The semantics of Mandarin futurates

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This paper investigates future interpretations in Mandarin declarative root clauses without overt future modals, i.e., Mandarin futurates. Mandarin futurates require future time adverbs and schedulable eventualities, which denote future readings relative to the utterance time or a context-determined past time. Moreover, Mandarin futurates presuppose the existence of a plan in the context and are incompatible with a single perfective aspect marker le_1. To account for these facts, I argue that a covert future modal M-PLAN is present in futurates and extend the formal analysis for English simple futurates to Mandarin with necessary modifications.

Keywords: simple futurates, modality, aspect, tense & tenselessness

1. Introduction

In the past decade or so, research on the temporal reference of superficially tenseless languages ("tenseless languages" hereafter) shows that clauses without overt aspectual markings in many of these languages allow either present or past interpretations, but cannot flexibly license future interpretations unless overt future markings are present, such as St'át'imcets (Matthewson 2006), Gitksan (Jóhannsdóttir & Matthewson 2007), Paraguayan Guaraní (Tonhauser 2011), Mbyá Guaraní (Thomas 2014), Mandarin (Sun 2014), Hausa (Mucha 2015), Washo (Bochnak 2016), Tlingit (Cable 2017), Atayal (Chen 2018), and so forth. Some scholars thus argue that these languages possess a covert non-future tense which constrains the reference time to be either present or past (Matthewson 2006; Jóhannsdóttir & Matthewson 2007; Thomas 2014; Sun 2014; Cable 2017; Chen 2018, among others). However, the non-future constraint is not quite clear-cut in some languages. Superficially tenseless clauses can also license future readings without overt future modals under certain circumstances, pointed out for Hausa, Mandarin, Paraguayan Guaraní, Washo, etc. For instance, Mandarin not only possesses overt future markers such as *hui* or *yao*, but also makes use

of bare predicates with future time adverbs to express future readings (Bittner 2014; Sun 2014), demonstrated by the examples in (1).[1]

(1) a. *Gongsi* *mingtian* ***hui/yao*** *kai* *nianhui.*
company tomorrow FUT open year-end-party
'The company will hold the year-end-party tomorrow.'
b. *Gongsi* *mingtian* *kai* *nianhui.*
company tomorrow open year-end-party
'The company holds the year-end-party tomorrow.'

There are two views on the trend of non-future interpretations of superficially tenseless, aspectually unmarked clauses. One view argues that the possibility of licensing future readings for these constructions weakens the evidence for a non-future tense. Hence these languages should be analyzed as without covert semantic tenses and aim for a tenseless or an optional tense analysis, depending on the data in the language (Tonhauser 2011; Mucha 2015; Bochnak 2016). The other view argues that the future reading in (1b) is attributed to a covert future modal (Sun 2014). This view is supported by the fact that constructions like (1b) in some tenseless languages show similar constraints on eventualities with "simple futurate constructions" in tensed languages like English. Other than future modals such as "will" or "would", English also adopts present tense in (2a) or the progressive marking in (2b) for future readings. The former is termed as "simple futurates" and the latter is termed as "progressive futurates" by Copley (2002; 2009).

(2) a. The Red Sox play the Yankees tomorrow.
b. The Red Sox are playing the Yankees tomorrow. (Copley 2009: 4)

Lakoff (1971), Copley (2002; 2009) point out that English futurates do not accept a presumably unplannable event, e.g., the winning of a match, as shown

[1] For examples taken from the literature, the form of the example, the glosses and the translations are given as in the original, to avoid deviating from the authors' assumptions or misleading the readers. This may create inconsistency across cited examples. My own data follow the Leipzig Glossing Rules. Abbreviations of my data are summarized at the end of the paper.

by the infelicity of the sentences in (3a–b), in contrast to the felicity of (3c) in which an overt future modal "will" is present. Copley (2002; 2009) argues that constructions in (2) involve a covert future modal (details in §3.1), the semantics of which restricts the type of eventualities that it combines with. The Mandarin examples in (4) reveal a similar pattern (Sun 2014).

(3) a. # The Red Sox defeat the Yankees tomorrow.
b. # The Red Sox are defeating the Yankees tomorrow.
c. The Red Sox will defeat the Yankees tomorrow.
(Copley 2009: 17–18)

(4) a. # *Huren dui mingtian ying Huojian dui.*
Lakers team tomorrow win Rockets team
'The Lakers win the Rockets tomorrow.'
b. *Huren dui mingtian hui ying Huojian dui.*
Lakers team tomorrow FUT win Rockets team
'The Lakers will win the Rockets tomorrow.'

Following Copley's terminology, I call Mandarin bare predicates with future time adverbials for future reference "simple futurates". Sun (2014) argues that simple futurates in tenseless languages like Mandarin are not counterexamples to the generalization of non-future restrictions on reference time, as future interpretations are marked, requiring an overt or a covert morpheme. As far as I am concerned, though this approach points out a possible direction of extending the English futurate analysis to superficially tenseless languages, the difference of simple futurates between tenseless languages and English is not well explored.

This paper aims to provide a detailed case study of Mandarin futurates, in comparison to English simple futurates. I hope that a thorough understanding of futurates in a single tenseless language will help to pave the way for further investigation on cross-linguistic variation of future interpretations, as well as the theoretical implications on tense. To obtain a clear pattern about the data and for the sake of cross-linguistic comparison in the future, it is necessary to be explicit about the range of data with factors controlled. Therefore, this paper only focuses on declarative root clauses

expressing futurity with the following properties: (a) the clause contains only one bare predicate; (b) no overt future modals such as *hui/yao* exists. Other types of sentences such as questions, imperatives, conditionals, sentences with subordinate clauses, verb serial constructions are beyond the scope of the current study. I leave them for future research.

The discussion is organized as follows. §2 focuses on the properties of Mandarin simple futurates, considering the following factors: constraints on eventualities, obligatoriness of future time adverbials, presupposition of the existence of a plan, constraints on the evaluation time, and the interaction with overt aspect markers. A comparison with English is laid out to demonstrate the variation and connection between tensed languages and tenseless languages. §3 offers a formal semantic analysis for Mandarin futurates that captures the aforementioned properties, based on necessary modifications of Copley's (2009) analysis for English simple futurates. §4 states the implications of the current proposal on the research about tense and future reference. §5 concludes.

2. Properties of Mandarin simple futurates

Though English and Mandarin both possess futurate constructions, futurates are not universal. On the one hand, in some languages like German, present tense predicates do not pose the plannability restriction on the eventualities when talking about the future (Copley 2009; Bochnak 2019). On the other hand, even if a language has futurate usages, variation exists. For example, English futurates include simple futurates and progressive futurates. In Mandarin, only simple futurates are observed.[2] In the following discussion, I

[2] The Mandarin progressive marker *zai* in (i.a) can only have a non-future progressive interpretation. In (i.b), *zai* cannot flexibly combine with a future time adverbial to obtain a future interpretation. Even the sentence in (i.c) with a punctual future time is felicitous with *zai*, *zai* still maintains its progressive reading. In other words, the sentence in (i.c) is better analyzed as a case of simple futurate with the progressive. Mandarin thus only has simple futurates and no progressive futurates.

shall further show that English and Mandarin simple futurates show differences in several dimensions, despite many similarities shared by the two languages.

2.1 Constraints on eventualities

Sun (2014) points out that like English, Mandarin simple futurates are incompatible with eventualities that are in principle unable to be scheduled, illustrated by the examples in (5) with eventualities that do not happen according to plan.

(5) a. **Mingtian Lulu hen jusang*.
tomorrow Lulu very frustrated
Intended: 'Tomorrow, Lulu will be very frustrated.'
b. **Xiaoxin yihou wangji Mali*.
Xiaoxin later forget Mary
Intended: 'Xiaoxin will forget Mary later.'
c. **Zhei-tiao yu xia zhou si*.
this-CLF fish next week die
Intended: 'This fish will die next week.'
(Sun 2014:215, 241, the intended reading is added by me.)

Different from English, Mandarin possesses more flexibilities with weather predicates in simple futurates. Namely, English simple futurates are odd with weather predicates (Copley 2009: 69) in (6a) while Mandarin simple futurates are fine.

(i) a. *Zhangsan zai gongzuo*.
Zhangsan PROG work
'Zhangsan is working.'
b. *#Mingtian Zhangsan zai gongzuo*.
tomorrow Zhangsan PROG work
'Intended: Zhangsan is going to work tomorrow.'
c. *Mingtian zhe-ge shihou, Zhangsan zai gongzuo*.
tomorrow this-CLF time Zhangsan PROG work
'Zhangsan will be working at this time tomorrow.'

(6) a. # It rains tomorrow.
b. *Mingtian* *xiayu*.
tomorrow rain
'It will rain tomorrow.'

When (6b) is uttered, the speaker has a strong belief about the weather condition being predictable based on the knowledge of science or reliable sources; e.g., prediction by weather forecast. In this sense, eventualities denoted by weather predicates are perceived the same as other eventualities predicted by scientific understanding of physical laws/principles of the world. For the latter type of eventualities such as celestial events, both English and Mandarin futurates are felicitous, as we can see in the sentences in (7)–(8a–b). Unlike eventualities such as *dizhen* 'have an earthquake' in (8c), celestial events such as sunrise, eclipse, or meteorites can be predicted scientifically with modern techniques. They are "planned" according to the laws of the universe and can be predicted by human beings if everything occurs inertially. Copley (2009) argues that these sentences still involve "plannable" eventualities. The planner that secures the occurrence of the plan is just the law-based world rather than a certain entity.

