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Syntax, Phonology, or Both?

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Abstract

The realisation of focus in Makkan Arabic (MA) phonology and word order has not been investigated yet. Therefore, this study aims to find answers to (a) to what extent prosodic prominence marking is used; (b) which pitch accent patterns can occur in sentences without and with focus; and (c) whether and how broad focus, information focus and contrastive focus are realised in word order. Two experiments were conducted: production and perception. In the production experiment, a question-answer paradigm was used to elicit information focus and contrastive focus at three sentence locations (initial, penultimate and final) in comparison with their broad focus counterparts. A total of 3528 utterances were produced by 14 speakers of Makkan Arabic. The results from the production experiment show that (a) prosodic prominence marking was not used, and (b) the number of accent distribution patterns was limited, as was the number of two pitch accent types observed: L+H* and H*. The results from the perception experiment reveal that MA listeners have a strong preference for producing some word orders to encode focus over others. These results contribute to the debate about the interaction between phonology and word order in encoding focus.

Keywords: Makkan Arabic, focus, prominence, word,order, pitch, prosodic marking, perception, production

1. Introduction

Information structure (IS) refers to the way in which the information is 'packaged' in an utterance (Chafe 1976). Different approaches to analyse IS, and various categories of IS are proposed (Halliday 1967a; Gundel 1974; Vallduví 1990; Rooth 1992; Lambrecht 1994; Krifka 2008). The present study focuses on one aspect of information structure: i.e., focus. Following Jackendoff (1972), Vallduví (1990) and Lambrecht (1994) and many others, focus is a discourse semantic aspect that is salient for discourse/semantic reasons. Focus is subdivided into three types: broad focus (often referred as broad focus (Ladd 2008) or sentence focus (Lambrecht 1994)), information focus and contrastive focus. In an utterance with information focus (1a), the element [*Peter*] is information-focused by virtue of highlighting new information: i.e., this utterance is embedded in the question-answer context in which it replaces the wh-phrase in (1a). In an utterance with contrastive focus (1b), the element [*Peter*] is contrastive-focused by virtue of being new information and also stands in a contrastive/corrective relationship with another element provoked in the previous discourse (i.e., the question). In the broad-

focus utterance (1c), the whole sentence is all new in the discourse by virtue of being an answer to the broad-focus question 'what happened?'. Capitals indicate a greater prominence on an individual word.

(1)   a. Who ate an apple? PETER ate an apple.

        b. Who ate an apple? George? PETER ate an apple.

        c. What happened? Peter ate an apple.

Focus can be represented in different levels of grammar: syntax and phonology. Languages differ in this respect. For example, Focus can be realised at syntax as in Hungarian (Kiss, 1998) and Modern Standard Arabic (Moutaouakil 1989), at morphology as in Japanese (see Heycock, 2012 and the references therein) , or at prosody as in Hijazi Arabic (Alzaidi, 2019). Therefore, focus marking is not universal (see Lambrecht 1994, Féry 2008, and Ladd 2008). A semantics-phonology aspect triggered by focus is the deaccentuation (i.e., the lack of F0 movements/pitch accents) of words following a focus (= post-focus words/region) and of words preceding a focus (= pre-focus words/region), as in Germanic languages (see Ladd 2008; Xu 2011).[1] Another aspect, that is widely discussed, is the complementarity hypothesis between syntax and phonology (Gundel 1988; Vallduví 1991; Ladd 2008). This hypothesis is simply that if a language uses, for example, syntax to mark focus, prosody is less relevant. There are studies in favour of the complementarity hypothesis (see Gundel 1988; Vallduví 1991; Ladd 2008), however, there are instrumental studies demonstrating that focus can be prosodically encoded and also syntactically marked at the same time. Therefore, these studies demonstrate the failure of this hypothesis, as the case found in Egyptian Arabic (Hellmuth 2010).

MA receives little attention in terms of the study of its intonation system, with the work by Alzaidi (2022) being an exception. Alzaidi (2022) finds that focus is not encoded prosodically. This finding is supported by results from the perception experiment in which MA listeners were not able to identify the focus location. Therefore, the question of how focus is encoded in MA is raised. Therefore, the present study aims to fill in this gap by contributing new data from MA (an understudied Arabic dialect) to show (a) to what extent prosodic prominence marking is used, (b) which pitch accent patterns can occur in sentences without and with focus, and (c) whether and how broad focus, information focus and contrastive focus are realised in syntax. The paper is structured as follows. Section 2 presents an overview of how focus is realised in prosody and syntax. Section 3 presents the methodology of production experiment and the results. Section 4 presents an experiment on the perception of word orders that explores the relation between syntax and focus marking. Section 5 presents a general discussion and concludes the paper.

2. Background

2.1 Marking focus: prosody

Studies on how focus is realised in prosody in Arabic are few. Recently, there has been a growing interest to study different aspects of intonation in Arabic dialects including focus. The results of the previous studies suggest that focus is realised in prosody differently across Arabic dialects (see Chahal

and Hellmuth 2014; El Zarka 2017; Alzaidi 2019 and Alzaidi 2022). This leads researchers including Hellmuth (2020) to suggest that these differences might be a result of contacts with other non-native languages. This seems to be supported by Alzaidi (2022)'s results which suggest that the MA intonation might be influenced by the intonation of non-native speakers of Arabic who have settled in Makkah since the late 18th and early 19th centuries (see Alzaidi 2022 for more information). To verify this claim, one might need to look at other components of grammar such as syntax to see whether there are pieces of evidence for the influence of contact with non-native languages, as suggested by Alzaidi (2022).

Due to the limited space given, our comparisons between the results of the present study and the results of the previous studies on Arabic dialects are based on (1) pitch accent types and patterns of the sentences with and without focus, and (2) the prosodic effects of focus on on-focus region (where the focused element occurs), pre-focus region (where words preceding the focus occur) and post-focus region (where words following the focus occur).

The number of pitch accent types is different across Arabic dialects (see Jun 2014 and El Zarka 2017, for an overview). The highest number of pitch accent types are observed in Lebanese (Chahal 2001) and Sanaani Arabic (Hellmuth 2014) (Lebanese = 6 pitch accents and 3 edge tones, Sanaani = 6 pitch accents and 2 edge tones). The lowest number of pitch accents and edge tones are observed in colloquial Egyptian Arabic (i.e., contains an L+H* pitch accent and two edge tones) (see Hellmuth 2006). Although, pitch accent types are available to the speakers of those languages, there is no specific pitch accent type used to encode either information focus or contrastive focus (Chahal and Hellmuth 2014; El Zarka 2017; Moussa 2019).

With regard to the prosodic patterns observed in the sentences with and without focus, Arabic dialects are different. For example, in the sentence without focus (i.e., broad focus), the placement of nuclear pitch accent of the sentence is optional as in Egyptian (El Zarka 2013), Jeddah (Moussa 2019), Hijazi (Alzaidi 2014) and Kuwaiti Arabic (Alharbi 1991).[2] In Lebanese Arabic, however, the nuclear pitch accent of the sentence is placed on the sentence-final word (Chahal 2001, Chahal and Hellmuth 2014). That nuclear pitch accent shifts once a word in the utterance is focused (Chahal and Hellmuth 2014).

Moreover, Arabic dialects show differences in contour shapes. For example, broad-focus sentences in Egyptian (Hellmuth 2006; Chahal and Hellmuth 2014), Jeddah (Moussa 2019), Najdi, Hijazi and Jizani Arabic (Alzamil and Hellmuth 2022) is characterised for being in a declination pattern. That is, the peaks of the pitch accents decline till the end of the sentence. In Lebanese Arabic, however, the broad-focus sentence is characterised for being in a flat-hat pattern in which the contour rises on the first target word and falls on the final word (Chahal 2001, Chahal and Hellmuth 2014). The presence of focus in an utterance changes that default intonational contour (see Alzaidi 2020 for an overview).

