Appendices

Appendix A: The MultiDD protocol
Appendix B: Dutch language tests
Appendix C: Research protocol MultiDD and MonoDD procedure
# Appendix A  The MultiDD protocol

University Hospital Groningen, Department of Otorhinolaryngology  
Examination protocol in children with speech and language problems

## Background Information

1. **Personal information**

<table>
<thead>
<tr>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Address</td>
</tr>
<tr>
<td>Date of birth</td>
</tr>
<tr>
<td>General Practitioner</td>
</tr>
<tr>
<td>Health Insurance</td>
</tr>
</tbody>
</table>

   Date of examination __/__/____

   Date of referral __/__/____

2. **Referred by**

   - General Practitioner
   - Otorhinolaryngologist
   - Paediatrician
   - others, _______________________________

3. **Has the child already received speech therapy?**

   - yes, ___ times a week in 19 ___ during ___ months
   - no
   - no information

4. **Is the child being treated by other specialists?**

   - yes, by the ______________________
     this specialist is visited ___ times
   - no
   - no information

5. **Specification of the problem**

   by the specialist who referred

## Background information: child

1. **Gender**

   - boy
   - girl

2. **Birth weight**

   - < 2.0 kg
   - 2.0 – 2.4 kg
   - 2.5 – 2.9 kg
   - 3.0 – 3.9 kg
   - 4.0 – 4.9 kg
   - > 5.0 kg

3. **Did the child visit a crèche**

   - yes, from ___ ; ___ years of age
   - no
   - no information

## Background information: family

4. **Parents**

   - two parents
   - one parent
   - other: _________

5. **Siblings**

   - yes, there are ___ children
   - no

6. **Language**

   - Dutch
   - Dutch dialect: __________
   - combination of languages: _______

7. **SES (socioeconomic class)**

   - low
   - middle
   - high
   - no information
Appendix A. The MultiDD protocol

General anamnesis: parental information

1. Specification of Speech and language problems by the parents:
   (e.g. unintelligibility, language delay, medical or behavioural problems)

2. Hearing of their child
   - no information
   - normal
   - deviant

3. General development of their child
   - no information
   - normal
   - different from peers

4. Interpretation of the problems, according to the parents
   - no information
   - Specific Language Impairment (SLI)
   - ORL associated problems
   - developmental problems

Speech and language anamnesis

1. How does your child speak
   - no information
   - babbling
   - some words
   - two word utterances
   - short sentences
   - long sentences

2. Do you understand what your child is saying?
   - no information
   - yes
   - sometimes not
   - mostly not

3. Do others understand what your child is saying?
   - no information
   - yes
   - sometimes not
   - mostly not

4. When your child is not understood, does he/she try to make it clear by other means?
   - no information
   - irrelevant
   - no
   - yes, by means of
     - no information
     - irrelevant
     - verbal: ____________
     - non-verbal: ____________
     - other: ____________

5. When your child is not understood, what is his/her reaction?
   - no information
   - irrelevant
   - cries
   - gets angry
   - goes his/her own way
   - a combination of reactions mentioned above
   - other: ____________
### 6. Does your child comprehend what is said to him/her?
- □ no information
- □ yes
- □ sometimes
- □ no

### 7. Can your child blow, suck, eat/drink or swallow adequately?
- □ no information
- □ yes
- □ no, problems with _____________________

### 8. Which school does your child attend?
- □ no information
- □ irrelevant
- □ crèche or kindergarten
- □ primary school
- □ special education: _____________________

### 9. How is school performance?
- □ no information
- □ irrelevant
- □ good
- □ moderate, he/she has difficulties with: _____
- □ bad

### 10. Was there a speech problem from the beginning, or did it appear suddenly?
- □ no information
- □ always a speech problem
- □ first normal development, then a delay
- □ the problem appeared suddenly after _____

### 11. How do you stimulate your child’s language development?
- □ irrelevant
- □ no information
- □ name
- □ reading aloud
- □ singing
- □ letting the child echo
- □ correcting
- □ rehearsing
- □ other: ______________________________

### 12. Has the speech improved lately?
- □ no information
- □ yes
- □ no

---

**Speech and language examination**  (age: ___ ; ___)

### 1. Language production: STP

<table>
<thead>
<tr>
<th>raw score</th>
<th>ZQ</th>
<th>age equivalent</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Interpretation STP**
- □ no information
- □ insufficient $(ZQ < 80)$
- □ below average $(80 \leq ZQ < 90)$
- □ average $(90 \leq ZQ \leq 110)$
- □ above average $(ZQ > 110)$

