Part III discusses the results of the three research purposes:

1. The development of a protocol for a multidisciplinary diagnostic procedure for children with speech and language problems.

2. Evaluation of the MultiDD protocol. Is the use of the MultiDD protocol feasible according to the co-operating disciplines, and useful to come to differentiation in diagnostics and treatment recommendations?

3. When referred to the MultiDD procedure or a regular MonoDD procedure for children with speech and language problems, are there differences regarding the background variables, therapy recommendations, therapy effect, and parental satisfaction?
7 General discussion

7.1 Development of a uniform multidisciplinary procedure

Our first research purpose was the development a uniform multidisciplinary procedure for children with speech and language problems.

The Department of Otorhinolaryngology / Communication Disorders in Children section, working as a diagnostic centre for speech and hearing problems, made the choice for four disciplines, co-operating in the multidisciplinary diagnostic team for children with speech and language problems: the speech therapist, the audiologist, the child psychologist and the otorhinolaryngologist. In other countries, instead of an otorhinolaryngologist, often a paediatrician or a child neurologist is involved in the diagnostic procedure (McConachie, Smyth, & Bax, 1997). In our opinion, this mainly has to do with the fact that in other countries the Health Services are otherwise organised than in the Netherlands. Children with developmental problems mostly are referred to (neuro)paediatric centres, in which the different expressions of their problems can be analysed. In the Netherlands instead of four co-operating disciplines, also less disciplines can be involved (KITS, 1997). Sometimes the medical specialist is absent, sometimes another medical specialist than the otorhinolaryngologist is present (BOSK/FOSS, 1993). The different composition of the co-operating disciplines can lead to other therapy choices.

As for the content of the protocol, the main problems we met were the criteria to define a speech and language problem and the choice for a suitable screening instrument for the global non-verbal development. In the Netherlands, like in other countries, there is no consensus about the differentiation between normal and deviant language development (Lahey, 1990; Enderby & Emerson, 1995; Bishop, 1997; Conti-Ramsden, Crutchley, & Botting, 1997; Kamhi, 1998; Luinge, Goorhuis-Brouwer, & Post, 2002). As the discussion about defining a language problem and the assessment of non-verbal development is still going on (Resing, et al. 2002), we realise that, like the choice for
co-operating disciplines, also the content and interpretation of the MultiDD protocol is a choice which can be discussed.

In conclusion: The four co-operating disciplines felt content with the MultiDD procedure which led to objective and reproducible criteria for “normal” and “abnormal” findings.

Our MultiDD protocol shows one possibility regarding co-operating disciplines and content. In the regular practice other protocols and co-operating disciplines are present. Further research is recommended to compare costs and efficacy of different multidisciplinary diagnostic procedures in children with speech and language problems.

7.2 Diagnosis related therapy recommendations

Our second research purpose was the evaluation of the MultiDD protocol.

In three explorative studies all children could be diagnosed using the protocol and scheme, which led to differentiation in therapy recommendation. A specific speech and language problem was present in fewer children than assumed by the specialists who referred the child for MultiDD examination. Cognitive delay was present in more children than assumed. Only the ideas about the presence of medical problems were confirmed. The scheme for the diagnosis related therapy recommendations turned out to be useful. Most parents were satisfied with the diagnostic and therapeutic procedure.

We concluded that the developed MultiDD procedure helps to classify children with speech and language problems in an adequate way. However, some questions can be raised. For instance, we found a large number of otorhinolaryngological problems in the population. Perhaps more children with otorhinolaryngological problems were referred because the MultiDD procedure was used within the Department of Otorhinolaryngology. Suppose the diagnostic team was a section within the Department of Paediatrics, would the medical problems have been more neurological and/or psychiatric based?
Another question concerns the relative small number of specific language problems. Perhaps only the children with the most severe language problems were referred. If so, this could also explain the absence of children with “no language problem”. Other studies show that sometimes children are referred to speech therapists or diagnostic centres who, after diagnostics show language abilities within normal ranges (Goorhuis-Brouwer & TenVergert, 1997).

In conclusion: The developed MultiDD protocol differentiates specific language problems from language problems in comorbidity with medical, audiological, or cognitive problems. For therapy recommendation this differentiation is of importance. The scheme for diagnosis related therapy was found to be useful in formulating treatment recommendations.

7.3 Similarities and dissimilarities between the MultiDD and MonoDD procedures

The third question in our research about the differences between the outcomes of a MultiDD procedure and a MonoDD procedure, can only be answered in an explorative way. Although children in both groups have similar speech and language difficulties according to their parents, this was not confirmed by the language scores obtained from standardised tests. We will discuss some similarities and dissimilarities.

