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How to *do so* in Mandarin Chinese

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Abstract   In light of extensive studies on the English *do so* construction, this paper investigates the lesser-known counterpart in Chinese as well as the properties of the words *do* and *so*. It will be shown that Chinese provides clearer evidence for analyzing this *do* as a light verb spelling out the eventuality predicate DO and takes a VP as its complement, which contains *so*. The analysis of the structure and derivation of the *do so* construction proposed in this work will be supported by comparison with related predicate anaphors and the structure containing a verb and *so* (such as *I think so*). The results of this study help resolving controversies relating to various constituency and argument structures. The cases illustrated are the *ba* construction, apparent prenominal PPs, control structures, and argument vs. non-argument PPs.

1 Introduction

The *do so* construction in English, illustrated in (1) below, has contributed significantly to the discussion of several theoretical issues over the decades and helped characterize grammatical properties related to constituency and argument structure, among others.

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(1) John read his friend's book; Bill did so as well.

This construction has been a useful diagnostic for determining constituency structures—[*do so*] must be anaphoric to a verbal constituent (a verb phrase). It also distinguishes subcategorized from non-subcategorized elements: the verb phrase that [*do so*] is anaphoric to must include the subcategorized complements of the verb, whereas non-subcategorized phrases can be optionally included as in (2a, b). The subcategorized complement is not included in (2c); therefore, the sentence is not acceptable (see, for instance, Lakoff and Ross 1976, cf. a more recent work Culicover and Jackendoff 2005 on some issues).

(2) a. John [read the report at school] yesterday; Bill did so today.
     b. John [read the report] at school yesterday; Bill did so at home today.
     c. John [read] the report at school yesterday; *Bill did so the novel
         at home today.

The derivation and internal structure of [*do so*] have also been topics of great interest. Hankamer and Sag (1976) observe that [*do so*] contrasts with others in the VP anaphora family, such as [*do it*] or [*do the same thing*], in their grammatical behavior, and argue that a distinction should be made between "surface anaphora" and "deep anaphora". However, as well summarized and commented in Houser (2010), there have been debates on whether the distinction of anaphora types best characterizes the behavior of the various VP-anaphora constructions and whether [*do so*] is a surface anaphor even if the distinction exists. The debate on surface and deep anaphora also bears on issues regarding ellipsis constructions. Because deep and surface anaphors differ in whether they have syntactically accessible internal structures (e.g., whether an element within a VP anaphor can be identified to serve as an antecedent for a following pronoun (missing antecedent phenomenon) and whether a sloppy reading is available (as in (3)–(4) below, discssued in Bresnan 1971, p. 592; Johnson 2001, p. 456; Houser 2010, pp. 15–17), they also contribute to the debate on the different approaches to VP-ellipsis—whether or not the missing or anaphoric VPs have syntactically accessible structures (see for instance, Hardt 1999; Culicover and Jackendoff 2005; Merchant 2001; Fox and Lasnik 2003; Baltin 2012; Johnson 2001; Saito 2007; Li 2014; Li and Wei 2014, among many others.).[1,2]

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[1] However, the data are not as clear as we would hope for, affecting conclusions on when a missing antecedent is possible. For instance, Andrew Simpson (personal communication) finds (3b) unacceptable even when the pronoun in the final clause does not appear. Williams (1977) argues that the *do it* construction should allow a missing antecedent, as illustrated by the following sentence (Williams 1977:693). See Houser (2010) for discussions on the controversy.

(i) John wouldn't order a new sink, so I did it, and of course it was broken when it arrived.
     (it = the sink that I ordered)

[2] It has been controversial what a true sloppy reading is and whether the availability of sloppy readings can distinguish different VP anaphors. For instance, Fiengo and May (1994, p. 248, fn. 13) provide examples of *do it* anaphora, allowing a sloppy reading, just like *do so*. That is, both Hankamer and Sag's surface anaphora (*do so*) and deep anaphora (*do it*) seem to allow the sloppy reading. Complicating the issue is what constitutes a real sloppy reading, as discussed in Fiengo and May (1994), Hoji (1998),

(3) a. I've never ridden a camel, but Ivan has *done so*, and he says *it* stank horribly.

   b. *I've never ridden a camel, but Ivan has *done it*, and he says *it* stank horribly.

(4) John$_i$ read his$_i$ friend's book; Bill$_j$ did so [=read his$_j$ friend's book], too.

In addition, the study of the [*do so*] construction should be able to contribute to the understanding of light verbs[3] or of eventuality predicates, because the major proposals for this construction depend on the presence of light verbs to capture some semantic constraint governing this structure (see Stroik 2001; Hallman 2004; Haddican 2007; Baltin 2012, among others). However, this has not received much attention in the literature.

While the English [*do so*] construction and related structures have been prominent in various theoretical discussions, relatively little attention has been paid to similar constructions in Mandarn Chinese.[4] This paper examines such constructions in Chinese, the main one of which will be referred to as the [*so do*] construction, corresponding to the English [*do so*] construction. The labeling difference is not only to refer to the constructions in these two languages separately

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Footnote 2 continued

among others. The challenge in solving the controversy is the difficulty of clear and solid judgments. For instance, according to Fiengo and May (1994) and Hoji (1998), true sloppy readings should be determined by constructions with mixed readings, and G. Li (2002) and Li and Wei (2014) show that the VP-ellipsis construction in Chinese indeed behaves as expected regarding the behavior of mixed-reading patterns.

(i) Zhangsan hui shuo ta xihuan tade laoshi; Lisi ye   hui.
     Zhangsan will say he like   his teacher Lisi also will
   a. 'Zhangsan$_1$ will say he$_1$ likes his$_1$ teacher; Lisi$_2$ will say (he$_1$ likes his$_1$ teacher).'
   b. 'Zhangsan$_1$ will say he$_1$ likes his$_1$ teacher; Lisi$_2$ will say (he$_2$ likes his$_2$ teacher).'
   c. 'Zhangsan$_1$ will say he$_1$ likes his$_1$ teacher; Lisi$_2$ will say (he$_2$ likes his$_1$ teacher).' (Mix 1)
   d. *'Zhangsan$_1$ will say his$_1$ teacher likes his$_1$ teacher; Lisi$_2$ will say (he$_1$ likes his$_2$ teacher).' (Mix 2)

(ii) Zhangsan hui shuo tade laoshi xihuan ta; Lisi ye   hui.
      Zhangsan will say his teacher like   him Lisi also will
   a. 'Zhangsan$_1$ will say his$_1$ teacher likes him$_1$; Lisi$_2$ will say (his$_1$ teacher likes him$_1$).'
   b. 'Zhangsan$_1$ will say his$_1$ teacher likes him$_1$; Lisi$_2$ will say (his$_2$ teacher likes him$_2$).'
   c. 'Zhangsan$_1$ will say his$_1$ teacher likes him$_1$; Lisi$_2$ will say (his$_2$ teacher likes him$_1$).' (Mix 1)
   d. 'Zhangsan$_1$ will say his$_1$ teacher likes him$_1$; Lisi$_2$ will say (his$_1$ teacher likes him$_2$).' (Mix 2)

The question is what the situation is when *hui* 'will' is followed by *shuo* 'say' (empty object construction) or *zheme shuo* 'so say' (the [*so* V] construction). Unfortunately, it is not easy to get a very clear and coherent judgment among speakers.

[3] In contrast to a regular or "heavy" verb, the term "light verb" in the generative framework was used by Grimshaw and Mester (1988) to refer to *suru* in Japanese, a verb that is thematically incomplete or "light" in the sense of Jespersen (1954) and Cattell (1984). It does not theta-mark its object but the head of the object theta-marks arguments. Hale and Keyser (1993) used "light verb" as an empty place holder in the syntactic structure, with elementary semantics. The term is now often used to refer to eventuality predicates, such as DO for activities, HOLD for states, CAUSE for causatives (see Huang 1997; Lin 2001 and many others).

[4] "Mandarin Chinese" will be abbreviated as "Chinese" in this paper. Variations between northern and southern Mandarin Chinese in the relevant constructions will be noted.

but also to reflect their word order—*so* precedes *do* in Chinese and follows *do* in English. We will investigate the basic properties of Chinese [*so do*] through comparison with the English [*do so*] construction. It will be shown that the two constructions share many important properties, and the term "SO construction" will be used to refer to both collectively. However, the two are not identical. We will focus on the syntactic structure of Chinese [*so do*], which will be compared with some other VP anaphora constructions in this language. The comparison will help us clarify the constituent structures with various light verbs and their event structures. Specifically, we will argue for the following points.

(i)   The [*so do*] construction should be distinguished from the construction with a regular or "heavy" verb V replacing *do*—[*so* V]; therefore the *do* of [*so do*] is not a heavy verb.

