

Word Order and Intonation in Georgian¹

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Abstract

Georgian is already known for its word order flexibility: All permutations of constituent order are possible and the choice among them is primarily determined by information structure. In this paper, we show that word order is not the only means to encode information structure in this language, but it is used in combination with sentential prosody. After a preliminary description of the use of p-phrasing and boundary tones for this purpose, we address the question of the interrelation between these two strategies. Based on experimental evidence, we investigate the interaction of focus with word order and prosody and we conclude that prosody has a much stronger effect than word order. Word order is indeed determined by pragmatic preferences, but does not constitute an unambiguous cue for the interpretation of information structure.

1. Introduction

Georgian is well-known for its extreme word order freedom, but less so for a comparable richness in tonal structures. The present paper investigates the relation between word order and intonation, and pre-

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sents the results of production and perception experiments, in which both components were varied.

In the next section, the syntactic and intonational issues are introduced. The syntactic issues are based on the abundant literature on Georgian morphosyntax. Two syntactic properties have often been discussed in the literature that are summed up below: free word order and the complex relationship between case marking and grammatical roles. Only the first one relates to intonation in a direct way (see section 2.1). The detailed discussions of syntactic issues contrast sharply with the paucity of studies on prosody. Indeed, we could not rely on any existing literature, as very little has been published about this subject. The only study available is a short paper on boundary tones in questions by Bush (1999). The survey of the intonational properties of Georgian found in this paper is based entirely on our own research, and has to be considered as preliminary (see section 2.2). Section 3 of this paper presents an experimental study which addresses the issue of the interrelation of prosody and word order for the encoding of information structure. Section 4 discusses the results and section 5 concludes. The result of our investigation reveals a rich intonation which a relatively simple analysis.

2. Background

2.1. Morphosyntactic issues

Georgian is characterized as a ‘free word order’ language: clausal constituents can appear in any order (see for instance Aronson 1982, Harris 1981, 1985, Hewitt 1995, Apridonidze 1986, and Tuite 1998). Subjects are canonically clause-initial, but there is some debate as to the question whether the canonical ordering of objects and verbs is OV or VO. Corpus studies on this question have been inconclusive. On the basis of a small scale corpus, Vogt (1971:222) finds different word order preferences in different styles. In conservative styles (exemplified in the corpus study through literary texts) SOV occurs in 75% of the examples, and SVO only in 16%. In fairy tales, that are representative of the ‘colloquial style’ in this study, the object is attested with the same frequency preceding or following the verb. Apridonidze (1986:136-143) examines word order in Modern Geor-

gian written texts; the frequencies reported in this corpus study allow for two conclusions: (a) verb initial orders only very rarely occur in sentences with more than two constituents; and (b) the frequency of verb final orders proportionally decreases depending on the sentence length. Furthermore, Tuite (1986) claims that there is a general preference for indirect objects (henceforth O_2) to precede the verb and for direct objects (henceforth, O_1) to follow the verb. But contrary to these treatments, Harris (1993) considers the orders SO_2O_1V and SO_1VO_2 to be equally preferred. According to Tuite (1998:41), the discourse function of postverbal constituents could play a determining role.

Further evidence supporting the view that Georgian is a V final language comes from idioms. Examples (1) and (2) show that idiomatic expressions only allow for the OV order. Our informants only judged the OV versions (a) and (b) as acceptable. The SVO (c) as well as the OSV (d) versions have been judged as non-acceptable. Based on the assumption that non-compositional VPs do not allow for information structural manipulations of their constituents, these facts imply a verb-final word order in neutral discourse conditions.

- (1) (a) p'it'er-i pex-eb-s tj'im-av-s.
 Peter-NOM leg-PL-DAT stretch-HAB-PRS.3.SG
 'Peter dies (lit. stretches the legs).'
- (b) pex-eb-s tj'im-av-s p'it'er-ma.
 (c) *p'it'er-i tj'im-av-s pex-eb-s.
 (d) *pex-eb-s p'it'er-i tj'im-av-s.
- (2) (a) meri-m ena moipxan-a.
 Mary-ERG tongue(NOM) scratch-AOR.3.SG
 'Mary spoke too much (lit. scratched the tongue).'
- (b) ena moipxan-a meri-m.
 (c) *meri-m moipxan-a ena.
 (d) *ena meri-m moipxan-a.

Concerning the interaction between information structure and word order, it has been observed that focused constituents are placed left adjacent to the verb in Georgian. In particular, McGinnis 1997 (citing Nash 1995) argues that objects bear new information focus in the SOV order and subjects contrastive focus in the OSV order. The observations about the preverbal focus position go hand in hand with the constraints on the placement of interrogative pronouns. As exem-

plified in the following examples, interrogative pronouns are realized in the immediately preverbal position (see Harris 1981:14; 1993:1385). We should note that (3c) and (3d) are possible questions when “the place to which Nino went is mentioned in a previous sentence and the listener does not understand this information properly”, i.e. they are acceptable as *echo* questions.

- (3) (a) nino sad ts’avid-a?
 Nino(NOM) where go-AOR:SBJ.3.SG
 ‘Where did Nino go?’
 (b) sad ts’avida nino?
 (c) *nino ts’avida sad?
 (d) *ts’avida nino sad?

In order to gain some insights about Georgian word order in speech production, Skopeteas & Asatiani conducted an experiment, using two types of questions related to situations presented through visual stimuli. The results delivered the following pattern: Questions asking explicitly for a narrow focus on the subject were answered with sentences with a subject in the immediately preverbal position, either OSV (20%), or SVO (55%); the remaining answers with two overtly realized arguments had the word order SOV (15%).² Questions inducing a narrow focus on the object were predominantly answered with the SOV order (66%), the less frequent orders being SVO (20%) and QVS (12%).³ Following generalizations can be drawn from these results:

- (a) Narrow focus is preferably (but not obligatorily) in the immediate preverbal position.
 (b) Especially in sentences with a narrow focus on the object, there is a position preceding the focus position. The results suggest that there is a *preference* to place topics in this position. This claim explains the small number of SOV sentences in subject-focus and the total absence of OSV in object-focus answers.
 (c) Postverbal position is free as far as information structural role is concerned.

² Verb initial orders (VSO and VOS) did not occur at all either because they are only triggered by discourse conditions which were not included in this experiment, e.g., presentational constructions, or because they are generally dispreferred in sentences with more than two constituents (Apridonidze 1986).

³ The remaining answers were elliptical: 10% of the answers to subject questions and 2% of the answers to object questions.

One of the most intensively discussed issues in the literature on Georgian syntax is the phenomenon of inversion which ‘inverts’ grammatical roles and their cases. Depending on the conjugation class and the tense-aspect-mood properties of the verb, agents may be marked through the nominative, the dative, or the ergative case affix. Case marking does not interact with information structure, hence it will not be accounted for in this study (the interested reader to the relevant literature: Harris 1981, 1985, Merlan 1982, Boeder 2005, Blevins 2005, Tschenkéli 1958, and Vogt 1971, 1974).

2.2. Intonational issues

Bush (1999) is the only study of Georgian intonation in the framework of generative grammar that we are aware of. He provides an insightful analysis of the boundary tones in questions, which he analyses as a complex $L_P H_P$, where L stands for low tone and H for high tone, and a subscripted P for boundary of a prosodic phrase. This complex boundary tone can be followed by an additional L_I or H_I , thus an additional boundary tone for an intonation phrase. One of his examples is reproduced in (4).

- (4) H_I $L_P H_P L_I$
 [[Rusulat 'laparakob]_P]_I
 Russian 2.SG:speak
 ‘Do you speak Russian?’

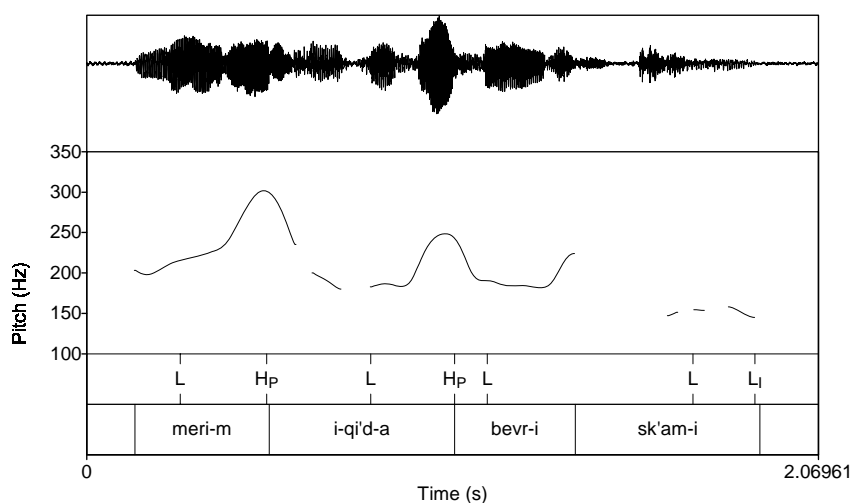
As will become clear below, his analysis of the complex contour found at the end of questions as boundary tones is in line with our own results, as we assume that most of the tonal excursions are to be analyzed as boundary tones.

The first pitch track from our own data (Féry & Fanselow 2006) illustrates the very clear phrasing structure. The sentence (5) shows a canonical word order and consists in as many phrases as there are content words, which implies that, in this sentence, also the verb is phrased individually. This is slightly unusual for Georgian, and we will see below that the verb has a tendency to be integrated into the phrase of a preceding or a following argument. Every non-final word in (5) starts with a low level, transcribed with a low tone L, but is terminated by a rising contour, which we interpret as a H_P , thus the boundary tone of a prosodic phrase (p-phrase). In (6), the whole expression is uttered in a single intonation phrase (i-phrase), and every p-phrase is downstepped relatively to the preceding one, which

means that the high part of a p-phrase is slightly lower than the high part of the preceding p-phrase. As can be seen from (6), the rise starts relatively late in the last syllable of every p-phrase. The last p-phrase contains a low part, terminated by an L_I as it is the last tone of the i-phrase. Usually, such a sentence ends with a low tone.

- (5) L H_P L H_P L H_P L L_I
 [[meri-m]_P [i-qi'd-a]_P [bevr-i]_P [sk'am-i]_P_I
 meri-ERG SV-buy-AOR.3.SG many-NOM chair-NOM
 'Mary bought many chairs.'

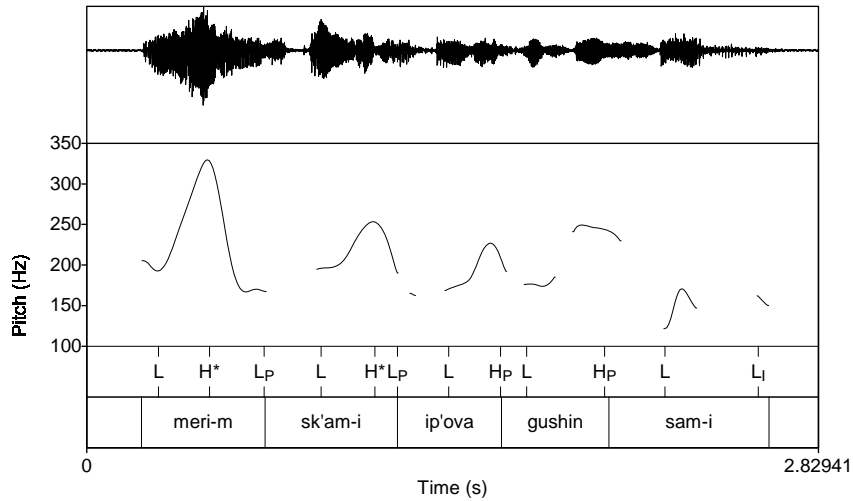
Figure 1. Sentence with unmarked word order



The next example, in (6), illustrates a sentence with marked word order, as it contains a discontinuous nominal phrase. The nominal head is in the preverbal position and is focused, and the dependent numeral is sentence-final. The phrasing is even clearer than in (5). The first two p-phrases have a low phrase boundary L_P , but a preceding rise. We choose to analyze this pattern as a prominent phrase, containing a high pitch accent, written as H^* on the first syllable, which carries the lexical accent of the word. This pattern is used here first for topicalization (*Merim*), and second for focus (*sk'ami*). The last phrase is analyzed as ending with a low tone and a low boundary tone. There is a sudden and steep fall from the end of *gushin* 'yesterday' to *sami* 'three'. Already on the first syllable of *sami*, the voice is low. But since the last three words are not especially prominent, they do not carry a pitch accent.

