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4 The ability to produce grammatical utterances: grammaticality in general

Annette Scheper

4.1 Introduction

Acquiring the morphological/syntactic rules of Dutch grammar is part of the task that Dutch-speaking children are faced with when acquiring their mother tongue. Morphology is the system of the smallest meaningful units of language which can either stand alone as a word form or be bound to another unit to add meaning, whereas syntax is the rule system used in constructing sentences. It is the rule system that governs the use of morphemes and word order (Haegeman, 1991). Normally developing Dutch children are still developing their morphology/syntax or grammaticality between the ages of four and six years (e.g. Schaerlaekens and Gillis, 1987; Van den Dungen and Verbeek, 1994, 1999; Krämer, 1995; Wijnen, 1995, 1998; Bol, 1996; Verhulst-Schlichting, 1996; Verrips, 1996; Gillis and Schaerlaekens, 2000).

The general picture for normal syntactic development is that children's utterances become longer as children grow older. Gillis and De Houwer (1998:49) state that Dutch children gradually diversify their use of clause and noun phrase constituents, but not at the expense of previously occurring elements: there seems to be a general addition operation, rather than a replacement one. Similarly, the development of verb and noun phrases starts with a limited repertoire that is gradually expanded. Complex verb and noun phrases start to be used in addition to simple ones, accompanied by a gradual diversification in the types of elements that occur in these verb and noun phrases.

When acquiring the grammatical rules of Dutch, children make grammatical errors, but as the children grow older, the frequency of errors should decrease. For example, children have to learn that words belong to different syntactic categories, such as nouns, verbs, etc., and that the syntactic category to which a word belongs determines its distribution, that is in what context it can occur. They have to learn that one cannot easily interchange words of one category for words of another, as this mostly results in ungrammatical sentences. Children also have to acquire which syntactic categories are obligatory within Dutch as a verb-second language with an underlying Subject-Object-Verb order and which morphological adjustments between verbs, nouns and prepositions are necessary (e.g. Gillis and De Houwer, 1998) (see for a more detailed explanation Chapter 6).

After the age of six, the grammatically marked utterances in the discourse have to decrease to 'normal' proportions that is as produced by adults (Van den Dungen and Verbeek, 1994, 1999). Spontaneous language is always more coloured by a certain degree of ungrammaticality than, for example, the language spoken to announce the daily news on radio or television. Children might occasionally speak ungrammatically for the same reasons that adults occasionally do, for example, when they do not take enough time to plan their message (Hsu and Hsu, 1996). Clearly, children should not be expected to be any less error-prone than adults, but –
to the extent that their processing or performance abilities are more limited than those of adults – children might make more grammatical errors than adults. The impact of ungrammatical utterances in the discourse should be so small, however, that the communicative message remains fully understandable most of the time.

It is important for language acquisition theory to explore the exclusiveness of specific morphological/syntactic phenomena in specific populations, such as in children with a psychiatric disorder. As described in Chapter 1, research has indicated that a high percentage of PI-children have problems with language (Cantwell and Baker, 1987; Cohen et al., 1989; Prizant et al., 1990). Although pragmatic difficulties are generally observed in PI-children, some researchers have shown that PI-children with internalizing or externalizing disorders have lower expressive syntactic scores than their normally developing peers (e.g. Cantwell, Baker and Rutter, 1978; Stevenson et al., 1985; Miniutti, 1991; Warr-Leeper, Wright and Mack, 1994). Stevenson and colleagues (1985) even concluded that deficiencies in expressive syntax were severe enough to be a significant marker, predicting subsequent externalizing PI. Also PI-children with Autistic Disorder and PDD-NOS, a disorder on the autistic spectrum, show severe language problems at the level of morphology/syntax alongside semantic/pragmatic problems (Van Berckelaer-Onnes, 1992, 1997). An explanation for the occurrence of externalizing disorders is the inability to process information through the auditory modality (e.g. Mattison, Cantwell and Baker, 1980; Zinkus and Gottlieb, 1983; Cantwell and Baker, 1985). Auditory processing impairments have been found in PI-children, particularly in children with ADHD and PDD-NOS (Westby, 1999; see 2.2; 2.3.1) and might lead to morphological and syntactic problems.

Detailed morphological/syntactic analyses of spontaneous language in the conversational and narrative genre have not yet been carried out in relation to psychiatric disorder. Frequently, only language test results were used to classify morphological/syntactic disorders (see 1.2.3).

The Dutch pilot studies for this research have shown that PI-children have problems with realizing syntactic categories in a semi-structured interview as part of the conversational genre. They also make more morphological/syntactic errors than their age-peers. Characteristic for these PI-children is the lack of obligatory morphological/syntactic information and errors of form. Furthermore, the utterances produced by these PI-children reflect low complexity (Ran and Smits, 1990; Mills and Tso, 1991). It was also noticed that – consequently – the frequent use of morphologically/syntactically marked or ungrammatical utterances mostly had a negative influence on the communicative interaction. These utterances were often judged as being not properly informative and therefore difficult to understand for the conversational partner. It was concluded that the morphological/syntactic problems can occur in isolation, but also often co-exist with problems in the level of semantics-pragmatics (Kolthoff, 1989; Ran and Smits, 1990; Mills and Tso, 1991). In these pilot-studies only a small group of PI-children was studied and only general measures were used to describe the morphological/syntactic skills. From these results it is not clear how specific aspects of morphology and syntax are affected in
PI-children and whether they show a retarded or atypical morphological/syntactic development (see 1.1).

