-extracted RC, and genitive-extracted RC do not exist. Or they are rarely used in daily communication. For example, Burmese only prefers relativizing subject and direct object.

Therefore, on the whole, the cross-language performance of RS in Table 1 is consistent with the prediction of NPAH and FGD for world languages, i.e., gaps are often used to relativize simple grammatical elements, while pronouns are usually used to relativize complex grammatical elements.

### B. RS of SVO Languages

The RC structure of SVO languages is generalized as shown below, in which "S", "V" and "O" represent subject, verb, and object, respectively.

Subject-Extracted RC:
Noun$_{head}$ [Ø$_{RS}$ V O]$_{RC}$
Noun$_{head}$ [Pronoun$_{RS}$ V O]$_{RC}$
Direct Object-Extracted RC:
Noun$_{head}$ [S V Ø$_{RS}$]$_{RC}$
Noun$_{head}$ [S V Pronoun$_{RS}$]$_{RC}$

In the subject-extracted RC, FGD/LD is from "noun" to "verb", and the total number of words = FGD + LD = 2 + 2 = 4. HPD is from "noun" to "verb", LD is from "pronoun" to "verb", and the total number of words = HPD + LD = 3 + 2 = 5. Thus, the gap should be preferred in relativizing subject. In the direct object-extracted RC, FGD/LD is from "noun" to "verb", and the total number of words = 3 + 3 = 6, HPD is from "noun" to "pronoun", LD is from "subject" to "pronoun", and the total number of words = 4 + 3 = 7. Similarly, the gap also should be preferred for direct object, indirect object/oblique, and genitive. Thus, according to the definition of FGD, the conclusion is that gap is the most preferred.

But this prediction is not consistent with most Indo-European SVO languages, such as French. When relativizing subject and direct object, French only uses the relative pronoun, because the gap will lead to grammatical errors, as in the English sentence "a girl [Ø$_{RS}$ is playing the piano]$_{RC}$". But Russian can use the gap to relativize direct object. Although it is reasonable, there is no logical relation in Russian between the main clause and RC, and the semantic connection is lost. Most Indo-European SVO languages, such as French, German, Czech, Swedish, Lithuanian, and Russian, use the relative pronoun RS in relativizing all grammatical elements, which FGD cannot explain.

Table 2. RS of Non-Indo-European SVO languages

| Languages | Subject | Direct Object | Indirect Object/Oblique | Genitive |
|---|---|---|---|---|
| Jin | Gap | Gap | | |
| Southern Min | Gap | Gap | Gap | Gap |
| Sui | Gap | Gap | | |
| Miao | Gap | Gap | Gap | Gap |
| Yao | Gap | Gap | | |
| Wa | Gap | Gap | | Gap |
| Blang | Gap | Gap | | |
| Tetun Dili | Gap | Gap | Gap | |

But FGD can predict the preference of non-Indo-European languages, as shown in Table 2.

RS for SVO languages, such as Portuguese and Spanish, depends on the speaker's intentions rather than the economic principle. Portuguese and Spanish can choose both gap and relative pronoun. In Portuguese, the relative pronoun means that the speaker has qualified the head; the gap means that the RC can modify the whole to which the head refers, or any one of the whole. And Vietnamese also has this same feature in relativizing subject. In Spanish, if the relative pronoun is used, RC will provide more adequate modification for the head; if the gap is used, the corresponding adjective/sentence will be needed to continue to supplement the information.

### C. RS of SOV Languages

The RC structure of SOV languages is summarized as shown below.

Subject-Extracted RC:
[Ø$_{RS}$ O V]$_{RC}$ Noun$_{head}$
[Pronoun$_{RS}$ O V]$_{RC}$ Noun$_{head}$
Direct Object-Extracted RC:
[S Ø$_{RS}$ V]$_{RC}$ Noun$_{head}$
[S Pronoun$_{RS}$ V]$_{RC}$ Noun$_{head}$

In the subject-extracted RC, FGD/LD is from "verb" to "noun", and the total number of words = 2 + 2 = 4. HPD is

from "pronoun" to "noun", LD is from "pronoun" to "verb", and the total number of words = 4 + 3 = 7. In the direct object-extracted RC, FGD/LD is from "subject" to "noun", and the total number of words = 3 + 3 = 6, HPD is from "subject" to "noun", LD is from "subject" to "verb", and the total number of words = 4 + 3 = 7. Likewise, the gap is still preferred for relativizing all grammatical elements.

