

PERSIAN PROSODIC STRUCTURE*

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1. Introduction

This paper is an attempt at discovering the system of Persian intonation in the framework of the autosegmental-metrical theory of intonation (e.g., Pierrehumbert 1980, Beckman and Pierrehumbert 1986, Ladd 1996). It presents a proposal as to the prosodic hierarchy of this language. Based on a total of >2100 utterances read by 8 native speakers, the proposed hierarchy is comprised of the Accentual Phrase (AP) as the smallest unit with the pitch accent (L+)H*, followed by the next level, the Intonational Phrase (IP), which contains one or more APs. Each of the AP and IP levels is marked by a right boundary tone which can be low or high. Based on the proposed structure, different types of Persian sentences are intonationally analyzed, and also, the interaction of contrastive focus with intonation is investigated.

1.1 Background on Persian

Persian is an Iranian language belonging to the Indo-Iranian sub-branch of the eastern branch of the Indo-European language family. The dialect examined in this paper is Modern Conversational Persian, which is spoken in Tehran, the capital city of Iran. Persian is classified as an SOV language (Karimi 2005). Jun (2005) classifies Persian with English, German, Dutch, Greek, Italian, Spanish, European Portuguese, Lebanese Arabic, and Bininj Gun-wok (a Northern Australian language) as “stress-accent” languages, i.e., languages in which a certain syllable in a word is made more prominent than other syllables by phonetic factors. Pitch accents in Persian occur on the lexically stressed syllables (Eslami and Bijankhan 2002). A summary of stress points in Persian includes the following (for more on stress see, for instance, Mahootian 1997 and Parmoon 2006). For nouns, adjectives, and most adverbs, the stress is word-final. Three examples are provided in (1).

- (1) Noun: šuné ‘comb’
 Adjective: kutáh ‘short’
 Adverb: yæváš ‘slowly’

Verbs have their stress on the final syllable of the main constituent, e.g., on the second syllable of *xærid* (the past stem) in (2).

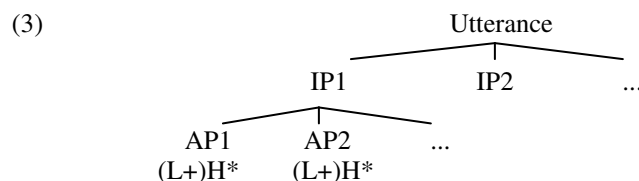
* I would like to thank Kevin Russell, Jila Ghomeshi, Rob Hagiwara, and the audience at the 2008 CLA meeting.

- (2) xærid-æm.
bought-1SG
'I bought.'

The negative marker *ne-/næ-*, the durative prefix *mi-*, and the subjunctive/imperative prefix *be-* attract the stress in verbs, e.g., *næ-xærid-æm* 'I didn't buy'.

2. Prosodic Structure

Based on the recordings done for this work, there is a recurrent tonal/accentual pattern for all utterances in Persian.¹ The pattern, which following Mahjani (2003) I will call the Persian Accentual Phrase (AP), consists of a low tone (L) followed by a high tone (H) forming the pitch accent L+H*, which is associated with the stressed syllable. There are two allophones for this pitch accent: L+H* and H*. The former is for words or phrases with final stress, e.g., nouns and adjectives, longer than one syllable. Initially-stressed words and monosyllabic content words have the allophone H*. Utterance initial APs usually take the form of the first allophone regardless of their stress pattern due to the occurrence of an utterance initial rise in Persian. An AP normally consists of one content word with its possible enclitic(s) (but see 2.1 below for factors altering this configuration). One or more APs are immediately dominated by an Intonational Phrase (IP), which corresponds to an utterance for mono-clausal sentences. The proposed prosodic structure of Persian is given in (3).



The part of an AP between the pitch accent and the AP end is handled by a right boundary tone, which can be high (h) or low (l). This part can consist of zero syllables (when the stressed syllable of an AP is its final syllable), in which case the boundary tone is realized on the stressed syllable itself. It can also consist of several unstressed syllables, in which case the boundary tone includes all these syllables up to the AP end. The motivation for the existence of the AP boundary tone comes from the comparison of APs that are the nuclear pitch accent (NPA) and those that are not: in most types of mono-clausal unmarked sentences, the NPA AP, which is the last AP, takes the l boundary tone, and other APs (which are pre-nuclear) take the h counterpart.² Echo questions, double focus