7.3.1 Subjects: similarities and dissimilarities by inclusion

In the MultiDD group 60 children were included, in the MonoDD procedure 41 children. In both groups, the children did not differ in background variables such as birthweight, day-care/home-care, family composition, and SES. Also the parental opinions about the language problems of their child were similar.

In both groups more boys than girls were included. In the MultiDD group, the boy-girl ratio of 3:1 was present, which is normally expected in a clinical population (Bishop, 1997; Leonard, 1998; Goorhuis-Brouwer & Sch aerlaekens, 2000). In the MonoDD group relatively more girls were included.
Inclusion of children in the MultiDD group was much easier than in the MonoDD group. In the MultiDD group, each week about two children could be included. In the MonoDD group, 41 children were included within a period of 26 months by 22 of the 65 GPs who participated in the study. This means that 43 GPs (66%) did not include children. This was partly due to the type of practice (rural villages with many old people), and partly because they had forgotten the research programme as speech and language problems hardly ever occurred in their practices. In addition, the problem was not a common one for the 22 GPs who did include children: each of the 22 GPs included between one and three children over a period of 26 months. It seems that the prevalence of children with language problems occurs only occasionally within a GP’s practice. Perhaps the problem is not as widespread as suggested in literature, which cites a prevalence of 5-10% (Bishop, 1997; Leonard, 1998; de Koning, et al. 2000). Another explanation might be that the GPs biased the term “language problem”, as most children were referred to a speech therapist. It is possible that only children with assumed specific language disorders were included by the GPs, and children with medical, audiological and/or cognitive problems were not diagnosed as language impaired. The possible bias, or more positive, the strict opinion concerning the term “language problem”, is underlined by the differences between the two groups regarding the number of children with global non-verbal developmental problems at T0. In the MultiDD group significant more children with global non-verbal developmental problems were included (38%) compared to the MonoDD group (17%). Also the fact that 68% of the children in the MultiDD group was referred by their GP underlines the idea that GPs may have a strict opinion of the term “language problem”. They did not refer to a speech therapist which could indicate that they considered the language problem as part of a broader problem.

In conclusion: In GP practises only a few number of children with language problems were included in the study. Either language problems are less common in GP practices than stated in the literature, or GPs do not consider language problems in comorbidity with medical and developmental problems as language problems. For them, language problems are therefore strictly related to specific language disorders and as a consequence related to speech therapy. As many children in the MultiDD
procedure were referred by their GP, the strict interpretation of the term “language disorder” can be underlined. The GPs refer to a MultiDD team as they consider the language problem as part of a broader problem.

7.3.2 Language development at T₀: difficulties in defining a language problem

At T₀, in the MultiDD group significantly more children showed language problems than in the MonoDD group. However, in almost all children some form of treatment was recommended. Considering the language measures, it could be expected that in the MonoDD group for relatively more children a wait-and-see approach was taken. Most of the children with adequate language development were referred for speech therapy because of pronunciation problems and/or periods of stammering (Goorhuis-Brouwer & Knijff, 2003). This brings us at the discussion about defining a language problem by using standardised tests versus ‘communicative incompetence’: “Should we assess severity purely in terms of statistical abnormality or in terms of the extent to which the child has communicative difficulties in everyday life?” (Bishop, 1997, p21). This is a worldwide discussion and continues to be debated among professionals. To define communicative difficulties in everyday life, one must have good normative data on language development, which is not available for many languages (Bishop, 1997, p23). This is also the case in the Netherlands. A recent study showed that most clinicians agree on milestone in language development at different ages, but do not agree on normal ranges of language abilities (Luinge, et al. 2002).

It seems that speech therapists who decided to start speech therapy, expect pronunciation difficulties and periods of stammering to interfere negatively in the communication in everyday life. If we realise that all children except one are under five years of age, the question can be raised if normal variations in articulation development are reckoned with. Articulation development starts at about 6 months of life when articulation patterns in the infant gradually become language specific and more fluent, based on auditory and motor development (Gazzaniga, 2000; Kuhl, 2000). Maturation and normal variations in the speed of speech motor development play an important role in this process. Language specific articulation and fluency is mature at about six years
of life. This knowledge, mainly expressed in “old” literature seems to be forgotten (Gesell & Armatruda, 1947; Piaget, 1959). Based on “new” insights in which language plays an important role in cognitive and social-emotional development, early treatment of language problems is thought to prevent learning disabilities, dyslexia and behavioural problems (Silva, Williams, & McGee, 1987; Stothard, et al. 1998; Coster, 2001). As a consequence, speech therapy in young children increased. The fact that children with average and above-average language scores receive speech therapy, suggests that the wish to prevent learning disabilities and dyslexia, perhaps leads to inappropriate standards, especially for articulation development.

