The language-screening instrument SNEL

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Chapter 1

General introduction

This chapter introduces two main topics that will be addressed in this thesis. The first topic concerns the following question: “What is language, and what is meant by a language problem?” This question is essential to the second aim of this thesis, which was to develop and to validate a language-screening instrument for identifying children who are at risk for language problems. In the final section, the outline of the body of this thesis will be discussed.

1.1 What is language and what is meant by a language problem?

What is language? The Cobuild dictionary gives following definition:

Language is a system of communication which consists of a set of sounds and written symbols which are used by the people of a particular country of region for talking or writing.

Language plays an important role in everyday life, and it has been the object of many studies. The phenomenon of language is complex, and it is not always clear what language is. Saffran et al. (2001) provided a relevant description of the complex phenomenon language. “Imagine that you are faced with the following challenge. You must discover the internal structure of a system that contains tens of thousands of units, all generated from a small set of materials. These units, in turn, can be assembled into an infinite number of combinations. Although only a subset of those combinations is correct, the subset itself is for all practical purposes infinite. Somehow you must converge on the structure of this system to use it to communicate. And you are a very young child.” (units = words, materials = a small set of sounds from which the words are constructed, combinations = sentences into which words can be assembled).

There are different orientations toward language (e.g., linguistic, cognitive, biological,
neurological, psychological) depending on the background of professionals. These different orientations are very useful for developing a full understanding of language and its evolution. Christiansen and Kirby (2003) stated that language arises from three distinct but interacting adaptive systems: individual learning, cultural transmission, and biological evolution. The aim of the study of language evolution is to understand how these systems interact along three different timescales: the lifetime of the individual (tens of years), the language (thousands of years), and the species (hundreds of thousands of years). Individual learning refers to the process of adaptation of the individual’s knowledge. Cultural transmission refers to the adaptation of knowledge concerning particular languages, which persists over time and is used repeatedly as input for individual learners (i.e., the adaptation of languages themselves to fit the needs of language learners). Biological evolution refers to the natural selection of the mechanism of adaptation (Christiansen and Kirby 2003).

This thesis focuses on the child as a language learner (individual learning). A key problem of this study is how to define language development and language problems. The profile of a child’s language development may sometimes deviate from the language profiles of other children, due to the disordering of one or more of the conditions that are necessary for the acquisition of language. Language problems may be due to other problems (Bishop 1997; Chapman 2000; Goorhuis-Brouwer and Schaerlaekens 2000), such as mental retardation, pervasive developmental disorders or autism, physical handicaps, hearing loss, environmental deprivation, neurological problems, or a combination of these factors. The child may also have a language problem that may have no clear etiology (e.g., specific language impairment). Children with language problems should be identified and diagnosced as early as possible (Blackman 1999; Mattson et al. 2001; Rescorla and Alley 2001), as these problems influence the overall development of a child. Contributing factors—as well as language problems themselves—should be addressed and resolved if possible in order to preclude further problems including difficulties in verbal, emotional, and educational development (Coster 2001; Silva et al. 1987).

It is not always clear when a child has a language problem. Enderby and Emerson (1995), p. 34, state that the normal acquisition of speech and language shows considerable variation and that it is not always easy to distinguish between children who are at the lower range of normality and those who deviate from the usual patterns of speech and language development. This thesis verifies how Dutch professionals define, screen, and diagnose language problems in children. It further describes various classifications of definitions of language development and language problems that are found in the literature.

1.2 The development of a language-screening instrument

The Dutch Health Insurance Board asked us to develop a language-screening instrument to facilitate the referral of children who are at risk for language problems from primary to
1.2 The development of a language-screening instrument

Secondary healthcare services. Secondary healthcare professionals can diagnose hearing, psychological, psychiatric, motor, neurological, or other problems that are possible causes of language problems. A screening instrument creates an effective link between primary and secondary healthcare. A fast, simple, and sensitive language-screening instrument can make a valuable contribution to the screening of children who are at risk for language problems.

Item selection

Although it is not always obvious how language development or language problems can be described, there appears to be consensus among researchers concerning the ordering of milestones in language development (Foster 1990; Goorhuis-Brouwer and Schaerlaekens 2000; Kelly and Sally 1999; Kuhl 2000).