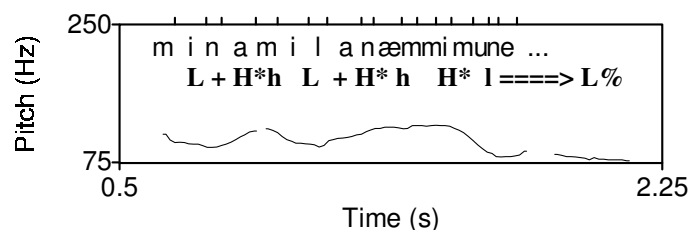
¹ The recordings for this work were done with the help of 8 native speakers of Persian (4 female, 4 male, one of the males being the author) who had an age range of 26-41 and had lived in Iran all their life before moving to Canada 3 to 6 years ago. They had been using Persian in some of their daily communications since they left Iran.

² The nuclear accent, which has also been referred to in the literature with terms such as “nuclear stress” and “sentence stress”, is used here in the sense of Hirschberg (2002) as

constructions, and vocatives are exceptions in this regard since they are mono-clausals whose NPA AP may have a high boundary tone (Sadat-Tehrani 2007a). Everything after the nuclear pitch accent is deaccented up to the IP end.³

An IP is phonologically marked by a boundary tone L% or H% on (part of) the final syllable. Phonetically, IPs are often accompanied by pitch resetting at the beginning and a pause and sometimes vowel lengthening at the end. There is usually one nuclear pitch accent in every IP. L% is used for declaratives (SOV or scrambled), leading yes/no questions (those with the particle *mæge*), WH-questions, alternative questions, imperatives, and vocatives, and H% is used for yes/no questions, tag questions, echo questions, coordinate structures, and IP-forming subordinate clauses. The prosodic structure of Persian is illustrated in Example (4). An accent mark indicates the stressed syllable of an AP, and the NPA AP is underlined. (Not all morpheme boundaries are shown.)

- (4) miná milán-æm mímune čænd ruz.
 Mina Milan-too stays a few day
 ‘Mina stays a few days in Milan too.’



The above utterance consists of three APs, the subject (*mina*), the adverb plus its enclitic (*milan-æm*), and the verb (*mimune*). The first two carry the pitch accent L+H* and the third H*. The pre-nuclear APs have a high boundary tone and the nuclear one (the verb) a low boundary tone. The phrase *čænd ruz* (‘a few days’) is deaccented since it follows the nuclear AP, and the low boundary tone of this AP is spread to the right up to the IP boundary tone (shown with an arrow).⁴ The utterance ends low with a low IP boundary tone (L%) which marks it as a declarative.

the perceptually most prominent accent in a prosodic phrase. For rules and constraints regarding the location of the NPA in Persian see Sadat-Tehrani (2007b).

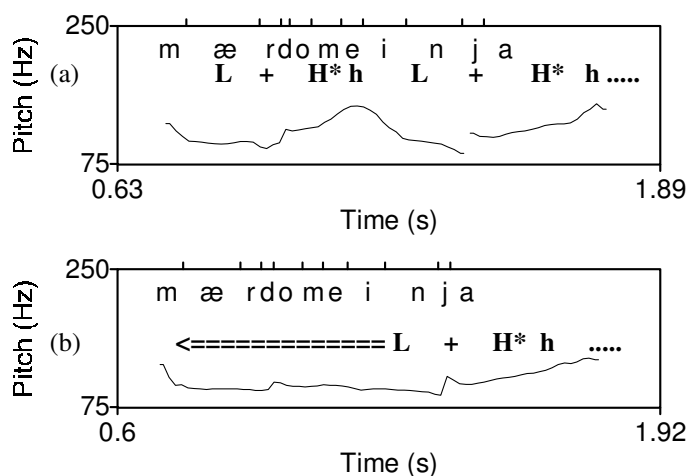
³ Deaccenting, a term introduced by Ladd (1980) and widely used in recent years (e.g., Venditti et al. 1996, Gussenhoven 2004, Jun 2005, and Cruttenden 2006), here refers to lack of any tonal event or pitch accent.

⁴ The term spreading (both in the rightward spreading above and the leftward spreading of the L discussed in Section 2.1) is used in the same sense as Grice, Ladd, and Arvaniti (2000). They observe that in the varieties of Romanian and Hungarian spoken in Transylvania, yes/no questions have a high plateau following the nuclear accent, and making use of Gussenhoven’s (1993) analysis, they see this high plateau as derived from the spreading (or their preferred term “copying”) of an H- phrase accent.