(7) a. The sun rises tomorrow at 5:13 a.m.
b. The meteorite impacts tomorrow at 5:13 a.m. (Copley 2009: 41)

(8) a. *Mingtian* *wudian-ban* *richu.*
tomorrow five-o'clock-half sunrise
'The sun rises tomorrow at 5:30 a.m.'
b. *Shizizuo* *liuxingyu* *lingchen* *yi-dianzhong*
Leo meteor-shower early-morning one-o'clock
kaishi.
begin
'The Leonids starts at one o'clock in the morning.'
c. * *Mingtian* *dizhen*.
tomorrow earthquake
Intended: 'There will be an earthquake tomorrow.'

The pattern of weather predicates in English and Mandarin suggests a graded pattern about simple futurates with predicates denoting natural phenomena. English somehow still perceives the weather to be "unplannable" or "unpredictable". But Mandarin treats weather predicates the same as predicates denoting celestial events, assuming that they are strongly believed to follow the laws of science and thus are predictable as if they are plannable.

2.2 Obligatoriness of future time adverbs

Simple futurates in both English and Mandarin require a future time to license the future reading. In the context where a salient future time is already set up, the future time adverb can be elided as in (9). Otherwise, an overt future time adverb is necessary in simple futurate constructions. The English example in (10a) without a future time adverb can only obtain a generic/habitual reading while the same example marked with "will" does not need a future time adverb to obtain the future reading.

(9) A: What's John's plan tomorrow?
B: John leaves.

(10) a. # Joe watches TV. (Intended: Joe watches TV sometime in the future.)
b. Joe watches TV tomorrow.
c. Joe will watch TV.

Similarly, the Mandarin sentences in (11a) cannot get a futurate reading without a future time adverbial, either. In contrast, the future marker *hui* in (11b) does not need a future time adverb to obtain future reference. Moreover, the felicity of the sentence in (12) shows that the future time in a futurate construction does not need to be specific.

(11) a. *Zhangsan* **(mingtian)* *dengtai* *yanchu.*
Zhangsan tomorrow get-on-stage perform
'Zhangsan performs on the stage tomorrow.'

b. *Zhangsan* *hui* *dengtai* *yanchu.*
Zhangsan FUT get-on-stage perform
'Zhangsan will perform on the stage.'

(12) *Zhangsan* *zai* *jianglai* *shiji* *chengshu* *de* *shihou*
Zhangsan at future timing mature DE time
zou. *Juti* *shi* *shenme* *shihou,* *xianzai* *hai* *bu*
leave detail COP what time now still NEG
hao *shuo*.
good say
'Zhangsan leaves at the right timing in the future. Exactly when it will be, it is hard to tell now.'

2.3 Presupposition of the existence of a plan

Simple futurates in English and Mandarin both presuppose the existence of a plan that is relevant to the assertion. For instance, Copley (2009) suggests that the nuclear stress is on "tomorrow" for (13a). The question and the negation form of (13a) in (13b) and (13c) both take it for granted that there is a plan of Joe going skydiving at some point.

(13) a. Joe goes skydiving tomorrow.
b. Does Joe go skydiving tomorrow?
c. Joe doesn't go skydiving tomorrow. (Copley 2009: 35)

Rullmann et al. (2022) observe that English simple futurates require a more specific type of plan – a schedule – in the presupposition. Specifically, the schedule cannot be simply about a one-off future event. Rullmann et al. (2022) collected acceptability ratings for the sentence in (14) in the discourse context from 34 L1 English speakers. Judgements were on a four-point Likert scale of 1–4, with 1 representing maximum acceptability. The average response score 2.85 indicates that English simple futurates are odd for one-off plans while progressive futurates are not.

(14) Context: The speaker's street has decided to have its first ever block party.

The speaker is letting their friend know about it.

a. Our street is holding a block party on March 25th. (1.12)
b. Our street holds a block party on March 25th. (2.85)

(Rullmann et al. 2022)

Similarly, the Mandarin sentence in (1b) (repeated below in (15a)) states that the year-end-party will occur tomorrow. If we negate it in (15b) or turn it into a question in (15c), both sentences still presuppose that something was already planned to occur in the future. However, the Mandarin counterpart in (16) given the same context in (14) is felicitous, indicating that Mandarin simple futurates pattern similar to English progressive futurates but not simple futurates with respect to the property of the plan.

(15) a. *Gongsi* *mingtian* *kai* *nianhui.*
company tomorrow open year-end-party
'The company holds the year-end-party tomorrow.'

b. *Gongsi* *mingtian* *bu* *kai* *nianhui.*
company tomorrow NEG open year-end-party
'The company does not hold the year-end-party tomorrow.'

c. *Gongsi* *mingtian* *kai* *nianhui* *ma?*
company tomorrow open year-end-party Q
'Does the company hold the year-end-party tomorrow?'

(16) b. *Women* *jiequ* *san* *yue* *er-shi-wu* *ri* *juxing* *juhui.*
1PL block three month twenty-five day hold party
'Our block is holding a party on March 25th.'

Moreover, the content of the presupposed plan is sensitive to focus in the futurate assertion. Variation in focus placement produces different inferences. For instance, if *mingtian* 'tomorrow' in (17a) is stressed (represented by a subscript F), it is presupposed that "the company has a plan of holding the year-end-party at a future time" and the assertion states that it is tomorrow but not other days/times when the company holds the party. However, if the vP

kai nianhui ‘hold year-end-party’ is stressed, as shown in (17b), then the presupposition is “the company plans something for tomorrow” and the assertion states that the activity is “holding the year-end-party”.

(17) a. *Gongsi* ***mingtian***$_{F}$ *kai* *nianhui.*
company **tomorrow** open year-end-party
‘The company holds the year-end-party tomorrow.’
Presupposition: The company has a plan of holding the year-end-party at some point.

b. *Gongsi* *mingtian* ***kai*** ***nianhui***$_{F.}$
company tomorrow **open** **year-end-party**
‘The company holds the year-end-party tomorrow.’
Presupposition: The company has a plan for something tomorrow.

As the two reviewers point out, though futurates are sensitive to focus, such focus sensitivity is different from focus association with operators such as English *only* and Mandarin *zhi* ‘only’. For instance, only the sentence in (18b) where the focus associated with *zhi* matches the information inquiry in the question-answer congruence is felicitous.[3] This contrast indicates a grammatical dependency of *zhi* on the question under discussion. However, the construction in (19b) is proper to answer the A-not-A question without any focus within the futurate. We could add information focus in the futurate, as (19c) suggest, but not necessary. With the focus, as one reviewer highlighted, the sentence conveys additional information about exhaustivity: it is tomorrow (but not other days/times) that Zhangsan will leave Nanjing.

(18) a. A: *Zhangsan* *xihuan* *shui?*
Zhangsan like who
‘Who does Zhangsan like?’

b. B: *Zhangsan* *zhi* *xihuan* ***Xiaoying***$_{F.}$
Zhangsan only like **Xiaoying**
‘Zhangsan likes only Xiaoying.’

[3] I thank the reviewer for offering the data in (18)–(19) to help illustrate the point.

c. B: *#Zhangsan zhi **xihuan**$_F$ Xiaoying.*
Zhangsan only **like** Xiaoying
'Zhangsan only likes Xiaoying.'

(19) a. A: *Zhangsan mingtian hui-bu-hui likai Nanjing?*
Zhangsan tomorrow FUT-NEG-FUT leave Nanjing
'Will Zhangsan leave Nanjing tomorrow or not?'
b. B: *Hui, Zhangsan mingtian likai Nanjing.*
FUT Zhangsan tomorrow leave Nanjing
'Yes, Zhangsan leaves Nanjing tomorrow.'
c. B: *Hui, Zhangsan **mingtian**$_F$ likai Nanjing.*
FUT Zhangsan **tomorrow** leave Nanjing
'Yes, Zhangsan leaves Nanjing tomorrow.'

2.4 Constraints on the evaluation time

English simple futurates are limited to present tense while progressive futurates can occur with past tense and present tense. In (20a), the present tense supplies the utterance time as the evaluation time for future. Namely, the eventuality will occur in the future with respect to the utterance time. In (20b), the past tense in the progressive futurate construction tells us that the eventuality was planned to happen in the future of a past evaluation time. However, when we replace the present tense in (20a) with the past tense in (20c) to obtain the same reading in (20b), this sentence is ungrammatical. In other words, only the present tense that supplies a present evaluation time is possible with futurates.

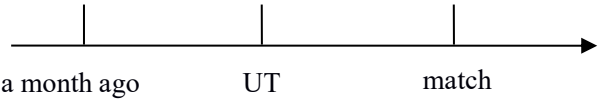
(20) a. The Red Sox play the Yankees tomorrow.
b. The Red Sox were playing the Yankees tomorrow, but now they won't.
c. *The Red Sox played the Yankees tomorrow, but now they won't.
Intended: 'The Red Sox were going to play the Yankees tomorrow.'

