zhi-{yao, you} ‘only-{need, have}’: on two conditional connectives in Mandarin

Alexander Wimmer

Abstract
This paper offers a compositional take on two internally complex conditional connectives in Mandarin, zhi-yao ‘only-need’ and zhi-you ‘only-have’. While the former conveys the antecedent proposition’s minimal sufficiency, the latter conveys its necessity for the consequent proposition to come true. Both connectives will be treated as pairing an exclusive particle, zhi, with a modal, an assumption that is less controversial for the necessity modal yao than for you, which will be treated as a possibility modal. Accepting this treatment, however, we have two connectives that openly differ in modal force. While the surface order will be preserved for zhi-you, an inversion will be shown to lead to better results for zhi-yao. In both cases, a possible extension to monoclausal uses is considered.

Keywords Conditionals · Modal force · Mandarin · (Minimal) Sufficiency · Necessity · only

1 Introduction
This paper deals with two conditional connectives in Mandarin, zhi-yao ‘only-need’ and zhi-you ‘only-have’. The two are special by virtue of their internal complexity. Both of them have the exclusive particle zhi ‘only’ as their first component, and differ only in the second. This difference leads to substantial differences in interpre-
tation, however, and a major goal of this paper is to account for these differences in a compositional fashion. I start by looking at each of *zhī-yāo,yòu* in turn.

The interpretive effect of *zhī-yāo* ‘only-need’ may be taken to consist in what Grosz (2012) calls minimal sufficiency. An informal definition of the latter goes like this:

(1) \[ p \text{ minimally suffices for } q \text{ iff } \approx \text{Grosz (2012)} \]

\[ \begin{align*}
& a. \text{ } p \text{ makes } q \text{ true} \\
& b. \text{ } p \text{ ranks low on a contextually salient scale} \\
\end{align*} \]

The scalar component in (1-b) easily translates into *p* being *easy* to satisfy, i.e., ranking low on an effort scale, cf. Liu (2017a) a.o.

A sentence like (2-a) can be shown to fall under this pattern. As a conditional connective, *zhī-yāo* combines with two proposition-denoting clauses, an antecedent *p* and a consequent *q*.\(^2\) In the case at hand, *p* is the proposition *that you smile*, and *q* the proposition *that I’m happy*.\(^3\)

(2) a. *zhī-yāo nǐ xiào wǒ jiǔ kǎixin le*

\[ \approx \text{‘It only takes a smile from you for me to be happy.’} \]

The minimal sufficiency interpretation the sentence intuitively has is given in (3): *p* is implied to both suffice for *q*, and to rank low(est) on a scale (to require minimal effort).

(3) \[ [p \text{ you smile}] \text{ makes } [q \text{ I’m happy}] \text{ true} \]

\[ [p \text{ you smile}] \text{ is easy to satisfy} \]

What makes *zhī-yāo* especially appealing for semantic analysis is its internal make-up, which strikingly resembles a pattern investigated by von Fintel and Iatridou (2007): an exclusive particle—*zhī* ‘only’—conspires with a necessity modal—*yāo* ‘need’—to convey minimal sufficiency.

(4) \[ zhi+yao \ p q \sim p \text{ minimally suffices for } q \]

The exclusive force we would expect an *only*-sentence to have is lost, and the sentence even has an additive flavor to it: if it takes as little as a smile from the hearer *H* for the speaker *S* to be happy, then it is easy to infer that relevant alternatives to a mere smile from *H*, which take conceivably more effort, make *S* happy at least as easily. (2-a) works in a scenario in which *H* has just offered *S* to bake a cake for her (say, because it’s *S*’s birthday). In uttering (2-a), *S* implies herself to be easier to please than that, by no means denying that she would be happy about a cake as well.

In terms of its internal composition, *zhī-yāo* strongly resembles another item which can also be used as a conditional connective, namely *zhī-yòu* ‘only-have’. The necessity modal *yāo* ‘need’ is replaced by *yòu* ‘have, exist’. The interpretive effect of this permu-

---

\(^{2}\) For convenience, I will use the terms ‘antecedent’/‘consequent’ interchangeably for the two respective clauses involved in a conditional as well as for the propositions they denote.

\(^{3}\) Example found online, https://www.ixigua.com/6769792101723931143?&wid_try=1 [2020/12/22].
tation is huge: instead of conveying (minimal) sufficiency, zhiyou conveys necessity. Necessity can be informally characterized as follows.\(^4\)

(5) \( p \) is necessary for \( q \) iff \( q \) cannot be true without \( p \) being true as well.

English necessity conditionals involve only if’ (Herburger 2015, 2019),\(^5\) and this is how zhiyou translates in the following example, a variation of (2-a).\(^6\)

(6) zhi-you ni xiao wo cai kaixin
    only-have you smile I CAI happy
    ‘Only if you smile am I happy.’

In line with the definition in (5), this sentence’s necessity-implication can be put as follows:

(7) \([ q \text{ I’m happy}] \) cannot be true without \([ p \text{ you smile}] \) being true as well

To recap:

(8) zhiyou \( p q \leadsto p \) is necessary for \( q \)

If these characterizations are correct, then zhiyao and zhiyou are in complementary distribution in terms of sufficiency and necessity. Thinking of these relations as semantic features \([\pm \text{suff}] \) and \([\pm \text{nec}] \), respectively, zhiyao can be described as \([+\text{suff},-\text{nec}] \), and zhiyou as \([-\text{suff},+\text{nec}] \). A diagnostic applied by Herburger (2016, 2019) enables us to add substance to this claim. If for a given conditional \( if p q \), where \( if \) is just a placeholder for a given conditional connective, you cannot felicitously follow up doubting that \( p \) makes \( q \) true, you have evidence for sufficiency. By contrast, if you can felicitously follow up admitting the possibility that \( q \) may be true without \( p \) being also true, you get evidence for necessity.

Let us start with zhiyou, just claimed to be \([-\text{suff},+\text{nec}] \):

(9) ni zhi-you nuli cai neng chenggong
    you only-have diligent CAI can succeed
    ‘Only if you work hard can you succeed.’

Following this example, the speaker S can felicitously doubt that \([ p \text{ hard work}] \) invariably leads to \([ q \text{ success}] \). This confirms \([-\text{suff}] \): (10-a) wouldn’t work as a

---

\(^4\) The definition in (5) sidesteps problems of temporal order that a more elegant definition of necessity in terms of sufficiency would face (Horn 1996; Herburger 2019). On that definition, necessity is defined in terms of sufficiency, and all that changes is the direction of verification: \( p \) is necessary for \( q \) iff \( q \) suffices for \( p \).

\(^5\) This is to leave aside pragmatic strengthening resulting in conditional perfection, which basically enriches sufficiency with necessity (Horn 2000; Herburger 2016).

\(^6\) The sentences in (2-a) and (6) aren’t exact minimal pairs in that the different connectives require different co-occurring particles in the consequent: a zhiyao-conditional has the particle jiu; a zhiyou-conditional has the particle cai in the consequent. Also, only (2-a) ends with the aspectual particle le. Another change in meaning from zhiyao to zhiyou that sometimes seems to occur is one in scalarity (Sun 2021 on cai): (6) no longer conveys a smile to be easy, but rather a hard thing, to put into action. It is in this sense that zhiyou may sometimes convey maximality (highness) rather than the minimality (lowness) just ascribed to zhiyao. For discussion of some of these issues, see this paper’s conclusion.
follow-up otherwise.\textsuperscript{7} At the same time, S cannot felicitously mention the possibility that there is \([q \text{ success}]\) without \([p \text{ hard work}]\), as seen in (10-b). This confirms \([+\text{nec}]\). In other words, \textit{zhiyou} patterns with \textit{only if} in these crucial respects.\textsuperscript{8}

\begin{equation}
\text{(10) a. danshi ni jishi nuli ye keneng bu chenggong}
\begin{align*}
\text{but you even.} & \text{if diligent also maybe not succeed} \\
\end{align*}
\begin{align*}
\text{‘But even if you’re} & \text{diligent, you might not succeed.’}
\end{align*}
\begin{align*}
\text{b. } & \#\text{danshi ni bu nuli ye keneng chenggong} \\
\text{#but } & \text{you not diligent also maybe succeed} \\
\end{align*}
\begin{align*}
\text{‘But if you’re} & \text{not diligent, you might still succeed.’}
\end{align*}
\end{equation}

These felicity judgments reverse when the conditional to be continued is a \textit{zhiyao}-conditional:

\begin{equation}
\text{(11) ni zhi-yao nuli jiu neng chenggong}
\begin{align*}
\text{you only-need diligent} & \text{Jiu can succeed} \\
\end{align*}
\end{equation}

Someone uttering (11) contradicts herself by subsequently questioning that \([p \text{ hard work}]\) leads to \([q \text{ success}]\), as seen in (12-a). This confirms that \textit{zhiyao} is \([+\text{suff}]\). On the other hand, the same speaker can consistently follow up entertaining the possibility that \([q \text{ success}]\) may come about without \([p \text{ hard work}]\) having been invested, (12-b). This is expected from \textit{zhiyao} being \([-\text{nec}]\). In other words, \textit{zhiyao}-conditionals work like English \textit{if}-conditionals, leaving aside minimalism for a moment.\textsuperscript{9}

\begin{equation}
\text{(12) a. } \#\text{danshi ni jishi nuli ye keneng bu chenggong} \\
\begin{align*}
\text{#but } & \text{you even.} \text{if diligent also maybe not succeed} \\
\end{align*}
\begin{align*}
\text{b. danshi ni bu nuli ye keneng chenggong} \\
\text{but you not diligent also maybe succeed} \\
\end{align*}
\end{equation}

Our preliminary finding can be summed up like this:

\begin{equation}
\begin{align*}
\text{(13) zhi-you ‘only-have’ } & [+\text{nec}] [-\text{suff}] \\
\text{zhi-yao ‘only-need’ } & [-\text{nec}] [+\text{suff}] \\
\end{align*}
\end{equation}

This classification is based on conditional uses of \textit{zhiyou} and \textit{zhiyao}. But at least \textit{zhiyou} is well known for its nonconditional, monoclusal uses (Hole 2004, 2017; Sun 2021 a.o.). The following example involves obligatory object fronting into the preverbal domain.\textsuperscript{10}

\textsuperscript{7} One may object that the possibility modal \textit{neng} ‘can’ in the consequent of (9) acts as a distorting factor here, weakening \textit{zhiyou}’s sufficiency. However, it seems that the pattern remains the same if \textit{hui} ‘will’ is used instead. This is not to claim that modals in the consequent never make a difference, cf. Sect. 4.

\textsuperscript{8} A reviewer raises the question whether \textit{zhiyou} patterns with \textit{only if} in all possible respects. One more aspect in which they certainly pattern the same is that having the consequent temporally precede the antecedent without further ado leads to oddity, an effect the observation of which von Fintel (1997) and Herburger (2019) ascribe to McCawley (1993).

\textsuperscript{9} Six out of seven native speakers sensed an inconsistency between (11) and (12-a) (or a slight variant thereof), even though one of those six still found this sequence natural. Two out of three liked (11) + (12-b); the third one explicitly stated that (12-b) does not contradict (11), but is merely an unusual thing to say.

\textsuperscript{10} Sentences like (14) do not seem to be accepted by all speakers of Mandarin, which might be due to regional variance.
(14) Lao Wang zhi-you cha t i cai he t i
   Old Wang only-have tea i CAI drink t i
   ‘Old Wang only drinks tea F.’

And even zhiyao does seem to have a monoclausal variant of sorts:

(15) Lao Wang zhi-yao shi cha t i jiu he t i
   Old Wang only-need be tea i JIU drink t i
   ≈ ‘For any x, x only has to be tea for Old Wang to drink x.’

Monoclausal uses can be schematized as follows:

(16) [ zhi-{yao/you} P ] Q

where P and Q are each properties of individuals: in the cases at hand, being tea for P and being drunk by Old Wang for Q. A successful analysis of zhiyao and zhiyou should cover these monoclausal uses as well.

Still, the main focus of this paper is on conditional uses, and the goal is to derive the featural opposition in (13) in a compositional fashion. A compositional analysis of zhiyou is proposed in Sect. 2. Under the tempting assumption that you is an existential modal, zhiyou-conditionals will be treated as necessity-conditionals wearing existential force on their sleeves, unlike only if conditionals, for which existential force is sometimes posited, cf. Herburger (2019) a.o. Sect. 3 deals with zhiyao, for which an inverse scope analysis is proposed. zhi’s exclusive force is weakened by having it scope below the universal modal denoted by yao, and silent even captures an additive implication zhiyao-conditionals give rise to. Both sections also consider an extension of the analysis to monoclausal uses. Section 4 discusses interactions of the two connectives with modals in the consequent, and Sect. 5 concludes with some remaining issues.

