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A Corpus-Based Study on the Variations of Semantic Constraints over Mandarin Chinese VV Construction in Different Sentential Contexts

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Abstract

The semantic constraints of VV construction in Mandarin Chinese have been of great concern in studies on reduplication as it is vital for the acquisition of the structure. However, previous researches scarcely consider the influence of sentential contexts over the semantic constraints of the construction. With the corpus-based empirical study, this paper examines the variations of semantic constraints over Mandarin Chinese VV construction in 9 different simplex sentential contexts. Statistics show that VV construction does exhibit variations of semantic constraints in different contexts. Research findings reveal the General Rule, the Sub-rule and the Specific rules for the variations. The interactions among the verbs, the simplex contexts and the VV construction may account for such variations: the sentential contexts, and the force dynamics of modality in the simplex sentences may affect the semantic features of verbs as well as that of the VV construction, resulting in the change or release of the semantic constraints of the VV construction. The study unveils the significance of the pragmatic and cognitive perspective in doing researches on the semantic constraints for VV construction. The research findings may contribute to second language teaching and natural language processing.

Keywords

Variations of Semantic Constraints, VV Construction, Simplex Sentential Contexts, Verbs, Collostructional Analysis, Force Dynamics

1. Introduction

Structures in Mandarin Chinese such as 看看 (kan-kan, take a look) is composed

of a mono-syllabic verb base and its toneless reduplicant with a delimitative aspectual meaning (Li & Thompson, 1981; Dai, 1993; Basciano & Melloni, 2017; Sui, 2018) and is taken to be a construction (Fang, 2020; Xue et al., 2022) (abbreviated as VV construction below). Studies (Xiao & McEnery, 2004; Fang, 2020, etc.) have revealed the semantic constraints of VV construction in Mandarin Chinese as follows:

1) The verbs should be [+dynamic] [-result].

2) There exists the hierarchy of semantic congruence of verbs with the VV construction: activity > semelfactive > accomplishment > stage-level state > achievement > individual-level state. Verbs of activity and semelfactive are relatively free to be reduplicated as VV construction, whereas static verbs (including stage-level state and individual-level state) and achievements are rather constrained.

However, these studies fail to take into consideration the influence of sentential contexts over the semantic constraints of VV reduplication. Therefore, the above mentioned semantic constraints are contextual neutralized. Researches have shown that contexts, especially sentence patterns may affect the semantic constraints of VV construction, resulting in variations among the constraints (Wang, 1988; Wu, 2009; Li, 2016). Nevertheless, the studies are mostly based on limited examination of corpora and empirical evidences are in scarcity. Based on statistical corpus analysis in the theoretical framework of Construction Grammar (Goldberg, 1995, 2006), with relevant pragmatic and cognitive considerations, this paper examines the variations of semantic constraints over VV Construction in different sentential contexts in an effort to find out the rules and patterns for the variations. Mechanisms and explanations for the rules and patterns are also delved into.

The research questions for the paper are as follows:

1) What are the variations of semantic constraints over VV Construction in different sentential contexts?

2) What are the rules or patterns for the variations?

3) What are the mechanisms and explanations for the patterns of variations?

The paper is divided into 5 sections: Section 1 gives the introduction of the research. Section 2 shows research methodology and research data. Section 3 reveals the variations of semantic constraints on VV construction in different sentential contexts based on the statistical analysis of the data. Section 4 reveals the rules and patterns for the variations, followed by discussions on the mechanisms and explanations for the rules and patterns. Section 5 is the conclusion.

2. Methodology and Data

The research objects are the simplex sentential contexts for VV constructions, which are exhausted through the corpus study, and are listed as follows (all examples in this paper, if not specified, http://www.china-language.edu.cn/):

1) The narrative sentences, with the criteria of modality, can be divided into 5 subcategories:

a) The narrative sentences without modality

[1] 我-看看-表，快-五点-了。

I-look look-watch, nearly-5 o'clock-le-$_{particle.}$

I took a look at the watch, it was nearly 5 o'clock.

b) Sentences of agentative or epistemic modality

[2] 他-要-出去-看看。 (a narrative with agentative modality)

He-will-go out-look look.

He will go out and take a look.

[3] 老鼠-都会-瞅空-出来-看看-景-的吧。(a narrative with epistemic modality)

Mice-probably-will-take their time-out-look look-the scenery-de$_{particle}$ ba$_{particle.}$

Mice probably will take their time out to have a look at the scenery.

c) The pivotal sentences

[4] 他们-让-魏老师-谈谈-抓教学效果的-经验。

They-let-Mr Wei-talk talk-focus-teaching effect-experience.

They ask Mr Wei to give a talk on his experience of focusing on teaching effect.

d) The Ba-sentences

[5] 他-把-板凳-靠-门-移移。

He-ba-bench-near-door-move move.

He moved the bench a little bit to the door.

e) The symmetry structure sentences

[6] 我-先-和-他-说说-这，说说-那。 (accessed in 2017 before the corpus was updated.)

I-first-with-him-talk talk-this, talk talk-that.

First I had a talk with him on anything.

2) The interrogative sentences

[7] 谁-尝尝-我们-炒的-鸡肉？

Who-taste taste-we-fry-chicken?

Who would like to have a taste of the chicken we fried?

3) The negative sentences

[8] 你-也-不-想想-还-能-干-几天。

You-even-not-think think-still-can-do-some days.

How come that you do not even think a little about the period of time you can work.