- (6) LH* L_P LH* L_P L H_P L H_P L L_I
 [[Meri-m]_P [sk'am-i]_P [ip'ova]_P [gushin]_P [sam-i]_P]_I
 Mary-ERG chair-NOM OV-find-AOR.3.SGyesterday three-NOM
 'Mary found three chairs yesterday.'

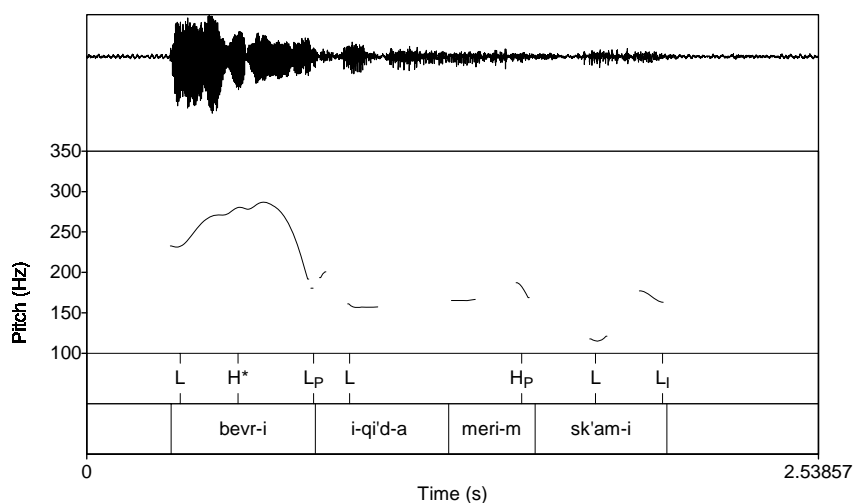
Figure 2. Sentence with marked word order



As can be seen from the next example in (7), an early focus on *bevri* 'many' does not erase all following boundary tones, but it renders them less prominent. Georgian has no obligatory deaccenting, though it shows compression of the register in this postfocal region (see Ishihara 2004 for the same phenomenon in Japanese) and it is not exceptional to find a full intonational pattern in a postnuclear stretch of discourse. In (7) the verb is integrated into the p-phrase of the subject. This can also be understood as a correlate of focus: it is a reduction of the number of phrases in the postfocal position.

- (7) LH* L_P L H_P L L_I
 [bevri]_P [i-qi'd-a meri-m]_P [sk'am-i]_P]_I
 many-NOM SV-buy-AOR.3.SG meri-ERG chair-NOM
 'Mary bought many chairs.'

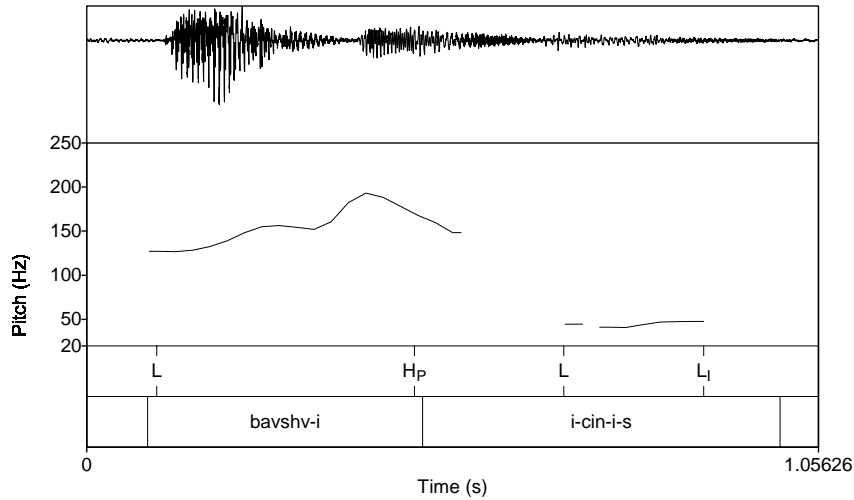
Figure 3. Sentence with a focused constituent



The next pair of examples illustrates an interesting difference between the realization of a word as part of a wide focus or as a narrow focus. The wide focus realization is shown in (8). There is a high tone on the second syllable of *bavshv́i* ‘child’. In the light of what has been said before, it is reasonable to interpret the word-final high tone as a boundary tone. The subject is separated from the verb as it forms a separate phrase. The falling pattern on the verb is interpreted as an interpolation from a downstepped high tone on the first syllables of *icinís* ‘is laughing’ to the low tones of this word.

- (8) {What happens?}
- | | | | |
|-------------------------|----------------|---------------------------------------|----------------|
| L | H _p | L | L _I |
| [bavshv-i] _p | | [i-cin-i-s] _p _I | |
| child-NOM | | SV-laugh-HAB-PRS.SBJ.3.SG | |
- ‘The child is laughing.’

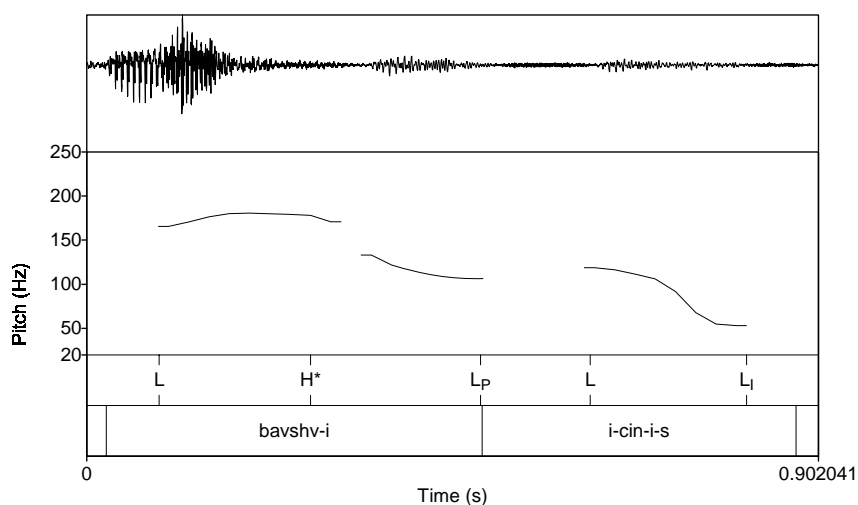
Figure 4. Wide focus realization



When the subject is contrastively focused, as in (9), there is a rise and a fall on this word, which already starts on the first syllable, which we analyze as a pitch accent LH* followed by a low boundary tone. There is a second boundary tone at the end of the i-phrase causing a second fall on the verb. In this case, as well, there are two p-phrases, but the tonal structure is different.

- (9) {Who is laughing?}
 LH* L_P L L_I
 [bavshv-i]_P [i-cin-i-s]_P_I
 child-NOM SV-laugh-HAB-PRS.SBJ.3.SG
 ‘The child is laughing.’

Figure 5. Narrow focus realization



The contrastive accent has a striking effect: in (9) the word *bavshvi* has a peak located on the first syllable, whereas in the rising contour in (8), the peak is late in the second syllable. The phonological structure is different: We postulate a high pitch accent only in case of a narrow focus; otherwise the peaks in the tonal structure are created by boundary tones. The last p-phrase has a low pattern, that we analyzed as the sequence of two low tones, the last one being a boundary tone.

This closes the overview of some of the characteristics of Georgian intonation, but it must be emphasized that further studies are in need in order to understand it more completely.

3. Experimental Study

The aim of the experimental study described in this section is to gain insights about the interaction between intonation and word order in the encoding of information structure in a language with great freedom in both respects. The method involves manipulations of these two factors and the elicitation of acceptability judgments on context-target sentence pairs by naïve listeners.

The experiment consists in two parts. First, a production part, as our material was spoken by a untrained speaker, and second a ac-

ceptability judgment experiment in which 60 native speakers of Georgian participated.

3.1. Production experiment: Recordings and material

The sentences used in the production experiment were spoken by a native speaker of Georgian, a woman in her twenties, with a master in linguistics. The recordings were performed by the second author in Tbilisi, in September 2005 on a DAT recorder (SONY 100). The informant was allowed to correct herself as often as she wanted. She was aware of the goal of the experiment, and instructed to speak as naturally as possible. The recording took place in two sessions, in approximately three hours. Later on, some informal naturalness checks of her realizations were made with other Georgian speakers, one of those being the third author. All listeners confirmed that our speaker was very natural. The questions used for the question-answer pairs in the perception experiment were spoken by another Georgian speaker, also a woman in her twenties, also with background in linguistics. The circumstances of this part of the recordings were similar to those just depicted, but her task was much easier. She, too, was generally judged of being natural.

As for the material, four different sentences were used, which are shown in (10). These sentences have been used in two different tenses (present and perfect) which license two different case markings on the arguments: agent=nominative, patient=dative, and recipient=dative in the present, and agent=dative, patient=nominative, and recipient=postpositional in the perfect. No significant interaction between information structure and case marking occurred in the results, hence we will not account in detail for this difference in the current paper.

- (10) (a) item 1
 dato nino-s ts'ign-s ts'a-a-kitx-eb-s.
 Dato(NOM) Nino-DAT book-DAT PV-IO.3.NV-read-CAUS-3.SG
 'Dato causes Nino to read a book.'
- (b) item 2
 deda gogo-s ts'eril-s da-a-ts'er-in-eb-s.
 mother(NOM) girl-DAT letter-DAT PV-IO.3.NV-write-CAUS-HAB-3.SG
 'The mother causes the daughter to write a letter.'
- (c) item 3

kali k'ac-eb-s muxa-s mo-a-tʃ'rev-in-eb-s.
 woman(NOM) man-PL-DAT oak-DAT PV-IO.3.NV-cut-CAUS-HAB-
 3.SG

'The woman causes the men to cut the oak.'

- (d) item 4
 bavʃv-i k'ata-s tagv-s da-a-tʃ'er-in-eb-s.
 child-NOM cat-DAT mouse-DAT PV-IO.3.NV-catch-CAUS-HAB-3.SG
 'The child causes the cat to catch the mouse.'

All four sentences were produced in four different word orders, as shown in (11) for sentence (10a). SO_2O_1V (Word Order 1) is an unmarked word order with initial subject and final verb (11a). The direct object is in the preverbal position. VSO_1O_2 (WO4) is a highly marked order because it exhibits three postverbal arguments (11d). O_2O_1SV (WO2), and O_1SVO_2 (WO3) are intermediate orders in terms of markedness (11b-c). Both orders violate the preference for subjects to precede objects, and additionally the latter order violates the preference for indirect objects to precede the verb.

- (11) (a) SO_2O_1V (WO1)
 dato nino-s ts'ign-s ts'a-a-kitx-eb-s.
 Dato(NOM) Nino-DAT book-DAT PV-IO.3.NV-read-CAUS-3.SG
 'Dato causes Nino to read a book.'
- (b) O_2O_1SV (WO2)
 nino-s ts'ign-s dato ts'a-a-kitx-eb-s.
- (c) O_1SVO_2 (WO3)
 ts'ign-s dato ts'a-a-kitx-eb-s nino-s.
- (d) VSO_1O_2 (WO4)
 ts'a-a-kitx-eb-s dato ts'ign-s nino-s.

