

Mandarin HAI: A Focus Operator

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This study explores the semantics of Mandarin HAI. It first describes an over-looked observation that sentences with HAI can almost always be interpreted with aspectual, additive, or scalar meaning depending on intonational patterns and shared information of the interlocutors. Then, it proposes that Mandarin focus-sensitive operator HAI has three components: the scalar component, the additive component, and the aspectual component. While the core meaning of HAI is scalar, the other components bear respective presuppositions. When a sentence with HAI is pronounced, an ordinary meaning and a set of focus alternatives are assigned, and the scalar component plus an optional component, either aspectual or additive, are triggered. This analysis unifies the different meanings of HAI, accounts for its ambiguity, and also makes cross-linguistic relevance.¹

1. The Three-Way Ambiguity of Mandarin HAI

In Mandarin, the particle HAI can have different meanings – the aspectual meaning ‘still’ as in (1), the additive meaning ‘also’ as in (2), and the scalar meaning ‘even’ as in (3) (Liu, 2000; Donazzan, 2008; Yang, 2017; Chen, 2018). Previous literature often tried to account for the semantics of HAI by assuming that its different uses cannot co-occur. The fact that sentences with HAI can be interpreted in more than one way depending on the context is frequently missed and the scope of the phenomenon is underestimated.

- (1) 这已经中午十二点了, 李四还没起。
Zhe yijing zhongwu shier dian le, Lisi HAI mei qi.
It already noon 12 clock le Lisi still not get-up
‘It’s already noon time, but Lisi is still asleep.’
- (2) 屋里有仨, 院子里还有俩。
Wu li you sa, yuanzi li HAI you lia.
Room in have three yard in also have two
‘There are three in the room, as well as two in the yard.’

¹ I am very grateful to the feedback from Dr. Brian Buccola and the audience of the Graduate Linguistics Expo At Michigan State (GLEAMS).

- (3) 李四那么讨厌, 你还喜欢他。
Lisi name taoyan, ni HAI xihuan ta.
 Lisi very annoying you even like him
 ‘You even like Lisi, who is so annoying.’

There exists a three-way ambiguity in the interpretation of HAI as exemplified by (4). Basically, as in (4a), if none of the words in the sentence is focused and if no relevant background information is given, the sentence has multiple meanings since all three meanings of HAI are available. Some contexts are provided in the parentheses in (4a) to aid understanding. The ambiguity concerning the meanings of a sentence with HAI can be resolved by unpronounced shared knowledge between the interlocutors, pronounced discourse, or focus on some of the words in the sentence. For instance, as in (4b)-(4f), if the sentence *Lee HAI xihuan John* has the parts in the parentheses as uttered immediate discourse or unpronounced shared knowledge, the alternative meanings are canceled. Alternatively, focusing on the bold-faced word of the sentence may also resolve ambiguity. Specifically, when the focus is on HAI, the additive use in (4b) and the aspectual use in (4c) can be ambiguous without having extra information in pronounced or unpronounced forms. Moreover, the scalar readings in (4d), (4e), and (4f) could show that the speaker is surprised by the recipient of the like behavior, the agent of the behavior, or the behavior of like itself when the focus is on *John*, *Lee*, or *xihuan* ‘likes’ respectively.

- (4) a. 李还喜欢章。
Lee HAI xihuan John.
 Lee HAI likes John
 ‘Lee still likes John. /
 Lee also likes John. /
 Lee likes even JOHN. (Compared with other people, John is someone not likely to be liked by Lee.) /
 Even LEE likes John. (Others may like John, but Lee seems unlikely to like John.) /
 Lee even **LIKES** John. (It is difficult to not hate John.)’