The prosodic effect of focus is also observed in the pre-focus words and post-focus words as in Lebanese (Chahal 2001) and Moroccan Arabic (Yeou et al. 2007) or only in the post-focus words as in Egyptian (Hellmuth 2006), Jeddah (Moussa 2019), Hijazi (Alzaidi et al. 2019; Alzamil and Hellmuth 2022), Najdi (Al-Rojaie 2021; Alzamil and Hellmuth 2022) and Jizani Arabic (Alzamil and Hellmuth 2022). That is, the pitch accents of post-focus words in Lebanese Arabic are deaccented; however, they

are compressed in F0 in Egyptian (Hellmuth 2006), Jeddah (Moussa 2019), Hijazi (Alzaidi et al. 2019; Alzamil and Hellmuth 2022), Najdi (Al-Rojaie 2021; Alzamil and Hellmuth 2022) and Jizani Arabic (Alzamil and Hellmuth 2022). This indicates that how focus is realised in prosody is different across Arabic dialects in pre-focus and post-focus region. Recent perception studies of focus find that the listeners identified the location focus (El Zarka and Hödl 2021; Alzaidi 2021; Alzaidi et al. 2023).[3]

In MA, Alzaidi (2022) investigates how focus is acoustically encoded. He finds that the focused word is realised with more phonetic enhancement (i.e., expanded excursion size, higher F0 and stronger intensity) than its broad-focus counterpart. Interestingly, the acoustic cues of the pre-focus and post-focus words are largely similar to their broad-focus counterparts. As for the differences between contrastive focus and information focus, they are similar phonetically. This indicates that the differences between the types of focus do not exist acoustically in this dialect. This makes it different from the neighbouring Hijazi Arabic. In Hijazi Arabic, the differences between these two types of focus are prosodically realised. The phonetic cues of contrastive focus are higher than that of their information-focus counterpart. With regards to our two research questions: (a) to what extent prosodic prominence marking is used and (b) which pitch accent patterns can occur in sentences without and with focus, we still do not know the answers. Answering the two questions does not only help to make the picture of the MA intonation clearer than before (i.e., giving more information such as pitch accent types and prosodic contours of the sentences with and without focus), but also helps to make the analysis of the intonation of this Arabic dialect straightforward to be compared with the analysis of the intonation of other Arabic dialects studies so far. Since the present study uses the AM annotation system (in its simplified version), the AM analysis to MA intonation can be compared with the previous AM studies(Chahal and Hellmuth 2014; El Zarka 2017).

2.2. Marking focus: word order

A speaker of Arabic has an option to encode focus by re-ordering the words in an utterance (see Moutaouakil 1989; Ouhalla 1997; Hellmuth 2010; Alzaidi 2019 and Alzaidi 2022). Since Sapir (1921), it is widely assumed that languages with rich case-marking systems have more variations in word order than those languages with little case-marking. Modern Standard Arabic (MSA), for example, has a rich case-marking system: nominative, accusative and genitive (see Bakir 1979; Moutaouakil 1989; Shlonsky 1997). That makes the variation in constituent ordering is possible since the listeners can differentiate between the parts of the speech of the arguments of the verb. In OSV in MSA, for example, it is clear that the object is the first argument in the structure due to its accusative case, whereas the second argument is the subject. An example illustrates that is in (2).

(2)   muħammad-an   zajd-un qabala   MSA
         Muhammad-ACC   zajd -NOM   met.3ms
         'Zaid met Muhammad.'

In (2), [*Muhammad*] is the object by virtue of being cased with accusative case marker, and [*zajd*] is the subject by virtue of being cased with the nominative case marker. This shows that the variation in constituent ordering is possible in MSA to encode focus as the case in (2). The discussion of different

word orders in Arabic is mostly dealt with in the context of grammar (particularly syntax) (Bakir 1979 and Ouhalla 1999) and rhetoric (see Owens and Elgibali 2010 and the references therein). Unfortunately, studies on the semantic/pragmatic triggering for focus in Arabic is very little

In encoding focus, MSA has a widely discussed syntactic construction; i.e., focus preposing. Focus preposing construction is used to encode contrastive focus, whereas information focus is realised in-situ in syntax (see Moutaouakil 1989). In (2), the element [*muħammadan*] is contrastive focus, and hence it is realised at the left periphery of the clause. In encoding information focus, that element should be realised in-situ in syntax, as in (3) below.

(3)   zajd -un   qabala   muħammad-an   MSA
        zajd -NOM   met.3ms   Muhammad-ACC
        'Zaid met Muhammad.'

In modern Arabic dialects, the syntactic distinction between information and contrastive focus is not found. In MA, for example, information and contrastive focus can be realised in-situ in syntax, as the examples in (4, 5 and 6) illustrate. The subscript BF, NF and CF stands for broad focus, information focus, and contrastive focus respectively.[4]

(4)   a. What happened?
        MA
        b. [zajd qabal   muħammad]$_{BF}$
          zajd   met.3ms   Muhammad
        'zajd met Muhammad.'

(5)   a. Who did zajd meet?
        MA
        b. zajd qabal [muħammad]$_{NF}$

(6)   a. Who did zajd meet? Faisal?
        MA
        b. zajd qabal [muħammad]$_{CF}$

In Arabic, it is generally the case that the repeated words from the previous discourse are deleted. In the present, I will call this syntactic construction as an argument-elision construction.   In this construction, the words carrying given information by virtue of being in the previous discourse are omitted. This construction is commonly used by speakers of Arabic (see Hellmuth 2010). In the example from MA (7b), the given words in the previous discourse in (7a) are omitted.

(7)   a. Who did zajd meet?
        MA
        b. [muħammad]
        Intended: 'zajd met Muhammad.'

This brief overview of variation in constituent ordering raises several questions: which word order is preferred by the native listeners of MA to trigger broad focus, information focus and contrastive focus. The present study aims to find an answer to this question by conducting the experiment on the perception of word order (§4).

3. Production experiment: phonology

3.1 Methods

Two sentence groups with identical segmental forms used in different contexts: broad-focus, information-focus and contrastive-focus conditions (i.e., contexts) triggered in three sentential positions: initial, penultimate and final position to evoke broad focus, information focus and contrastive focus. The sentence group is with the structure subject + verb + object 1 + to/from + object 2. Stressed syllable is indicated by bold letters. The target sentence was preceded by a question that triggers broad-focus condition, narrow information focus realised on sentence-initial, -penultimate and final word, and narrow contrastive focus realised on sentence-initial, sentence-penultimate and final word. Each question-answer pair was preceded by an anecdote to create an appropriate context in the participants' mind for the relevant question-answer pair. An example is in (9).