Finally, all four orders were combined with different information structural patterns, and this for the four sentences. The answer types that are investigated appear in (12), along with an example of question. (12a) asks for an all-new sentence. The answer to such a question is usually considered as unmarked, both from the point of view of syntax and of intonation. (12b-d) ask for a narrow focus on a particular constituent: subject, direct object and indirect object. (12e) asks for a double focus.

- (12) (a) All-new pattern (wide focus)
 'What happens?'
- (b) Subject focus
 'Who does cause Nino to read a book?'

- (c) Direct object focus
‘What does Dato cause Nino to read?’
- (d) Indirect object focus
‘Whom does Dato cause to read a book?’
- (e) Double focus (subject and direct object)
‘Who does cause Nino to read what?’

Since Georgian is an intonation language using tonal patterns for expressing information structure, the contexts provided elicited different intonation patterns.

3.2. Perception experiment: material and method

Material

In the perception experiment, listeners were asked to judge the well-formedness of question-answer pairs. Some of them were congruent and some were non-congruent. We call ‘congruent’ a prosodic realization which was intended to answer the context question with which it was presented, and ‘non-congruent’ all other pairs. This is shown in (13) with an example for each case.

- (13) (a) Question
‘Who does cause Nino to read a book?’
- (b) Congruent answer (WO3)
ts’ign-s DATO ts’a-a-kitx-eb-s nino-s.
book-DAT Dato(NOM) PV-IO.3.NV-read-CAUS-3.SG Nino-DAT
‘It is Dato, who causes Nino to read a book.’
- (c) Non-congruent answer (WO3)
TS’IGN-S dato ts’a-a-kitx-eb-s nino-s.
book-DAT Dato(NOM) PV-IO.3.NV-read-CAUS-3.SG Nino-DAT
‘It is a book, that Dato causes Nino to read.’

In order to keep the material to be judged in comfortable limits, the material used in the perception experiment included for every context and every word order, the congruent prosody and only one non-congruent prosody. Which non-congruent answer was used in each case is shown in table 1. For instance, in the all-new context, and in Word Order 1, the non-congruent answer was the one with a narrow focus on the indirect object in the leftmost top cell of table 1 (narrow focused constituents are underlined in this table).

Table 1. Focused constituents in prosodically non-congruent answers

	WO1	WO2	WO3	WO4
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all new question	<u>S</u> O ₂ O ₁ V	O ₂ O ₁ <u>S</u> V	O ₁ SVO ₂	VSO ₁ <u>O</u> ₂
subject question	<u>S</u> O ₂ O ₁ V	O ₂ O ₁ <u>S</u> V	O ₁ SVO ₂	VSO ₁ <u>O</u> ₂
direct object question	<u>S</u> O ₂ O ₁ V	O ₂ O ₁ <u>S</u> V	O ₁ <u>S</u> VO ₂	VSO ₁ <u>O</u> ₂
indirect object question	SO ₂ <u>O</u> ₁ V	O ₂ O ₁ <u>S</u> V	O ₁ SVO ₂	VSO ₁ <u>O</u> ₂
multiple constituent question	SO ₂ O ₁ V	O ₂ O ₁ <u>S</u> V	O ₁ SVO ₂	VSO ₁ <u>O</u> ₂

Our experimental study included four factors: the focus of the question (5 levels; see (12)), the word order of the answer (4 levels; see (11)), and the prosodic realization of the answer (2 levels; see (13)). Crossing the levels in all combinations gave a design of $5 \times 4 \times 2 = 40$ conditions. The forty conditions have been recorded with four different sentences (see (10)) in two different aspects, giving a total of 320 question/answer pairs.

Method

Question-answer pairs were presented auditorily to listeners who gave judgments on a scale from 1 to 5 about their appropriateness: 1 was the best and 5 the worst (see Cowart 1997 for this method, as well as Keller & Alexopoulou 2001 for experiments on Greek, and Féry & Stoel 2006 for some results on German perception of similar pairs in German). Sixty (male and female) native speakers of Georgian, all students at the University of Tbilisi, participated to the experiment, which was conducted in parallel with a further experiment, not reported in this paper, by the first and third authors and two Georgian student assistants. The experiment took place at the University of Tbilisi and was performed in two days. The informants were paid for their participation.

The 320 pairs were divided into 4 subsets, and each informant was asked to rate only one. Every person thus had to give a rating for 80 question/answer pairs, which contained each experimental condition twice. The subsets of sentences were rated by 15 persons each. The context-answer pairs had been implemented in a DMDX presentation and were automatically randomized for each subject. The duration of the entire experimental session betrayed approximately 20 minutes. Subjects went first through a training session containing five question-answer pairs, and when they felt confident with the task, they went on with the actual experiment. They had been instructed to listen carefully to the question-answer pairs and to attribute a high score if the answer sounded natural and made sense as an answer to the preceding question. The written instructions made clear that the

ratings should not reflect their intuitions about “correct” Georgian, but rather the speaker had to consider whether they thought that the question-answer pair could occur in a natural conversation.

3.3. Hypotheses

The main hypothesis, which has driven the study reported here, is the question of the relationship between word order and intonation. We hypothesize that in an intonation language, word order freedom correlates with a rich prosodic structure. If this hypothesis is correct, congruent prosody is very important to identify the correct information structure, and furthermore, some prosodic patterns should be felt as more strongly deviant than others. An unmarked intonation should be acceptable in more contexts than a marked one. Similar studies in English and German (Gussenhoven 1983, Alter et al. 2001, Féry & Stoel 2006) have firmly established that a prenuclear accent is readily accepted, whereas a postnuclear one provokes strong negative reactions.

Because of the lack of background knowledge about Georgian intonation, we formulate our first hypothesis, about the role of prosody, in a fairly general way. We expect that prosodically prominent constituents will be interpreted as focused. This generalization will be captured by the STRESS-FOCUS constraint (see Féry & Samek-Lodovici 2004), which is given in (14).

(14) Hypothesis I: STRESS-FOCUS

A focused phrase has the highest prosodic prominence in its focus domain.

Based on the discussion of the literature on word order in section 2.1, as well as the intuitions of the third author and the experience of the other authors, we assume that word orders are organized hierarchically on the scale, as in (15). The putatively best order WO1 (SO₂O₁V) is unmarked. The second best order should be WO2 (O₂O₁SV), which displays only one deviation from the unmarked order (S is preverbal instead of being initial). We expect the third preferred order to be WO3 (O₁SVO₂), which additionally displays a deviation from the general preferences for the indirect order to be realized preverbally and the direct order to be realized postverbally. WO4 (VSO₁O₂) order is assumed to be more marked than the others, since we know from the Apridonidze’s (1986) corpus data that V-

initial orders only very rarely occur in sentences with more than two constituents.⁴

(15) Hypothesis II: Word order markedness scale

$SO_2O_1V > O_2O_1SV > O_1SVO_2 > VSO_1O_2$

In order to derive predictions in terms of constraint interaction we transform the scalar relation between the four word orders into four levels of violation of a general constraint against movement, namely STAY (Grimsaw 1997). The canonical SO_2O_1V order does not contain any violation, while the further orders are assigned violations incrementally according to their position in the scale in (15): $O_2O_1SV = 1$ violation, $O_1SVO_2 = 2$ violations, $VSO_1O_2 = 3$ violations.

The third hypothesis relates to the preferred positions for particular discourse functions. In Section 2.1, a number of observations concerning the discourse functions of word order were made. In particular, we have seen that there is a preference for the placement of the focus constituent at the left side of the verb and adjacent to it. Furthermore, we have seen that constituents may be focused when they are in a right peripheral position. These preferences are captured in the constraint ALIGNFOCUS (Keller & Alexopoulou 2001) which is given in (17):

(16) Hypothesis III: ALIGNFOCUS

The focused constituent must be placed in a position which is preferred for focused constituents in Georgian (either left adjacent to the verb or right peripheral).

Since Georgian is a ‘free word order’ language (see section 2.1) we assume that violations of the canonical word order will be licensed by information structural manipulations such as focus. Thus, we expect that the constraint that ensures that focused constituents are placed in the preferred position will outrank the constraint that

⁴ It may also be noticed that we did not expect an interference of the word order of the question to the acceptability scorings. The order of the questions used in the experiment always do not coincide with any of the word orders of the answers, as shown in following:

- | | | |
|-----|---------------------------------|------------|
| (a) | All-New Question: | SV |
| (b) | Subject Focus Question: | SVO_2O_1 |
| (c) | Direct Object Focus Question: | O_1VSO_2 |
| (d) | Indirect Object Focus Question: | O_2VSO_1 |
| (e) | Multiple Constituent Question: | SVO_2O_1 |

bans deviations from the canonical word order. Second, since we know that the position of focused constituents is a matter of preference (not obligatorily), we assume that the appropriate intonation will license the acceptability of suboptimal word orders. In this sense, the expected constraint ranking is the following:

(17) Hypothesis IV:

STRESSFOCUS >> ALIGNFOCUS >> STAY

Finally, as stated at the beginning of this section, we expect that in case of prosodically non-congruent sentences there will be an influence from the position of the accent. Postnuclear accents are expected to have a stronger impact on the acceptability judgments. The effects of the early and late accents do not conflict with STRESS-FOCUS (since they only apply in non-congruent answers), hence it is not possible to determine the constraint interaction in the current experimental setting. However, this hypothesis will be proven useful in order to interpret the gained results in non-congruent prosodic realizations.

4. Results

4.1. Results of the production experiment

This section provides an overview of the tonal patterns produced by our speaker. She only produces congruent sentences, since she was instructed to produce as naturally as possible answers to given questions. We concentrate on the first sentence, as the speaker was very consistent in her productions of the four sentences, and we only establish comparisons with other sentences when necessary.

First, let us examine the sentences in (18), which were uttered as answers to the question asking for an all-new sentence. The speaker produced all word order variants as answers to all questions listed in (12). Pitch tracks are provided to allow the reader to understand/follow our claims.

A special feature of Georgian intonation that we already mentioned in section 2.2 is the clear phrasing, indicated in (18) for each realization. A constituent is often phrased individually and realized with the tonal excursions typical for a p-phrase, to the exception of the verb. In our data, the verb is always included in the same p-

phrase as an adjacent argument. It is generally the preceding argument, which is the direct object in (18a) and the subject in (18b and c). In (18d), however, since the verb is sentence-initial, there is no preceding argument. In this case, the verb is included into the phrase of the following argument, again the subject.

As for the tonal contour, non-final phrases have two possible contours: a rise, analyzed as L H_P or a rise followed by a fall, analyzed as LH*L_P (see section 2.2). In the all-new sentences, we found the latter contour only once, namely on the Dative constituent *Nino* in WO3 (18c), which is very probably interpreted as a topic, due to the marked word order.

The p-phrase containing the verb may start with a high tone followed by an immediate fall. The boundary tone ending it is low if it is the last p-phrase in the sentences, as in (18a) and (18c), or high if it is not the final one, as in (18b) and (18d). Every intonation phrase ends with a low part, which covers at least the last word of the sentence.