Common SOV languages include Japanese, Korean, Mongolian, and Turkish. Japanese and Korean use the gap in relativizing subject, direct object, and indirect object/oblique, while they can adopt both the gap and the resumptive pronoun in relativizing genitive. Both Japanese and Korean have two kinds of gap strategies, i.e., subcategorized gap and nonsubcategorized gap, while Turkish can only use the subcategorized gap to relativize subject, direct object, indirect object/oblique, and genitive. The difference is that when all grammatical elements are relativized in Mongolian, both the gap and the resumptive pronoun can be adopted. Specifically, there are 7 languages containing SOV word order that use both gap and pronoun to relativize all grammatical elements: Oromo, Chechen, Korku, Japanese, Korean, Mongolian, and Mandarin Chinese.

The problem of FGD is that it can only explain the preference for gap, but it cannot interpret why pronoun and gap can exist in the RC structure. Although the FGD cannot predict the RS of these SOV languages, most SOV languages only prefer to use the gap, as shown in the following Table 3.

Table 3. RS of SOV languages

| Languages | Subject | Direct Object | Indirect Object/Oblique | Genitive |
|---|---|---|---|---|
| Tibetan | Gap | Gap | Gap | Gap |
| Burmese | Gap | Gap | | |
| Naxi | Gap | Gap | Gap | Gap |
| Turkish | Gap | Gap | Gap | Gap |
| Uygur | Gap | Gap | Gap | Gap |
| Daur | Gap | Gap | Gap | Gap |
| Manchu | Gap | Gap | Gap | Gap |
| Ewenki | Gap | Gap | Gap | Gap |
| Oroqen | Gap | Gap | Gap | Gap |
| Somali | Gap | Gap | Gap | Gap |
| Tamil | Gap | Gap | Gap | |
| Kannada | Gap | Gap | Gap | |

According to the RS of SOV languages in Table 3, FGD is able to predict its preference, i.e., gap. In total, 19 of the 27 languages with SOV word order use the gap in relativization.

### D. RS of VSO Languages

The RC structure of VSO languages is shown below.
Subject-Extracted RC:
Noun$_{head}$ [V Ø$_{RS}$ O]$_{RC}$
Noun$_{head}$ [V Pronoun$_{RS}$ O]$_{RC}$
Direct Object-Extracted RC:
Noun$_{head}$ [V S Ø$_{RS}$]$_{RC}$
Noun$_{head}$ [V S Pronoun$_{RS}$]$_{RC}$

In the subject-extracted RC, FGD/LD is from "noun" to "verb", and the total number of words = 2 + 2 = 4. HPD is from "noun" to "pronoun", LD is from "verb" to "pronoun", and the total number of words = 3 + 2 = 5. In the direct object-extracted RC, FGD/LD is from "noun" to "subject", and the total number of words = 3 + 3 = 6, HPD is from "noun" to "pronoun", LD is from "verb" to "pronoun", and

the total number of words = 4 + 3 = 7. In the same way, the gap is preferred for relativizing all grammatical elements.

VSO languages investigated in this paper include Arabic, Irish, Welsh, Tamashek, Dupaningan Agta, Tagalog, Chamorro, Nandi, Gude, Fijian, and Maori. FGD can only predict the RS preferred by four Austronesian VSO languages, as in Table 4.