To see the constraints on the evaluation time for Mandarin futurates, I rely on controlled contexts targeting different evaluation times, i.e., to set up a context

with a plan in the past and test the felicity of Mandarin futurates. Two factors are controlled. The first factor is the evaluation point for future (whether the eventuality is in the future of the utterance time or a set-up past evaluation point). The second factor is the type of temporal adverbs, since futurates always require a future time adverbial syntactically or contextually. Two types of time adverbs are of particular interest. Time adverbs such as *tomorrow*, *last week*, *yesterday* are sensitive to the utterance time (Dowty 1982; Klein 1994; Altshuler 2020, among others). For example, the set of intervals denoted by *tomorrow* includes the intervals that are within the day after "today", i.e., the day that contains the utterance time.[4] For simplicity, I shall call these temporal adverbials "indexical time adverbs". The other type of time adverbs like *shi tian hou* 'after ten days' or *January 10, 2020* is insensitive to the utterance time and thus not indexical. I call these temporal adverbials "neutral time adverbs". The following discussion shows that Mandarin simple futurates with indexical time adverbs tend to allow only the present future reading, i.e., the evaluation point for future is the utterance time. But the evaluation point for simple futurates with neutral adverbs can be the utterance time or a past time.

The context depicted in (21) and visualized in Figure 1 involves a scheduled event after the utterance time (represented as UT) according to a past plan. A simple futurate sentence with an indexical time adverb is felicitous in this context, as shown by the example in (22).

(21) Context: On March 10, you are checking the meeting notes of the basketball club which was taken a month ago on Feb 10. The notes said that the match between the Lakers and the Rockets would be on March 11, i.e., tomorrow. You say:



[4] The exact denotations for the indexical temporal adverbials may vary depending on the framework. It is not our focus to investigate the semantics of temporal adverbials in this paper. The point here is to highlight that the temporal adverbs under discussion are sensitive to the utterance time in the context.

Figure 1. Present future

(22) *Anzhao yi-ge yue qian zhiding de jihua,*
according-to one-CLF month ago make DE plan
Huren dui gen Huojian dui ***mingtian*** *bisai.*
Lakers team and Rockets team **tomorrow** compete
'According to the plan made a month ago, the Lakers play the Rockets tomorrow.'

If the scheduled event was to occur before the utterance time according to a past plan, as described in the context in (23) (depicted in Figure 2), the Mandarin simple futurate sentence with an indexical time adverb *shangzhou* 'last week' is infelicitous for most of our consultants,[5] demonstrated by the sentence in (24a). In this scenario, a sentence with the future marker *hui* in (24b) or a sentence with an epistemic modal in (24c) is a preferred statement.

(23) Context: On March 10, you are checking the meeting notes of the basketball club which was taken a month ago on February 10. The notes said that the match between the Lakers and the Rockets would be on March 3, namely a week ago. You don't know whether the match happened or not. You comment:

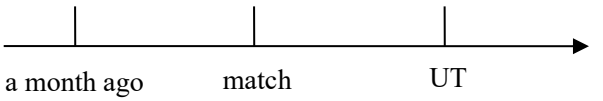


Figure 2. Past future

[5] The acceptability of (24a) demonstrates variation. Among my six consultants, two share the same judgement with one reviewer that (24a) in the given context is acceptable. Four consultants and I have the judgement demonstrated in (24).

(24) a. *# Anzhao yi-ge yue qian zhiding de*
According-to one-CLF month ago make DE
jihua, Huren dui gen Huojian dui ***shang-zhou***
plan Lakers team and Rockets team **last-week**
bisai.
compete
Intended: 'According to the plan made a month ago, the Lakers were going to play the Rockets last week.'

b. *Anzhao yi-ge yue qian zhiding de jihua,*
according-to one-CLF month ago make DE plan
Huren dui gen Huojian dui ***hui*** *zai* ***shang-zhou***
Lakers team and Rockets team **FUT** at **last-week**
bisai.
compete
'According to the plan made a month ago, the Lakers were playing the Rockets last week.'

c. *Anzhao yi-ge yue qian zhiding de jihua,*
According-to one-CLF month ago make DE plan
Huren dui gen Huojian dui ***yinggai*** ***shang-zhou***
Lakers team and Rockets team **should** **last-week**
bisai-guo le.
compete-EXP SFP
'According to the plan made a month ago, the Lakers should have played the Rockets last week.'

In a similar context in (25) where the event was scheduled to occur before the utterance time according to a past plan, changing the indexical time adverb to a neutral time adverb *shi tian hou* 'after ten days', the simple futurate form is felicitous, as is illustrated in the example below.

(25) Context: On March 10, you are checking the meeting notes of the basketball club which was taken a month ago on Feb 10. The notes said that the match between the Lakers and the Rockets was scheduled to take place on Feb 20, ten days from the time of the meeting. You don't know whether the match happened or not. You comment:

Anzhao *yi-ge* *yue* *qian* *zhiding* *de* *jihua,*
according-to one-CLF month ago make DE plan
Huren *dui* *gen* *Huojian dui* *shi-tian hou* *bisai.*
Lakers team and Rockets team ten-day after compete
'According to the plan made a month ago, the Lakers was competing with the Rockets in ten days.'

Though the sentence with a neutral time adverb is fine with a past future reading for the context in (25), our consultants also point out that if the sentence in (25) is used independently without any background information, the most prominent reading is still a present future reading.

To summarize, if the simple futurate contains an indexical time adverb that anchors the evaluation point to the utterance time, it tends to possess a present future reading. To obtain a past future reading, Mandarin needs the future marker *hui* or an epistemic modal. When combined with neutral time adverbs, the evaluation point can be either the context-salient past time or the utterance time.

2.5 Interaction with overt aspect markers

Mandarin simple futurates show a similar pattern with overt future modal *hui* in the interaction with overt aspect marking. Mandarin *hui* is compatible with imperfective complements. The progressive reading is a subcategory of imperfective interpretations. When the reference time is punctual, the progressive marker *zai* is possible to occur in the complement of *hui*, as we can see in the example in (26). However, the progressive marker *zai* is odd with *hui* if the reference time is durative like *mingtian* 'tomorrow'. It is unknown to me why punctuality of the time adverb plays a role in the acceptability of *hui* with progressive complements.

(26) a. *Mingtian* *ni* *jiandao* *Zhangsan* *de* *shihou,*
tomorrow 2SG see Zhangsan DE time
ta *hui* *zai* *chouyan.*
3SG FUT PROG smoke

'When you see Zhangsan tomorrow, he will be smoking.'

b. *??Mingtian ta hui zai chouyan.*
tomorrow 2SG FUT PROG smoke
Lit: '?He will be smoking tomorrow.'

In contrast, *hui* is incompatible with the perfective aspect marker le_1 (Wu 2003; Lin 2006; Bittner 2014)[6], as illustrated in (27a). However, the sentence becomes acceptable if the aspectual adverb *yijing* 'already' is present.[7]

(27) a. **Mingtian zhe-ge shihou, Zhangsan **hui***
tomorrow this-CLF time Zhangsan **FUT***
*likai-**le** Nanjing.*
leave-**PFV** Nanjing

b. *Mingtian zhe-ge shihou, Zhangsan **hui** yijing*
tomorrow this-CLF time Zhangsan **FUT** already
*likai-**le** Nanjing.*
leave-**PFV** Nanjing
'Zhangsan will have already left Nanjing by this time tomorrow.'

Similarly, simple futurates are fine with the progressive marker *zai*. We again observe that the punctuality of the reference time affects the acceptability of a future sentence with *zai*. The sentence in (28a) is odd with a progressive predicate while the sentence in (28b) with a punctual reference time *mingtian zhe-ge shihou* 'tomorrow at this time' is acceptable. The sentences in (29a)

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[6] In the Mandarin literature, the morpheme *le* as a verbal suffix is dubbed as le_1 while the sentence-final particle *le* is dubbed as le_2.

[7] The punctuality of the reference time constrained by the time adverb also plays a role in the acceptability of the sentence in (27b). The sentence in (i) is almost the same as the one in (27b). The only difference is that the time adverb is durative. According to our consultants, (i) is ungrammatical. I also admit that even with the punctual time adverb and *yijing* 'already' in (27b), some of our consultants still find (27b) marginal, but it is apparently much more acceptable than the one in (i).

(i) */?? *Mingtian Zhangsan hui yijing likai-le Nanjing.*
tomorrow Zhangsan FUT already leave-PFV Nanjing

and (29b) show that simple futurates are also incompatible with *le*$_1$ unless other aspectual elements such as *yijing* 'already' is present, a similar pattern as *hui*. Specifically, simple futurates are totally fine with a future time adverb that is not punctual (*mingtian* 'tomorrow') in a future perfective construction with *yijing*, slightly different from *hui*.[8]

(28) a. ??*Zhangsan* ***mingtian*** ***zai*** *gongzuo.*
Zhangsan **tomorrow** **PROG** work
Intended: 'Zhangsan will be working tomorrow.'

b. *Zhangsan* ***mingtian*** ***zhe-ge*** ***shihou*** ***zai*** *gongzuo.*
Zhangsan **tomorrow** **this-CLF** **time** **PROG** work
'Zhangsan will be working at this time tomorrow.'

(29) a. **Zhangsan* ***mingtian*** ***(zhe-ge*** ***shihou)*** *likai-**le***
Zhangsan **tomorrow** **this-CLF** **time** leave-**PFV**
Nanjing.
Nanjing

b. *Zhangsan* ***mingtian*** *(**zhe-ge*** ***shihou)*** ***yijing***
Zhangsan **tomorrow** **this-CLF** **time** **already**
*likai-**le*** *Nanjing.*
leave-**PFV** Nanjing

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[8] This paper is only concerned with declarative future sentences with one predicate. *Le*$_1$ can be used in future contexts under certain circumstances. For instance, in describing a future plan consisting of a series of actions, *le*$_1$ can be marked on the non-final predicate, demonstrated by the examples in (i). I shall leave this topic for future research.