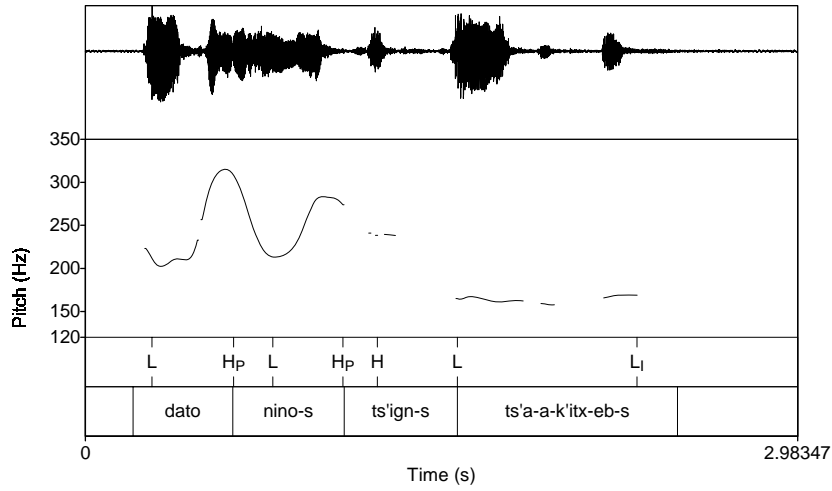
Several further features of Georgian intonation are visible from the pitch tracks of (18): downstep in (18a-b), expressing cohesion between the succession of p-phrases inside of an i-phrase, and absence of downstep in (18c-d). We speculate that these two patterns of tone scaling correlate with marked word order. Only unmarked word orders induce regular downstep.

(18) Wide focus in four variants

(a) WO1: SO₂O₁V

L H _P	L H _P	HL	L _I
[dato] _P	[nino-s] _P	[ts'ign-s	ts'a-a-k'itx-eb-s] _P
Dato(NOM)	Nino-DAT	book-ACC	PV-IO.3.NV-read-CAUS-3.SG

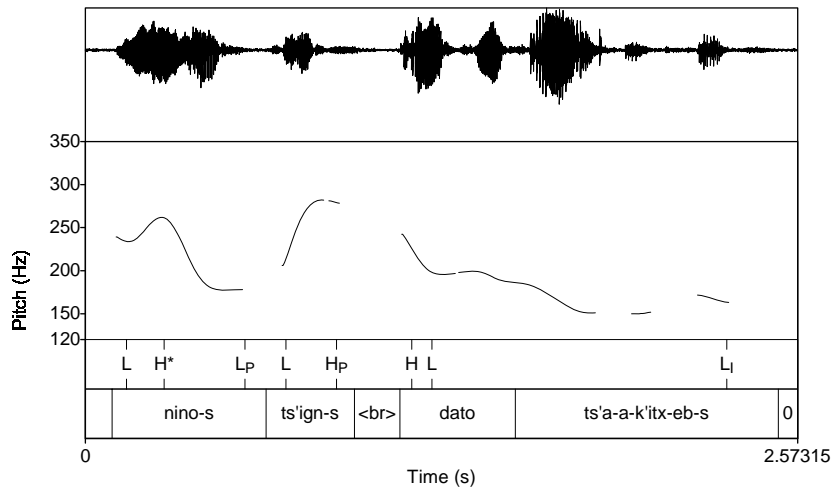
Figure 6. Item 1 in WO1 (SO₂O₁V): all new context



(b) WO2: O₂O₁SV

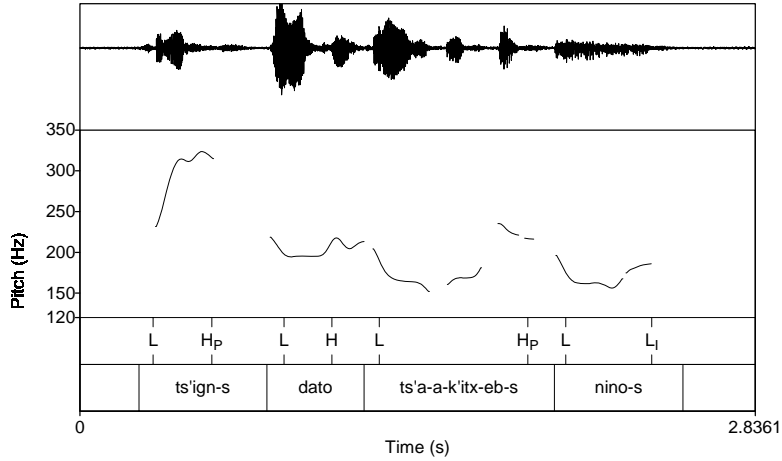
LH* L_P L H_P HL L_I
 [nino-s]_P [ts'ign-s]_P [dato ts'a-a-k'itx-eb-s]_P

Figure 7. Item 1 in WO2 (O₂O₁SV)



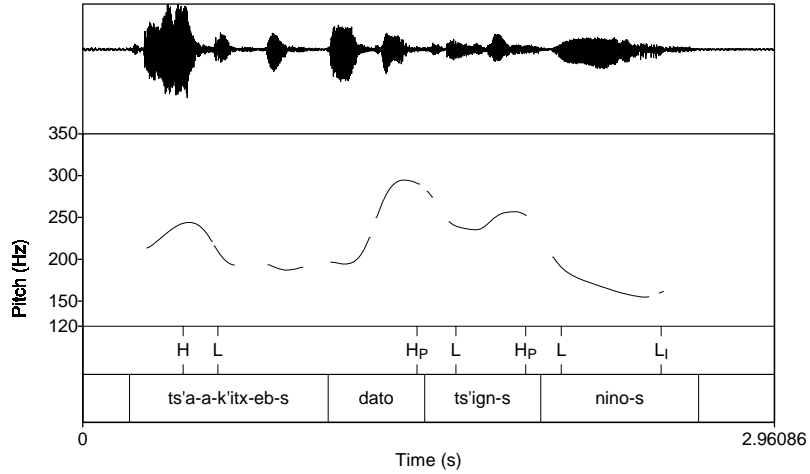
(c) WO3: O_1SVO_2
 L H_P LH L H_P L L_I
 [ts'ign-s]_P [dato ts'a-a-k'itx-eb-s]_P [nino-s]_P

Figure 8. Item 1 in WO3 (O_1SVO_2): all new context



(d) WO4: VSO_1O_2
 HL H_P L H_P L L_I
 [ts'a-a-k'itx-eb-s dato]_P [ts'ign-s]_P [nino-s]_P

Figure 9. Item 1 in WO4 (VSO_1O_2): all new context



The examples in (19) and (20) illustrate specific word orders as answers to different questions. (19) illustrates the unmarked word

order WO1 (SO₂O₁V) and (20) the marked one WO4 (VSO₁O₂), as answers to different questions. Let us first examine WO1.

(19a) is identical with (18a), and the pitch track is not reproduced here. In the realizations (19), the first constituent *dato* was realized with a pitch accent in three versions of this sentence, and in (19c), the second constituent *nino* was also assigned a pitch accent. This emphasized realization, always found early in the sentence, correlates with a topic or with a focus, but a focus or a topic is not necessarily realized with this contour (see (19c) for instance, in which the focused constituent has the default tonal pattern LH_p. Notice also the rapid fall on the preverbal object *ts'ign-s* followed by a flat contour on the verb in all instances of (19). This tone structure is independent of the focused or backgrounded status of the object. We analyze it as a high tone followed by a low tone which aligns immediately after the high tone as well as at the end of the sentence (L₁).

(19) Four different prosodies of WO1

(a) All-new congruent pattern

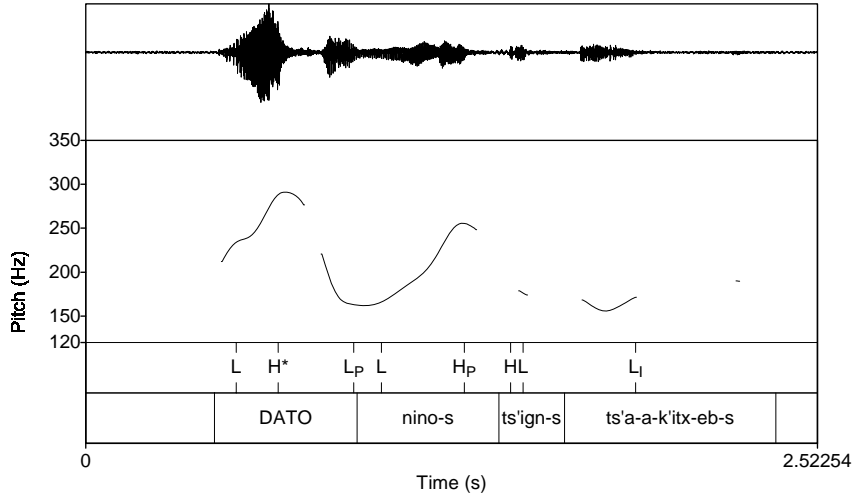
L H _p	L H _p	HL	L ₁
[dato] _p	[nino-s] _p	[ts'ign-s	ts'a-a-k'itx-eb-s] _p
Dato(NOM)	Nino-DAT	book-ACC	PV-IO.3.NV-read-CAUS-3.SG

(see Figure 6)

(b) Subject focus congruent pattern

L H* L_P L H_P HL L_I
 [DATO]_P [nino-s]_P [ts'ign-s ts'a-a-k'itx-eb-s]_P

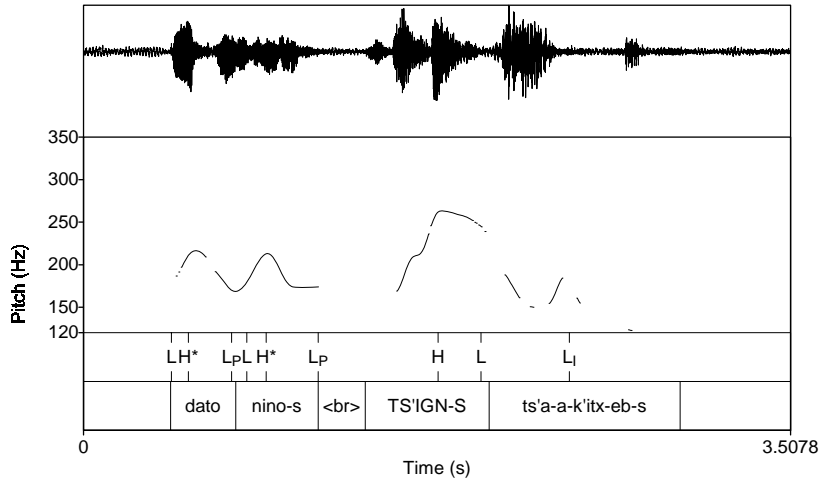
Figure 10. Item 1 in WO1 (SO₂O₁V): subject focus



(c) Direct object congruent pattern

L H* L_P L H*L_P HL L_I
 [dato]_P [nino-s]_P [TS'IGN-S ts'a-a-k'itx-eb-s]_P

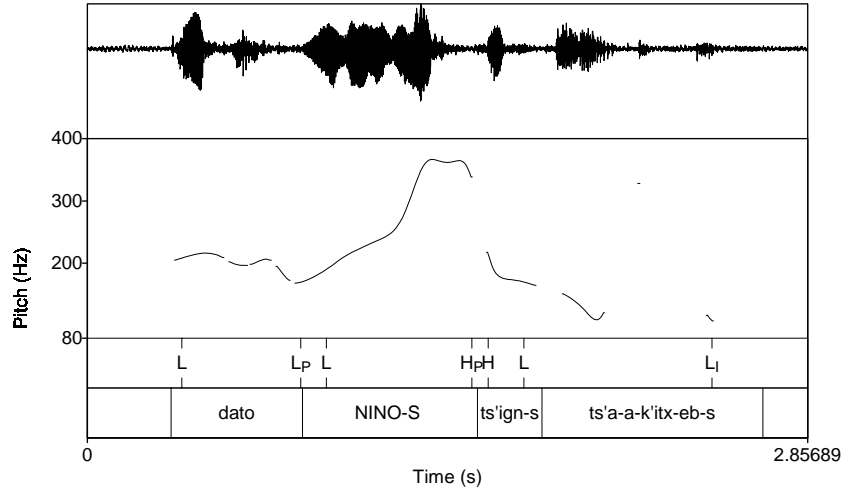
Figure 11. Item 1 in WO1 (SO₂O₁V): direct object focus