However, on the basis of the diagnostic criteria for the types of PI-children we are studying, we should expect to find clear morphological/syntactic difficulties alongside the better-known semantic/pragmatic difficulties in PI-children (e.g. Westby, 1999). Among the diagnostic criteria for identifying PI-children with ADHD are for example: (1) difficulties in sustaining attention in tasks or play activities, (2) easily distracted by extraneous stimuli and (3) excessive talking (APA, 2000). The ability to be attentive and motivated, both part of MAM, are prerequisites for performing a behavioural (language) task in a goal-oriented way (Westby and Cutler, 1994). We already explained in 2.3.1 that executive dysfunctioning causes interrelated impairments in both PI and LI in a child. PI-children with executive dysfunctioning miss subtle cues in conversation, interrupt others, change topics, and lose their focus, reflecting difficulties in the area of semantics/pragmatics. However, executive functioning deficits may also lead to general difficulties in organizing language production and processing incoming language, leading to problems in the area of morphology/syntax. More precisely, a child that cannot keep his attention on (language) tasks or activities might likely produce fragmented sentences with missing obligatory information. In turn, excessive talking could cause, for example, absence or errors in the fine-tuned ability of establishing connectivity within T-units\(^1\) or between T-units in extended discourse. To conclude, morphological/syntactic and semantic/pragmatic difficulties might co-occur in PI-children with ADHD.

The main question of this chapter is to what extent the 120 Dutch-speaking PI-children have problems with morphology/syntax in conversation. To gain a deeper insight into the conversational abilities of these children a detailed error and complexity analysis of the morphology and syntax is carried out. With both types of analysis the severity and type of morphological/syntactic disorder can be diagnosed. Furthermore, the morphological/syntactic analysis is divided into two parts, the grammatical form and the complexity of utterances. The analysis related to the grammatical form is divided into an analysis of lexical categories as opposed to functional categories (Chomsky, 1986). This distinction seems to be particularly relevant, since some research indicated that SLI-children seem to have more problems with the realization of functional than with lexical categories (e.g. Clahsen, 1989, 1992; Leonard, 1998). However, research has indicated that the grammatical problems of SLI-children also involve the use of lexical categories as related to the argument structure (e.g. Rice, 1996; Leonard, 1998; De Jong, 1999; see 1.2).

We know that many LI-children show uneven profiles, i.e. they may resemble younger N-children in some aspects of language use but not in others (Leonard, 1996:298). These uneven profiles can differ in groups of LI-children. It is assumed

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1 T-unit is an abbreviation of 'Terminable unit', that is a main or independent clause with all its modifiers and subordinate clauses (Hunt, 1970:4). A STAP interview is finished when 50 T-units are expressed by the child. The variables 'ungrammatical T-unit' and 'grammatical error' are analysed in these 50 T-units according to STAP (Van den Dungen and Verbeek, 1994, 1999).
that there is a group of SLI-children that show only impairment in the area of morphology/syntax, so-called Grammatical SLI-children (G-SLI) (e.g. Rice, 1993; Van der Lely, 1994). Semantic-pragmatic disorders tend to co-occur with autistic features (Rapin, 1996; Bishop, 1998; Bishop, Chan, Adams, Hartley and Weir, 2000; see 1.2). However, some research has identified children who do not meet the diagnostic criteria for autism but do show semantic-pragmatic disorders (SP-SLI-children) (Rapin, 1996; Conti-Ramsden, Crutchley and Botting, 1997). Bishop (1989; 1998) even distinguishes a group of children with Pragmatic Language Impairment (PLI), a disorder that is intermediate between autistic disorder and SLI. Recent Dutch research shows that children with Specific Language Impairment have a significantly increased risk for developing behavioural problems at an older age, i.e. from the age of eight years (Coster, 2002).

Children with Williams' Syndrome, a rare neurodevelopmental disorder, are often used as a prime example for the modularity of an innate faculty for morphological/syntactic rules: these children are characterized by serious cognitive deficits alongside intact language (see 2.2 and 2.3.2). However, recent research has shown that Williams' Syndrome children show some clear morphological/syntactic problems, suggesting that the notion of spared, modular, language capacities in Williams' Syndrome should be further discussed (Karmiloff-Smith, Grant, Berthoud, Davies, Howlin and Udwin, 1997).

It is possible that the morphological/syntactic profiles can also vary in specific types of PI-children. A more detailed morphological/syntactic analysis will shed light on relationships between specific morphological/syntactic problems in specific diagnostic groups of PI-children (see 3.2.3).

We want to determine whether the PI-children especially have difficulties in the area of morphology/syntax in the realization of functional or lexical categories or both in the conversational and narrative genre (Chapter 4 to 9). The first part of the complete morphological/syntactic analysis is related to the grammaticality of utterances and the second part to the complexity of the utterances. Table 4.1 presents all the specific morphological/syntactic variables used in the complete analysis of grammatical form and complexity of morphosyntax in the conversational genre (see Chapter 4 to 8).

