Spared domain-specific cognitive capacities?

Syntax and morphology in Williams syndrome and Down syndrome

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Abstract

Williams syndrome and Down syndrome have a perspicuous impact on the overall system of cognitive capacities, on the one hand, but on the other hand, they affect the linguistic capacities in a highly specific way. In this paper, a case study on Williams syndrome and results of an extensive study on Down syndrome are presented and compared.

For each syndrome there are characteristic linguistic deficits, on different levels though, and what is the focus of the paper, there are spared areas of linguistic capacities. Specific areas and the degree of spared capacities can be assessed only on the level of the various interactive components of the system of grammar, but not by a superficial inspection and juxtaposition of data. Due to cross-modular asynchronous retardations, the global picture differs, but the reflexes in the data of the responsible system components provide insight into a highly developed system of grammatical competence, despite the severe cognitive limitations.

The conclusion will be that in each syndrome there are clearly spared areas of grammatical competence that provide evidence for intact subsystems that subserve particular aspects of (domain-specific) grammatical processing.

1. Introduction

In present day language acquisition research, the answer to the following question is a topic of intense controversies: Is language acquisition guided by domain-specific or domain-general cognitive capacities?
Domain-general theorists (cf. strong emergentist approaches, see MacWhinney 1999) deny the existence of domain-specific innate abilities and their alleged role in processes by which language is acquired, used, and represented in the brain. In the light of constructivism, their advocates emphasize (1) the importance of learning from a rich linguistic environment and (2) the domain-general nature of those (innate) cognitive capacities involved in the process of language learning. Of course, there is no doubt that attention, memory, auditory processing, pattern detection, association, and other domain-general cognitive tools are important for language development, and that they contribute to the process in non-trivial ways. (cf. e.g. Sabbagh & Gelman 2000). It ought not to be difficult to find evidence in developmental data for their contribution. Evidence to this extent, however, does not warrant the conclusion that domain-specific abilities play no role at all, contrary to what extreme emergentists seem to be convinced of. So, the crucial question is not whether domain-general processes play a role in language acquisition (they do), but whether domain-general tools alone are sufficient for language acquisition.

Domain-general theorists seem to be at a loss with cases of dissociations, for example with children who master formal properties of grammar at a high level, while other aspects of cognition are extremely impaired. In this light, the study of Williams syndrome (WS) has recently attracted considerable attention because of its uneven cognitive-linguistic profile, with a remarkable preservation of linguistic abilities in the context of otherwise widespread general cognitive deficits. In early reports on the syndrome, the impression prevailed that the language of individuals with Williams syndrome is totally intact. In the meantime, the generally accepted view of WS is that language abilities are spared, but that this sparing is relative rather than absolute. Moreover, there is growing evidence that WS is characterized by within-domain dissociations of language as well. Recent studies attested deficits and a number of atypical features in the lexical development and in the semantic processing in WS...
(cf. Bellugi, Bihrlle, Neville, Doherty & Jernigan 1992; Bellugi, Wang & Jernigan 1994; Rossen, Klima, Bellugi, Bihrlle & Jones 1996; Stevens & Karmiloff-Smith 1997; Tyler, Karmiloff-Smith, Voice, Stevens, Grant, Udwin, Davies & Howlin 1997). As for the structural and rule-based aspects of grammar, there is little agreement in the literature till now. On the contrary, it seems as if positions have become more entrenched during the last years. Those researchers who defend an innate modular account of the grammar faculty report an intact computational competence in WS (cf. Bellugi et al. 1994; Bromberg, Ullman, Marcus, Kelly & Coppola 1994; Clahsen & Almazan 1998, 2001; Krause & Penke 2001; Schaner-Wolles 2000a; Zukowski 2001; among others). Opponents of this account, on the other hand, are arguing against the intactness of aspects of grammar in WS, as there are regular morphology (Thomas, Grant, Barham, Gsödl, Laing, Lakusta, Tyler, Grice, Paterson & Karmiloff-Smith 2001), morphosyntax (Pezzini, Volterra, Ossella & Sabbadini 1994; Volterra, Capirci, Pezzini, Sabbadini & Vicari 1996), and syntax (Karmiloff-Smith, Tyler, Voice, Sims, Udwin, Howlin & Davies 1998; Grant, Valian & Karmiloff-Smith 2002). Grant, Valian and Karmiloff-Smith (2002) hold the opinion that „the strong claims made about the intactness of morphosyntax are sometimes supported by weak evidence“ (404), and that „[...] the syndrome should no longer be used to bolster claims about the existence of independently functioning, innately specified modules in the human brain.“ (403).

Critics of domain-specific cognitive capacities for grammar primarily fail to acknowledge dissociations between grammar and general cognitive abilities in WS because they tend to focus on those aspects of grammar that are driven by lexical knowledge (see also Schaner-Wolles 2000a, b for more detailed discussions). In these areas of grammar, correlations with general cognitive impairments are not surprising, given that lexical-semantic knowledge is the interface to the cognitive conceptual system. But this fact is not relevant for an argument against a selectively spared computational system for language. The crucial question in this
connection is this: Are there genuine formal, especially syntactic, aspects of the grammatical competence that are spared by general cognitive impairment? If these spared grammatical capacities exist, then this is the relevant piece of evidence for the dissociation controversy. Contrary to the suppositions of Grant et al. (2002: 415), it is NOT the case, that “claims about syntactic modularity require intact syntactic performance or a complete dissociation between syntax and mental age”. Poor performance does not reflect poor competence per se, and is no argument against spared grammatical capacities. Poor performance may reflect for example task-dependent effects and therefore lead to underestimating linguistic competence. On the other hand, poor development or performance may also be a function of how different domain-general cognitive capacities affect the process of language development or language processing. For instance, syndrome-specific cognitive limitations may deprive the language faculty of necessary resources for getting a tight grasp on grammar. As a consequence, the submodules of grammar will start to develop later than in typically developing children, and perhaps they may develop in an asynchronously retarded way, or reach a developmental plateau at a certain point. Auditory short-term memory, for example, is discussed as playing an important role in the development of aspects of language, and in vocabulary acquisition in particular (Gathercole & Baddeley 1990; see Baddeley, Gathercole & Papagno 1998 for a review of the literature in this connection).

