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The Role of Information Structure on Prenuclear Accents: A Cross-Linguistic Perspective*

Xueyun Tian
University of Cambridge

1 Introduction

1.1 Basic notions

Information structure (IS) reflects how information is organised in speech. There is no comprehensive definition or categorisation of information structure (Büring 2007), yet there are several basic notions of information structure, including focus[1], degree of givenness (or information status), and topic (Krifka 2008).

The idea of differentiating between nuclear and prenuclear pitch accents and the notion of 'nucleus' originated from the British tradition of analysing pitch accents (see Figure 1), and the term is adopted (though revised) in the Autosegmental-Metrical (AM) theory of intonational phonology (Ladd 2008).

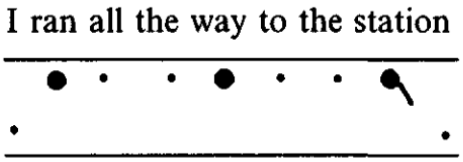

Figure 1 Prenuclear and nuclear accents in the British tradition, illustrated with a tadpole diagram (from Cruttenden 1986: 18). The nuclear accent is on *sta-*, realised as a pitch fall; a prenuclear accent falls on *ran*, realised as an increase in pitch from *I* to *ran*; and *way* has a 'tertiary stress', manifested by intensity or loudness but not pitch, and therefore different from sentence pitch accents.

In the British tradition, the nuclear accent is the most prominent accent in an intonational unit and is also called the primary accent, and prenuclear accents are secondary accents that are less prominent than the nuclear accent, and appear in

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[1] Focus is probably the most well-studied notion among these notions of IS, especially regarding its relation to sentence accent. The definition of 'focus' is slightly different in different contexts. In Krifka's (2008) analysis, 'focus' is semantically defined as 'indicating the presence of alternatives that are relevant for the interpretation of linguistic expressions'. General observations are that (1) new information is focused, and (2) the part that corresponds to the wh-constituent in the answer to a wh-question is the focus (Büring 2007).

non-final positions (Cruttenden 1986: 18, 54). However, in practice, it may not always be easy to compare the differences in prominence among several sentence accents, especially in broad focus conditions. In the tones and break indices (ToBI) system of English, the nuclear accent is defined as the last accent of the intermediate phrase, and a prenuclear accent is an accent preceding the nuclear accent within the same intonation unit (Bishop 2013), as shown in Figure 2. Nuclear accents are obligatory, and prenuclear accents can be optional. The latter definition is more commonly used in practice, and prenuclear accents are also often associated with accents on the sentence topic position.

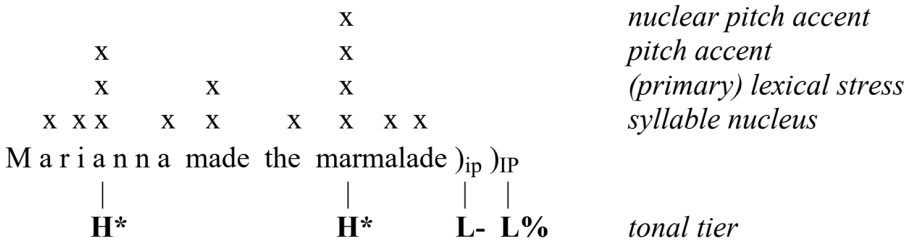

Figure 2 Prenuclear and nuclear accents in the AM model (from Bishop 2013: 6). The stressed syllable in *Marianna* receives a prenuclear accent.

It should be noted that the above definition may vary slightly in other languages with different prosodic hierarchies, and in some languages (e.g., Hungarian and Chinese) there is no clear definition of 'prenuclear accent'. In this paper, in order to make cross-linguistic comparisons, prenuclear accents in these languages will be roughly equated with accents in the pre-focus region in narrow-focus conditions or sentence topic positions.