(i) a. *Women* *mingtian* *zuo-wan-**le*** *zhe-fen* *baogao* *jiu*
1PL tomorrow do-finish-**PFV** this-CLF report then
dao *Lisi* *jia* *qu.*
arrive Lisi home go
'We will go to Lisi's home after we have finished this report tomorrow.'

b.**Women* *mingtian* *zuo-wan* *zhe-fen* *baogao* *jiu* *dao-**le***
1PL tomorrow do-finish this-CLF report then arrive-**PFV**
Lisi *jia* *qu.*
Lisi home go

'Zhangsan will have already left Nanjing (by this moment) tomorrow.'
(Adapted from Dai 1994, cited from Lin 2000: 120)

2.6 Interim summary

In §2.1–§2.5, I have investigated the following properties related to simple futurates in English and Mandarin: constraints on the predicate, evaluation point of future (i.e., present future or past future), obligatoriness of future time adverbs, presuppositions and interaction with aspect markers, summarized below in Table 1.

Table 1. Simple futurates in English and Mandarin

Language	**English**	**Mandarin**
Unplannable events	×	× (weather predicates OK)
Evaluation point	UT	UT, past time (limited)
Compatibility with aspect markers	NA	× PFV, √ PROG (limited)
Obligatory future time adverbs	√	√
Presupposition	existence of a plan	existence of a plan

As summarized in Table 1, simple futurates in either language require future time adverbs to license future readings and are infelicitous with events that cannot be scheduled, though Mandarin has more flexibility in allowing weather predicates. English simple futurates take the utterance time as the evaluation point for future and are only compatible with present tense. Mandarin simple futurates do not limit the evaluation point. Though the most prominent reading still takes the utterance time as the evaluation point for future, we can obtain a past future reading in specific contexts with a neutral time adverb that does not carry an index anchoring to the utterance time. Moreover, Mandarin simple futurates are incompatible with perfective aspect marker *le*$_1$ on the predicate unless *yijing* 'already' is present. Finally, both simple futurate constructions in English and Mandarin presuppose that some

sort of plan that is physically plannable and relevant to the assertion is made in the context.

3. The semantics of Mandarin simple futurates

Copley (2002; 2009) proposes that English simple futurates contain a covert future modal and terms it as ALL_b in Copley (2009). But I think the earlier term "PLAN" is more intuitive and thus adopt this terminology. Due to the obvious parallel between English simple futurates and Mandarin simple futurates, following Sun (2014), He (2020), I extend Copley's proposal for English simple futurates to Mandarin with necessary modifications inspired by Rullmann et al. (2022). The covert future modal is analyzed within the widely accepted framework by Kratzer (1977; 1981; 1991). The framework takes modals as quantifiers over the best accessible worlds which is ranked by the ordering sources as to how good they are with respect to an ideal among the accessible worlds provided by the conversational background. To differentiate the two covert futurate modals in English and Mandarin, I label the English futurate modal as E-PLAN and the one in Mandarin M-PLAN. §3.1 is devoted to the details of Copley (2009) and my amendment to the proposal based on Rullmann et al. (2022). §3.2 focuses on the interaction between future interpretations and aspect. This section offers my account for the incompatibility of future modals and le_1 in Mandarin. §3.3 spells out the analysis for Mandarin simple futurates, taking into account the properties discussed in §2. §3.4 briefly compares the differences between M-PLAN and the overt future modal *hui*.

3.1 English simple futurates: Copley (2009) & Rullmann et al. (2022)

Copley's analysis consists of two key components: a covert metaphysical modal PLAN and the concept of "direction" modeling plan-making. To make Copley's proposal accessible to the reader, I stick to an earlier version of direction and E-PLAN with essentially the same ingredients of later versions and reinterpret her ideas in my notations.

Plan-making involves the entity that has the intension and the ability to secure the occurrence of the plan, which is called the "director". The director

is not necessarily the syntactic subject of the sentence. For example, the director of the plan in (30a) is whoever has the authority on scheduling baseball games, i.e., Major League Baseball. Thus, we assume that the director is contextually determined via an assignment function g.

(30) a. The Red Sox play the Yankees tomorrow.
b. The sun rises tomorrow at 5:13 a.m.

The content of a plan is formalized as a proposition of type <i,st>, which has a time argument to saturate. The plan being "plannable" means that the director should have the ability to secure the plan to happen if a plan is made. For instance, the result of a match is in principle not scheduled. We also lack the knowledge about the scientific laws to predict an earthquake to occur at a specific time. Therefore, eventualities denoted by *defeat* and *have an earthquake* are understood as "unplannable". This intuition can be modeled as follows: if in the actual world w at t, there exists a plan p made by a director with the necessary ability and intention, p will be true at a future time in the worlds that share the same history with w up to t and is consistent with the director's commitments. If so, we say that the director "directs" p in w at t, which is abbreviated as DIRECT (p)(t)(w).

Simple futurates also presuppose the existence of some plan. Copley (2009) suggests that the content of the plan is one of the focus alternatives of the futurate. For instance, the time adverb in "Joe skydives tomorrow" is assumed to host the information focus and the set of alternatives with different future time adverbs is encoded in the presupposition of E-PLAN. However, as we showed in §2.3, though Mandarin futurates are sensitive to focus, focus is not necessarily present. Similarly, the English sentence in response to the yes-no question in (31) does not seem to host a specific focus, either.

(31) A: Does John skydives tomorrow?
B: Yes, he skydives tomorrow.

Beaver & Clark (2008)[9] propose that sets of alternatives can be evoked at various levels in the compositional build-up of the sentence meaning. Non-veridical, propositional operators such as negation, possibility modals, etc. are quasi-associating expressions that do not lexically encode grammatical dependency on the Question Under Discussion (QUD). I suggest that the focus-association of the simple futurate modal is a type of quasi-association rather than the conventional association conveyed by exclusives such as *only*. They associate with focus in a way such that the alternatives evoked within their syntactic scope form a set of propositions that can be congruent to the current question under discussion.

To represent how the content of the plan is determined, Rullmann et al. (2022) offer a better solution, even though their proposal does not involve a modal analysis. Rullmann et al. (2022) suggest that simple futurates presuppose the existence of a schedule, which is a specific type of plan. It can be characterized as a matrix of information concerning future events with multiple dimensions, e.g., events, participants, times. A schedule is a (physical or mental) representation providing a set of answers to a multiple *wh*-question about future events in the context. For example, Table 2 depicts the schedule for the chores in a household. It answers the question in (32a), dubbed as the "schedule question", which is the maximal multiple *wh*-question answered by the schedule.

Table 2. A schedule for chores

	8 December	**15 December**	**22 December**
Vacuuming	Ann	Bob	Cam
Laundry	Bob	Cam	Ann
Dishes	Cam	Ann	Bob

(32) a. Who does which chore on which day?
b. $\lambda p \exists x,y,z[person(w)(x) \wedge chore(w)(y) \wedge day(w)(z) \wedge p=\lambda w'[x \text{ does } y \text{ on } z \text{ in } w']]$

[9] I thank the reviewer for suggesting Beaver & Clark's work for reference.

Assuming that a question denotes a set of propositions that are its possible answers (Hamblin 1973; Karttunen 1977), the denotation of (32a) is formalized as the set of propositions of the form "person x does chore y on day z", as shown in (32b). Given the fact that English simple futurates are infelicitous with one-off plans, Rullmann et al. (2022) suggest that this set cannot be a singleton set. In a given discourse, (32a) or any of its subquestions maybe the QUD. If a simple futurate sentence is uttered and the common ground does not contain a schedule at the utterance time, one can be accommodated. The addressee can try to conjure up a context containing a schedule to satisfy the presupposition.

Based on the insights from Rullmann et al. (2022), I suggest that the content of the plan in the presupposition of E-PLAN is a set of answers to the schedule question, which is contextually determined and represented by a discourse variable C. E-PLAN carries a numerical index 1 that picks out a director g(1) via assignment and a variable C that determines the content of some plan. The modified semantics of the covert futurate modal E-PLAN is shown in (33).

(33) $\| \text{E-PLAN}_{1,C} \|^{g,c} = \lambda p.\lambda t.\lambda w:\ t \subseteq t_c \wedge \exists p' \in C \wedge \text{DIRECT}_{g(1)}(p')(t)(w) \wedge \forall w'[w' \in \text{BEST}(\text{MB},\text{O},w,t) \rightarrow \exists t'[t' > t \wedge p'(t')(w')]]$.
$\forall w'[w' \in \text{BEST}(\text{MB},\text{O},w,t) \rightarrow \exists t'[t' > t \wedge p(t')(w')]]$.

"$\exists p' \in C$" suggests that there is a proposition p', which is a possible answer to the schedule question determined by the context. "$\text{DIRECT}_{g(1)}(p')(t)(w)$" requires p' to be plannable for g(1). Moreover, p' will happen in a future time in all the best accessible worlds. The presupposition thus conveys that there is some plan p' in the context. The modification of "$t \subseteq t_c$" added by me requires the time argument taken by $\text{E-PLAN}_{1,C}$ to be within the context supplied evaluation time t_c, i.e., the utterance time. This secures that only the present tense is able to combine with $\text{E-PLAN}_{1,C}$. If defined, $\text{E-PLAN}_{1,C}$ acts like a normal future modal: in all the best accessible worlds, p holds at a time t' after t. "BEST (MB,O,w,t)" represents the sets of best accessible worlds given the metaphysical modal base MB and the ordering source O. A metaphysical modal base contains all the propositions that are true in the actual world (Thomason 1970), i.e. all the possible worlds in the modal base have the same history as

the actual world up to t. The ordering source can be bouletic or inertial, representing the commitment to the plan by the director. When the director is an entity, the ordering source is often bouletic. In simple futurates denoting natural phenomena, the director is the world which is committed to the plan according to its law-like principles. The ordering source is thus inertial, in the sense of Dowty (1979) that an "inertial world" means a world in which everything proceeds normally.