In conclusion: Many children with adequate language development according to the standardised tests received speech therapy, mainly because of pronunciation difficulties. Questions can be raised about the standards used. Our study underlines the literature in which it is stated that it is difficult to determine when a child has a deviant language development, as the normal acquisition of speech and language shows considerable variation. “It is not easy to distinguish between a child at the lower range of normality and who is deviating from the usual pattern of speech and language development (Enderby & Emerson, 1995, p34)”.

7.3.3 Parental opinion about language development compared to diagnosis at $T_0$

In the MultiDD group, the five diagnosis groups proposed in our scheme (Figure 3.1) were present. Children in the diagnosis group “no language problem” made the biggest group (37% of the children). The other four diagnosis groups (“SLI” and language problems in comorbidity with medical/audiological and/or developmental problems) contained an similar number of children (12 to 18%).

In the MonoDD group, three different diagnosis groups were found because of the unknown medical and audiological status: “no language problem” (78%), “SLI” (10%), and “language problems in comorbidity with developmental problems” (12%). Similar to the MultiDD group, the group children with “no language problem” made the biggest group.
7. General discussion

As all parents were concerned about the language development of their child - this was one of the three inclusion criteria - it becomes clear that parents, like clinicians, find it difficult to differentiate between normal and deviant language development. Parents seem to have high standards concerning language development, perhaps because they think that language development influences the social and cognitive development to a great extend, which is underlined by current politics and educational goals (Goorhuis-Brouwer, 1988; Meijer, van der Ploeg, & Thoomes, 1999; Goorhuis-Brouwer & Knijff, 2002). Also, parents find it difficult to judge the cause of the language problem, as most parents thought their child had a specific language problem (63% in the MultiDD group and 73% in the MonoDD group). At T1, in 49% (MultiDD group) and 74% (MonoDD group) of the children of which parents still assumed language problems, adequate language scores were found.

In conclusion: Parents are easily alarmed because of the assumed relationship with social and cognitive development, and thus with achievement in school. They have high standards for the language development of their child, and these notions are supported by politics and education. Research on normal variations in language development must prove if these standards are beneficial to children.

In children with speech and language problems, a specific language impairment is less common than assumed by the parents. Multidisciplinary examination indicates that language problems in comorbidity with medical and/or developmental problems more often are present than supposed. Even adequate language development can be present when a speech and language problem is assumed.

7.3.4 Language improvement related to treatment during the year

Language improvement, defined as an improvement of at least 15 points at the RTB or STP (or an improvement from inadequate to adequate at the GDS), was similar in the MultiDD and MonoDD group. As language scores at T0 differed significantly between the MultiDD and MonoDD groups, this means that language skills of children with language problems as well as children with adequate language skills could improve.
7. General discussion

In both the MultiDD and MonoDD groups, improvement of language skills was found in all diagnosis groups. As most children in the MonoDD group received speech therapy, whereas children in the MultiDD group received more different forms of treatment, this means that speech therapy is not the only form of therapy. Medical help, developmental guidance, and a wait-and-see approach can also have a positive effect on language functioning.

**Medical treatment**

In the MultiDD group language improvement was mainly present in children with medical problems, independent of adequate or inadequate language scores at T0. Language abilities of the majority of these children improved by medical treatment. In the diagnostic group “no language problems” 41% of the children improved, in the diagnostic group “language and medical problems” 55% of the children improved. By means of medical treatment the conditions for language development are strengthened. Better hearing has a positive influence on auditory perception and physical health has a positive effect on attention. Both auditory perception and attention are essential for language development, especially for language comprehension (Goorhuis-Brouwer & Schaelaekens, 2000). Improvement of language skills in children with adequate language development by medical treatment means, that a language score within normal range does not implicate that a child functions according to its capacities. The medical status can have a negative effect on language development, even if language scores are adequate already.

**Speech therapy or a wait-and-see approach**

Speech therapy seemed helpful in children with SLI, both in the MultiDD group (43% of the children improved) as in the MonoDD group (50% of the children improved). By means of speech therapy the language input is adjusted to the language abilities of the child. This adjusted language input facilitates the child to detect semantics and grammatical rules (Goorhuis-Brouwer & Schaelaekens, 2000). Speech therapy seemed
to be less effective in the MonoDD children with pronunciation problems and adequate language scores. Half of these children still received speech therapy at T1. Perhaps this indicates that some pronunciation problems cannot be quickened by speech therapy, thus underlining the discussion about inappropriate standards (Bishop, 1997; Luinge, et al. 2002). For these children a wait-and-see approach could be followed more often. By means of a wait-and-see approach the child gets the opportunity to mature, which can be as effective for young children as speech therapy (Glogowska, et al. 2000). Moreover, a wait-and-see attitude reassures parents, and this has a positive effect on parent-child interaction (Goorhuis-Brouwer, 1988; Coster, 2001).