2.1 Inside an AP

Although an AP normally consists of one content word with its possible enclitic(s), there are factors which can alter the number of words in an AP. Such factors include information structure, focus, phrase length, subordination, and speech rate. Example (5) illustrates the effect of information structure on the configuration of AP.

- (5) *mærdom-e inja xeyli mehræbun-æn.*
 people-EZ⁵ here very kind-are
 ‘The people here are very kind.’



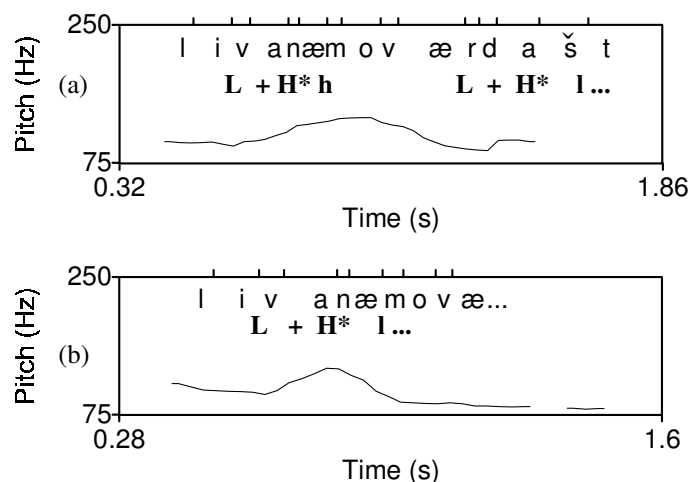
There are two alternative phrasings for the subject noun phrase (*mærdom-e inja*). The first is when the noun phrase comprises two APs (Figure a), i.e., one AP for each word. This can be the case when (5) is used as part of the new information, e.g., in answer to the question ‘How do you like your new town?’ The second alternative is when the whole subject noun phrase forms one AP (Figure b). This can happen when the subject noun phrase is given information, e.g., as part of the answer to the question ‘How do you find the people there?’ In such cases, i.e., where the L of an AP is realized on several unstressed syllables before the H*, a low plateau is formed (on *mærdom-e in-* in the above example) which can be accounted for by the spreading of the L to the left up to the beginning of the AP (indicated with an arrow). Thus, in such leftward spreading cases, there is no observable valley, and the low part of the contour has the shape of a level low stretch.

If an enclitic is located at the end of an AP, e.g., the ezafe vowel *-e* in Figure 5a, it bears the AP boundary tone. If this AP boundary tone on the

⁵ The Ezafe vowel *-e* (usually pronounced *-ye* after vowels) syntactically links some elements with their modifiers in Persian (for analyses of the Ezafe construction, see e.g., Ghomeshi 1997a and Samvelian 2007).

enclitic is high, it is predictably higher than the previous H*. The same scenario exists for words with more than one enclitic, as exemplified in (6).

- (6) livan-æm-o vərdašt.
 glass-my-RA⁶ s/he picked up
 ‘S/he picked up my glass.’



In the AP *livan-æm-o*, the word *livan* ‘glass’ has the pattern L+H* and both of the enclitics *-æm* and *-o* bear the boundary tone of the AP which can be l or h due to the different intonations of the sentence. Figure a is the default version with the nuclear pitch accent on the verb (*vərdašt*) and Figure b has the NPA on ‘glass’ which gives it a marked pronunciation. The enclitics *-æm* and *-o* are high in Figure a and low in Figure b. Note that, as mentioned above, the h in 6a is phonetically realized higher than its preceding H*.

Besides the above-discussed meaning-changing tonal variations, there are also some inter-speaker variations on the AP structure which do not bear on semantic or pragmatic factors. As an example, the prepositional phrase in (7) may be pronounced in either of the ways demonstrated without any change in meaning.

- (7) a. | AP | AP |
 L+H* h L+H* h
 be næzær-e uná ...
 to opinion-EZ they
 ‘In their opinion...’