Here is an example in the context described above to illustrate how the revised proposal of Copley works in a compositional way. The Logical Form (LF) for the sentence in (34a) is shown in (34b).

(34) a. Bob does the dishes tomorrow.
b. [$_{TP}$ PRES$_7$ [$_{ModP}$ E-PLAN$_{1,C}$ [$_{vP}$ Bob do the dishes tomorrow]]]

I assume that the temporal adverbial denotes a property of times (of type <i,<s,t>>), i.e., *tomorrow* denotes a set of intervals that are within "tomorrow". For simplification, the context sensitivity in the semantics of *tomorrow* is omitted. The obligatoriness of future time adverbs in futurates (both in English and Mandarin) is because without adverbials, simple futurates are easily understood as habituals or generics (Rullmann et al. 2022). If the context makes the future time reference clear, a plain futurate does not require an overt future time adverb. Following Copley (2009), I simply take the denotation of the verb phrase "Bob do the dishes" as "λtλw[do-the-dishes (b)(t)(w)]", meaning that the event of Bob doing the dishes is temporally located at t in w, without elaborations on the internal structure. The temporal adverbial adjoins to the verb phrase and constrains the eventuality time via predicate modification. E-PLAN$_{1,C}$ then scopes over the verb phrase. Adopting the referential view for tense (Partee 1973), the tense operator carries a numerical index 7 which selects an interval from the context via the assignment function. It then supplies the time argument for the modal phrase. The detailed derivation for (34a) is demonstrated in (35).

(35) a. ‖tomorrow‖ = λt.λw.[t ⊆ tomorrow in w]
b. ‖vP‖ = λt.λw.[do-the-dishes(b)(t)(w) ∧ t ⊆ tomorrow in w]
c. C = λp∃x,y,z[person(w)(x) ∧chore(w)(y) ∧day(w)(z) ∧

p=λw'[x does y on z in w']]

d. $\|\text{E-PLAN}_{1,C}\|^{g,c}=\lambda p.\lambda t.\lambda w$: $t \subseteq t_c \wedge \exists p' \in C \wedge \text{DIRECT}_{g(1)}(p')(t)(w) \wedge$
$\forall w'[w' \in \text{BEST}(\text{MB},\text{O},w,t) \rightarrow \exists t'[t' > t \wedge p'(t')(w')]]$.
$\forall w'[w' \in \text{BEST}(\text{MB},\text{O},w,t) \rightarrow \exists t'[t' > t \wedge p(t')(w')]]$.

e. If $\text{E-PLAN}_{1,C}$ is defined,
$\|\text{ModP}\| = \lambda t.\lambda w.\forall w'[w' \in \text{BEST}(\text{MB},\text{O},w,t) \rightarrow \exists t'[t' > t \wedge$
do-the-dishes(b)(t')(w') $\wedge$ t' $\subseteq$ tomorrow in w']].

f. $\|\text{TP}\| = \lambda w \forall w'[w' \in \text{BEST}(\text{MB},\text{O},w,t_c) \rightarrow \exists t'[t' > t_c \wedge$
do-the-dishes(b)(t')(w') $\wedge$ t' $\subseteq$ tomorrow in w']].

In the context, the director g(1) offered by the assignment function is any entity that has the authority to schedule the chores for Bob. The presupposition suggests that at least a plan expressed by some proposition that can answer the question "Who does which chore on which day" is scheduled. Once $\text{E-PLAN}_{1,C}$ combines with the present tense to secure the evaluation point to be the utterance time (t_c), the sentence in (34a) is defined. It means that in all the best accessible worlds in w at the utterance time, there is a time t' after the utterance time that is within tomorrow and Bob does the dishes at t'.

3.2 Interaction between future interpretations and aspect

Mandarin simple futurates share many properties with English simple futurates. For instance, both constructions require a future time adverb overtly (or is at least mentioned in the previous context if it is not syntactically present), presuppose the existence of a plan and require the eventualities to be plannable. Mandarin simple futurates also differ from English simple futurates in the following dimensions: (a) the evaluation point for future is the utterance time in general. But under certain circumstances the evaluation point can also be a past time; (b) Mandarin simple futurates can combine with weather predicates while the English counterparts are degraded in similar circumstances; (c) English simple futurates contain bare predicates while Mandarin is possible to have progressive aspect *zai* but not perfective aspect *le1* marked on the predicate. The properties in (a)–(b) are easy to modify based on Copley's (2009) analysis for English simple futurates. The interaction between future modals and aspect is less studied. I shall first introduce the

assumptions for aspect in a neo-Davidsonian framework and the cross-linguistic picture of aspect marking in future contexts in §3.2.1. In §3.2.2, I shall introduce the proposals in the literature for the incompatibility between future and perfective aspect; §3.2.3 is devoted to my analysis for this property.

3.2.1 The cross-linguistic picture of aspect in future contexts

Comrie (1976), Dahl (1985), Malchukov (2009), et al. suggest that perfective (or more generally aspectual distinctions involving perfective as a marked member) is more often found in the past, less often in future and usually lacking in the present or else is reinterpreted. Malchukov (2009) provides a small sample of languages summarized in (36) to illustrate the pattern of aspect distinction in different temporal contexts.

(36) Aspectual opposition in past, present and future contexts
   a. Romance: only in the past
   b. Greek: past and future, *present
   c. Slavic: present, past and future, but present perfective is reinterpreted
   d. ChiBemba (Bantu): present (imperfective), past (perfective, imperfective, perfect), future (perfective, imperfective)

The perfective and imperfective distinction is only observed in the past tense context in Romance languages. In Greek, the perfective/imperfective distinction is found in past and future contexts, but perfective is not applicable in present tense. In Slavic languages, the perfective/imperfective distinction is observed in present, past and future contexts. However, present perfective is reinterpreted as either future or generic. For instance, in East Slavic languages such as Russian, the morphological combination of present tense and perfective aspect does not give rise to a present reading but offers a future reading. The Bantu language ChiBemba morphologically makes a three-way distinction in its aspectual system: perfective, imperfective and perfect. According to Chung & Timberlake (1985: 227–228), the three-way distinction is observed in the past tense and reduced in the future, but in present tense, only imperfective exists.

The rareness of present perfective is due to the semantic conflict between the instantaneous utterance time in present contexts and the semantics of perfective, which I postpone to elaborate on in §3.2.3. In principle, perfective aspect in past contexts and future contexts do not face such a conflict. However, perfective aspect in future contexts is much less common than in past contexts. For instance, Mandarin is a language where the perfective aspect marker *le*$_1$ is in general infelicitous in future contexts. Hausa (Chadic language of the Semito-Hamitic languages, Africa) disallows either perfective or imperfective aspect in future contexts. The morpheme *zā* is often treated as "future tense" in the Hausa literature and has long been observed that *zā* is incompatible with either perfective or imperfective, as shown in (37).

(37) a. **Zā ta-nà wàsà gòbe.*
Zā 3SG.F-IPFV play tomorrow
Intended: 'She will be playing tomorrow.'
b. **Zā tā yi wàsà gòbe.*
Zā 3SG.F-PFV do play tomorrow
Intended: 'She will have played tomorrow.' (Mucha 2015: 83)

3.2.2 Previous accounts

To address the incompatibility of future perfective, several options are proposed in the literature. One type of analysis for this phenomenon is to attribute the infelicity to type-mismatching between the future modal and aspectual phrases. For example, Lin (2006) proposes the denotations in (38) for the future modal *hui*, perfective, and imperfective aspect in Mandarin.

(38) a. $\|hui\| = \lambda P_{<i,t>}\lambda t\lambda t_0[P(t) \wedge t_0 < t]$
b. $\|\text{PFV}\| = \lambda P_{<i,t>}\lambda t_{Top}\lambda t_0\exists t[t \subseteq t_{Top} \wedge P(t) \wedge t_{Top} < t_0]$
c. $\|\text{IPFV}\| = \lambda P_{<i,t>}\lambda t_{Top}\exists t[t_{Top} \subseteq t \wedge P(t)]$ (Lin 2006: 4, 6, 18)

Lin (2006) only focuses on the temporal semantics of *hui*, thus does not discuss its modal nature in detail. In Lin's framework, the perfective aspect is a temporal-aspectual particle that takes a proposition (the denotation of VPs in Lin's proposal) with a time argument unsaturated and returns a function of

type <i,it>.[10] Namely, perfective aspect takes a proposition and requires two time arguments t_{Top} and t_0, returns true if the temporal trace associated with the proposition is within t_{Top} (the reference time in a matrix clause) and t_{Top} precedes t_0 (often the utterance time in a matrix clause). In contrast, the imperfective aspect in (38c) returns a proposition of type <i,t>. That is, the imperfective aspect takes a proposition and only one time argument (the reference time), returns true if the temporal trace associated with the proposition includes the reference time. Lin (2006) suggests that the future modal must take a proposition of type <i,t> as the first argument, which is compatible with an imperfective phrase. However, a perfective phrase in Mandarin is of the type <i,it>, which does not match the semantic type of the first argument of the future modal. Therefore, a future sentence with a perfective phrase is ungrammatical due to type mismatch while no problem occurs for imperfective phrases.

