Relation between Information Structure and Clause Internal Pauses in the Spontaneous Discourse in Korean

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ABSTRACT

This paper investigates any possible correlation between the information structure and the occurrence of clause internal pauses in the spontaneous discourse. One of the possible functions of pause is its capacity to signal the information structure of the discourse. However, this aspect was not much explored in Korean spontaneous speech. In the present study, information structure of spontaneous speech was defined for each word or word group on the basis of the information structure analysis model proposed by Van Donzel (1999) and Roulet (1991, 1997). Thus, at a local level (words or word groups) of discourse structure, a distinction was made between three types of information, new, given and inferable. The results showed that clause internal pauses tend to appear more frequently before new information than other types of information. However compared to the total number of words or word groups it was not noticed any specific ordering concerning different kind of information status and pausing. It was however found that clause internal pauses did not appear randomly. The majority of them occurred at the initial part of the clause or the sentence. This tendency was mostly related to the division of sentence (or clause) into topic and comment. Thus, the role of pauses as a marker of information structure seems to be less effective in spontaneous discourse.

Keywords: pause, information structure, new information, inferable information, given information

1. Introduction

This paper investigates any possible correlation between the information structure and the occurrence of clause internal pauses in the spontaneous discourse. Even though pauses are subject to two types of constraints : physiological and cognitive, earlier studies argued that their occurrence could be determined by the syntactic or discourse structure. That is, speakers make pauses (breathing pauses included) to coincide with major syntactic or discourse boundaries on both clause/sentence and the paragraph level (among others, Swerts et al., 1994 ; Van Donzel, 1999). Thus, full discourse boundaries include in general final syllable lengthening, boundary marking pitch mouvement and pause. Thus, the role of pause as a marker of

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discourse structure was widely attested. Besides these boundaries marking pauses (or grammatical pauses), the occurrences of internal clause pauses (or non grammatical pauses) show more complex aspects. Pausing at this point reveals diverse phenomena related to speech processing such as encoding problems as well as the speaker's strategies in the formulation of the message. Related to the latter, speakers use pausing strategies to build tension, to make listeners have specific expectations about the rest of the telling, and to draw the listener's attention before important words at this position or to plan the continuation of his/her telling (Van Donzel, 1999). Such pauses appear to support particular functions within the message. Thus, these functional pauses should be distinguished from hesitation pauses due to mainly encoding problem. In general, hesitation pauses (or filled pauses) include hesitation sound ("ehh"), false start, repetitions of utterances, words, syllables, and sounds. Of course, they have also some function in that they give a clear signal to the listener as to where the speaker is confused or not sure about how to continue (Van Donzel, 1999). However, from the speaker's point of view these pauses appear more involuntary and their occurrences were not directly influenced by discourse features. One of the most widely attested discourse features that causes clause internal pauses is known as informational status of discourse entities. Clause internal pauses are said to be realized before highly informative words (Blaauw. 1995) and the complexity of information processing plays a central role in the occurrence of pause (Goldman Eisler, 1968).

So far, many studies were conducted on the relation between the information structure and the pausing. Even though the definition of information structure at the discourse level is a very complicated process as described in Prince's (1981) study, it was revealed that at least two types of information, new and given, were relevant to the location of the pauses. That is, pauses tend to appear more frequently before a new information than a given information. From the speaker's point of view, new information constitutes an important part of discourse to which he/she want to draw the listener's attention. So, information that is new to the discourse and to the listener will be realized in a prominent way whereas information that has already been mentioned previously (given information) will generally not be as prominent. In this way, the speaker may give instruction to the listener as to where he/she should pay attention. Pause is viewed as one of the prosodic means available to the speaker to signal an important part of discourse (Van Donzel, 1999).

This evidences, however, resulted mostly from the read-aloud elicited speech. Therefore, not much is know with the same degree of certainty about the behavior of pauses in the spontaneous speech. Furthermore the binary distinction (generally used in the phonetic literature) between either given or new is possibly not sufficient to define all type of information in spontaneously occurring discourse. Van Donzel (1999) extended these assumptions by using spontaneous monologue. Moreover, based on Prince's (1981) theory, she

proposed ternary distinction in new, given, and inferable. Thus, it appears potentially more accurate in the analysis of information structure.

