Chapter 1

General introduction

1.1 Introduction

In modern society, a tremendous amount of information exchange makes use of some form of written language. The ability to decode and produce written language does not emerge ‘spontaneously’, but has to be learned. The majority of children has no problems when they are formally taught to read and write. However, a small, but substantial proportion of children has severe problems with the acquisition of literacy skills. Developmental dyslexia refers to such a disturbance in the acquisition of reading and spelling skills.

Not everyone who experiences these problems is diagnosed with developmental dyslexia. The American Psychiatric Association uses the term developmental dyslexia when reading achievement as measured by individually administered tests of reading accuracy or comprehension is substantially below the expected given the person’s chronological age, measured intelligence and age appropriate education (DSM-IV, 1994). Hence, not a low level of reading performance is decisive, but the discrepancy between reading and general intelligence level. The average population risk of developmental dyslexia is around 3-10%, however, the risk of first-degree relatives of dyslexics is estimated around 40% (Gilger et al. 1991), suggesting a genetic component to the disorder.

Developmental dyslexia is a heterogeneous disorder. Converging evidence has pointed to a deficit in the phonological domain, but visual problems have also been shown (Stein & Talcott, 1999). This thesis will not go into the visual deficits associated with developmental dyslexia, nor will it concentrate on the reading and writing problems. Rather, it will focus on oral language. The reason to study the development and

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1 Visual and phonological problems may both stem from the same source. An important hypothesis pinpoints the visual and phonological deficits to an impairment in magnocells (see Stein & Talcott, 1999 for an overview).
processing of spoken language in developmental dyslexia has been brought about by indications that indeed the problems of dyslexic children are not restricted to the written domain, but that they also surface in spoken language. However, oral language skills in dyslexia have not received much attention in the literature and therefore tests of those skills are needed for insight into the pattern of language performance.

In particular, sensitivity to subject-verb agreement will be measured in three different dyslexic populations: kindergarten children at familial risk for dyslexia, eight year old children and adults, by means of two different experimental methods: investigating linguistic behaviour (using a grammaticality judgement task and analysing spontaneous speech) and a neurophysiological study (using Event-Related brain Potentials (ERPs)).

Furthermore, the performances of the eight year old dyslexic children will be compared to those of children with Specific Language Impairment (SLI). SLI refers to a specific language impairment, in the sense that language acquisition is affected in the absence of any obvious neurological, physical or cognitive deficits. Like developmental dyslexia, there is a genetic component to the disorder (Bartlett et al., 2002; the SLI Consortium, 2002). The language deficit of children with SLI can take many forms: morphosyntactic problems are often observed, just like word-finding difficulties and phonological impairment (Leonard, 1998). Studies of school going children with SLI indicate that they have more chance of experiencing difficulties with the acquisition of literacy skills than children without language problems. Thus, at first sight an overlap seems to exist between the symptoms displayed in children with developmental dyslexia and children with SLI. In this thesis, children with dyslexia will be directly compared to children with SLI to further investigate commonalities between the two syndromes.

The overall aim of this dissertation is to gain insight into oral language skills in developmental dyslexia with specific attention to subject-verb agreement. Agreement morphology has, as yet, not been researched in developmental dyslexia which is needed in order to acquire fuller understanding of the extent and properties of aspects of morphosyntactic functioning in dyslexia. Such information is not only vital for a linguistic typology of dyslexia, but may furthermore be used to review theoretical explanations of (morpho-)syntactic problems in developmental dyslexia. An important hypothesis explaining grammatical disorders in child language is that these stem from problems with auditory perception, phonological segmentation and/or verbal working memory limitations. Tests that measure these abilities have been administered and will be related to the results on the grammaticality judgement task to investigate the latter assumption.
1.2 Outline

This dissertation is structured in the following way.