(ii) The [*so do*] construction behaves differently from the commonly understood VP-ellipsis construction, represented by [Subject + Modal/Auxiliary + [$_{VP}$ ___]] in Chinese; therefore the *do* of [*so do*] is not a modal or an auxiliary that licenses VP-ellipsis.

(iii) Combining (i) and (ii), *do* of [*so do*] is a light verb, in line with the main proposals for the *do* of English [*do so*] in the literature.

(iv) [*So do*] is base-generated, rather than derived via syntactic or PF deletion of a VP having a syntactically accessible internal structure, because it does not need a linguistic antecedent and allows split antecedents. Nor is extraction possible from within the phrase. It will also be shown that the criteria distinguishing surface and deep anaphora in the line of research by Hankamer and Sag (1976) do not apply straightforwardly to the Chinese [*so do*] construction: it has properties that typically characterize deep anaphora and surface anaphora.

(v)   [*So do*] is a *v*P headed by a light verb DO. However, there are also other predicate anaphors that do not have light verb specifications. Such differences in light verb specifications provide a window to understanding event types and clausal structures.

(vi) [*So do*] and related predicate anaphora constructions serve as good tests to define constituent and argument structures, including those with light verbs. They help resolve controversies involving these structures.

We will begin with the basic properties of *so* and *do* in the [*so do*] construction in Sect. 2, and then compare it with the construction [*so* V] and VP-ellipsis in Sect. 3. These sections will provide a better understanding of the properties of the [*so do*] construction, which will allow us to discuss in Sect. 4 how the construction is derived and to investigate the role of light verbs in other predicate anaphora consructions. Section 5 puts the structures to use and demonstrates how the anaphora constructions help resolve various controversies regarding constituent and argument structures in Chinese. Section 6 concludes the paper.

2 Basic properties of *so, do,* [*so do*][5]

A typical English [*do so*] sentence like (5) can be straightforwardly translated into (6) in Chinese:

(5) John hit his own son; Mary did so, too

(6) Zhangsan da-le   ziji-de erzi, Mali ye   *zheme/name   zuo-le.*
     Zhangsan hit-LE   self-DE son   Mary also so   do-LE
     'Zhangsan hit his own son; Mary did so, too.'

The expression *zheme/name* is the demonstrative *zhe* 'this'/*na* 'that', plus the suffix -*me*. Another morpheme *yang* 'appearance' can follow *zheme/name*. When *yang* appears, *me* is optional, as in (7).

(7) Zhangsan da-le   ziji-de erzi, Mali ye   *zhe(me)/na(me)-yang zuo-le.*
     Zhangsan hit-LE   self-DE son   Mary also so   do-LE
     'Zhangsan hit his own son; Mary did so, too.'

The presence of *yang* in such expressions is required in some contexts, such as in the postverbal position (complement), or as a predicate, or before the modification marker *de* within noun phrases (see Wei 2012 for a review of the relevant literature on the distributional possibilities as in Chao 1968; Lü 1980, 1984; Zhu 1982, and Liu et al. 1996). This paper will first focus on the behavior of *zheme/name* before turning to those with—*yang* and some other VP-anaphora expressions in Sect. 3. Moreover, because *zheme* and *name* are interchangeable, we will only use *zheme* in the following text for the sake of simplicity.[6]

 The Chinese [*so do*] and English [*do so*] constructions share many properties, which can be demonstrated by the fact that the Chinese [*so do*] examples always have an acceptable [*do so*] counterpart in English. For instance, a shared property is that they have similar flexibilities in the types of verb phrases that can antecede them. (7) is an example of [*so do*] anaphoric to a transitive verb with its object. An intransitive verb is also possible, as in (8) below.

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[5] As noted in Hankamer and Sag (1976), the English [*do so*] construction behaves differently from the one with so preposed: *he did so as well* vs. *So did he*. Chinese does not have the structure that allows the preposing of **so** to the sentence initial position with Subject-Aux inversion. However, it is possible that the constructions with *zheme-zhe* 'so ASP' or *zheme-yang* as predicates discussed in Sect. 3 are close counterparts of the English inverted **so** construction.

[6] Taiwanese uses only one expression *an-ne* (having a dialectal variation of *an-ni*), corresponding to Mandarin *zheme/name(-yang)*; namely, the *that/this* distinction does not exist in the Taiwanese *so* constructions, even though Taiwanese does distinguish *that* and *this* as demonstratives. Notably, *an-ne* needs the associative or modification marker *e* (corresponding to the marker *de* in Mandarin) when appearing before an adjective or number + classifier: *an-ne e kuan* 'that kind of height (that all)', *an-ne e tsit-liap gam-a* 'an orange like that', more like *zheme/name-yang* in Mandarin. For discussion on such expressions in Taiwanese, see Chang (2002), Cheng et al. (1989), Liu (2003), Shen (2011), among others.

(8) Zhangsan yijing   likai-le, Mali ye yijing   *zheme zuo-le.*
    Zhangsan already   leave-LE   Mary also already so   do-LE
    'Zhangsan already left; Mary did so, too.'

Regardless of transitivity, the types of verb phrase that these constructions can be anaphoric to are restricted to those that can appear in commands—agentive predicates or activities and accomplishments in Vendler's (1967) notion of verb type (see Houser's 2010 review of verb type restrictions and the notion of agentivity, stativity for [*do so*] in English in Chap. 3, Sect. 3.2, and the important references cited there, such as Lakoff 1966; Lakoff and Ross 1976; Kehler and Ward 1999, 2004; Culicover and Jackendoff 2005; Higgins 1992; Quirk et al. 1985).[7] Such verb type constraints can be illustrated by the following examples.

(9) a. Zhangsan zhidao daan, *Lisi ye   zheme zuo.
        Zhangsan know   answer Lisi also so   do
        'Zhangsan knows the answer; *Lisi also does so.'
 cf. b. *zhidao daan!
         know   answer

(10) a. Zhangsan daoda   bowuguan le, *Lisi zheme zuo-le
        Zhangsan arrive.at museum   LE Lisi that do-LE
        'Zhangsan arrived at the museum; *Lisi also did so.'
  cf. b. *daoda   bowuguan!
          arrive.at museum

These examples show that [*so do*] in Chinese cannot be anaphoric to the stative verb *zhidao* 'know' in (9a) or the achievement verb *daoda* 'arrive' in (10a), because both cannot appear in commands, as in (9b) and (10b). By way of contrast, activity and accomplishment verb phrases are possible with [*so do*], such as *xie(-wan)* '(finish) writing' in (11a) and *qi-si* 'angry to death' in (12a), both of which can be used in imperatives, as in (11b) and (12b).

(11) a. Zhangsan xie(-wan)   zhe baogao le, Mali ye   *zheme zuo*(-le).
        Zhangsan write-finish this report LE Mary also so   do-LE
        'Zhangsan wrote (and finished) the report; Mary did so, too.'

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[7] Houser (2010) notes that some contexts allow *do so* in non-agentive or non-eventive cases. Building on his corpus study, Houser argues that the semantic restriction on the antecedent of *do so* is the result of the interaction of a constellation of parameters of verbal meaning, such as verb class and (subcomponents of) agentivity. More significantly, nearly all of the counterexamples to the previous claims found in the corpus have one of two syntactic profiles. Either they involve a nonfinite *do so* (typically *to do so*), or the antecedent of *do so* is contained within a relative clause modifying the subject of *do so*. Interestingly, the semantic constraint is more strictly observed in Chinese *do so* constructons. Neither of the noted contexts helps alleviate the semantic constraint on Chinese [*so do*]. The distinction could possibly be traced to the different functions of *do* in the two languages – *do* in English can be an auxiliary, licensing VP ellipsis, as well as a light verb DO denoting activity or agentivity. Chinese does not have the former option.

cf. b. xie(-wan)   zhe baogao!
      wirte(-finish) this report
      'Write (and finish) this report!'

(12) a. Zhangsan qi-si-le   baba, Lisi ye   *zheme(yang) zuo.*
       Zhangsan anger-dead-LE father, Lisi also so   do
       '(Intended) Zhangsan angered his father to death, and Lisi did so, too.'
cf. b. qi-si   ta!
      anger-dead   him
      'Anger him to death!'

Stage-level adjectives with degree expressions can also apper in commands, illustrated in (13a), and thus possible with [*so do*], as in (13b).

(13) a. guai   yi-dian ba!
       well-behaved a-bit   SEP
       'Be a bit more well-behaved!'
    b. ta yao   wo guai   yi-dian, keshi wo bu keneng *zheme zuo.*
       he want me well-behaved a-bit   but I not likely   so   do
       'He wants me to be a bit more well-behaved; but I am not likely to do so.'

Some constituents other than verbs can or must be included in the interpretation of the VP-anaphora but certain others cannot. When a manner adverb is present in the [*so do*] clause, [*so do*] generally is anaphoric to the verb phrase including the manner expression. However, it can be excluded when focus markers like *zhishi* 'only', *shi* 'be', or *que* 'however' appear to bring the manner expression into focus.