- b. (李过去喜欢章,) 李还喜欢章。
 (*Lee guoqu xihuan John,*) *Lee HAI xihuan John.*
 Lee past likes John Lee HAI likes John
 ‘(Lee likes John in the past, and) Lee still likes John.’
- c. (李喜欢唐,) 李还喜欢章。
 (*Lee xihuan Tang,*) *Lee HAI xihuan John.*
 Lee likes Tang Lee HAI likes John
 ‘(Lee likes Tang, and) Lee also likes John.’
- d. (章那么讨厌,) 李还喜欢章。
 (*John name taoyan,*) *Lee HAI xihuan John.*
 John so annoying Lee HAI likes John
 ‘(John is so annoying, and it is surprising that) Lee likes even JOHN.’
- e. (李那么挑剔,) 李还喜欢章。
 (*Lee name tiaoti,*) *Lee HAI xihuan John.*
 Lee so picky Lee HAI likes John
 ‘(Lee is so picky, and it is surprising that) even LEE likes John.’
- f. (章讨厌/李挑剔/章骂李,) 李还喜欢章。
 (*John taoyan / Lee tiaoti / John ma Lee,*) *Lee HAI xihuan John.*
 John annoying / Lee picky / John scold Lee Lee HAI likes John
 ‘(John is annoying, or Lee is picky, or John scolded Lee, and it is surprising that)
 Lee even LIKES John.’

In previous literature, this three-way ambiguity of HAI was overlooked. Even in cases where ambiguity was recognized, not all possibilities of the ambiguous meanings were considered. For instance, when using (4) as an example, Chen (2018) did point out the ambiguity between additive and aspectual readings but missed the interpretations of the scalar reading. Similarly, in a more complex sentence (5), Liu (2000) mentioned the ambiguity in (5a), but missed the scalar readings in (5b).² The fact that the aspectual-additive ambiguity is often identified but the scalar reading is frequently missed is probably not a coincidence but due to the fact that both aspectual and additive reading requires the same focus condition – focus on HAI. This probably reveals that the scalar reading of HAI is operated at a different level than the other

² The example is originally from Ma (1984).

two readings. This serves as the evidence to support the current analysis which considers the scalar meaning as the basis of the semantics of HAI.

- (5) a. 老张还愿意帮助他。
Laozhang HAI yuanyi bangzhu ta
 Laozhang HAI be-willing help him
 ‘Laozhang is still willing to help him. /
 Laozhang is also willing to help him. /
 Laozhang is relatively willing to help him.’³
- b. 老张还愿意帮助他。
Laozhang HAI yuanyi bangzhu ta
 Laozhang HAI be-willing help him
 ‘Even Laozhang is willing to help him. (Laozhang does not like to help.) /
 Laozhang is even willing to help him. (It is relatively understandable for
 Laozhang to help him because of being forced.) /
 Laozhang is willing to even help him. (The behavior of help is surprising.) /
 Laozhang is willing to help even him. (The recipient of help is surprising.)’

2. Previous Analyses of Mandarin HAI

Previously, some analyses on the semantics and pragmatics of Mandarin HAI assumed that there is one core meaning of HAI (Liu, 2000; Yang, 2017), other analyses concluded that there are separate accounts for the multiple uses of HAI (Zhang, 2014; Chen, 2018). In this section, I am going to briefly review the previous analyses and show that there are some issue(s) with each one of them.

On the one hand, two previous studies assumed that there is one core meaning of HAI (Liu, 2000; Yang, 2017). Firstly, Liu (2000) argued for a single core meaning of HAI which is ‘persistence’. Following the analysis of English *even* from Kay (1990), Liu (2000) argued that HAI evokes a relationship between two propositions in a scalar model, and the proposition containing HAI makes a stronger proposition than other propositions. For instance, one could

³ This translation is sometimes identified as the marginal use, which is covered by the scalar use in the current analysis. It will be discussed in detail later in section 5.

assume a scalar model as in Figure 1 with the following assumptions: 1) Chinese 800 is harder than Chinese 100; 2) John's Chinese is more advanced than that of Bill's; 3) there is a function which is *X can do exam in Y well*.

| | Chinese 100 | Chinese 800 |
|------|-------------|-------------|
| John | 1 → | |
| | ↓ | |
| | | ↑ |
| Bill | | ← 0 |