However, in her study as well as in the other previous studies, the relation between information structure and pausing was not exhaustively explored. Because, in these previous studies, the information analysis was restricted only to the nominal constituent. Thus, the other syntactic categories (verb, adverb, modifier, etc.) were excluded from the analysis. This is due to probably Prince's (1981) original taxonomy to which many studies make reference. Indeed, in Prince's (1981) study, verbs, for instance, were considered as part of the concepts expressed by the noun (e.g. 'reading a book' counts as one concept) and were therefore not classified separately. However, depending on the context, verbs can express valuable information and can convey different kinds of information. So, for more integral analysis of information structure, all discourse entities regardless of their syntactic categories, should be included.

Thus, taking into consideration these problems, the present study will attempt to explore the relation between the occurrence of clause internal pauses and information structure in spontaneously produced discourse. As temporal phenomena of speech, pause constitutes essential elements of prosody that organize the spoken discourse. Knowledge about pausal phenomena would not only give useful insight into the grammatical structure of spontaneous discourse, but would also be relevant for language and speech technological application. As noted by Zellner (1995), speech synthesis will sound more fluent, will be more pleasant to listen to, and will likely be more intelligible when silent and filled pauses are systematically integrated into the verbal stream. It is therefore important to consider how pausal phenomena occur in speech communication and how they are related to the textual material from which they are generated.

2. Experimental design

2.1 Speech Material and Recording

Two native speakers of standard korean, one male and one female, were selected as speakers. They were all students that were in their late twenties. The two speakers were asked to talk naturally for about 20 minutes. To create a more natural ambiance and to familiarize speakers with the recording process, we undertake a sufficient practice time before recording, until they feel completely relaxed. No commands concerning speaking style or the subjects of conversation were not given to the speakers. The recordings were made in the phonetic laboratory of the University of Paris V. with a Sennheiser MKH105 high frequency condensator microphone, and stored on DAT-tape. The recorded conversation was digitized with a 11000Hz sampling frequency at 16bits.

Two speakers have talked together for some 17 minutes[1] (total segmental duration+duration

of all pauses) about various themes (studies, health, projects etc). The conversation between two speakers was transcribed literally including all hesitations, false starts and overlapping passages. This transcription was used for analysis of information structure.

2.2 Measurement of Pauses

The location and the measurement of pauses were performed directly on the speech signal by the basis of visual inspection and auditory judgement. The auditory judgement allows to distinguish stop closures from silent pauses. The silent intervals equal or greater than 200ms were measured as pauses (breathing pauses included). According to Zellner (1995), pauses are more easily perceived if their duration is around 200ms-250ms. A 200ms criterion was selected for this study in order to provide a more detailed description on the relation between information structure and pausing. Measurements were made using WinPitch 1.91. The segmentation of the pauses didn't pose any specific problem. All occurrences of pauses were measured regardless of their location in the discourse (internal or boundary). All hesitation pauses were also measured. However, this study is restricted to the analysis of silent pauses (breathing pauses included).

2.3 Method of information structure analysis

The information structure of the conversation between two speakers was defined on the basis of ternary distinction, new, given and inferable, proposed by previous studies (Prince, 1981, Van Donzel, 1999). However, to define a more integral and objective information structure of the spoken discourse and to avoid the above mentioned problems concerning analyses of information structure, we had recourse to the information structure analysis model proposed by Roulet (1991, 1996). Inspired from Chafe's (1994) study, Roulet (1996) argues that each "speech act" (minimal discourse unit) in the discourse introduces an activated information that constitutes discourse object. The introduction of this activated information implies at least one anchor point in the discourse memory,[2] in the form of the semi-active information. This latter can be verbalized or not. Thus, the anchor point can be indicated or not by a trace (anaphore, definite expression, etc) in the act that introduce the activated information. One discourse act can have the same anchor point as the preceding act. If it is new, it is recoverable in the previous text or in the context or in the interference of them. If, in the act that introduces an activated information, it is not possible to find out any trace of its anchor point, it was taken as anchor point the semi-active information the most immediately accessible in the discourse

1) This duration did not contain the silent or filled intervals that occur at turn boundaries.
2) According to Berrendonner (1983), discourse memory contains the whole knowledges shared by speakers. It is continuously alimented by their successive utterances and by extra-linguistic elements.

memory. Even though we have very briefly presented this model, the notions such as "discourse object" and "anchor point" permit to grasp different type of information zone in the discourse regardless of syntactic identity of discourse elements. Thus, based on the different approaches proposed by Roulet (1991, 1996) and Van Donzel (1999), the information structure was defined as follow.