(8)　　a. Group A:

Subject (Target word)	Verb	Object 1 (Target word)	li(to)	Object 2 (Target word)
La.ma		**La**.ma		**La**.ma
Mu.na	**wad**.dat	**Mu**.na	li	**Mu**.na
Li:na		**Li**:na		**Li**:na

　　b. Group B:

Subject (Target word)	Verb	Object 1 (Target word)	ʕan (about)	Object 2 (Target word)
Ta.**li:n**		Ta.**li:n**		Ta.**li:n**
Na.**wa:l**	**xab**.ba.rat	Na.**wa:l**	ʕan	Na.**wa:l**
Ma.**na:l**		Ma.**na:l**		Ma.**na:l**

(9)　　Sample of anecdotes of question-answer paradigm to trigger different focus conditions:[5]

Anecdote	لمى ولينا وسهى أخوات. لمى عندها بنتين نهي و منى. لما قررت إنها تحج، حبت تترك بنتها الصغيرة منى عند اختها لينا. وفي يوم التروية، لمى ودت بنتها للينا.
	'Lama, Lina and Suha are sisters. Lama has two daughters, their names are Nuha and Muna. Lama decided to perform Hajj, so she liked to leave her little daughter Muna with her sister Lina. On the day of Al-Tarwiah, Lama took Muna to Lina.'
Broad focus	What happened?　　Lama waddat Muna li Lina
Information focus (on Object 1)	Who did Lama took to Lina?　　Lama waddat [Muna]$_{NF}$ li Lina
Contrastive focus (on Object 1)	Who did Lama took to Lina? Nuha?　　Lama waddat [Muna]$_{CF}$ li Lina

Fourteen native speakers of Makkan Arabic (5 males and 9 females, between 23 to 38 years) were recorded in a quiet fully-furnished room. Each speaker was requested to read first an anecdote silently, and then answer the prompt question at normal speech rate. The question and the answers were written and shown on the slides placed in the computer screen. A Zoom H2 recorder with 44.1 kHz sampling frequency, a 16 bit resolution, and a distance of 0.5m from the speaker's mouth was used.

Our analysis of the data presented in this section is based on some general considerations of the Autosegmental-Metrical framework (AM) such the relevance of high (H) and low (L) tonal targets for

pitch accents (Pierrehumbert 1980 and Ladd 2008). MA has not yet received attention in AM literature. Therefore, we will use simplified labels based on the raw F0 contour rather than phonological categories that are yet to be established in further research. Based on AM analyses of other Arabic dialects (Chahal 2001; Hellmuth 2006; Alzaidi 2014), pitch accent contours were classified as H* and L+H* with L boundary tone, as described in (10). The labelling of the pitch accents were performed by 7 native speakers of Arabic who are MA students in the Department of English Language in the King Saud University, Riyadh. They are well trained on AM labelling of Arabic dialects. This is to avoid the researcher's bias. The labelling was based on labellers' impressions (i.e., perception) and also on F0 tracks if needed (in cases of confusion). Labelling was based on labellers' impression and F0 trajectories in the stressed syllable of each word. These final labels are agreed upon by all the seven annotators.

(10) a. **H*:** a single tone pitch accent, starts from a mid-point in the speaker's range to a high point.
b. **L+H*:** a bi-tonal pitch accent, starts from a very low point in the speaker's range to the high point.
c. **L%:** represents a fall to the lowest part of the speaker's pitch range.

3.2 Results
3.2.1 The global F0 curve

The data gives us a rough idea of what default and focus intonation in MA looks like. The analysis is divided into two parts: broad intonation (i.e. default intonation) and focus intonation.

The global prosodic contour of the declarative sentence under broad focus displays a pitch accent associated mostly with the stressed syllable of each content word. It shows that the start of the rising pitch movement is aligned with the onset of the stressed syllable, and the end of the rising pitch movement is aligned with the offset of the stressed syllable. That is, the pitch contour falls across the unstressed syllable up until the beginning of the next rising pitch movement. It is also shown that that the final pitch movement on the last lexical item is compressed (due to an effect of final lowering). As for the placement of nuclear pitch accent of the broad-focus utterance, it is not clear and it seems that it is optionally realised either on the sentence-initial content word, or on the sentence-penultimate content word. These properties are illustrated in the most typical pitch tracks. All pitch tracks presented in the present paper are produced by the same male speaker (age = 28 years old, living and raised in Makkah).
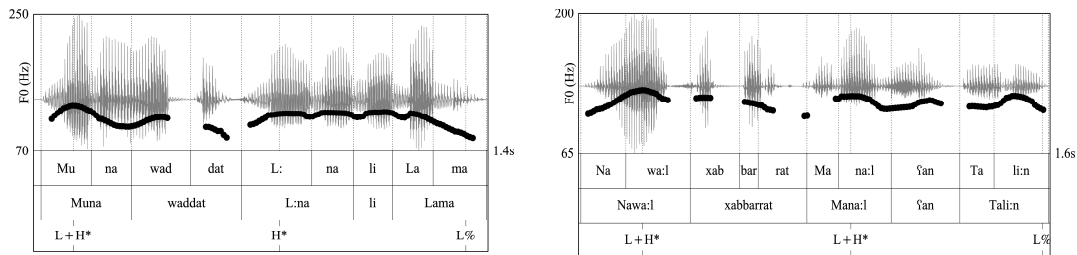

(a) The sentence is broad-focus.   (b) The sentence is broad-focus.

Figure 1: Sample pitch tracks of a MA broad-focus declarative utterance (read speech), showing a pitch accent on every content word, and final lowering. These utterances are produced by the same male speaker.

Figure 2 below shows the typical F0 contours of a sentence with the sentence-initial content word carrying the focus discourse function. Figure 3 shows the typical F0 contours of a sentence with the sentence-penultimate word carrying the focus discourse function. Figure 4 shows the typical F0 contours of a sentence with the sentence-final word carrying the focus discourse function. As can be seen, there is an accentual peak on all the content words including the focused, pre-focus and post-focus materials. In these figures, a stressed syllable is aligned with an F0 prominence. This is not only observed in the on-focus but also in pre-focus and post-focus domain. This accentuation does not differ much compared to their broad-focus counterparts (Figure 1). The only pattern seen in the data illustrated in the figures below are that the focused material is realised with higher pitch range and F0. These have been confirmed acoustically by Alzaidi (2022) as stated above. This suggests that MA resists the deaccentuation (i.e., an aspect of semantics-phonology interface) of discourse-given material in the pre-focus and post-focus domain, similar to Egyptian Arabic (Hellmuth 2006 and 2013) and Hijazi Arabic (Alzaidi et al. 2019), but different from Lebanese Arabic (Chahal 2001 and Chahal and Hellmuth 2014).
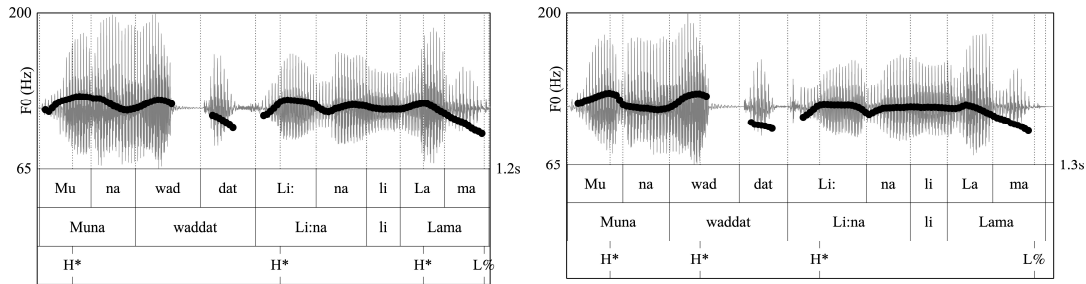
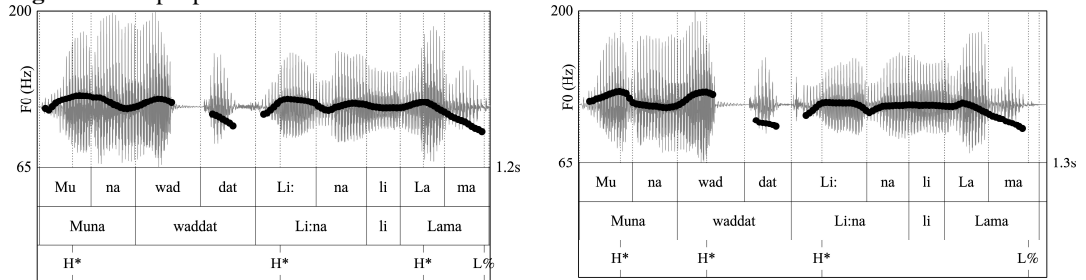(a) The sentence-initial word is information-focused.