Figure 1. An example of the scalar model in Liu 2000

In the scalar model in Figure 1, 1 means true and 0 means false. The 1 cell means that if only one proposition is true, it is the one on the upper left corner, pairing John, the more advanced student, with Chinese 100, the easier course. If only one proposition is false, then it will be the proposition that Bill can do the exam in Chinese 800 well. While this argument correctly pointed out the scalar particle nature of the word HAI and provided some insights for future research, the analysis is informal and it did not specify the scales in each use of HAI (Zhang, 2014). Also, it did not analyze the ambiguity of different meanings.

Secondly, Yang (2017) also assumes one meaning of HAI. Following Alternative semantics (Rooth, 1985) and the assumptions in König (2002), Yang (2017) argued that HAI has only one core meaning which is the additive reading and that various interpretations of HAI result from the interaction between the additive meaning, the focus associate (the element which is in focus in a sentence), and the focus domain. While the analysis in Yang (2017) reduced different meanings of HAI to one core meaning and correctly pointed out that HAI is focus-sensitive, the analysis is descriptive and informal. In fact, Yang (2017) admits that 'I will

present the idea in a relatively informal way, leaving the formalization of HAI's meaning for further research.'

On the other hand, there are two analyses of HAI that claim that separate analyses should account for the different meanings of HAI. One analysis of this type comes from Zhang (2014). Following the analysis in Umbach (2012) on the German particle *noch*, which also has multiple interpretations such as the aspectual, additive, and scalar uses, Zhang (2014) made a distinction between the additive use and other uses of HAI. Specifically, Zhang (2014) argued that the additive use of HAI is based on discourse order and requires the utterance of a precedent sentence. Essentially, the sentence with HAI either means something similar to the precedent sentence or strengthens the meaning of the precedent sentence. Furthermore, the other usages of HAI are termed two-dimensional HAI, as HAI requires two scales assigned by a mapping function. The issue with the analysis is that the additive reading does not necessarily require a precedent sentence. Also, while it seems that Zhang (2014) has implied that some usages of HAI are scalar, the analysis missed the focus-sensitive nature of HAI.

Another HAI analysis that separates the usages was proposed in Chen (2018). Chen (2018) argued that the meaning of HAI varies according to its position in comparative structures. Specifically, both the HAI_{HIGH} in (6) and HAI_{LOW} in (7) are scalar uses of HAI, with the following difference. In (6), HAI employs the scale of likelihood and presupposes that the prejacent *p* is less likely than the negation of the prejacent. In (7), however, both *Zhangsan* and *Lisi* are presupposed to be considered tall according to the standard of the interlocutors. In other words, (6) indicates the structure of HAI_{HIGH} where the assertion is out of expectation, whereas HAI_{LOW} in (7) leads to the positive inference in the comparative structure according to Chen (2018).

(6) 张三还比李四高。
Zhangsan HAI bi Lisi gao.
 Zhangsan HAI than Lisi tall
 ‘Zhangsan is taller even than Lisi.’

(7) 张三比李四还高。
Zhangsan bi Lisi HAI gao.
 Zhangsan than Lisi HAI tall
 ‘Zhangsan is even taller than Lisi.’

Here, the semantic distinction between the two structures proposed by Chen (2018) may be non-existent. A closer look at the two sentences shows that three meanings of HAI are all available for both structures, depending on the intonational pattern, focus association, or shared knowledge. Examples (8) and (9) respectively show the interpretations of (6) and (7) missed by Chen (2018). The utterances in the parentheses could either be pronounced sentences or unpronounced shared knowledge, and the bold-faced words are focused.