2 zhi-you ‘only-have’

This section offers a compositional analysis of zhiyou-conditionals. As a reminder, zhi-you ‘only-have’ is internally composed of an exclusive, zhi, and an existential, you. The purpose of the following two subsections is to shed some light on each of these two items. The section on you contains the auxiliary assumption that you has a modal variant. This assumption allows us to bring zhi and you together in an analysis that resembles Herburger (2015, 2019)’s analysis of only if conditionals in that an exclusive applies to a modal claim of existential force.

2.1 zhi’only’

This subsection motivates a treatment of zhi as an exclusive particle—a view that may be uncontroversial, but still requires some motivation. On the rather old-fashioned working semantics assumed here, zhi asserts the conjunction of its prejacent p (positive component) and the negation of all of p’s contextually salient alternatives except for
p itself (exclusive component). So our preliminary semantics for zhi looks as follows. It takes a proposition p, the prejacent, asserts p to be true (17-a) and none of p’s non-identical alternatives p’ to be true (17-b). Alternatives are restricted to C, a set of contextually salient alternatives.

\[
\begin{align*}
\llbracket zhi_C \rrbracket & = \lambda p. \\
& \begin{align*}
a. & \quad p & \text{positive} \\
b. & \quad \neg \exists p' \in C: p' \neq p \& p' & \text{exclusive}
\end{align*}
\end{align*}
\]

The assertion in prose:

(18) p is true \\
& no p’ from C but p holds true

Let us now look at the simple sentence in (19), which has both the positive and the exclusive implication. The subscript \(F\) signals focus-marking.

(19) Xiao Wang zhi chi-le yi ke yingtao\(F\) \\
Little Wang only eat-ASP one CL cherry\(F\) \\
\(\Rightarrow\) LW ate a cherry \\
\(\Rightarrow\) LW ate nothing but a cherry

The alternatives in C can be thought of in two different ways here: namely, as differing or not differing in logical strength. In C1, they don’t, in C2, they do, and \(\llbracket p \text{ LW ate a cherry} \rrbracket\) is asymmetrically entailed by its non-identical alternatives.

\[
\begin{align*}
& \begin{align*}
a. & \quad C1 = \{ \text{LW ate a cherry, LW ate a peach, LW ate an orange} \} \\
b. & \quad C2 = \{ \text{LW ate a cherry, LW ate a cherry and a peach, LW ate a cherry and a peach and an orange} \}
\end{align*}
\end{align*}
\]

On either way of thinking of C, the working semantics in (17) derives the positive and the exclusive implication we observed.

\[
\begin{align*}
\llbracket zhi_C [\text{LW ate a cherry}] \rrbracket \text{ is true iff} \\
& \begin{align*}
a. & \quad \text{LW ate a cherry} \\
b. & \quad & \text{no p’ from C but [LW ate a cherry] holds true} \\
& \quad \Rightarrow \text{LW neither ate a peach nor an orange}
\end{align*}
\end{align*}
\]

There are well known refinements to such an analysis. Consider a case with focus on the numeral liang ‘two’:

(22) Xiao Wang zhi chi-le liang\(F\) ke yingtao \\
Little Wang only eat-ASP two\(F\) CL cherry \\
\(\Rightarrow\) LW ate two cherries \\
\(\Rightarrow\) LW didn’t eat more than two cherries

In this case, the prejacent has a conceivable weaker alternative, that LW ate one cherry, that we do not want zhi to exclude: the truth of \(\llbracket p \text{ LW ate two cherries} \rrbracket\) is implied—and on the present analysis, entailed. p entails that Little Wang ate one
cherry, so the positive and the exclusive implication seem to be incorrectly predicted to contradict each other. One reaction to this has been to assume that only only excludes alternatives that are not entailed by p. In defense of the working analysis, one could follow e.g. von Fintel (1997) in considering weaker alternatives not to count as relevant, hence to be banned from C to begin with. As a result, our weaker alternative that LW ate one cherry is not asserted to be false, and the contradiction doesn’t arise.

The rich literature on exclusives offers other refinements to the entry in (17), which pertain to the so-called prejacent-implication and the implication that the prejacent ranks low on a scale. Scalar lowness will become crucial in the context of zhiyao. But (17) should suffice for the analysis of zhiyou to follow.

2.2 you ‘have’

You has a whole variety of uses exemplified in the following two sets of examples, both of which have one thing in common: existential quantification. The three examples in (23) come with existential (∃) quantification over individuals. The first of two properties ascribed to these individuals (the expression denoting this property, to be more precise) sits in the subject NP: the property of being a person, a story, and a cat, respectively. In (23-a) and (23-b), you precedes a subject-internal determiner, yige ‘a’ and xie ‘some’. This is not the case in (23-c), which has a determinerless subject.

(23)  
a. you yi-ge ren lai le
    have one-CL person come ASP
    ‘A person came.’ Cheng (1994)
b. you xie gushi hai mei jiang-wan ...
    have CL story still not tell-finish
    ‘Some stories haven’t been told completely yet.’ Pu Shu, Na xie huar
c. waimian you mao zai miao
    outside have cat be meow
    ‘There is a cat meowing outside.’

These examples can be informally paraphrased as follows:

(23)’ for some individual x:

a. x is a person & x came
b. x is a story & x has not been told completely yet
c. x is a cat & x is meowing

The adverbial uses in (24-a) and (24-b) differ from the preceding examples in the type of entities existentially quantified over: (24-a) comes with ∃-quantification over times, (24-b) over worlds. In other words, the former use is temporal, the latter modal.

\[\text{\textsuperscript{11} As for the prejacent-implication, Horn (1996) traces the ‘conjunctivalist’ view entertained here back to the medieval philosopher Peter of Spain. Nowadays it is more standard to take p as presupposed rather than asserted (Horn 1969; Alonso-Ovalle and Hirsch 2018), or its truth to be derived on the basis of an interplay between a weak presupposition and the exclusive assertion (Horn 1996; Coppock and Beaver 2014; von Fintel and Iatridou 2007).}\]
(24) a. ta you-shi qu hei-senlin sanbu
   she have-time go Black-Forest walk
   ‘She sometimes goes for a walk in the Black Forest.’

b. ta you-keneng mingtian lai
   she have-possibility tomorrow come
   ‘Maybe she comes tomorrow.’

The corresponding paraphrases no longer involve individuals, but existential force
remains in place:

(24)′ a. at some time t, she goes hiking in the Black Forest at t

b. in some possible world w, she comes tomorrow in w

The use called modal here is of particular interest: if there is a modal version of
you, this would be the candidate to be part of conditional zhi-you. Let us first look
at the general pattern that seems to emerge for you on the basis of the examples just
given. We can derive (25), according to which you takes two properties p and q, and
ascribes them to an entity x that it existentially quantifies over, be x an individual, a
time, or a world.12

(25) \[ you \] = λpλq. ∃x: p(x) & q(x)

What we may want is a modalized version of (25), an existential quantifier over
worlds. Accordingly, p and q are now properties of worlds (of semantic type s,t).

(26) \[ you♦ \] = λp_{s,t}λq_{s,t}. ∃w: p(w) & q(w)
   there is a world w such that p and q are true in it

It’s not quite as easy as that though. Starting with the temporal case (24-a), it is far
from clear that you itself takes on a temporal meaning. This temporal specification
rather seems to arise compositionally, namely by virtue of shi ‘time’ in you-shi serving
as you’s first argument p. We get an LF like (27-a) and an interpretation like (27-b),
but you seems to remain a quantifier over an underspecified x in this case, not over a
time in particular.

(27) a. \[ you time_{i,t} \] [i,t she goes hiking in the BF] LF for (24-a)

b. ∃x: time(x) & she goes hiking in the BF at x

The modal variant is even trickier. What you immediately combines with is the
possibility modal keneng, which albeit translates as ‘possibility’ in this case. So a
paraphrase of you-keneng that is faithful to its internal composition would be some-
thing like ‘there is a possibility that’. In analogy to shi ‘time’ denoting a set of times, we
may treat keneng as denoting a particular set of worlds, namely those that are epistemic
alternatives in the sense of being epistemically accessible, say, to the speaker:

(28) \[ keneng \] = λw′. w′ is an epistemic alternative

12 The definition in (25) arguably deviates from Cheng (1994)’s, who treats you as an existential closure
operator.
If this is on the right track, we are in a position to treat the modal example in (24-b) in a parallel fashion to the temporal one. In the LF in (29-a), the two arguments of you are now two properties of worlds rather than times, type $s,t$.

(29)  
\[
\begin{align*}
&\text{a. } [\text{you } \text{keneng}_{s,t} ] [s,t \text{ she comes tomorrow}] \\
&\text{b. } [\text{you } ]([\text{keneng }])([\text{ she comes tmrw }]) \\
&\quad = [\lambda p \lambda q. \exists x: p(x) & q(x)] \\
&\quad (\lambda w'. w' \text{ is an epist. alt.})(\lambda w''. \text{ she comes tmrw in } w'') \\
&\quad = \exists x: x \text{ is an epist. alt.} & \text{she comes tmrw in } x \\
&\quad \text{there is an x such that x is an epistemic alternative,} \\
&\quad \& \text{she comes tomorrow in } x
\end{align*}
\]

Still, concerns raised by a reviewer on the existence of a modal you like the one in (26) remain in place. For one thing, you itself does not seem to quantify over worlds here, just like it does not seem to quantify over times in the temporal case. Worlds are only brought into play by keneng, and all that you seems to add is quantificational force. For another, the same reviewer also points out that you, unlike zhi-you, cannot serve as a conditional connective:

(30) *you ni lai, ta cai/jiu lai

*have you come she Cai/Jiu come

(intended:) ‘It is (only) possible that if you come, she comes’

What we see in (30) seems to touch on a more general idiosyncrasy of zhiyou, which complicates a decompositional analysis. Informally speaking, it seems that zhiyou leads a life of its own, in our case: functions in environments in which you itself does not. This dichotomy between zhiyou and you arises in monoclausal environments as well. Sun (2021): 322, footnote 3 observes bare you to exhibit the so-called definiteness restriction, brought to prominence by Milsark (1974). The following pair of monoclausal examples illustrates this: zhiyou has no trouble associating with the proper name Lao Wang in focus, (31-a). By contrast, it seems hard to make sense of a maximally similar sentence with bare you, (31-b).

(31)  
\[
\begin{align*}
&\text{a. } \text{zhi-you } [\text{Lao Wang}]_{F} \text{ cai he cha} \\
&\quad \text{only-have } [\text{Old Wang}]_{F} \text{ Cai drink tea} \\
&\quad \text{‘Only Old Wang drinks tea.’} \\
&\text{b. } ??\text{you Lao Wang he cha} \\
&\quad ??\text{have Old Wang drink tea}
\end{align*}
\]

zhiyou is more than the sum of its parts. Should these idiosyncrasies discourage us from entertaining the modal variant of you? I don’t have a satisfying answer to this problem, and keep entertaining the modal entry in (26) as an auxiliary assumption, with the stipulation that its appearance is limited to conditional zhiyou. The latter may or may not have formed in analogy with zhi-yao, the second part of which is clearly a modal, as will also be argued for below. Be this as it may, what the entry in (26) does keep in its favor, I think, is that it is just a specification of the less controversial type-neutral entry provided in (25).
2.3 zhi-you

We saw at the beginning that zhiyou resembles only if in coming with necessity, but not with sufficiency. This subsection derives this in a compositional fashion, based on the above entries for zhi ‘only’ and modal you ‘have’. If these two entries (and especially the latter of the two) are accepted, zhiyou does not cause the same problems that only if has caused in the past (von Fintel 1997; Herburger 2019): the modal you contained in it would openly deliver the very same ∃-force that Herburger (2019) posits only if conditionals to have.

The following zhiyou-conditional will serve as the basis for the analysis to come.

(32) zhi-you ni qu, wo cai qu
     only-have you go I cai go
     ‘Only if you go will I go.’

The (non-)implications we want to derive are

- insufficiency: there is a chance for the speaker not to go even if the hearer goes
- necessity: there is no chance for the speaker to go if the hearer does not go

In line with a suggestion made by a reviewer, the aim is to work out a single lexical entry for zhiyou, which is a lexical unit despite its internal complexity. This suggests a constellation like (33-b) rather than (33-a), where zhi outscopes an entire modal claim headed by modal you, which as we saw in the previous subsection doesn’t occur in isolation anyway.

(33) a. zhi [ [you p] q]
    b. [ [zhi you] p ]

To work out option (33-b), a higher-type zhi which takes modal you as an argument is required. The entry from above, repeated in (34), will not do.

(34) [ zhiC ] = λp. p & ¬∃p′ ∈ C[ p′̸= p & p′ ]

Drawing inspiration to some extent from the type-shifts in Coppock and Beaver (2014), (35) derives such a higher-type version, zhi′. Its first argument slot R will later on be saturated by modal you, the p- and q-slots by the antecedent and the consequent, respectively. R stands for a function that takes two propositions and returns another proposition. The contribution of zhi′ is to apply the simpler zhi to R(p)(q), the proposition resulting from R’s application to p and q. As a result, we get the conjunction of R(p)(q) together with the negation of any proposition R(p′)(q), where p′ is an alternative other than p.