(14) a.   Zhangsan   henhendi da-le ziji-de erzi, keshi Mali ?(zhishi)
       Zhangsan   heavily   hit-LE self-DE son but   Mary only
       qingqingdi *zheme*   *zuo*-le.
       lightly   so   do-LE
       'Zhangsan hit his own son heavily, but Mary did so only lightly.'
    b.   Zhangsan shi henkuaidi chi   yi-da-wan fan, keshi Lisi ?(shi)
       Zhangsan be quickly   eat   one-big-CL rice, but   Lisi be
       manmandi   *zheme zuo.*
       slowly   so   do
       'Zhangsan ate a bowl of rice QUICKLY, but Lisi did so SLOWLY.'
    c.   Zhangsan henkuaidi chi   yi-da-wan fan, keshi Lisi ?(que)
       Zhangsan quickly   eat   one-big-CL rice, but   Lisi however
       manmandi   *zheme* *zuo.*
       slowly   so   do
       'Zhangsan ate a bowl of rice quickly; Lisi however did so slowly.'

If a [*so do*] clause does not contain a manner expression, [*so do*] is anaphoric to the preceding verb phrase and any manner expression contained within this VP. That is, the following examples only have an interpretation according to which Mary's hitting is light and her reading is careful:

(15) a. Zhangsan qingqingdi da-le   ziji-de erzi, Mali   ye   *zheme zuo*-le.
          Zhangsan lightly   hit-LE self-DE son   Mary also so   do-LE
          'Zhangsan hit his own son lightly; Mary did so, too.'
      b. Zhangsan zixidi   nian-le na-ben shu,   Mali   ye   *zheme zuo*-le.
          Zhangsan carefully read-LE that-CL book Mary also so   do-LE
          'Zhangsan read the book carefully; Mary did so, too.'

Preverbally, other adverbial expressions can be optionally included in the interpretation of [so do]. If the contrasting phrases *zai jiali* 'at home' and *jintian* 'today' are not present in the [so do] clause in the following examples, the interpretation of [so do] preferably includes the locative and temporal expressions. By contrast, if the contrasting adverbial phrases appear, [so do] merely refers to the verb phrase *nian shengjing* 'read bible'.

(16) a. Zhangsan *zai tushuguan* nian shengjing, Mali (*zai jiali*) ye zheme zuo.
          Zhangsan at library   read bible   Mary at home   also so   do
          'Zhangsan read the bible at the library; Mary also did so (at home).'
      b. Zhangsan *zuotian*   nian shengjing, Mali (*jintian*) ye   zheme zuo.
          Zhangsan yesterday   read bible   Mary today   also so   do
          'Zhangsan read the bible yesterday; Mary also did so (today).'

For phrases occurring postverbally, subcategorized complements are always included in the interpretation of the anaphor [so do], just like [do so] in English. Thus, the verb phrase *da-le* 'hit' excluding the subcategorized complements *ziji-de meimei* 'her own sister' cannot antecede [so do] or [do so], as in (17) below.

(17) Zhangsan da-le   ziji-de erzi, *Mali *zheme zuo* ziji-de meimei.
      Zhangsan hit-LE self-DE son   Mary so   do   self-DE sister
      '*Zhangsan hit his own son; Mary did so her own sister.'

When a postverbal phrase is a result or descriptive expression, [so do] is not possible, as illustrated below.

(18) a. Zhangsan nian-de   hen   lei, *Mali ye   zheme zuo(-le).
          Zhangsan read-DE   very   tired Mary also so   do-LE
          'Zhangsan was tired from reading; *Mary did so, too.'
      b. Zhangsan pao-de kuai, *Mali ye   zheme zuo.
          Zhangsan run-DE fast   Mary also so   do
          'Zhangsan is fast at running; *Mary does so, too.'

The unacceptability of these sentences follows from the general constraint that [so do] must be anaphoric to a verb phrase that can occur in commands.

(19) a. *nian-de hen   lei!
        read-DE very tired
   b. *pao-de kuai!
        run-DE fast

Although the Chinese [*so do*] and the English [*do so*] share many properties, they diverge in their acceptability with postverbal non-subcategorized postverbal complements, which include duration phrases, frequency phrases and purposive phrases, in addition to descriptive and result phrases as shown above. This difference is illustrated by the unacceptability of the Chinese [*so do*] in contrast to the acceptability of the English [*do so*] counterparts in the following examples.

(20) a. Zhangsan mai wanju gei ta   wan, *Mali zheme zuo gei ta   chai.
      Zhangsan buy toy   for him play Mary so   do for him tear
      'Zhangsan bought a toy for him to play with; Mary did so for him to tear apart.'
   b. Zhangsan mai wanju gei ta   wan, Mali   ye   zheme zuo.
      Zhangsan buy toy   for him play Mary also so   do
      'Zhangsan bought a toy for him to play with; Mary did so, too.'
   c. Zhangsan nian-le san-ci/san-ge   zhongtou, *Mali zheme
      Zhangsan read-LE three-times/three-CL hours   Mary so
      zuo-le si-ci/   si-ge   xiaoshi.
      do-LE four-times   four-CL   hours
      'Zhangsan read three times/for three hours; Mary did so four times/for four hours.'
   d. Zhangsan nian-le san-ci/san-ge   zhongtou, Mali ye   zheme
      Zhangsan read-LE three-times/three-CL hours   Mary also so
      zuo-le.
      do-LE
      'Zhangsan read three times; Mary did so, too.'

These examples show that postverbal non-subcategorized complements must be included in the interpretation of the Chinese [*so do*], but not so in the English [*do so*], as indicated by the acceptable *do so* form in (20a, c). This contrast can be attributed to the difference in constituent structures in these two languages and the fact that the SO construction is VP anaphora. Both [*so do*] and [*do so*] replace a VP constituent (or *v*P, more precisely, see Sect. 3)—VP anaphora. Chinese has strictly right branching structures for verb phrases; therefore, all postverbal constituents are within the VP. On the other hand, English either is not strictly right branching, allowing some postverbal phrases to right-adjoin to a VP or a position higher than the VP (see Huang 1982 for suggestions that such a contrast exists between Chinese and English), or English allows a VP to be raised to a higher position, crossing an adjunct that is base-generated preverbally but surfaces postverbally, following the line of research developed in Kayne (1994).

In brief, Chinese [*so do*] and English [*do so*] behave alike in regard to the freedom and restrictions on the VP anteceding these expressions except in cases involving non-subcategorized postverbal constituents.

3 [*so do*] vs. [*so* V] vs. VP-ellipsis

To better understand the properties of [*so do*] in Chinese, let us compare this construction with other anaphora patterns. First, consider the construction [*so* V], which replaces *do* in [*so do*] with a copy of the verb in the antecedent clause (again, English has the reverse word order [V *so*]). Chinese allows the [*so* V] form, as long as a preverbal manner adverb corresponding to *so* occurs. This is illustrated by the examples in (21a, c) below, whose manner adverbs must be present. Without manner adverbs, the sentences are not acceptable, as in (21b, d). These cases show that *so* in [*so* V] refers to the preverbal manner expression.

(21) a. Zhangsan *qingqingdi* da-le   Lisi, Mali   ye   *zheme da*-le.
      Zhangsan   lightly   hit-LE   Lisi   Mary   also   so   beat-LE
      'Zhangsan hit Lisi lightly; *Mary hit so (intended: hit Lisi lightly), too.'
    b. Zhangsan   da-le   Lisi, *Mali   ye   *zheme da*-le.
      Zhangsan   hit-LE   Lisi   Mary   also   so   hit-LE
      'Zhangsan hit Lisi; *Mary hit so (intended: hit Lisi), too.'
    c. Zhangsan jingjingdi   zou-le, Mali   ye   *zheme zou*-le.
      Zhangsan quietly   leave-LE Mary   also   so   leave-LE
      'Zhangsan left quietly; *Mary left so (intended: left quietly), too.'
    d. Zhangsan zou-le,   *Mali   ye   *zheme zou*-le.
      Zhangsan leave-LE   Mary   also   so   leave-LE
      'Zhangsan left; *Mary left so (intended: left), too.'

In contrast to Chinese, English [V *so*] is generally not possible, as indicated by the impossibility of a direct translation of the sentences above into English. The fact that [*so* V] is possible in Chinese can be attributed to the fact that a verbal object can be empty in Chinese. That is, a [*so* V] sentence like (21a) in Chinese should be equivalent to an English sentence like the one below.

(22) John hit Lisi lightly; Mary hit Lisi that way, too.