(8) a. (张三比李四帅,)张三还比李四高。
*(Zhangsan bi Lisi shuai,) Zhangsan HAI bi Lisi **gao**.*
 Zhangsan than Lisi handsome Zhangsan HAI than Lisi tall
 ‘(Zhangsan is more handsome than Lisi, and) Zhangsan is also taller than Lisi.’

b. (张三以前比李四高,)张三还比李四高。
*(Zhangsan yiqian bi Lisi gao,) Zhangsan **HAI** bi Lisi **gao**.*
 Zhangsan past than Lisi tall Zhangsan HAI than Lisi tall
 ‘(Zhangsan was taller than Lisi, and) Zhangsan is still taller than Lisi.’

(9) a. (张三比李四帅,)张三比李四还高。
*(Zhangsan bi Lisi shuai,) Zhangsan bi Lisi **HAI** **gao**.*
 Zhangsan than Lisi handsome Zhangsan than Lisi HAI tall
 ‘(Zhangsan is more handsome than Lisi, and) Zhangsan is also taller than Lisi.’

b. (张三以前比李四高,)张三比李四还高。
*(Zhangsan yiqian bi Lisi gao,) Zhangsan bi Lisi **HAI** **gao**.*
 Zhangsan past than Lisi tall Zhangsan than Lisi HAI tall
 ‘(Zhangsan was taller than Lisi, and) Zhangsan is still taller than Lisi.’

To sum up, all previous analyses of Mandarin HAI seem to be problematic, even though they provided some insights in terms of the semantics of HAI.⁴ Following a previous analysis of English focus-sensitive particle *even* (Crnič 2011), I propose that Mandarin HAI is a focus sensitive operator.

3. A Previous Analysis of English Even

According to Crnič (2011), English *even* is a focus-sensitive scalar particle. That is, when a sentence is uttered, a set of alternative propositions is made, and the set is conditioned by the intonational pattern of a sentence. Operators such as English *even* require the alternatives to be ordered in a certain way with respect to their likelihood or noteworthiness. *Even* imposes this ordering of the alternatives as its scalar presupposition. As a scalar particle, *even* is composed of a scalar and an additive component. These two components may take distinct scope at LF, and the additive component may not generate pathological inferences. Essentially, *even* presupposes that the meaning of its sister is less likely than an appropriate number of alternatives over which *even* quantifies.

Crnič (2011) also pointed out that *even* often induces an additive or existential inference besides its scalar presupposition. For example, the sentence *EVEN John arrived late* has an existential inference that some people other than John arrived late. However, not all occurrences of *even* are accompanied by additive inference. Note that the current analysis of Mandarin HAI also assumes the scalar component is fundamental and the additive component is optional, parallel to the English *even* analysis.

⁴ There is another recent conference presentation regarding the semantics of HAI versus HAISHI (Gao 2020) that is not discussed here, since neither the slides nor any proceeding of this project is available.

4. Mandarin HAI as a Focus Operator

The current analysis argues that Mandarin focus-sensitive operator HAI has three components: the scalar component, the additive component ADD, and the aspectual component ASP. The scalar component is the basis of HAI, and factors such as intonation, adjacent utterances, or assumptions of interlocutors could trigger one or more components of HAI and thus derive the meaning of HAI in each sentence. Specifically, when a sentence with HAI is pronounced, an ordinary meaning and a set of focus alternatives are assigned, and the scalar component plus an optional component, either aspectual or additive, are triggered. Different components of HAI are associated with different focused elements - while all focused elements trigger the scalar component, the focus on the operator HAI triggers the optional component ADD or ASP.

The analysis of Mandarin HAI is summarized in (10). To derive the meaning of a sentence, different factors may trigger the definedness condition of one or more HAI component(s) as in (10a). The scalar component of HAI is defined only if among all the alternatives in the domain of HAI, C , there exists at least one alternative argument q such that the propositional argument of HAI, p , is not more likely than q ($p \leq q$). The additive component of HAI is defined only if there exists an argument q that is different from p . The aspectual component is defined only if there exists an argument q , where q and p refer to the same event ($\Phi(p) = \Phi(q)$) and the event of q happens before that of p ($q \ll p$). If defined, the meaning of HAI can be found in (10b), and the denotation of HAI can be found in (10c). Note that having three components does not mean that there are three meanings or three lexical entries of HAI. Rather, there is one lexical entry or meaning – Mandarin HAI means scalar. Moreover, the ADD component bears an additive presupposition, and the ASP component is the bearer of the aspectual presupposition.