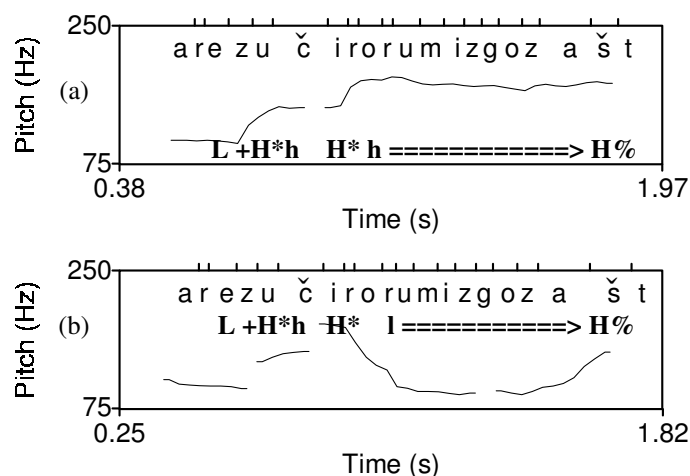
⁶ The enclitic *-ra* marks an object noun phrase for specificity and is conversationally pronounced as *ro* (and mostly *o* after consonants). For different analyses of *-ra* see, e.g., Dabir-Moghaddam (1992), Ghomeshi (1997b), and Karimi (2003).

- b. | AP |
 L+H**h*
 be nəzær-e uná ...

2.2 Implication of the right spreading of the AP boundary tone

The prosodic structure proposed in this paper does not include the level Intermediate Phrase, a level between the IP and the AP, and its characteristic tone the phrase accent (e.g., L-). Phrase accents in the autosegmental-metrical framework refer to the changes in the F0 from the last pitch accent to the end of the phrase (Pierrehumbert 1980). Phrase accents were later regarded as edge tones for the Intermediate Phrase (Beckman and Pierrehumbert 1986). Previous works (Mahjani 2003, Scarborough 2007) have suggested the Intermediate Phrase level for Persian; however, my data suggest that the prosodic levels of IP and AP suffice for Persian and considering a level between the two only complicates the representations. The evidence comes from the fact that the AP boundary tone can in all instances account for the part of the F0 contour following the NPA, i.e., the part that the phrase accent is supposed to associate with. How this is done is by the spreading of the AP boundary tone of the NPA to the right. In other words, the part of the F0 contour that is between the NPA and the IP boundary always has the same tone as that of the NPA AP boundary tone. Thus, the following two situations do not occur after the NPA AP in Persian: a low AP boundary tone followed by a high stretch and a high AP boundary tone followed by a low plateau. Example (8) is illustrative.

- (8) arezú čĩ-ro ru miz gozašt?
 Arezu what-RA on table put
 ‘Arezu put what on the table?’ [echo question]



Example (8) contains an echo question with two possible pronunciations appearing in a and b. In both versions, the boundary tone of the nuclear AP (*čĩ-*

ro ‘what’) is spread to the right up to the end of the IP (shown with an arrow). This AP boundary tone, which is high for a and low for b, spans over the string *ru miz gozašt*, suggesting the sufficiency of two levels of prosodic hierarchy (AP and IP) for Persian.

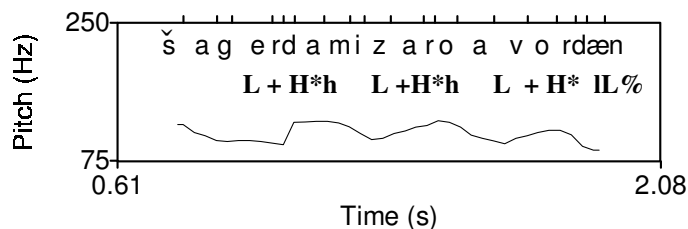
3. Intonation patterns

In this section, the intonation pattern of declaratives, yes/no questions, WH-questions, and compound and complex sentences is presented. Also, the impact of contrastive focus on intonation will be investigated.

3.1 Declaratives

Declaratives in Persian are characterized by one or more APs, the last of which being nuclear and bearing a low boundary tone, and the previous ones (the pre-nuclear ones) having a high boundary tone. A declarative is usually realized as one low-boundary-toned IP which corresponds to an utterance. Example (9) contains a simple SOV declarative.

- (9) *šagerdá mizá-ro avórdæn.*
 students tables-RA brought
 ‘The students brought the tables.’

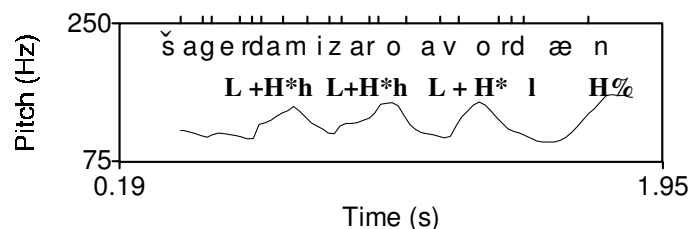


The above declarative consists of three L+H* APs: one for the subject *šagerdá* ‘students’, one for the direct object *miza* ‘tables’ plus its enclitic *-ro*, and one for the verb *avordæn* ‘brought’. The first two are marked by a high boundary tone and the third, which is the NPA, by a low boundary tone. The utterance ends low, hence marked by a low IP boundary tone (L%).