**Developmental guidance**

Developmental guidance was mainly recommended in the MultiDD group, but also for a few children in the MonoDD group. In the MultiDD group 44% of the children improved, in the MonoDD group 20% of the children improved. The improvements underline the idea that test scores in developing children are not always a definite indication for learning capacities. By means of developmental guidance the child is stimulated to behave according to developmental age. For many children with developmental problems this means that the differences between capacities and commands diminish. Therefore, the surrounding world can be explored in a way which suits the child. From our clinical experience we can state that many children behave more spontaneous and explorative when addressed at developmental level. This has a positive effect on overall development (Goorhuis-Brouwer & Knijff, 2002).

Furthermore, our data showed that children could improve on language production, either on the sentence development by imitation or on spontaneous speech, on language comprehension, or on both. This means that language development and language improvement can only be understood from a modular approach. Language is not a unitary construct, but rather is composed of interactions between different levels of processing: auditory, phonological, lexical and syntactic (Bishop, 1997). The auditory and phonological aspects of language, which lead to language comprehension and articulation, are influenced by hearing and motor development. The lexical and
syntactic aspects of language which lead to sentence development, are influenced by cognitive abilities (Goorhuis-Brouwer & Schaerlaekens, 2000). From this we can understand that some children improve in language comprehension and others in language production.

In conclusion: Speech therapy is not the only possible strategy for language-impaired children. Also medical help, developmental guidance, and a wait-and-see approach can have a positive effect on language functioning. With a diagnosis related therapy, improvement in language skills can be reached in all diagnosis groups in part of the children. Even children with adequate language development, improvement in language abilities can be reached.

For half of the children with articulation problems speech therapy did not quicken the correct pronunciations. Therefore, the question arises as to whether these articulation problems can be influenced by speech therapy, or whether they are part of the normal maturation process.

When improvement in language abilities is reached, this can be on language production and/or language comprehension. Therefore, all language measures should be taken into account.

7.3.5 Limitations in language improvement

As improvement of language skills was found in 42% of the children in the MultiDD group and in 27% of the children in the MonoDD group, this means that language abilities are relatively stable for individual children. Only a few children are capable of a language improvement. This is in line with the findings of Zink (1995), who found that language abilities remained stable in most children between 2;6 and 5;0 years old (Zink, 1995). In children with language problems, despite having speech therapy, only a portion of the children improved (Bishop & Edmundson, 1987; Conti-Ramsden & Botting, 1999; Johnson, et al. 1999; Glogowska, et al. 2000). For many children there is a considerable stability in language performances over time. Therefore, it must be accepted that a language problem is often a persistent problem.
These results also underline the ideas that language disorders can be genetically based, which, for many children are persistent problems (Bishop, 1997; Leonard, 1998; Bishop, 2002). Genes are biochemical messengers, determining which substances are manufactured in the growing organism at different time points. It is plausible that the genetic mechanism involves disruption in the timing of early neuro-developmental events, such as neuronal migration. This can increase the risk of language problems that are difficult to overcome (Bishop, 1997). The indicators for potential language improvement in individual children remain unclear. Bishop & Edmundson, who mentioned an improvement percentage of 46% in children with SLI receiving speech therapy and in 11% of children with language problems in comorbidity with cognitive delay, argued that a persistent language problem is directly related to the range of language functions that are impaired (Bishop & Edmundson, 1987). However, this is not the only factor. They also stated that even if syntax, morphology and phonology are immature, language improvement is possible. In these children, a positive prognostic sign is the presence of the ability to relate the main events of a story in correct sequence.

In conclusion: Not all children will overcome their language problem. For many children there is a considerable stability in language scores over a twelve-months period. When language problems are persistent, this has implications for therapy. In these cases, at least two questions should be raised: 1) How long should speech therapy be continued? 2) Which coping strategies should be developed to give the child a good chance for success in everyday life and future employment?