- (10) a. $[[\text{HAI}]]^{\text{S}, \text{C}}(\text{C}, \text{p}, \text{w})$ is defined only if $\exists \text{q} \in \text{C} [\text{p} \neq \text{q} \rightarrow \text{p} \leq \text{q}]$
 $[[\text{HAI}_{\text{ADD}}]]^{\text{S}, \text{C}}(\text{C}, \text{p}, \text{w})$ is defined only if $\exists \text{q} \in \text{C} [\text{p} \neq \text{q} \rightarrow \text{q}(\text{w}) = 1]$
 $[[\text{HAI}_{\text{ASP}}]]^{\text{S}, \text{C}}(\text{C}, \text{p}, \text{w})$ is defined only if $\exists \text{q} \in \text{C} [\Phi(\text{p}) = \Phi(\text{q}) \wedge \text{q} \ll \text{p} \rightarrow \text{q}(\text{w}) = 1]$
 b. If defined, $[[\text{HAI}]]^{\text{S}, \text{C}}(\text{C}, \text{p}, \text{w}) = 1$ iff $\text{p}(\text{w}) = 1$
 c. $[[\text{HAI}]]^{\text{S}, \text{C}} = \lambda \text{C}. \lambda \text{p}. \exists \text{q} \in \text{C} [\text{p} \leq \text{q}]. \lambda \text{w}. \text{p}(\text{w}) = 1$
 Optionally, $[[\text{HAI}_{\text{ADD}}]]^{\text{S}, \text{C}}$ or $[[\text{HAI}_{\text{ASP}}]]^{\text{S}, \text{C}} = \lambda \text{C}. \lambda \text{p}. \exists \text{q} \in \text{C} [\text{q}(\text{w}) = 1]. \lambda \text{w}. \text{p}(\text{w}) = 1$

The idea of different components come from Crnič (2011), who argues that English *even* can spell out a scalar component and an additive component. The reasons why the scalar component is considered basic are as follows. First, when HAI is used in a sentence to mean additive or aspectual, it more or less shows that the speaker is surprised by the addition, or the continuity of a behavior. One piece of evidence comes from the comparison between HAI and HE ‘and’ in (11a-b), which shows that HAI cannot be substituted for HE, which is fundamentally and purely additive. In order to express the additive meaning using HAI, other words need to be added as in (11c-d) in order to sound idiomatic. HAI’s additive use also differs from HE in that native speakers of Mandarin can have focus on HAI in sentences (11c) and (11d), but focusing on HE without also focusing on the following word *jidan* ‘egg’ in (11a) is unacceptable. Moreover, if the interlocutors uttered more words in (11c-d) as compared to (11a), they want to convey more information than in the simpler utterance, since, according to the Cooperative Principle of Gricean Theory (Grice 1975), interlocutors should be as informative as required.

- (11) a. 他买了面包和鸡蛋。
Ta maile mianbao HE jidan
 He buy-le bread and egg
 ‘He bought bread and (an) egg.’
 b. *他买了面包还鸡蛋。
 **Ta maile mianbao HAI jidan*
 He buy-le bread HAI egg
 c. 他买了面包, 还买了鸡蛋。
Ta maile mianbao, HAI maile jidan

He buy-le bread HAI buy-le egg
 ‘He bought bread, and (he) bought an egg as well.’

- d. 他买了面包还有鸡蛋。
Ta maile mianbao HAI you jidan
 He buy-le bread HAI have egg
 ‘He bought bread and also (an) egg.’

