Pauses in speech by French speakers with Down Syndrome

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Abstract

A better understanding of the control mechanisms of speech in verbal interaction is very important for the evaluation of the pragmatic competence of a mentally deficient speaker. This study focuses on pauses in the oral production of a Speaker with Down syndrome involved in a conversation : it brings to light the temporal compensation mechanisms which allow the speaker to go beyond the distortions of the segmental level. It confirms the important role of prosody in the success of a conversation, particularly with a speaker who has a handicap which disrupts language structure. Down Syndrome is a condition characterised by an overall delay in cognitive, social, linguistic and motor development. At the oral production level, it leads to deficits in segmental and supra-segmental speech patterning. The goal of this study is to bring elements of response to the following question : is the pragmatic function of language preserved in spite of significant distortions of the motor functions of the phonatory organs ? The description of the management of pauses by a speaker with Down syndrome involved in a conversation makes it possible to clarify this subject, while taking into account the various functions which are specific to them beyond the respiratory function : their role in encoding, in the delimitation of syntactic boundaries, and in the regulation of speaking turns, among others.

This study allowed us to define criteria which make it possible to characterise the oral production of a Speaker with Down syndrome. These elements relate to the variation of the frequency and the length of pauses. The results obtained are the following:

1.a high frequency of occurrence of pauses in the production of the trisomic speaker

2.a frequency of occurrence of "mixed pauses", of which the majority have very long lengths, this element revealing a lack of ease and disfluency on the production level;

3.a significant recourse to false-starts, hesitation, repetition and lengthening, to mark sound pauses;

4.a considerable number of very long pauses pauses;

5.a relatively high number of pauses located at the boundaries of or within syntagms, with rather long lengths of intra-syntagmatic uses;

We furthermore noted a rarity of long phonic sequences in the speaker with Down syndrome, these sequences seldom exceeding 2000 ms.

In spite of these results, it is important to note that we have defined parameters which show that the speaker with Down syndrome integrated rules relating to the management of pauses in verbal interaction.

1. Introduction

Down Syndrome is a condition characterised by an overall delay in cognitive, social, linguistic and motor development [1] [2]. At the oral production level it leads to deficits in segmental and supra-segmental speech patterning [3]. A better understanding of the control of vocal and gestural mechanisms in verbal interaction is essential for a comprehension of the linguistic and pragmatic competence of subjects with Down Syndrome. The goal of this study is to bring elements of response to the following question : is the pragmatic function of language preserved in spite of significant distortions of the motor functions of the phonatory organs ? The description of the management of pauses by a Speaker with Down syndrome in a verbal interaction makes it possible to clarify this subject, while taking into account the various functions which are specific to them beyond the respiratory function : their role in encoding, in the delimitation of syntactic boundaries, and in the regulation of speaking turns, among others.

Research carried out on normal speech patterns has made it possible to define several types of pauses [4] :

- silent pauses (SP) ; they can be respiratory or not ;

- non-silent pauses (NSP) or filled pauses ; they are divided into 4 sub-categories : hesitation (uh, well, etc.) ; false starts (start followed by a reformulation) ; repetitions (involuntary repetition of one unit) ; lengthened syllables ; these vocal units are produced by the speaker.

We have integrated one other sub-category in non-silent pauses : pauses of regulation, produced by the listener, which consist of indices of regulation of the type "hmh", "yeah", "mm", etc. : considering the specificity of our corpus, it appeared relevant to us to distinguish this last sub-type of non-silent pause from the others.

In addition to "silent" and "non-silent" pauses, we have introduced a third category, that of "mixed pauses". This type consists of a succession of one or several silent pauses and of one or more non-silent pauses ; the various configurations which we have grouped into this category are the following :

- a silent pause preceded and/or followed of a non-silent pause

- a silent or filled pause, produced by the speaker, preceded and/or followed of a regulatory index produced by the hearer.

Contrarily to other authors [5], considering the specificity of the sample retained within the framework of this study, namely a conversation between two speakers, it seemed necessary to us to introduce this third category of pause and to distinguish it from the preceding ones, since, on the one hand, they give an account of specific conversational strategies, and on the other hand, it is important to consider the impact which they can have on the perceptive level in terms of degree of fluidity and discursive affluence.

Research carried out on normal speech has been an attempt to explain the nature of the parameters correlated with the frequency and the length the of pauses. This reveals that the length of the pauses seems to vary according to individual [5] [6] and contextual parameters [5] [6] [7] [8] (among these parameters we can cite pauses category, type of speech, and rate).

In this study , we will thus analyse the variation of the frequency and the length of the pauses according to some selected parameters, in a conversation involving a young adult with Down Syndrome.