1.2 Information structure and sentence accents

Information structure is often realised through prosody: focus requires prominence, topic also tends to be accented, and givenness typically leads to deaccenting. There is abundant empirical evidence from many languages showing that information structure influences the nuclear accent of a sentence in several aspects, including the placement of the nuclear accent (for example, narrow focus typically receives the nuclear accent), the phonetic realisation of nuclear accent, and the perception of nuclear accent. In comparison, the influence of information structure on prenuclear accent remains unclear. Some studies in English and German prenuclear accents have shown that the occurrence of prenuclear accents is unaffected by the status of focus and givenness: Büring (2007) found that prenuclear accents are optional and 'ornamental' and can occur out of the focused constituent (will not be deaccented when followed by a narrow focus), and Calhoun (2010) claimed that the presence of prenuclear accent is rhythmically constrained. Nonetheless, other studies show that prenuclear accents are acoustically different when the information structure is different (Braun 2006, Féry & Kügler 2008). Moreover, the study of prenuclear accents

is less straightforward than that of nuclear accents because prenuclear accents are less prominent than nuclear accents, and thus harder to detect in transcription and perceptual experiments. Compared to nuclear accents, more inconsistencies between transcribers occur regarding prenuclear accents, and listeners are less sensitive when recognising prenuclear accents (Ladd 2008, Baumann, Mertens & Kalbertodt 2021).

Theoretical analyses of IS and accent are mainly centred around the relationship between focus and accent. One important concept is Focus Projection, which posits that focus can 'project' up the syntactic tree from an accented word to a higher node that dominates a complete constituent, and the entire constituent is treated as focused (Ladd 2008).

Different models of Focus Projection are mainly concentrated on the relationship between focus and the nuclear accent, yet they also make different predictions about focus and prenuclear accents. Jackendoff (1972) proposed that the focused constituent is the most prominent element (receiving nuclear accent) in a sentence and that prominence within a focused constituent is determined by default prosodic principles, which suggests that IS does not influence prenuclear accents. In Selkirk's (1995) version of Focus Projection, however, there are no prosodic principles independent of IS (Arregi 2016), and her Focus Projection rules predict that prenuclear accents are optional in broad focus contexts, and absent in narrow focus contexts (Bishop 2013). Gussenhoven (1984), on the other hand, proposed another model of Focus Projection in which a nuclear accent marks the focus, and prenuclear accents are optional.

Overall, the relationship between IS and prenuclear accents has been less studied compared to the relationship between IS and nuclear accents, and existing studies tend to suggest that prenuclear accents are less influenced by IS compared to nuclear accents and are mainly constrained by phonological principles. Studies also suggest that prenuclear accents are not obligatory, although models differ in their idea of how optional prenuclear accents are. It should also be noted that current theories are largely based on the study of English and other West-Germanic languages, such as German and Dutch. Therefore, it is necessary to explore the relationship between accent and IS in typologically different languages.

In this paper, I examine related studies on different languages with the following questions in mind:

> Q1. Are prenuclear accents influenced by IS? If so, what is the degree of influence and how is it realised (e.g., is it realised through the presence of prenuclear accents, or the phonetic realisation of prenuclear accents, or other features)?
>
> Q2. Does the relationship between prenuclear accents and IS vary between typologically different languages?

Then, I briefly discuss other factors that influence the placement and phonetic realisation of prenuclear accents, and finally conclude that prenuclear accents, though less prominent than nuclear accents and less influenced by IS in general, are

not peripheral and are necessary for marking different structures and conveying meaning.

2 Cross-Linguistic Observations

2.1 English and German

English and German are both West Germanic languages and are typologically similar. They are also the most well-studied languages in terms of information structure and prosodic prominence.

Production studies in English and German show that IS does not influence the presence of prenuclear accents. Chodroff & Cole (2018) tested the influence of IS (including four different contexts: given, accessible, new, and contrastive) on prenuclear accents in American English, and Baumann et al. (2021) conducted a similar study in German. Both studies found that IS has no significant influence on pitch accent assignment on prenuclear position (i.e., sentence topic position) and that the prenuclear position always has accentuation across different contexts. Moreover, Baumann, Becker, Grice & Mücke (2007) reported high percentages of prenuclear accents on subject position among speakers across sentences with different types of focus (see Table 1 and Table 2). These studies all demonstrated that prenuclear accents on sentence-initial referents are consistently placed, questioning the idea that prenuclear accents are optional. They also show that the presence of prenuclear accents is not influenced by IS.