13 The same reviewer provides the interesting argument that zhiyou cannot associate with a focus outside p. Indeed, if such an association were possible, p’s necessity for q should be defeasible via focus placement on q, which does not seem to be the case. Under the analysis to follow, zhi continues to take semantic scope with respect to q, by virtue of taking q as an argument.

14 The type-label p is an abbreviation for the propositional type s.t, again following Coppock and Beaver (2014).
zhi-yao, you 'only-need, have'

(35) \[[ \text{zhī}'C] = \lambda R_p.(p,p) \lambda p \lambda q. \left[ \text{zhī}C \right](R(p)(q)) \]
\[= R(p)(q) & \neg \exists p' \in C \left[ p' \neq p & R(p')(q) \right] \]

To get to the entry for conditional zhīyou, modal you is inserted for R. The entry for the former is repeated in (36), with the intensional step of having it take an evaluation world as its third argument.

(36) \[[ \text{you} \bigodot \rightleftharpoons \lambda p \lambda q \lambda w. \exists w' \text{[accessible from } w]: p(w') & q(w') \]

With these ingredients in place, the semantics of zhīyou is derived in (37). What we end up with is an operator that takes two propositional arguments p and q. Its assertive contribution conjoins the existential claim that p and q are both true in some world w′ with the negative claim that no alternative p′ other than p is going to verify this existential claim. In other words: there is no world w′′ that makes both p′ and q true.

(37) \[[ \text{zhīyou}_C \rightleftharpoons \left[ \text{zhī}'C \right] \text{you} \bigodot \rightleftharpoons \left[ \text{zhī}'C \right](\left[ \text{you} \bigodot \right](p)(q)) \]
\[= \exists w': p(w') & q(w') & \neg \exists p' \in C [ p' \neq p & \exists w'': p'(w'') & q(w'') ] \]

Let us apply the semantics proposed for zhīyou in (37) to the example in (32). We get an LF like the following.

(38) \[ \left[ \text{zhīyou}_C \left[ p \text{ you go} \right] \right] \left[ q \text{ I (cai) go} \right] \]
\[\text{LF for (32)} \]

If we now take the last line from (37) and substitute p and q with the concrete propositions from (38), we get (39-a), which is paraphrased in (39-b):

(39) a. \[ \exists w': \left[ p \text{ you go}(w') \right] & \left[ q \text{ I go}(w') \right] \]
\[& \neg \exists p' \in C [ p' \neq p \text{ you go} & \exists w'': p'(w'') & \left[ q \text{ I go}(w'') \right] ] \]

b. some world w′ is such that you go in w′ & I go in w′, & there is no p′ in C such that:
   • p′ does not equal the proposition that you go
   • there is a world w″ such that p′ holds in w″ & I go in w″

The contextually salient alternatives in C are all alternatives to the focused antecedent p, including p itself. So in a context in which besides the hearer’s going, Mary’s and Henry’s going are entertained as possibilities, C looks like this:

(40) C = \{ \left[ p \text{ you go} \right], \text{Mary goes}, \text{Henry goes} \}

When C is as in (40), the exclusive second conjunct of the truth conditions in (39) entails that there is neither a way for the speaker to go in the event that Mary goes, nor in the event that Henry goes. This captures necessity, which amounts to a negated existential claim. The negation comes from zhī’s exclusive second conjunct, existential force from you. Both of these components are overtly realized by zhī-you.

\[\text{ Springer}\]
The same goes for insufficiency. The prejacent-implication of \textit{zhi} re-asserts the existential claim coming from \textit{you}, delivering the respective first line of (39-a) and its paraphrase in (39-b): there is some world \(w'\) in which the hearer’s going coincides with the speaker’s. This allows there to be worlds in which the hearer goes, but the speaker doesn’t.

So under the assumptions made about \textit{zhi} and \textit{you} here, both insufficiency and necessity can be derived on the basis of overt material. This transparency should not be taken for granted: it has proven quite difficult to derive the necessity-implication exhibited by English \textit{only if} conditionals in a compositional fashion (von Fintel 1997; Herburger 2015, 2016, 2019). The quantificational force of such conditionals does not manifest itself overtly. Plain \textit{if}-conditionals come with sufficiency, hence warrant the assumption of having universal rather than existential force.\(^{15}\) But universal force cannot be maintained for \textit{only if} conditionals without further assumptions: the exclusive component of \textit{only} ends up negating universal rather than existential claims. Herburger (2019)’s take on this problem is to assume a principle called \textit{Conditional Duality} (CD): conditionals have existential force in negative (downward-entailing) environments, including the one created by \textit{only}, and universal force otherwise. Under the present account of \textit{zhi-you}, the latter wears existential force on its sleeves, so there is no need to resort to CD in dealing with it.

### 2.4 Monoclausal \textit{zhiyou}

The above analysis covers conditional, biclausal \textit{zhiyou}. Can it be extended to non-conditional, monoclausal \textit{zhiyou} as illustrated in the following example repeated from the introduction?\(^{16}\)

(41) Lao Wang zhi-you cha\(_F\) cai he  
Old Wang only-have tea\(_F\) CAI drink  
‘Old Wang only drinks tea\(_F\).’

Such an extension seems motivated in that the two kinds of \textit{zhiyou} seem to give rise to analogous implications. In the biclausal cases, the two relevant implications were necessity and insufficiency. These seem to carry over to monoclausal examples like (41). Necessity figures as plain exclusiveness here: the implication that Old Wang drinks nothing other than tea. Just like conditional \textit{zhiyou}’s necessity, exclusiveness can be shown to be uncancelable:\(^{17}\)

(42) a. Lao Wang zhi-you cha cai he  
Old Wang only-have tea CAI drink  

b. #ta youshi ye he guozhi  
#he sometimes also drink juice

\(^{15}\) This is to set aside the elegant treatment of conditionals as (singular) definite descriptions, a view that dates back to Stalnaker (1968, 1980).

\(^{16}\) Thanks to a reviewer for raising this question.

\(^{17}\) While three consultants judged the additive continuation in (42-b) to be fine, four saw (a slight variant of) it as problematic.
We also seem to have something analogous to insufficiency. (43-b) is an attempt at
an insufficiency-continuation, and it seems to work fine. One may think of a scenario
in which Old Wang disprefers certain kinds of tea, or sometimes simply doesn’t feel
like having tea at all.

(43)  a. Lao Wang zhi-you cha cai he
     Old Wang only-have tea CAI drink
b. ta youshi lian cha ye bu he
     he sometimes even tea also not drink
     ‘Sometimes he doesn’t even drink tea.’

As a reminder, the entry for bi(clausal) zhiyou repeated from above looked as
follows:

(44) \[
\llbracket zhiyou^{bi}_C \rrbracket = \lambda p_{s,t} \lambda q_{s,t}. \exists w': p(w') \& q(w') \\
& \& \neg \exists p' \in C [ p' \neq p \& \exists w'': p'(w'') \& q(w'') ]
\]

The task is to derive mo(noclausal) zhiyou from (44). The biclausal variant takes
two propositions, i.e. properties of worlds, and quantifies over both propositions and
worlds. The monoclausal one can be conceived of as taking two properties of individ-
uals, and as quantifying over both properties and individuals. Its semantic type would
then be that of a generalized quantifier, \(<et, (et, t)>\):

(45) \[
\llbracket zhiyou^{mo}_C \rrbracket = \lambda P_{e,t} \lambda Q_{e,t}. \exists x: P(x) \& Q(x) \\
& \& \neg \exists P' \in C [ P' \neq P \& \exists y: P'(y) \& Q(y) ]
\]

This says that there is an individual x of which properties P and Q both hold, and
that for no alternative property P' different from P is there an individual y that both P'
and Q are true of.

Here is a possible LF for the example in (41). P is now satisfied by the property of
being tea, Q by the property of being drunk by Old Wang.

(46) \[
\llbracket zhiyou^{mo}_C [P \text{ tea}_{e,t} ] \rrbracket [Q \lambda z. OW \text{ drinks } z ]
\]

Based on the entry in (45), we predict (46) to have the following truth conditions:

(47) a. \(\exists x: \text{tea}(x) \& \text{OW drinks } x \)
    & \& \neg \exists P' \in C [ P' \neq \text{tea} \& \exists y: P'(y) \& \text{OW drinks } y ]

b. some x is such that x is tea & Old Wang drinks x,
    & there is no P' in C such that:
    \(\bullet P' \) does not equal \text{tea}
    \(\bullet \)there is a y such that P' holds of y & Old Wang drinks y

In the respective first line of the a- and b-variants in (47), zhi’s prejacent-implication
figures as the existential claim that there is some x that is tea and that Old Wang drinks.
This is in line with the insufficiency-implication, some evidence of which we saw in (43): for something to be tea is not a guarantee for it to be drunk by Old Wang.

As already mentioned in Sect. 2.2, Sun (2021) notes a problem for any decompositional take on zhiyou, including this one: unlike you, zhiyou easily associates with foci on definite NPs, including proper names, as illustrated in (48).

(48) zhi-you [Lao Wang]F cai he cha
  only-have [Old Wang]F CAI drink tea
  ‘Only [Old Wang]F drinks tea.’

It is clear that the entry for monoclusal zhiyou given in (45) doesn’t work without further ado here, one potential solution being a type-shift of the NP in focus.18 Leaving it at that, I will turn to zhi-yao ‘only-need’ next. Here the modal following zhi has universal rather than existential force, and the relevant implications are the reverse of those for zhi-you: (minimal) sufficiency comes, necessity goes. The next section aims to capture both aspects of zhiyao’s meaning.

3 zhi-yao ‘only-need’

Zhiyao was stated above to come with minimal sufficiency: sufficiency plus scalar lowness of the antecedent p. p’s lowness is another implication we need to account for. Before getting into possible analyses, let’s take a brief look at the kind of scalar lowness zhiyao conveys.

3.1 Scalar lowness

Take the sequence of conditionals in (49). Only the second conditional has zhiyao in it. (49-b) is slightly odd, an intuition one may ascribe to a lowness-requirement coming from zhiyao: the only alternative antecedent provided in the context, that Mary comes, is logically weaker, hence scalarly lower, than the one zhiyao combines with, that Mary and John come. This conflicts with the assumed lowness-implication: Mary’s and John’s cannot count as low in the given context, given that the only alternative available is even lower.19

(49) a. yao-shi Mali lai, wo jiu kaixin
    need-be Mary come I JIU happy

18 Partee (2002/1986)’s ident-shift from type e to e, t offers itself here.

19 A consultant sees a plain contradiction between the two sentences. She writes that “in using [zhiyao], it is implied [Mary] alone will not make the speaker happy”. This contradiction may relate to a constraint observed by Grosz (2012): “while thresholds can be shifted downwards ..., they cannot be shifted upwards” (p. 147). In (49-b), zhiyao sets the threshold for speaker-happiness to be Mary’s and John’s (joint) coming. This contradicts the previous sentence, according to which Mary’s coming is by itself sufficient for the speaker to be happy. The very establishment of such a threshold is a different matter. Following ideas in Lai (1999) and Beck (2019), one might see threshold-readings as the effects of scalar implicatures: zhiyao(p)(q) conveys p to be the lowest condition to make q true. Anything even lower than p is scalarly implicated not to make q true.
It doesn’t seem far-fetched to ascribe zhi-yao’s scalar lowness to the zhi it contains: after all, only is well known for implying scalar lowness as well, cf. Guerzoni (2003), Grosz (2012), Liu (2017a), Greenberg (2019) a.o. In fact, the oddity seen in (49) disappears if zhi-yao is replaced by the conditional connective yao-shi ‘if’ (lit.: ‘need-be’), which contains yao, but crucially lacks zhi. The felicity of (50-b) can be ascribed to scalar lowness being absent from yaoshi.

(50) a. yao-shi Mali lai, wo jiu kaixin need-be Mary come I JIU happy
b. yao-shi Mali he Yuehan yiqi lai, wo ye kaixin need-be Mary and John together come I also happy

How low does zhiyao rank its antecedent? Greenberg (2019) defends the view that only requires its prejacent to be the lowest in the context—and not, say, lower than most of its available alternatives (Grosz 2012). In answering the question for zhiyao, we may vary a diagnostic applied by Greenberg (2019): the context makes salient a lower and a higher alternative, created here by lower and higher numbers of peaches eaten. If zhiyao wants the antecedent to rank lowest, then the saliency of a higher alternative does not suffice for zhiyao to be felicitous. This is in fact what is suggested by (51).20

(51) a. Context: John is full after eating one peach.
   Mary is full after eating five peaches.
   ?Xiao Wang zhi-yao (chi) san-ke tao-zi jiu bao le
   ‘Little Wang is full after eating as few as three peaches.’