Secondly, when discussing the ambiguity of HAI, I mentioned that the aspectual-additive ambiguity is identified more often, probably because they are related to the focus on HAI. This could also serve to support the argument that aspectual and additive readings operate at a different level than scalar ones. Thirdly, the scalar component can co-occur with the other two components, while the additive component cannot co-occur with the aspectual component. This suggests that the scalar component is of a different status compared to the other two components. Lastly, it is worth noting that English *even* also has the scalar component as basic according to Crnić (2011). Therefore, analyzing Mandarin HAI draws parallels between operators of different languages.

4.1 The Scalar Component of HAI

The scalar component serves as the core of Mandarin HAI semantics, and it will always be triggered. HAI relates the propositional argument of HAI and the alternatives in this scalar dimension in the following way as in (12), where C is the domain of the all the alternatives to p in this scalar dimension, and \leq means ‘no more likely than’ or ‘less likely than or as likely as.’

- (12) The definedness condition of HAI:
 $\llbracket \text{HAI} \rrbracket^{\text{s,c}}(C, p, w)$ is defined only if $\exists q \in C [p \neq q \rightarrow p \leq q]$
 If defined, $\llbracket \text{HAI} \rrbracket^{\text{s,c}}(C, p, w) = 1$ iff $p(w) = 1$
 $\llbracket \text{HAI} \rrbracket^{\text{s,c}} = \lambda C. \lambda p. \exists q \in C [p \leq q]. \lambda w. p(w) = 1$

The proposal in (12) suggests that among all the alternatives in the domain of HAI, C , there exists at least one alternative argument q such that the propositional argument of HAI, p , is no more likely than q . The definitive feature of HAI is that it triggers a scalar presupposition.

Figure 2 shows the scalar component of an example sentence *Lee HAI xihuan JOHN* ‘Lee even likes JOHN’. See also the derivation of this sentence in (13).

| | | | |
|------|-----|------|------|
| | Tom | John | Andy |
| Jane | 1 | | |
| Lee | | | |
| Bill | | | 0 |

Figure 2. The Scalar Component of *Lee HAI xihuan JOHN* ‘Lee even likes JOHN’

- (13) a. *Lee HAI xihuan John*
 b. $[[\text{HAI C1}]] [\text{Lee xihuan John}_F]$
 c. $[[\text{HAI C1}]] [\text{Lee xihuan John}_F]$ $]]^{\text{S}, \text{C}}(w)$ is defined only if $\exists q \in \{\text{Lee likes } x \mid x \text{ is a relevant individual}\}$ that $\text{Lee likes John} \leq q$.
 If defined, $[[\text{HAI C1}]] [\text{Lee xihuan John}_F]$ $]]^{\text{S}, \text{C}}(w) = 1$ iff Lee likes John is in w .

Previous analyses on HAI or English *even* concluded that the focus alternatives are less likely than the target proposition (Liu, 2000; Crnič, 2011). The current analysis is different from previous ones in that cases where two situations are similar in terms of likelihood are also included in the components. The modification can be justified by two considerations. First, it is possible that the speaker believes that both the alternative and the target proposition are equally unlikely. Therefore, they have the same level of likeliness as of unlikeliness. Second, technically speaking, there is no clear-cut distinction between ‘0.0001 less likely than’ and ‘as likely as.’ Therefore, it is advantageous to add an equal in terms of likelihood in the analysis.

4.2 The Additive Component of HAI

The description of the additive component of HAI can be found in (14). Figure 3 shows an example additive component of *Lee HAI xihuan John* ‘Lee also likes John’.

- (14) The definedness condition of HAI_{ADD} :
 $[[\text{HAI}_{\text{ADD}}]]^{\text{S}, \text{C}}(C, p, w)$ is defined only if $\exists q \in C [p \neq q \rightarrow q(w) = 1]$
 If defined, $[[\text{HAI}_{\text{ADD}}]]^{\text{S}, \text{C}}(C, p, w) = 1$ iff $p(w) = 1$
 $[[\text{HAI}_{\text{ADD}}]]^{\text{S}, \text{C}} = \lambda C. \lambda p. \exists q \in C [q(w) = 1]. \lambda w. p(w) = 1$

| | | |
|------|-----|------|
| | Tom | John |
| Jane | 1 | 1 |
| Lee | 1 | 1 |
| Bill | 1 | 1 |