Question	**Answer** lit.: 'Marlene wants a banana to-peel'	**Focus type**
Was gibt's Neues? 'What's new?'	[*Marlene will eine Banane schälen.*]$_{\text{focus}}$	broad
Was will Marlene schälen? 'What does Marlene want to peel?'	*Marlene will* [*eine Banane*]$_{\text{focus}}$ *schälen.*	narrow
Will Marlene eine Kartoffel schälen? 'Does Marlene want to peel a potato?'	*Marlene will* [*eine Banane*]$_{\text{focus}}$ *schälen.*	contrastive

Table 1 An example of Baumann et al.'s (2007) experimental material. In narrow and contrastive focus conditions, *Marlene* receives a prenuclear accent.

Though the presence of prenuclear accents seems not to be influenced by IS, the accent type and phonetic realisation of prenuclear accents can differ in different contexts. Braun (2006) reported a delayed and raised peak in prenuclear accents

on contrastive topics compared to non-contrastive ones[2], and Féry & Kügler (2008) found that prenuclear accents on new information have a higher peak than on given information. Both studies showed that new information leads to higher prominence in prenuclear accents.

Focus type	Percentage of prenuclear accents
broad	98%
narrow	94%
contrastive	86%

Table 2 Percentages of prenuclear accents among all speakers in Baumann et al.'s (2007) experiment, showing that prenuclear accents consistently exist in different contexts, though the percentages for narrow and contrastive focus are slightly lower than for broad focus.

Perception studies show that prenuclear accents play a role in reflecting IS. Although some findings suggest that German listeners do not use prenuclear accents to predict a sentence's referential information (e.g., Roettger, Franke & Cole 2019), several studies show that IS influences the perception of prenuclear accents. For instance, Baumann, Kalbertodt & Mertens (2020) observed that listeners prefer different prenuclear accent types across different IS conditions: for example, listeners found rising accents most appropriate for contrastive referents, and the low accent (L*) inappropriate for new referents.

Evidence from language processing also shows that prenuclear accents play a role in IS processing. Bishop's (2013) experiments indicate that English listeners expect broad focus to have higher prenuclear prominence, and narrow focus to have lower prenuclear prominence, and this expectation has an impact on the perception of prenuclear accents and the processing of sentences. Bishop (2017) further observed that prenuclear accents are optional in broad focus contexts and do not significantly affect processing, while they disrupt processing in narrow focus conditions, supporting Selkirk's (1995) model of Focus Projection. Furthermore, Braun & Biezma's (2019) eye-tracking study on German lexical processing demonstrated that prenuclear L*+H accents can activate alternatives of contrastive topic, showing that prenuclear accent type influences listeners' interpretation of IS.

In conclusion, IS does not influence the presence of prenuclear accents in English and German. However, that does not mean prenuclear accents are irrelevant to IS: many studies have shown that the phonetic form and accent type of prenuclear accents are closely related to IS in production, perception, and processing.

[2] Interestingly, Baumann et al.'s (2021) experiment shows contradicting results: contrastive topics show reduced prominence in terms of tonal range and slope, and Tonal Centre of Gravity (TCoG), though the duration increases.

2.2 Swedish

Unlike English and German, Swedish and other North Germanic languages are pitch accent languages. In Stockholm Swedish, there is a distinction between *big accents* and *small accents*, previously referred to as *focus accent* and *word accent* (Myrberg & Riad 2015). There is no parallel distinction in West Germanic languages. Big and small accents differ in their distribution, level of perceived prominence, and position in the prosodic hierarchy: big accents are more prominent than small accents; big accents are heads of prosodic phrases (ϕ), while small accents operate at the prosodic word (ω) level (Myrberg & Riad 2015).