With respect to the narrative genre, we carried out a comparable analysis including the variables related to grammaticality, temporality, transitivity, agreement and morphosyntactic packaging (see Chapter 9). Each morphological/syntactic variable will be discussed in the following chapters. In Table 4.1, the numbers 4 to 9 refer to the specific chapter that presents the results of a specific variable. Each section contains a motivation of the specific linguistic variable on which the research question(s) are formulated. Then the research variables are defined and operationalised and the results related to a specific morphological/syntactic variable are presented. Each section will be rounded off with concluding remarks.
Table 4.1 The complete set of morphological/syntactic variables for grammatical form and complexity in the conversational and narrative genre

<table>
<thead>
<tr>
<th>Chapter</th>
<th>Type of analysis</th>
<th>Variables</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 Production of grammatical utterances</td>
<td>Error-analysis</td>
<td>Total number of Ungrammatical T-units, Total number of Grammatical errors Clustering of Grammatical errors</td>
</tr>
<tr>
<td>5 Realization of lexical categories</td>
<td>Error-analysis</td>
<td>(Un)grammatical missing subjects and objects Missing Preposition Missing Adverbial phrases</td>
</tr>
<tr>
<td>6 Ungrammatical use of lexical categories</td>
<td>Error-analysis</td>
<td>Wrong lexical choice of Preposition Wrong lexical choice of Adverbial (phrase) Word order errors</td>
</tr>
<tr>
<td>7 Ungrammatical use of functional categories</td>
<td>Error-analysis</td>
<td>Tense marking: Incorrect Past tense marking Agreement marking: Incorrect Subject-Verb Agreement Incorrect Determiner-Noun Agreement</td>
</tr>
<tr>
<td>8 Morphological/syntactic packaging</td>
<td>Analysis of complexity</td>
<td>Mean Length of Utterance (MLU) Mean Length of 5 Longest Utterances (MLUL) Morphosyntactic packaging by the use of: Clausal ellipsis Conjunction reduction constructions Embedded clauses Transitivity by the use of: Obligatory Object verbs Optionally Object verbs Intransitive verbs Copula verbs Transitivity by the use of: Split or Particle verbs Light or GAP verbs</td>
</tr>
<tr>
<td>9 Genre comparison conversation / narrative</td>
<td>Error-analysis and Analysis of complexity</td>
<td>Total number of Ungrammatical clauses Total number of Grammatical errors Temporality by the use of: Number of missing lexical verbs Correct use of past tense Incorrect past tense marking Transitivity by the use of: Obligatory Object verbs Optionally Object verbs Intransitive verbs Copula verbs Ungrammatical missing subjects and objects Agreement relations by the use of: Incorrect subject-verb agreement Incorrect determiner-noun agreement Morphosyntactic packaging by the use of: Discourse topic drop Conjunction reduction constructions Embedded clauses</td>
</tr>
</tbody>
</table>
4.2 Ungrammatical T-units and Grammatical Errors

4.2.1 Research questions, definitions and operationalisations

Our main question in this section is to what extent the 120 PI-children have problems with morphosyntax in terms of grammatical form in general as compared to normally developing children, either the N-children from the Roelofs-population (1998) or the STAP-population (1994). Therefore, we want to answer the following questions: *is the number of ungrammatical T-units and grammatical errors in interviews with PI-children comparable to the amount in interviews with N-children? And, is there comparable development with age?*

Problems with 'grammaticality' are defined as a significantly high number of ungrammatical T-units and/or a significantly high number of grammatical errors compared to normally developing children, according to STAP (Van den Dungen and Verbeek, 1994, 1999). Of these two variables the former is the stricter criterium in grammaticality, since a large number of errors can be produced in a few T-units, whereas if a large number of T-units is affected, then the morphological/syntactic problem is more widespread. The term 'T-unit' is an abbreviation of 'Terminable unit', that is a main or independent clause with all its modifiers and subordinate clauses (Hunt, 1970:4). A STAP interview is finished when 50 T-units are expressed by the child. The variables 'ungrammatical T-unit' and 'grammatical error' are analysed in these 50 T-units according to STAP (Van den Dungen and Verbeek, 1994, 1999).

As morphological/syntactic abilities develop with age, younger children should produce more ungrammatical T-units and make more grammatical errors than the older ones. What we have to find out is whether PI-children show a similar general developmental rate and course as the N-children. Therefore, we are interested in age effects in both populations with respect to grammaticality.

To answer these questions we will describe the definitions and operationalisation of the specific variables and the results with respect to the production of (un)grammatical T-units caused by grammatical errors in interviews with PI-children in comparison to N-children.

After transcription and segmentation of the conversational genre in communicative contributions (i.e. 50 T-units, elliptical answers, yes/no-answers and breaks) (see also 10.3), a grammatical judgement is made with regard to the 50 T-units expressed by the child. According to STAP (Van den Dungen and Verbeek, 1994, 1999), we counted the *total number of ungrammatical utterances* out of 50 T-units and the *total number of grammatical errors* in 50 T-units. A T-unit is defined as ungrammatical when the T-unit is incorrect from morphological or syntactic perspective related to standard conversational Dutch. It concerns a judgement of the form of language defined as follows (Van den Dungen and Verbeek, 1994:25, 1999):

(1) "A morphological error is an error in the inflection or conjugation of a verb, a noun or an adjective. It concerns a clear morphological error or an inflected or conjugated form which is not appropriate in the context".

...
(2) "A syntactic error is an error in the structure of the T-unit. A syntactic error arises from deletion, insertion, grammatical substitution, inversion or a combination of the above".

Examples of possible grammatical (morphological and syntactic) errors are given in 1 to 4.