(b) The sentence-initial word is contrastive-focused.
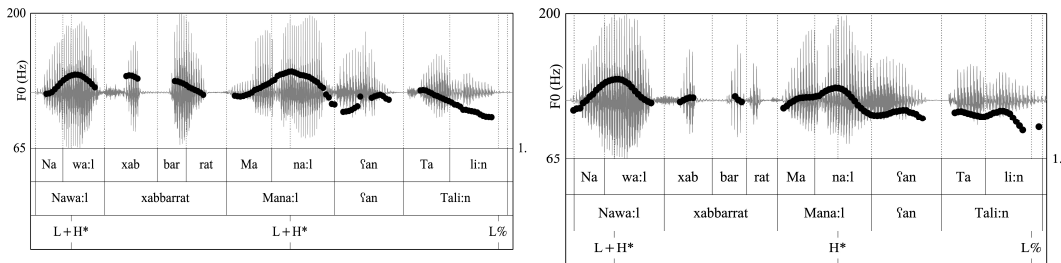
(c) The sentence-initial word is information-focused. contrastive-focused.

(d) The sentence-initial word is contrastive-focused.

Figure 2: Sample pitch tracks of SVOO sentences with focus on the sentence-initial word.

(a) The sentence-penultimate word is information-focused.

(b) The sentence-penultimate word is contrastive-focused.

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(b) The sentence-penultimate word is information-focused. (d) The sentence-penultimate word is contrastive-focused.
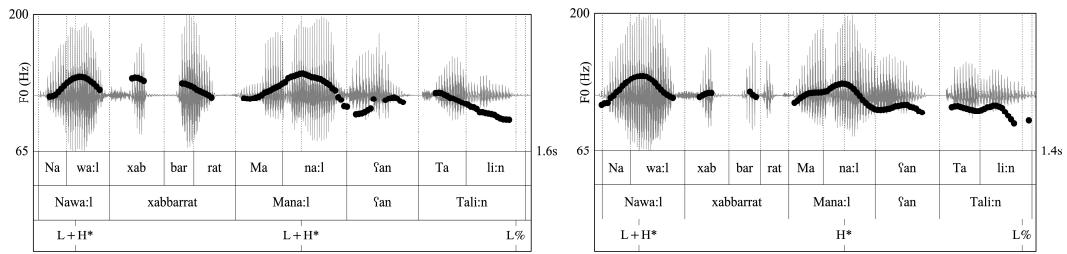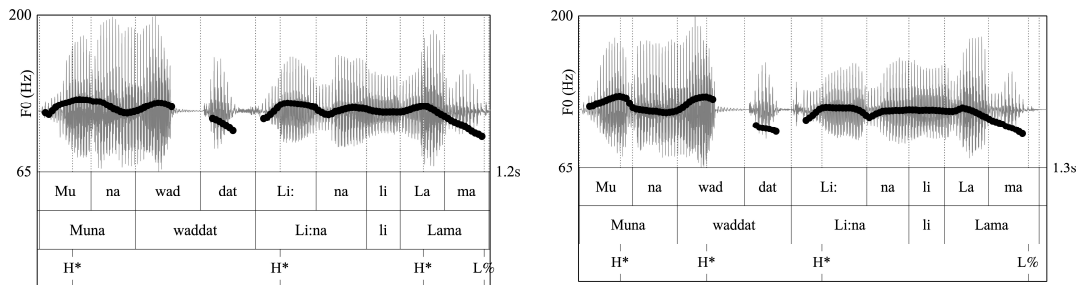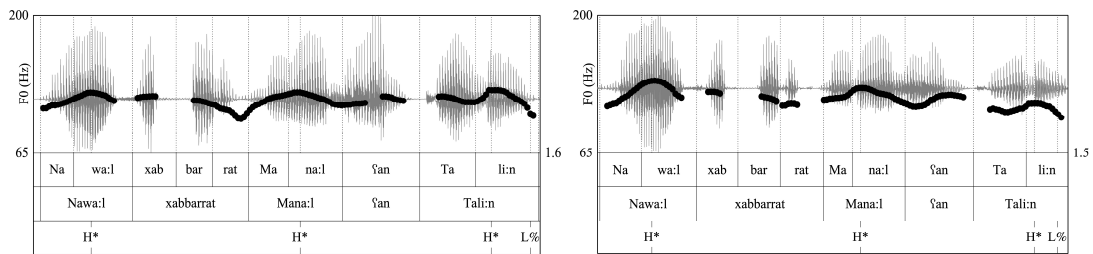
Figure 3: Sample pitch tracks of SVOO sentences with focus on the sentence-penultimate word.

(a) The sentence-final word is information-focused. (b) The sentence-final word is contrastive-focused.

(c) The sentence-penultimate word is information-focused. (d) The sentence-penultimate word is contrastive-focused.

Figure 4: Sample pitch tracks of SVOO sentences with focus on the sentence-final word.

Table 1 and Figure 5 show the summary of the quantitative analysis. Table shows the mean F0 excursion values (st.) at four different position: sentence-initial element, verb, sentence- penultimate element, and sentence-final element in three different focus constructions: broad, information and contrastive focus. Broad refers to all-new sentences, INF refers to the structures with information focus realised on the sentence-initial word, ICF refers to the structures with contrastive focus realised on the sentence-initial word, PNF refers to the structures with information focus realised on the sentence-penultimate word, PCF refers to the structures with contrastive focus realised on the sentence-penultimate word, FNF refers to the structures with information focus realised on the sentence-final word, and FCF refers to the structures with contrastive focus realised on the sentence-final word.

Table 1: Mean F0 excursion values (st.) in broad focus, sentences with information and contrastive focus on sentence-initial element, sentence-penultimate element and sentence-final element.