In Stockholm Swedish, there can be more than one big accent in a sentence, including prenuclear accents and the nuclear accent[3]. Big accents are affected by focus and information structure. Myrberg (2021) studied the relationship between focus and big accents within the sentence subject in Stockholm Swedish. The study demonstrated the necessity to distinguish between nuclear and prenuclear accents as prenuclear accents are scaled lower than nuclear accents and found that prenuclear accents lack correlation with focus and serve primarily as phrasing markers. To be specific, the sentence subject always contains at least one prenuclear big accent, even when the subject is information-structurally given and followed by a narrow focus. This conclusion is similar to those in English (Chodroff & Cole 2018) and German (Baumann et al. 2007, 2021), though Myrberg's (2021) experimental design is different. It should also be noted that this experiment did not distinguish between the notions of focus/background and given/new, which are treated separately in many other studies mentioned in this paper and are shown to be independent of each other (e.g., Genzel, Ishihara & Surányi 2015, Wang, Xu & Ding 2017).

In Swedish, big accents are by default aligned to the rightmost ω of a ϕ (right-aligned), like West Germanic languages, but can also be aligned to the leftmost ω (left-aligned). For example, the prenuclear accent in sentence (1) can be right-aligned (1a) or left-aligned (1b)[4]:

(1) *Den bruna haren med många söta ungar bor [i* PARKEN*]$_{focus}$.*
the brown hare with many cute kids lives in park.the

'The brown hare with cute kids lives in the park.'

a. {(Den bruna haren med många söta **ungar**^{right}) (bor [i PARKEN]$_{focus}$)}.

b. {(Den **bruna**^{left} haren med många söta ungar) (bor [i PARKEN]$_{focus}$)}.

(Myrberg 2021)

Myrberg (2021) compared the alignment of big accents to the prosodic phrase in different focus conditions, and findings indicated that the patterns of alignment of

[3] Nuclear accent is defined as the rightmost big accent in the intonation phrase (ι) (Myrberg & Riad 2015).

[4] Prosodic phrases are marked by round brackets, and intonation phrases are marked by curly brackets. Small caps represent words with nuclear accents, and bold represents words with prenuclear big accents.

prenuclear accents are influenced by whether the focus (and the nuclear accent) falls within the subject. For example, when the subject contains two big accents and consists of five prosodic words, if the subject receives the focus, the most common pattern of big accents within the subject is left (prenuclear) + right (nuclear), as in (2a); if the subject does not receive the focus, the most common pattern of big accents in the subject is left (prenuclear) + left (prenuclear), as in (2b).

(2) a. {{(Den **bruna**$^{\text{left}}$ haren) ([med många söta UNGAR$^{\text{right}}$]$_{\text{focus}}$)} bor i parken.}

b. {(Den **bruna**$^{\text{left}}$ haren) (med **många**$^{\text{left}}$ söta ungar) (bor [i PARKEN]$_{\text{focus}}$).}

(adapted from Myrberg 2021)

This finding shows that the position of focus (and nuclear accent) has an indirect impact on the position of prenuclear accents within a prosodic phrase. This phenomenon seems not to be studied much in other languages.

In sum, the presence of prenuclear accents in Swedish is, like English and German, not influenced by IS. However, IS seems to indirectly influence the position of prenuclear accents. The phonetic parameters of prenuclear accents in different contexts have not been studied in this experiment.

2.3 Bulgarian

Andreeva, Barry & Koreman (2016) investigated the prosodic cues of broad focus, narrow non-contrastive focus, and narrow contrastive focus in the production of Bulgarian. They found that prenuclear accents are not deaccented in narrow focus conditions and that the accent type is typically L*+H regardless of focus condition, but prenuclear accents show reduced prominence in narrow focus conditions compared to broad focus conditions. To be specific, the duration of the prenuclear accented word (as well as the accented syllable and vowel) is shortened, and the accented vowel shows lower mean F_0, smaller F_0 change[5], and lower intensity. Moreover, they found that in contrastive focus, compared to non-contrastive focus, the F_0 change on prenuclear accents is smaller, making it less prominent.

This finding is consistent with the tendencies in English and German: the prenuclear accent is consistently placed regardless of focus conditions, but its prominence is reduced in narrow focus contexts, creating a greater contrast between focus and background.

2.4 Hungarian

The realisation of IS in Hungarian is different from that in languages previously discussed: in Hungarian, narrow focus is obligatorily marked by syntactic movement,

[5] 'F_0 change' is measured by calculating the differences between the mean F_0 of the accented syllable and the mean F_0 of the preceding and following syllables.

and focus is immediately followed by the verb (Mycock 2010, Mády 2015), as shown in (3a) and (3b).