Table 4. RS of Austronesian VSO languages

| Languages | Subject | Direct Object | Indirect Object/Oblique | Genitive |
|---|---|---|---|---|
| Dupaningan Agta | Gap | Gap | | |
| Tagalog | Gap | Gap | Gap | |
| Fijian | Gap | Gap | Gap | |
| Chamorro | Gap | Gap | Gap | |

The prediction of FGD is not consistent with other VSO languages. For instance, Irish uses the resumptive pronoun to relativize direct object, indirect object/oblique, and genitive; Welsh uses the resumptive pronoun to relativize indirect object/oblique and genitive; Tamashek adopts the resumptive pronoun to relativize genitive; Gude adopts both the resumptive pronoun and the gap to relativize subject, direct object, and indirect object/oblique. The resumptive pronoun in Arabic can be either independent or non-independent. As in Portuguese and Spanish, if the noun modified by RC is a general noun, the relative pronoun may not be used, but there must be an anaphora (pronoun) in the RC that is consistent with the gender, number, and case of head. The anaphora is usually an independent pronoun, a silent pronoun or a suffix. The reason why the pronoun strategy is used in Arabic is because the gap causes a sentence to split into two sentences, which are grammatically and semantically valid, but are already two separate sentences.

### E. New Motivation

15 pairs of parameters related to VO-OV word order shows that VO languages favor the "Noun-RC" structure, while OV languages favor the "RC-Noun" structure [16]. The possible RS of subject-extracted RC and direct object-extracted RC in SVO languages are as follows:
SU: [S$_{gap+v}$ V O$_{gap+v}$] (weaken the predication of V)
[S$_{pronoun+v}$ V O$_{pronoun+v}$] (highlight the predication of V)
DO: [S$_{pronoun+v+pronoun}$ V O$_{pronoun+v+pronoun}$] (highlight the predication of V)

When subject and direct object are relativized in SVO languages, the gap will cause the predicate verb of RC to interfere with the main predicate verb of the main clause, which violates the Primary Predicate Prominence Principle and is not conducive to the processing of RC. The Primary Predicate Prominence Principle means that since RC contains the predicate verb, RC should be far away from the main predicate verb as far as possible to avoid interference with its prediction [17]. Thus, gap is obviously not suitable for Indo-European SVO languages. When subject-extracted RC must adopt the pronoun, direct object, indirect object/oblique, and genitive-extracted RC must also use the pronoun. Using the pronoun can not only highlight Primary Predicate Prominence Principle, but also help to identify RC as soon as possible.

The possible RS of subject-extracted RC and direct object-extracted RC in SOV languages are as follows:

SU: [$_{gap+v}$S $_{gap+v}$O V] (highlight the predication of V and recognizability of O)

[$_{pronoun+v}$S $_{pronoun+v}$O V] (highlight the predication of V and weaken the recognizability of O)

DO: [$_{gap+gap+v}$S $_{gap+gap+v}$O V] (highlight the predication of V and recognizability of O)

[$_{gap+pronoun+v}$S $_{gap+pronoun+v}$O V] (highlight the predication of V and weaken the recognizability of O)

When subject, direct object, indirect object/oblique and genitive are relativized in SOV languages, gap is preferred. Firstly, it conforms to the Primary Predicate Prominence Principle and Economy Principle. Secondly, it can highlight the recognizability of object in the main clause. That's why most SOV languages prefer to use gap strategies to relativize all grammatical elements.

## V. CONCLUSION

Firstly, this paper found new universals and diversities for RC by investigating 62 languages. With the increase of relativizing difficulty, RS is gradually diversified. At the same time, gaps are used to relativize simple grammatical elements, while pronouns are used to relativize complex grammatical elements. Secondly, this paper examined two factors (NPAH and FGD) that influence RS proposed by predecessors in 62 languages and illustrated their effective range. On the whole, the cross-language performance of RS is consistent with the prediction of NPAH and FGD. But NPAH cannot explain which RS should be used when we relativize a grammatical element. FGD cannot interpret the RS in most Indo-European languages, some VSO languages, and why pronoun and gap can exist in the RC structure. Therefore, this paper put forward the Primary Predicate Prominence Principle as the new motivation to reinterpret the RS. Influenced by the Primary Predicate Prominence Principle, Indo-European SVO languages prefer to use pronoun strategies for relativizing all grammatical elements, while non-Indo-European SVO languages prefer to use gap strategies for relativizing subject and direct object because of FGD. Influenced by the Primary Predicate Prominence Principle and FGD, SOV languages prefer to use gap strategies when relativizing subject, direct object, indirect object/oblique and genitive. Moreover, this paper also found

that the RS for Portuguese, Spanish and Arabic depends on the speaker's intention.

## CONFLICT OF INTEREST

The author declares no conflict of interest.

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