Zhiyao is odd here because it wants three to be the lowest number of peaches eaten, but the context makes salient the even lower number one.21

To take stock: zhiyao comes with scalar lowness, in the sense that the antecedent p is implied to rank lowest on a contextually salient scale. (52) provides a lexical entry that captures this insight. Zhiyao is treated as a conditional operator with a special presup-
Following previous analyses of exclusive particles such as Liu (2017a)’s and Greenberg (2019)’s, it is treated as triggering a minimality-presupposition of sorts, (52-a): every alternative proposition \( p' \) that is different from the antecedent \( p \) ranks higher on a salient scale than \( p \). This presupposition coincides with the standard conditional assertion that all (closest) \( p \)-worlds are \( q \)-worlds, (52-b).

\[
\begin{align*}
\text{(52)} & \quad [\text{zhiyaoC}] = \lambda p\lambda q:
\begin{align*}
a. & \quad \forall p' \in C: (p' \neq p) \rightarrow (p <_C p'). \quad \text{henceforth: } \text{low}_C(p)
b. & \quad \forall w: p(w) \rightarrow q(w)
\end{align*}
\end{align*}
\]

Of course, (52) ignores the internal make-up of *zhi-yao* ‘only-need’. We want to derive this meaning in a compositional fashion. Before doing so, some more clarity needs to be gained about the two ingredients *zhi* and *yao*. A semantics for *zhi* has already been provided in 2.1. However, it seems worthwhile to refine it a bit in light of the role scalar lowness has come to play by now. After this refinement, some data involving *yao* will be considered to motivate its treatment as a necessity modal, hence as a universal quantifier over possible worlds.

### 3.2 *zhi*, again

In decomposing *zhi-yao*, one may want to assign the scalar lowness presupposition to *zhi*, enriching the semantics given for this exclusive particle in Sect. 2.1. Before doing so, let us briefly convince ourselves that *zhi* comes with lowness, independently of whether it combines with *yao* or not.

Take (53), with the numeral part of the object NP in focus. In addition to the positive and the exclusive implications we have already convinced ourselves of, two cherries are also conveyed to be low in number.

\[
\begin{align*}
(53) & \quad \text{Xiao Wang zhi chi-le liangF-ké yingtao} \\
& \quad \text{Little Wang only eat-ASP liangF-CL cherry} \\
& \quad \leadsto \text{LW ate two cherries} \quad \text{positive} \\
& \quad \leadsto \text{LW did not eat more than two cherries} \quad \text{exclusive} \\
& \quad \leadsto \text{two cherries are low in number} \quad \text{lowness}
\end{align*}
\]

Analogous to other exclusives, scalar lowness is sometimes *zhi*’s sole contribution. An example of this sort is (54). The context makes salient a ranking of fruits depending on their sizes. The *zhi*-sentence has the object noun *yingtao* ‘cherry’ in focus. The effect

\[
\text{Analogous to other exclusives, scalar lowness is sometimes *zhi*’s sole contribution. An example of this sort is (54). The context makes salient a ranking of fruits depending on their sizes. The *zhi*-sentence has the object noun *yingtao* ‘cherry’ in focus. The effect}
\]

22 This is reminiscent of Schulz (2014)’s treatment of the difference between indicative and subjunctive conditionals. She assumes the LFs of both types of conditionals to involve variants of the necessity operator \( \Box \). These variants only differ in their presuppositions, not in their assertions.

23 Liu (2017a) observes prefocal *jiu* to also pair scalar lowness with exclusiveness:

\[
\begin{align*}
(54) & \quad \text{jiu YuehanF hui shuo fayu} \\
& \quad \text{JIU JohnF can speak French} \\
& \quad \leadsto \text{the individual John constitutes a low number of people} \\
& \quad \leadsto \text{nobody other than John can speak French}
\end{align*}
\]

\[\text{\textcopyright Springer}\]
of *zhi* in this case is a so-called *rank order* reading (Coppock and Beaver 2014): a cherry is conveyed to be small in size. The exclusive implication that Little Wang didn’t eat anything besides a cherry is rather uninformative in this case, compared to the same sentence without *zhi*.\(^{24}\)

(54)  
\begin{align*}  
\text{a. Context: John ate a peach.} \\
\text{Mary ate a watermelon.} \\
\text{b. Xiao Wang zhi chi-le yi-ke yingtao}_F \\
\text{Little Wang only eat-ASP a-CL cherry}_F \\
\end{align*}

The propositional alternatives made contextually salient vary along the object noun (the fruit eaten).

(55) \[ C = \{ \text{LW ate} \begin{cases} 
\text{a cherry,} \\
\text{a peach,} \\
\text{a watermelon} 
\end{cases} \} \]

From this set of propositions, *zhi* excludes the peach- and the melon-alternatives, which, again, is hardly informative in that the prejacent is already about the single fruit that Little Wang ate. The lowness-implication that a cherry is small in size is compatible with default assumptions about fruits and their sizes: a cherry is smaller than both a peach and a watermelon.

As we did for *zhiyao* above, we can once again apply Greenberg (2019)’s diagnostic and check if it is indeed minimality we are dealing with, in the sense that *zhi* ranks its prejacent lowest among its alternatives. The data point in (56) suggests this to be the case. (56) varies the previous example to the effect that the fruit eaten by Little Wang, which is a peach this time, is no longer the smallest in the context: John ate a cherry, hence an even smaller one. This results in a certain oddity of the *zhi*-sentence, in spite of the fact that a larger fruit, the watermelon eaten by Mary, is also salient.\(^{25}\)

(56)  
\begin{align*}  
\text{a. Context: John ate a cherry.} \\
\text{Mary ate a watermelon.} \\
\text{b. #Xiao Wang zhi chi-le yi-ke taozi}_F \\
\text{#Little Wang only eat-ASP a-CL peach}_F \\
\end{align*}

Based on scalar lowness, we can now enrich our initial lexical entry of *zhi* with the scalar presupposition already assigned to *zhiyao* in the preceding subsection, making our working semantics for *zhi* look a bit more like the kind of *only* that Greenberg (2019) ascribes to Guerzoni (2003) and refers to as ‘hybrid’: the prejacent p

\(^{24}\) Five out of six native speakers accept (54-b) in its context. The other one commented he needed more context to use *zhi*. The issue, I suppose, lies in accent placement. With accent on the numeral yi ‘one’, the context does indeed not license the use of *zhi*.

\(^{25}\) Three out of five informants saw an issue with (56-b) in its context. A sixth also dispreferred *zhi*, but probably for reasons other than fruit size, cf. footnote 24.
is presupposed to rank lowest on a salient scale, (57-a). The assertion remains as previously assumed.26

\[(57) \quad \lceil \text{zhí}\rceil \, C = \lambda p:\]
\[\begin{align*}
\text{a.} & \quad \text{low}_C(p). \quad \text{p ranks lowest in C} \\
\text{b.} & \quad p \land \neg \exists p' \in C : p' \neq p \land p'
\end{align*}\]

Before moving on to yao, a quick note on the notion of scalar lowness and its relation to propositional strength. It is safe to assume a positive correlation between the two: the stronger a proposition, the higher on a scale. (54) provides an example where alternatives do not differ in strength, and the scale is purely pragmatic (related to fruit size).27 So scalarity is to some extent independent of entailment. A question already touched upon in footnote (21) is whether this independence is limited in the sense that entailment, if present, dictates the scalar ranking holding between alternatives. The following example suggests this to be the case. The context in (58-a) enforces a negative correlation between an effort and an entailment scale: the less peaches one eats, the more effort it takes; put differently: the stronger an alternative is, the lower it ranks on the effort scale. In this context, zhí infelicitously combines with the stronger proposition (58-b):

\[(58) \quad \begin{align*}
\text{a.} & \quad \text{Mary & John are having a strange contest: Who eats less peaches within half an hour?} \\
& \quad \text{At the end, Mary has eaten 2 peaches.} \\
& \quad \text{John was not that disciplined:} \\
\text{b.} & \quad \text{?ta \ zhi chi-le san-ke taozi} \\
& \quad \text{he only eat-ASP three-CL peach}
\end{align*}\]

This suggests that zhí disallows for a given entailment scale to be pragmatically overwritten.

### 3.3 yao ‘need’

The modal yao displays a striking range of uses reflected by the various translations it may receive. As seen in (59), yao may translate as ‘want’, ‘will’ or ‘need’.28

\[(59) \quad \begin{align*}
\text{a.} & \quad \text{wo yao yi tai xin shouji} \\
& \quad \text{I \ YAO one CL new cellphone} \\
& \quad \text{‘I want a new cellphone.’}
\end{align*}\]

---

26 The exclusive assertion conspires with the scalar presupposition to imply all higher alternatives to be false: It rejects all of p’s alternatives except for p itself. The scalar presupposition restricts these alternatives to be higher than p.

27 Recent work has proposed a silent at least operator, cf. Crnič (2011), Alonso-Ovalle and Hirsch (2018). Such an operator, squeezed between zhí and its prejacent, would convert such pragmatic scales into entailment-scales.

28 yao is translated as ‘need’ in (59-c). This may suggest that this is exactly the variant we find in zhí-yao, glossed as ‘only-need’ throughout this paper. Still, there is an apparent difference in modal flavor: yao seems to be deontic (rule-related) in (59-c). But as a conditional connective, zhí-yao is more plausibly to be seen as epistemic (knowledge-related) or doxastic (belief-related). In other words, to utter zhí-yao p q will often be a claim that p makes q true, given one’s knowledge or beliefs.
b. women mingtian yao qu lüxing
   we tomorrow YAO go travel.
   ‘We will go traveling tomorrow.’

c. ni yao zao dian shuijiao
   you YAO early a-little sleep
   ‘You need to sleep earlier.’

This range of uses is likely to be one of modal flavor rather than force, the underlying
core meaning being one of (strong) necessity, i.e. universal quantification over possible
worlds.

The fact that yao expresses the speaker’s desire to get a new cell phone in (59-a)
can be ascribed to its taking on a bouletic (desire-related) flavor. want is treated as
a universal quantifier over possible worlds under Heim (1992)’s influential analysis
defended by Rubinstein (2017), the latter also putting forth a unified view of necessity
modals and want-like attitude verbs. Yao supports such a view by virtue of instantiating
both classes of verbs.

The future use in (59-b) is expected under an account that treats the future auxiliary
will as a necessity modal, not as a tense operator, a view Iatridou (2000) ascribes to
Palmer (1986), among others.29

The data set in (59) suggests yao to be a necessity rather than a possibility modal, that
is, to differ from you ‘have’ in being a universal, rather than an existential, quantifier
over possible worlds. This is captured in (60), a lexical entry that otherwise resembles
the one given for modal you above: yao takes two propositions p and q, the first of
which restricts quantification over q-worlds. In the conditional uses (yao-shi, zhi-yao),
this slot is to be satisfied (in part at least) by the antecedent clause.30

(60)  [yao□] = λpλq. ∀w: p(w) → q(w)
   all p-worlds are q-worlds

This entry may leave a lot to be desired, but should suffice for given purposes.
Xie (2022) takes a closer look at both of the following issues: for one thing, the
range of modal flavors yao allows, to the exclusion of others; for another, the question

29 To be sure, future-oriented yao does not cover the same range of uses as will. To convey that something
will not happen in the future, one cannot simply negate yao:

(i)  a. mingtian yao xia yu
    tomorrow YAO fall rain
    ‘It will rain tomorrow.’
  b. *mingtian bu yao xia yu
     *tomorrow not YAO fall rain
     (intended:) ‘It won’t rain tomorrow.’

To be sure, (i-b) is not in and of itself ungrammatical. Five out of six native speakers accept it as an expression
of a desire for rain not to fall tomorrow. Such cases are interesting not only because they illustrate yao’s
neg-raising behavior, some more cases of which can be found below.

30 The domain of quantification is generally assumed to be subject to further restrictions one may vaguely
subsume under the term relevance. Both maximal similarity to the actual world and modal flavor play a role
here. To capture this, one could equip yao with more argument slots. A different option discussed by von
Fintel and Heim (2011b) is to have the antecedent combine intersectively with these additional restrictions,
allowing us to leave the number of arguments as is.
of whether *yao* is a weak or a strong necessity modal, though see the appendix for some preliminary discussion. Under a prominent view, necessity is weakened via a restriction on the domain: the set of worlds quantified over (von Fintel and Iatridou 2008; Rubinstein 2014; Vander Klok and Hohaus 2020). Under this view, *yao*’s force remains universal, no matter how we settle the question whether it is weak or strong. In other words, we can keep the entry in (60) no matter what.

### 3.4 A compositional challenge

We have defined the ingredients of *zhi-yao*; now comes the task of deriving its contribution in a compositional fashion. This turns out to be trickier than in the case of *zhi-you*.

An obvious first thing to do would be to treat *zhi-yao* in a parallel fashion as *zhi-you* is treated in Sect. 2.3. This requires, again, working with *zhi‘* a type-shifted variant of *zhi* that can take *yao* as an argument. The new *zhi* repeated in (61-a) differs from the old one in presupposing the prejacent to be low. The *zhi‘* derived from this is given in (61-b). Its R-slot is to be filled by *yao*, and what is presupposed to be low is its first propositional argument p, which is in focus.