(3) a. *János* *fel-hív-t-a* *Mari-t.*
John.NOM VM-call-PAST-DEFO.3SG Mary-ACC
'John called Mary.'

b. *János* *Mari-t* *hív-t-a* *fel.*
John.NOM Mary-ACC call-PAST-DEFO.3SG VM
'John called MARY.'

(Mycock 2010)

In terms of focus and prenuclear accent, Genzel et al. (2015) investigated how different types of focus (broad, narrow, and contrastive) are expressed prosodically in Hungarian, and found that almost all topics[6] are accented, showing that IS does not influence the presence of prenuclear accents in Hungarian. Nonetheless, they found that IS influences the accent type of prenuclear accents: topics are more likely to have a rising accent (L* + H/L + H*) than a falling accent (H* + L/H + L*)[7] before contrastive focus compared to non-contrastive ones. Mády (2015) also observed parametric differences in prenuclear rising accents when followed by contrastive focus: they have a longer duration, an earlier F_0 valley, and a later F_0 peak. These results show that in Hungarian, although focus is marked explicitly by syntax, focus still receives prosodic marking and influences the degree of prominence of prenuclear accents.

In terms of givenness, Genzel et al. (2015) observed that topics are always accented across different statuses of givenness, which is parallel to the findings in English and German. Nevertheless, givenness leads to more rising accents, fewer falling accents, and lower F_0 peaks on topics, which means that the prenuclear accent on topics is less prominent when carrying given information.

In sum, the presence of prenuclear accents in topic position in Hungarian is not affected by IS, like in other languages discussed above. On the other hand, focus and givenness are shown to affect the accent type and phonetic parameters of prenuclear accents.

2.5 Chinese dialects

In the languages discussed above, IS is expressed largely through F_0 contours. Unlike these languages, Chinese languages are tonal languages, and pitch information is explored more in the lexical domain. Nonetheless, many Chinese dialects still use pitch cues to mark different IS. For instance, in Beijing Mandarin, focus is marked

[6] There is no consensus on whether topic and comment belong to the same intonation phrase (ι) in Hungarian (Genzel et al. 2015), but if they do, then the accent on sentence topic can be considered as a prenuclear accent.

[7] Rising pitch contours are less prominent than falling pitch contours in Hungarian.

by in-focus F_0 increase and post-focus compression (PFC)[8] (Xu, Chen & Wang 2012, Wang et al. 2017).

Existing studies on the role of IS on sentence prosody in Chinese varieties tend to concentrate on the phonetic cues (F_0, duration, and intensity) of IS and do not rely on the terms in analysing pitch accents in intonation languages (e.g., nuclear and prenuclear accents), possibly because F_0 is not the main feature in marking prominence: the prosodic realisation of corrective focus in Standard Mandarin relies more on duration than F_0 (Chen & Gussenhoven 2008), and givenness is marked jointly by F_0 range and duration (Ouyang & Kaiser 2013); moreover, in Hong Kong Cantonese, the main prosodic cues of focus are intensity and duration (Wu & Xu 2010), which is different from the notion of 'pitch accent' in the intonational analyses of European languages. Therefore, it is less straightforward to identify a less prominent, 'secondary' accent in Chinese.

Though prominence in Chinese is not analysed as 'nuclear' and 'prenuclear' accents, studies in Chinese do distinguish between the most prominent part of a sentence and other parts preceding or following it[9]. Studies have shown that in Beijing Mandarin, pre-focus F_0 remains largely unchanged in narrow focus conditions compared to broad focus conditions (Wang et al. 2017), suggesting that IS has no influence on prenuclear accents (if there is one), which is a tendency parallel to findings in other languages discussed above.

There seem to be significant variations in the prosodic realisation of IS in different Chinese dialects, even in Mandarin dialects that are relatively close and mutually intelligible. This variation of prosodic marking of focus within Chinese dialects is possibly a result of language contact (Xu et al. 2012, Liu, Van de Velde & Chen 2016, Qin & Xu 2020).