| Focus Region	Focus Condition	Subject	Verb	Object 1	Object 2
All Sentence	Broad Focus (N e u t r a l)	5.09	4.31	3.70	4.62
Sentence-Initial	Information Focus (INF)	6.85	4.90	3.81	4.27
	Contrastive Focus (ICF)	6.85	4.89	3.84	3.97
Sentence-Penultimate	Information Focus (PNF)	5.17	4.35	5.24	4.44
	Contrastive Focus (PCF)	5.37	4.51	5.15	4.23
Sentence-Final	Information Focus (FNF)	5.35	4.39	4.08	5.53
	Contrastive Focus (FCF)	5.36	4.69	3.86	5.67
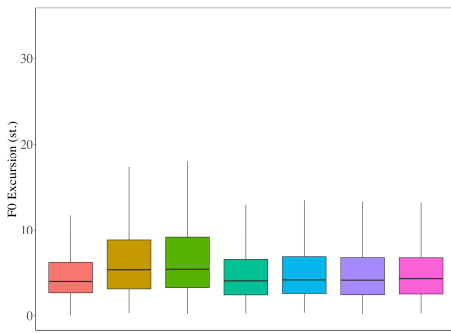
(a) F0 prominence: focus is on sentence-initial position.
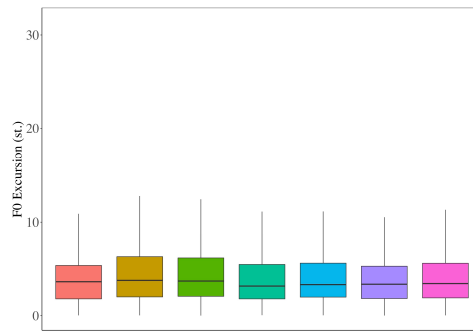
(b) F0 prominence: verb.
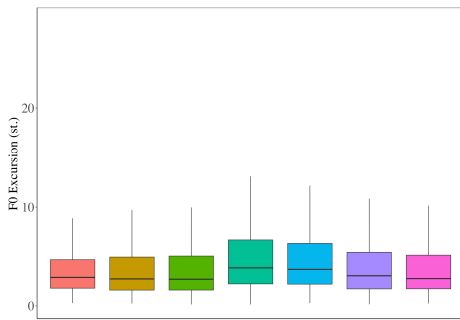
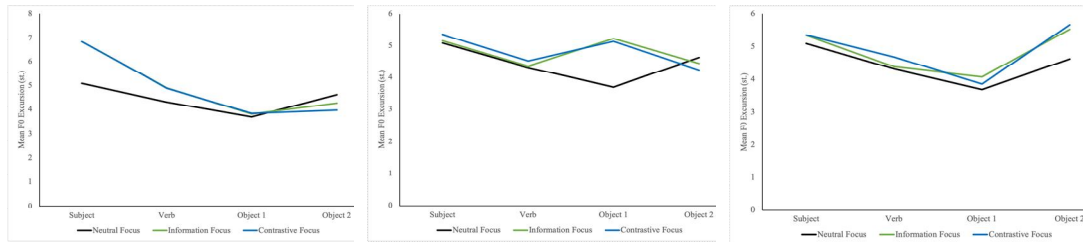(c) F0 prominence: focus is on sentence-penultimate position.
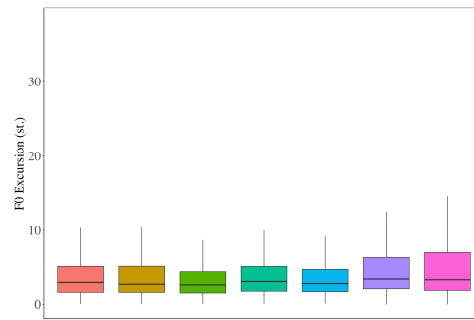
(d) F0 prominence: focus is on sentence-final position

Figure 5: Differences in F0 prominence. Neutral stands for broad focus.

From Table 1 and Figure 5, we notice the following observations. First, focused words have a larger F0 excursion in all the sentential positions. Second, the difference in F0 prominence between information focus and contrastive focus is largely similar. Third, the F0 of the discourse-given elements are not affected. That is, the F0 excursion of the subject is not affected when the focused element is sentence-penultimate (PNF and PCF) and sentence-final (FNF and FCF), as shown visibly in Figure 4a. Not only that, but also the verb in all the focus conditions has a very similar F0 excursion, as visible in Figure 4b. This indicates that the verb is not affected due to either the presence of a focus (after or before) or for being discourse-given. Finally, the F0 excursion of the sentence-penultimate and sentence-final target in

structures with sentence-initial, sentence-penultimate and sentence-final focus does not show large differences compared with their counterpart in broad-focus structures.

The data presented in Table 1 and Figure 5 may suggest that MA lacks a prosodic strategy to encode focus. However, the data still shows an interesting pattern. If we focus on the global F0 contour, there is a clear difference between the three focus conditions: broad, information and contrastive focus. Figure (6) below illustrates.

(a) sentence-initial position.   (b) sentence-penultimate position.   (c)sentence-final position.

Figure 6: Global F0 prominence contour in sentence-initial, sentence-penultimate and sentence-final focus constructions.

As shown in Figure 6, in sentence-initial focus, the global F0 contours starts higher than the global F0 contour of the broad-focus contour, and then falls to the sentence-penultimate word and then starts levelling till the end of the structure. In sentence-penultimate focus, the global F0 falls till the verb, and then rises from the verb to object 2 (i.e., the sentence- penultimate focus) and then falls to the sentence-final word. In the sentence-focus final, the global F0 contours falls to object 1 and then rises to object 2. Furthermore, all the content words display obligatory pitch accents. This indicates that the presence or absence of accents does not play a role in the distinction of focus in MA. However, in broad-focus utterances, the F0 falls from the subject to object 1 and then levels. In the narrow focus conditions, however, the F0 of the non-focused words is lower than the F0 of the focused word. This indicates that the F0 of focused word is the only prosodic pattern which signals a particular focus condition.

3.2.2 Distribution of pitch accents

The analysis of the 3528 utterances suggests two nuclear pitch accents for the tonal inventory of MA: H* and L+H*, and one boundary tone (L%) which is typical of broad declarative statements. These tones are defined in (10) above.

Starting with initial patterns, we observe that initial accents were rising in all the cases (100%), as shown in Figure 7. The rise observed in the first stressed syllable in the broad-focus utterances had a substantially expanded excursion size than the L+H* on the third accented stressed syllable as shown in Table 1 and Figure 5a. In focus constructions, the rise observed in the initial pitch accent was slightly lower than its counterpart in the broad-focus focus unless the sentence-initial word is focused. In the sentence-initial focus, the rise had an expanded excursion size than any pitch accents in the utterance. The typical examples are shown in Figure 2 above.
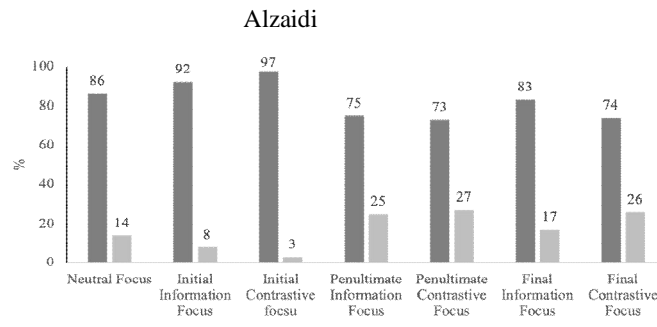
Alzaidi

Figure 7: Patterns of initial pitch accents in different focus conditions.

In verb position, the pitch accent type H* was the only pitch accent observed. Across all the speakers, the verbs had almost the same F0 pattern in which the rise starts from the onset of the stressed syllable, reaching its peak and then falls towards the following unstressed syllable. All the verbs in our production experiment are either parts of all discourse-new sentences or discourse-given by virtue of being repeated from the previous discourse. As shown in Table 1 and Figure 5b, the F0 excursion of the verb is almost the same across all focus conditions. Typical examples showing the F0 pattern observed in the verb are in Figure 1, 2, 3, and Figure 4.

In sentence-penultimate positions (Figure 8), the pitch accent type L+H* (73%) was the most common one, followed by H*. (27%). As noted before, the F0 excursion of the penultimate pitch accent was observed to be more compressed than the one observed on the initial pitch accent in the same utterance under the same focus condition, as shown in Table 1.

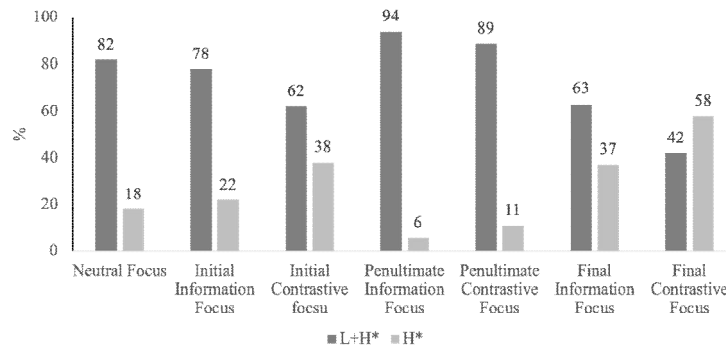**Figure 8**: Patterns of penultimate pitch accents in different focus conditions.