A similar idea is proposed by Mucha (2015) for Hausa. Mucha (2015) suggests that the future form in Hausa is $z\overline{a}$+PROSP, i.e., the combination of an overt modal $z\overline{a}$ and a covert prospective aspect PROSP. The temporal futurity is obtained by the covert prospective aspect PROSP and $z\overline{a}$ is just a plain modal that scopes over the prospective aspect. The denotations of the two elements are shown in (39). The type of the eventuality argument is <l> in Mucha's analysis. PROSP takes in a property of eventuality and returns a function of type ⟨l,⟨i,st⟩⟩, which serves as the first argument P for $z\overline{a}$. $Z\overline{a}$ then states that P holds in all the best-ranked worlds based on some modal base MB according to some ordering source (O (w),(t)). The main idea of Mucha's proposal is that $z\overline{a}$ selects an argument of type <l,<i,st>>. A perfective or imperfective aspect can only return an argument of type <i,st> while prospective aspect offers an argument of <l,<i,st>>, the right fit for $z\overline{a}$. Therefore, $z\overline{a}$ occurs in future contexts because of the covert PROSP and is incompatible with perfective/imperfective morphology due to type-mismatch.

(39) a. $\|\text{PROSP}\| = \lambda P_{<l,<s,t>>}.\lambda e.\lambda t.\lambda w.\ [P(e)(w)\&\tau(e) > t]$

[10] Lin's (2006) proposal does not adopt a neo-Davidsonian analysis for eventualities, but it can be easily transformed. This point is not crucial for my proposal though.

b. $z\overline{a}$ presupposes a realistic modal base and an inertial or bouletic ordering source. If defined:
$\| z\overline{a} \| = \lambda P_{<l,<i,<s,t>>>}.\lambda t.\lambda w.\forall w'[w' \in \text{BEST}_{O(w),(t)}(\text{MB}(w)(t)) \rightarrow \exists e[P(e)(t)(w')]]$ (Mucha 2015: 86)

Another type of analysis is to attribute the incompatibility between future modal and perfective aspect to the semantics of the perfective aspect. Bittner (2014) suggests that Mandarin *le1* requires relative verifiability. "Verifiability" means that at a certain perspective point, we can tell if the eventuality modified by *le1* has occurred or not. The perspective point is the speech act by default, but it can be anaphoric. The conflict between future contexts and perfective aspect *le1* is because in a future sentence without *yijing* 'already', the perspective point is at the utterance time. The use of *le1* requires the eventuality to be verifiable at the utterance time but the future modal says that the eventuality is irrealis and is not verifiable at the utterance time, leading to a semantic conflict. The crucial role of the "context-setting aspectual adverb" (Bittner 2014: 107) *yijing* 'already' is to introduce a future perspective point for *le1*. The perspective point remains to be the utterance time for *hui*. With *yijing*, the perspective points for *le1* and *hui* are separate, which does not conflict with the future irrealis property of the modal and the verifiability constraint of the perfective aspect.

The proposal by Bittner (2014) is attracting, but it is difficult to precisely see the formal implementation of the idea. For example, it is unclear for us to see how to formally define the concept of "relative verifiability" in a future context. It is also unclear how the semantics of *yijing* 'already' technically introduces the perspective point to *le1* and why the perspective point for the future modal is different from *yijing* 'already' in these constructions. A full analysis following Bittner's line is powerful only when these key questions are answered.

Also, the type-mismatch analyses are not ideal for Mandarin facts. First, assuming different semantic types for perfective and imperfective aspect in Mandarin as Lin (2006) proposes increases the complexity of the theory for Mandarin temporal reference. Elements that can take both perfective phrases and imperfective phrases as complements, such as attitude predicates or epistemic modals that take propositional complements, will need extra mechanism

to handle the different semantic types. For example, if we do not assume two lexical entries for attitude predicates, stipulations of some sort of compositional rules are necessary to existentially close one time argument of perfective phrases so that both perfective and imperfective complements are of the same semantic type. Second, the analysis for Hausa in Mucha (2015) does not fit the Mandarin data, either. Unlike Hausa $z\overline{a}$ that disallows perfective or imperfective morphology in its complement, Mandarin *hui* only disallows a single perfective aspect. Without making stipulations about Mandarin imperfective, the grammatical sentences with imperfective phrases are ruled out as well if we extend the analysis for Hausa to Mandarin.

3.2.3 The proposal

In this section, I propose a third type of analysis,[11] figuring out the following puzzles: (a) the temporal difference between a perfective phrase and an imperfective phrase; (b) how *yijing* 'already' affects such a difference; (c) how to capture the sensibility of Mandarin future modals to this property.

I suggest that *le*$_1$ can go for a standard neo-Reichenbachian analysis for the perfective aspect as in (40). The denotation adopts a neo-Davidsonian semantic framework for eventualities, which are of type <v>. The perfective aspect takes a property of eventualities and a time argument (of type <i>), returns true if the runtime of the P eventuality is within the interval denoted by the time argument.

(40) $\|\text{PFV}\| = \lambda P.\lambda t.\exists e[P(e) \wedge \tau(e) \subseteq t]$ (Adapted from Kratzer 1998: 107)

The fact that *le*$_1$ in a declarative root clause with one predicate reports a past eventuality can be derived following the literature about the cross-linguistic rareness of "present perfective"(Bennett & Partee [2004]1972; Ogihara 1996; Pancheva & von Stechow 2004; Reis Silva & Matthewson 2007, among others). The present tense in a matrix clause supplies the utterance time for the perfective aspect, which is assumed to be instantaneous. The utterance time is the intuitive "now" of the interlocutors and it is a single moment. If the predicate denotes an event (non-stative), the runtime of the eventuality is too long

[11] I am indebted to Gennaro Chierchia for pointing out this theoretical possibility to me.

to be contained in an instantaneous moment,[12] leading to the infelicity of the combination of present tense and perfective aspect.

In fact, the tense-aspectual treatment for *le*$_1$ in Lin (2006) is partially motivated by the same concern. The strategy of encoding a temporal precedence relation in the semantics of perfective aspect cuts off the direct link between the utterance time and perfective and connects perfective to another time without the momentary concern. Therefore, we shall not encounter the present perfective contradiction even when the utterance time is supplied by the context. This is one way to theoretically represent the correlation between perfective marker and past contexts.

The other way is to leave perfective marker as aspectual as it is in (40), let the semantic conflict filter the present contexts and preserve the past contexts, with only one assumption: the reference time in present contexts is the utterance time, which is instantaneous. It is not because the semantics of perfective encodes the "past" that directly gives us the "past reading", but because the present context always provides the instantaneous utterance time as the input for perfective while the past context can offer intervals large enough to fit in the event time. Thus, perfective usually successfully "survives" in past contexts. In fact, even in past contexts, if the reference time is instantaneous, the reading of perfective is coerced to avoid the interpretation of fitting the event time in an instantaneous past time (Wurmbrand 2014). This semantic conflict indirectly results in perfective being common or even only observed in past contexts cross-linguistically.[13]

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[12] Specifically, accomplishments and achievements involve a process of "change of state", which at least takes two moments for the original state and the result state after the change. Hence the runtime of accomplishments and achievements are not as instantaneous as the utterance time does, even achievements are conceptually punctual. Activities are homogeneous down to some minimal extent that allows the right type of activities to be recognized, which also requires a runtime longer than a single moment. States are homogeneous with the sub-interval property (Dowty 1979), thus in principle can fit its runtime in a single moment, i.e., compatible with perfective aspect in present tense.

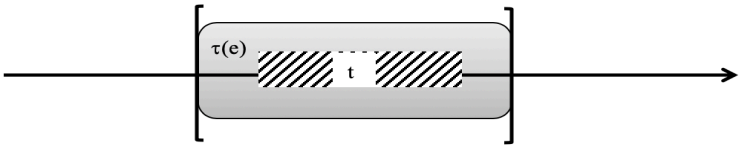
[13] Comrie (1976) claims that aspectual qualification is less relevant for actions that have not yet occurred. Therefore, lack/neutralization of tense and aspect distinctions is frequent in future contexts, negative clauses and irrealis moods (Aikhenvald & Dixon 1998).

Please note that the argumentation above does not depend on the existence of tense in the language. No matter which positions we stand for tense, a proper analysis must allow the context to supply a reference time, whether it is introduced by a tense operator or not. As long as we assume that the present reading in Mandarin always takes the instantaneous utterance time as the reference time, the semantic conflict brings about the generalization of perfective marker in past contexts. Therefore, a standard neo-Reichenbachian analysis for the perfective aspect works equally well to derive the past-perfective correlation in Mandarin.

If I am on the right track, the semantics of perfective and imperfective aspect are formalized in (41). The output of a perfective aspectual phrase or an imperfective aspectual phrase is a set of intervals. The sets of intervals returned by a perfective phrase and an imperfective phrase possess different temporal properties, as highlighted in the figures in (42) and (43), which omit irrelevant details for simplification.