3.2 Yes/no questions (YNQs)

The word order of declaratives and their YNQ counterpart is the same and the act of questioning is done by change of intonation. The YNQ counterpart of (9) above is given in (10).

- (10) *šagerdá mizá-ro avórdæn?*
 students tables-RA brought
 ‘Did the students bring the tables?’



As can be seen, the tonal pattern of the YNQ is phonologically very similar to that of the declarative: a series of L+H* APs with the last AP being the most prominent. The difference between the YNQ and the declarative is in the IP boundary tone. While it is low for the declarative (L%), it is high for the YNQ (H%). This means a pitch increase on the final syllable of the IP, a characteristic seen in many languages.⁷ Apart from the phonological difference of the IP boundary tone, there are three phonetic differences between declaratives and YNQs. The first is related to the scaling of the H* which is realized higher in YNQs, hence a greater pitch excursion (H-L). This occurs especially in the final AP due to the fact that there is less declination in YNQs than in declaratives,⁸ so the verb AP (*avordæ*n) has a higher peak in the YNQ (148 Hz) than in the declarative (114 Hz). The second difference concerns the overall pitch register, i.e., the relative position of the pitch contour with regard to the pitch axis. The register for YNQs is higher than that of declaratives. That is to say that YNQs occupy higher pitches. For the above examples, the pitch register is 89–125 Hz for the declarative and 100–148 Hz for the YNQ. The third difference between the declarative and its YNQ counterpart is related to final lengthening. It is the case that YNQs get lengthened at the end. This can be seen in the increased duration of the vowel /æ/ in the interrogative – 210 ms – compared to that of the statement – 50 ms.

Formal style YNQs can be formed with the placement of the question particle *aya* in front of the sentence (and less often in the middle). This type of question is also employed in informal style although to a lesser degree. In YNQs with *aya*, this initially-stressed particle simply forms a separate AP in the form of H*, or (more often) L+H* as it is usually utterance initial (recall that utterance initial APs always have the form L+H*).

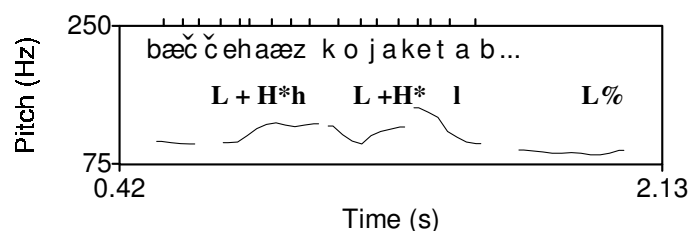
3.3 WH-questions (WHQs)

WH-words in Persian, which include *ki* 'who', *či* 'what', *key* 'when', *čera* 'why', *koja* 'where', and *kodum* 'which', remain in situ in their unmarked order. An example is provided in (11).

⁷ There are, however, languages in whose YNQs a final rise is not a common pattern, e.g., Danish, Finnish, Hungarian, Bulgarian, Russian, Moroccan Arabic, Brazilian Portuguese (Hirst and Di Cristo 1998) and Chickasaw (Gussenhoven 2004).

⁸ This declination contrast is also reported for Danish and Vietnamese (Hirst and Di Cristo 1998).

- (11) *bæččehá æz kojá ketab xæridæn?*
 children from where book bought
 ‘Where did the children buy books from?’



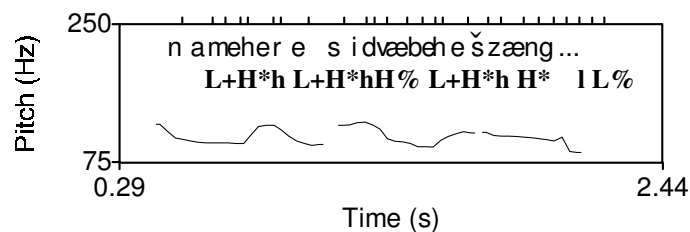
An AP is assigned to the WH-word *koja* ‘where’. The subject noun phrase *bæččeha* ‘children’ takes one AP too (note that the preposition *æz* ‘from’ which is usually low is realized high due to fast speech rate and is merged with the previous AP *bæččeha*). Similar to declaratives, the IP and the utterance end low, marked with an L%. The WH-word is usually the most prominent word in the sentence as far as information structure is concerned. This is encoded in Persian in the location of the NPA: it is always on the WH-word. Everything following the WH-word, i.e., *ketab xæridæn*, is deaccented. There is often a pitch increase on the H of the WH-word AP, a phenomenon that stems from the focus nature of WH-words.

