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Chapter 7

General discussion
On November 20th 1989 the United Nations approved the convention of the rights of the child. In article 6 it states: **Governments must do all they can to ensure that children survive and develop to their full potential** (1). As specific language impairment (SLI) has a great impact on the development of the child and limits its potential as an adult this means that early identification of children with language problems should be considered a major task for public health services. The studies described in this thesis provide an evidenced-based recommendation for the Dutch healthcare system on how to detect children with SLI at an early age.

At the time of starting this study in 2012 we found that in our study population the mean age of entry of children with SLI to the designated special needs schools for children with SLI was 5 years and 6 months (25% were 6 years and 5 months or older). We also found that the mean age at which these children started speech and language therapy was 3 years and 7 months, and 25% were 4 years and 3 months or older. In view of the findings reported in Chapters 2 and 3 it may be presumed that on the grounds of data which had already been collected from these children at the well-child healthcare visits it could have been possible for many of them to have been diagnosed and already receiving appropriate guidance at an earlier age.

Several possibilities exist for detecting children with SLI. The outcomes of the studies presented in this thesis will be discussed in connection with this and taking the situation in the Netherlands into account.

The two available options for identifying children with SLI, as described in chapter 1, are:

- Screening, with the option of using risk factors
- Developmental surveillance/monitoring

**Screening**

The advantage of screening is that it can be used as a quick and easy to apply method to distinguish between children who may need extra care and children who do not. The main issue with screening is that a standardized protocol is necessary. Language milestones reached at a fixed age norm (= age visit) could be suitable for screening for developmental language problems.

In the study described in **Chapter 2** we investigated whether language milestones could be used as a screening test to detect children with a high risk for severe SLI. The outcome was that from the age of 24 months failure to meet an individual language milestone was predictive for SLI. However, due to the low sensitivity, this failure on an individual language milestone was proved not suitable for screening purposes. The predictive values of combinations of milestones are presented in **Chapter 3**. This showed that combinations of milestones at a single age visit also have high specificities, but sensitivities were generally low. A concise tool with acceptable predictive properties for
detecting children with SLI was constructed, using a combination of language milestones at several age visits. This concise tool could easily be implemented in the Dutch well-child healthcare system because it uses data which at present are collected and registered in the regular files. The concise tool as described in Chapter 3 is quick and easy to administer and is acceptable to children and parents. The concise tool, with its established acceptable predictive properties, is an improvement on the current policy. Implementation of the concise tool in the Dutch well-child healthcare system does not need more time, equipment, personnel or training than the current Dutch Developmental Instrument (=DDI) method. It could increase the efficiency of detecting children with a high risk for having SLI at a young age and may therefore be more cost-effective than the present system.

However, a disadvantage of the concise tool is that its sensitivity is not optimal, implying that some children with SLI will still be missed. Also, as the children who were studied as cases had severe SLI, it means that the calculated predictive properties are for detecting children with severe SLI. However detecting such children should be a priority. The specificity of the concise tool is very high, but not perfect. This means that some children who do not pass the test do not have (severe) SLI. Some of these children could have a less severe form of SLI or another developmental disorder. This implies that the false positive test result can still be valuable. Since signs which could point to SLI are not always very specific, failure on the test is not always an indication of the presence of SLI, but could be an indication of another developmental disorder. So, when a child fails on the concise tool further assessment is needed. This may reveal a disorder, but not necessarily SLI.

**Screening using risk factors (targeted screening)**

Screening using risk factors or targeted screening is frequently used for many disorders. Law et al. (2000) discussed using targeted screening for speech and language delay, selecting a subgroup with higher risk levels for screening, as one of the alternatives to universal screening (2). In their review, Berkman et al. (2015) reported that in the outcomes of multivariate analyses of cohort populations the risk factors generally associated with speech and language delays or disorders were as follows: being male, a family history of speech and language concerns, lower levels of parental educational achievement and perinatal risk factors (3). The perinatal risk factors, determined in at least one study, were maternal binge drinking, prematurity, low birth weight and younger maternal age. This does not completely agree with our findings described in Chapters 4 and 5 of this thesis. We found no relationship with perinatal factors, apart from an indication that the Apgar score, especially in girls might have an association with SLI (Chapter 4). In Chapter 5 we established risk factors associated with SLI as: younger maternal age, not being breastfed directly after birth and not being the firstborn in the
family. However, socio economic status (SES) could be a confounder in this and may reduce the effect size of these risk factors. Using these risk factors for targeted screening would not improve the yield as they have very low sensitivity and specificity rates for predicting SLI.

Using parental questionnaires as a step in a targeted screening program for language problems is not advisable. There is a strong chance that parents of children with SLI will have language and/or reading difficulties themselves, as SLI is found more often in families where parents also have language problems. This could influence the outcomes of questionnaires and make them unreliable.

Screening using risk factors or targeted screening is therefore not a viable option to detect children with SLI.

**Developmental surveillance/ monitoring**

The AAP recommended developmental surveillance as the preferable method to identify children with developmental disorders (4). Developmental surveillance is an ongoing process which can be accomplished by monitoring attainment of developmental milestones, eliciting parental concerns and informally observing age appropriate tasks. The shortcomings of such a surveillance method are the subjective judgments of the observers and the fact that detection is usually later (5-7). Developmental surveillance is a time-consuming method for professionals and parents and the predictive properties are unknown (7).