Example 1 Pronoun error in Dutch (PI-child; age 4;5)
Kimberley: Moet je altijd slapen, als je donker is.
Must-you-always-sleep-when-you-dark-is.
(You always have to go to sleep, when you is dark)
Paraphrasis: [Dan] moet je altijd slapen, als <het> donker is.
[Then] must-you-always-sleep-when-it-dark-is.
(You always have to go to sleep, when it is dark)

Example 2 Verb omission in Dutch (PI-child; age 4;7)
Pricilla: Die Ø beetje pot.
That Ø bit-broken.
(That Ø bit broken)
Paraphrasis: Die [trui] <is> <een> beetje kapot.
That [sweater]-is-a-little-broken.
(That [sweater] is a little damaged)

Example 3 Grammatical gender error in Dutch (PI-child; age 8;2)
Brenda: Maar die konijn is op wereldreis.
But-that-rabbit-is-on-world-trip.
(But that rabbit is making a trip around the world)
Paraphrasis: Maar <dat> konijn is op wereldreis.
But-that-rabbit-is-on-world-trip.
(But that rabbit is making a trip around the world)

Example 4 Word order error in Dutch (PI-child; age 7;5)
Pieter: Ze zal wel voor de kamer van het raam staan.
She-will-in-front-of-the-room-of-the-window-stand.
(She will be standing in front of the room of the window)
Paraphrasis: Ze zal wel voor <het raam> van <de kamer> staan.
She-will-in-front-of-the-window-of-the-room-stand.
(She will be standing in front of the window of the room)

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2 First, a Dutch example of a T-unit with a grammatical error or missing category is shown followed by a glossed version in English and then an English translation. Then the paraphrase line in Dutch is presented followed by a glossed version in English and the English translation. A grammatical form error is marked in Bold and a grammatical missing category is marked with the symbol [Ø] in Bold. The corrected form is presented between angle brackets < > in the paraphrase line. The conventions of transcription and segmentation symbols are shown in Appendix 4a.
When a morphological or syntactic error (omission, error in form and placement) is detected, the ungrammatical T-unit must be paraphrased into a grammatical one in the register of informal conversational Dutch. The type of morphological/syntactic error is classified into a specific morphological/syntactic category related to the noun, verb and adverb phrase to analyze the core problem of the ungrammaticality (see Appendix 3b variables according to STAP).

_Grammaticality in general_ includes also the _total number of grammatical errors_ as defined in this section. The ungrammaticality of a single T-unit can be based on a single grammatical error, but also on two or more grammatical errors, i.e. _clustering of grammatical errors_. Clustering of two grammatical errors is shown in Example 5.

**Example 5**  
*Subject Verb agreement and grammatical gender error in Dutch (PI-child; age 5;9)*

Kay:

Wij _maakt_ zo een soort trippeltje _die_ zo naar beneden _ken_.

We make a kind of _<lexical new form>_ that downwards _can_.

(We is making a kind of _<lexical new form>_ that goes downwards)

Paraphrasis:

Wij _<maken>_ zo een soort _<trippelije>_<dat> zo naar beneden _kan_.

We make a kind of _<lexical new form>_ that downwards _can_.

(We are making a kind of _<lexical new form>_ that goes downwards)

In Example 6, clustering of ten grammatical errors in a single T-unit is shown.

**Example 6**  
_Clustering of ten grammatical errors in Dutch (PI-child; age 4;2)_

Gary:

^" PIons, helemaal onder water met eh bodem _gegooid_, helemaal _angere_ water.

(Splash, entirely under water thrown with eh bottom, entirely other water)

Paraphrasis:

<Toen> _<heb>_<ik> _<de_kikker>_ helemaal _<zin>_<dat> andere water.

(Then I threw the frog right down to the bottom under water, entirely in that other water)

In order to identify children with problems in morphosyntax, we analysed the grammaticality in general, including _ungrammatical T-units, total grammatical errors and clustering of grammatical errors_. A frequent use of ungrammatical T-units and grammatical errors indicate a slight or severe morphological/syntactic disorder. According to the STAP guidelines children who are more than 2 standard deviations (sd) below the norm on either variable are interpreted as having severe problems. Children whose scores are between -2sd and -1sd are categorized as having slight problems. In a normal population 2.5% can be expected to score below 2sd and 16% below 1sd. If the children are different as a group, these percentages should be higher. On these variables the PI-children are compared with the N-children from the STAP population. Differences are tested using a Binomial test (see 3.6).
4.2.2 Results: Ungrammatical T-units and Grammatical Errors

Table 4.2 shows the distribution of the total number of PI-children per age group and the total number of PI-children according to the production of the number of ungrammatical T-units and grammatical errors per interview. The production of ungrammatical T-units and grammatical errors expressed by 120 PI-children are compared to the production of 240 N-children from the STAP-population.

Table 4.2 Distribution of total number and percentage of 20 PI-children per age group and total number and percentage of 120 PI-children categorized according to z-scores sd ≤ -2, -2 < sd ≤ -1 and sd > -1 on the variables total number of ungrammatical T-units and total number of grammatical errors in the conversational genre

<table>
<thead>
<tr>
<th>PI-children n=120</th>
<th>Ungrammatical T-units</th>
<th>Grammatical errors</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>sd ≤ 2</td>
<td>-2 &lt; sd ≤ -1</td>
</tr>
<tr>
<td>Normal distribution</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 yrs</td>
<td>11</td>
<td>55%</td>
</tr>
<tr>
<td>5 yrs</td>
<td>7</td>
<td>35%</td>
</tr>
<tr>
<td>6 yrs</td>
<td>9</td>
<td>45%</td>
</tr>
<tr>
<td>7 yrs</td>
<td>12</td>
<td>60%</td>
</tr>
<tr>
<td>8 yrs</td>
<td>13</td>
<td>65%</td>
</tr>
<tr>
<td>9 yrs</td>
<td>9</td>
<td>45%</td>
</tr>
<tr>
<td>Total children / %</td>
<td>61</td>
<td>51%</td>
</tr>
<tr>
<td></td>
<td>88</td>
<td>73%</td>
</tr>
</tbody>
</table>