(61) a. \[
[zhi]\lambda p: \text{low}_{C}(p). p & \neg \exists p’ \in C[ p’ \not= p & p’ ]
\]

b. \[
[zhi‘] = \lambda R_{p,(p,t)} \lambda p\lambda q: \text{low}_{C}(p). [zhi]\lambda p( p(q) ) & \neg \exists p’ \in C[ p’ \not= p & R(p’)(q) ]
\]

To apply *zhi‘* to *yao* is to insert the latter for R in the second line of (61-b). This is what happens in the third line of (62).

(62) \[
[zhi‘ yao□] = [zhi‘]( [yao□] )
= \lambda p\lambda q: \text{low}_{C}(p). [yao□]( p(q)) & \neg \exists p’ \in C[ p’ \not= p & [yao□](p’)(q) ]
= \forall w’: p(w’) \rightarrow q(w’) & \neg \exists p’ \in C[ p’ \not= p & \forall w’’: p’(w’’) \rightarrow q(w’’)]
\]

What this analysis derives is, for one thing, the antecedent p’s presuppositional evaluation as low. For another, the prejacent-implication (the first conjunct of the assertion) ensures p’s sufficiency for q. Both of these aspects are welcome. At the same time, however, we end up with there being no salient alternative p’ that is both different from p and suffices for q. In other words, the second conjunct fails to derive the intuitive meaning of *zhiyao*, which is at least neutral regarding the question of whether some alternative antecedent p’ suffices for q, if there isn’t even an additive implication that any such antecedent verifies q as well, as will be argued below. These undesirable results are reminiscent of challenges von Fintel and Iatridou (2007) (henceforth: vF&I) tackle in their (de)compositional analysis of *only have to*, which is hence worth taking a look at.

vF&I’s working example is the following:

(63) To get good cheese, you only have to go to the North End!

von Fintel and Iatridou (2007)
Just as in the case of zhi-yao, an exclusive particle (only) and a necessity modal (have to) conspire to convey minimal sufficiency: roughly, that going to the North End is an easy means to get good cheese. The analysis vF&I end up proposing crucially involves a decomposition of only into a negation, called ne here, and an exceptive component que, which asserts something other than the prejacent to be true:

\[(64)\] vF&I’s only-decomposition

\[\text{only}_C \rightarrow \text{ne}_- + \text{que}_C\]

In addition, que is assumed to split from ne below the necessity modal □ denoted by have to. What is crucial for present purposes is that □ is taken by vF&I to be silently restricted by the proposition denoted by the infinitival purpose clause to the left, to get good cheese. We start out with a highly simplified LF like (65-a), outscoped by only, with the purpose clause proposition acting as a silent restrictor to □. After decomposition and que’s lowering under □, we get (65-b): que takes immediate scope with respect to the proposition φ, that you go to the North End. Its truth conditions are informally paraphrased as in (65-c).

\[(65)\] vF&I on (63), strongly simplified

a. only\(_C\) [ □ (\(\phi'\) [silent] get good cheese) (\(\phi\) go to the NE) ]

b. \(-\square\) (\(\phi'\) [silent] get good cheese) ( que\(_C\)(\(\phi\) go to the NE) )

c. not all good-cheese worlds are such that you do anything other in them than going to the North End

What matters most for given purposes is the combinatorics involving □ and its arguments (Hole 2004, 2006). For one thing, zhiyao seems to differ from only have to by (sometimes) acting as a genuine conditional connective, combining with two overt propositions. Here is a possible Mandarin version of (63), which closely resembles an example presented in Hole (2006):

\[(66)\] ni zhi-yao qu North End jiu neng dedao hao-de nailao
you only-need go North End JIU can get good-DE cheese

From (66), we can derive an LF like this:

\[(67)\] [ zhiyao\(_C\) [\(\phi\) go to the NE] ] [\(\phi'\) good cheese ]

\(\text{LF for (66)}\)

31 This move is motivated by languages like French, where exclusiveness tends to find its discontinuous expression in a negation (ne) and an exceptive (que) surrounding the main verb.

32 A more accurate analysis would have the purpose clause proposition be assigned to a propositional variable restricting □, cf. von Fintel (1994).

33 To be sure, zhiyao can be used to form a structurally more similar translation of (63):

\[(i)\] xiangyao hao-de nailao, ni zhi-yao qu North End
want good-DE cheese you only-need go North End
‘If you want good cheese, you only have to go to the North End.’

But this looks like an anankastic conditional (von Fintel and Iatridou 2004; von Stechow 2006), and zhiyao doesn’t serve as a connective here.
Comparing the LFs in (67) and (65-b), it seems that the order in which *zhīyào* combines with the two propositions in question is the reverse of that in which *only have to* does: [φ′ get good cheese], the restrictor of *have to*, is the nuclear scope of *zhīyào*, and vice versa, the nuclear scope of *have to*, [φ go to the NE], is *zhīyào*’s restrictor.34

Here is a summary of this combinatory reversal:

(68) ... □ (φ′) (φ) for *only have to*  
     ... □ (φ) (φ′) for *zhīyào*

Mandarin (66) evokes a temporal succession between restrictor and nuclear scope just as we tend to find it in ordinary conditional constructions: [φ go(ing) to the NE] temporally (and causally) precedes [φ′ get(ing) good cheese].35

However, Hole (2006) takes steps towards a vF&I-style treatment of *zhīyào*: for one thing, he assumes the latter to contribute negated universal quantification, albeit over focus alternatives rather than possible worlds. For another, he assumes the order in which *zhīyào* takes its arguments to reverse at LF: the matrix clause [φ′ get good cheese], rather than acting as the nuclear scope, is mapped to *zhīyào*’s restrictor. As a result, the linear order of arguments is in fact vF&I’s, φ′ > φ, and the resulting LF looks something like this:

(69) [zhīyào C [φ′ get good cheese ]] [φ go to the NE]  
    ≈ LF for (66) following Hole (2006)

By contrast, the analysis to be spelled out in the following subsection will preserve surface order and take the LF in (67) to be the input to semantic interpretation, even though another reversal is going to happen.36

### 3.5 Inverting *zhǐ-yào*

This subsection pursues an inverse scope treatment of *zhǐ-yào*, which is shown to deliver desirable results. *zhǐ*’s exclusive force becomes innocuous, scoping below *yào* and above the antecedent. There is some prima facie motivation for such an analysis considering that *yào* appears to be a *neg-raising* modal: a negation that precedes *yào*34

34 What is ignored from (66) is the possibility modal *nèng* ‘can’ in the consequent. In line with Hole (2006)’s paraphrase of his example, I assume *nèng* not to replace *zhīyào* as the construction’s centerpiece, but to take narrow scope with respect to the consequent φ′. This derives a reading on which φ ensures φ′’s mere *possibility*. So the sentence ends up being about how easily this possibility comes about, in line with its intuitive interpretation: As vF&I observe, going to the North End in and of itself won’t bring one into the possession of good cheese. The hardest part may be over, but one still has to enter a store, look for good cheese in it and suchlike. *Nèng* can be seen as reflecting the need for these additional steps.

35 This matching between temporal and linear precedence is natural. A conditional paraphrase of English (63) sounds odd unless we form an anankastic conditional out of it, cf. footnote 33:

(i) If you ??(want to) get good cheese, you only have to go to the North End

To be sure, Hole (2006)’s remarks on *zhīyào* are preliminary, and he explicitly leaves a deeper investigation to the future: ‘The recalcitrant fact is that it is not obvious how the overall type of focus quantification ... (~∀) can be matched with the ‘only’-word [zhǐ] plus the necessity modal [yào] in the subordinate clause’ (Hole 2006: 372; bracketed additions added).

 Springer
on the surface appears to scope below it at LF. The following song line may serve as
an illustration. It clearly reads as a prohibition, not as a permission not to pick wild
flowers along the road, despite logical compatibility of these two readings

(70) lu-bian de ye hua ni bu yao cai
road-side PRT wild flower you not need pick
‘You {may not/*don’t need to} pick the wild flowers along the road’
{□¬/*¬□}

Exclusive particles negate (certain) alternatives. So zhi, too, is a negative item of
sorts. And if overt negation scopes below yao, one might expect zhi to do so as well.
Some more neg-raising data are provided in section two of the appendix.

In deriving a lexical entry along these lines, we essentially take the step from (71-a)
to (71-b).

(71) [[zhiyaoC]] = λpλq.
   a. [[zhiC][[□]]](p)(q)
   b. [[□]][[zhiC](p)](q)

The configuration we get is reminiscent of one investigated in depth by Grosz
(2012): minimal sufficiency conditionals in which only appears in a conditional
antecedent, conveying the proposition denoted by the latter to rank low on a scale. A
German example involving nur ‘only’ is given in (72-a), an LF for it in (72-b).

(72) a. Wenn nur zweiF Leute kommen, spielen wir schon Siedler.
    if only twoF people come play we already Settlers
    ≈ ‘It only takes 2 ppl for us to play Settlers’ cf. Grosz (2012): 235
b. [□][ only [ 2F come ] ] we play Settlers

The zhi we have in (71-b) is no longer the typeshifted variant zhi’, but the simpler
one. Given the derivation to follow, it now makes sense to define an intensionalized
version of this simpler zhi, one that takes a world argument w in addition to the
prejacent:

(73) [[zhiyaoC]] = λpλw: lowC(p). p(w) & ¬∃p’ ∈ C: p’≠p & p’(w)

Having defined this intensional zhi, we can continue to work out our lexical entry
based on the structure derived in (71-b). The antecedent is again presupposed to rank
low on a scale, (74-a). The final assertion is in the second line of (74-b) and boils down
to this: in all worlds w’ in which p and no other salient p’ holds, q holds as well.

(74) [[zhiyaoC]] = λpλq:
   a. lowC(p).
   b. ∀w’: [ [[zhiC](p)](w’) → q(w’)]
    [ λw. p(w) & ¬∃p’ ∈ C: p’≠p & p’(w) ](w’) → q(w’)
    [ p(w’) & ¬∃p’ ∈ C: p’≠p & p’(w’) ] → q(w’)

@Springer
Let us apply this semantics to a concrete example, repeated from (2-a):

(75)  
\[ \text{zhi-yao san zhi maomi lai, ta jiu kaixin} \]
\[ \text{only-need 3 CL cat come she JIU happy} \]

The two implications we would like to capture are:

- sufficiency: three cats make her happy
- lowness: three cats are low in number

Our example gets the following LF:

(76)  
\[ \left[ \left[ \text{zhiyao}_C \left[ \phi_3 \text{ cats come} \right] \right] \left[ \phi' \text{ she’s happy} \right] \right] \]

LF for (75)

If focus is on the numeral, the alternatives in C vary according to the number of cats showing up:

(77)  
\[ C = \{ \left[ \phi_3 \text{ come} \right], 4 \text{ come}, 5 \text{ come} \} \]

The interpretation of (76) can now be derived by taking the entry in (74) and inserting \[ \left[ \phi_3 \text{ cats come} \right] \] and \[ \left[ \phi' \text{ she’s happy} \right] \] for p and q, respectively.

(78)  
\[ \left[ \left( 76 \right) \right] \]

a. presupposes
\[ \text{low}_C(\phi_3 \text{ come}) \]
b. asserts
\[ \forall w': \left[ \left[ \phi_3 \text{ come}(w') \right] \land \lnot \exists p' \in C: p' \neq \left[ \phi_3 \text{ come} \right] \land p'(w') \right] \rightarrow \left[ \phi' \text{ she’s happy}(w') \right] \]

Presupposition and assertion can be paraphrased as follows.

(79)  
\[ \left[ \left( 76 \right) \right] \]

a. presupposes
three cats are low in number
b. asserts
for every world w': if
- three cats come in w' &
- there is no p' in C such that:
  - p' does not equal the proposition that 3 cats come &
  - p' is true in w'.

she’s happy in w'

The assertion can be simplified as follows:\[38\]

---

\[37\] The alternatives for zhiyao do not have to form an entailment scale as they do in (77). A nonlogical scale is equally conceivable. This is illustrated in Wimmer (2021a) for (what are assumed to be) minimal sufficiency conditionals in Mandarin and German.

\[38\] That’s because zhi, apart from locally asserting \[ \phi_3 \text{ cats come} \], excludes all of \( \phi \)'s non-identical alternatives, which in our case involve numbers higher than three. As a consequence, antecedent-worlds are such that three and no more than three cats come in them.
(80) **assertion**

for every world \( w' \): if exactly three cats come in \( w' \), she’s happy in \( w' \)

On a closer look at the assertion, a potential complication regarding sufficiency arises: the pronominal referent is asserted to be happy in worlds in which exactly three cats come. But we would like her to be happy in any kind of world in which three cats come, including worlds in which four or five come. In other words, under the derived assertion the coming of three cats does not actually seem to be sufficient for her to be happy.