A possible third option could be:

**Combined approach, combining screening and developmental surveillance**

The outcomes of our studies provide an alternative option for detecting children with SLI. This is developmental screening using the concise tool in combination with developmental surveillance. The concise tool developed in our study, described in Chapter 3, provides an instrument suitable for developmental screening. The developed concise tool has acceptable predictive properties, however it also has some disadvantages as described earlier. To compensate for its shortcomings the tool could be combined with developmental surveillance. The developmental surveillance is already in use in the Dutch well-child healthcare system. This means that children who are not identified with the concise tool can be detected later on. The same applies to the detection of children with a less severe form of SLI. Furthermore, the broad insight into the development of the
child, gained by ongoing developmental surveillance, will enable the professional to choose the most suitable facility for further diagnostic investigations when a child fails on the concise tool. The data on achievements in other developmental areas will provide additional information to the professional and help to decide whether the failure on the concise tool should be regarded as a language problem or whether other developmental disorders are more probable. As we have shown in Chapter 6, SLI may now be regarded as a developmental disorder which is not restricted to only language skills. A broad assessment by an experienced assessor is required when a child fails the concise tool.

In conclusion we can state that the best option for detecting children with SLI at an early age in the Netherlands is a combined approach, i.e. implementation of the concise tool alongside the long-running program of developmental surveillance in the well-child healthcare system. This recommendation requires very little extra effort, because the data for the concise tool are already collected during the usual well-child health visits in the present program. No extra instrument or training is necessary. However, it is important that the age visits at 24, 36 and 45 months of age are used to assess the language milestones of the DDI. Using this combined approach will increase the number of children with SLI who are detected before the age of starting elementary school. This makes it possible for appropriate educational support to be in place when these children start school, thus giving them the best possible start in education.

One of the goals of this thesis was to gain insight into the characteristics of children with SLI which could provide a better understanding of the etiology of this developmental disorder. In the pilot study described in Chapter 4 we concluded that no association could be established between perinatal risk factors and SLI except for a relationship with the Apgar score. However, this finding could not be reproduced in the major study (Chapter 5), where no association was found between perinatal risk factors and SLI. The only factors which were found to have a weak association with SLI were maternal age, being breastfed directly after birth and place in the birth order. Therefore, these studies have not provided extra insight into the etiology of SLI.

An interesting finding was that more children with SLI were also late with motor development, compared to normally developing children (Chapter 6). This suggests that it may be debatable whether SLI can be regarded as a "specific" impairment which is not associated with other developmental problems. The earlier theory that isolated developmental disorders, such as SLI, could exist is difficult to explain and is not supported by our study.

Conclusions

The main aim of the studies in this thesis was to find the best method to detect children with SLI at an early age within the framework of the well-child healthcare system in the Netherlands.
We have shown that, for the situation in the Netherlands, the best approach to identify children with SLI as early as possible is a combined approach using our concise tool of language milestones at age visits at 24, 35 and 45 months of age in combination with developmental surveillance already in place in the Dutch well-child healthcare system. At present the data used in the concise tool are part of the information collected at the visits to the well-child clinics and have been registered in the well-child files along with data on developmental monitoring. Therefore implementation of this method will need very little extra money, time or effort.

The outcomes of the studies regarding the characteristics of SLI showed that most perinatal risk factors were not associated with SLI. Only younger maternal age, not being breastfed directly after birth and not being the firstborn in the family were found to have a relationship with the child having SLI. However, the effect size of these risk factors could potentially be reduced when SES is taken into account.

An important finding of our study was that children with SLI were also late in reaching motor milestones. This suggests that SLI is not an isolated developmental disorder.

**Directions for further study**

The concise tool developed in this study is a promising innovation. The predictive properties of language milestones for SLI described in Chapters 2 and 3 are specifically calculated for the Dutch language and Dutch healthcare system. Further studies are needed to investigate whether our outcomes are applicable in other languages, countries and healthcare systems.

Cases in our study population were children with such severe SLI that they were unable to attend mainstream education. Therefore our studies do not provide information on how useful our findings could be in detecting children with less severe forms of SLI who are still able to attend mainstream education. Additional studies could provide tools for identifying these children.

Further investigations are needed to provide more insight into the population of children who fail when the concise tool is used but who do not have SLI. It may be possible to calculate predicative properties for other developmental disorders, for instance autism spectrum disorder or ADHD, using a combination of milestones which are also registered in the DDI. These could include data on adaptive and personal/social behaviour. It could also be valuable to investigate whether early milestones in other developmental regions could also be predictive for SLI, such as milestones concerning executive functioning (8).

There is as yet limited evidence for benefits of early treatment for most developmental disorders and this is clearly the case for SLI. More studies are needed to investigate the effects of early detection of developmental disorders.

A limitation of our studies is that data on social economic status (SES) were lacking or were not very precise. In the pilot study we used postal area codes as a variable. While
this gives information on the SES of the population in the postal area it cannot be used as an accurate measure of SES of the individual child (9). Larger studies which include more exact information on SES could provide more information on factors influencing the etiology of SLI.

An important outcome of our study was that children with SLI reached motor milestones later than children who were developing normally. This supports the recent ideas that SLI may not be an isolated developmental disorder. This needs to be investigated further.
References