It is expected that English does not have acceptable sentences similar to the one in (21a), because transitive verbs in English require their objects to appear overtly. It also follows that, if an object cannot be empty in Chinese, then the [*so* V] construction is not possible. Li (2014) discusses a number of constructions not allowing objects to be missing. As predicted, such structures do not accept the [*so* V] form. For instance, objects followed by secondary predicates cannot be empty and the [*so* V] construction is not acceptable as in (23a), unless the secondary predicate is also missing as in (23b).

(23) a. ta   henkuaidi mai-le yi-ge   juzi,   hen ruan; *wo ye *zheme*
     he   quickly   buy-LE one-CL orange very soft I   also so
     mai-le   hen ruan.
     buy-LE   very soft
     'He quickly bought an orange, which is soft; I also bought that way soft.'

   b. ta   henkuaidi mai-le yi-ge   juzi,   hen ruan; wo ye *zheme*
     he   quickly   buy-LE one-CL orange very soft I   also so
     mai-le.
     buy-LE
     'He quickly bought an orange, which is soft; I also bought that way.'

The discussion above shows that *so* in [*so* V] cannot replace the object of a verb. However, a limited set of verbs taking a clausal complement seems to allow such a replacement in both Chinese and English. This is illustrated by the examples below.[8]

(24) a. John thinks that Mary is smart; Bill thinks so, too.
   b. I guess Mary will stop smoking; he guesses so, too.

(25) a. Zhangsan renewei Mali hen congming, Lisi ye *zheme* renwei.
     Zhangsan think   Mary very smart   Lisi also so   think
     'Zhangan thinks Mary is smart; Lisi also thinks so.'
   b. wo cai   Mali hui jie   yan;   ta ye *zheme* cai.
     I guess Mary will stop smoking; he also so   guess
     'I guess Mary will stop smoking; he guesses so, too.'

Nonetheless, apart from this limited set of cases, *so* in [*so* V] typically replaces manner adverbs. Other preverbal adverbials as in (26a, b) or postverbal phrases as in (26c, d) that can support the [*so do*] anaphor are not possible with [*so* V].

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[8] Not all clausal complements can be replaced by *so*. The following examples demonstrate unacceptability with verbs such as *know, regret*.

(i)   John knows/regrets that he did not do anythig; *Bill knows/regrets so, too.

(ii) Zhangsan zhidao/houhui ta mei zuo shenme, *Lisi ye zheme zhidao/houhui.
     Zhangsan know/regret   he not do anything Lisi also so   know regret
     'Zhangsan knows/regrets that he did not do anythig; *Lisi knows/regrets so, too.'

It is possible that Case plays a role in distinguishing these two types (Li 2005; Aoun and Li 2008), if the verbs in (24–25) assign Case to their objects, but not the verbs in (i–ii) (cf. Kiparsky and Kiparsky 1970 on clausal complements of factive verbs being immediately dominated by an NP, but not non-factive verbs). Another possibly related contrast between these two sets of verbs (at least for some of the members) might be the (im)possibility of *that/this way* in place of a clausal complement:

(iii) Does John really think this way?
(iv)   *Does John really know/regret this way?

The acceptability of (iii) seems to suggest that *think* can be base-generated without an object. This may lead one to question whether the clausal complement of *think* is a real object. We put this issue aside, except noting that *so* can replace a clausal complement in limited cases.

(26) a. Zhangsan *zuotian*   zou le, *Mali ye   zheme zou-le.
          Zhangsan yesterday leave-LE Mary also so   leave-LE
          'Zhangsan left yesterday; *Mary left so, too.'

      b. Zhangsan *zai jiali* shui-le, *Mali ye   zheme shui-le.
          Zhangsan at home sleep-LE Mary also so   sleep-LE
          'Zhangsan slept at home; *Mary slept so, too.'

      c. Zhangsan nian shengjing *gei wo ting*, *Mali   ye   zheme nian(-le)
          Zhangsan read bible   for me lislten Mary also so   read-LE
          'Zhangsan read the bible for me to listen; *Mary read so, too.'

      d. Zhangsan nian-le *san-ci/san-ge*   *zhongtou*, *Mali ye   zheme
          Zhangsan read-LE three-times/three-CL hours   Mary also so
          nian-le.
          read-LE
          'Zhangsan read three times/three hours; *Mary read so, too.'

These sentences all become acceptable if the verb after *zheme* 'so' is replaced by *zuo* 'do'. A generalization which has emerged from the discussion so far is that the *so* of the [*so* V] construction replaces a manner expression and nothing more. The unacceptability of [*so* V] sentences without manner expressions contrasts with the acceptability of their [*so do*] counterparts, showing that [*so do*] is different from [*so* V]. Accordingly, we may conclude that *do* of the SO construction is not a V, i.e., not a regular or "heavy" verb.

The *do* in the SO construction not only is not a heavy verb, but it also is not an auxiliary that licenses VP-ellipsis. Houser (2010, Chapt. 1) lists several reasons why English *do* in the [*do so*] construction is not an auxiliary, which include the impossibility of this *do* undergoing subject-aux inversion, alternating with other auxiliaries, preceding negation, etc. Chinese does not have an auxiliary *do* selecting a VP complement, which provides the first piece of evidence for not equating the *do* in [*so do*] with an auxiliary licensing VP-ellipsis. Secondly, the [*so do*] construction does not behave like the VP-ellipsis structure in regard to verb type restrictions. A typical VP-ellipsis construction can be illustrated by the sequence [Modal [$_{VP}$ ___]] in Chinese, like the following example.

(27) Zhangsan hui xihuan pingguo, Lisi ye   hui ___.
      Zhangsan will like   apple   Lisi also will
      'Zhangsan will like apples, and Lisi will, too.'

Relevant to our discussion is the verb type restriction: the VP-ellipsis construction [Modal [$_{VP}$ ___]] is not subject to verb type restrictions, in contrast to the [*so do*] structure, which allows only those that can occur in imperative constructions, as described in Sect. 2.

(28) a. Zhangsan hui   nian-de hen   lei,   Lisi ye   hui.
          Zhangsan will   read-DE very tired, Lisi also will
          'Zhangsan will get very tired from reading; Lisi also will.'

b. Zhangsan neng pao-de kuai; Lisi ye   neng.
   Zhangsan can run-DE fast Lisi also can
   'Zhangsan can run fast; Lisi also can.'

c. Zhangsan hui zhidao zhejian shi;   Lisi ye   hui.
   Zhangsan will know this   matter Lisi also will
   'Zhangsan will know this matter; Lisi also will.'

d. Zhangsan mingtian hui   daoda luguan; Lisi ye   hui.
   Zhangsan tomorrow will   arrive hotel Lisi also will
   'Zhangsan will arrive at the hotel tomorrow; Lisi also will.'

Briefly summarizing, the [*so do*] construction behaves differently from [*so* V] and VP-ellipsis constructions. The *so* in [*so* V] typically is anaphoric to a manner expression but [*so do*] is anaphoric to a verb phrase consisting of a verb, obligatorily with the postverbal constituents in Chinese and optionally with preverbal adverbials, such as manner, time, location expressions. VP-ellipsis is not subject to verb type constraints; in contrast, [*so do*] can only be anaphoric to those that can appear in imperatives—largely activities and accomplishments (agentive verbs). These contrasts show that *do* in [*so do*] is neither a heavy verb, nor an auxiliary licensing VP-ellipsis constructions.

4 Deriving [*so do*]

Having briefly laid out the important properties of [*so do*], in contrast to [*so* V] and VP-ellipsis, let us turn next to the derivation and structural representation of [*so do*].

4.1 Surface versus deep anaphora

As noted earlier, an important topic in the literature regarding [*do so*] in English concerns the distinction between deep and surface anaphora. In more recent terms, the issue is whether the [*do so*] construction is derived via deletion of some elements from a richer syntactic structure containing the element "replaced" by the anaphor or is base-generated as it is. Surface anaphora, in contrast to deep anaphora, can be analyzed as the result of deletion, due to identity requirements in some syntactic or semantic form with an antecedent (see Merchant 2013, among many others). According to Hankamer and Sag (1976), [*do so*] in English is a surface anaphor, in contrast to [*do it*] or [*do the same thing*], which are cases of deep anaphora. Briefly, the criteria that have been used to distinguish deep and surface anaphora are: surface anaphora (i) requires a linguistic antecedent and syntactic identity between the antecedent and the anaphor, (ii) disallows split antecedents, (iii) allows a missing antecedent, and (iv) allows a sloppy interpretation. Interestingly, according to these criteria, [*so do*] in Chinese behaves like a surface anaphor in some respects and a deep anaphor in some others.

First of all, [*so do*] in Chinese can be easily used without a linguistic antecedent:[9]

(29) Observing John ripping a book in half:
 a. ni   kebie   zheme   zuo!
    you   do.not   so   do
    'You should not do so.'
 b. ni   keneng   zheme   zuo   ma?
    you   possible so   do   Q
    'Will you possibly do so?'