First, when we compare the number of ungrammatical T-units produced, a significantly high number of PI-children represent the two marked categories (second and third column). Instead of the expected 2.3% (based on the results in the STAP-population) half (51%) of the PI-children show severe problems with grammaticality (p < .000). Additionally, a third (31%) of the PI-children shows slight grammatical problems (p < .000) instead of the expected 16%. These results indicate that 82% of the PI-children have a severe or slight morphological/syntactic disorder. These PI-children with a severe or slight morphological/syntactic disorder (z ≤ -1) are distributed over the four specific psychiatric disorders as follows (see 3.2.1): 32 (out of 41: 78%) PI-children with internalizing disorders, 31 (out of 32: 97%) PI-children with externalizing disorders, 22 (out of 25: 88%) PI-children with PDD-NOS and 13 (out of 22: 59%) PI-children with 'No Diagnosis' (see also 3.2). These results indicate that particularly PI-children with externalizing symptoms, that is Oppositional Behavioural Disorder and ADHD, and PI-children with a combination of internalizing and externalizing symptoms, that is PDD-NOS, produce too many ungrammatical utterances.
Only 18% of all 120 PI-children showed no problems at all in morphology/syntax. These children are more or less equally divided over the age groups. At least 10% of the PI-children in each age group have no problems. In two age-groups this percentage is considerably higher, namely 25% in the five-year-olds and 30% in the six-year-olds.

Second, when we compare the total number of grammatical errors that are produced in an interview (see Table 4.2), again a significantly high number of children is found in the two marked categories: 73% of the PI-children have severe problems (p<.000) and 18% have slight problems with morphosyntax (p<.000). Thus, 91% of the PI-children have a severe or slight morphological/syntactic disorder on this variable, whereas only 9% of the PI-children show a 'normal' percentage of grammatical errors. These children are almost equally divided over the age groups (0% to 10%) with the exception of 15% found in the eight-year-old age group. Thus, PI-children produce more ungrammatical T-units compared to N-children of the same age. Almost each age group in the PI-children produces twice as many ungrammatical T-units as expected in the STAP-norms\(^3\) (see Appendix 4b). On average a third of the utterances in the interview is grammatically marked. In both populations\(^4\) the mean percentage of ungrammatical T-units decreases, as is shown in Figure 4.1.

Figure 4.1 Development with age of mean percentage of ungrammatical T-units (related to 50 T-units) in 240 N-children (STAP, 1994) and 120 PI-children in the conversational genre

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\(^3\) Unfortunately, STAP (Van den Dungen and Verbeek, 1994, 1999) only provides z-scores on behalf of the total population, so no individual scores are available. The mean total number of ungrammatical T-units are the values found at the z-score of zero. STAP only uses age groups of four, five, six, seven till eight-year-old. Therefore, the number of ungrammatical T-units in eight and nine-year-olds are assessed by extrapolation and are similar to the number in the seven-year-olds.

\(^4\) The mean value of the eight and nine-year-old N-children is assessed by extrapolation.
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It is evident from this figure that the PI-children are slower in their development of grammaticality. The N-children show a minimal decrease with age, but because of the non-availability of individual scores of all the N-children, we cannot investigate whether the development within these children is substantial and linear. Within the PI-children there is an extremely significant age effect (F(5,114)=5.394; p<.000), i.e. there was an expected decrease of ungrammatical T-units with age. This can almost be fully described as a linear trend (F(1,114)=17.268; p<.000; Eta squared .196; R squared .121).

With respect to the variable grammatical errors we find comparable results to these for the variable ungrammatical T-units. Appendix 4c presents how many grammatical errors (out of 50 T-units) per age group are found in the N and PI-children. The PI-children make far more errors than the N-children: N-children have only a third of the number of grammatical errors compared to PI-children. Figure 4.2 shows both developments with age in producing grammatical errors (see also Appendix 4c). Both populations show a decrease of the total number of grammatical errors with age. Again, the PI-children show a slower development with respect to the production of errors than the N-children. Possibly the shape of the development curve in PI-children is comparable to earlier stages in the N-children, but the nine-year-old PI-children still have not reached the level of four-year-old N-children. Since individual scores of all N-children are unavailable, we cannot investigate whether the development within these children is substantial and linear. Within the PI-children an extremely significant age effect (F(5,114)=5.65; p<.000) was found, largely explained by a linear decrease (F(1,114)=20.490; p<.000; Eta squared .20; R squared .14).

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5 The data of the PI-children were submitted to a one-way Analysis of Variance (ANOVA) in a between-subjects design with Ungrammatical T-units as dependent variable and age as independent variable for all age-groups (4-5-6-7-8-9 yrs) (Van den Brink and Koele, 1986). The one-way ANOVA is executed with the specifications Polynomial and Contrast to find possible linear age effects within one population. Only significant results are reported in the text.

6 In order to quantify the extent of the differences the Eta squared value is used: Eta squared value more than 20% indicates a 'substantial' difference; Eta squared value between 20% and 10% indicates 'moderate' difference; Eta squared value below 10% indicates 'relative small' difference. In order to gain insight in the linearity of the relation between age and a dependent variable the R squared values are reported as percentage variance explained, as for example the relation under investigation between age and the total number of ungrammatical T-units. If the R squared value and Eta squared value approach each other, the variance explained can be almost fully described as a linear trend. If the R squared value is at least 80% of the Eta squared value, the variance explained can be largely described as a linear relation. If the R squared value is at least 60% of the Eta squared value, the variance explained can be partly described as a linear relation.

