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Summary

The subject of this thesis is developmental language disorder, which is a developmental disorder with no obvious cause, usually called specific language impairment (SLI). In Chapter 1 the background and impact of SLI are described. SLI is the most prevalent developmental disorder in childhood, found in 2-12% of children and has many negative consequences for the potential development and well-being of the individual. The American Academy of Pediatrics (AAP) recommends early identification of developmental disorders and this also applies to language developmental disorders such as SLI. Early diagnosis and treatment of SLI is generally considered to be beneficial for the child although there is as yet no hard evidence to support this. A possible benefit of early detection of SLI is that parents and co-educators are made aware of the child’s problems and can adjust their expectations for the child. Furthermore early diagnoses can be followed by appropriate interventions. However at present there is limited evidence that earlier treatment leads to better outcomes.

A major problem with identifying children with SLI is that the natural history of language delay or disorder is unknown. Symptoms such as being late with talking or not talking at all at a certain age are not very specific for predicting a developmental language disorder. Some children are late starting to use verbal language to express themselves, but they catch up later. Other children start talking at a normal age, but later on it becomes obvious that their language development is inadequate and they are diagnosed as having SLI. The fact that symptoms of SLI resemble those of psychiatric disorders and learning problems makes it even more difficult to predict which child will have SLI.

The great majority of children with SLI are identified late or not at all, even in the Netherlands with its extensive and well-organized system of well-child healthcare. The goal of this thesis was to investigate the best way to detect children with specific language impairment (SLI) at a young age in the Netherlands. For this purpose studies were performed to investigate characteristics of children with SLI and compare these with normally developing children. Information on these characteristics could also provide more insight into the etiology of an isolated developmental disorder such as SLI.

The studies had a nested case-control design, where cases were children attending special needs schools for children with severe speech and language difficulties and controls were normally developing children attending mainstream education. The data of all children in the study population had been registered in the files of the Dutch well-child healthcare system in a uniform way by trained professionals long before the diagnosis of SLI was known. The fact that the children with SLI had been extensively investigated and the diagnosis had been confirmed meant that they may be regarded as meeting the internationally used criteria for SLI.

An overview of the predictive properties of 23 isolated language milestones for identifying children with SLI is given in Chapter 2. From the age of 18 months a significant difference was seen in reaching language milestones between children with SLI and
normally developing children. From the age of two years onwards failing to meet language milestones at the corresponding age norm is predictive of SLI, however the low sensitivity rate is a shortcoming, limiting its value as a screening test for SLI. However, failure on a language milestone at the age norm, especially after the age of two years, is a reason for concern.

The predictive properties improved when language milestones were combined. This is described in Chapter 3. Outcomes are given for combinations of milestones at 24, 36 and 45 months of age. The outcomes showed that combinations of two language milestones at 24, 36 or 45 months of age had high specificity rates, but lower sensitivity rates. Using a combination of five milestones at these three different ages made it possible to achieve a specificity of 96% (95% CI 94%-99%) and a sensitivity of 71% (95% CI 66%-77%). This means that many children with SLI can be identified before the age of four years using language milestones at 24, 36 and 45 months of age. This lead to the development of a concise tool, which is easy to use and can help professionals detect those children needing further investigations before the age of four years old and before starting elementary school.

The outcomes of the pilot study searching for perinatal risk factors for SLI are given in Chapter 4. This study showed that none of the perinatal risk factors studied had a significant relationship with having SLI. Only the Apgar score had a slight association with SLI and this was more pronounced in girls than in boys.

No relationship was found between perinatal risk factors and having SLI in the larger population in the major study with the same study design and using more variables (Chapter 5). The previous findings concerning the Apgar score could not be reproduced. However, children with SLI had younger mothers than children in the control group (mean 30y 9mo versus mean 31y 9mo) (p=0.02). Also, children with SLI were less frequently breastfed directly after birth (55% versus 71%) (p=0.0007) and were less frequently firstborns (33.3% versus 46.2%) (p=0.002), but effect sizes were small.

In Chapter 6 the outcomes of the study comparing groups of children with and without SLI on reaching motor milestones at the age norm are reported. More children with SLI were late in reaching motor milestones compared with normally developing children. A significant difference was found between both groups in the proportion failing to reach three of the seven investigated gross motor milestones at the age norm (p < 0.05). The proportion of children not reaching the motor milestone at the age norm was significantly higher for five of the six fine motor milestones in children with SLI compared with control children (p < 0.05). This led to the conclusion that it is debatable whether SLI can be regarded as a "specific" impairment which is not accompanied by other developmental problems.

In the general discussion in Chapter 7, various methods for detecting children with SLI in the Netherlands based on the outcomes of the studies are discussed. The following possible methods were discussed 1) screening or screening in combination with use of
risk factors 2) developmental surveillance/monitoring and 3) a combined approach combining screening and developmental surveillance.

Screening using isolated language milestones or a combination of milestones at a certain age had high specificity rates for detecting children with SLI, but due to the lower sensitivity rates, could not be recommended for screening purposes. However, the constructed concise tool using combinations of language milestones at three different age visits had better predictive properties. Nevertheless, some children with SLI could be missed due to the lower sensitivity rate. Also, due the design of the study the predictive properties were calculated for detecting only those children with severe SLI. As a failure on the concise tool is not specific for developmental language problems, additional investigations are indicated.

Screening using risk factors is not a viable option for detecting children with SLI, mainly because of the limited effect size of these factors. Developmental surveillance is valuable but has significant problems such as being based on subjective judgment, being time consuming and needing experienced and well-trained professionals.

The third option, which is a combined approach, that is, screening using a screening tool in combination with developmental surveillance is, in our opinion, the best way to detect children with SLI within the Dutch well-child healthcare system. The concise tool developed in this study and described in Chapter 3, provides an instrument for developmental language screening. Due to its relatively poorer sensitivity and some other shortcomings, this instrument should be combined with the presently used system of developmental surveillance. Implementation of the concise tool is easy because the data used are already registered, meaning no extra time, training or equipment is needed.

The finding that more children with SLI were later in reaching motor milestones at the age norm than normally developing children raises a discussion about the generally used definition of SLI which was used until recently. From these findings it is clear that children who fit the definition and diagnosis of SLI have much broader developmental problems than only language development. This means that it is debatable whether SLI is an "isolated" developmental disorder.