### 2. Language comprehension: RTB

<table>
<thead>
<tr>
<th>raw score</th>
<th>TBQ</th>
<th>age equivalent</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Interpretation RTB**
- □ no information
- □ insufficient $(TBQ < 80)$
- □ below average $(80 \leq TBQ < 90)$
- □ average $(90 \leq TBQ \leq 110)$
- □ above average $(TBQ > 110)$
Appendix A. The MultiDD protocol

3. Spontaneous language production: GDS
   - no information
   - babbling (< 0;9)
   - varied babbling (0;9-1;0)
   - babbling, sometimes an understandable word (1;0-1;6)
   - some words; one-word utterances (1;6-2;0)
   - two-word utterances (2;0-2;6)
   - 2-3 word utterances (2;6-3;0)
   - 3-5 word utterances (3;0-3;6)
   - simple sentences, word sequence errors (3;6-4;6)
   - simple sentences, correct word sequence (4;6-5;6)
   - grammatically correct sentences, also compound (>5;6)

Interpretation GDS
   - age adequate
   - age inadequate
   - no information

4. Other problems:
   - mouth habits
   - articulation
   - nasality
   - fluency
   - other problems: ________________

5. Reaction to language stimulation
   - positive
     - listens
     - imitates
   - negative
     - doesn’t listen
     - doesn’t imitate
     - gets angry

6. Communication
   - no information
   - verbal (+), non-verbal (-)
   - verbal (-), non-verbal (+)
   - verbal (-), non-verbal (-)

7. Parent-child interaction

Medical examination

1. Ear
   - Normal
   - Grommets obstructed
   - Inflammation
   - Retraction/perforation
   - Congenital deviation

Interpretation: ear
   - Normal
   - Deviant
   - Suitable in total physiognomy

2. Nose
   - Open and clean
   - Other:

Interpretation: nose
   - Normal
   - Deviant
   - Suitable in total physiognomy

3. Neck/throat
   - Normal
   - Enlarged lymph nodes

Interpretation: neck/throat
   - Normal
   - Deviant
   - Suitable in total physiognomy
4. **Mouth/pharynx**
   - Tonsils:
     - Absent
     - Quiet
     - Irritated
     - Enlarged
     - Other:
     - Adenoid: enlarged
     - Hyperaemic pharyngeal arch or mucosa
   - Other:

   **Interpretation: mouth/pharynx**
   - Normal
   - Deviant
   - Suitable in total physiognomy

5. **Anatomy and Function of speech organs**
   - Closing of lips:
     - normal
     - not possible
     - possible, not shown
   - Tongue movement:
     - normal
     - limited
     - long frenum of the tongue
     - Velopharyngeal insufficiency

   **Interpretation: speech organs**
   - Normal
   - Deviant
   - Suitable in total physiognomy

6. **Neurological screening**
   - Nothing unusual
   - Deviant posture
   - Deviant spontaneous movements
   - Deviant consciousness
   - Deviant speech motor system

   **Interpretation: neurology**
   - Normal
   - Deviant
   - Suitable in total physiognomy

**ORL diagnosis**
- Normal
- Deviant:
  - ear
  - nose
  - mouth/throat
  - neck
  - speech organs
  - neurology
  - ORL problem suitable in total physiognomy
- Unknown

### Hearing examination

1. **Behavioural observation audiometry:**
   - R L (sub) normal (30-40dB)
   - mild hearing impairment (40-70dB)
   - severe hearing impairment (> 70dB)

2. **Pure tone audiometry:**
   - R L normal hearing (10-20dB)
   - mild hearing impairment (15-30dB)
   - moderate hearing impairment (30-60dB)
   - severe hearing impairment (60-90dB)
   - deaf (>90dB)

3. **Audiogram**

![Audiogram](image)


### Appendix A. The MultiDD protocol

#### 4. Tympanometry

- no measure
- flat curve, high admittance value
- shallow flat curve, (almost) normal volume
- normal curve, pressure +200 to -99daPa
- normal curve, pressure -100 to -199daPa
- normal curve, pressure -200 to -400daPa
- pressure < -400daPa
- other:

#### 5. Co-operation

- good co-operation
- moderate co-operation
- no co-operation
- protest

#### Audiological diagnosis

- normal hearing
- conductive hearing loss
- perceptive hearing loss
- conductive and perceptive hearing loss
- unknown

### Developmental screening and behavioural observation

#### 1. Behaviour during the examination:

<table>
<thead>
<tr>
<th>General</th>
<th>Interest in surroundings</th>
<th>Play</th>
<th>Contact</th>
</tr>
</thead>
<tbody>
<tr>
<td>quiet</td>
<td>alert</td>
<td>enterprising</td>
<td>open / co-operative</td>
</tr>
<tr>
<td>hyperactive / restless</td>
<td>not alert</td>
<td>not enterprising</td>
<td>contact improvement during observation</td>
</tr>
<tr>
<td>not cheerful</td>
<td>inquisitive</td>
<td>concentrated</td>
<td>withdrawn</td>
</tr>
<tr>
<td></td>
<td></td>
<td>imitative</td>
<td>anxious</td>
</tr>
<tr>
<td></td>
<td></td>
<td>imaginative</td>
<td>unrestrained</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>other:</td>
</tr>
</tbody>
</table>

#### 2. Behaviour according to parents:

<table>
<thead>
<tr>
<th>At home</th>
<th>The child in contact with other children:</th>
<th>Reaction of other children to the child:</th>
</tr>
</thead>
<tbody>
<tr>
<td>normal</td>
<td>very active</td>
<td>good contact</td>
</tr>
<tr>
<td>cheerful, active</td>
<td>sometimes active</td>
<td>avoid the child</td>
</tr>
<tr>
<td>noisy, restless</td>
<td>not active, wait-and-see</td>
<td>treat him/her like a baby</td>
</tr>
<tr>
<td>quick tempered</td>
<td>no information</td>
<td>no information</td>
</tr>
<tr>
<td>too quiet, withdrawn</td>
<td></td>
<td>other</td>
</tr>
<tr>
<td>other:</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### 3. Global non-verbal development: DOS-R

- Adequate
- Inadequate
- Not able to test, because: ________________________

#### Interpretation

of the global non-verbal development

- normal development
- developmental problems
Appendix A. The MultiDD protocol

Results

1a Language Impairment
☐ yes, ☐ SLI
☐ articulation problem
☐ other: ___________
☐ no
☐ no information

1b Medical problem
☐ yes, ☐ ORL problems
☐ audiological problems
☐ neurological problems
☐ other: ___________
☐ no
☐ no information

2a Developmental problems
☐ yes, ☐ developmental delay
☐ behaviour problems
☐ related with personality
☐ other: ___________
☐ no
☐ no information

2b Combination of medical and developmental problems (1b and 2a)
☐ yes
☐ no
☐ no information

Treatment recommendation

1. Wait-and-see
☐ recommendation and wait-and-see policy

2. Speech and language therapy
☐ local speech therapist
☐ speech therapist at the University Hospital

3. Medical treatment
☐ grommets
☐ adenoidecomy
☐ tonsillectomy
☐ medication
☐ hearing aids
☐ pharyngoplasty
☐ child neurological treatment
☐ child psychiatric treatment
☐ other:

4. Psychological examination
☐ yes
☐ no

5. Contraindication for certain treatment
☐ yes: ___________
☐ no

6. Check-up
☐ yes, in _____ months
☐ no

7. Approval of parents
☐ yes
☐ no, because:
Appendix B  Dutch language tests

**Dutch language tests**, as mentioned in Table 3.1.

- **AWT** Actieve Woordenschattest, an active lexicon test measured by naming pictures (Jans & Albrecht, 1988).
- **ADIT** Auditieve Discriminatie Test, which tests the auditory discrimination and phonetic sound differences in words (Crul & Peters, 1976).
- **FAN** Fonologische Analyse Nederlandstalige kinderen (phonological analysis) (Beers, 1995).
- **GRAMAT** Grammaticale Analyse voor Taalontwikkelingsstoornissen, a grammatical analysis of spontaneous language (Bol & Kuiken, 1988).
- **PKW** Proefkreeche Woordenschattest, an active and passive lexicon test in pre-school children (Kohnstamm, van der Lem, & den Hartog, 1980).
- **PPVT** Peabody Picture Vocabulary Test, which tests the passive lexicon by choosing the mentioned picture out of four (Manschot & Bonnema, 1974; Bonnema & Manschot, 1978).
- **RTB** Reynelltest voor Taalbegrip, an adapted Dutch version of the comprehension scales of the Reynell Developmental Language Scales (van Eldik, et al. 1995).
- **RTOS** Reynell Taalontwikkelingsschalen, an adapted Dutch version of the Reynell Developmental Language Scales, consisting of a language comprehension and a production scale (Schaerlaekens & Zink, 1993).
- **STAP** Spontane Taalanalyse Procedure (spontaneous language analysis) (van Ierland, van den Dungen, & Verbeek, 1994).
- **STP** Schlichtingstest voor Taalproductie, a language production test, consisting of a sentence development scale, an active lexicon measure or word development scale, an auditory memory test and a lexicon list (Schlichting, et al. 1995).
- **TAK & TAK-BB** Taaltoets Allochtone Kinderen and Taaltoets Allochtone Kinderen Bovenbouw, two language tests for foreign children of 5-9 years old and 9-13 years old, respectively, regarding the verbal skills and language skills in school (Verhoeven & Vermeer, 1986; Verhoeven & Vermeer, 1993).
- **TARSP** Taalanalyse Remediëring en Screening Procedure (spontaneous language analysis) (Verhulst-Schlichting, 1987; Verhulst-Schlichting, 1989).
- **TOAST** Taalonderzoek via Analyse van Spontane Taal (spontaneous language analysis) (Moerman-Coetsier & van Besien, 1987).
- **TvK** Taaltests voor kinderen, language tests for children regarding the phonological, morphological, syntactic and semantic aspects of language (van Bon, 1982).
- **UAO** Utrechts Articulatie Onderzoek, analyses the articulation skills of children by naming pictures (Peddemors-Boon, van der Meulen, & Vries, 1977).
- **UTANT** Utrechtse Taalniveau Test, a language test consisting of scales of the passive lexicon, reasoning by analogy, morphology rules and naming tasks (Kohnstamm & Sanavno, 1983).
Appendix C  Research protocol MultiDD / MonoDD procedure

Background Information (T₀ and T₁)

Respondent number ___. ______
Age (T₀) ___ ; ______
Age (T₁) ___ ; ______

Background information: child (T₀)  Background information: family (T₀)

1. Gender
   □ boy
   □ girl

2. Birthweight
   □ < 2.0 kg
   □ ≥ 2.0 kg

3. Did the child attend a crèche
   □ yes
   □ no
   □ no information

4. Parents
   □ two parents
   □ one parent
   □ other: _________

5. Siblings
   □ yes, there are ___ children
   □ no

6. SES (socioeconomic class)
   □ low
   □ middle
   □ high
   □ no information

General anamnesis: parental information (T₀)

1. Specification of Speech and language problems by the parents:
   (e.g. language delay, pronunciation problems, medical or behavioural problems)

2. Hearing of their child
   □ no information
   □ normal
   □ deviant

3. General development of their child
   □ no information
   □ normal
   □ different from peers

4. Interpretation of the problems, according to the parents
   □ no information
   □ Specific Language Impairment (SLI)
   □ ORL associated problems
   □ developmental problems
Speech and language examination (T₀ and T₁)

1. Language production: STP

<table>
<thead>
<tr>
<th>ZQ (T₀)</th>
<th>ZQ (T₁)</th>
</tr>
</thead>
</table>

Interpretation STP

<table>
<thead>
<tr>
<th>T₀</th>
<th>T₁</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>no information</td>
<td></td>
<td></td>
</tr>
<tr>
<td>insufficient (ZQ &lt; 80)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>below average (80 ≤ ZQ &lt; 90)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>average (90 ≤ ZQ ≤ 110)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>above average (ZQ &gt; 110)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2. Language comprehension: RTB

<table>
<thead>
<tr>
<th>TBQ (T₀)</th>
<th>TBQ (T₁)</th>
</tr>
</thead>
</table>

Interpretation RTB

<table>
<thead>
<tr>
<th>T₀</th>
<th>T₁</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>no information</td>
<td></td>
<td></td>
</tr>
<tr>
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<td></td>
</tr>
<tr>
<td>above average (TBQ &gt; 110)</td>
<td></td>
<td></td>
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</tbody>
</table>