(41) a. $\|\text{PFV}\| = \lambda P.\lambda t.\exists e[P(e) \wedge \tau(e) \subseteq t]$
b. $\|\text{IPFV}\| = \lambda P.\lambda t.\exists e[P(e) \wedge t \subseteq \tau(e)]$

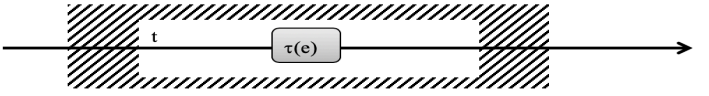
(42) Imperfective AspP: $\lambda t.\exists e[t \subseteq \tau(e)]$



(The set of t obtained by imperfective alone)

Figure 3. The set of t obtained by imperfective alone

(43) Perfective AspP: $\lambda t.\ \exists e[\tau(e) \subseteq t]$



(The set of t obtained by perfective alone)

Figure 4. The set of t obtained by perfective alone

In the figures in (42)–(43), the white space stands for the set of intervals that is returned by the overt aspect marker. The space with slashes stands for the superset of this set. The grey box represents the runtime of the eventuality. As depicted by the figure in (42), the set of t returned by an imperfective aspect has an upper bound (a maximal value $\tau(e)$). Hence the set of t is not closed under superset. If $p(x) = 1$ and an operation α on x is also true for p, i.e., $p(\alpha(x)) = 1$, then $p(x)$ is closed under the operation α. For imperfective aspectual phrases, any superset larger than $\tau(e)$ will be out of the set of t. On the contrary, in (43), the set of intervals returned by a perfective aspect is closed under superset, i.e., the superset of t still satisfies the property "$\lambda t.\ \exists e[\tau(e) \subseteq t]$", since time is infinite, and no boundaries is set for t.

I assume that Mandarin future modals, including the overt *hui* and the covert M-PLAN, are sensitive to this difference: the set of intervals denoted by the complement of the future modal cannot be closed under the superset operation. The reason why elements like *yijing* 'already' "rescue" perfective phrases as the complement of the future modal is because *yijing* 'already' changes the property of the set of intervals returned by the perfective phrase. The exact semantics of the aspectual adverb *yijing* 'already' is an important and complex issue (Soh & Gao 2008). Now I set aside the details of many other properties of *yijing* 'already' and highlight only the temporal properties relevant to the current discussion. I assume the semantics in (44) for *yijing* 'already'. Though it is inadequate for a full picture of *yijing* 'already', it is enough for our purpose here to show how it makes a perfective complement acceptable with a future modal. *Yijing* 'already' takes a temporal proposition and shifts the time argument associated with the proposition to a past time.

(44) $\|yijing\| = \lambda p_{<i,<s,t>>}.\lambda t.\lambda w.\exists t_0[t_0 < t \wedge p(t_0)(w)]$.

A simple sentence in (45a) serves as an example to illustrate the semantics of *yijing* 'already'. The LF structure is demonstrated in (45b). Since the goal for this paper is not about whether Mandarin is tensed or tenseless, I follow the proposal in Bochnak (2016), Bochnak et. al (2019) and assume that a superficially tenseless clause contains a phonologically covert, indexed

temporal pronoun that represents the reference time. In the matrix clause, this temporal pronoun is free and receives its value from context via the variable assignment function. The indexed pronoun t_7 for the sentence in (45b) denotes the utterance time, represented by t_c. Given the derivation in (46), the sentence in (45a) means that Zhangsan left before the utterance time.

(45) a. *Zhangsan yijing likai le Nanjiing.*
Zhangsan already leave PFV Nanjing
'Zhangsan has already left Nanjing.'
b. [$_{TP}$ t_7 [$_{AspP2}$ *yijing* [$_{AspP1}$ *le*$_1$ [$_{vP}$ Zhangsan leave Nanjing]]]]

(46) a. $\|AspP_1\| = \lambda t.\lambda w.\exists e[\tau(e)(w) \subseteq t \wedge leave(e)(w) \wedge Theme(e)(w) = n \wedge Agent(e)(w) = z]$
b. $\|yijing\| = \lambda p.\lambda t.\lambda w.\exists t_0[t_0 < t \wedge p(t_0)(w)]$
c. $\| AspP_2 \| = \lambda t.\lambda w.\exists t_0 \exists e[t_0 < t \wedge \tau(e)(w) \subseteq t_0 \wedge leave(e)(w) \wedge Theme(e)(w) = n \wedge Agent(e)(w) = z]$
d. $\|TP\|^c = \lambda w.\exists t_0 \exists e[t_0 < t_c \wedge \tau(e)(w) \subseteq t_0 \wedge leave(e)(w) \wedge Theme(e)(w) = n \wedge Agent(e)(w) = z]$

In other words, *yijing* 'already' returns a set of intervals and shifts the eventuality to be in a period that precedes all the members in that set, which is visualized in (47). Comparing to a single perfective complement that leaves the boundaries of t open in (43), a perfective phrase with *yijing* 'already' closes one boundary in (47). In this case, only the supersets of t that are after t_0 satisfy "$\lambda t.\ \exists t_0 \exists e[t_0 < t \wedge \tau\ (e) \subseteq t_0]$" Therefore, with *yijing* 'already' scoping over a perfective complement, the set of intervals that serves as the input for a future modal is no longer closed under superset.

(47) Perfective with *yijing* 'already': $\lambda t.\ \exists t_0 \exists e[t_0 < t \wedge \tau(e) \subseteq t_0]$

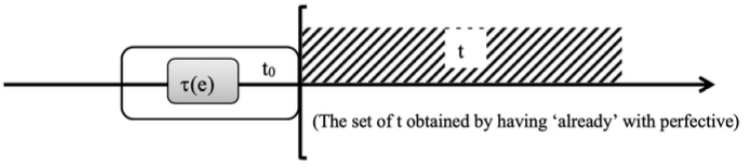


Figure 5. The set of t obtained by perfective with *yijing* 'already'

This observation is formalized in (48). The complement p of *hui* or the covert modal in futurates, satisfies the presupposition that not all the supersets of t hold for p.[14] This presupposition then excludes perfective complements and allows imperfective complements or complements that contain other elements (*yijing* 'already') to yield the right input.

(48) $\lambda p{:}\neg\forall w'\forall t'\forall t''(p(t')(w') \wedge t' \subseteq t'' \rightarrow p(t'')(w'))$.

Given the assumption that verb phrases carry an eventuality argument, which is existentially closed by aspect, verb phrases and imperfective phrases are then of different semantic types. The former is of type <v,t>, the latter of type <i,t>.[15] Future modals can take either imperfective phrases or bare verb phrases as complements. We have two theoretical options in composition. Either we assume different lexical entries for future modals to handle different types, or we assume a type-shifter to deal with the mismatch. For future expressions in which no overt aspect marking is present, I assume that the complement of *hui* or M-PLAN possesses a covert bleached aspect ASP in (49).

[14] One reviewer asked if there is independent evidence for the presupposition. I simply take the definedness condition as a technical implementation to encode the sensitivity under discussion. Presupposition happens to be modeled in that way in formal semantics, too. I do not have independent evidence for the perfective-sensitivity to be a presupposition but not something else. Therefore, I am open to any other solutions that can equally achieve the goal properly.

[15] Aspectual phrases and bare verb phrases denoting different semantic types is not a bad result. In fact, the obligatoriness of aspect marking on Mandarin eventives in episodic expressions offers support for such a distinction. Klein et al. (2000), Tsai (2008), Sun (2014) et al. observe that Mandarin root clauses with bare eventives require aspect marking when denoting an episodic reading. Otherwise, the sentence displays an "incomplete" feeling or is even considered as ungrammatical. Sun (2014) suggests that eventives with aspect markings are of type <i,t>. They can directly combine with a time argument of type <i> supplied by the context. However, eventives are of type <v,t>, which cannot combine with a time argument. Hence aspect marking is necessary for eventives to shift the type for further composition. Therefore, the current assumption about VP and imperfective phrases has independent support, which is likely to be on the right track.

(49) $\|\text{ASP}\| = \lambda P.\lambda t.\lambda w.\exists e[P(e)(w) \wedge \tau(e) = t]$

The bleached aspect in (49) turns a property of eventualities into a temporal proposition for the next derivation (Matthewson 2012). It is very similar to a perfective aspect except that it is not defined by an inclusion relation but an identity relation between the event time and the reference time. Therefore, it does not trigger a presupposition failure of the future modal since the aspectual phrase is not closed under the superset operation. Even though ASP is merely a type-shifter as the theoretical consequence of adopting Kratzer's (1998) proposal within a Davidsonian framework, this assumption helps us maintain a unified clausal spine in the complement of future modals with a uniformed semantic type.

3.3 The analysis for Mandarin simple futurates

To recap, Mandarin simple futurates have several different properties, compared to English simple futurates. First, the time argument associated with the PLAN modal is not constrained to the utterance time. When the time adverb is not indexical such as *shi tian hou* 'after ten days', Mandarin simple futurates allow a past futurate reading. Therefore, the temporal constraint on t for E-PLAN should be removed from the Mandarin version. Second, Mandarin simple futurates are natural with weather predicates while English futurates are not. Mandarin treats simple futurates with weather predicates as cases in which the law-based world directs the weather. Third, unlike English, Mandarin simple futurates are fine with one-off plans. Hence it is fine for the set of possible answers to the schedule question to be a singleton set. Lastly, M-PLAN is incompatible with *le*$_1$. Hence it carries the non-perfective presupposition.

The meaning of M-PLAN is defined in (50). The denotation sets two restrictions on the presupposition of the first argument p that M-PLAN takes. The first restriction, i.e., "$\neg\forall w'\forall t'\forall t''(p(t')(w') \wedge t' \subseteq t'' \rightarrow p(t'')(w'))$", aims to capture the non-perfective property of the argument, as I discussed in §3.2.3. The second restriction, i.e., "$\exists p' \in C \wedge \text{DIRECT}_{g(1)}(p')(t)(w) \wedge \forall w'[w' \in$ BEST

(MB,O,w,t) → ∃t'[t'>t ∧p'(t')(w')]]", extends the analysis for English simple futurates to Mandarin.