WH-words can also undergo WH-movement since Persian allows words and phrases to be topicalized for emphasis or other information structure considerations. The intonation of such WHQs is not different from the in-situ cases. For instance, if *æz koja* ‘from where’ in (11) moves to the front, the intonation will be L+H* l L%, which means that the WH-phrase will be the nuclear and the only AP of the utterance, and everything following it will be deaccented.

3.4 Compound and complex sentences

Compound sentences usually include more phrase boundaries than mono-clausals. Example (12) contains a compound sentence consisting of two clauses connected with the conjunction *væ* ‘and’.

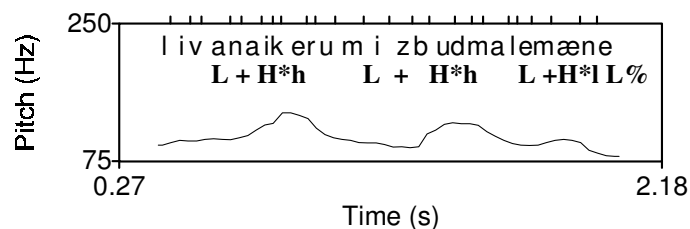
- (12) *namehé resíd væ be-héš zæng-zædæm.*
 the letter reached and to-him I called
 ‘The letter arrived and I called him.’



The two clauses are realized as two separate IPs (with the conjunction being part of the second IP) as suggested by the following three pieces of evidence. The first two are phonetic reasons: an amount of pause at the end of the first clause (sometimes represented by a comma in writing), and a certain degree of vowel lengthening there compared to when the same segments are used in the middle of one single IP. The third reason is related to prominence facts. The whole structure in (12) has two prominent elements (the verbs), one before the conjunction and one after. In other words, each clause in (12) has a different nuclear pitch accent, which testifies to their each being a separate IP

Complex sentences are sometimes pronounced as one IP and sometimes more than one. An example of the former is those complex sentences which contain a short relative clause. As a general, though not unbreakable, rule, a (short) relative clause is realized as one AP⁹ with the pattern L+H* with the H* associating with the final syllable, and a complex sentence containing a relative clause forms one single IP with one nuclear pitch accent. Example (13) is illustrative (the relative clause is italicized).

- (13) *livanáí ke ru miz búd* mal-e *mæn-e*.
 the glasses that on table were property-EZ I-is
 ‘The glasses that were on the table are mine.’



The relative marker *ke* is cliticized to the head noun and becomes part of its AP. It bears the AP's high boundary tone and like other enclitics, it is realized higher than the H* (in slower speech, *ke* becomes part of the L of the next AP, i.e., the one that the relative clause forms).¹⁰ The relative clause AP boundary tone is high since that AP is not the NPA of the utterance; the NPA is on the AP *mæn-e* which has a low boundary tone.

Nouns that take a clausal complement behave intonationally like relative clauses. These nouns include *vage'iyæt* 'fact', *šaye'e* 'rumour', *edde'a* 'claim', *næzæriyye* 'theory', *fekr* 'thought' (for a larger list see Gholamalizadeh 1995). An example is given in (14).

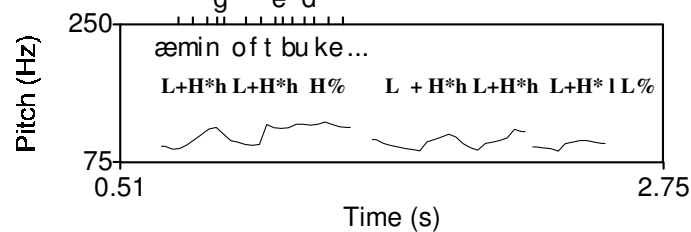
⁹ Generally, it is more likely to get larger APs in relative clauses than in matrix clauses.

¹⁰ There is a possibility that the head noun (*livanáí*) and the relative clause (*ke ru miz búd*) together form one single AP. As already mentioned, this can be the result of information structure considerations. Such a phrasing occurs for instance when *livanáí ke ru miz búd* 'the glasses that were on the table' is given information.