4) The imperative sentences, which, according to the criteria of modality, are divided into 2 subcategories:

a) The speaker oriented modality sentences (with modal verbs)

[9] 你-可以/应该-问问-我-嘛！

You-may/should –ask ask-me-ma$_{mood\ particle.}$

You may/should briefly ask me (about it).

b) The standard imperative sentences

[10] 你-听听。

You-listen listen.

Listen briefly to (it)!

Interrogative and imperative sentences belong to speaker oriented modality (Bybee, 1985). However, their functions differ: interrogatives focus on doubts and confusion on the part of the speaker whereas imperatives are about the order of the speaker. Therefore, they are categorized into different sentence patterns. Similarly, the imperatives are subcategorized into (4)a and (4)b due to their formal and functional differences: 4(a) is with a deontic modal verb, revealing the appropriateness of the order or advice for act—social obligations or conventions upon which the speaker also agrees, nevertheless, 4(b) is without such a modal verb and is solely about the order or advice for act given by the speaker. The variations of semantic constraints on VV Construction are therefore examined in the above sentence patterns.

2.1. Methodolgoy

First, the semantic features of verbs are presented in **Table 1**:

Table 1. The semantic classification of verbs by Xiao & McEnery (2004).

Classes	+/−dynamic	+/−durative	+/−bounded	+/−telic	+/−result
Activity	+	+	−	−	−
Semelfactive	+	−	+/−	−	−
Accomplishment	+	+	+	+	−
Achievement	+	−	+	+	+
Individual-level state	−	+	−	−	−
Stage-level state	+/−	+	−	−	−

The semantic features for VV constructions are: [+dynamic] [+durative] [+bounded] [−telic] [−result] (Li, 1924; He, 1962; Li & Thompson, 1981; Xiao & McEnery, 2004; Fang, 2020). **Table 1** shows that verbs of activity share the most of the semantic features with VV construction, followed by semelfactives and accomplishments. Since the verbs should be [+dynamic] [−result], we may conclude that achievements and individual-level state verbs are strictly constrained by VV construction, whereas stage-level state verbs can be sanctioned when they are [+dynamic]. We first calculate the types of these verbs ($V_{T.}$) in the different sentence patterns listed in Section 2, then the percentage of the types of these verbs ($V_{per.}$) in the sentence patterns versus their total types. Furthermore, the frequency of the VV construction for each category of verbs in the sentences (V_{vvfreq}) and the percentage of such frequency ($V_{vvper.}$) versus the total of the VV construction for each verb category are presented. From $V_{T.}$ and V_{per}, we may see whether the constraints of VV construction on achievements and individual-level state verbs are lifted, from V_{vvfreq} and V_{vvper} we may evaluate the relative significance of such release of the constraints.

Secondly, the semantic congruence of the verbs with the VV construction is weighed by the collostructional strength of the verbs through collostructional analysis which "takes into account of grammatical structure and is specifically geared to investigating the interaction of lexemes and the grammatical constructions associated with them" (Stefanowitsch & Gries, 2003: p. 209).

Specifically, types of verbs in different sentences with significant VV collostructional strength ($V_{Tcollo.}$) and the percentage of such verb versus the total types of the verbs ($V_{Tcollo.\ per.}$) will be calculated, followed by type frequencies (tokens) of verbs with significant VV collostructional strength ($V_{freqcollo.}$), and the percentage of such frequencies ($V_{freqcollo.\ per.}$) versus the total frequencies of the VV construction for the verbs. With $V_{Tcollo.\ per.}$ and especially $V_{collo.\ per.}$, the ranking for the semantic congruence of the verbs with VV construction will be available, hence, the hierarchy of semantic congruence of verbs in the sentences. From the hierarchy, the variations of semantic constraints of VV construction in different sentence patterns will be discerned.

Based on the above statistics, the research will delve into the rules or patterns for the variations, followed by the exploration into the mechanisms and explanations for the patterns.

2.2. Data Collection

The Corpora for the research is Yuliaokuzaixian (http://www.china-language.edu.cn/) which is a balanced online corpora with 12,842,116 words. We extract all the 2017 of the nine simplex sentences listed in Section 2 with their frequencies of VV construction, shown in Table 2:

Table 2. The frequencies of the simplex sentence patterns with VV construction.

Simplex sentence patterns	VV construction
The narrative without modality	529
Sentences of agentative or epistemic modality	126
The pivotal sentences	63
The Ba-sentences	5
The symmetry structure sentences	15
The interrogative sentences	143
The negative sentences	16
The speaker oriented modality sentences	55
The standard imperative sentences	1065
Total	**2017**

Table 3 presents the number of types of verbs reduplicated in the sentences, and the corresponding frequencies (tokens) of VV construction.

Table 3. The tokens of the reduplicated verbs and frequencies of VV construction.

Verbs	Type	Freq. of VV
Activity	53	1611
Semelfactive	13	68
Accomplishment	85	278
Stage-level state	14	59
Achievement	1	1
Total	**166**	**2017**

Statistical studies in Section 3 will be based on the data in Table 2 and Table 3.

3. Statistical Analysis on the Variations of Semantic Constraints over VV Construction in Different Sentential Contexts

In this section, variations of semantic constraints over VV construction in the 9 sentential contexts presented in Section 2 are to be delved into with statistical analysis.

3.1. In Narrative Sentences

According to Section 2, there are 5 subcategories of narrative sentences, namely: the narrative sentences without modality (NWM), sentences of agentative or epistemic modality (SA/EM), the pivotal sentences (PIS), the Ba-sentences (BS) and the symmetry structure sentences (SSS).