Secondly, split antecedents are possible. The [*so do*] in the following example can be simultaneously anaphoric to both *zhu fan* 'cook meal' and *xi cai* 'wash vegetables'.

(30) Lisi keyi *zhu fan*,   Zhangsan keyi *xi   cai*,   wo ye   keyi *zheme*
     Lisi can cook meal   Zhangsan can wash vegetable I   also can so
     zuo,   yiqi   zhunbei.
     do   together   prepare
     'Lisi can cook; Zhangsan can wash vegetables; I can do so as well, (let's) prepare together.'

Missing antecedents seem to be difficult when a pronoun referring back to such a missing noun phrase appears in a subsequent subject position:

(31) Zhangsan meiyou dailai yi-ge   piaoliang de nuhai; Lisi *zheme zuo*-le;
     Zhangsan not   bring one-CL pretty   DE girl,   Lisi so   do-LE
     #ta$_i$ xianzai   jiu   zai nar.
     she now   right at there

However, if a pronoun occurs in an object position and refers back to such a missing noun phrase, missing antecedents are possible.

(32) Zhangsan meiyou dailai yi-ge   piaoliang de nuhai; Lisi *zheme zuo*-le;
     Zhangsan not   bring one-CL pretty   DE girl,   Lisi so   do-LE
     Hai   ba ta$_i$ jieshao   gei   wo   renshi.
     moreover   BA her   introduce for   me   know
     'Zhangsan did not bring a pretty girl; Lisi did so; moreover, (he) introduced her to me.'

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[9] In contrast to English [*do* so], generally presented as having a linguistic antecedent in the literature cited in this work and others, using [*so do*] without a linguistic antecedent is prominent in Chinese works (see Chao 1968, Lü 1980, 1984; Zhu 1982; Liu et al. 1996). Typical examples include (i) below.

(i) Bie   *zheme(-yang)*   xiang/zuo!
    Do.not   so   think do
    'Don't think/do so.'

The kind of sloppy reading discussed in Hankamer and Sag is also available in the Chinese [*so do*] construction. The following sentence can have a reading according to which Lisi also brought his own friend.

(33) Zhangsan$_i$ dailai-le ta$_i$/ziji$_i$-de pengyou; Lisi ye   zheme zuo-le.
      Zhangsan bring-LE he/self-DE friend   Lisi also so   do-LE
      'Zhangsan brought his/self's friend; Lisi did so as well.'

The facts above show that, according to the distinction made by Hankamer and Sag, the [*so do*] construction in Chinese behaves like a deep anaphor in allowing a non-linguistic antecedent and split antecedents; however, it behaves like a surface anaphor in allowing sloppy interpretations and missing antecedents. Nonetheless, Williams (1977), Fiengo and May (1994), and Culicover and Jackendoff (2005) compare [*do so*] and [*do it/that/the same thing(s)*] and show that sloppy readings and missing antecedents actually are allowed in these constructions, even though they should belong to different types of anaphora according to Hankamer and Sag. For instance, the following sentences are acceptable with a sloppy reading, just like their *do so* counterpart:

(34) Max$_i$ hit his$_i$ friend, and Oscar$_j$ *did it*, too. (do it = hit his$_{i/j}$ friend)

Indeed, Houser (2010) argues that [*do so*], [*do it*], and [*do the same thing*] should all be analyzed as deep anaphora (also see many interesting examples for similar claims in Kehler and Ward 1999).[10] According to Houser, [*do so*] contrasts with [*do it*]/[*do the same thing*] only in the missing antecedent phenomenon: not possible in the deep anaphor [*do it/the same thing*] and possible in the alleged surface anaphor [*do so*]. This contrast, Houser suggests, can be accommodated through discourse and information factors. Limited space prevents us from detailing all the arguments and evidence for analyzing all these expressions as deep anaphors. Readers are referred to Houser (2010, Chap. 2).

Further note that extraction from within the [*so do*] phrase is not possible. The following cases show that neither *wh*-movement in (35) nor passivization in (36) can originate from within [*so do*]:

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[10] [*Do so*] anaphora allows mismatches in syntactic identity of various kinds between the target and antecedent. Kehler and Ward (1999) provide many of such examples, like (i) below.

(i) Since regardless of which bit is initially assigned, it will be [flipped] if more
     information is gained by doing so. [K&W, ex. (33)]

Andrew Simpson (personal communication) points out that this sentence is not acceptable to him if *flipped* is missing. Nonetheless, even if the verb must be present, the predicate of the antecedent does not match with *do so* in voice.

(35) juzi,   wo   xiwang ta manman chi; *pingguo, wo xiwang ta ye
      orange, I   hope   he slowly eat   apple   I   hope   he also
      zheme   *zuo*.
      so   do
      'Oranges, I hope that he slowly eats (them); *apples, I hope that he does
      so as well.'

(36) Zhangsan bei [(Lisi) ma],   *Mali ye   bei *zheme*   *zuo*.
      Zhangsan BEI Lisi scold   Mary also BEI so   do
      '(Intended) Zhangsan was scolded (by Lisi), *Mary was done so as well.'

The extraction impossibilities indicate that the construction does not have an
internal structure that can be accessed syntactically. In addition, [*so do*] in Chinese
allows split antecedents and does not require a linguistic antecedent. Therefore, we
conclude that the construction is base-generated as it is, not derived by deleting a
VP licensed by an antecedent.

4.2 Structure

If the [*so do*] construction is not derived via deletion of elements from a structure
similar to its antecedent, how is it represented syntactically? Let us first begin with
the key word *do*. Recall that *do* in [*so do*] is not a heavy verb, nor an auxiliary. What
is it, then? The most likely candidate is a light verb. Indeed, this is what Stroik (2001)
and Haddican (2007) propose for the *do* of the English [*do so*] construction: *do* is the
spell-out of the light verb DO.[11] In the works of Hale and Keyser (1991,1993), Huang
(1994, 1997), Lin (2001), Borer (2005), among others, an eventuality predicate DO,
commonly referred to as a light verb, is present in sentences with activity and
accomplishment predicates.[12] DO dominates a VP that contains the root V.

When *do* of the [*so do*] construction is the light verb DO (or Agentivity as in
Baltin 2012), *so* must be related in some way to the complement VP of the light
v. Both Stroik (2001) and Haddican (2007) place *so* within the VP complement of
v. They only differ in defining the status of *so*. Stroik (2001) argues that *so* has two
roles; it can be the main verb and the complement of *do*, as in (37). This view is
supported by the fact that *so* replaces only the main verb *studying* in (38a) rather
than the elements larger than VP, as in (38b-d).

(37) [$_{vP}$ *do* [$_{VP}$ *so*]]

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[11] In the line of research such as Davidson (1967), Hale and Keyser (1991, 1993), Huang (1994, 1997),
Lin (2001), Borer (2005), a lexical verb is dominated by an eventuality predicate like DO, CAUSE,
BECOME, HOLD, etc.

[12] Baltin (2012) postulates an agentivity projection, whose head is spelled out as *do* in the English [*do so*]
construction.

(38) a. Max may have been [studying], but Mo may have been doing so, too.
    b. *Max may have [been studying], but Mo may have done so, too.
    c. *Max may [have been studying], but Mo may do so, too.
    d. *Max [may have been studying], but Mo does so, too.

By contrast, Haddican (2007) analyzes *so* as a nominal complement that is incorporated into the matrix V, as in (39). The claim that *so* has nominal and verbal properties is built on the use of the nominal *wh*-word *what*, as shown in the echo question test (40). The nominal complement *wh*-word *what* facilitates inquiring the action encoded in *so*, *fix the car*. To express this relationship, Haddican proposes that *so*, as a nominal complement in NP, is incorporated into the matrix V, following Hale and Keyser's (1993) analysis of ergatives, as illustrated in (39).[13]

(39) [$_{vP}$ *do* [$_{VP}$ *so*$_i$-V [$_{NP}$ t$_i$]]]

(40) A: If you haven't fixed the car yet, you should do *so*.
    B: Sorry, do *what*?
    A: *Fix the car.*

Haddican's *what* diagnostic can be repeated in Chinese, which also allows 'so' to be replaced by the nominal *wh*-word *shenme* 'what' and 'so' seems to take the position of the verb phrase *qu xiu che* 'go to fix cars', as in the pair (41). The dual role of 'so' is represented through incorporation.

(41) A: Zhangsan qu xiu che, Lisi ye   zheme zuo.
       Zhangsan go fix car   Lisi also so   do
       'Zhangsan goes to fix cars, and so does Lisi.'
    B: zuo *shenme*?
       do what
       'Do what?'
    A: *qu xiu che.*
       go fix car
       'Go to fix cars.'