2. Experimental procedure

<u>Speakers</u> : The speaker with Down syndrome (A) is a 22 year old male suffering from a slight mental deficiency. He was initially schooled in a normal classroom before his placement in a medico-educational institute. He can read and write. He underwent speech therapy between the ages of 5 and 14. He is severely myopic, has significant respiratory disorders due to the deterioration of the interventricular and interoricular communication. and pulmonary arterial hypertension. He has fairly good language production, no major difficulties with morphosyntactic structure, but significant problems on the articulatory level sometimes make him incomprehensible to listeners. The other speaker (B) is a 22 year old student, a co-ordinator in a centre offering various activities to young people with mental and/or motor handicaps. The two speakers know each other well since they met during the production of a play, the young Down Syndrome adult being one of the actors.

<u>The sample</u> : in this study, we are dealing with an somewhat spontaneous conversation, which actually lasted about thirty minutes and took place on the premises of the centre mentioned above. The sample retained for analysis lasts about 19 minutes. The corpus was transcribed using a Sanyo TRC-8800 transcriber : we have produced a phonetic transcription by using the IPA as well as some extensions of this alphabet [17].

<u>Analysis equipment</u> : Length measurements were taken using Winpitch II software. We took into account the oscillograph tracing as well as the amplitude curve and the fundamental frequency. In many cases, it was necessary to compare the three curves in order to obtain a reliable measurement.

3. Results

	Speaker A	Speaker B	TOTAL
Phonatory time (without pauses)	17.08%	44.16%	61.24%
Intra-speaker pause times	17.06%	9.97%	27.03%
TOTAL	31.14%	54.13%	

Table I – Phonatory time and Intra-speaker pause times for Speakers A & B.

Category	Speaker A	Speaker B
SP	34.4%	47.4%
MP	55.2%	40%
NSP	10.4%	12.6%

Table 2 – Percentage of intra-speaker pause category for both speakers

	Speaker A	Speaker B
False-starts	29%	12.79%
Hesitations	24%	40.69%
Repetitions	15%	2.32%
Lengthening	32%	44.18%

Table 3 – Recourse to false-starts, hesitations, repetitions, lengthening in both speakers' mixed pauses

Firstly, as regards intra-utterance pauses, this study shows that speakers do not manage the difference between time allotted to pauses and to phonation in the same way: The speaker with Down syndrome allots half of his speech time to pauses, whereas in other speaker's production, the proportion is in a ratio of one to five. Pauses are more frequent and longer in the speaker with Down syndrome, and particularly mixed pauses, whereas the other speaker makes more frequent use of silent pauses. As regards "duration categories", short pauses are most frequent in both speakers, but the number of long pauses is excessive in the production of the speaker with Down syndrome.

Concerning non-silent pauses, unintentional repetitions or false starts are rarely observed in the normal speaker, who would rather uses hesitations with vocal unit lengthening. The speaker with Down syndrome uses false starts and repetitions more frequently, and when lengthening is observed, it does not exclusively concern vocalic units, but consonantal units as well.

Pauses are characterised by a syntactic function, which corresponds more frequently to a sentence frontier in the normal speaker, and the least often to a boundary between or inside phrases. In the production of the speaker with Down syndrome, we notice an impairment of the

syntactic function : pauses are quite often located between, or inside phrases.

4. Discussion

Language impairment analysis is very problematic when based on a single case study, mainly because it may be dangerous and inaccurate to distinguish elements relating to pathology from individual characteristics. It also seems hazardous to generalise from only one case. Nevertheless, beyond individual strategies, which are characteristic of normal and disabled speakers with language impairment, some of the observed phenomena are indisputably due to a language dysfunction.

Our initial aim in this study was to explore pragmatic competence in a speaker with Down syndrome involved in a conversation. The choice of temporal criteria (pauses in this contribution) seemed to be obvious : actually, temporal control is a fundamental and necessary component for successful verbal interaction. Its analysis allows us to understand the way rules of interaction are controlled (or not) by a speaker.

This study reveals that, generally speaking, the speaker with Down syndrome has obvious control over the management of some of the temporal parameters which relate in particular to the organisation of the "duration categories". The impairment appears primarily through the imbalance in the "effective" speaking time and the time devoted to pauses, which translates a lack of fluency as well as efficiency in temporal management. Time allotted to pauses is too important compared to the standard rules of conversation in the French language. But this time of pause is far from useless. To the contrary, it is firstly an "efficient time" since unquestionably it corresponds to the encoding function. Secondly, non silent pauses, especially mixed pauses, reveal how the speaker with Down syndrome is willing to take an active part in the conversation : at no time, even after very long pauses, does he give up ; in spite of his disability, he shows that he has an accurate perception of the rules of interaction, and that he is willing to participate fully as an interlocutor. From this point of view the way in which he is involved in the conversation contributes to its success. Moreover, the fact that the other speaker does not seem to be disturbed by very long pauses (and does not take advantage of them) is a guarantee that the speaker with Down syndrome's turn and speaking time belong to him completely.