As for the final accented syllable within the sentence, it was observed that this accent is generally described as having the F0 peak realised on the stressed syllable of the sentence-final word. Typical examples are in Figure 1, 2, 3 and Figure 4. Table 2 summaries the results from the analysis of the pitch accent distribution.

Table 2: The percentage of the pitch accent distributions.

Focus Region	Focus Condition	Subject	Verb	Object 1	Object 2
All Sentence	Broad Focus	L+H* (86%) H* (14%)	H* (100%)	L+H* (82%) H* (18%)	H* (100%)
Initial	Information Focus	L+H* (92%) H* (8%)	H* (100%)	L+H* (78%) H* (22%)	H* (100%)
	Contrastive Focus	L+H* (97%) H* (3%)	H* (100%)	L+H* (62%) H* (38%)	H* (100%)
Penultimate	Information Focus	L+H* (75%) H* (25%)	H* (100%)	L+H* (94%) H* (6%)	H* (100%)
	Contrastive Focus	L+H* (73%) H* (27%)	H* (100%)	L+H* (89%) H* (11%)	H* (100%)
Final	Information Focus	L+H* (83%) H* (17%)	H* (100%)	L+H* (63%) H* (36%)	H* (100%)
	Contrastive Focus	L+H* (74%) H* (26%)	H* (100%)	L+H* (42%) H* (58%)	H* (100%)

4. Perception experiment: word order

This section aims to present the methodology and the results of the perception experiment. This experiment examined the acceptability of word order permutation in transitive sentences. In this section, the methodology and the results are presented.

4.1 Methods

4.1.1 Material

The experiment included the written scenarios, used in the production experiment (in Section 3). Each scenario accompanies by a question and an answer. The scenarios and the questions were designed to provide appropriate context for the sentences. The test contained three types of questions. For each of these questions, the target word is information focused in one case, and contrastive focus in another.

(11)   a. Questions of the type "What happened?" that trigger broad focus.
        b. Questions about the subject x2
        c. Questions about the direct object x2 (object 1)

All participants heard the questions with the answers with the same intonation. In order to test possible word orders, each question was repeated several times depended on the focus scope. In broad focus, there are four possible word orders: VSO, SVO, SOV and OSV. In subject/object focus constructions, there are five possible word order: VSO, SVO, SOV, OSV and S/O. The design of the stimuli is shown in Table 3. We also added 13 fillers. The filters contained scenarios accompanied with questions that were not related to the types of sentences investigated.

Table 3: The design of the perception experiment stimuli. S and O refer to subject and object respectively.

Answers	Broad question	Subject question		Object question	
		Information	Contrastive	Information	Contrastive
Answer 1	VSO	VSO	VSO	VSO	VSO
Answer 2	SVO	SVO	SVO	SVO	SVO
Answer 3	SOV	SOV	SOV	SOV	SOV
Answer 4	OSV	OSV	OSV	OSV	OSV
Answer 5		S	S	O	O

Each question type was represented by 6 sentence targets (8a).[6] We also included the one-word answers (i.e., argument-elision constructions). Therefore, 54 stimuli sentences were used in total. Examples of stimuli are given in Table 4.

Table 4: The design of the perception experiment stimuli.

Anecdote	لمى ولينا وسهى أخوات. لمى عندها بنتين نهي و منى. لما قررت إنها تحج، حبت تترك بنتها الصغيرة منى عند اختها لينا. وفي يوم الترويّة، لمى ودّت بنتها للينا.	
	'Lama, Lina and Suha are sisters. Lama has two daughters, their names are Nuha and Muna. Lama decided to perform Hajj, so she liked to leave her little daughter Muna with her sister Lina. On the day of Al-Tarwiah, Lama took Muna to Lina.'	
Broad focus	What happened?	A1: waddat Lama Muna li Lina $\quad$ VSO$_1$O$_2$
		A2: Lama waddat Muna li Lina $\quad$ SVO$_1$O$_2$
		A3: Lama, Muna waddat li Lina $\quad$ SO$_1$VO$_2$
		A4: Muna, Lama waddat li Lina $\quad$ O$_1$SVO$_2$
Information focus (on Object 1)	Who did Lama took to Lina?	A1: waddat Lama [Muna]$_{NF}$ li Lina $\quad$ VSO$_1$O$_2$
		A2: Lama waddat [Muna]$_{NF}$ li Lina $\quad$ SVO$_1$O$_2$
		A3: Lama, [Muna]$_{NF}$ waddat li Lina $\quad$ SO$_1$VO$_2$
		A4: [Muna]$_{NF}$, Lama waddat li Lina $\quad$ O$_1$SVO$_2$
		A5: [Muna]$_{NF}$. $\quad$ O$_1$
Contrastive focus (on Object 1)	Who did Lama took to Lina? Nuha?	A1: waddat Lama [Muna]$_{CF}$ li Lina $\quad$ VSO$_1$O$_2$
		A2: Lama waddat [Muna]$_{CF}$ li Lina $\quad$ SVO$_1$O$_2$
		A3: Lama, [Muna]$_{CF}$ waddat li Lina $\quad$ SO$_1$VO$_2$
		A4: [Muna]$_{CF}$, Lama waddat li Lina $\quad$ O$_1$SVO$_2$
		A5: [Muna]$_{CF}$ $\quad$ O$_1$

The participants were supposed to rate the naturalness of the response to the questions on a 5-point scale by their scores (from 1, which the least acceptable, to 5, which is completely acceptable). The scale is provided in (12).

(12) $\quad$ 1 $\qquad$ 2 $\qquad$ 3 $\qquad$ 4 $\qquad$ 5

$\quad$ Unacceptable answer $\qquad\qquad\qquad\qquad$ acceptable answer

The stimuli sentences and fillers were carefully snuffled and presented to a speaker in the form of a PowerPoint presentation.

4.1.2 Subjects

Twenty-five native participants of Makkan Arabic participated in the perception experiment. They were born and raised in Makkan. Their age ranged from 24 to 33 years old (mean age = 28).They came to Riyadh for short-term courses related to their work. They are monolingual in the sense that they don't

speak foreign languages apart from Makkan Arabic. They received formal education and all are university graduates. In their schools, they learnt MSA.

4.2 Results

In reporting the results of the perception of word order, our discussion discusses the results from the perception of word orders in in all the seven types of questions (11) separately.

In the broad-focus structures, Table 4 and Figure 9 reveal that the listeners have a strong preference to SVO (65%) and VSO (43%). Interestingly, the SVO word order scored higher than the VSO word order in the answer to the broad-focus questions. However, they do not accept OSV and SOV word orders in the answer to the broad-focus questions. Since SOV and OSV are not marked word orders in MA, these results are expected.

Table 5: The percentage of perception of word orders in broad-focus structure.

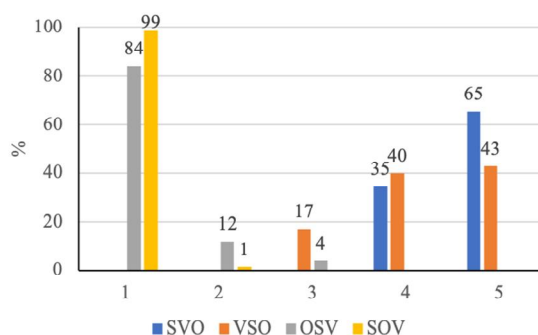| Word order	1	2	3	4	5
SVO				35	65
VSO			17	40	43
SOV	99	1			
OSV	84	12	4		

Figure 9: Perception of word orders in broad-focus structure.