There might be further evidence from Chinese that *so* is base-generated as an NP in category.[14] Recall that, as mentioned in Sect. 2, the Chinese expression *zheme/name* can be followed by the morpheme *yang* 'appearance'. In addition, the nominal suffix—*zi* can be optionally attached to these expressions to make an NP: *zheme-yang(zi), name-yang(zi)* and the NP can function as a predicate as in (42a), in addition to appearing before the verb as in [*so* V] and [*so do*] in (42b, c), respectively.

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[13] It is not clear how strongly the use of *what* in such contexts argues for the nominal status of the position. Note that, even though verbs like *think* do not allow subcategorized nominal complements, one can still use *what* in the object position in echo questions. In fact, we can even say *what do you think*? in non-echo contexts, despite the fact that *think* simply cannot take nominal objects, including gerunds: *I think fixing the car. The evidence based on the morphological shape of *zheme-yang(zi)* 'this-*me* appearance = so' is clearer.

[14] We do not make an NP/DP distinction in this paper.

(42) a. ta *zheme/name-yang(zi)*, hao ma?
 he so-appearance   fine Q
 'Him this/that way, ok?'

 b. ni bu neng *zheme/name-yang(zi)* kan (ren).
 you not can so-appearance   look people
 'You cannot look at people this/that way.'

 c. ni bu neng *zheme/name-yang(zi)* zuo.
 you not can so-appearance   do
 'You cannot do (it) this/that way.'

However, it is not critical which one of the structures, (37) and (39), is adopted. What is important is that the overt morpheme *so* can be understood as representing a VP when it occurs with the light verb *do*. To be clearer, let us adopt Haddican's analysis and show that the same analysis can straightforwardly apply to the Chinese [*so do*] construction.

The prominent difference between English [*do so*] and Chinese [*so do*] is word order: the English *so* follows the light verb *do*, whereas the Chinese 'so' precedes the light verb *zuo*, DO. Therefore, the formation of [*so do*] should involve the following three steps. First, *zheme*, the counterpart of the English *so* in (37) and (39), is base-generated at the complement NP position (e.g., *shenme* 'what') of the VP, as in (43a), and subsequently incorporated to the verb, as in (43b).[15] Then, the incorporated verb undergoes V-to-*v* movement, deriving the word order [*so do*] as in (43c). The corresponding tree structure and derivation are shown in (44).

(43) a. [$_{vP}$ *zuo* <DO>   [$_{VP}$ V [$_{NP}$ *zheme*]]]
 b. [$_{vP}$ *zuo* <DO>   [$_{VP}$ *zheme*$_i$-V [$_{NP}$ t$_i$]]]   (NP incorporation to V)
 c. [$_{vP}$ [*zheme(yang)*$_i$-V]$_j$-*zuo* <DO> [$_{VP}$ t$_j$ [$_{NP}$ t$_i$]]] (V-to-*v* movement)

(44) Structure of *zheme-zuo*
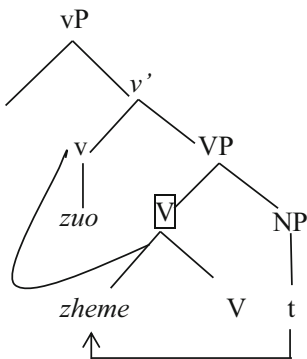
Because [*so do*] is a *v*P, we predict that it should not be interpreted as containing elements higher than a *v*P. This prediction is born out: a higher aspect or negation cannot be included in the interpretation of [*so do*]. The following examples show that a progressive aspect marker and a negation must appear before [*so do*] in order to obtain the relevant interpretation.

(45) a. Zhangsan zhengzai kanshu,   Lisi ye   *(zhengzai) *zheme zuo*.
         Zhangsan PROG   read.book Lisi also PROG   so   do
         'Zhangsan is reading; Lisi is doing so, too.'
    b. Zhangsan mei   likai, Lisi ye   *(mei)   *zheme zuo*.
         Zhangsan has.not leave Lisi also has.not so   do
         'Zhangsan did not leave; Lisi did not do so, either.'

It is also expected that preverbal adverbials can be optionally included in [*so do*] but postverbal constituents must all be included in [*so do*]. Preverbal adverbials can adjoin to *v*Ps or higher projections. However, postverbal consitutents (duration, frequency phrases, purposive clauses) are all be dominated by *v*Ps or VPs in Chinese (see Li 1990). The properties of the constructions in (15)–(20) of Sect. 2 are all accounted for. The structure in (44) correctly reflects the possible and impossible interpretations.

That the structure in (44) correctly reflects the interpretative possibilities available can be further demonstrated by use of the so-called bare anaphor *zheme-zhe* or *name-zhe*.[16] A bare anaphor is constituted by *zheme/name* followed by the aspect marker –*zhe,* indicating a continuous or a resultant state. Again, we will only give examples with *zheme-zhe* in the following discussion, because *zheme-zhe* and *name-zhe* have identical syntactic behavior.

The form *zheme-zhe* indicates that either *zheme* is raised to the aspect marker or the aspect marker is lowered and combined with *zheme.* Whether there is raising or lowering, there is nothing that intervenes between the two and the resulting structure must be at least an Aspect Phrase. The following examples show that aspect and negation (which inflects according to aspect) can be included, showing that the bare anaphora can accommodate aspectual elements, in contrast to *zheme zuo* in (44).

(46) a. Zhangsan zhengzai kanshu,   Lisi ye   (*zhengzai) *zheme-zhe*.
         Zhangsan PROG   read.book Lisi also PROG   SO-ASP
         'Zhangsan is reading; Lisi is so, too.'
    b. Zhangsan mei   likai,   Lisi ye   (*mei)   *zheme-zhe*.
         Zhangsan has.not leave   Lisi also has.not SO-ASP
         'Zhangsan did not leave; Lisi is not so [did not do so], either.'

---

[16] Such bare anaphors are more commonly used in the northern Chinese speech than elsewhere. Sometimes, *zheme-zhe* is pronounced as *zheme-zhao.*

In addition to *zheme-zhe/name-zhe*, the *so* family has *zheme-yang/name-yang*, which also occurs without a light verb.[17] These elements can serve as predicates by themselves and behave like *zheme-zhe*:

(47) a. Zhangsan zhengzai kanshu, Lisi ye (*zhengzai) *zheme-yang*.
       Zhangsan PROG read Lisi also PROG so-appearance
       'Zhangsan is reading; Lisi is so, too.'
   b. Zhangsan mei likai, Lisi ye (*mei) *zheme-yang*.
       Zhangsan has.not leave Lisi also has.not so-appearance
       'Zhangsan did not leave; Lisi is not so [did not do so], either.'

Moreover, the absence of a light verb (and a heavy V) in the *zheme-zhe* and *zheme-yang* construction means that there is no specification of what the eventuality predicate is. Alternatively, any specification of an eventuality predicate would be compatible. This leads us to predict that *zheme-zhe* and *zheme-yang* should be able to take as antecdents aspect phrases containing event type verbs that are not possible with the [*so do*] construction. This indeed is the case. In contrast to *zheme zuo* [*so do*], which is restricted to activities and accomplishments, *zheme-zhe* and *zheme-yang* are acceptable in examples such as (48a, b, c, d) below, which are not activities or accomplishments but are statives, inchoatives, and unaccusatives. Replacing *zheme-yang* or *zheme-zhe* with *zheme zuo* makes the sentences unacceptable, as illustrated in (48a', b', c', d').

(48) a. Zhangsan hen xihuan Lisi, Mali ye *zheme-zhe/zheme-yang*.
       Zhansan very like Lisi Mary also so-ASP so-appearance
       'Zhangsan likes Lisi very much; Mary is so as well [so does Mary].'
 cf. a'. Zhangsan hen xihuan Lisi, *Mali ye *zheme zuo*.
       Zhangsan very like Lisi Mary also so do
   b. Zhangsan hen pang, Lisi ye *zheme-zhe/zheme-yang*.
       Zhangsan very fat Lisi also so-ASP so-appearance
       '(Intended) Zhangsan is very fat; Lisi is so as well.'
 cf. b' Zhangsan hen pang, *Lisi ye *zheme zuo*.
       Zhangsan very fat Lisi also so do
   c. Zhangsan pang-le, Lisi ye *zheme-zhe/zheme-yang*.
       Zhangsan fat-LE Lisi also so-ASP so-appearance
       'Zhangsan became fat; Lisi was so as well [so did Lisi].'
 cf. c'. Zhangsan pang-le, *Lisi ye *zheme zuo*.
       Zhangsan fat-LE Lisi also so do
   d. jintian hui xia yu, mingtian ye hui *zheme-zhe/zheme-yang*.
       today will fall rain tomorrow also will so-ASP so-appearance
       '(Intended) It will rain today; tomorrow will be so as well
       [so will tomorrow].'
 cf. d'. jintian hui xia yu, *mingtian ye hui *zheme zuo*.
       today will fall rain tomorrow also will so do

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[17] The suffix *-me* can be omitted when *yang* 'appearance' follows.