Elements that contribute to the perception of disfluency in the speaker with Down syndrome are excessive pause length, as well as disproportionate use of filled or mixed pauses (especially repetition or false-starts). These phenomena make it difficult to understand him (especially for uninformed listeners). These objective, measurable elements, which correspond to a disfluency in speech production, reveal the existence of more complex problems (concerning lexical access, morpho-syntactic construction, etc). Nevertheless, it is obvious that encoding function is actually used by the speaker with Down syndrome.

It appears to us that these elements constitute a base on which specialists can rely to improve the efficiency of the speaker with Down syndrome's contribution to a conversation, so that the same elements which reveal a disfluency could sometimes be the expression of encoding problems.

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Duration Category	SP A	SP B	MP A	MP B	NSP A	NS B	TOTAL A	TOTAL B
I (0-500 ms)	7.27%	8.65%	0.57%	0.96%	1.53%	1.92%	**9.37%**	**11.53%**
II (501-1000 ms)	2.68%	2.88%	4.40%	3.84%	1.91%	1.15%	**8.99%**	**7.87%**
III (1001-1500 ms)	1.72%	0.96%	4.40%	3.84%	0%	0.38%	**6.12%**	**5.18%**
IV (1501-2000 ms)	0.38%	0.57%	4.78%	1.92%	0%	0%	**5.16%**	**2.49%**
V (2001-2500 ms)	0%	0.38%	2.10%	0.96%	0.19%	0%	**2.29%**	**1.34%**
VI (2501 – 3000 ms)	0%	0%	1.14%	0%	0%	0%	**1.14%**	**0%**
VII (> 3000 ms)	0.19%	0.19%	1.91%	0%	0%	0%	**2.1%**	**0.19%**

Table 4 – Pauses and duration category in both speakers.

Frontier type / Duration category	Proposition Speaker A	Proposition Speaker B	Inter-syntagm. Speaker A	Inter-syntagm. Speaker B	Intra-syntagm. Speaker A	Intra-syntagm. Speaker B
I (0-500 ms)	14.7%	32%	5.5%	2.8%	6.6%	6.1%
II (501-1000 ms)	13%	20.1%	7%	4.1%	6%	3.4%
III (1001-1500 ms)	11.4%	12.1%	3.3%	2.8%	2.7%	2.8%
IV (1501-2000 ms)	8.2%	5.4%	2.7%	2.1%	3.8%	0.8%
V (2001-2500 ms)	3.3%	4.8%	1%	0%	2.2%	0%
VI (2501 – 3000 ms)	2.2%	0%	0.5%	0%	0%	0%
VII (> 3000 ms)	5.4%	0.8%	0%	0%	0.5%	0%
TOTAL	**58.2%**	*75.2%*	**20%**	*11.8%*	**21.8%**	*13.1%*

Table 5 – Pauses occurrence, syntactic distribution and duration category in both speakers

Type of pause / Duration category	IBA PS	IBA PNS	IBA PM	TOTAL IBA	IAB PS	IAB PNS	IAB PM	TOTAL IAB
I (0-500 ms)	48.23%	3.53%	0%	**51.76%**	50.49%	0%	0.97%	**51.46%**
II (501-1000 ms)	11.76%	4.71%	7.06%	**23.53%**	15.53%	0.97%	8.73%	**25.23%**
III (1001-1500 ms)	8.23%	0%	3.53%	**11.76%**	6.80%	0%	2.91%	**9.71%**
IV (1501-2000 ms)	0%	1.18%	4.71%	**5.89%**	3.89%	0%	3.89%	**7.78%**
V (2001-2500 ms)	0%	0%	1.18%	**1.18%**	0.97%	0%	1.94%	**2.91%**
VI (2501 – 3000 ms)	0%	0%	1.18%	**1.18%**	0%	0%	0.97%	**0.97%**
VII (> 3000 ms)	0%	0%	4.70%	**4.70%**	0%	0%	1.94%	**1.94%**
TOTAL	**68.22%**	**9.42%**	**22.36%**	**100%**	**77.68%**	**0.97%**	**21.35%**	**100%**

Table 6 – Inter-turn pauses and duration category in both speakers.