In chapter 2, existing evidence on weaknesses in oral linguistic development, and in particular on affected (morpho-)syntactic ability in children with developmental dyslexia will be discussed. Different theoretical views on the possible nature of such problems will be offered. In particular, three hypotheses on the relation between written and oral language will be examined. The first one is that the observed language problems of dyslexic children relative to their normally reading peers are the result of the reading problems of dyslexic children. Exposure to written text enhances a child’s awareness of linguistic structures. As the level and amount of text that dyslexic children are able to read is reduced compared to normally reading children, sensitivity to and development of language may also lag behind. A second hypothesis suggests that the phonological problems that underlie reading problems also underlie grammatical deficits. A third claim on the relation between reading and oral language is that difficulties with oral language interfere with the development of literacy skills as bootstrapping from semantic and syntactic skills cannot be optimised.

Furthermore, the diagnostic category ‘SLI’ will be presented. Common grounds between the two syndromes will be explored, and it will be investigated whether there are similarities in the breakdown of morphosyntactic and reading behaviour. The relation between these two types of language impairment will be discussed and it will be investigated whether assumptions on the source of the morphosyntactic deficits in SLI may apply to developmental dyslexia.

Chapter 3 will outline the main research questions that will be addressed in the different experiments. In addition, the linguistic background of subject-verb agreement will be presented.

In chapters 4 and 5, data will be provided from two (potentially) dyslexic populations. Children at familial risk of developing dyslexia, but who are at pre-reading age and children with established developmental dyslexia will be examined on their sensitivity to subject-verb agreement using a grammaticality judgement task. In chapter 4, it will be investigated whether decreased sensitivity to subject-verb agreement is a linguistic marker for developmental dyslexia in children who are at pre-reading age. Furthermore, the hypothesis that sensitivity to agreement morphology depends on phonological ability will be addressed, by comparing performance on phonological tasks
with grammaticality judgement performance. In addition, the predictive value of
phonological and early literacy skills in relation to reading will be evaluated.

Chapter 5 studies agreement morphology in children with developmental dyslexia
who are around 8 years old. In this chapter, the aim is to gather converging evidence on
the existence of morphosyntactic weaknesses in children with dyslexia of that age and to
investigate whether these are characteristic for dyslexic children. Sensitivity to agreement
morphology will be interpreted relative to normally reading children, who are at the same
age as the dyslexic children, but also relative to normally developing children who have
the same reading level and who are consequently around one and a half years younger. In
this way it can be investigated whether any observed difference between normally reading
children and dyslexic children with respect to sensitivity to agreement morphology is an
effect of the difference in reading ability itself. The second hypothesis that phonological
skills influence processing of inflectional morphology will furthermore be tested by
relating the results on the grammaticality judgements to measures of different levels of
phonological processing: speech perception, phonological awareness and verbal working
memory ability. In addition, the pattern of performance on judging the grammaticality of
sentences violating subject-verb agreement will be directly compared to that of children
with SLI. Do the data provide evidence for an overlap in the performances between these
two groups? Word decoding, speech perception, phonological awareness and verbal
working memory will be taken as variables to examine the relation between these and
sensitivity to subject-verb agreement. Furthermore, several accounts of morphosyntactic
deficits in SLI will be highlighted and it will be examined whether the data of both
experimental groups can be explained by these accounts.

Another window on processing agreement information in developmental dyslexia
will be presented in chapter 6. Neurophysiological responses to violations of subject-verb
agreement, and another type of ungrammaticality (phrase-structure violations), will be
investigated in adults with dyslexia relative to subjects without dyslexia. Two well
described ERP components, the P600 and the Early Left Anterior Negativity (ELAN)
triggered by morphosyntactic and phrase-structure violations will be elicited to answer the
question whether brain behaviour in response to processing morphosyntactic and word
category information in dyslexic subjects differs from that of normal language users.

Chapter 7 is devoted to draw conclusions on the research questions as posited
above, and will link up the experimental results acquired in the different studies.