Table 4 shows the types of the verbs (V_T) and the percentage of the different verb types ($V_{per.}$) in the 5 sub-category sentence patterns versus the total types of the different verb categories (the second column, Table 3) in the format of $V_T/V_{per.}$:

Table 4. The types of the verbs (V_T) and the percentage of the different verb types ($V_{per.}$).

Classes	NWM	SA/EM	PIS	BS	SSS
Activity	35/66.04%	17/32.08%	**12/22.64%**	2/3.77%	7/13.21%
Semelfactive	**11/84.62%**	3/23.08%	1/7.69%	**1/7.69%**	**2/15.38%**
Accomplishment	35/41.18%	18/21.18%	8/9.41%	2/2.35%	0/0%
Achievement	0/0%	0/0%	0/0%	0/0%	0/0%
Individual-level state	0/0%	0/0%	0/0%	0/0%	0/0%
Stage-level state	1/7.14%	**5/38.46%**	1/7.14%	0/0%	0/0%

Table 4 shows that for the 5 sub-categories of narrative simplex sentences, achievements and individual-level state verbs are not reduplicated as achievements are [+result] and individual-level state verbs are [−dynamic], therefore, the

semantic constraints that the verbs should be [+dynamic] [−result] are observed for the VV construction in narrative simplex sentences. However, for the narrative sentences without modality (NWM), the Ba-sentences (BS) and the symmetry structure sentences (SSS), semelfactives are of the highest percentage ($V_{per.}$) versus the total types of the different categories verbs, whereas for sentences of agentative or epistemic modality (SA/EM), it is the stage-verb state verbs which share the most semantic congruence with the VV construction.

Table 5 shows the frequency of the VV construction for each category of verbs in the sentences (V_{vvfreq}) and the percentage of such frequency ($V_{vvper.}$) versus the total of the VV construction for each verb category (the third column, Table 3) in the format of $V_{vvfreq}/V_{vvper.}$.

Table 5. The frequencies of VV for verbs in sentences (V_{vvfreq}) and the percentage ($V_{vvper.}$).

Classes	NWM	SA/EM	PIS	BS	SSS
Activity	380/23.59%	92/5.71%	49/3.04%	2/0.12%	13/0.81%
Semelfactive	**59/87.76%**	3/4.41%	1/1.47%	**1/1.47%**	**2/2.94%**
Accomplishment	89/32.01%	25/8.99%	**12/4.32%**	2/0.72%	0/0%
Achievement	0/0%	0/0%	0/0%	0/0%	0/0%
Individual-level state	0/0%	0/0%	0/0%	0/0%	0/0%
Stage-level state	1/1.69%	**6/10.17%**	1/1.69%	0/0%	0/0%

Table 5 attests what is shown in Table 4, confirming the validity of the data in Table 4. It should be noted that in the pivotal sentences (PIS), the accomplishments are of the highest percentage of the frequencies of the VV construction versus the total frequencies of VV construction for the verb category.

Next, we will turn to the semantic congruence of the verbs in narratives with the VV construction measured by the collostructional strength of the verbs through collostructional analysis. First, Table 6 shows the types of verbs in the 5 sub-categories of simplex narrative sentences with significant VV collostructional strength (V_{Tcollo}) and the percentage of such verb types ($V_{Tcollo.\ per.}$) versus the total types of the verbs (the second column, Table 3) in the format of $V_{Tcollo}/V_{Tcollo.\ per.}$:

Table 6. Types of verbs with significant VV collostructional strength (V_{Tcollo}) and the percentage of the different verb types ($V_{Tcollo.\ per.}$).

Classes	NWM	SA/EM	PIS	BS	SSS
Activity	15/28.30%	**8/15.09%**	**6/11.32%**	2/3.77%	7/13.21%
Semelfactive	**6/46.15%**	1/7.69%	1/7.69%	**1/7.69%**	**2/15.38%**
Accomplishment	15/17.65%	8/9.41%	5/5.88%	2/2.35%	0/0%
Achievement	0/0%	0/0%	0/0%	0/0%	0/0%
Individual-level state	0/0%	0/0%	0/0%	0/0%	0/0%
Stage-level state	0/0%	1/7.14%	1/7.14%	0/0%	0/0%

Table 6 presents the types (V_{Tcollo}) and the percentage of the types of each verb category that are of significant collostructional strength ($V_{Tcollo.\ per.}$), from which we can see the significance of each verb category with the VV construction, for example, for the narrative sentences without modality (NWM), the types for semelfactives are of the highest percentage that is in semantic congruence with VV construction, followed by verbs of activity and accomplishment, verbs of stage-level state are greatly constrained into VV construction. However, tokens (frequencies) of these verbs ($V_{freqcollo.}$) as well as their percentage of VV construction in the sentences ($V_{freqcollo.\ per.}$) should also be weighed if we are to decide on the hierarchy of semantic congruence of verbs with the VV construction and then find out the variations of the semantic constraints for the 5 subcategories of simplex narrative sentences.

Table 7 shows the frequencies (tokens) of verbs with significant VV collostructional strength ($V_{freqcollo.}$), and the percentage of such frequencies ($V_{freqcollo.\ per.}$) versus the total frequencies of the VV construction for the verbs (the third column, Table 3) in the format of $V_{freqcollo.}/V_{freqcolloper}$:

Table 7. Frequencies of verbs with significant VV collostructional strength ($V_{freqcollo.}$) and the percentage ($V_{freqcollo.\ per.}$).