Adapting the analysis of [*so do*] described in (43) and (44), we may derive *zheme-zhe* and *zheme-yang* as follows: *zheme-(yang)* is base-generated within VP and merges with *v*; the new complex *zheme-(yang)-v* merges with *zhe* or the head in Asp, as in (49) and (50), respectively.

(49)   a.   [$_{AspP}$ zhe [$_{vP}$ v [$_{VP}$ zheme]]]
      b.   [$_{AspP}$ zhe [$_{vP}$ zheme$_i$-v [$_{VP}$ t$_i$]]]
      c.   [$_{AspP}$ [zheme$_i$-v]$_j$-zhe [$_{vP}$ t$_j$ [$_{VP}$ t$_i$]]]

(50)   a.   [$_{VP}$ zheme-yang]
      b.   [$_{vP}$ zheme-yang$_i$-v [$_{VP}$ t$_i$]]
      c.   [$_{AspP}$ [zheme-yang$_i$-v]$_j$-Asp [$_{vP}$ t$_j$ [$_{VP}$ t$_i$]]]

Thus far, the facts regarding what can or cannot antecede these predicate anaphors are all accommodated by the proposed structures, which in turn can provide diagnostic tests to determine constituency and argument structures.

5 Diagnostics for constituency and argument structures

Just like the English [*do so*] construction providing useful tests to determine constituency and argument structures, the Chinese predicate anaphora constructions can help resolve a good number of controversial issues in the literature. In what follows, we will demonstrate the application of these constructions to determine the structures of several prominent Chinese constructions: the *ba* construction, the control structure, and the constructions containing a *dui* 'to' phrase. In addition, the fact that the subcategorized complement (thematic argument) of a verb must be included in the interpretation of the SO construction can also help solve some controversies relating to argument structures.

5.1 Disposal ba construction

The *ba* construction is a controversial topic in Chinese grammar. It has been referred to as the disposal construction, and also given many other names. Semantically, it principally indicates that action is carried out on some entity (see, among many others, Sybesma 1999; Li 2006, Huang et al. 2009, Chap. 6 for the main properties associated with different terms for this construction). A typical *ba* sentence as in (51) below has the interpretation according to which the object *Lisi* is "affected" by the event of us giving a scolding. There have been many proposals made to capture the grammatical properties of *ba* (see Li 2006, Huang et al. (2009) for reviews of proposals that appear to have covered all logically possible analyses). Tests provided by verbal anaphora here will be shown to shed further light on the event structure of the *ba* construction.

(51) women ba Lisi ma-le   yi-dun.
      we   BA Lisi scold-LE one-CL
      'We gave Lisi a scolding.'

As shown in (52a) below, the constituent headed by the affective element *ba*, [*ba* [*Lisi da le yi-dun*]], can antecede [*so do*] or *zheme-zhe* 'so-ASP'. However, the constituent after the *ba*-DP, [*da le yi-dun*] 'give a beating', cannot be replaced by [*so do*] or *zheme-zhe*, as seen in (52b).

(52) a. Zhangsan [ba [Lisi da-le yi-dun]], Mali ye   *zheme zuo/zheme-zhe*
          Zhangsan BA Lisi hit-LE one-CL   Mary also so   do so-ASP
          'Zhangsan gave Lisi a beating; Mary did so, too.'
      b. *Zhangsan [ba [Lisi da-le yi-dun]], Mali ye   *ba Lisi zheme*
          Zhangsan BA   Lisi hit-LE one-CL   Mary also BA Lisi so
          zuo/zheme-zhe
          do so-ASP

These cases suggest that the constituent headed by *ba* must at least be a *v*P (a higher phrase such as an Aspect Phrase can be included). This conclusion is consistent with the proposal of Sybesma (1999), Li (2006), Huang et al. (2009, Chap. 6) in that *ba* takes a *v*P complement as in (53), whose Specifier is the NP immediately following *ba*. It is plausible that *ba*P is also a type of *v*P or some other functional projection dominating *v*P. The unacceptability of (52b) can be attributed to the fact that [*da yi-dun*] is a VP or *v*', which does not match the category of [$_{vP}$ *so do*] or [$_{\text{ASPECT PHRASE}}$ *so* ASP].

(53) [$_{baP}$[$_{ba'}$ *ba* [$_{vP}$ Lisi [$_{v'}$ [v [$_{VP}$ da-le   yi-dun]]]]]
                    BA   Lisi   hit-LE one-CL

In addition, the acceptability of [*so do*] in this construction indicates that the eventuality predicate is DO. It is also compatible with *zheme-zhe*, which does not have a specified eventuality predicate. The acceptability of (52a) can be contrasted with the following sentence, whose subject is an inanimate noun phrase:

(54) Zhangsan-de xiaohua ba Lisi xiao de duzi   teng,
      Zhangsan-DE joke   BA Lisi laugh DE belly hurt
      Mali-de   xiaohua ye   zheme-zhe/*zheme zuo.
      Mary-DE joke   also SO-ASP/   so   do
      '(Intended) Zhangsan's joke causes Lisi to laugh himself
      to stomach ache, and Mary's joke did so, too.'

When the *ba* construction takes an inanimate subject, it has a causative interpretation: the subject *zhangsan-de xiaohua* 'Zhangsan's joke' causes the causee *Lisi* to laugh so hard that *Lisi* has a stomach ache. In this case, the eventuality predicate is CAUSE, not DO. It is expected that [*so do*] is not compatible, but [*so* ASP], the one without the specification of eventuality predicate, is acceptable. The

contrast between (52a) and (54) supports the distinction of *ba* sentences into two types, depending on the animacy of the subject.

5.2 Dui phrase with the light verb DO

A decades-long controversy in the literature concerns the possibility of a PP in prenominal position. Li (1985, 1990) observes that a PP generally cannot occur before a noun (phrase). However, this observation has been questioned because of examples containing a *dui*-phrase in prenominal position and a *dui*-phrase is generally analyzed as a PP (see Tang 1990, 2001; Ernest 2002; Paul and Djamouri 2009; Paul et al. 2013, among others). A commonly observed example is the one below, where the *dui*–phrase appears before the head noun.

(55) dui   wo   de   taidu
     to   me   DE   attitude
     'the attitude toward me.'

We show below that such an apparent pre-nominal *dui*-PP actually should be a verb phrase containing the light verb DO, making the *dui*-phrase a *v*P (or a larger phrase dominating *v*P), rather than just a PP. Therefore, examples like the one above cannot challenge the claim that a PP alone may not be used as a prenominal modifier in Chinese.

    The following example shows that *zheme zuo* [*so do*], headed by the light verb DO, can refer to the entire predicate containing the *dui* phrase, in addition to the bare anaphor *zheme-zhe* 'SO-ASP'.

(56) Zhangsan hui *dui*   wo hen hao;   Lisi ye   hui *zheme zuo/ zheme-zhe*.
     Zhangsan will to/treat me very good Lisi also will so   do   SO-ASP
     'Zhangsan will treat me well; Lisi will do so as well.'

If the main predicate of the sentence is the stative verb *hao* 'well', our analysis should only allow *zheme-zhe* and disallow [*so do*], because *hao* is a stative adjective and the eventuality predicate should be HOLD, incompatible with the activity DO. However, (56) can be interpreted as 'Zhangsan will treat me well'. That is, *dui* is like a verb meaning 'treat' and the sentence is essentially the same as the ones with *dui* replaced by the verb *duidai* or *dai*, both meaning 'treat':

(57) a. Zhangsan *duidai* wo   tebie   hao.
       Zhangsan treat   me   especially well
       'Zhangsan treats me especially well.'
    b. Zhangsan *dai*   wo tebie   hao.
       Zhangsan treat   me especially   well
       'Zhangsan treats me especially well.'

It can be understood that both the morphemes *dui* and *dai* mean 'treat' and compounding of the two, *dui* and *dai,* also means 'treat'. Any of the three possibilities can be used, as in (55–57) and the ones below:

(58) duidai/dai   wo   de taidu
     treat treat   me   DE attitude
     '(someone's) attitude of treating me.'

In other words, *dui* should be part of a *v*P with the eventuality predicate DO. The *dui*-phrase in (55) would be dominated by a *v*P with the *v* being DO, making the [*so do*] structure acceptable, as in (56). Accordingly, the *dui*-phrase in such cases is not a PP in prenominal position and is irrelevant to the issue of whether a PP can occur in a prenominal position.

5.3 Control structures

Because of the lack of clear clausal boundaries and tense marking in Chinese, it is not easy to decide if sentences such as (59) below are object control structures containing a nominal object and a clausal complement like (59a) in English, or consisting of a V with a single clausal complement like English (59b):

(59) wo yaoqiu   ta mashang   huiqu.
     I   ask   he immediately   return
     a.   'I asked him to return immediately.'
     b.   'I asked that he return immediately.'