7 The differences found can be classified as 'moderate' differences and the percentage variance explained is judged as 'large'.

8 The mean value of the eight and nine-year-old N-children from the STAP-population is assessed by extrapolation.

9 ANOVA with grammatical errors as dependent variable and age (4-5-6-7-8-9yrs) as independent variable is used in the PI-children. These differences can be classified as 'substantial' differences and the percentage variance explained is judged as 'large'.
4.2.3 Conclusion: Ungrammatical T-units and Grammatical Errors

The developmental literature described in section 1.1.1 reported relatively few PI-children with morphological/syntactic problems. We found that many PI-children produce too many ungrammatical T-units and grammatical errors in all age groups compared to the N-children form the STAP-population. It is even more remarkable that the PI-children do not catch up in the period under investigation: the grammatical difficulties are still persistently present in some older PI-children.

It is evident from the results that morphological/syntactic problems are not exclusively related to one type of PI, since we found that grammaticality problems were distributed over all the four specific PIs. However, particularly PI-children with externalizing disorders (Oppositional Behavioural Disorder and ADHD (APA, 2000)) and with the internalizing/externalizing disorder PDD-NOS (APA, 2000) tend to have grammaticality problems: nearly all children in both disorders showed slight to severe morphological/syntactic problems.

4.3 Clustering of Grammatical Errors

4.3.1 Research questions, definitions and operationalisations

An ungrammatical T-unit always indicates at least one grammatical error, but there can be more errors within the T-unit. Clustering of grammatical errors is not visible in the number of ungrammatical T-units, so the variable grammatical errors is necessary as counterpart to show the density of ungrammaticality in the conversation. Clustering of grammatical errors influences the information exchange between the child and the adult negatively, since error-clusters seem to be highly related to unintelligibility of the target message.

The extremely high number of grammatical errors in PI-children makes it worthwhile to analyze the clustering of grammatical errors: the occurrence of two or more errors within a T-unit, i.e. error clustering versus non-error clustering: the occurrence of single errors within a T-unit. Therefore, we have to answer the following questions: is the number of clustering of errors in interviews with PI-
children comparable to the average amount in interviews with N-children? And, is there comparable development with age?

In order to answer this question, we calculated the percentage T-units with a single error out of 50 T-units as opposed to the percentage T-units with two or more errors out of 50 T-units. The two variables with respect to grammaticality, i.e. total number of ungrammatical T-units and of grammatical errors (STAP; Van den Dungen and Verbeek, 1994, 1999), are thus more or less mutually dependent.

Since this type of analysis has not been carried out on PI-children nor on Dutch-speaking N-children, we had no expectations about possible group or age effects. Thus, Dutch norms related to clustering of grammatical errors were not available unlike the many other norms for other morphological/syntactic variables based on the 240 N-children from the STAP-population. We therefore had to compare the PI-children with the N-children from the Roelofs-population\(^\text{10}\) (1998).

As Roelofs (1998) predominantly focused on pragmatic development in normally developing children, we had to carry out the morphological/syntactic analyses of N-children\(^\text{11}\) ourselves in order to have a comparison group. For reasons of time, we had to make a selection of the N-children from the Roelofs-population. Therefore, not all age groups of the 75 N-children were included, but only the four, six and eight year olds (n=45). This age range, including the youngest and oldest N-children, was selected in order to cover all age groups in morphological/syntactic development.

To determine whether the Roelofs-population represents a population with 'normal grammatical behaviour', we compared the ability to produce grammatical T-units of these 45 N-children from the Roelofs-population with the production of 180 same-aged N-children from the STAP-population, using a Binomial test. First, with respect to the grammaticality of the T-units, the results indicate that a large subgroup (73%) of the Roelofs-population shows 'normal grammatical behaviour', but that the number of N-children with grammatical problems was higher than would be expected (see Appendix 4d). In a normally distributed population of 45 N-children, it can be expected that one child (2.3%) might show a severe problem in the production of ungrammatical T-units, but in fact four out of 45 N-children had such a problem. In a normally distributed population of 45 N-children, it can be expected that seven children (16%) might show slight problems with the production of ungrammatical T-units, but in fact eight out of 45 N-children had such a problem.

Second, with respect to the grammatical errors, 60% of the 45 N-children from the Roelofs-population had a normal amount of grammatical errors in their T-units (see Appendix 4d). Here, eight children instead of the expected one child were found to

\(^{10}\) This was not only the case with respect to the analyses of clustering of grammatical errors, but also with respect to the analyses of the use of lexical verbs with their arguments, of tense marking, of the use of prepositions and conjunctions that were not studied in the STAP research project (Van den Dungen and Verbeek, 1994, 1999) (see for results Chapters 5 to 8).

\(^{11}\) A preliminary analysis of the verb and its argument structure in the N-children of the Roelofs-population (Roelofs, 1998) was carried out by students (Baker, De Geus, Van Amstel, Gosselaar, Schuitj, Ureem, Verkoeijen and De Wijckerslooth, 1998), whereas the final analysis has been carried out by Annette Schepers.
have a severe problem and ten instead of the expected seven children showed slight problems. 

Furthermore, the development with age in the Roelofs-population shows 'normal grammatical growth', when compared to the same-aged N-children from the STAP-population: there is a linear decrease with age of the mean total number of ungrammatical T-units and grammatical errors observed in the Roelofs-population (see Appendix 4e). These results show that the four-year-olds in the Roelofs-population produce significantly more ungrammatical T-units and grammatical errors than the older ones and confirm a development in grammatical skills with age comparable to the STAP-population.