In structures with sentence-initial information structure, Table 5 and Figure 10 show that the listeners have a very strong preference to SVO word order and the one-word answer (subject in which the given-information elements are deleted). As expected, the other word orders (OSV and SOV) are scored the highest for being infelicitous word orders. As for VSO, it becomes less preferred after SVO and the one-word answer (S).

Table 6: The percentage of perception of word orders in the structure with sentence-initial information focus.

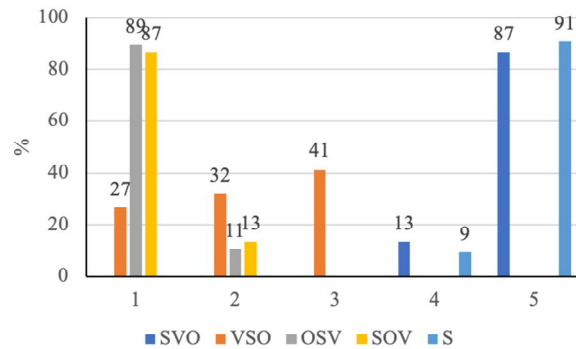| Word order	1	2	3	4	5
SVO				13	87
VSO	27	32	41		
OSV	89	11			
SOV	87	13			
S				9	91

Figure 10: Perception of word orders in the structure with sentence-initial information focus.

The results in Table 6 and Figure 11 reveal that the highest score was associated with SVO word order to encode contrastive focus placed on the subject. Interestingly, the one-word answer (S) was less preferred by most of the listeners to encode contrastive focus. That is unlike the information focus in which the one word answer is the most felicitous word order as shown in Table 5 and Figure 10. In encoding contrastive focus placed on the sentence-initial word, the lest preferred word orders selected by the listeners are VSO, OSV and SOV. There are few listeners who also selected the one-word answer (S) to be infelicitous (3%).

Table 7: The percentage of perception of word orders in the structure with sentence-initial contrastive focus.

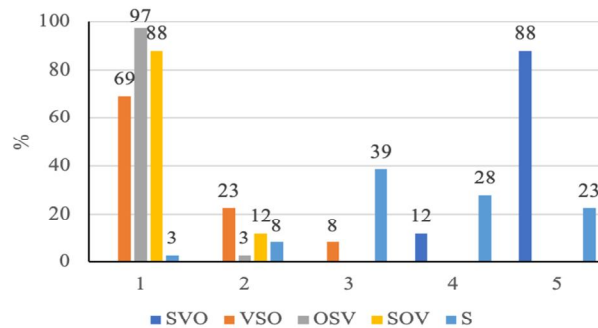| Word order	1	2	3	4	5
SVO				12	88
VSO	69	23	8		
OSV	97	3			
SOV	88	12			
S	3	8	39	28	23

Figure 11: Perception of word orders in the structure with sentence-initial contrastive focus.

In the structures with sentence-penultimate information focus, the listeners select SVO and the one-word answer (O) as the most felicitous. Few listeners recognize SVO and OSV as a possible word. However, the percentage of the responses which prefer these word orders are few (SVO = 11 of 75

responses (15%) and OSV = 2 out of 75 responses (3%)). SOV, OSV, VSO are selected to be the less preferred word order to encode information focus in sentence-penultimate position.

Table 8: The percentage of perception of word orders in the structure with sentence-penultimate information focus.

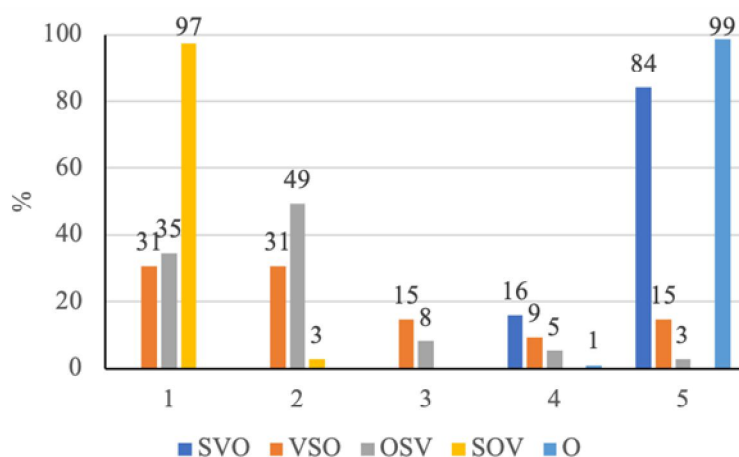| Word order	1	2	3	4	5
SVO				16	84
VSO	31	31	15	9	15
OSV	35	49	8	5	3
SOV	97	3			
O				1	99

Figure 12: Perception of word orders in the structure with sentence-penultimate information focus.

In the structure with sentence-penultimate contrastive focus, as shown in Table 8 and Figure 13, the listeners selected the OSV to be the most felicitous word order. They also selected SVO to be felicitous. However, the one-word answer (O) in which the given-information words are deleted are less preferred. This result is similar to what is observed with structures with sentence-initial contrastive focus (Table 7 and Figure 12). In encoding contrastive focus placed on the sentence-penultimate position, the listeners selected VSO and SOV to be the most infelicitous.

Table 9: The percentage of perception of word orders in the structure with sentence-penultimate contrastive focus.

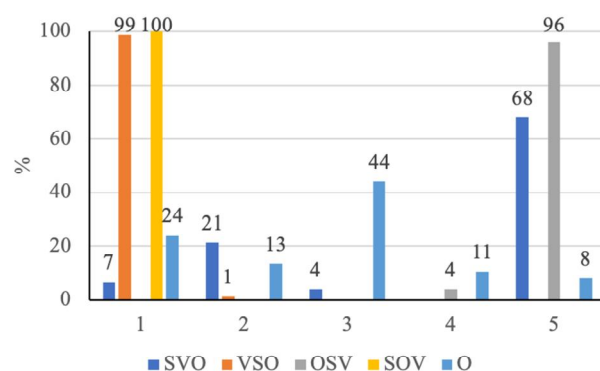| Word order	1	2	3	4	5
SVO	7	21	4		68
VSO	99	1			
OSV				4	96
SOV	100				
O	24	13	44	11	8

Figure 13: Perception of word orders in the structure with sentence-penultimate contrastive focus.

To sum up, the results from the perception experiment on word order reveal interesting findings. First, native listeners of MA preferred SVO word order to the question that evokes broad-focus condition. Second, the argument-elision construction is more preferred to answer the question that trigger information focus than the question that triggers contrastive focus. Third, in encoding contrastive focus, focus preposing constructions are more preferred than in-situ constructions in which the focused word is realised in-situ in syntax.

5. General discussion and conclusion

The detailed analysis of the data from the production experiment and the experiment on word order above aimed to find out (a) to what extent prosodic prominence marking is used, (b)which pitch accent patterns can occur in sentences with and without focus, and (c) which word order is preferred to encode broad focus, information focus and contrastive-focus.