(d) Indirect object congruent pattern

L L_P L H_P HL L_I
 [dato]_P [NINO-S]_P [ts'ign-s ts'a-a-k'itx-eb-s]_P

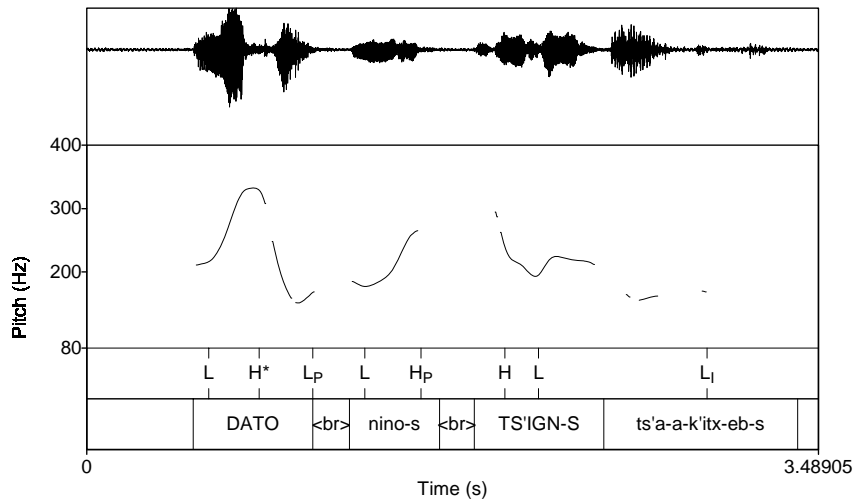
Figure 12. Item 1 in WO1 (SO₂O₁V): indirect object focus



(e) Double focus congruent pattern

L H* L_P L H_P HL L_I
 [DATO]_P [nino-s]_P [TS'IGN-S ts'a-a-k'itx-eb-s]_P

Figure 13. Item 1 in WO1 (SO₂O₁V): multiple focus



The illustrations of (20) show the marked word order WO4. The speaker reflects this markedness in the tonal structure, as well. In (20e), the verb seems to be phrased separately in order for the following subject to be emphasized with the LH*L contour. Another remarkable characteristic of this marked word order is the realization of a final focus. In (20d) a sentence-final constituent is narrowly focused, which is, as we saw, possible, but not a preferred option, since the unmarked focus position is pre-verbal. The speaker realized all occurrences of a final focus with a surprising low and flat tonal pattern. The constituent is phrased individually. Correlating with the low and flat intonation of a final focus, other properties often associated with emphasis appear, like intensity, longer duration and tenseness of the consonants. We hypothesize that the presence of a final high tone is so dispreferred in Georgian that our speaker avoided it altogether and kept a final low pattern throughout the sentences. We distinguish a final focus from a final non-focused p-phrase by assigning a L* to the narrowly focused final constituent.

(20) Four different prosodies of WO4 (VSO₁O₂).

(a) All-new congruent pattern

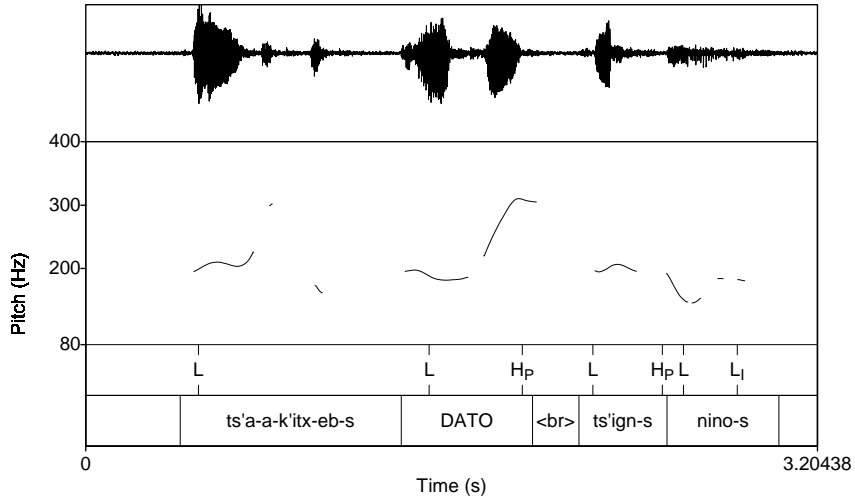
H L	H _P	L H _P	L L _I
[ts'a-a-k'itx-eb-s	dato] _P	[ts'ign-s] _P	[nino-s] _P
PV-IO.3.NV-read-CAUS-3.SG	Dato(NOM)	book-ACC	Nino-DAT

(see Figure 9)

(b) Subject focus congruent pattern

L L H_P L H_P L L_I
 [ts'a-a-k'itx-eb-s DATO]_P [ts'ign-s]_P [ninos]_P

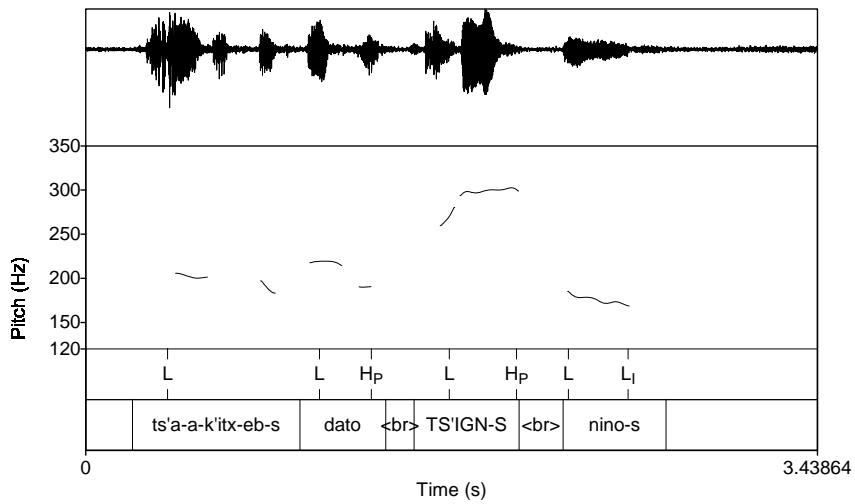
Figure 14. Item 1 in WO4 (VSO₁O₂): subject focus



(c) Direct object congruent pattern

L L H_P L H_P L L_I
 [ts'a-a-k'itx-eb-s dato]_P [TS'IGN-S]_P [ninos]_P

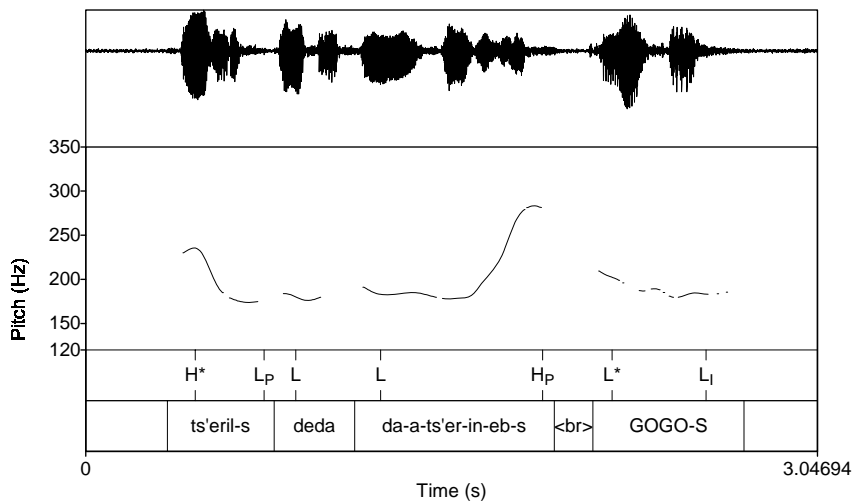
Figure 15. Item 1 in WO4 (VSO₁O₂): direct object focus



Two of our word orders (WO2 and WO4) had instances of final narrow focus. All eight instances displayed this low and flat contour with extra features of emphasis. One more instance of the final focus (L^*L_I) is shown in (21), with item 2. The further items are not illustrated here but show similar prosodic patterns.

- (21) H^* L_P L L H_P L^* L_I
 [[ts'eril-s]_P [deda da-a-ts'er-in-eb-s]_P [GOGO-S]_P]_I
 letter-DAT mother(NOM) PV-3-write-CAUS-HAB-3.SG girl-DAT
 'The mother causes the daughter to write a letter.

Figure 18. Item 3 in WO3 ($O_I SVO_2$): indirect object focus



To sum up, the production experiment revealed the following features of Georgian intonation.

A. *Comparison between the tonal contours of an all-new sentence and of a narrow focus*

In the introductory comments in section 2.2, it was shown that only a prominent word is realized with a starred tone. And indeed, we find some principled differences between the realization of words in an all new sentence and in narrow focus.⁵ First, an all-new sentence

⁵ According to the intuition of the third author, main stress is always on the first syllable in our examples, but the verbs can also have a secondary stress on the third syllable. As in our sentences, the verb had only little prominence, there is no tonal reflex of this in the pitch tracks.

contains non-prominent phrases, LH_P , especially when the word order is unmarked.

When the narrowly focused word is initial, it is mostly realized with a rise-fall LH^*L_P , exactly in the same way as a topicalized word. In this case, the remaining of the sentence has a compressed range, but at least when the subject or the direct object are initial (in the unmarked WO1, WO2), the remaining of the sentence is fully intonated. In marked WO3, it is the indirect object which is initial, and our speaker realized a narrowly focused word with a very high pitch accent in the rise-fall, and the remaining of the sentence was more compressed than in the other cases.

A medial narrow focus (neither sentence-initial, nor sentence-final), is realized just with a rise when it is integrated with the following verb (direct object in WO1 subject focus in WO2 and WO3), but when it is phrased individually, it is again realized with a rise-fall (direct object in WO3, WO4 focus).

The indirect object in WO1 is an exception. It is phrased individually, but it is realized just with a steep rise. The reason could be that the subject in this pattern is realized as a topic with a rise-fall, and two full rise-falls in a row are avoided.

A sentence-final focus is realized differently from all we know: it is realized separately, in a p-phrase preceded by a short break, at a mid or low level and with a flat intonation. It is long and emphatic in the sense that every consonant shows more tenseness and aspiration when it is in a narrowly focused word than when it is part of a wide focus. It was analyzed a L^*L_f .

In all cases, a crucial property of the narrow focus is what we call emphatic realization: the consonants are realized with intensity, the words are longer than in the sentences with wide focus. But this property is exaggerated on a final constituent.

In sum, we assume that the correlates of narrow focus are a high pitch accent when non-final and a low pitch accent when final, a clear phrasing except when preverbal, and tenseness as well as intensity in the segmental part of the focused word.

B. Prenuclear part

Before the high tone of a narrow focus, the full tonal structure is usually present. In verb-final WO1 for instance, even if the focus is on one of the objects, the subject and the prenuclear object have the same tonal contour as the one they have in the all-new pattern. The

same can be said for the WO2 and WO3, if the focused word is not final. In WO4, there were some compression and restructuring of the prenuclear material, but this could be due to the high markedness of this word order.

In a sentence with final focus, the pre-focal stretch of discourse is clearly compressed. It is also realized more rapidly and without any correlate of the emphasis we find in narrowly focused words.

C. Postnuclear part

In many languages, the material after a narrow focus (postnuclear) is the place where deaccenting is observed. But in our elicited material, it is remarkable how little material is deaccented. Some examples of a sentence-initial narrow focus are illustrated above. But still, the remaining material - except for the verb - is realized with a full tonal pattern.