As *zheme* can replace a clausal complement in the [*so* V] construction (see (25)), we can use [*zheme* V] as a diagnostic to determine constituency structures. The following contrast is observed:

(60) Zhangsan yaoqing Mali mashang   qu ta jia;   Lisi ye   *zheme*
     Zhangsan invite   Mary immediately go he home; Lisi also so
     yaoqing   *(Mali).
     invite   Mary
     'Zhangsan invited Mary to go to his home immediately; Lisi also invited Mary (to go to his home immediately).'

(61) Zhangsan yaoqiu Mali mashang   qu ta jia;   Lisi ye   *zheme*
     Zhangsan ask   Mary immediately go he home; Lisi also so
     yaoqiu   (Mali).
     ask   Mary
     'Zhangsan asked Mary to go to his home immediately; Lisi also asked Mary (to go to his home immediately).'
     'Zhangsan asked Mary to go to his home immediately; Lisi also asked (that Mary go to his home immediately).'

With a verb like *yaoqing* 'invite' in (60), [*so* V] cannot occur without the noun phrase 'Mary' but a verb like *yaoqiu* 'ask' can do without the noun phrase as in (61). Further note the contrast between the following two sentences:

(62) a. *Zhangsan   *yaoqing*   shenme?
        Zhangsan   invite   what
        '(Intended) What did Zhangsan invite?'
    b. Zhangsan   *yaoqiu*   shenme?
        Zhangsan   ask   what
        'What did Zhangsan ask for?'

These contrasts suggest that *yaoqing* 'invite' is subcategorized for a nominal object and a clausal object (object control structure), but *yaoqiu* 'ask, request' is subcategorized for a clausal complement and optionally a nominal object (single clausal complement structure or object control structure). That is why (61) not only is like the English translation 'Lisi also asked Mary (to go to his home immediately)' but also should allow the second possible interpretation: 'Zhangsan also asked that Mary go to his home immediately.' The verb in the former takes a nominal and a clausal object and the latter, only a clausal object. Further examples showing the use of [*zheme* V] to determine the presence of a control structure can be found in the following minimal pair, which suggests that *xiwang* 'hope' can only take a clausal complement, while *qiangpo* 'force', which is an object control verb can take a clausal complement and a nominal object.

(63) a. Zhangsan xiwang Mali mashang   likai, Lisi ye   *zheme* xiwang
      Zhangsan hope   Mary immediately leave Lisi also so   hope
      (*Mali)
       Mary
      'Zhangsan hopes for Mary to leave immediately; Lisi hopes so as well.'
    b. Zhangsan *qiangpuo* Lisi$_i$ [PRO$_i$ mashang   likai], Mali ye   *zheme*
      Zhangsan force   Lisi   immediately leave Mary also so
      qiangpo *(Lisi).
      force   Lisi
      'Zhangsan forced Lisi to leave immediately; Mary also forced Lisi (to leave immediately).'

5.4 Argument structure

Chinese limits the number and type of constituents in the postverbal position. Some linguists have claimed that a subcategorized PP occurs postverbally but some others claim that such as PP occurs preverbally (e.g, Huang 1982; Koopman 1984; Travis 1984; Li 1985). This section uses the generalization established in Sect. 2 that the constituent replaced by [*so do*] cannot exclude the subcategorized complement of the verb to show that a preverbal PP can be a subcategorized complement.

    Compare the following sentences:

(64) a. Zhangsan *gei wo* jieshao-le yi-ge hao pengyou; *Lisi ye *gei wo*
       Zhangsan to me introduce-LE one-CL good friend   Lisi also to me
       zheme   zuo.
       so   do
       'Zhangsan introduced a good friend *to me*; *Lisi did so *to me* as well.'
   b. Zhangsan *gei wo* jieshao-le yi-ge hao pengyou; Lisi ye
       Zhangsan to me introduce-LE one-CL good friend   Lisi also
       zheme   zuo.
       so   do
       'Zhangsan introduced a good friend *to me*; Lisi did so as well.'
   c. Zhangsan *gen wo* jieshao-le yi-ge hao pengyou *gei ta*; Lisi ye
       Zhangsan with me introduce-LE one-CL good friend to him Lisi also
       gen wo   zheme zuo.
       with me so   do
       'Zhangsan introduced a good friend to him *with me*; Lisi did so
       with me as well.'

The phrase *gei wo* 'to me' cannot appear with *zheme zuo*, as in (64a). That is, [*so do*] cannot exclude 'to me', as in (64b). In contrast, (64c) shows that the phrase *gen wo* 'with me' can be excluded from [*so do*]. Such behavior is expected if 'to me' is a subcategorized complement of the verb 'introduce', but not 'with me'. The following examples illustrate the same contrast between 'to me' and 'for me' in relation to making phone calls.

(65) a. Zhangsan *gei wo* da-le dianhua; *Lisi mei   *gei wo* zheme zuo.
       Zhangsan to me hit-LE phone   Lisi not.have to me so   do
       'Zhangsan made a call to me; Lisi did not do so to me.'
   b. Zhangsan *gei wo* da-le dianhua; Lisi mei   zheme zuo.
       Zhangsan to me hit-LE phone   Lisi not.have so   do
       'Zhangsan made a call to me; Lisi did not do so.'
   c. Zhangsan *wei wo* da-le dianhua; Lisi mei   *wei wo* zheme zuo.
       Zhangsan for me hit-LE phone   Lisi not.have for me so   do
       'Zhangsan made a call for me; Lisi did not do so for me.'

Similar tests apply to the locative *zai* 'at' phrase. A preverbal *zai* phrase may modify the entire predicate or be a subcategorized complement of a verb. We predict that the former can occur with *zheme zuo* but not the latter. This prediction is born out. The following sentence is acceptable only if the subject is physically on the table/chair. That is, the locative *zai* phrase cannot be a subcategorized complement of the verb *fang* in order to occur with *zheme zuo* 'so do'.

(66) ta shi *zai zhuozi-shang* fang yi-ben shu; ta bu shi *zai yizi-shang*
     he be at table-top   place one-CL book he not be   at chair-top
     zheme   zuo.
     so   do
     'He did place a book on the table; he did not do so on the chair.'

6 Conclusion

This paper studies the VP-anaphor [*so do*] in Chinese through comparisons with the English [*do so*] construction, as well as the related Chinese [*so* V], [*so* ASP] and [*zheme/name-yang(zi)*] structures. We have shown that [*so do*] in Chinese and [*do so*] in English behave very much alike. Therefore, the two *SO* constructions can be analyzed similarly and the main proposals for English [*do so*] in the literature can be adapted for Chinese [*so do*]. In fact, Chinese [*so do*] provides clearer evidence for the analysis taking *do* in such constructions as a light verb spelling out the eventuality predicate DO, because of its contrast with the [*so* V] construction in Chinese, which is much more widely used than the counterpart in English. [*So* V] and [*so do*] differ substantially in what they can be anaphoric to, leading us to conclude that the *do* of [*so do*] is not a V. In addition, the [*so do*] construction behaves differently from the commonly understood VP-ellipsis construction; therefore, the *do* of [*so do*] is not a modal or an auxiliary licensing VP-ellipsis. The overt realization of the eventuality predicate DO as *do* in [*so do*] contrasts with the absence of eventuality predicate specifications in the construction [*so* ASP] and the constructions containing *zheme/name-yang(zi)*. The difference in the specification of eventuality predicates captures the presence vs. absence of verb type constraints relevant to these expressions.

Chinese further provides clearer evidence for the base-generation approach to the *SO* constructions, instead of a deletion analysis. Chinese [*so do*] can be easily found in contexts where there are no linguistic antecedents. Split antecedents are possible; and extraction is not possible from within the phrase. Nonetheless, Chinese [*so do*] can also have the kind of sloppy interpretation discussed in Hankamer and Sag (1976) and allows certain cases of missing antecedents. These properties affirm the doubt raised in earlier works such as Williams (1977) and more recently Houser (2010) as to whether the distinction between deep and surface anaphora as in Hankamer and Sag (1976) adequately accommodates the noted differences between English [*do so*] and [*do it/do the same thing*].

This work has also demonstrated how the anaphoric [*so do*] and the related [*so* V], [*so* ASP] and [*zheme/name-yang(zi)*] can help solve issues related to constituent and argument structures. The constructions examined include the *ba* construction, control structures, those with preverbal PPs and *dui* phrases. Just as the English [*do so*] construction has played an important role in helping to analyze underlying syntactic structures, the present work has also shown how the often-neglected Chinese [*so do*] and related anaphoric constructions can help us better understand the grammatical properties of Chinese.

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