Figure 3. The Additive Component of *Lee HAI xihuan John* ‘Lee also likes John’

4.3 The Aspectual Component of HAI

The aspectual component of HAI is indicated in (15), where \ll means ‘before’ and Φ means ‘the event of.’ Specifically, $A \ll B$ means ‘the time of A is before the time of B,’ and $\Phi(p) = \Phi(q)$ means that proposition p and proposition q refer to the same event. The description of the aspectual component of HAI can be found in (15), and the aspectual component of *Lee HAI xihuan John* ‘Lee still likes John’ can be found in Table 1.

- (15) The definedness condition of HAI_{ASP} :
 $\llbracket HAI_{ASP} \rrbracket^{g,c}(C, p, w)$ is defined only if $\exists q \in C [\Phi(p) = \Phi(q) \wedge q \ll p \rightarrow q(w)=1]$
 If defined, $\llbracket HAI_{ASP} \rrbracket^{g,c}(C, p, w) = 1$ iff $p(w) = 1$
 $\llbracket HAI_{ASP} \rrbracket^{g,c} = \lambda C. \lambda p: \exists q \in C [q(w) = 1]. \lambda w. p(w) = 1$

Table 1. The Aspectual Component of *Lee HAI xihuan John* ‘Lee still likes John’

| | ... | past | ... | target time |
|-----------------|-----|------|-----|-------------|
| Lee, likes John | | 1 | | |

4.4 Conclusion

Mandarin HAI should be analyzed as a focus sensitive operator as in (16). It has a scalar component as its basis, as well as optional additive and aspectual components. In (16c), the parentheses ($q(w) = 1$) indicate optionality. While a sentence with HAI is almost always ambiguous when using a purely scalar reading, a scalar additive reading, and a scalar aspectual

reading, the ambiguity can be resolved by some specific focus condition, the interlocutors' shared knowledge, or immediate utterances in the conversation.

- (16) a. $[[\text{HAI}]]^{\text{g},\text{c}}(C, p, w)$ is defined only if $\exists q \in C [p \neq q \rightarrow p \leq q]$
 $[[\text{HAI}_{\text{ADD}}]]^{\text{g},\text{c}}(C, p, w)$ is defined only if $\exists q \in C [p \neq q \rightarrow q(w) = 1]$
 $[[\text{HAI}_{\text{ASP}}]]^{\text{g},\text{c}}(C, p, w)$ is defined only if $\exists q \in C [\Phi(p) = \Phi(q) \wedge q \ll p \rightarrow q(w) = 1]$
 b. If defined, $[[\text{HAI}]]^{\text{g},\text{c}}(C, p, w) = 1$ iff $p(w) = 1$
 c. $[[\text{HAI}]]^{\text{g},\text{c}} = \lambda C. \lambda p: \exists q \in C [p \leq q (q(w) = 1)]. \lambda w. p(w) = 1$

5. Discussion

The current study provides a new analysis of the Mandarin particle HAI. The analysis is arguably better than previous analyses of HAI in that it unifies the different meanings of HAI as an operator and can account for the ambiguity of HAI. In the following subsections, discussions regarding the optional components, the marginal meaning of HAI, ambiguity and misinterpretation of HAI, cross-linguistic considerations, as well as other questions for future studies are presented.

5.1 *The Optional Components of HAI*

There is a question about how to specify the relationship between the additive component and the aspectual component of HAI. It could be that they are independent of each other. Alternatively, it could be that the aspectual component is derived from the additive component – the aspectual reading is an addition in terms of time. The relationship between the two components, as well as methods to evaluate different hypotheses regarding the relationship, are topics of future research.

5.2 *The Marginal Meaning of HAI*

HAI has also been argued to have a marginal use as in (16) (Liu, 2000; Yang, 2017). For example, (17b) means that today is considered to be a marginal case of being cool and that there are other days which are better examples of being cool (Liu, 2000). The marginal use is not

discussed in detail in the current analysis because it is the same as the scalar use. Note that both examples can have the word *suan*, and it may be that *suan* creates the illusion that HAI means something different from scalar.