- (14) L+H*^h L+H*^h L+H*^h L+H*^hL%
 ín šaye'é ke mašin ærzun šodé qædimí-ye.
 this rumour that the price of car cheap has become old-is
 'The rumour that the price of car has come down is old.'

Complex sentences realized as two IPs are exemplified by those containing clausal complements of verbs. Example (15) is illustrative.

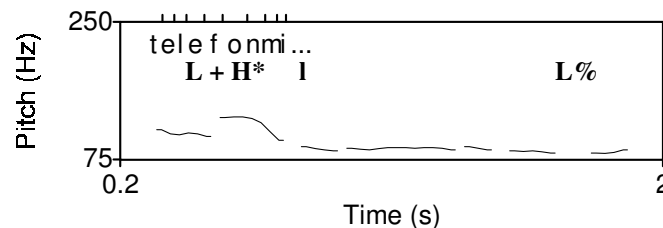
- (15) æmín goftébud ke šagerdá mizá-ro avórdæn.
 Amin had said that students tables-RA brought
 'Amin had said that the students brought the tables.'



The behaviour of such sentences is quite like coordinate structures. The matrix clause containing the verb 'say' or 'want', etc. has a series of (L+)H* APs and it finally ends high with an H%, thus bringing the first IP to an end. The NPA of this IP is on the stressed syllable of the matrix verb and all the following syllables bear the high boundary tone of the NPA AP. The optional complementizer *ke* is cliticized to its preceding element. The second IP corresponds to the complement clause and has a typical declarative intonation. In fact, the intonation of the complement clause is not affected by the matrix clause and is only determined by the sentence type that the complement clause has. In other words, if the complement clause is a declarative, it has a declarative intonation (as in (15)), and if it is a YNQ or WHQ, it has a YNQ or WHQ intonation respectively.

A subordinate clause following a matrix clause can be totally deaccented, as happens in some adverbial clauses which follow the matrix clause, illustrated in (16).

- (16) telefón-mikærdæn hær væqt mitunestæn.
 they called each time they could
 'They called whenever they could.'



The adverbial clause in (16) is *hær væqt mitunestæn* which appears after the matrix clause. Intonationally, the whole utterance forms one IP and the adverb clause is deaccented since it follows the NPA.

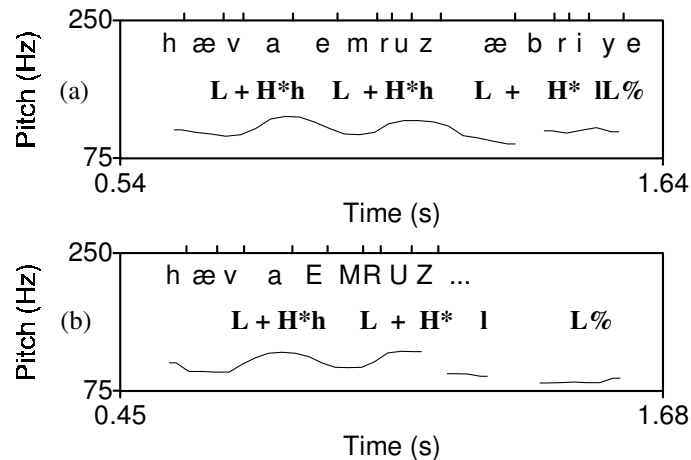
Having seen the intonational behaviour of declaratives, YNQs, WHQs, and compound and complex sentences, we deal with the interaction of contrastive focus and intonation in the next section.

4. Contrastive focus

Contrastive focus, referred to as focus in this paper, denotes highlighting one or more elements in contrast to other elements in the discourse. This type of focus is also referred to as “corrective focus” (Gussenhoven 2007). A focused constituent in Persian forms its own AP. The tonal pattern of this AP is not different from that of ordinary APs, i.e., it is (L+)H*, and the boundary tone of focus APs is always low in single focus constructions. Phonetically, focus APs have a greater pitch excursion and a longer duration than ordinary ones.¹¹ The focused AP is the nuclear pitch accent of the IP and thus results in deaccenting what follows up to the IP end.

Example (17) compares two versions of the same declarative sentence without and with focus.

- (17) a. hævâ emrûz æbrî-ye.
 weather today cloudy-is
 ‘The weather is cloudy today.’
 b. hævâ EMRÛZ æbri-ye.
 weather today cloudy-is
 ‘The weather is cloudy TODAY.’