Although the Roelofs-population does not represent a population with the most ideal 'normal grammatical behaviour' on all levels, we might nevertheless conclude that, if the PI-children are significantly worse than these N-children from the Roelofs-population, we can be sure that the PI-children genuinely have morphological/syntactic problems. In sum, we think that for the analyses of clustering of grammatical errors it is acceptable to use the N-children from the Roelofs-population (1998) as a comparison group.

4.3.2 Results: Clustering of Grammatical Errors

In Table 4.3 it is shown how many T-units with a single error as opposed to T-units with two or more grammatical errors the N and PI-children produce in the age groups of four, six and eight years.

Firstly, we compare the production of T-units with a single error. From Table 4.3 it is clear that the 60 PI-children produce significantly more T-units with one grammatical error than the 45 N-children; this proved to be a significant group effect (F(1,99)=4.061; p<.047). An age effect was also observed with respect to the variable under investigation (F(2,99)=3.595; p<.031). As expected the 45 N-children show a significant linear decrease with age in using T-units with a single error (F(1,42)=9.532; p<.004; Eta squared .19; R squared .19). Surprisingly, the 60 PI-children do not show a significant linear decrease in the production of T-units with a single error. However, a delayed start of this development in the PI-children might be there, as a decrease in the production of one-error T-units is only observed between six and eight years and not from age four on, contrary to this development observed in the N-children.

12 ANOVA with T-units with a single grammatical error related to total number of 50 T-units as dependent variable and age (4-6-8yrs) as independent variable shows a significant group and age effect in the N- and PI-children. No significant group*age interaction effect was found.

13 If a main effect for age or a group*age interaction effect is found, post hoc trend analyses using one-way ANOVA were executed to examine the linearity of the age effects in both N and P-children. One-way ANOVA with T-units with a single grammatical error related to total number of 50 T-units as dependent variable and age (4-6-8yrs) as independent variable in the N-children is used.
The ability to produce grammatical utterances: grammaticality in general

Table 4.3 Mean total number, percentage (related to 50 T-units) and standard deviations T-units with one grammatical error and T-units with two or more grammatical errors (i.e. clustering of errors) in 45 N-children (Roelofs, 1998) and 60 PI-children in the conversational genre

<table>
<thead>
<tr>
<th>Mean total T-units with:</th>
<th>N-children n=45</th>
<th>PI-children n=60</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single grammatical error</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>x</td>
<td>%</td>
</tr>
<tr>
<td>4 yrs</td>
<td>8.41</td>
<td>17%</td>
</tr>
<tr>
<td>6 yrs</td>
<td>6.80</td>
<td>14%</td>
</tr>
<tr>
<td>8 yrs</td>
<td>5.00</td>
<td>10%</td>
</tr>
<tr>
<td>Total mean</td>
<td>6.73</td>
<td>13%</td>
</tr>
<tr>
<td>Clustering of two or more grammatical errors</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>x</td>
<td>%</td>
</tr>
<tr>
<td>4 yrs</td>
<td>5.46</td>
<td>11%</td>
</tr>
<tr>
<td>6 yrs</td>
<td>3.13</td>
<td>6%</td>
</tr>
<tr>
<td>8 yrs</td>
<td>3.67</td>
<td>7%</td>
</tr>
<tr>
<td>Total mean</td>
<td>4.09</td>
<td>8%</td>
</tr>
</tbody>
</table>

Secondly, in Table 4.3, it also shown that the frequency of T-units with clustering of two or more grammatical errors found in the production of the PI-children is higher than in the production of the N-children. This proved to be a highly significant group effect (F(1,99)=39.157; p<.000). Just as no age effect was observed for the production of one-error T-units, also no significant age effect is found for the production of more-than-one-error T-units in both populations (F(2,99)=4.046; p<.020), although the N-children show an expected decrease with age in error-clustering that is almost significant (F(2,42)=3.131; p<.054). This cannot be explained as a linear development. The PI-children show again no significant decrease with age of clustering of errors. Figure 4.3 illustrates the distribution of the clustering of errors in both populations.

---

14 ANOVA with T-units with clustering of two or more grammatical errors related to total number of 50 T-units as dependent variable and age (4-6-8yrs) as independent variable in the N- and PI-children. No significant group*age interaction effect was found. Notice the high standard deviation found in the four-year-old PI-children, which indicates a great individual variation within this age group related to the production of two or more grammatical errors within one T-unit.

15 One-way ANOVA with T-units with clustering of two or more grammatical errors related to total number of 50 T-units as dependent variable and age (4-6-8yrs) as independent variable in the N-children.
Notably, the frequency of clustering in the eight-year-old PI-children is even higher than the frequency of clustering found in the four-year-old N-children, because of the extremely high number of grammatical errors found in PI-children.

In order to gain insight into whether PI-children with a specific PI showed particular problems with error-clustering, we calculated z-scores for 60 PI-children based on all N-children (Roelofs-population): the cut-off point for severe error-clustering problems ($z \leq -2$) was set at 10. This means that PI-children who used 10 or more T-units with clustering of two or more errors in the interview were defined as deviant; the cut-off point for slight error-clustering problems ($-2 < z \leq -1$) was set at 7. If we take the severe and slight problems together ($z \leq -1$), 43 (72%) PI-children showed clustering that occurs most frequently in PI-children with externalizing disorders ($n=14; 33\%$), followed by PI-children with PDD-NOS ($n=11; 26\%$) and then followed by PI-children with internalizing disorders and 'No Diagnosis' (both $n=9; 21\%$).