The analysis of the production experiment reveals interesting prosodic observations. First, Makkan Arabic like Arabic dialects shows a dense pitch accent distribution in which each content word is realised with a pitch accent that its peak is realised within the lexically-stressed syllable (Chahal and Hellmuth, 2014). That is the case in the utterances with and without focus. This also shows that MA, similar to Egyptian (Hellmuth 2006, 2011 and 2013) and Hijazi Arabic (Alzaidi et al. 2019), resists deaccentuation of elements carrying given information. Second, there is no specific prosodic contour realised in the utterances with and without focus. Third, contrastive focus was not realised prosodically different from information focus in MA. That is, there is specific pitch accent shown on the words carrying focus. The prosodic distinction between information focus and contrastive focus in MA differs from what is reported for Hijazi Arabic in which the contrastive focus has a larger F0 excursion than its information-focus counterpart. This is also observed in other Arabic dialects including Egyptian, Hijazi and Lebanese Arabic. Fourth, as shown in Table 1, in broad-focus utterances, the sentences in Makkan Arabic begins with a strong accent followed by weaker ones. The universal character of the utterance-initial rise was also observed by (Varga 2008) and (Mády and Kleber 2010). Finally, the focused words are realised with a larger F0 excursion in all the sentential positions. However, the prosodic distinction between information and contrastive focus is not clear enough as shown in Table 1. This is because the F0

excursion of both foci are largely similar. Indeed, the F0 excursion of the contrastive focus occurred in sentence-penultimate position had smaller F0 excursion than its information-focus counterpart as shown in Table 1.

The analysis of the distribution of pitch accents reveals that there is no specific pitch accent associated with focus in Makkan Arabic. Information and contrastive focus can be realised with a single pitch accent H* or a bitonal pitch accent L+H*. That is similar to what has been observed in Egyptian (Hellmuth 2006) and Hijazi Arabic (Alzaidi 2014) in which focus is realised with L+H* more than H*. Contrastive focus is found to be assigned more with the bitonal pitch accent L+H* than with the single pitch accent H*. Moreover, the accent on the verb and the sentence-final word was of H*. That is, the verb and final accents show little variation. This pattern is very different from those in languages including Egyptian Arabic (Hellmuth 2006). In Egyptian Arabic, Hellmuth (2006) observed that the verb and the sentence-final word were associated with L+H*. One possible explanation of the differences between MA and Egyptian Arabic in this respect is that verbs are widely known to be prosodically weak and hence it is not possible to be realised with this bitonal pitch accent at least in MA. As for the sentence-final word, it seems that the sentence-final word is more affected prosodically by the final lowering, or it might be due to the differences in the test materials used in the production experiments in both studies.

The perception experiment on word order aimed to find which felicitous word order encodes broad, information and contrastive focus in MA. In the perception experiment, the listeners distinguished between expected felicitous and expected infelicitous word orders in each type of the discourse structures. The analysis of the results from this experiment reveals five findings. First, the most preferred word order for broad focus is SVO. However, there are a larger number of listeners who preferred the VSO word order. The preference of SVO word order for broad-focus may suggest that this is the default word order in this modern Arabic dialect (cf. Mohammad 2000, Bani Younes, 2020). Several studies suggest that the basic word order in most modern Arabic dialects is SVO (see Mohammad 2000 and Bani Younes 2020). Second, in structures with narrow information focus, the elision of the given-information elements is most preferred to the full complete structure. That is reflected in the results in which the participants find the one-word answer is the most felicitous word order to encode information focus placed either on sentence-initial or sentence-penultimate word. Third, in encoding contrastive focus the listeners preferred full structures in which all the arguments of the verb included those which are given-information to be spelt out. That is in contrary with the structures with information focus. This suggests that contrastivity might be best encoded perceptually when the structure is syntactically full (i.e., all the arguments of the predicate including the predicate itself are spelt-out). Fourth, the results from the perception experiment showed that left-dislocation structures are preferred when the contrastive-focused word is non-initial. This suggest that contrastivity is encoded in syntax more than the information focus. This is because in the structures with information focus, the left-dislocation structures are infelicitous. Finally, the SVO word was found to be felicitous in the structures with information and contrastive focus placed in non-initial position. This raises an interesting question of where contrastivity if encoded is triggered in MA. The instrumental study by (Alzaidi 2022) as reviewed so far found that contrastivity is not encoded

prosodically. The present study also found that the SVO word order is felicitous in the structures with contrastive focus placed in non-initial position. One possible answer to how contrastivity is triggered is context. So, in SVO word order, the contrastivity is triggered by pragmatics rather than prosody or syntax. This is a suggestion that is in need of future research.

The present study contributed new data to the literature on the encoding of focus phonologically and in word order in MA, an under-researched Arabic dialect. The results of both experiments contributed to enhance our understanding of how focus is realised both in phonology and syntax in this dialect. One of the future research is to see whether and how MA intonation is computationally modelled, taken into account that focus is not prosodically marked in this dialect (see Alzaidi, et al. 2023). Another possible future research is on the semantic/pragmatic triggering for focus in Arabic dialects.

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التنغيم، أم التركيب النحوي، أم كلاهما؟

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الملخص

تناولت هذه الدراسة أثر البؤرة على التركيب التنغيمي للجملة الخبريَّة في لهجة أهل مكة وأثرها على ترتيب الكلمات في الجملة. والهدف العام لهذه الدراسة هو الحصول على إجابات لهذه الأسئلة البحثية: ١- هل هناك أثر تنغيمي بوجود كلمة تحمل بؤرة الجملة الدلاليَّة ٢- وما إذا كانت هذه البؤرة الدلاليَّة لها شكل تنغيمي محدد تجعل هذه الكلمة مميزة صوتيَّاً عن مثيلاتها في السياقات التي لا يوجد بها كلمة تحمل معنى دلالياً مهماً مقارنة بنظرياتها في الجملة نفسها، و٣- هل هناك تركيب نحوي يُستخدم ويُفضل لدى متحدثي اللهجة الأصلين للدلالة على كلمة تحمل البورة الدلاليَّة المهمة في الجملة الخبريَّة، وتوصلت نتائج هذه الدراسة إلى أن المعنى له أثر في التركيب التنغيمي للجملة ولكن قد يبدو هذا الأثر غير واضح صوتياً، ووجدت الدراسة أيضاً أن هناك تركيباً نحوياً مفضلاً للجمل الخبريَّة التي تحمل كلمة ذات دلالة مهمة في الجملة.

الكلمات المفتاحية: مكة، البؤرة، النبرة، الكلمة، الترتيب، دلائل النبرة، الاستماع، الإنتاج.

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Endnotes

[1] Xu (2011) uses the term 'post-focus compression' to indicate deaccentuation of post-focus words.

[2] For more information about the placement of nuclear pitch accents in Arabic dialects, please see El Zarka (2013).

[3] There are very few studies on the perception of focus. Future research is needed to test the hypothesis that post-focus compression in *F0* and/or intensity or deaccentuation of post-focus words help listeners to identify the focus location (see Xu, 2011).

[4] For more information about how focus is realised in other Arabic dialects including Modern Standard Arabic, Egyptian, Hijazi, and Lebanese Arabic, please see (Moutaouakil 1989, Aoun et al. 2010, Hellmuth 2010 and Alzaidi et al. 2019) and the references therein.

[5] All the scenarios were deigned in the same. The only changes in the scenarios are the proper nouns used to create different sentences using the same sentence frame (i.e. X waddat Y from Z, X xabbarat Y about Z).

[6] We used only one sentence group (Group A) in (8a). In addition, we did not take the focus contexts in which the sentence-final word is the target key word. We only focus on the data in which the sentence-initial and sentence-penultimate word are the target words. This is to make sure that the perception experiment did not last for more than one-hour session. The average time for the perception experiment was about 38 minutes. All the stimuli used in the perception experiment were produced by the female native speaker of Makkan Arabic (age =31 years old).

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