Classes	NWM	SA/EM	PIS	BS	SSS
Activity	334/20.73%	**77/4.78%**	**41/2.55%**	2/0.12%	11/0.68%
Semelfactive	**54/79.41%**	1/1.47%	1/1.47%	**1/1.47%**	**2/2.94%**
Accomplishment	65/23.38%	14/5.04%	8/2.88%	2/0.72%	0/0%
Achievement	0/0%	0/0%	0/0%	0/0%	0/0%
Individual-level state	0/0%	0/0%	0/0%	0/0%	0/0%
Stage-level state	0/0%	2/3.39%	1/1.69%	0/0%	0/0%

Both $V_{Tcollo.\ per.}$ and $V_{freqcollo.\ per.}$ contribute to the decision on the hierarchy of semantic congruence of verbs with the VV construction. In the symmetry structure sentences (SSS), $V_{T.\ collo.\ per}$ and $V_{freqcollo.\ per}$ align with each other for the decision of the hierarchy, however, for cases where they may run into conflict with each other, the hierarchy is decided on the percentage of greater significance of difference, for example, in the narrative sentences without modality (NWM), $V_{T.\ collo.\ per}$ for verbs of activity and accomplishment is 28.30% and 17.65% respectively, whereas $V_{freq.\ collo.\ per.}$ for them is 20.73% and 23.38% respectively, as there is greater significance of difference in $V_{T.\ collo.\ per}$ (28.30%/20.73% = 1.37 vs 23.38%/17.65% = 1.33), we therefore decide that verbs of activity are more congruent with VV construction in the sentence. Based on the above criteria, we decide on the hierarchy of semantic congruence of verbs with the VV construction in NWM: semelfactive > activity > accomplishment > stage-level state, verbs of achievement and individual-level state are prohibited, roughly in line with the sematic constraints presented in Section 1. The variation is that greater semantic congruence of verbs of sem-

elfactive with VV construction is found over the verbs of activity in NWM. For sentences of agentative or epistemic modality (SA/EM) and the pivotal sentences (PIS), the hierarchy is: activity > accomplishment > stage-level state > semelfactive, verbs of achievement and individual-level state are also prohibited, again roughly in line with the sematic constraints in Section 1. The variation is that greater semantic congruence of verbs of stage-level state with VV construction is found over the verbs of semelfactive. For the Ba-sentences (BS), the hierarchy is: semelfactive > accomplishment > activity, verbs of achievement and individual-level state as well as stage-level state are prohibited, roughly in line with the sematic constraints presented in Section 1. VV construction is not productive in Ba-sentences. The variation is that greater semantic congruence of verbs of semelfactive and accomplishment with VV construction are found over the verbs of activity. Finally, for the symmetry structure sentences (SSS), the hierarchy is: semelfactive > activity, verbs of achievement and individual-level state are prohibited, roughly in line with the sematic constraints presented in the introduction. The variation is that verbs of accomplishment and stage-level state are quite constrained in VV construction in SSS and greater semantic congruence of verbs of semelfactive with VV construction is found over the verbs of activity.

3.2. In the Interrogative Sentences

Table 8 shows the types of the verbs ($V_{T.}$), the percentage of the different verb types ($V_{per.}$) in the simplex interrogative sentences versus the total types of the different categories verbs (the second column, Table 3), the frequency of the VV construction for each category of verbs in the inter-rogative sentences (Vvvfreq) and the percentage of such frequency (Vvvper) versus the total of the VV construction for each verb category (the third column, Table 3):

Table 8. Statistics for $V_{T.}$, $V_{per.}$, V_{vvfreq} and $V_{vvper.}$ in interrogatives.

Classes	V_T	V_{per}	V_{vvfreq}	V_{vvper}
Activity	21	39.62%	114	7.08%
Semelfactive	1	7.69%	126	1.47%
Accomplishment	17	20.00%	26	9.35%
Achievement	0	0/0%	0	0/0%
Individual-level state	0	0/0%	0	0/0%
Stage-level state	2	14.29%	2	3.39%

As is shown in Table 8, in simplex interrogatives, achievements and individual-level state verbs are not reduplicated, therefore, the semantic constraints that the verbs should be [+dynamic] [−result] are observed. Furthermore, V_T, Vper and Vvvper for verbs of stage-level state are higher than those of semelfactives.

To decide upon the hierarchy of semantic congruence of verbs with the VV construction and find out the variations of semantic constraints over VV construction in interrogatives, collosreuctional strength is again calculated for verbs of VV construction in interrogatives. Table 9 shows the types of verbs in interrogatives with significant VV collostructional strength ($V_{T\ collo.}$), the percentage of such verb types ($V_{T.\ collo.\ per.}$) versus the total types of the verbs (the second column, Table 3), the frequencies (tokens) of verbs with significant VV collostructional strength ($V_{freqcollo.}$), and the percentage of such frequencies ($V_{freqcollo.\ per.}$) versus the total frequencies of the VV construction for the verbs (the third column, Table 3):

Table 9. Statistics for $V_{Tcollo.}$, $V_{Tcollo.\ per.}$, $V_{freqcollo.}$ and $V_{freqcollo.\ per.}$ in interrogatives.