### 4.3.3 Conclusion: Clustering of Grammatical Errors

We conclude that the 60 PI-children at four, six and eight year show significantly more clustering of two or more errors within a T-unit than the 45 same-aged N-children. In N-children single grammatical errors occur more frequently than clustering, whereas in PI-children clustering occurs more frequently than single errors (see Chapter 5 to 8 for detailed error-analyses). What is more, clustering of errors produced by PI-children could sometimes consist of seven to ten grammatical errors (see Example 6 in 4.3), whereas in N-children such a high number of errors within a single T-unit never occurs.

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16 We derived z-scores based on the mean scores of 45 N-children from the Roelofs-population (1998). Since the N-children showed a total mean of 4.09 error-clustered T-units and a standard deviation of 2.80 (see Table 4.3), the cut-off point for severe error-clustering problems ($z \leq -2$) was set on 10 and for slight problems ($-2 < z \leq -1$) on 7.
Although error-clustering is found in all four types of PI-children (see 3.2), the subgroups of externalizing disorders and PDD-NOS have the highest number of children who are deviant in this aspect. Remarkably, the highest number of error-clustered T-units is observed in some PI-children with PDD-NOS: sometimes 40% to 50% of their T-units showed clusters of errors. It is evident that clustering of errors at T-unit level negatively influences the intelligibility of the information exchange about daily-life topics in the interview.

4.4 General conclusions: the ability to produce grammatical utterances

It is clear that morphology/syntax in terms of grammatical form in general is affected in the 120 children with a psychiatric disorder in the conversational conversational genre. 82% of all PI-children as a group produce too many ungrammatical T-units compared to the 240 N-children of the STAP-population, as we take the total number of ungrammatical T-units as criterium for the degree of ungrammaticality. Taking the total number of grammatical errors as criterium, even 91% of all PI-children showed too many grammatical errors compared to the N-children at all ages studied (see Table 4.4).

Table 4.4

<table>
<thead>
<tr>
<th>Grammatical form in general</th>
<th>N-children n=240/n=45</th>
<th>PI-children n=120/n=60</th>
</tr>
</thead>
<tbody>
<tr>
<td>Too many Ungrammatical T-units</td>
<td>2.3%</td>
<td>82%</td>
</tr>
<tr>
<td>Too many Grammatical errors</td>
<td>2.3%</td>
<td>91%</td>
</tr>
<tr>
<td>Clustering of errors: Too many single T-units with two or more errors</td>
<td>8%</td>
<td>21%</td>
</tr>
</tbody>
</table>

Consequently, only 18% of the PI-children show 'normal' grammatical abilities with respect to the production of ungrammatical T-units and only 9% with respect to the production of grammatical errors. Although younger PI-children show significantly more problems with ungrammaticality than older ones, it is highly remarkable that the oldest PI-children still not reach the grammatical level of the youngest N-children, but even produce more errors and ungrammatical T-units.

Moreover, the difficulties in producing correct morphological/syntactic utterances are observed in all four specific psychiatric disorders (see 3.2.1). Almost all PI-children with externalizing PI and PDD-NOS produce too many ungrammatical utterances.

What is more, taking cluster analysis of grammatical errors as an additional measure of grammaticality, striking evidence is found for the existence of morphological/syntactic impairment in PI-children. It seems that in PI-children often more than one
morphological/syntactic category within a single utterance is involved in creating ungrammaticality. Clustering of seven to ten grammatical errors is not an exception in these children, whereas the N-children never produce this large number of errors within one single utterance. The phenomenon of error-clustering is found in all four specific psychiatric disorders, although the largest proportion of children is found in the subgroup with externalizing disorders and PDD-NOS. The latter also produced the highest number of error-clustered T-units in their interviews compared to the other three PI-groups with specific PI. These results confirm the findings of Stevenson et al., (1985): we also find significantly more morphological/syntactic problems in a large subgroup of PI-children with internalizing and/or externalizing disorders, but most obviously in PI-children with externalizing symptomatology. Since every aspect of ungrammaticality influences the comprehension of the message in the conversational genre, the high level of ungrammaticality found in PI-children influences the information exchange about daily-life events between the child and the adult in an extremely negative way, resulting in communicative breakdowns.

The following chapters present the results of the (un)grammaticality of specific lexical and functional categories in the 120 PI-children. In this way, we can define more precisely the morphological/syntactic disabilities in PI-children in the conversational genre. As stated in 3.2.3, we use the Explanatory Criterion (Burisch, 1984) that uses significant difference of group effects to classify deviant behaviour from normal behaviour. On the basis of a detailed morphological/syntactic spontaneous language analysis we will explore whether clear differences can be found between the PI-children and the N-children.

The results presented in Chapters 5 to 7 are largely based on error analyses, whereas Chapter 8 mainly concerns analysis of complexity. More precisely, in Chapter 5 we analysed the effect of missing lexical categories and in Chapter 6 the effect of wrongly used lexical categories on grammaticality. Next, in Chapter 7 the analysis of errors in the realization of functional categories is the central issue, followed by Chapter 8 concerning the ability of syntactic packaging in the conversational genre. Finally, in Chapter 9 the performance related to grammaticality, temporality, transitivity of the verb, agreement relations and the ability of syntactic packaging are compared in two genres, the narrative and the conversational genre. Finally, we will try to provide a profile for the morphological/syntactic disorders that is typical for the 120 Dutch-speaking psychiatrically impaired children.