Many Chinese dialects seem to lack or have limited prosodic marking of focus. Dialects like Taiwan Mandarin (Xu et al. 2012), Taiwanese (Xu et al. 2012), and Hong Kong Cantonese (Wu & Xu 2010) lack PFC, though the in-focus position has prosodic markings. In these dialects, the focus is harder to recognise (but still recognisable) in perception compared to dialects like Beijing Mandarin. These studies did not pay attention to the prenuclear (or pre-focus) part of a sentence, however, since PFC is a more important focus marker than prenuclear deaccenting and they both serve to increase the prosodic contrast between focus and background, it is reasonable to predict that in these dialects, narrow focus may not lead to deaccenting in prenuclear position.

Furthermore, an interesting study by Qin & Xu (2020) investigated the prosodic cues of focus in Chongqing Mandarin, a Southwest dialect of Mandarin Chinese, and found that, unlike Beijing Mandarin, Chongqing Mandarin shows no significant changes in F_0, duration, or intensity in focused words, and there is no evidence

[8] PFC is the reduction of pitch range and intensity of the post-focus components in speech. It is a common phenomenon in Indo-European, Altaic, and Uralic languages, and is an important cue in the perception of focus.

[9] Caveat: since the influence of IS on prosodic prominence in Chinese languages is studied in a different framework, the discussions below are not based on direct evidence of prenuclear accents but are inferred from findings on the pre-focus region of sentences.

of PFC. In perception, native speakers had difficulty identifying focused words (the identification accuracy is below 50%). These results indicate that Chongqing Mandarin (and possibly other Southwest Mandarin dialects) lacks prosodic focus. Moreover, statistical tests show that the F_0 maximum, mean F_0, mean duration, and mean intensity in the pre-focus region do not have significant differences across different focus conditions, indicating that IS does not influence the phonetic parameters in the prenuclear position in Chongqing Mandarin.

In sum, the prosodic focus marking varies greatly in Chinese varieties, and some dialects do not prosodically mark focus at all. Studies do not directly address the relationship between IS and nuclear/prenuclear accents, yet existing evidence shows that IS does not have impacts on the pre-focus region in Chinese dialects like Beijing Mandarin and Chongqing Mandarin, suggesting that IS may not influence prenuclear accents in many Chinese varieties, which is different from the other languages discussed above.

3 Further Discussion

The section above examines the role of IS on prenuclear accents in several languages and the general tendencies are that the presence of prenuclear accents is constant and unaffected by IS, and the influence of IS is mainly on specific phonetic cues. These findings are counterevidence to the idea that prenuclear accents are 'optional', 'ornamental', and peripheral. This section gives a brief further discussion on the contribution of prenuclear accents in conveying meaning through intonation, distinguishing different structures, and expressing intentions.

Some studies have shown that prenuclear accents contribute to the expression of question intonation. In Northern Standard German, listeners can identify intonation questions (questions with statement-like syntax) by differences in how pitch falls after prenuclear accent peaks (Petrone & Niebuhr 2013). Perception studies in Dutch (Van Heuven & Haan 2002) and Castilian Spanish (Face 2007) yielded similar results.

Prenuclear accents can also help differentiate syntactic structures that are similar in IS. In Columbian Spanish, four similar syntactic structures can express contrastive narrow focus (*el perrito* 'the puppy' in (4)), which is marked by the word *ser* 'to be': cleft structures (4a), inverted cleft structures (4b), pseudo-cleft structures (4c), and focalising *ser* (FS) structures (4d). Flores & Méndez Vallejo (2022) found that the word *ser* receives a prenuclear accent in FS structures, while in other structures, *ser* receives limited or no accent. For example, in (4d), the word *fue* (the past tense form of *ser*) receives a prenuclear accent, while in (4a-4c), *fue* typically receives no accent. Their findings suggest that compared to cleft constructions, *ser* in FS structures functions differently in discourse despite similar syntactic roles, demonstrating the importance of prenuclear accent in discourse.