3. Spontaneous language production: GDS

<table>
<thead>
<tr>
<th>T₀</th>
<th>T₁</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>no information</td>
<td></td>
<td></td>
</tr>
<tr>
<td>babbling (&lt; 0;9)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>varied babbling (0;9-1;9)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>babbling, sometimes an understandable word (1;0-1;6)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>some words; one-word utterances (1;6-2;0)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>two-word utterances (2;0-2;6)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2-3 word utterances (2;6-3;0)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3-5 word utterances (3;0-3;6)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>simple sentences, word sequence errors (3;6-4;6)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>simple sentences, word sequence right (4;6-5;6)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>grammatically correct sentences, also compound (&gt;5;6)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Developmental screening and behavioural observation (T₀ and T₁)

1. Global non-verbal development: DOS-R

<table>
<thead>
<tr>
<th>T₀</th>
<th>T₁</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Adequate</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inadequate</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not able to test, because:</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Interpretation of the global non-verbal development

<table>
<thead>
<tr>
<th>T₀</th>
<th>T₁</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>normal development</td>
<td></td>
<td></td>
</tr>
<tr>
<td>developmental problem</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Results (T₀)

1a Language Impairment

<table>
<thead>
<tr>
<th>yes</th>
<th>no</th>
<th>no information</th>
</tr>
</thead>
</table>

2a Developmental problem

<table>
<thead>
<tr>
<th>yes</th>
<th>no</th>
<th>no information</th>
</tr>
</thead>
</table>

1b Medical problem

<table>
<thead>
<tr>
<th>yes</th>
<th>no</th>
<th>no information</th>
</tr>
</thead>
</table>

2b Medical and developmental problems

<table>
<thead>
<tr>
<th>yes</th>
<th>no</th>
<th>no information</th>
</tr>
</thead>
</table>
**Treatement recommendation (T₀)**

- [ ] wait-and-see approach
- [ ] speech and language therapy
- [ ] medical examination or treatment
- [ ] psychological examination

**Monthly Questionnaire (between T₀ and T₁)**

The questions in this questionnaire refer only to the treatments your child received in the last four weeks

Today’s date ___ / ____ / _______

1. **Have you and your child visited the speech therapist within the last four weeks?**
   - [ ] yes, we visited the speech therapist ___ times in the last four weeks
   - [ ] no, we have not visited the speech therapist within the last four weeks

2. **Has your child been admitted to hospital in the last four weeks?**
   - [ ] yes, my child was admitted to hospital ___ times within the last four weeks.
   - [ ] no, my child has not been admitted to hospital within the last four weeks.

3. **Has your child received other treatments in the last four weeks?**
   (e.g. treatment in the Department of Otorhinolaryngology, a centre for audiology, physiotherapist, paediatrician, child neurologist, child psychiatrist or psychologist)
   - [ ] yes, my child received other treatments in the last four weeks
   - [ ] no, my child has not received other treatments in the last four weeks

3a. **When other treatments were received: who did you and your child visit for treatment?**
   Note: You can mark several boxes.
   - [ ] the Department of Otorhinolaryngology was visited ___ times within the last four weeks
   - [ ] the centre for audiology was visited ___ times within the last four weeks
   - [ ] the physiotherapist was visited ___ times within the last four weeks
   - [ ] the paediatrician was visited ___ times within the last four weeks
   - [ ] the child neurologist was visited ___ times within the last four weeks
   - [ ] the child psychiatrist was visited ___ times within the last four weeks
   - [ ] another treatment was received: ____________________, we visited him/her ___ times within the last four weeks
Evaluation of the speech and language development, according to parents (T₁)

1. Did the language skills improve in the past year?
   - yes, the language skills are now age-adequate
   - there is some improvement, but language skills are still delayed
   - it got worse
   - no
   - no information

2. Are language skills in accordance with the global non-verbal development?
   - yes
   - no
   - no information

3. Are parents still worried about the language development of their child?
   - yes
   - no
   - no information

4. Are parents satisfied with the treatment of their child during the past year?
   - yes
   - no
   - no information
   - not applicable

5. How long did it take before the right treatment was received?
   - 0 - 3 months
   - 3 - 9 months
   - 6 - 9 months
   - 9 - 12 months
   - the child has not received the right treatment yet
   - no information

6. Is the child still under treatment?
   - yes, speech therapy
   - medical treatment or guidance
   - developmental treatment or guidance
   - otherwise: _____________________________
   - no

7. Remarks about less preferable things in the past year