One discourse element (word or word group) is considered as new information, if this element introduces the information non recoverable (discourse new and hearer new) and /or if it constitutes an discourse object.

One discourse element is considered as given information, if it has previously been mentioned in the discourse or it is present in the situation of the communication (discourse old and hearer old) and /or if it constitutes an anchor point.

One discourse element is considered as inferable information, if it can be inferred from the previous context or from the listener's knowledge of the world (discourse new but hearer old). and /or if it constitutes the discourse object.

The analysis of information structure was performed on the verbatim transcription without recourse to any prosodic information, using the method described above. The clauses were taken as a referent unit ("speech act" in the Roulet's study). Note that the analysis of information structure was related to the local level of discourse structure. That is, the categorization of information status was applied to words (adverb, verb, modifier, etc.) or word groups (noun phrase, i.e. noun with subsequent particle and verbal phrase, i.e. verb with following auxiliary). Thus, it was not taken into consideration the hierarchical aspect of discourse structure. Therefore, the information structure is different from the topic organization that is concerned with the global level of discourse structure. According to Roulet (1996), information structure is one of the components that constitute topic organization of discourse.

Based on the toxonomy described above and previous claims (Van Donzel, 1999 ; Swerts et al., 1994), the general expectation concerning pausal phenomena will be formulated as follow : new information will be marked more frequently by pauses than the other types of informations. inferable information will be preceded by pauses less often than new information but more often than given information. Finally, given information will be rarely marked by pauses.

3. Results and Discussion

At first, we examined the total number of pauses that occurred in the discourse. Table 1 presents the distribution of all occurrences of pauses in relation to their position in the discourse. As can be seen from the table, the pausal strategy used by two speakers is very different. For speaker 1 (female) the total frequency of pauses is relatively low and the majority

of pauses (79%) occurred at the discourse boundary. As for speaker 2 (male), less than half of the pauses (42%) were located at clause internal positions. These results reflect a speaker-dependent pausing strategy. For speaker 1, a pause appears at every 8.1 words or word groups. Whereas, for speaker 2, it appears for every 2.8 words or word-groups. According to Van Donzel (1999), the fewer pauses used by the speaker, the more speaker is sure about what to say. However this interpretation appears excessively simplified

Table 1. Distribution of total number of pauses in relation to discourse structure.

Positions \ Speakers	Speaker 1	Speaker 2
Clause internal pauses	13 (20.6%)	102 (42%)
Boundary marking pauses	50 (79.4%)	141 (58%)
Total	63	243

To explore how the all occurrences of clause internal pauses are related to the information structure, we checked the information status of each discours element that follows pauses. The results are presented in table 2.

Table 2. Distribution of clause internal pauses, broken down for information types.

Information status \ Speakers	Speaker 1	Speaker 2
New	8 (61.5%)	62 (60.8%)
Inferable	3 (23.1%)	12 (11.8%)
Given	2 (15.4%)	28 (27.4%)
Total	13	102

As we can see from the table, for speaker 1, 61% of clause internal pauses are associated with new information, 23% with inferable information and the other 15% with given information. For speaker 2, 61% of clause internal pauses appear before new information, 12% before inferable information and the other 27% before given information. However, for speaker 1, because of the small sample size per category, the results should be interpreted with care. Two speakers show a similar tendency in the sense that more than half of the clause internal pauses are associated with new information. Thus, clause internal pauses tend to appear more frequently before new information than before other types of information. These results are in accordance with general expectations according to which information that is essential to the content of the message can be regarded as a potential landing site for pause. However, as for inferable and given information, the generally expected ordering was inversed for speaker 2.

Since, as noted by Van Donzel (1999), inferable category represents information that is neither completely new nor completely evoked, this type of information is still important to the whole discourse. So one can expect that this category could be more frequently accompanied by a pause than given information. In addition, the results show that the given information was marked with pauses more frequently than expected.

These figures make sense only when we have information about the total number of item within each category. The table 3 gives the number of words or word groups associated with a pause relative to total number of words or word groups. Since a speaker can potentially pause between each pair of words in a sentence, a word or word group boundary may be regarded as a potential pause position. Note that total number of words or word groups were obtained taking into consideration only non initial boundary constituents of the clause or the sentence.

