

Deuxième Colloque Européen "Recherches et Théories Psychologiques sur le Retard Mental,  
organisé par l'Association pour la Recherche et la Formation en Psychologie de  
l'Education et du Développement et le Laboratoire de psychologie du Développement de  
l'Université de Provence à Aix-en-Provence du 27 au 29 mai 1998.

## **MORPHOSYNTAX, METASYNTAX AND MEMORY IN X-FRAGILE SYNDROME AND DOWN'S SYNDROME**

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### **1. Theoretical frame.**

From articulation to ideas, all aspects of language are strongly linked. There are now several hypotheses to explain these links, their synergy and their developmental sequences in 2-year-old to 10-year-old children (Ferguson, 1978; Schwartz et al. 1980; Panagos, 1982; Caramata & Schwartz, 1985). The modularity of language is the most well-known of these hypotheses.

The analysis of language difficulties in SLI children (Specific Language Impairment children) with normal cognitive abilities and in mentally retarded children (with genetic pathologies) gives us the opportunity to test these different hypotheses. The language specificities of these different syndromes allow us to analyse the reciprocal and sequential effects of the different language components. This procedure has a theoretical and fundamental interest but also a practical interest. Effectively, it leads to numerous applications in speech and language pathology (concerning the pathologies definition as well as the hierarchisation of the therapeutical goals and the construction of the therapeutical programs).

### **The "between syndrome" language differences.**

The analysis of the language specificities of the two most frequent genetic syndromes and their comparison with the language of normally developing children has a theoretical and practical interest. Our study focuses on language specificities of X-fragile and Down's syndrome children.

The X-fragile syndrome, which biological characteristics and transmission modalities have been known for about ten years, is the most frequent cause of hereditary mental retardation. This pathology has a different impact on boys and girls. 1/4000 boy present the abnormality for only 1/7000 girls.

Literature reports that children with X-fragile syndrome have a relatively intact lexicon and syntax. The difficulties are observed in abstract reasoning, pragmatical communication, auditive treatment of the information, speech muscles coordination (Scharfenaker & al., 1996). Behavioral troubles are with these language difficulties characteristic of the pathology: hyperkinesy, attentional deficit, agressivity, anxiety, (évitement of regard) and comportemental stereotypies (Goldson & Hagerman, 1992). Some studies report abnormal speech rate (rythm), difficulties in non-duplicate syllables repetition and relatively intact lexical abilities. But published data concerning language problems in X-fragile syndrome are very rare. Data concerning syntactic abilities are rare and contradictory (Rondal, 1997; Gérard, 1998).

Down's syndrome is the most frequent genetic abnormality (1/800 child). In this pathology, all language aspects are severely disrupted: phonology, lexicon, morpho-syntax and metalanguage. Language impairments are better documented in Down's syndrome than in X-fragile (see Rondal and Edwards, 1997 for a review of the literature; Comblain, 1996a; Piérart, 1997 and in press). Memory is also impaired (Comblain, 1996 a and b for a review of the literature).

Developmental interpretation of the data are the most interesting part of this study. Is the language development of the described genetic syndromes simply delayed (globally or restrictively) compared with the one of normally developing children ? Or is the language development qualitativeley and quantitatively different in genetic syndromes and normally developing children. Answering these questions is of a great interest for speech and language therapy.

## **2. Experimental design**

**2.1. A new assessment tool : ISADYLE** (Piérart, Comblain, Grégoire, Mousty, Noël, in preparation).

French oral language tests are based on old theoretical positions (1962 is the most recent reference). Only one level of analysis is presented. Sample are composed of children age from 4-year-old to 8-year-old.

Our research on children's language components has four goals :

- a) to construct a long version of a language test in order to make a precise examination of language impairment in children;
- b) to construct a short version of a language test (only the statistically discriminant items of the long version of the test will be used in the short version);
- c) to realise proportionately stratified samples in French part of Belgium.
- d) to construct a longitudinal and transversal oral language data bank on 1200 children aged from 3-year-old to 12-year-old.

## **2.2. Samples.**

The battery ISADYLE has been applied to two samples of mental retarded childrens from 9-year-old to 12-year-old. The first sample is composed of 9 children with an X-fragile syndrome. The second sample is composed of 9 Down's syndrome children, stritely paired to the first ones on the chronological age. Their results will also been compared to their of mentally normal children from the same chronological age and the same mental age.

## **2.3. Items and tasks.**

Ten tasks are proposed in order to assess comprehension and production of morphosyntax. Moreover, a repetition task and a metasyntactic task are also included in ISADYLE. The material used for this part of the test is composed of pictures and toys (playmobils).

1. Production and comprehension of simple sentences (“ S+V ” and “ S+V+O ”). These sentences are proposed before the most complex ones.
2. Production and comprehsnion of passive sentences. We only use “ actional ” verbs. The sentences are plausibly reversible and non-plausibly reversible.
3. Comprehension of relative clauses (in grammatical subject group). We only use the pronouns “ qui ” (who) and “ que ” (whom).
4. Comprehension of subordonate clauses. In half of the sentences events are produced in the same order than in the reality. In the other sentences events are not produced in the same order than in the reality.
5. Comprehension of interrogative sentences : intonation, “ est-ce que ”, “ verb-subjects ”

order, “ pourquoi ” (why), “ comment ” (how) and “ qui ” (who).

6. Comprehension of negative sentences. Negation is marked by “ ne ... pas ”.
7. Production and comprehension of verbal temporal marks : three tenses for children under 8-years-olds (passé composé, présent and futur progressif) and three tenses for the children above 8-years-old (imparfait, présent and futur simple).
8. Production and comprehension of pronouns (third person in the singular form) in subjects and object grammatical functions.
9. Comprehension of definite (le, la, les) and indefinite (un, une, des) articles.
10. Directed production task. Children must complete a sentence which starting is produced by the experimenter.
11. Sentence repetition task. These sentence correspond to those tested in comprehension and production parts of ISADYLE.
12. Metasyntactical assessment. Detection and correction of grammatical errors.
13. Working memory tasks. Nonword repetition and digit span.

### **3. Results and discussion.**

We decide here to summarise our results. More details will be presented in the oral communication.

Results of morphosyntactic assessment show great similarities between the difficulty of linguistic structure proposed in Down's syndrome subjects, X-fragile and in non-delayed children. Errors of these groups are also similar. These results confirm those previously obtained by Comblain (1996c), Comblain, Fayasse and Rondal (1993a,b,c) with mild mentally retarded subjects, moderated mentally retarded subjects of mixed etiologies and normal children. Data favour the hypothesis of continuity in grammatical development and functioning between normal children and mentally retarded subjects as well as between mentally retarded subjects themselves. Intersyndromic differences observed in morphosyntactic abilities seems to be in favour of the X-fragile syndrome subjects.

Concerning working memory performance of Down's syndrome subjects and X-fragile subjects, they are inferior, for both groups, to the level expected regarding the mental age of the subjects. Digit span is rarely superior to 2 digits and subjects do not repeat nonword exceeding a length of three syllables. It seems so that both group of mentally retarded subjects share the

same pattern of working memory deficit.

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