Classes	$V_{Tcollo.}$	$V_{Tcollo.\ per.}$	$V_{freqcollo.}$	$V_{freqcollo.\ per.}$
Activity	14	26.42%	93	5.77%
Semelfactive	0	0%	0	0%
Accomplishment	7	8.24%	14	5.04%
Achievement	0	0/0%	0	0/0%
Individual-level state	0	0/0%	0	0/0%
Stage-level state	0	0%	0	0%

It can be seen from Table 9 that the hierarchy of semantic congruence of verbs with the VV construction in the interrogatives is: activity > accomplishment, and Table 8 shows that verbs of stage-level state and semelfactive can be reduplicated in interrogatives, although none is found of significant collostructional strength in the corpus. As V_T, Vper and Vvvper for verbs of stage-level state are higher in interrogatives than semelfactives, the hierarchy of semantic congruence is: stage-level state > semelfactive. Now the complete hierarchy of semantic congruence of verbs with the VV construction in the interrogatives is obtained: activity > accomplishment > stage-level state > semelfactive, verbs of achievement and individual-level state are prohibited, roughly in line with the sematic constraints presented in Section 1. The variation is that in simplex interrogatives, greater semantic congruence of verbs of stage-level state with VV construction is found over the verbs of semelfactive.

3.3. In the Negative Sentences

Table 10 shows the statistics for V_T, the $V_{per.}$, the V_{vvfreq} and V_{vvper} for each verb category in the negatives:

It can be seen from the above table that VV construction in simplex negative sentences is not productive, and achievements and individual-level state verbs are not reduplicated in the pattern, hence the semantic constraints [+dynamic] [−result] for the verbs. Furthermore, verbs of semelfactive and stage-level state are not found into VV construction in the negatives in the corpus, showing their constraint into VV construction in sentence pattern.

Table 10. Statistics for $V_{T.}$, $V_{per.}$, V_{vvfreq} and $V_{vvper.}$ in negatives.

Classes	V_T	V_{per}	V_{vvfreq}	V_{vvper}
Activity	5	9.43%	14	0.87%
Semelfactive	0	0%	0	0%
Accomplishment	2	2.35%	2	0.72%
Achievement	0	0/0%	0	0/0%
Individual-level state	0	0/0%	0	0/0%
Stage-level state	0	0%	0	0%

For the hierarchy of semantic congruence of verbs with the VV and the variation of semantic constraints over VV Construction in negatives, Table 11 shows the statistics for the V_{Tcollo}, the $V_{Tcollo.\ per}$, the $V_{freqcollo.}$, and the $V_{freqcollo.\ per.}$ for the verbs:

Table 11. Statistics for $V_{Tcollo.}$, $V_{Tcollo.\ per.}$, $V_{freqcollo.}$ and $V_{freqcollo.\ per.}$ in negatives.

Classes	$V_{Tcollo.}$	$V_{Tcollo.\ per.}$	$V_{freqcollo.}$	$V_{freqcollo.\ per.}$
Activity	2	**3.77%**	11	0.68%
Semelfactive	0	0%	0	0%
Accomplishment	2	2.35%	2	0.72%
Achievement	0	0/0%	0	0/0%
Individual-level state	0	0/0%	0	0/0%
Stage-level state	0	**0%**	0	0%

From Table 10 it is already known that achievements and individual-level state verbs are prohibited, also, semelfactives and stage-level state verbs are quite constrained for VV construction in the negatives. Therefore, with Table 11 available, the hierarchy of semantic congruence of verbs with the VV construction in the negatives is: activity > accomplishment, roughly in line with the sematic constraints presented in Section 1. The variation is that in simplex negatives, the semantic congruence of verbs of semelfactive with VV construction decreases and stage-level state verbs are quite constrained in the construction.

3.4. In the Imperative Sentences

As is shown in Section 2, imperatives are subcategorized into the speaker oriented modality sentences (with modal verbs) (IM_{SM}) and the standard imperatives (IM), Table 12 presents the statistics for V_T and the V_{per} in the 2 sub-categories in the format of $V_T/V_{per,}$ and the V_{vvfreq} as well as the V_{vvper} in the format of V_{vvfreq}/V_{vvper}:

Table 12. Statistics for V_T, V_{per}, V_{vvfreq} and V_{vvper} in IM_{SM} and IM.

Classes	V_T/V_{per} IMSM	V_T/V_{per} IM	V_{vvfreq}/V_{vvper} IMSM	V_{vvfreq}/V_{vvper} IM
Activity	**11/20.75%**	**36/67.92%**	46/2.86%	**901/55.93%**

Continued

Semelfactive	0/0%	1/7.69%	0/0%	1/1.47%
Accomplishment	8/9.41%	44/51.76%	8/2.88%	114/41.01%
Achievement	1/100%	0/0%	1/100%	0/0%
Individual-level state	0/0%	0/0%	0/0%	0/0%
Stage-level state	0/0%	**9/64.29%**	0/0%	**49/83.05%**

Table 12 shows that for IM_{SM}, verbs of individual-level state are again prohibited for VV construction and verbs of semelfactive as well as stage-level state are quite constrained. What should be noted is that one case of verbs of achievement for VV construction is found, which will be further discussed in Section 4. It may be concluded that the semantic constraints [+dynamic] [−result] are roughly met. For IM, verbs of achievements and individual-level state verbs are not available for VV construction, hence the semantic constraints [+dynamic] [−result]. Similarly, verbs of semelfactive are quite constrained, however, in IM, verbs of stage-level state are quite productive in VV construction.

For IM_{SM} and IM, statistical analysis of the hierarchy of semantic congruence of verbs with the VV and the variation of semantic constraints over VV Construction can be found in Table 13 which shows the types of verbs in IM_{SM} and IM with significant VV collostructional strength ($V_{Tcollo.}$), the percentage of such verb types ($V_{Tcollo.\ per.}$) versus the total types of the verbs (the second column, Table 3) in the format of $V_{Tcollo}/V_{Tcollo.\ per}$, the frequencies (tokens) of verbs with significant VV collostructional strength ($V_{freqcollo.}$), and the percentage of such frequencies ($V_{freqcollo.\ per.}$) versus the total frequencies of the VV construction for the verbs (the third column, Table 3) in the format of $V_{freqcollo.}/V_{freqcolloper}$:

Table 13. Statistics for $V_{Tcollo.}$, $V_{Tcollo.\ per.}$, $V_{freqcollo.}$ and $V_{freqcollo.\ per.}$ in IM_{SM} and IM.