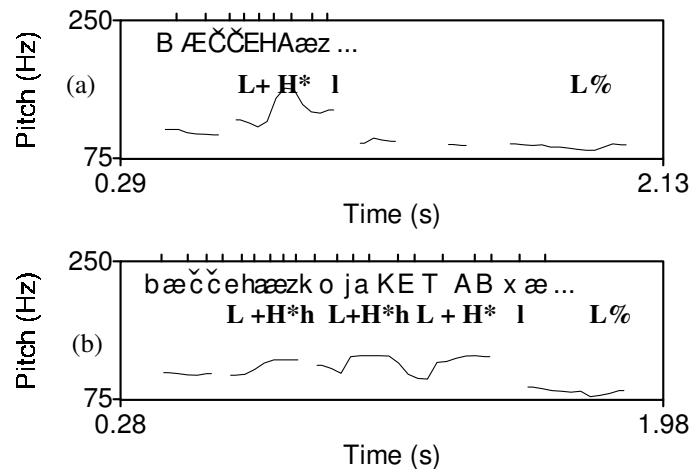


¹¹ In a representation where realizational properties such as pitch excursion are treated in the phonology, the pitch accent for a focus AP may be shown as L+[^]H*, with [^] denoting extra high.

The utterance in (17a) has three L+H* APs whose boundary tones are high – AP1 and AP2 – and low – AP3. The third AP is the nuclear pitch accent of the utterance. In the focused version (17b), there are two APs: one for the subject and one for the adverb, both being in the form of L+H*. Due to focus on the adverb, the element to its right (i.e., the complement plus the cliticized verb *æbri-ye*), although being the NPA in the default version, is deaccented. In (17b), the focused AP (*emruz* ‘today’) is the NPA. So focus overrules the default NPA of an utterance.

Focus can occur in all sentence structures in Persian. Example (18) contains two focus versions of the WHQ in (11) above. The first has the focus on an item preceding the WH-word (*bæččeha* ‘children’) and the second on an item following it (*ketab* ‘book’).

- (18) a. BÆČČEHÁ æz koja ketab xæridæn?
 children from where book bought
 ‘Where did THE CHILDREN buy books from?’
 b. bæččehá æz kojá KETÁB xæridæn?
 children from where book bought
 ‘Where did the children buy BOOKS from?’



In the presence of a focused item, a WH-word acts like an ordinary AP: if the focus precedes the question word, the question word undergoes the normal deaccenting common to post-focal elements; if the focus follows the question word, the question word is realized as a normal (L+)H* AP without causing any deaccentuation. So the deaccentuation of focus has priority over the deaccentuation of the WH-word. Figure a has the subject *bæččeha* focused and as a result it has formed the only AP of the utterance and everything following it bears its spread low AP boundary tone. In Figure b, where the focus is on the post-WH-word direct object *ketab*, the WH-word is an AP with the pattern L+H* and a high AP boundary tone since it is not the NPA. The focused AP (*ketab*) attracts the prominence, gets a low AP boundary tone, and deaccents the

verb. Both utterances end with an L% as is the common IP boundary tone for WHQs.

5. Conclusion

The intonational structure of Persian was studied in this paper. The prosodic hierarchy consists of the level Accentual Phrase characterized by the pitch accent (L+)H*, immediately dominated by the level Intonational Phrase. Each of these levels is marked by a right boundary tone. The right boundary tone of the AP spreads to the right and associates to all of the syllables between the AP end and the IP end. An AP normally contains one content word plus its possible enclitic(s), but factors like information packaging may change this configuration. The last AP in most mono-clausal sentences is nuclear and has a low boundary tone, everything after which is deaccented up to the IP end. Declaratives and their yes/no question counterparts are intonationally similar in that they are both composed of a series of (L+)H* APs, but YNQs show more pitch excursion on their APs and have an overall higher register. They also exhibit more lengthening on the final vowel. WH-questions have a falling intonation, similar to declaratives. The WH-word, which is the NPA of the utterance and which triggers deaccentuation, is usually pronounced with a pitch increase. Contrastively-focused APs are longer and have a greater pitch excursion than their non-focused counterparts. They have a low boundary tone and cause deaccentuation. In focused WHQs, the deaccentuation of focus has priority over that of the WH-word. So if a WH-word is located to the right of focus, it loses its AP status and is deaccented, whereas if it precedes focus, it behaves like an ordinary AP.

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