- (17) a. 张三的房间还(算)干净。
Zhangsan-de fangjian HAI (suan) ganjing
 Zhangsan-de room HAI consider clean
 ‘Zhangsan’s room can be considered as (relatively) clean.’
- b. 今天还算凉快。
Jintian HAI suan liangkuai
 today HAI consider cool
 ‘Today can be considered to be relatively cool.’

5.3 Ambiguity and Misinterpretation

One way to resolve the ambiguity of sentences with HAI, as indicated earlier, is to cancel alternative readings with intonation or shared background knowledge. Another way to resolve the ambiguity in a sentence is to cancel non-spell out components using other particles in a sentence. For instance, in (18), the particle *zai* which can indicate the current moment ‘at the moment, now’, can make the sentence more likely to trigger the aspectual component of HAI to mean ‘still’ than sentences without this aspectual element.

- (18) 巴黎还在下雨。
Bali HAI zai xiayu
 Paris HAI at rainy
 ‘It is still rainy in Paris.’

However, it is worth noting that adding *zai* may not cancel ambiguity to the same extent in all cases. For instance, in (19), a three-way ambiguity also exists even with *zai*. If it is known that Lisi is doing other things that normally do not co-occur with washing dishes such as having a Zoom class, then it is likely that the additive reading is conveyed by HAI. If Lisi is someone who is unlikely to wash dishes, then the purely scalar reading is triggered. The reason why adding *zai* is more likely to resolve the ambiguity in (18) rather than (19) is probably that the

competing additive use makes little sense for a city and weather combination as in (18). Future studies could test the nuances regarding how HAI interacting with other particles may change the scope of ambiguity.

- (19) 李四还在洗碗。
Lisi HAI zai xiwan
 Lisi HAI at wash-dishes
 ‘Lisi is also washing dishes. /
 Lisi is still washing dishes. /
 Lisi is even washing dishes.’

Note that it seems that the three-way ambiguity in (19) can also be canceled by adding another word relevant to time such as *xianzai* ‘now’ as in (20). In other words, in (20), which has two aspectual elements *zai* and *xianzai*, HAI is more likely to have the aspectual meaning ‘still’ than having only *zai* as in (19).

- (20) 李四现在还在洗碗。
Lisi xianzai HAI zai xiwan
 Lisi now HAI at wash-dishes
 ‘Lisi is still washing dishes now.’

In fact, the reason why the ambiguity of HAI is missed in previous literature is probably because other particles or elements in the sentence other than HAI itself cancel other available readings.

5.4 Cross-linguistic Considerations

The current study draws a parallel between Mandarin HAI and English *even*. English *even* has the additive and scalar reading, but one may wonder why it does not have the meaning of ‘still’. However, it is likely that the aspectual component also exists as a potential meaning for *even*, though it is rarely triggered. In (21), the headlines do have aspectual readings. The reason people tend to think that *even* cannot have the scalar aspectual reading is probably that *still* is preferred to denote that meaning. Note that Mandarin *yiran* ‘still’ can co-occur with HAI to form *yiran*

HAI, parallel to the acceptable English use of *even still*. These observations show that it is promising to expand the current model to similar particles in other languages.

- (21) a. Here's why you can contract COVID-19 even after getting the vaccine.
 b. How did that happen? Catching covid-19 even after being vaccinated.
 c. You can get Covid-19 even after getting two doses of the vaccine. But there is no need to panic.
 d. Can I still get COVID-19 after getting vaccinated?

5.5 Questions for Future Studies

In future studies, it would be useful to compare the distribution of HAI to that of HAISHI, discuss the occurrence of HAI under negation and in questions, and explore how focus particles vary, overlap, and interact. It is also worthwhile to explore ways of determining and evaluating the relationship of components.

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