This points to a potential problem in the characterization of *zhiyao*-conditionals as implying sufficiency. It does not seem to reveal a problem with the analysis itself. *Zhiyao*-conditionals can be shown to be nonmonotonic just like other conditionals have been observed to be (von Fintel 2011a; Liu 2017b). This is suggested by the following Sobel-sequence, whose first member is a *zhiyao*-conditional:

(81) a. zhi-yao Mali lai wo jiu kaixin
    only-need Mary come I JIU happy

b. dan Mali he Yuehan yiqi lai, wo jiu bu kaixin le
    but Mary and John together come I JIU not happy ASP

The *zhiyao*-conditional in (81-a) does not entail just any kind of world in which Mary comes to ensure the speaker’s happiness, or else the continuation in (81-b) would come out odd. This is predicted by the present analysis insofar as it ascribes a weaker assertion to (81-a): that the speaker is happy as long as no one other than Mary comes. This is fully compatible with her no longer being happy as soon as both Mary and John come.

Still, *zhiyao*-conditionals do seem to trigger an additive, albeit cancelable, inference of sorts, to the effect that any stronger proposition than the prejacent-antecedent will verify the consequent as well, and we do get sufficiency after all, even if it is not part of *zhiyao*’s lexical semantics. It is probably by virtue of this additive inference that (82-b) can be understood as an affirmative answer to (82-a):39

(82) a. A asks: Are you happy if Mary & John come?
   B replies:
   b. zhi-yao Mali lai wo jiu kaixin
      only-need Mary come I JIU happy
   \(~\ Finland ~\) B is also happy if Mary & John both come

The following subsection tackles this additive inference. In so doing, it also captures sufficiency, which seemed absent from the truth-conditions derived in this subsection.

---

39 Four out of five informants have this intuition. Three out of these four also consider it a clearer answer than if *yaoshi* ‘if’ is used instead of *zhiyao*. A reviewer brings up the possibility that this might be because *yaoshi* can have a contrastive topic instead of a focus in its scope, while *zhiyao* cannot.
3.6 Additivity

The additive inference just mentioned is plausibly licensed by the scalar presupposition triggered by zhiyao, according to which any alternative p′ but the antecedent p itself is stronger than p. Given the assertion that all worlds in which nothing but p holds are worlds in which the consequent q holds, it is easy to infer that any other p′, presupposed to be stronger than the q-verifying p itself, will verify q as well.

It is not by coincidence that this kind of reasoning is reminiscent of Rullmann (1997)’s regarding the additivity of even. More recent work such as Ćrnić (2011, 2012) returns to the more traditional view that even triggers an additive presupposition. This crucially includes Panizza and Sudo (2020), who propose that even is overtly or covertly involved in minimal sufficiency readings of English just. If we follow this line of work, the additivity (and sufficiency) of zhiyao can be derived by inserting an even-operator on top of a zhiyao-conditional’s LF. This operator asserts nothing, but triggers two presuppositions. One of these two is an additive one, a universal variant of which is provided in (83-b).

(83) \[ \text{even}_C(p) \] presupposes
a. p to be the least likely alternative in C scalar presupposition
b. all q in C other than p to be true additive presupposition

So we may enrich the LF for (75) given in (76) by placing silent even on top. The latter associates with the same focus as zhiyao, even though its alternatives are structurally more complex.\(^{40}\)

(84) \[ \text{even}_C \psi [ \text{zhiyao}_C \phi \text{three cats come} ] \phi' \text{she (jiu) happy} ] \]

LF for (75)

Silent even takes the entire zhiyao-conditional \(\psi\) as its prejacent, and presupposes all of \(\psi\)’s non-identical alternatives q to be true, given (83-b):

(85) \[ \text{[} (84) \text{]} \] presupposes all q in \(C'\) other than \(\psi\) to be true, where \[ \text{[} \psi \text{]} = \text{[} \text{zhiyao}_C \phi \text{three come} ] \phi' \text{she’s happy} \]

Since even’s alternatives in \(C'\) and zhiyao’s in C associate with the same focus, they vary along exactly the same lines, in this case the numeral.

(86) \[ a. \ C = \{ \text{three come}, \text{four come}, \text{five come} \} \]
\[ b. \ C' = \{ \psi \text{zhiyao}_C(\phi \text{three come})\phi', \text{zhiyao}_C(\text{four come})(\text{happy}), \text{zhiyao}_C(\text{five come})(\text{happy}) \} \]

\(^{40}\) The configuration at hand is essentially the same as one that I assume for German minimal sufficiency conditionals in Wimmer (2021b). Panizza and Sudo (2020) credit Krifka (1991) for the view that only may pass on alternatives for even to work with. Bade and Sachs (2019) (discussing silent exhaustification under embedding) point out that under Rooth (1992)’s classical view of focus association, the lower operator is predicted to cause an intervention effect.
For the sake of simplicity, let us informally paraphrase the alternatives in $C'$ along the lines of (80):

$$C' = \begin{cases} [\psi \text{ in all worlds in which exactly three come, she’s happy}]; \\ \text{in all worlds in which exactly four come, she’s happy}; \\ \text{in all worlds in which exactly five come, she’s happy} \end{cases}$$

According to the presupposition in (85), any $C'$-alternative other than $\psi$ holds true: the coming of exactly 4 cats and the coming of exactly 5 cats are both presupposed to make her happy. Any alternative antecedent in $C$ is thus presupposed to make the consequent true, which in the case at hand means that any relevant number of cats higher than 3 is presupposed to make her happy.

If this is on the right track, what remains puzzling is the ease with which zhiyao licenses silent even. This cannot be taken for granted, as is revealed by a look at German conditionals of the form if only $p \ q$. Grosz (2012) observes that such conditionals are in principle ambiguous between an exclusive and a minimal sufficiency reading, and that it usually takes an overt particle like even in the consequent for the minimal sufficiency reading to arise. Here is a variant of the examples he provides:

$$\text{Sie ist (selbst) froh, wenn nur dreiKatzen kommen.}$$

she is (even) glad if only 3 cats come

In the absence of even, there is a preference for an exclusive reading, according to which she’s implied to no longer be happy if more than three cats show up. even-insertion, by contrast, enforces the minimal sufficiency reading that any number of cats higher than three will make her at least as happy as three do.41

Mandarin zhiyao is not ambiguous in the same way as wenn nur ‘if only’. It has a clear minimal sufficiency reading, which does not require any special particle in the consequent to be enforced. To be sure, the consequent has jiu in it, but its presence seems to be dictated by the very presence of zhiyao, possible exceptions taken aside (Hole 2004):

$$\text{zhi-yao ni lai, wo *(jiu) kaixin}$$

only-need you come I *(JIU) happy

I hope for future work to shed some light on why zhiyao and wenn nur come apart in this way.

### 3.7 Monoclausal zhiyao?

As mentioned in the introduction, zhiyao has potential monoclausal uses like zhiyou does, even though the situation is not as clear:42

[41] Grosz (2012) takes Heim (1991)’s conversational maxim Maximize Presupposition to play a role here, whereas Wimmer (2021b) argues for the competing theory Obligatory Implicatures (Bade 2016).

[42] The involvement of shi ‘be’ may raise the suspicion that (90) is actually a conditional with a ‘clefted’ antecedent, with a paraphrase like as long as it’s tea, Old Wang drinks it. The viability of such a reductionist analysis has to be left open here.
What (90) seems to convey is that Old Wang is fairly unselective when it comes to tea. The two (non-)implications we ascribed to biclausal *zhīyào*, sufficiency and non-necessity, seem to roughly carry over. This is suggested by the continuations in (91). The sufficiency-denying continuation in (91-a) feels odd to four out of seven Mandarin speakers. By contrast, seven speakers accept the necessity-denying continuation in (91-b).43

(91) a. #tā yǒushí lián chá yě bù hé
   sometimes even tea also not drink
   ‘Sometimes he doesn’t even drink tea.’

b. tā yǒushí yě hé guòzhī
   he sometimes also drink juice
   ‘Sometimes he also drinks juice.’

In analogy to how *zhīyǒu* was treated above, it seems tempting to assume a type-shifted variant of our bi(clausal) *zhīyào* to be at work in (90). As a reminder, this is what the latter looks like:

\[
\begin{align*}
\text{(92)} & \quad [\text{zhīyào}_b C] = \lambda p \lambda q : \text{low}_C(p), \\
& \quad \forall w' : [ p(w') & \land \lnot \exists p' \in C : p' \neq p & \land p'(w') ] \rightarrow q(w')
\end{align*}
\]

The mo(noclausal) counterpart would then again be a quantifier over individuals which takes two properties:

\[
\begin{align*}
\text{(93)} & \quad [\text{zhīyào}_m C] = \lambda P_{e,t} \lambda Q_{e,t} : \text{low}_C(P), \\
& \quad \forall y : [ P(y) & \land \lnot \exists P' \in C : P' \neq P & \land P'(y) ] \rightarrow Q(y)
\end{align*}
\]

This monoclausal variant would then be involved in an LF for (90):

\[
\begin{align*}
\text{(94)} & \quad [\text{zhīyào}_m C \text{ (be) tea}_{e,t} ] (jīu) [ \lambda z. \text{OW drinks } z ]
\end{align*}
\]

LF for (90)

Based on the entry in (93), we predict (94) to presuppose (95-a), and to ‘assert’ (95-b):

\[
\begin{align*}
\text{(95)} & \quad a. \text{} \quad \text{presupposition} \\
& \quad \text{low}_C(\text{tea}) \\
& \quad b. \text{} \quad \text{assertion} \\
& \quad \forall y : [ \text{tea}(y) & \land \lnot \exists P' \in C : P' \neq \text{tea} & \land P'(y) ] \rightarrow \text{OW drinks } y
\end{align*}
\]

The property of being tea is presupposed to rank low on a scale, and all y that have no other property P’ but being tea are asserted to be drunk by Old Wang. One question that arises is how a property can be thought of as low in the first place. For

43 Two additional speakers suggest to add [semantically harmless] material to either (90) or the necessity-denying continuation in (91-b), but see no contradiction between them either.
concreteness, let us put (90) into a scenario in which someone asks if Old Wang drinks \textit{da hong pao} tea, which seems to be quite expensive. As a result, we are dealing with the following two alternatives:

\begin{equation} \begin{aligned} C &= \{ \text{tea}, \text{da hong pao tea} \} \end{aligned} \end{equation}

One may see the two elements in C as forming a value-scale, with \textit{da hong pao} constituting the upper end. By virtue of its genericity, the focus predicate cha ‘tea’ is interpreted as ranking at least as high on the scale as the cheapest tea one can think of. The denotation of the focus predicate becomes (or rather remains) a superset of the denotation of its only alternative.\footnote{The focus predicate’s genericity ensures supersethood either way. The reason for invoking an \textit{at least} interpretation here is that genericity itself does not seem to ensure lowness: if the other, more specific alternative were the next best tea available, the generic predicate \textit{tea} could not plausibly be construed as scalarly lower than that alternative, which shows that tea value necessarily factors into the way the scale is construed. A more explicit account might include a silent \textit{at least} operator, cf. Crnič (2011), Alonso-Ovalle and Hirsch (2018).} It is in terms of this superset-relationship that I consider lowness to be satisfied here, in analogy to the superset-relationship between a weaker and a stronger proposition.

As for the assertion in (95-b), it says that any y of which no predicate \(P'\) other than \textit{tea} holds—hence any y that is not (also) \textit{da hong pao} tea—will be drunk by Old Wang. This seems intuitive enough. So while the formal details remain to be worked out, the present take on biclausal \textit{zhiyao} inspires a plausible treatment of what might be its monoclausal counterpart.

\section{Interaction with quantificational adverbs}

One of this paper’s core observations was conditional \textit{zhiyao’s} and \textit{zhiyou’s} opposition regarding whether or not the antecedent is implied to be sufficient for the consequent:

\begin{equation} \begin{aligned} \text{zhiyao} &\quad [+suff] \\ \text{zhiyou} &\quad [-suff] \end{aligned} \end{equation}

This opposition in terms of sufficiency was explained on the basis of differences in quantificational force:

- \textit{zhiyao} is taken to bring universal force, given \textit{yao} ‘need’
- \textit{zhiyou} is taken to bring existential force, given \textit{you} ‘have’

As a reviewer points out, this explanation rests on a nonstandard assumption regarding the source of a conditional’s quantificational force. The present account locates it in the respective connective. But on the so-called \textit{restrictor view} (Lewis 1973; Kratzer 1986; von Fintel and Heim 2011b), force comes from a modal or quantificational adverb in the consequent, henceforth referred to as q-items, and all a conditional connective does is to introduce the antecedent as a restriction on the operator denoted by that item. It is hence an interesting question to ask how \textit{zhiyao} and \textit{zhiyou} interact with a q-item that doesn’t match their assumed force—more concretely, when
(98)  a. a zhiyao-conditional’s consequent contains an existential q-item
    b. a zhiyou-conditional’s consequent contains a universal q-item

The same reviewer exemplifies both combinations, and checks whether they can be felicitously followed up by denying sufficiency.