Classes	$V_{Tcollo}/V_{Tcollo.\ per}$ IMSM	$V_{Tcollo}/V_{Tcollo.\ per}$ IM	$V_{freqcollo.}/V_{freqcolloper}$ IMSM	$V_{freqcollo.}/V_{freqcolloper}$ IM
Activity	**5/9.43%**	**18/33.96%**	**36/2.23%**	**854/53.01%**
Semelfactive	0/0%	0/0%	0/0%	0/0%
Accomplishment	2/2.35%	10/11.76%	2/0.72%	69/24.82%
Achievement	0/0%	0/0%	0/0%	0/0%
Individual-level state	0/0%	0/0%	0/0%	0/0%
Stage-level state	0/0%	**2/14.29%**	0/0%	**39/66.10%**

From Table 12 and Table 13, it can be seen that the hierarchy of semantic congruence of verbs with the VV for IM_{SM} is: activity > accomplishment > achievement, roughly in line with the sematic constraints presented in Section 1. The variation is that verbs of semelfactive and stage-level state are quite constrained

in VV construction whereas verbs of achievement show a limited degree of semantic congruence with the construction. For IM, the hierarchy is: activity > stage-level state > accomplishment > semelfactive, roughly in line with the sematic constraints in Section 1. The variation is that the semantic congruence of verbs of stage-level state with VV construction increases whereas that of verbs of semelfactive decreases.

4. Findings and Discussions

To find out the rules or patterns for the variations of semantic constraints over VV Construction in the sentence patterns, we first summarize the variations in Table 14 (semantic congruence abbreviated as SC):

Table 14. The variations of semantic constraints over VV Construction in the sentence patterns.

Sentence	Variations of semantic constraints over VV
NWM	Greater SC of verbs of semelfactive over the verbs of activity
SA/EM	Greater SC of verbs of stage-level state over the verbs of semelfactive
PIS	Greater SC of verbs of stage-level state over the verbs of semelfactive
BS	Not productive, greater SC of verbs of semelfactive and accomplishment over that of activity
SSS	Not productive, verbs of accomplishment and stage-level state quite constrained, greater SC congruence of verbs of semelfactive over the verbs of activity
Interrogative	Greater SC of verbs of stage-level state over the verbs of semelfactive
negative	Not productive, the SC of verbs of semelfactive decreases, with stage-level state verbs quite constrained in VV
IM_{SM}	Semelfactives and stage-level state verbs quite constrained, verbs of achievement show a limited degree of SC with VV
IM	Greater SC of verbs of stage-level state over the verbs of over verbs of activity whereas that of semelfactives decreases

From Table 14, the general rule for the variations of semantic constraints over VV Construction in the simplex sentence patterns obtains as follows:

The General Rule:

The semantic congruence of sememlfactives with the VV construction increases in narrative sentences without modality (NWM), the Ba-sentences (BS) and the symmetry structure sentences (SSS), Whereas in sentences of agentative or epistemic modality (SA/EM), the pivotal sentences (PIS), the simplex interrogatives, the negatives, the speaker oriented modality (with modal verbs) (IM_{SM}) and the standard imperatives (IM), the semantic congruence of sememlfactives with the VV construction decreases.

Apart from the general rule, there is also a rule which obtains for most of the

simplex sentence patterns which is labeled as the Sub-rule here:

The Sub-rule:

In the simplex sentences of agentative or epistemic modality (SA/EM), the pivotal sentences (PIS), the interrogatives and the standard imperatives (IM), the semantic congruence of stage-level state verbs increases with VV construction. In the simplex sentences of the negatives and the speaker oriented modality (with modal verbs) (IM_{SM}), stage-level state verbs are quite constrained in VV construction.

Furthermore, specific rules can be found for the variations of semantic constraints over VV Construction in the specific sentence patterns, summarized as follows:

Specific Rule 1:

VV construction is not productive in the simplex Ba-sentences (BS) and the symmetry structure sentences (SSS), and the semantic congruence of accomplishments with the VV construction in BS increases whereas in SSS, the semantic congruence of accomplishments with the VV construction decreases.

Specific Rule 2:

For the speaker oriented modality sentences (with modal verbs) (IM_{SM}), verbs of achievement show a limited degree of semantic congruence with VV construction.

For the explanations of the above rules, the semantic and pragmatic impact of the simplex sentences on the semantic constraint of VV construction over the verbs is of great significance (Liu, 1995), and such impact is discussed within related theoretical frameworks for the motivation of the rules.

4.1. Explanation for the General Rule

For the narrative sentences without modality (NWM), the Ba-sentences (BS) and the symmetry structure sentences (SSS), the major function is to narrate what happened in certain circumstances, so there is a temporal boundary for the event, hence the semantic feature [+bounded]. Xiao & McEnery (2004: p. 54-55) points out that semelfactives are [+bounded] when interpreted as a single event and [-bounded] when they "suggest multi-event readings". However, it is also possible for the multi-event readings to be [+bounded] when the event is narrated (http://ccl.pku.edu.cn:8080/ccl_corpus/index.jsp):

[11] 村上的八音队……在风中-敲-了。

The village band…in the wind-knock-le$_{particle}$.