Milestones seem to be good indicators of language problems (Stromswold 2000; Hall 1997). Milestones that have not been achieved by a certain age (e.g., the absence of babbling by 10 months, not using single words at 18 months, or not using short utterances at 24 months of age) can serve as rough indicators of language problems (Kelly and Sally 1999). Figure 1.1 shows a compilation of the minimum, mean, and maximum age as a function of milestones in language production, as mentioned in the literature (Diedrich and Carr 1984;
General introduction


Scale construction

It is difficult to measure language development directly, as it is a broad construct. One assumption of this thesis, however, is that language development can be visualized by the ordering of language milestones. In psychometrics, the Item Response Theory (IRT) model has been developed for measuring latent traits (e.g., language development) indirectly. The Mokken model is based on the principles of IRT and on the idea that such latent traits can be measured according to respondent responses (or responses that are provided by parents) to test items (e.g., language milestones), assuming that a certain mathematical relationship exists between the responses on the items and the latent trait (Baker 2001; Molenaar and Sijtsma 1982). A scale that satisfies the assumptions of a Mokken model has favorable psychometric properties, including high reliability and sample independence. The advantage of a sample-independent scale is that the same scale holds for various subgroups in the population, allowing the comparison of levels of difficulty across subgroups and across repeated measurements for the same person (Mokken 1997). Repeated measurements are necessary in order to gain insight into the developmental course, as the development of a child is highly dynamic.

External validation

Sensitivity and specificity are two basic concepts in the accuracy of screening instruments; they describe how well a test discriminates between children who do and do not have language problems. The criteria for identifying language problems should not be too strict, but neither should they exclude children who may benefit from extra help with language learning (Bishop 1997). One useful technique for examining the relation between sensitivity and specificity is to plot a Receiver Operating Characteristic (ROC) (Macmillan and Creelman 1991; Obuchowski 2003). The ROC can be used to determine the accuracy of the language-screening instrument for identifying children who are at risk for language problems.

Tape (2004) described the historical background of ROC. The name Receiver Operating Characteristic is part of a field known as “Signal Detection Theory,” which was developed during the Second World War for analyzing radar images. It was necessary for radar operators to decide whether blips on their screens represented enemy targets, friendly ships, or just noise. Signal detection theory measures the ability of radar-receiver operators to make such important distinctions (i.e., Receiver Operating Characteristics). It was not until the 1970s that signal detection theory was recognized as useful for interpreting medical test results.
1.3 Outline of the thesis

Application

The aim of the language-screening instrument that we have developed is to identify children who are at risk for language problems, and who should therefore be referred to secondary healthcare practitioners for further diagnosis and appropriate therapy in an early stage. The instrument can be applied during routine, formal primary healthcare screenings. Routine formal screening relies on standardized screening instruments to provide systematic screening of the language development of all children (Blackman 1999). Examiners screen language development according to responses on short questionnaires that can be completed by parental report. In this way, children can be screened effectively in a relatively short time.

Should the test properties of the language-screening instrument be satisfactory, the Groningen Public Health Service intends to implement the instrument within its primary healthcare system (Groningen Public Health Service 2004).

1.3 Outline of the thesis

The second and third chapters of this thesis address the following question: “What is language, and what is meant by a language problem?” Chapter 2 provides a survey of how Dutch primary healthcare professionals define and diagnose language problems in children from one to six years of age. Chapter 3 describes why in the literature there is no uniform concept of language problems. Several models are found in the literature for classifying language and language problems, depending on the background of professionals. Analysis showed that the different orientations could be integrated into a general and clinical diagnostic model for screening, testing, examining, and mapping (STEM) language problems in young children. The four levels are interrelated; together they comprise a complete approach for addressing children with language problems.

Chapters 4, 5, and 6 concern the development of a language-screening instrument for use with children from one to six years of age. Chapter 4 introduces the Mokken model. In a pilot study, it was analyzed if this model could be used to scale milestones in language development of children from one to two years of age. Based on the results of Chapter 4, in Chapter 5 a scale of language milestones for children from one to six years of age was constructed according to the Mokken model. In Chapter 6, the language-screening instrument for all ages between one and six years is constructed and validated, resulting in SNEL.

Finally, Chapter 7 summarizes the findings and discussions of the previous chapters of this thesis.