(50) ‖ M-PLAN$_{1,C}$ ‖ ^{g,c} = λp.λt.λw: ¬∀w'∀t'∀t''(p(t')(w') ∧ t'⊆ t''→ p(t'')(w')) ∧ ∃p'∈ C ∧ DIRECT$_{g(1)}$(p')(t)(w) ∧∀w'[w'∈ BEST (MB,O,w,t) → ∃t'[t'>t ∧p'(t')(w')]].
∀w'[w'∈ BEST (MB,O,w,t) → ∃t'[t'>t ∧p(t')(w')]].

The derivation of the example in (51a) illustrates how the analysis works. The LF structure of the sentence in (51a) is demonstrated in (51b). The complement of M-PLAN contains a bleached aspect ASP, which secures that the non-perfective presupposition is satisfied.

(51) a. *Zhangsan* *mingtian* *likai* *Nanjing*.
Zhangsan tomorrow leave Nanjing
'Zhangsan leaves Nanjing tomorrow.'
b. [$_{TP}$ t_7 [$_{ModP}$ M-PLAN$_{1,C}$ [$_{AspP2}$ [$_{AdvP}$ *mingtian*] [$_{AspP1}$ ASP [$_{vP}$ *Zhangsan leave Nanjing*]]]]]

If the presupposition is satisfied, M-PLAN acts like a normal future modal and shifts the event time to the future. The derivation for (51a) is illustrated in (52). At the level of TP, the context offers the utterance time, which saturates the last argument for the future modal phrase. The sentence then obtains a reading in (52c) which says that for all the best worlds accessible from w given a metaphysical modal base and a bouletic ordering source, Zhangsan leaves Nanjing tomorrow in those worlds.

(52) a. ‖AspP$_2$‖ = λt.λw. ∃e[τ(e)(w) = t ∧ t ⊆ tomorrow in w∧ leave(e)(w) ∧ Theme(e)(w) = n ∧ Agent(e)(w) = z]
b. If M-PLAN$_{1,C}$ is defined,
‖ModP‖ = λt.λw. ∀w'[w'∈ BEST (MB,O,w,t) → ∃t' ∃e [t'> t ∧ τ(e)(w') = t'∧ t' ⊆ tomorrow in w'∧ leave(e)(w') ∧ Theme(e)(w') = n ∧ Agent(e)(w') = z]
c. λw. ∀w'[w'∈ BEST (MB,O,w,t_c) → ∃t' ∃e [t'> t_c ∧ τ(e)(w') = t'∧ t' ⊆ tomorrow in w'∧ leave(e)(w') ∧ Theme(e)(w') = n ∧ Agent(e)(w') = z]]

3.4 Differences between M-PLAN and *hui* 'will'

Hui and M-PLAN are both future modals in Mandarin. Other than the incompatibility with *le*$_1$, the two future modals are different in several dimensions. First, unlike M-PLAN, *hui* does not presuppose the existence of a plan in the context. Second, *hui* does not pose constraints on the "plannability" of eventualities. In other words, *hui* does not involve the "direction" component that constrains the property of eventualities, or the existence of some contextually-determined plan in its presupposition. Therefore, eventualities that cannot be scheduled are totally fine with *hui* but not M-PLAN, as illustrated by the examples in (4), repeated below. The sentence in (53a) is only acceptable in a context where someone can control the result of the match and there is a plan for the result, a reading (53b) lacks.

(53) a. # *Huren dui mingtian ying Huojian dui.*
Lakers team tomorrow win Rockets team
'The Lakers win the Rockets tomorrow.'

b. *Huren dui mingtian hui ying Huojian dui.*
Lakers team tomorrow FUT win Rockets team
'The Lakers will win the Rockets tomorrow.'

Third, *hui* seems to involve an epistemic modal base rather than a metaphysical modal base as M-PLAN does. The sentences in (54) only differ in the choice of future modals. Compared to (54a), (54b) has a flavor of "prediction" based on the knowledge or evidence that the speaker possesses, which links to an epistemic modal base as Giannakidou & Mari (2018) suggests. Given the controversy about "prediction" and the various interpretations of *hui*,[16] the details about modal bases and ordering sources call

[16] Besides the future usage, the morpheme *hui* can also be treated as dynamic modals about capability and genericity, shown by the examples in (i). M-PLAN does not possess such usages.

(i) a. *Zhangsan hui youyong.* (ability)
Zhangsan HUI swim

for a thorough investigation, which goes beyond the scope of the current project and I have to leave it for future research.

(54) a. *Zhangsan mingnian jingxuan zongtong.*
Zhangsan next-year elect president
'Zhangsan joins the presidential election next year.'
b. *Zhangsan mingnian hui jingxuan zongtong.*
Zhangsan next-year FUT elect president
'Zhangsan will join the presidential election next year.'

Lastly, though the utterance time is the most common evaluation point for both *hui* and M-PLAN while a past evaluation point is limited, *hui* is not sensitive to the type of time adverbials when a past evaluation time is picked. For example, in the scenarios of (23) and (25) which target a past evaluation time, *hui* is fine with indexical time adverbs and neutral adverbs, as suggested by the examples in (55a) and (55b) respectively, showing a slightly different pattern from M-PLAN.

(55) a. *Anzhao yi-ge yue qian zhiding de jihua,*
according-to one-CLF month ago make DE plan
Huren dui gen Huojian dui ***hui*** *zai* ***shang-zhou*** *bisai.*
Lakers team and Rockets team **FUT** at **last-week** compete
'According to the plan made a month ago, the Lakers were playing the Rockets last week.'

'Zhangsan can swim.'

b. *Shui hui wang dichu liu.* (generic)
water HUI go low-place flow
'Water flows downward.'

b. *Anzhao* *yi-ge* *yue* *qian* *zhiding* *de* *jihua,*
according-to one-CLF month ago make DE plan
Huren *dui* *gen* *Huojian* *dui* ***hui*** *zai* ***shi-tian***
Lakers team and Rockets team **FUT** at **ten-day**
hou *bisai.*
after compete
'According to the plan made a month ago, the Lakers would play the Rockets in ten days.'

4. Implications on the debate of tense

I now turn to the implications of my proposal on the debate about tense in Mandarin. Sun (2014) observes that Mandarin bare predicates are feasible with present or past time adverbs, but the combination with future time adverb is bad unless overt future markers such as *hui, jiang* or *yao* are present, demonstrated by the examples below.

(56) a. *Lulu* ***xianzai*** *hen* *jusang.*
Lulu **now** very frustrated
'Lulu is very frustrated now.'
b. *Lulu* ***gangcai*** *hen* *jusang.*
Lulu **just.now** very frustrated
'Lulu was very frustrated just now.'
c. ***Mingtian*** *Lulu* ****(hui)*** *hen* *jusang.*
Tomorrow Lulu **MOD** very frustrated
'Tomorrow, Lulu will be very frustrated.'
(Adapted from Sun 2014: 163–165)

(57) a. ***Zhei-ji-nian*** *Zhongguo* *dui* *hen-shao* *shu-qiu.*
this-several-year China team very-few lose-ball
'The Chinese team rarely loses these years.'
b. ***Yiqian*** *Zhongguo* *dui* *hen-shao* *shu-qiu.*
in-the-past China team very-few lose-ball
'The Chinese team rarely lost in the past.'

c. ***Mingnian*** *Zhongguo* *dui* ****(jiang)*** *hen-shao*
next.year China team **MOD** very-few
shu-qiu.
lose-ball
'The Chinese team will rarely lose next year.'
(Adapted from Sun 2014: 168–171)

In other words, Mandarin root clauses with bare predicates can denote past or present interpretations while future interpretations are constrained unless being marked. Based on this generalization, Sun (2014) proposes that Mandarin possesses a covert tense that sets the reference time to a non-future interval in the grammar. This paper suggests that even though there are seemingly counterexamples to Sun's observation that allow future time adverbs with bare predicates, it does not mean that futurates serve as strong evidence against a tensed analysis for a superficially tenseless language that show a trend of a non-future constraint on reference time. A covert future modal may in fact play a role in the structure, posing detectable constraints on other elements.

Moreover, the differences between English futurates and Mandarin futurates suggest that the restrictions on simple futurates differ in languages that do not have a contrasting progressive form for future time reference. Future research should therefore investigate simple futurates in a variety of other languages, including those with independent differences in their tense/aspect systems (Rullmann 2022). This paper makes an effort towards this direction and advocates more cross-linguistic exploration to better understand the universals and variations.

5. Conclusions

This paper investigates future interpretations in a Mandarin declarative root clause with only one predicate and no overt future modals. In comparison with English, I considered the type of eventualities, obligatoriness of time adverbs, interaction with overt aspect markers, and the presupposition about the existence of a plan.

To account for these properties, I follow the idea in Sun (2014) that Mandarin futurates contain a covert future modal M-PLAN. I extend to

Mandarin the analysis in Copley (2002; 2009) with modifications based on Rullmann et al. (2022). M-PLAN presupposes the existence of a schedulable plan, which is one possible answer to the schedule question in the context. Moreover, to capture the sensitivity of non-perfectivity in its complement, I propose that the presupposition of M-PLAN requires that the set of intervals as the input for the modal should not be closed under the operation of superset.

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Abbreviations

CLF	classifier	NEG	negation
COP	copula	PFV	perfective
DE	nominal modifier	PL	plural
EXP	experiential aspect marker	PRES	present tense
F	feminine gender	PROG	progressive
FUT	future morpheme	PROSP	prospective aspect
HUI	non-future usages of *hui*	Q	question marker
IPFV	imperfective	SFP	sentence-final particles
MOD	modal	SG	singular

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