The village band knocked (the instrument) in the wind.

Example [11] shows that the agent (the village band) performed the act of knocking repeatedly for a bounded period of time. So in narrative NWM, BS and SSS, semelfactives could be [+bounded]. Also, the multi-event readings of semelfactives could be construed as [+durative] (Fang, 2020), with these altered semantic features for semelfactives in the sentential contexts, it can be seen from **Table 1** that the semantic congruence of semelfactives turns out to be greater with

VV construction than that of the verbs of activity. Nevertheless, for the simplex sentences of agentative or epistemic modality (SA/EM), the pivotal sentences (PIS), the interrogatives, the negatives, the speaker oriented modality (with modal verbs) (IM_{SM}) and the standard imperatives (IM), modality is their prominent feature, and modality backgrounds the temporal endpoint as the event happens in the future, therefore, the semelfactives in the modality could be [-bounded]:

[12] 我们-也-要-敲-钟。(http://ccl.pku.edu.cn:8080/ccl_corpus/index.jsp)

We-also-will-knock-the bell.

We will also knock the bell.

In [12], no temporal endpoint is indicated for the future repeated act of knocking, hence the semantic feature [−bounded] which conflicts with VV construction. Furthermore, semelfactives can only be conditionally construed as [+durative], therefore, in simplex sentences with prominent function of modality, the semantic congruence of semelfactives decreases with VV construction compared with narrative NWM, BS and SSS.

4.2. Explanation for the Sub-Rule

Section 4.1 reveals that the prominent function for the simplex sentences of agentative or epistemic modality (SA/EM), the pivotal sentences (PIS), the interrogatives and the standard imperatives is modality.

Talmy (2000) proposes the force dynamic theory which presents change-of-state force-dynamic patterns in **Figure 1** (Talmy, 2000: p. 418):

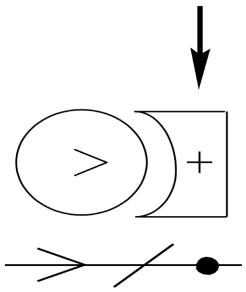

Figure 1. Change-of-state force-dynamic patterns.

In **Figure 1**, the dark black arrow indicates the force dynamics of the antagonist, the opposing force-bearing entity, and ">" in the circle represents the intrinsic motion tendency of the agonist, the opppsite of antagonist, the black dot at the bottom symbolizes the resultant static state of the agonist. Therefore, the agonist turns from the intrinsic motion state to the static state as the result of the force dynamic of the antagonist, reflecting exactly the force dynamic pattern of stage-level state verbs in VV construction shown in [13]:

[13] 校长-让-他-歇歇

The school principal-let-him-rest rest

The school principal let him have a rest

Example [13] is the pivotal sentence (PIS), and the initial state of the agonist

"He" may be busy working, which is of course the motion state, and the force dynamics by the antagonist "the school principal" caused him to stop the motion, hence the static state denoted by the stage-level state verb "歇 (rest)". In other words, the stage-level state verb in PIS exhibits the change-of-state force-dynamic patterns. As such a pattern is also available for other simplex sentence patterns of modality (Talmy, 2000), it may be concluded that the stage-level state verbs in other simplex sentences of modality also experience the change-of-state force-dynamic patterns.

According to the metaphor "Changes are Motions" (Lakoff & Johonson, 1980: p. 259), the stage-level state verbs could attain the [+dynamic] feature conditionally. As can be seen from **Table 1**, if the stage-level state verbs are [+dynamic], the semantic constraints [+dynamic] [−result] are released, and the stage-level state verbs in SA/EM, PIS, the interrogatives and IM certainly increase its semantic congruence with the VV construction.

However, from **Table 14**, it can be seen that for simplex sentences of SA/EM, PIS and the interrogatives, stage-level state verbs show greater semantic congruence with VV construction over the semelfactives, for IM, stage-level state verbs show greater semantic congruence with VV construction over the verbs of activity, in other words, in IM, stage-level state verbs shows greater semantic congruence of with the VV construction than in SA/EM, PIS and the interrogatives. Furthermore, the simplex sentences of negatives and the speaker oriented modality (with modal verbs) (IM_{SM}) both exhibit modality, whereas the stage-level state verbs are quite constrained, so two questions are to be answered:

1) Why are there greater semantic congruence of stage-level state verbs in IM with the VV construction than in SA/EM, PIS and the interrogatives?

2) Why are the stage-level state verbs quite constrained in VV construction in the simplex sentences of negatives and the IM_{SM}?

For the first question, one possible explanation is the pragmatic/social power relations. For IM, the speaker in position to give the imperative order is often of higher social status and therefore with greater social power. For the simplex sentences of SA/EM, 95.24% (120 cases) of them are of agentative or dynamic modality, so it is about the agent's strong will to get something done.

For the PIS, as shown in [4], there is the causative force of act (namely, LET) between the subject "他们 (they)" and the object "魏老师 (Mr. Wei)", but it does not mean that "他们 (they)" are of higher social status with greater social power. The same is true for speaker and the hearer in the interrogatives in [7] though it conveys weaker imperatives (Fang, 2020), so the same power relation as in IM is not available. Therefore, IM shows greater social power than SA/EM, PIS and the interrogatives, resulting in greater force dynamics. Consequently, it is easier for the stage-level state verbs in IM to realize the change of state, and accrodingly easier to gain the [+dynamic] feature to be reduplicated, hence the greater semantic congruence with the VV construction than in SA/EM, PIS and the interrogatives.