D. Phrasing

In the construction of our material, we assumed that all word order variants were possible in all contexts, but of course not with all kind of prosodic patterns.

4.2. Results of the perception experiment

Sixty subjects participated to the perception experiment and gave 80 judgments each. From the total 4.800 trials, 455 trials were non-valid (subjects failed to select any valid value within the time window). Some additional elements had to be eliminated due to technical errors, such that the final data set contained 3797 (79.1%) valid judgments. In the final subject/treatment table, missing values have been imputed through the regression analysis using the variables without missing values as predictors (see Rietveld & Van Hout 2005:202ff.).

Valid judgments have been normalized through transformation into standard scores in order to eliminate individual differences in the way subjects perceived the rating scale (see Cowart 1997:114; Featherston 2005). All analyses reported in the present paper have been conducted on the normalized data.

4.2.1. All new

In an all-new sentence, every constituent is focused, and, as a result, we should be able to test Hypothesis II: In the congruent prosody, the judgments are expected to reflect word order markedness only. The prosodic realization is expected to play a role as well: the non-

congruent prosodies should get lower scores than the congruent ones (Hypothesis I). In all focus questions, the incongruent prosodic realization is an instance of underfocusing (Krifka 2001), i.e. the focused constituent is only a part of the information that is expected to be focused in a certain context.

Finally, the effect of prosody is expected to be stronger than the effect of the deviation from the canonical word order (Hypothesis IV). These expectations about the tested word order result from the constraint interaction presented in Figure 19.

Figure 19. Constraint profile in all new questions

all focus	STRESSFOCUS	ALIGNFOCUS	STAY
SO ₂ O ₁ V			
O ₂ O ₁ SV			*
O ₁ SVO ₂			**
VSO ₁ O ₂			***
S <u>O</u> ₂ O ₁ V	*		
<u>O</u> ₂ O ₁ SV	*		*
O ₁ S <u>V</u> O ₂	*		**
VSO ₁ <u>O</u> ₂	*		***

The expectations contained in Figure 19 were borne out, as it is shown in the obtained results in Figure 20. Error bars show the standard error of the means at a .95 level.

Figure 20. Judgments in All-Focus Questions

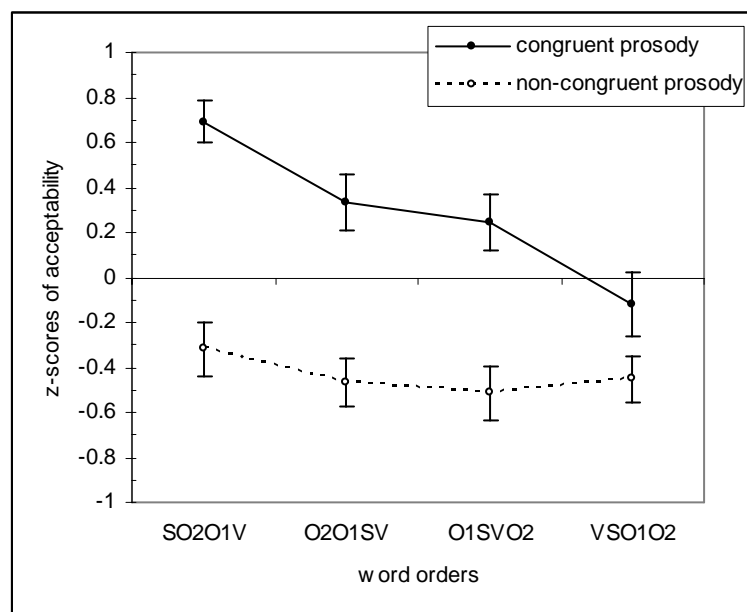


Table 2. All new questions: descriptives

		judgments	standard scores		
		mean	mean	SE	SD
congruent	SO ₂ O ₁ V	4.490	0.692	0.096	0.747
	O ₂ O ₁ SV	4	0.334	0.124	0.967
	O ₁ SVO ₂	3.703	0.246	0.123	0.957
	VSO ₁ O ₂	3.436	-0.119	0.145	1.129
non congruent	SO ₂ O ₁ V	3.125	-0.319	0.118	0.921
	O ₂ O ₁ SV	2.730	-0.469	0.105	0.818
	O ₁ SVO ₂	2.732	-0.512	0.120	0.930
	VSO ₁ O ₂	2.771	-0.453	0.106	0.824

A repeated measures ANOVA at a alpha-level of .05 revealed significant main effects for prosodic congruence ($F_{1,59}=61.487, p <.001$) and for word order ($F_{1,59}=18.927, p <.001$), as well as a significant interaction between the two factors ($F_{1,59}=12.314, p <.001$), resulting from the fact that the violation of stress-focus correspondence eliminates the difference between the different word orders (see Figure 20).

Our predictions in Figure 19 and the result in Figure 20 are compared in the next figure. The predicted hierarchy in the left side of Figure 21 is the direct result of the constraint interaction in Figure 19. The “obtained” hierarchy is calculated on the basis of the results in Figure 20. Following Keller & Alexopoulou (2001), we deduce a hierarchical relation between two means of acceptability judgments whenever the difference between them is larger than one standard error. In particular, we assume that $x > y$ holds, when both x is higher than the higher bound of y ($y + SE_y$) and y is lower than the lower bound of x ($x - SE_x$).

Figure 21. Gradient acceptability of answers to all new questions

predicted hierarchy	obtained hierarchy
SO ₂ O ₁ V	SO ₂ O ₁ V
>O ₂ O ₁ SV	>{O ₂ O ₁ SV O ₁ SVO ₂ }
>O ₁ SVO ₂	
>VSO ₁ O ₂	>VSO ₁ O ₂
>SO ₂ O ₁ V	>SO ₂ O ₁ V
>O ₂ O ₁ SV	>{O ₂ O ₁ SV O ₁ SVO ₂ VSO ₁ O ₂ }
>O ₁ SVO ₂	
>VSO ₁ O ₂	

Figure 21 shows that all attested differences in the obtained data were predicted from the constraints in Figure 19. A high correlation between the predicted and the obtained acceptability order was reached ($\rho(8) = .97$, $p < .001$).

However, Figure 20 shows that the impact of word order markedness is eliminated in the prosodically non-congruent tokens, which may be due to the effects of accent placement that were introduced in section 3.3. Non-congruent prosody always lowers the acceptability of a question-answer (this is always true), but that it does so in different degrees. It is thus crucial to distinguish among the different non-congruent prosodies. Recall that in each word order only one non-congruent prosody was used in the perception experiment, and that which one it was differs for all cases (see the underlined constituents in Figure 21).

Judging from the results for the all-new sentences, an early non-congruent narrow focus has on general a more drastic effect on acceptability than a late one. The effect for WO1 and 2 are bigger than the effects for WO3 and 4, and in the former cases the non-congruent prosodies are ones with an initial narrow focus. An alternative explanation is that non-congruent prosodies have more effects on the judgment when the word orders are less marked. Marked word orders are difficult to process anyway, so that the prosody might have less influence on the scores in this case. However, this hypothesis is not confirmed in the contexts involving a congruent narrow focus. We will see below that WO4, with a very marked word order becomes even worse with a non-congruent prosody, and this is all cases.

4.2.2. Subject Focus

In this condition, the context question induces a narrow focus on the subject. As far as word order is concerned, according to Hypothesis III, the focused subject is preferably realized in the preverbal position and this will give an advantage to WO2 (O_2O_1SV) and WO3 (O_1SVO_2). Furthermore, Hypothesis II on the ranking of word orders predicts the ranking $O_2O_1SV > O_1SVO_2$ among the optimal word orders and the ranking $SO_2O_1V > VSO_1O_2$ among the suboptimal ones. The same pattern is expected to occur in the prosodically non-congruent question/answer pairs. The incongruent prosodic realizations in constituent questions are cases of not-matching focusing (Krifka 2001). The prosodically prominent constituent is not the expected one in the presented context. The constraint profile is summarized in Figure 22.

Figure 22. Constraint profile in subject questions

S focus	STRESSFOCUS	ALIGNFOCUS	STAY
<u>S</u> O_2O_1V		*	
O_2O_1 <u>S</u> V			*
O_1 <u>S</u> V O_2			**
V <u>S</u> O_1O_2		*	***
S <u>O</u> $_2O_1V$	*	*	
<u>O</u> $_2O_1SV$	*		*
<u>O</u> $_1SVO_2$	*		**
V <u>S</u> O_1O_2	*	*	***

The results in the following figure have given empirical support to the assumed constraint profile in Figure 22.

Figure 23. Judgments in Subject Questions

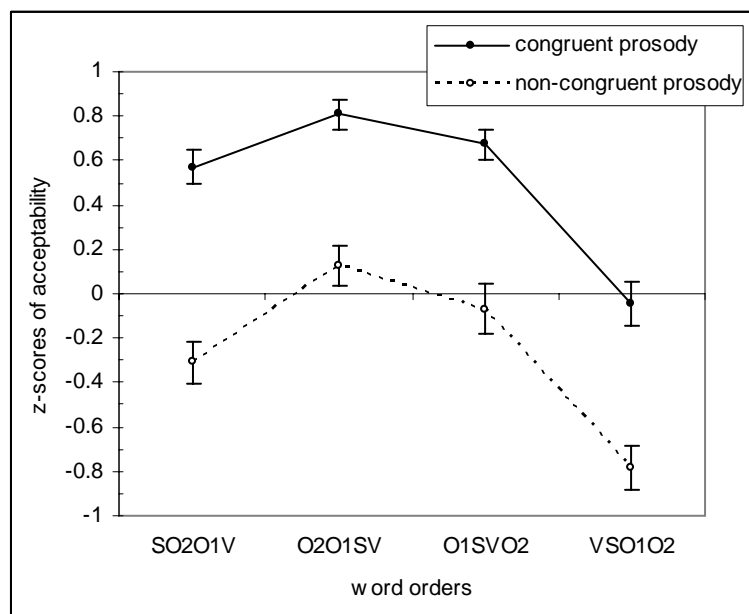


Table 3. Subject questions: descriptives

	judgments	standard scores		
		mean	SE	SD
congruent	<u>S</u> O ₂ O ₁ V	4.245	0.571	0.602
	O ₂ O ₁ <u>S</u> V	4.550	0.807	0.527
	O ₁ <u>S</u> VO ₂	4.370	0.675	0.524
	<u>V</u> SO ₁ O ₂	3.355	-0.047	0.761
non congruent	<u>S</u> O ₂ O ₁ V	2.941	-0.309	0.727
	O ₂ O ₁ <u>S</u> V	3.596	0.128	0.700
	O ₁ <u>S</u> VO ₂	3.267	-0.069	0.897
	<u>V</u> SO ₁ O ₂	2.25	-0.784	0.766

A repeated measures ANOVA at a alpha-level of .05 has given two significant main effects for prosodic congruence ($F_{1,59}=73.713$, $p < .001$) and for word order ($F_{1,59}=28.265$, $p < .001$). There is no significant interaction between the two factors which confirms the observation that may gathered from Figure 23, that the effects of these

factors are cumulatively combined in the result. The predicted and obtained hierarchies of answer types to the subject question are compared in Figure 24.