7.3.6 Examining language development

Measurement of language development using standardised tests was not possible for all the children. In both groups in about the same number of children did not co-operate with the standardised tests. In particular, the Sentence Development test (STP) was difficult to administer in a clinical setting. This means that in some children spontaneous speech, which could be assessed in all children, was the only language measure present.
Comparison of the ZQ scores (adequate/inadequate) and GDS scores showed a correlation of .84. (Alink, 2002). In the few children for whom the STP and GDS did not correspond, the GDS was found to be “inadequate”, whereas the STP was “adequate”. Therefore, it might be argued that in clinical practice, the GDS, in combination with the findings of the RTB, give reliable insight in the language abilities of the child by the first examination. Of course, this does not mean that further analysis of speech production is unnecessary. Especially when children are referred for speech therapy, we appeal for further analysis by using either the STP or a in-depth analysis of the spontaneous speech as in GRAMAT or TARSP (Bol & Kuiken, 1988; Verhulst-Schlichting, 1989). Analysis of speech production give insight into the way speech therapy has to be developed. Different therapeutic strategies must be chosen for different language problems (Groenhuis & Goorhuis-Brouwer, 1991b; Goorhuis-Brouwer & Schaerlaekens, 2000). Moreover, for evaluating therapy effects, in-depth analysis of language production is recommended.

In conclusion: In language impaired children, standardised tests (especially for language production) are sometimes difficult to administer. For diagnostics, language comprehension, as measured by the RTB together with screening of spontaneous speech (GDS), is sufficient to define a language problem. For therapeutic strategies and evaluation of therapy effects, further analysis of language production is necessary.

7.3.7 Parental satisfaction

In both groups, almost all parents were satisfied with the treatment of their child: 87% in the MultiDD group and 81% in the MonoDD group. As a variety of therapeutic strategies could be chosen, it seems that parents are satisfied with any form of help. In the current clinical practice, we learned from the parents that:

- When a medical problem is diagnosed, the parents are relieved. There is a “clear” cause and often something can be done. It is not their fault that the child has a language problem;

- When a wait-and-see strategy is recommended, the parents also are relieved. The problem obviously is less severe than assumed at first glance;
- When speech therapy is recommended, the parents also are relieved. Speech therapy is looked upon as a ‘harmless’ therapy. Besides, when speech therapy is recommended, they feel that the specialist also thinks “something can be done” for the language problem;
- When developmental guidance is recommended, the parents often need time to accept that the language problem of their child is not the only developmental problem. However, they feel supported as the child receives developmental guidance. The most important aspect for parents is that their feelings are recognised and validated and that something “can be done”. If not, they are uncertain about education and experience psychological pressure (Goorhuis-Brouwer, 1988; Coster, 2001).

Speech therapy was often recommended for children in the MonoDD group, and this seemed reasonable to the parents. Also most parents of children in the MultiDD group thought that speech therapy was an appropriate solution. However, when the language problem was explained in relation to the developmental and medical aspects of the child, other treatment recommendation was accepted. In both groups, a few parents were not satisfied because they felt the specialist did not take their views seriously. From their point of view, the language problem of the child was underestimated or overestimated. The parents did not agree with the specialist’s recommendation. Therefore, it is of utmost importance that parents understand why the specialist gave a particular recommendation.

In conclusion: parents are satisfied when help is given, regardless of the form of help. For most parents, a clear explanation about the diagnosis and the resulting treatment recommendations is of great importance.

7.4 Recommendations for future research

In both groups the GP referred most, if not all children. This indicates that GPs possibly differentiate between mild and complex language problems. As in children with complex language problems medical and cognitive problems can be present, a MultiDD procedure seems more appropriate for these children than a MonoDD procedure. Future
research should be focused on the development of a screening instrument which facilitates the GPs in making choices regarding speech therapy or a MultiDD procedure. This also applies to other specialists who are key figures in the early detection of impairments, like the Child Health care practitioners.

In a MultiDD procedure, the choice for co-operating disciplines as well as the content of a MultiDD procedure may vary in different organisations. Future research is recommended regarding costs and efficacy of different MultiDD procedures.

Our research underlines the difficulty to make a distinction between normal and deviant language development, i.e. there is no golden standard. Especially the presence of articulation problems seems to be difficult to define. Future research is recommended concerning normal variations in language and articulation development in young children.

Language improvement in the MonoDD group was mainly found in children receiving speech therapy, whereas in the MultiDD group language improvement was found in children receiving speech therapy, medical treatment, developmental guidance, or a wait-and-see approach. Research is needed to develop criteria for the application of these specific forms of therapy and their separate effects on language development.

Many language impaired children did not improve their language abilities, despite treatment. Research is needed to distinguish persistent from transient language problems. Phonological, syntactical, morphological, and pragmatic development should be measured before and after therapy.

For children with persistent language problems, it is important to focus research on the development of coping strategies. The question has to be answered which future perspectives these children have.