Following (99-a), which instantiates (98-a), sufficiency is felicitously denied in (99-b): because of you keneng ‘possibly’ and despite zhiyao, diligence is no longer implied to suffice for success.

(99)  a. zhi-yao nuli jiu you keneng chenggong
       only-need diligent have possibility succeed
    b. dangran nuli-le ye you keneng bu chenggong
       of course diligent-asp also have possible not succeed

The same sufficiency-denying continuation seems to cause infelicity following (100-a), which instantiates (98-b): because of yiding ‘necessarily’ and despite zhiyou, diligence is implied to be not only necessary, but also sufficient for success.

(100)  a. zhi-you nuli cai yiding hui chenggong
       only-need diligent necessarily will succeed
    b. #dangran nuli-le ye you keneng bu chenggong
       #of course diligent-asp also have possible not succeed

In other words, the mismatching q-items in the consequents reverse the featural ascriptions given in (97). Does this follow from the present analysis, or does it indicate the need to treat zhiyou- and zhiyao-conditionals in terms of the restrictor view instead?

Under the present analysis, the q-items take narrow scope with respect to the consequent, such that their contribution remains in the scope of zhiyao and zhiyou, respectively. This turns out to be less problematic for the zhiyao-case in (99-a) than for the zhiyou-case in (100-a).

As for (99-a), we get an LF that looks roughly as in (101). The arguably most important part is the existentially modalized consequent $\phi'$. $\diamond$ is supposed to represent the denotation of the complex expression you-keneng here, a compositional treatment of which was sketched in Sect. 2.2.

(101)  \[ zhiyaoC [\phi\text{ diligent}] ] [\phi' (succeed) ] \]  

The predicted truth-conditions look as in (102), and say that in all worlds $w'$ in which you are diligent and nothing else (say, talented), there is a possibility for you to succeed.

(102)  truth-conditions for (101):

\[
[ zhiyaoC [\phi\text{ diligent}] ] (\phi' (succeed)) \\
= \forall w': [ [\phi\text{ diligent}] (w') & \neg \exists p' \in C: p' \neq [\phi\text{ diligent}] & p'(w') ] \rightarrow [\phi' (succeed) ] (w')
\]

So under the present account, the lack of sufficiency is actually predicted, in the sense that $\diamond$, spelled out as youkeneng, has a weakening effect. Success is not a reality.
in any of the worlds \( w' \) universally quantified over; it’s just the possibility of success that is ensured in all of these worlds.

By contrast, (100-a) poses a much trickier challenge. The adverbial \( yiding \) ‘necessarily’ instantiates a necessity modal, \( \Box \). Now it’s the latter to take narrow scope with respect to the consequent \( \phi' \):

(103) \[ zhiyouC [\phi \text{ diligent}] [\phi' \Box(\text{succeed})] \] LF for (100-a)

With the universal \( \Box \) being within the scope of existential \( zhiyou \), we fail to capture both sufficiency and necessity. The first conjunct of the truth-conditions derived in (104) says that in some diligent world \( w' \), success is a necessity. Given that necessity is non-actual, this even weakens the existential claim ascribed to \( zhiyou \)-conditionals without \( yiding \). The second conjunct, once successful at capturing necessity, now says that in no \( w'' \) in which you are something other than diligent do you necessarily succeed. This is undesirable in that it leaves open the possibility for you to succeed in some such \( w'' \).

(104) **truth-conditions for (103):**
\[
\begin{align*}
\llbracket zhiyouC \rrbracket (\phi \text{ diligent})(\phi' \Box(\text{succeed})) \\
= \exists w': [\phi \text{ diligent}](w') & [\phi' \Box(\text{succeed})](w') \\
& \neg \exists p' \in C [ p' \neq [\phi \text{ diligent}] & \exists w'': p'(w'') & [\phi' \Box(\text{succeed})](w'') ]
\end{align*}
\]

What we want instead is a hybrid approach like (105): in the first conjunct of the assertion, \( \Box \) takes over as the restrictor view has it, supplying universal quantification and ensuring sufficiency, but is completely ignored in the second conjunct, where \( zhiyou \) makes its negated existential claim, ensuring necessity.

(105) **desired truth-conditions for (103):**
\[
\begin{align*}
\forall w': [\phi \text{ diligent}](w') & [\phi' \text{ succeed}](w') \\
& \neg \exists p' \in C [ p' \neq [\phi \text{ diligent}] & \exists w'': p'(w'') & [\phi' \text{ succeed}](w'') ]
\end{align*}
\]

What we would like is a principled way of getting this result, which is a challenge I have to leave to future work. If there is any consolation to be found, it’s that at least as far as sufficiency is concerned, a definitely in an only if conditional’s consequent seems to have the same sufficiency-enforcing effect, as can be seen from the infelicity of the sufficiency-denying continuation in (106-b).

(106) Only if you work hard do you definitely\( \Box \) succeed,
\[
\begin{align*}
a. \text{ but even if you don’t work hard, you might still succeed.} \\
b. \text{?but even if you work hard, you might still fail.}
\end{align*}
\]

As far as I can see, (106) poses a similar challenge for Herburger (2019)’s treatment of only if conditionals as having existential force, at least as far as the emergence of sufficiency is concerned. At the same time though, the necessity-denying continuation in (106-a) seems to work, and this absence of necessity was predicted for the Mandarin case in (104).
To sum up this section, the present account correctly predicts zhiyao’s interaction with a non-matching q-item, but gets into some trouble when it comes to zhiyou’s, which seems to call for a hybrid approach of sorts.

5 Conclusion

This paper offered a decompositional analysis of Mandarin zhi-you ‘only-have’ and zhi-yao ‘only-need’, with the main focus on their biclausal uses as conditional connectors, but possible extensions to monoclausal uses. The following logical structures were proposed, assuming that you instantiates an existential modal (♦) and, less controversially, yao a universal one (□):

(107)  
\[
\begin{align*}
\text{zhi-you ‘only-have’} & \quad (\text{only}(\Diamond))(p)(q) \\
\text{zhi-yao ‘only-need’} & \quad \Box(\text{only}(p))(q)
\end{align*}
\]

If this account is on the right track, then zhi-you and zhi-yao are special by virtue of transparently wearing their respective modal force on their sleeves. The same cannot be said of English if-conditionals, whose modal force has to be posited, at least in the absence of modals in the consequent.

I conclude with some (more) remaining issues, both of which touch on scalarity.

only if conditionals and scalarity

In Sect. 3.2, zhi was endowed with a presupposition of scalar lowness, in line with many existing only-accounts. This lowness-presupposition was only discussed in the context of zhiyao, not of zhiyou. So, how does it factor into a proper treatment of the latter?

It is worth noting in this respect that zhiyou-conditionals tend to have scalar readings. The following example is a case in point.

(108)  
\[
\begin{align*}
a. & \quad \text{Among these cats,} \\
b. & \quad \text{ta zhi-you san zhi lai cai hui kaixin}
\text{she only-have three CL come CAI will happy}
\end{align*}
\]

Such examples seem to convey five cats to be high in number, so quite the opposite of lowness. Given this highness-effect, it seems that salient alternatives all involve numbers lower than three, and that the following alternatives are active by default:

(109)  
\[
C = \{ \text{three come, two come, one comes} \}
\]

It would be desirable to ascribe this highness-effect to zhi’s compositional interaction with a scale-reversing (or downward-entailing) operator, such that its lowness converts into highness qua focus association across such an operator, which is an assumption Crnič (2012) makes for conditionals in the scope of only. The lowness presupposition would shape the alternatives such that those involving higher numbers
are ignored, an effect Krifka (2000) ascribes to other scalar particles. But under the present analysis, \textit{zhiyou} combines with the focus-containing antecedent directly, not with the conditional as a whole, and the structural simplicity of the alternatives in (109) reflects this. And even if the alternatives were entire conditionals, as they are assumed to be under all approaches to \textit{only if} I am aware of, no scale-reversing, but a scale-preserving operator would be involved: the prejacent-conditional outscoped by \textit{zhi} would be an existential claim rather than a universal one, given the assumed contribution of \textit{you} ‘have’, and mean something like ‘\textit{some} world in which three cats come is a happy world’. This asymmetrically entails, and is hence stronger than, the alternative claims of there being a happy world with \{two, one\} cat(s) showing up in it. So it is far from clear how the prejacent-conditional could be construed as weak with respect to these alternatives, and how \textit{zhi}’s lowness-presupposition could give rise to highness-effects.

\textit{jiu} and \textit{cai}

\textit{zhiyao} has to be followed up by the particle \textit{jiu} in the consequent, \textit{zhiyou} by the particle \textit{cai} (Hole 2004, 2017):

\begin{equation}
(110) \begin{align*}
\text{a. } & \text{zhi-yao ni qu wo *(jiu) qu only-need you go I *(JIU) go } \\
\text{b. } & \text{zhi-you ni qu wo *(cai) qu only-have you go I *(CAI) go }
\end{align*}
\end{equation}

And while \textit{jiu} and \textit{cai} cannot be deleted from the conditionals in (110), \textit{zhiyao} and \textit{zhiyou} can. The meaning seems to be largely preserved, subtle differences notwithstanding. In other words, (111-a) is still a (minimal) sufficiency conditional and (111-b) is still a necessity conditional.

\begin{equation}
(111) \begin{align*}
\text{a. } & \text{zhi-yao ni qu wo jiu qu only-need you go I } JIU \text{ go } \approx \text{‘It takes as little as your going for me to go.’ } \\
\text{b. } & \text{zhi-you ni qu wo cai qu only-have you go I } CAI \text{ go } \text{‘Only if you go will I go.’ }
\end{align*}
\end{equation}

In the end, something has to be said about the interaction between \textit{zhiyao} and \textit{jiu} on the one hand and \textit{zhiyou} and \textit{cai} on the other.

If there is no considerable change in meaning from (110) to (111), it seems fair to think of an agreement phenomenon holding between the respective connective and its matching particle. Such views have in fact been put forth, in some version or other; cf. Hole (2004), Tsai (2017), Wimmer (2021a) on \textit{jiu} and Hole (2017) on \textit{cai}, critically

\footnote{The same effect on the alternatives is predicted by nonscalar approaches to exclusives that evoke the concept of (innocent) excludability such as Fox (2007), but also Hole (2004) in his discussion of Mandarin \textit{cai}.}

\footnote{In Sect. 3, \textit{zhiyao} was ascribed an additive inference. A follow-up question to test is if this additive effect is weakened if \textit{zhiyao} is dropped. Liu (2017a) does link constructions involving postfocal \textit{jiu} to additivity.}
reviewed by Sun (2021). There are differing views as to which of the two items carries
the actual semantics. Hole (2004), Tsai (2017) and Wimmer (2021a) treat postfocal
jiu as semantically vacuous. By contrast, Hole (2017) and Sun (2021) treat zhiyou as
vacuous.

It also raises the question as to which semantic features are involved in these sorts
of agreement. The question of scalarity comes up again. But cai and jiu have both been
disentangled from scalarity, which has been argued to be a marginal pragmatic effect
these particles occasionally come with (Hole 2004; Sun 2021). It seems that the only
safe thing to do is to endow cai with an exclusive feature. jiu’s featural characterization
remains open, even though it is also exclusive under Liu (2017a)’s analysis. Loosely
following Tsai (2017) and Zhang and Jia (2017), it is tempting to endow jiu with a
sufficiency-feature of sorts. But such an ascription runs into similar problems in that
jiu is well known for its temporal uses, which a sufficiency-ascription seems to fall
short of capturing. In other words, there remain quite a few puzzles to be solved.

Acknowledgements For valuable feedback, I am indebted to Giuliano Armenante, Sigrid Beck, Mingya
Liu and to two anonymous JEAL reviewers, whose constructive comments have added a lot more depth
to this paper—which would not exist in the first place without my endlessly patient consultants: Xuna Yu,
Xiaozhu Zhou, and especially Xiaojie Su and Yiting Tian, who readily elicited judgments from several
members of her family. Toshiko Oda kindly elicited some more. I am also grateful to Kate Pilson, Vali
Tamm and the editors of JEAL. Of course, all remaining shortcomings are my own.

Funding Open Access funding enabled and organized by Projekt DEAL.

Open Access This article is licensed under a Creative Commons Attribution 4.0 International License, which
permits use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give
appropriate credit to the original author(s) and the source, provide a link to the Creative Commons licence,
and indicate if changes were made. The images or other third party material in this article are included
in the article’s Creative Commons licence, unless indicated otherwise in a credit line to the material. If
material is not included in the article’s Creative Commons licence and your intended use is not permitted
by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the
copyright holder. To view a copy of this licence, visit http://creativecommons.org/licenses/by/4.0/.

Appendix

Is yao weak or strong?

A question left aside in Sect. 3.3 is whether yao is a strong necessity modal like must or
a weak necessity modal like ought or should. To check this, two diagnostics from von
Fintel and Iatridou (2008) offer themselves, both of which set up a contrast between
the modal in question and a strong necessity modal. Puzzlingly, these two diagnostics
deliver inconsistent results.