Table 3. Distribution of clause internal pauses in relation to total number of discourse item within the essential information categories

Speakers / Information status	Speaker 1	Speaker 2
New	8 / 240 (3.3%)	62 / 268 (23.1%)
Inferable	3 / 30 (10%)	12 / 47 (25.5%)
Given	2 / 65 (3.1%)	28 / 109 (25.7%)
Total	13 / 335 (3.9%)	102/ 424 (42%)

The data shows that the ordering in this respect is different from what we have seen before. Any specific ordering concerning information status was not observed. We see that, for speaker 1, 3.3% of all new informations are marked with a pause, 10% of all inferable informations and 3.1% of all given informations. For speaker 2, 23.1% of all new informations are signaled by a pause, 25.5% of all inferable informations and 25.7% of all given informations. For speaker 2, clause internal pauses were evenly distributed through different types of information status. Moreover, variability among the speakers are high. New information, for instance, is realized with a pause in 23.1% for speaker 2 whereas only 3.3% are realized with a pause for speaker 1. Thus, pausing as marker of information structure seems less effective in this matter.

In order to explore this matter further, we examined the position of internal pauses in the clause or the sentence. Table 4 shows the relative position of pauses over the clause or the sentence. This position was expressed in the percent of the total number of syllables in the clause or sentence. As shown from the table, the majority of clause internal pauses (90% for speaker1, 67% for speaker 2) occur within the first 40% for two speakers. Only 8.8% of them occur in the last 40% for speaker 2. Thus, these results show a general tendency for pauses to occur more frequently at the initial part of the clause or the sentence and rarely appear in the final part of the clause or the sentence.

Table 4. Relative position of clause internal pauses on 20% intervals over the clause or the sentence.

Speakers / Relative positions	Speaker 1	Speaker 2
0%-20%	7 (53.8%)	20 (19.6%)
20%-40%	5 (38.5%)	48 (47%)
40%-60%	1 (7.7%)	25 (24.5%)
60%-80%	0	9 (8.8%)
80%-100%	0	0
Total	13	102

An opposite tendency was observed in the study of pausal phenomena in a Danish news reading (Malbaek Hansen et al. 1993). In their study, the pauses which did not coincide with syntactic boundaries as defined by the authors, appeared in the majority at the final part of the sentence. According to the authors, this tendency is not to be sought in syntax. They explained this tendency in terms of information structure of the sentence and the text as a whole. In other words, the internal information structure in the sentence level divides generally into two parts according to the information to be conveyed. The first part, topic, introducing theme or a new referent, is used to identify what the sentence is about, whereas the second part, the comment or rheme, conveying the new knowledge, gives the information intended to make a change in the hearer's mental model. Thus more important part is the final part in the sentence and this important part is put in prominence with various acoustic means such as insertion of pauses.

If we examine locations of clause internal pauses relative to the clause or sentence structure in the present study. we can observe this type of influence of internal information structure of sentence on the pausing. Indeed we observe that for two speakers 64.3% (6/13 for speaker 1, 68/102 for speaker 2) of clause internal pauses occur after the first discourse element of clause or sentence. These elements have, of course, a grammatical function within the clause or the sentence. 17% (17/102 for speaker 2) of them correspond to subject (marked by subject particle /i/, /ka/), 17.6% (18/102 for speaker 2) to thematic constituent (marked by topic particle /in/, /n in/) and 34% (6/13 for speaker 1 and 33/102 for speaker 2) to adverbial constituent (adverb of time or place marked by locative particle /esʌ/ "at", sentence adverb such as /mullon/ "of course", /manjak ˇ-e/ "if-locative particle", /idʒe/ "now" etc. and adverb /tʒʌmdʒʌm/ "gradually", /tʒintʒ'a/ "really", etc.). However, These discourse elements have another important function in the clause or the sentence. In addition to being the subject, the thematic or the adverbial constituent of the sentence, at the same time they constitute the topic of the sentence (except for adverbs and sentence adverbs). That is, placed at the initial position in the clause or the sentence, they were used to identify what the sentence is about. Note that, however, topic

does not always introduce given information, it can introduce new referent as well as inferable referent, likewise comment does not always convey new information but it can also convey given or inferable information. Others have already noted that it is common to find an initial noun phrase subject followed by a pause (Swerts et al., 1994). However their study was based more or less on restricted speech. The results of the present study suggest that internal topic boundaries in the sentence level are still marked with pauses in spontaneous speech.