Figure 24. Gradient acceptability of answers to subject questions

predicted hierarchy	obtained hierarchy
O ₂ O ₁ <u>S</u> V	O ₂ O ₁ <u>S</u> V
>O ₁ <u>S</u> VO ₂	>O ₁ <u>S</u> VO ₂
> <u>S</u> O ₂ O ₁ V	> <u>S</u> O ₂ O ₁ V
>V <u>S</u> O ₁ O ₂	> <u>O</u> ₂ O ₁ SV
> <u>O</u> ₂ O ₁ SV	>{V <u>S</u> O ₁ O ₂ <u>O</u> ₁ SVO ₂ }
> <u>O</u> ₁ SVO ₂	
>S <u>O</u> ₂ O ₁ V	>S <u>O</u> ₂ O ₁ V
>VS <u>O</u> ₁ O ₂	>VS <u>O</u> ₁ O ₂

Again the acceptability judgments confirmed our hypotheses (the correlation between the predicted order and the obtained order was very high: $\rho(8)=.95$, $p < .001$). First, the placement of the focused subject in the preverbal position increases acceptability, as may be seen in the acceptability means for WO2 (O₂O₁SV) and WO3 (O₁SVO₂) (compare also with the graph for all-new sentences). In the remaining word orders, markedness decides between the two.

Only one means was not predicted by our hypotheses, as it may be seen in Figure 24: The marked WO4 (VSO₁O₂), even with congruent prosody, was judged to be worse than WO2 (O₂O₁SV) which satisfies the word order preferences with non-congruent prosody. This finding implies that a strong deviation from the canonical word order which is not licensed by the context may not be accommodated by prosody alone.

Moreover, as before, when we compare which non-congruent prosodies were used, it becomes clear that, again, an early superfluous focus is better accepted than a late one. But the difference is not so important as in the all-new pattern.

4.2.3. Direct Object Focus

The next context question licenses a focus feature on the direct object. According to Hypothesis III, the optimal order among the exam-

ined ones is expected to be WO1 (SO_2Q_1V), since in this order the focused constituent is placed immediately before the verb. The orders WO2 (O_2Q_1SV) and WO3 (Q_1SVO_2) violate the word order preferences, since the preverbal position is filled with information that belongs to the background of the question. We predict also a difference $O_2Q_1SV > Q_1SVO_2$, following Hypothesis II concerning the intrinsic markedness of word orders. Finally, the order VSO_1O_2 is expected to have generally a low rating due to its markedness. The expectations resulting from the assumed constraints are presented in Figure 25.

Figure 25. Constraint profile in direct object questions

O ₁ focus	STRESSFOCUS	ALIGNFOCUS	STAY
SO_2Q_1V			
O_2Q_1SV		*	*
Q_1SVO_2		*	**
VSO_1O_2		*	***
$\underline{S}O_2O_1V$	*		
Q_2O_1SV	*	*	*
$O_1\underline{S}VO_2$	*	*	**
$VSO_1\underline{O}_2$	*	*	***

Figure 26. Judgments in Direct Object Questions

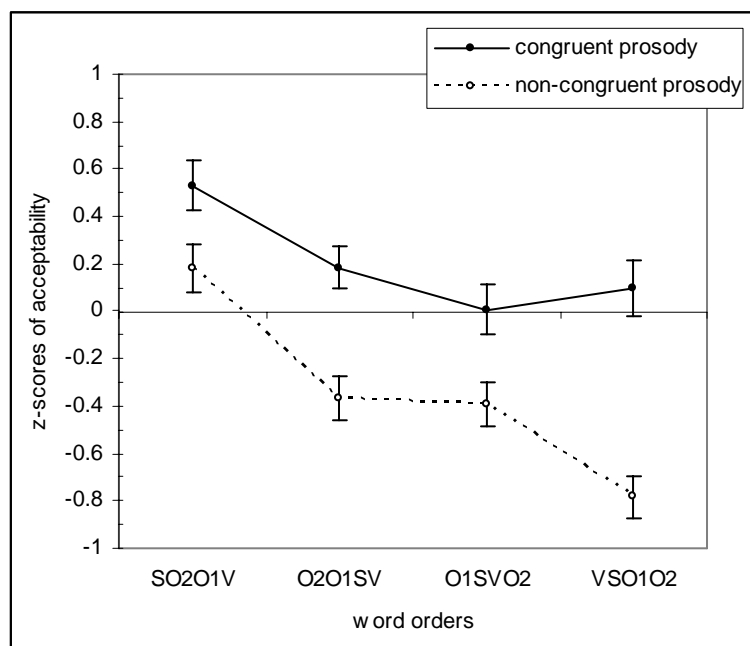


Table 4. Direct object questions: descriptives

		judgments	standard scores		
		mean	mean	SE	SD
congruent	SO ₂ O ₁ V	4.263	0.530	0.103	0.801
	O ₂ O ₁ SV	3.666	0.185	0.091	0.705
	O ₁ SVO ₂	3.419	0.005	0.106	0.823
	VSO ₁ O ₂	3.616	0.098	0.118	0.918
non congruent	SO ₂ O ₁ V	3.608	0.178	0.102	0.791
	O ₂ O ₁ SV	2.868	-0.366	0.092	0.714
	O ₁ SVO ₂	2.807	-0.390	0.093	0.722
	VSO ₁ O ₂	2.288	-0.784	0.087	0.680

A repeated measures ANOVA revealed a significant main effect of prosody ($F_{1,59}=35.735, p <.001$), a significant effect of word order ($F_{1,59}=40.484, p <.001$), and a significant interaction between word order and prosody ($F_{1,59}=6.533, p <.02$). All differences identified in the gained data are in line with the assumed constraint interaction as it is shown in Figure 27.

Figure 27. Gradient acceptability of answers to direct object questions

predicted hierarchy	obtained hierarchy
SO ₂ <u>Q</u> ₁ V	SO ₂ <u>Q</u> ₁ V
>O ₂ <u>Q</u> ₁ SV	>{O ₂ <u>Q</u> ₁ SV <u>Q</u> ₁ SVO ₂ VS <u>Q</u> ₁ O ₂ S <u>Q</u> ₂ O ₁ V}
> <u>Q</u> ₁ SVO ₂	
>VS <u>Q</u> ₁ O ₂	
>S <u>Q</u> ₂ O ₁ V	
> <u>Q</u> ₂ O ₁ SV	
>O ₁ <u>S</u> VO ₂	>{ <u>Q</u> ₂ O ₁ SV O ₁ <u>S</u> VO ₂ }
>VSO ₁ <u>Q</u> ₂	
	>VSO ₁ <u>Q</u> ₂

There is a difference in the relation between O₂O₁SV and O₁SVO₂ in the congruent and the incongruent conditions. It has to be noticed that in the incongruent O₁SVO₂ sentence, it is the subject that is accentuated. This prosodic marking is incongruent to the question, but it conforms to the rule of the language to realize the focus preverbally, and this is a possible explanation for the advanced relative scoring of O₁SVO₂ in the incongruent sentences.

4.2.4. Indirect Object Focus

None of the examined word orders realizes an indirect object focus structure by placing this constituent in the preverbal position. Since the postverbal argument position could also bear focused information, WO3 (O₁SVO₂) is predicted to be the best among the other candidates. WO2 (O₂O₁SV) and WO1 (SO₂O₁V) violate the general preferences for the placement of focused information, since they include the focused element either in the sentence-initial position or in the second position respectively. Between the two orders we expect an advantage for SO₂O₁V reflecting the fact that this is the canonical order. WO4 (VSO₁Q₂), though it has a general disadvantage due to its intrinsic markedness is expected to be more acceptable in this context of the indirect object question, since the stressed O₂ is in a right peripheral position which may be used for focused constituents as specified in Hypothesis III. The exact constraint profile is pre-

sented in Figure 28 and the data gathered in the context of indirect object questions is presented in Figure 29.

Figure 28. Constraint profile in indirect object questions

O ₂ focus	STRESSFOCUS	ALIGNFOCUS	STAY
S <u>O</u> ₂ O ₁ V		*	
<u>O</u> ₂ O ₁ SV		*	*
O ₁ S <u>V</u> O ₂			**
V <u>S</u> O ₁ O ₂			***
S <u>O</u> ₂ <u>O</u> ₁ V	*	*	
O ₂ O ₁ <u>S</u> V	*	*	*
<u>O</u> ₁ S <u>V</u> O ₂	*		**
V <u>S</u> O ₁ O ₂	*		***

Figure 29. Judgments in Indirect Object Questions

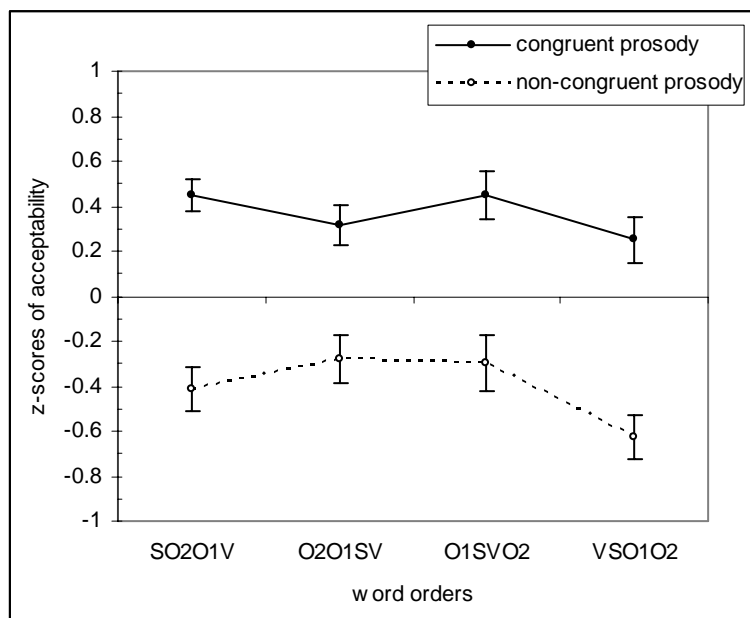


Table 5. Indirect object questions: descriptives

		judgments	standard scores		
		mean	mean	SE	SD
congruent	<u>S</u> O ₂ O ₁ V	4.096	0.449	0.075	0.581
	O ₂ O ₁ <u>S</u> V	3.906	0.315	0.086	0.673
	O ₁ SVO ₂	4.1	0.451	0.107	0.832
	VSO ₁ O ₂	3.785	0.249	0.102	0.791
non congruent	SO ₂ <u>O</u> ₁ V	2.796	-0.413	0.096	0.750
	O ₂ O ₁ <u>S</u> V	3	-0.283	0.108	0.843
	<u>O</u> ₁ SVO ₂	2.974	-0.297	0.123	0.954
	V <u>S</u> O ₁ O ₂	2.440	-0.628	0.098	0.765

Similarly to the previous context questions, the prosodic realization is decisive for the judgments. A repeated measures ANOVA revealed a significant main effect of prosody ($F_{1,59}=50.341$, $p < .001$). The word order factor did not reach significance nor did the interaction between prosody and word order.

Comparing the results in the context of indirect object question to the previous results in - reveals that no order reached a high scoring, what confirms our prediction that none of the examined orders is an optimal realization of the indirect focus condition. This is the only context, in which the order O₁SVO₂ has been judged to be (slightly) better than the others, and this difference is due to the placement of indirect object in positions that are dispreferred for focus in the other orders: SO₂O₁V, O₂O₁SV. The hierarchy of answer types is summarized in Figure 30.

Figure 30. Gradient acceptability of answers to indirect object questions

predicted hierarchy	obtained hierarchy
O ₁ SVO ₂	{O ₁ SVO ₂ SO ₂ O ₁ V}
>VSO ₁ O ₂	
>SO ₂ O ₁ V	>{VSO ₁ O ₂ O ₂ O ₁ SV}
>O ₂ O ₁ SV	
>O ₁ SVO ₂	>{O ₁ SVO ₂ SO ₂ O ₁ V O ₂ O ₁ SV}
>VSO ₁ O ₂	>VSO ₁ O ₂
>SO ₂ O ₁ V	
>O ₂ O ₁ SV	

The obtained hierarchy differs from the predicted one in the scorings gathered for VSO₁O₂. Both in the congruent as well as in the non-congruent realizations, this order obtained lower scorings than the other orders. This finding is in line with the result in direct object questions (see previous section) that shows that a word order that strongly deviates from the canonical one, is not easily accommodated. However, the means of judgments for the VSO₁O₂ order in the congruent realization is the highest scoring that this order obtained in all experimental conditions, suggesting that the right peripheral placement of the focused constituent has a positive influence to the degree of acceptability.