One diagnostic is to form a sentence with the modal M in question and conjoin it
with the negation of a corresponding strong necessity claim:

(112) You ought to do the dishes but you don’t have to.

von Fintel and Iatridou (2008)
A strong necessity modal to contrast yao with is bixu ‘must’. This works, suggesting that yao is in fact a weak necessity modal.

(113) Ni yao zao dian shuijiao dan bushi bixu de. you yao early a-little sleep but not must PRT ‘You need to sleep early, but don’t have to.’

Another diagnostic is to form a universal claim with the modal in question and then try and strengthen the claim for only a subset of the entities quantified over:

(114) Everybody ought to wash their hands; employees have to.

von Fintel and Iatridou (2008)

Surprisingly, this contrast doesn’t carry over as smoothly as before. In a forced choice setup of sorts, Mandarin consultants were presented with two variants of the first sentence, (115-a). One variant had yao, the other yinggai ‘should’ in it, whose translation already suggests that its weak necessity status is less controversial. Five speakers were asked to select the variant of (115-a) that fits best with the continuation in (115-b), which contains bixu ‘must’ from above.

(115) a. mei-ge ren dou { yao, yinggai } xi shou, ... each-CL person all { YAO, should } wash hand ... b. ..., er yuangong bixu xi shou ... but employee must wash hand

Four out of five speakers liked the combination with yinggai better than the one with yao. In addition, four noted the contrast between the two sentences to be clearer with the former than with the latter. In other words, yao patterns more like a strong necessity modal under this diagnostic, while it patterns like a weak one under the one applied in (113).

What is more, a reviewer points out that it doesn’t take a setup like (115) for yao to have a strong reading, as the following example suggests:

(116) nimen yao zai jiu dian qian ba zuoye jiao shanglai, fouze you YAO at nine o’clock before ba hw hand.in up otherwise ji lingfen record zero.point ‘You must hand in your assignments before 9 am. Otherwise, I will give you zero points.’

It is left for future work to refine the semantics of yao so as to resolve this conflict. Again, neither refinement should affect the modal’s quantificational force, which plausibly remains universal: All that is under debate is what kind of necessity we are dealing with, not necessity itself.
Neg-raising data involving yao

In Sect. 3.5, yao was mentioned to be a neg-raiser. This was brought up in support of the assumption that zhi from zhi-yao ‘only-need’ scopes below yao. This section adds a few more data elicited to exemplify yao’s neg-raising behavior.

To negate deontic (rule-oriented) yao is to express a prohibition. This can be seen in (117): A speaker uttering (117-a) disallows for the cat to be let in. She thus contradicts herself by following up giving permission to let the cat in, (117-b-i).

(117) (Is it allowed to let the cat in when it shows up on the balcony?)
   a. ni bu yao rang mao jin-lai, ...
you not need let cat in-come
   b. (i) ..., #danshi ni dangran keyi rang ta jin-lai
      ... #but you naturally can let it in-come
      (ii) ..., wo dui mao-mao guomin
           ... I to cat-hair allergic

The same pattern emerges in (118), where yao’s flavor is teleological (goal-oriented). The speaker uttering (118-a) claims eating an apple a day to be detrimental to one’s health. As strange as such a claim may sound, she is inconsistent in then following up with (118-b-i), identifying daily apple-eating as the best way to stay healthy.

(118) (To stay healthy, should one eat an apple a day?)
   a. ni bu yao mei tian chi ping-guo, ...
you not need each day eat apple
   b. (i) ..., #jinguan zhe shi zui hao de fangfa
      ... #although this be most good DE method
      (ii) ..., tamen dui shenti bu hao
           ... they to body not good

This neg-raising behavior makes the question of whether yao is weak or strong even more difficult to answer: Building on previous work by Larry Horn, Rubinstein (2014) elaborates on the tendency of weak necessity modals to be neg-raisers. So we have just added two more examples conflicting with those where yao exhibits a strong reading.

One may wonder if these observations carry over to conditional zhiyao, whose flavor was assumed to be often epistemic or doxastic in footnote 28. Bare yao’s epistemic or doxastic uses seem highly restricted, cf. Xie (2022) for recent discussion. At least the conditional tentatively classified as anankastic in footnote 33 suggests that there are teleological occurrences of zhiyao, even though it does not serve as a conditional connective here:

(119) xiangyao hao-de nailao, ni zhi-yao qu North End
     want good-PRT cheese you only-need go North End
     ‘If you want good cheese, you only have to go to the North End.’

Springer
Whatever the exact analysis of such sentences looks like, a teleological paraphrase offers itself: *all it takes for you to reach your goal of getting good cheese is to go to the North End.*

References

Alonso-Ovalle, Luis, and Aron Hirsch. 2018. Keep ‘only’ strong. *Proceedings of SALT* 28: 251–270.

Bade, Nadine. 2016. Obligatory presupposition triggers in discourse. *Empirical foundations of the theories Maximize Presupposition and Obligatory Implicatures.* Ph.D. Thesis. Universität Tübingen.

Bade, Nadine, and Konstantin Sachs. 2019. EXH passes on alternatives: A comment on Fox and Spector (2018). *Natural Language Semantics* 27: 19–45.

Beck, Sigrid. 2019. Readings of scalar particles: Noch/still. *Linguistics and Philosophy* 43: 1–67.

Cheng, Lisa Lai-Shen. 1994. Wh-words as polarity items. *Chinese Languages and Linguistics* II: 614–640.

Coppock, Elizabeth, and David Beaver. 2014. Principles of the exclusive muddle. *Journal of Semantics* 31: 371–432.

Crnić, Luka. 2011. Getting even. Ph.D. Thesis. MIT.

Crnić, Luka. 2012. Focus particles and embedded exhaustification. *Journal of Semantics* 30: 533–558.

von Fintel, Kai. 1994. *Restrictions on quantifier domains.* Ph.D. Thesis. UMass Amherst.

von Fintel, Kai. 1997. Bare plurals, bare conditionals, and only. *Journal of Semantics* 14: 1–56.

von Fintel, Kai, and Sabine Iatridou. 2004. What to do if you want to go to Harlem: Notes on anankastic conditionals and related matters. Ms., MIT.

von Fintel, Kai, and Sabine Iatridou. 2007. Anatomy of a modal construction. *Linguistic Inquiry* 38: 445–483.

von Fintel, Kai, and Sabine Iatridou. 2008. How to say ought in foreign: The composition of weak necessity modals. *Time and modality,* 115–141, Springer.

von Fintel, Kai. 2011a. Conditionals. *Semantics: An International Handbook of Natural Language Meaning* 2: 1515–1538.

von Fintel, Kai, and Irene Heim. 2011b. *Lecture notes on intensional semantics.* Cambridge: MIT.

Fox, Danny. 2007. Free choice and the theory of scalar implicatures. *Presupposition and implicature in compositional semantics,* 71–120. Springer.

Greenberg, Yael. 2019. Even and only: Arguing for parallels in scalarity and in constructing alternatives. In *Proceedings of NELS 49.* Edited by Maggie Baird, and Jonathan Pesetsky, 61–70.

Grosz, Patrick Georg. 2012. *On the grammar of optative constructions.* Amsterdam: John Benjamins Publishing.

Guerzoni, Elena. 2003. Why even ask? On the pragmatics of questions and the semantics of answers. Ph.D. Thesis. Massachusetts Institute of Technology.

Heim, Irene. 1991. *Artikel und Definitheit,* 487–535. In Semantik: Ein internationales Handbuch der zeitgenössischen Forschung.

Heim, Irene. 1992. Presupposition projection and the semantics of attitude verbs. *Journal of Semantics* 9 (3): 183–221.

Herburger, Elena. 2015. *Only if: If only we understood it.* *Sinn und Bedeutung (SuB)*19: 304–321.

Herburger, Elena. 2016. Conditional perfection: The truth and the whole truth. *SALT* 25: 615–635.

Herburger, Elena. 2019. Bare conditionals in the red. *Linguistics and Philosophy* 42: 131–175.

Hole, Daniel. 2004. *Focus and background marking in Mandarin Chinese: System and theory behind cai, jiu, dou and ye.* London: Routledge.

Hole, Daniel. 2006. Mapping VPs to restrictors: Anti-diesing effects in Mandarin Chinese. Where semantics meets pragmatics, 337–380, Brill, Paderborn, Germany.

Hole, Daniel. 2017. A crosslinguistic syntax of scalar and non-scalar focus particle sentences: The view from Vietnamese and Chinese. *Journal of East Asian Linguistics* 26: 389–409.

Horn, Laurence R. 1969. A presuppositional analysis of only and even. In *Proceedings of CLS* 5: 98–107.

Horn, Laurence R. 1996. Exclusive company: Only and the dynamics of vertical inference. *Journal of Semantics* 13: 1–40.

Horn, Laurence R. 2000. From if to iff: Conditional perfection as pragmatic strengthening. *Journal of Pragmatics* 32 (3): 289–326.

Iatridou, Sabine. 2000. The grammatical ingredients of counterfactuality. *Linguistic Inquiry* 31: 231–270.
Krator, Angelika. 1986. Conditionals. In Proceedings of CLS 22.
Krifka, Manfred. 1991. A compositional semantics for multiple focus constructions. In Proceedings of SALT I.
Krifka, Manfred. 2000. Alternatives for aspectual particles: Semantics of still and already. In Proceedings of the twenty-sixth annual meeting of the Berkeley Linguistics Society, 401–412.
Lai, Huei-Ling. 1999. Rejected expectations: the scalar particles cai and jiu in Mandarin Chinese. Linguistics 37: 625–661.
Lewis, David. 1973. Counterfactuals. Oxford: Blackwell.
Liu, Mingming. 2017a. Varieties of alternatives: Mandarin focus particles. Linguistics and Philosophy. https://doi.org/10.1007/s10988-016-9199-y.
Liu, Mingming. 2017. Mandarin conditional conjunctions and only. Studies in Logic 10: 45–61.
McCawley, James. 1993. Everything that linguists have always wanted to know about logic but were ashamed to ask. Chicago: University of Chicago Press.
Milsark, Gary Lee. 1974. Existential sentences in English. Ph.D. Thesis. MIT.
Palmer, Frank Robert. 1986. Mood and modality. Cambridge: Cambridge University Press.
Panizza, Daniele, and Yasutada Sudo. 2020. Minimal sufficiency with covert even. Glossa 5: 1–25.
Partee, Barbara. 2002/1986. Noun phrase interpretation and type-shifting principles, 357–381. Chicago: Blackwell Publishing.
Rooth, Mats. 1992. A theory of focus interpretation. Natural Language Semantics 1: 75–116.
Rubinstein, Aynat. 2014. On necessity and comparison. Pacific Philosophical Quarterly 95(4): 512–554.
Rubinstein, Aynat. 2017. Straddling the line between attitude verbs and necessity modals. In Modality across syntactic categories. Edited by Ana Arregui, María Luisa Rivero, and Andrés Salanova, 610–633. Oxford University Press.
Rullmann, Hotze. 1997. Even, polarity, and scope. Papers in Experimental and Theoretical Linguistics 4: 40–64.
Schulz, Katrin. 2014. Fake tense in conditional sentences: A modal approach. Natural Language Semantics 22: 117–144.
Stalnaker, Robert C. 1968. A theory of conditionals. In Ifs, 41–55. Springer.
Stalnaker, Robert C. 1980. A defense of conditional excluded middle. In Ifs, 87–104. Springer.
von Stechow, Arnim, Sveta Krasikova, and Doris Penka. 2006. Anankastic conditionals again. In A Festschrift for Kjell Johan Sæbø: In partial fulfillment of the requirements for the celebration of his 50th birthday, 151–171.
Sun, Yenan. 2021. A bipartite analysis of zhiyou ‘only’ in Mandarin Chinese. Journal of East Asian Linguistics 30: 1–37.
Tsai, Cheng-Yu Edwin. 2017. Preverbal number phrases in Mandarin and the scalar reasoning of jiu. In Proceedings of WCCFL 34: 554–561.
Vander Klok, Jozina, and Vera Hohaus. 2020. Weak necessity without weak possibility: The composition of modal strength distinctions in Javanese. Semantics and Pragmatics 13.
Wimmer, Alexander. 2021a. Flavors of scalar lowness. In Proceedings of IATL 2018–2019, Edited by Gabi Danon, 175–189.
Wimmer, Alexander. 2021b. Keeping only exclusive in conditional antecedents. Paper submitted to the Proceedings of CLS 57.
Xie, Zhiguo. 2022. Epistemic modality and comparison in Mandarin Chinese. Journal of East Asian Linguistics 31: 1–39.
Zhang, Linmin, and Jia Ling. 2017. Mandarin Chinese particle jiù: A current question restrictor. http://semanticsarchive.net/Archive/TlkNmU5N/ZhangLing_2017_TEAL11.pdf. Slides presented at TEAL 11 [accessed 2018/03/04].