Besides these units, the other 23.5% of clause internal pauses appear after a discourse marker (6/13 for speaker 1, 21/102 for speaker 2). Discourse markers (/kinde/ "by the way", /kesʌ/ "so", kik'a/ "so", /kirigo/ "and then" etc.), at sentence initial position, indicate the major transition points between the different parts of discourse. According to Van Donzel (1999), this type of information will be followed by a pause as an indication to the listener that the speaker is about to continue his/her story and that something important is coming up. But by pausing right after discourse marker, speaker signals also he/she is apparently not quite sure about how to continue it. In this respect, pauses after adverbs and sentence adverbs seem to behave like as pauses after discourse markers, That is, pauses after adverbs and sentence adverbs signal primarily speaker's intention to continue his/her speech, And at the same time, they allow the speakers to programme the rest of their sentence.

Finally, only a few of the remaining pauses occur after modifiers (3.9% 4/102) and objectives of the sentence (7.8% 8/102) for speaker 2.

These results show that clause internal pauses do not occur randomly at least in the present study. They tend to appear at the initial part of the clause or the sentence and these early positions seem to reflect boundary of internal information structure (topic and comment) in the sentence level. Even though the comment part conveys more important information, pauses do not intervene between discourse elements that constitute comment in order to put them in prominence[3] in the present study. And this abstraction of pauses in the comment part seems to result in low rate of new information marked by pauses. Thus, the role of pauses as a marker of information structure was relevant in relation to division of sentence (or clause) into topic and comment but was of less importance in the marking of information status of discourse elements.

These results lead us to the cognitive explanation of pausal phenomena. According to Goldman Eisler (1968), a pause is the external reflection of some of the cognitive processes involved in speech production. In this sense, pauses provide additional time during which the final output can be planned and programmed. Thus, pausing after a discourse marker and topic constituent seem to allow the speakers the time to structure and programme their sentence. And this assumption can be supported by the fact that it was usually observed that a rather long and more complex list of items come after pauses. These phenomena appeared more evidently for speaker 1.

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3) Pausing is not the only means available to the speaker to mark prominence. Other means include pitch accent, variation in intensity and variation in vowel quality etc.

4. Conclusion

In this study, we explored the role of clause internal pauses as a marker of information structure in spontaneous discourse. Clause internal pauses i.e. those not realized at major syntactic boundaries are related to the marking of local information structure. The information structure was defined for each word or word group on the basis of information structure analysis model proposed by Van Donzel (1999) and Roulet (1991, 1996).

The results of the present study showed that the occurrence of clause internal pauses per different information type are roughly in accordance with what we expected on the basis of the literature. That is, more than half of the clause internal pauses appear before new information. In this respect, pauses seem to contribute to the marking of information structure. However, the data did not show a clear order in the relation between different types of information and frequency of pauses. Furthermore, compared to the total number of words or word groups in the discourse, we did not observe any specific ordering concerning information structure and pausing. That is, new information and inferable information were marked with pauses less often than was expected whereas given informations were marked with pauses more often than was expected. This can be explained by the fact that the majority of clause internal pauses appeared at the beginning part of the clause or the sentence. And this tendency was mostly related to internal information structure of the clause or the sentence. Thus, the role of pauses as a marker of information structure was relevant in relation to division of a sentence (or clause) into topic and comment but was of less importance in the marking of information status of discourse elements. However, for a more reliable conclusion, further investigations with more speakers and more various speech materials are necessary.

Note that, in the present study, we have focused specifically on the informational aspects of the text in order to explain occurrence of clause internal pauses used by speakers. But these does not mean that other factors such as rhythmic and temporal factors, cognitive constraint, degree of inter-lexical cohesion and situational constraint are not important for the occurrence of clause internal pauses. Moreover, interactive aspects to which the present study did not pay specific attention will have influence on pausal structure.

To conclude, the factor information status in terms of new, given and inferable, mentioned in several studies as an important contributor of pausing, seems to be less effective than expected in spontaneous discourse. Because, the information status of a word (or word group) can be changed or altered for a communicative purpose particularly in spontaneous speech. Information that is already mentioned may be put on prominence in order to be emphasized. However, the change of information can in fact only be made when prosodic informations were taken into consideration in the analysis. Therefore, in order to grasp these dynamic aspects of spontaneous speech, and to obtain more reliable cues from the text (without recourse to prosodic

information), instead of local and linear analyses of information structure, it may be necessary to utilize more global and non-linear discourse analysis which considers hierarchical aspects of discourse organization as well as pragmatic function of individual elements.

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