For the second question, the simplex sentences of negatives imply deontic modality (Fang, 2020), therefore, example [8] actually implicates that "you should think a little about the period of time you can work". For the IM_{SM}, it is already made clear in Section 2 that they convey deontic modality which is on social obligations or conventions to get something done. As social obligations or conventions are of weaker force dynamic than an order, a strong personal will or a causative force of act, it is relatively harder for the stage-level state verbs to realize the change of state, therefore, it is not so easy for them to gain the [+dynamic] feature, hence their constraint in VV construction.

4.3. Explanation for the Specific Rules

For Specific Rule 1, it is known that VV construction is not productive in the simplex Ba-sentences (BS) and the symmetry structure sentences (SSS). BS often narrates the process and result of a dynamic event (Xue, 1987; Zhang & Cheng, 2000; Fang, 2020), so it is [+dynamic] but [+result], which actually violates the semantic constraints of VV construction, hence the low frequency. SSS narrates the iterative event which is [−telic] as in [7], furthermore, the object of the paralleling predicate verbs can either be omitted or is not definite, these features undermine the dynamics of the act (Wang, 2018; Fang, 2020), resulting in the weakening of the semantic feature [+dynamic], therefore, VV construction, with the prominent semantic features [+dynamic], is not so productive in SSS.

Since the semantic feature [+result] for BS entails the semantic feature [+telic] but not vice versa (Xiao & McEnery, 2004: p. 48), it can be seen from **Table 1** that verbs of achievement are the most congruent with BS, and BS, though not productive for VV construction, coerces the [+result] feature of VV construction, the evidence is that in BS with VV construction, the resultative complement, which is not sanctioned in VV construction, is made possible:

[14] 蔡三宝-立即-把-帽沿-拉拉-**低**。

Cai Sanbao-immediately-Ba the brim of the hat-pull pull-**lower**.

Cai Sanbao immediately pulled the brim of the hat a little bit lower.

In [14], 低 (lower) is the resultative complement, and is legal in VV construction due to the coercive effect of the BS. This explains the increased semantic congruence of verbs of accomplishment with the VV construction in BS. However, as verbs of accomplishment are [+telic], it is difficult for them to denote iterative event and accordingly are not in line with the iterative meaning of SSS, resulting in their constraints in VV construction.

For Specific Rule 2, first, according to Lv (1942/1990: p. 56) and Shui (2008: p. 12), when the dynamic event ends, it will turn to the static state. The same is true for verbs of achievement, therefore, they exhibit dyadic features: on the one hand, they could denote the instant completion of a dynamic event, on the other hand, they may mean the static state that follows the end of the dynamic event, as in ([15] and [16] are sentences by the author, attested grammatical and acceptable by native speakers):

[15] 他-到-上海-了。

He-arrive in-Shanghai-le$_{particle.}$

He arrived in Shanghai.

[16] 他-到-上海-两天-了。

He-arrive in-Shanghai-two days-le$_{particle.}$

He has been in Shanghai for two days.

到 (arrive in) is a verb of achievement in Mandarin Chinese, in [15], the dynamic endpoint meaning of the verb is foregrounded, however, in [16], the meaning of a static state following the dynamic event is foregrounded as it is impossible for the instant completion of a dynamic event to last for two days, only the resultant static state will do. As the SA/EM, PIS, the interrogatives and the IM are with greater force dynamics, the dynamic endpoint meaning of the achievements would be foregrounded, correspondingly, the semantic feature of [+result] for achievements would be foregrounded in VV construction. Since the semantic feature [+result] is not sanctioned in VV construction, their severe constraint could be expected. However, it is known in Section 4.2 that the speaker oriented modality sentences (with modal verbs) (IM_{SM}) convey deontic modality, and are of weaker force dynamic, it is possible for the static state meaning of the achievements to be foregrounded, and the corresponding instant dynamic endpoint meaning is background, which makes it possible for the semantic feature of [+result] for achievements to be coerced, hence their limited occurrence in VV construction, See the following example:

[17] 这-粹宝斋-你-得-到到。

This-Cui Bao Zhai-you-ought to-arrive arrive.

You ought to arrive in Cui Bao Zhai and stay there for a short while.

In [17], the verb of achievement 到 (arrive in) reduplicated as VV construction actually means that the hearer should arrive in the place and stay there for a brief period of time.

5. Conclusion

Targeting the three research questions proposed in Section 2.2, this paper employs corpus-based quantitative studies to show that there are variations of semantic constraints over VV construction in different sentential contexts. The study supports the argument that contexts may change the semantic constraints of VV construction. Research findings reveal that there do exist systemic rules/patterns for the variations, namely, the General Rules, the Sub-rules and the Specific rules. The motivations for the rules are the result of the interactions among the sentential contexts, the verbs and the VV construction. Specifically, the semantics of sentential contexts and some pragmatic factors such as power relation may alter or coerce the semantic features of verbs as well as the VV construction, and the force dynamics of the different sentential contexts may release the semantic constraints of the VV construction over the verbs, resulting in variations of semantic constraints. The study confirms the importance of doing empirical researches on semantic constraints of VV construction in the pragmatic and cognitive framework.

The research findings are conducive to second language teaching as well as natural language processing. The limitation of the research is the relatively limited data for the collostrutional analysis of some sentence patterns as confined by the corpus size. Future research could turn to larger corpus for statistical analysis. Besides, more contextual and pragmatic factors may be tagged and examined to see how they interact with the verbs, the VV construction and the specific sentence patterns to affect the semantic constraints of VV construction.

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Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

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