In the non-congruent realizations, a low and flat prosody is expected on the narrowly focused indirect object in the order O₁SVO₂, but instead an unmarked prosody (with an early accent) is provided. This may be the reason why acceptability decreased more than in the case of O₂O₁SV with a late accent.

4.2.5. Multiple Constituent Focus

We know that multiple constituent questions license different answer types, depending on which argument is the sorting key of a pair list answer (see experimental evidence from speech production in Skopeteas & Féry 2007). Since there is a preference for subjects to be used as sorting keys of multiple constituent questions, we expect that the hierarchical relation among the acceptability degrees of different

orders will not be substantially different from the hierarchical relation in direct object questions.

Figure 31. Constraint profile in multiple constituent questions

S&O ₁ focus	STRESSFOCUS	ALIGNFOCUS	STAY
<u>S</u> O ₂ O ₁ V			*
O ₂ <u>O</u> ₁ <u>S</u> V			**
<u>O</u> ₁ <u>S</u> V <u>O</u> ₂		*	***
V <u>S</u> <u>O</u> ₁ <u>O</u> ₂		*	***
<u>S</u> O ₂ O ₁ V	*		
<u>O</u> ₂ O ₁ <u>S</u> V	*		*
O ₁ <u>S</u> V <u>O</u> ₂	*	*	**
V <u>S</u> O ₁ <u>O</u> ₂	*	*	***

Figure 32. Judgments in Multiple Constituent Questions

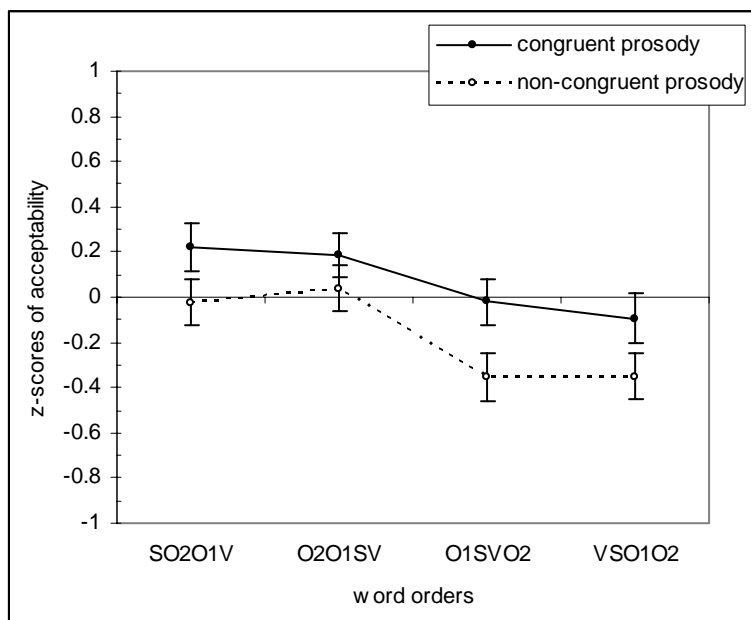


Table 6. Multiple constituent questions: descriptives

		judgments	standard scores		
		mean	mean	SE	SD
congruent	<u>S</u> O ₂ O ₁ V	3.771	0.22	0.109	0.846
	O ₂ <u>O</u> ₁ SV	3.746	0.187	0.097	0.754
	<u>O</u> ₁ SVO ₂	3.381	-0.02	0.1	0.773
	V <u>S</u> O ₁ O ₂	3.254	-0.095	0.111	0.858
non congruent	S <u>O</u> ₂ O ₁ V	3.422	-0.026	0.102	0.79
	<u>O</u> ₂ O ₁ SV	3.508	0.039	0.105	0.815
	O ₁ S <u>V</u> O ₂	2.868	-0.356	0.105	0.814
	VSO ₁ <u>O</u> ₂	2.933	-0.35	0.098	0.759

A repeated measures ANOVA revealed a significant main effect for prosody ($F_{1,59}=12.005$, $p <.001$), a significant main effect for word order ($F_{1,59}=14.268$, $p <.001$), but no significant interaction between the two factors.

The results reveal a preference for WO1 (SO₂O₁V) and WO2 (O₂O₁SV) both in the sentences with congruent as well as in the sentences with incongruent prosody. The ratings for SO₂O₁V have been generally lower (compare with all-new sentences in Figure 20), so that this sentence type has the same level of acceptability like the O₂O₁SV order. At a lower level of acceptability O₁SVO₂ has been judged to be equally probable like VSO₁O₂ in this context. Finally, the incongruent prosodies have only little effect on the general acceptability of the sentence.

Figure 33. Gradient acceptability of answers to multiple constituent questions

predicted hierarchy	obtained hierarchy
$\underline{S}O_2O_1V$	$\{ \underline{S}O_2O_1V \mid O_2O_1\underline{S}V \}$
$>O_2O_1\underline{S}V$	
$>\underline{O}_1\underline{S}VO_2$	$>\{ \underline{O}_1\underline{S}VO_2 \mid V\underline{S}O_1O_2 \mid \underline{S}O_2O_1V \mid O_2O_1\underline{S}V \}$
$>V\underline{S}O_1O_2$	
$>\underline{S}O_2O_1V$	
$>O_2O_1\underline{S}V$	
$>O_1\underline{S}VO_2$	$>\{ O_1\underline{S}VO_2 \mid VSO_1O_2 \}$
$>VSO_1O_2$	

We speculate that the general markedness of multiple constituent questions is responsible for the generally low judgments of the prosodically congruent sentences of this condition in comparison to those of the previous conditions.⁶

5. Discussion

A repeated measures ANOVA in the entire dataset reveals a marginally significant interaction for questioned constituent and word order ($F_{1,59}=3.885$, $p <.06$) a highly significant interaction between questioned constituent and prosodic congruence ($F_{1,59}=14.545$, $p <.001$), and a significant interaction between all three factors ($F_{1,59}=7.872$, $p <.01$). No significant interaction has been found between prosody and word order.

Our experimental study brings evidence concerning the information structural properties of Georgian sentence forms. Word order has been shown to be sensitive to our experimental conditions. In sum, our results show that:

- (a) The order SO_2O_1V is the most preferred order among those examined in this paper. It got low grades in subject and indirect-object focus as predicted by the hypothesis concerning focus

⁶ Moreover, our experimental stimuli were provided with answers with a single pair interpretation of the multiple constituent questions, an uncommon situation.

placement in Georgian, but the grades were still relatively high in these contexts. Furthermore, it has reached the lowest score in multiple constituent questions, but this may depend on factors concerning the interaction between a such question and a single pair answer and does depend on the word chosen order.

- (b) The order O_2O_1SV outranked the other orders in the conditions which include focus on the subject, i.e. in the subject question and the multiple constituent question.
- (c) The order O_1SVO_2 also induced high ratings in the subject focus condition, as expected from the fact that it provides the S preverbally. Furthermore, it has been judged to be appropriate in the context of indirect object questions, what is consistent with our observation that the postverbal position may be used for focused constituents.
- (d) The order VSO_1O_2 has been generally judged to be inappropriate for the question types examined in our experiment. The judgments for this order were better in the context of direct and indirect object questions.

Some tendencies concerning the acceptability of certain orders have been observed across conditions. The canonical order SO_2O_1V attracted high scorings in all conditions, while the dispreference for VSO_1O_2 holds across conditions too. Furthermore, the relation between O_2O_1SV and O_1SVO_2 is also retained when both orders are optimal (see Figure 23) or suboptimal (see Figure 26), and it is inverted when the context triggers un-equal violations in both orders (see Figure 29).

The effects of prosodic structure have been very consistent across conditions. Speakers have judged incongruent intonation in average 0.88 points lower in the 1-5 scale and they have been rejecting incongruent prosodic realizations consistently across conditions. Highly significant main effects for prosodic congruence have been obtained in all question contexts. It is striking that in multiple constituent questions the difference between congruent and incongruent prosodic marking is lower. This is due to the lower degree of acceptability for the congruent pair on the reasons discussed above (see section 4.2.5).

An interesting point of our result is the absence of interaction between intonation and word order in the acceptability judgments, which reflects the fact that both factors had additive effects in most

cases. We have shown in sections 4.2.1-4.2.5 that different word orders trigger different degrees of acceptability in certain contexts. The data patterns concerning the different orders are quite similar in the two prosodic conditions (congruent and incongruent). Congruent intonation has an additional effect on speakers' intuitions about the appropriateness of particular word orders, but may not determine the acceptability alone.

We have seen that a very limited number of constraints is enough to predict the most properties of the obtained data pattern. The constraints that we have used in these study are three uncontroversial constraints: one constraint that bans deviations from the canonical word order (STAY), a constraint that preserves the congruent prosodic realization of the sentence in a given context (STRESS-FOCUS), and finally a constraint that accounts for the placement of the focused constituent in the word order (ALIGNFOCUS). The data pattern revealed a very large number of differences among the conditions tested, most part of which were predicted by the interaction of these three constraints. Some deviations from our predictions suggested that a strongly marked word order is not easy to accommodate, even in the licensing context. Some additional differences in the acceptability of prosodically non-congruent sentences have been accounted in terms of the effects of an early or late accent placement.

6. Conclusion

This paper has presented the results of a production and of perception experiment which have investigated the intonation of Georgian, a language with a rich tonal structure and free word order. Both experiments were based on variation in word order and prosody. We could lean on a vast literature on syntax in general, and formulate hypotheses on the basis of what is known about this language, which were largely confirmed. But as far as intonation, we could not lean on existing works and we had to develop a framework in which we could inscribe our findings on the tonal and phrasing patterns of Georgian.

In brief, the production experiment has delivered the following results. First, phrasing is pervasive in Georgian. Every constituent is

phrased individually, and each p-phrase has its own tonal contour, except for the phrase which is phrased separately. There is no such things as pitch accents, but rather the tonal contour is assigned in the domain of phrases. A very prominent element, like a narrow focus, is preferably realized as a phrase with a rise and a fall, but it can also be realized as just a rise. The choice between the two depends on the place of the phrase in the sentence. A sentence-final narrow focus is realized with a flat and low contour. In this case, the correlates of phrasing are duration, intensity and quality of the segments.

As for word order, the results of the perception experiment could confirm the hypotheses formulated in section 3.3. There is an intrinsic markedness for the order in which the constituents appear: Subject is preferably initial and verb comes rather sentence-finally. Verb initial orders are highly marked, especially in sentences with more than one constituents.

Marked word orders are better accepted when they are contextually licensed. Our experiment has shown that marked word orders are preferred when the contexts induce a focus interpretation for the immediately preverbal constituent or for the right peripheral one.

In the domain of prosody, the only hypothesis we could formulate was very low-level: given the fact that Georgian is an intonation language, we expected that the prosodic prominence would play a major role. A congruent prosodic realization (produced by our speaker when the sentence was presented in the context for which it was originally intended) should get better scores than the non-congruent one. This hypothesis was entirely confirmed by our results. Furthermore, it has been shown that the effect of prosody often overrides the effects of word order, which leads to the conclusion that prosody is the strongest cue for the interpretation of information structure in Georgian.

Glosses

3	3. person
AOR	aorist
CAUS	causative
DAT	dative
ERG	ergative

HAB	habilitative
IO	indirect object (person marker)
NOM	nominative
NV	neutral version
OV	objective version
PL	plural
PRS	present
PV	preverb
SBJ	subject (person marker)
SG	singular
SV	subjective version

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