(4) a. *Fue* *el* *perrito* *quien/el* *que* *salió* *ladrando.*
be.PAST the puppy REL/DET REL leave.PAST bark.PROGR

'It was the puppy who came out barking.'

b. *El perrito fue quien/el que salió ladrando.*
the puppy be.PAST REL/DET REL leave.PAST bark.PROGR

'The puppy was who came out barking.'

c. *El que/Quien salió ladrando fue el perrito.*
DET REL/PRON leave.PAST bark.PROGR be.PAST the puppy

'The one who came out barking was the puppy.'

d. *Salió ladrando fue el perrito.*
leave.PAST bark.PROGR be.PAST the puppy

'The one who came out barking was the puppy.'

(adapted from Flores & Méndez Vallejo 2022)

In addition, paralinguistic factors have significant impacts on prenuclear accent. For instance, in American English, affect (or speaking style) significantly influences the phonetic realisation of prenuclear accents: prenuclear prominence increases, and the accent type L+H* becomes more frequent when speakers adopt a lively speaking style, suggesting that prenuclear accents may have a more substantial role in carrying paralinguistic information compared to marking IS (Chodroff & Cole 2018).

The above examples demonstrate that multiple linguistic and paralinguistic factors can influence the assignment and phonetic parameters of prenuclear accents, showing that prenuclear accents are not merely phonologically constrained, but can convey meanings and intentions, and mark different semantic and syntactic structures.

4 Conclusion

By examining the role of IS (focus and givenness) on prenuclear accents in a variety of languages, this paper gives a preliminary answer to the questions raised at the beginning.

Regarding Q1, in most languages examined, prenuclear accents are influenced by IS, but the degree of influence is lower than that of nuclear accents. Typically, prenuclear accents consistently occur and will not be deaccented in narrow focus conditions or when carrying given information, suggesting that their presence may be structurally determined. Nonetheless, the status of focus and givenness influences the degree of prominence of prenuclear accents, represented by accent type and phonetic parameters (mainly F_0, but duration and intensity changes are observed as well). When preceding narrow focus or carrying given information, prenuclear accents will become less prominent, typically manifested by lower mean F_0 and smaller F_0 change, enhancing the contrast between the nuclear accent and other parts of a sentence. Moreover, the alignment of prenuclear accents within a prosodic phrase may also be influenced by IS in certain languages (e.g., Myrberg 2021).

As for Q2, most of the findings are consistent cross-linguistically. It should be noted in languages like Hungarian in which focus is explicitly marked by word-order, IS still influences the phonetic parameters of prenuclear accents, like in other European languages discussed in this paper. On the other hand, there are cross-linguistic differences as well. Differences are mainly between Chinese languages and other languages: in many Chinese dialects, the prosodic marking of IS (mainly focus) can be optional or rather limited, and IS seems to not have any influence on prenuclear accents according to existing data. The reason remains to be investigated.

It should also be noted that compared to studies in English and German, relatively little attention has been paid to the role of IS on prenuclear accents in other languages. The distinction between 'nuclear' and 'prenuclear' accents has not been central in the previous intonational analysis of these languages due to language-specific prosodic structures, though some recent studies have proven the nuclear-prenuclear distinction necessary (e.g., Myrberg 2021). Furthermore, the concept of prenuclear accents may not be prevalent in all languages of the world: for example, it is possible that some dialects of Chinese do not have 'prenuclear accents'. Further research is needed to explore whether this concept is compatible with Chinese and other tonal languages, and its specific definitions in this particular context. Additionally, most existing studies (except for English, German, and Chinese) are production experiments, and there are comparatively limited studies on perception and processing. Future studies can be done in these areas and will possibly reveal a more nuanced relationship between IS and prenuclear accents.

Abbreviations

AM	Autosegmental-Metrical	ACC	Accusative Case
DEFO	Definite Object	DET	Determiner
F_0	Fundamental Frequency	H*+L/H+L*	Falling Tone
L*+H/L+H*	Rising Tone	IS	Information Structure
NOM	Nominative Case	PAST	Past Tense
PFC	Post-Focus Compression	PROGR	Progressive Aspect
REL	Relative Pronoun	SG	Singular
ToBI	Tone and Break Indices	VM	Verb Modifier

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Xueyun Tian
University of Cambridge
xt248@cam.ac.uk