In sum, there is no denying that the grammatical performance of individuals with WS is not intact in an absolute sense. On the other hand, there is enough evidence for relatively spared computational subsystems of grammar in individuals with WS as well. The data to be discussed below from a case study of a twelve-year old German-speaking girl with WS follow this pattern.

Additional support for relatively spared computational subsystems of grammar is gained from other syndromes associated with intellectual disabilities as well, – even from Down
syndrome (DS), for which severe, selective impairments of grammar are reported in general (cf. Bates & Goodman 1999; Chapman 1995; Miller 1988, 1996; Fowler 1988, 1990; among others). This notwithstanding, there are exceptions among individuals with DS as well. Rondal (1995) documented two adults with DS, Françoise and Paul. Their grammatical abilities were characterized as normal or quasi-normal at an adult level, in spite of a non-verbal IQ of about 60 and a mental age of about five or six years. And Vallar and Papagno (1993) report the case of a 23-year old Italian woman with DS, who was fluent in three languages (Italian, English, and French). She showed a remarkably good acquisition of the Italian language and vocabulary. In addition, she was able to learn English and French, although with less proficiency. She was impaired in tasks assessing verbal and non-verbal reasoning, visuo-spatial perception and memory, and verbal long-term memory. However, she had a perfectly normal verbal short-term memory. These findings prompted the authors to support the view that phonological short-term memory, which may occur in the presence of substantial deficits of general intelligence, plays an important role in the development of aspects of language, and in vocabulary acquisition in particular (cf. Gathercole & Baddeley 1990). Apart from this exceptional trilingual DS woman, there is considerable evidence that DS is associated with a specific deficit in verbal short-term memory. Conversely WS has been linked with a deficit in visuo-spatial short-term memory whereas verbal short-term memory is a particular strength (cf. e.g. Jarrold, Baddeley & Hewes 1999; Jarrold & Baddeley 2001). It has been suggested that the differences in short-term memory deficits might potentially explain the specific patterns of language learning observed in DS and WS (cf. Jarrold et al. 1999; Vicari, Carlesimo, Brizzolara & Pezzini 1996; Wang & Bellugi 1994; among others). Future work will clearly be needed to understand possible interrelations of this kind. Françoise, for example, the DS woman reported by Rondal (1995) had a relatively superior vocabulary and adult-like language skills but a poor verbal short-term memory. As mentioned
before, there is no doubt that specific memory functions may influence aspects of language. However, neither specific verbal short-term memory deficits nor another domain-general cognitive function can explain or be responsible for the spared syntactic skills in DS, which I will report on here.

In a large experimental study on the language of eighty-two German-speaking children, adolescents and adults with DS, we gained strong evidence for spared syntactic abilities in DS as well (cf. Schaner-Wolles 1994, 2000a). As it was attested for other languages before, our German-speaking DS subjects, too, had severe problems with morphology in general and were doing even worse on morphosyntax. This could indeed have been caused by “a selective impairment in one or more aspects of auditory processing, a deficit that is superimposed on their more general cognitive delay”, as Bates and Goodman (1999:62) argue for DS, supporting an emergentist account. What is more interesting in our German data, however, is that the individuals with DS were able to successfully master complex syntactic principles, e.g. those that govern the clause structure.

This paper is organized as follows. Section 2 elaborates on the grammatical phenomena of German dealt with in the experimental data (verb second property, morphological case marking, pronominal dependency relations). Section 3 reports on the case of a German-speaking girl with Williams syndrome. In particular, her performance data on two sentence-picture matching tasks (a passive-active test and a pronominal dependency test) are presented, and compared with those of typically developing children. Section 4 introduces into the syntactic and morphosyntactic results of sentence repetition tasks from an experimental study on DS referred to in the preceding paragraph. Section 5, finally, compares the WS and DS results, and presents general conclusions.
2. The modularity of grammar - exemplified for German

Generative linguistics characterizes the human language processing capacity as a highly modular system. Syntax is one of the modules of grammar, and syntax itself consists of submodules, too. Given that these submodules of the overall grammar processing capacity form cognitively autonomous processing units, they may be impaired or spared selectively. The modular units are autonomous in the sense that modular interaction takes place at the level of input-output relations between the modules and not among processing units of the various subsystems. The system that determines grammatical well-formedness is the combinatorial result of the interaction of all the relevant subsystems. Details aside, at least three main components have to be distinguished, namely the lexicon, the syntactic structure component, and the component that determines the antecedent-dependent relations.

The lexicon is the store of the individual grammatical properties of the lexical elements. The lexical item is a local interface between various types of information, namely phonological, morphological, syntactic, and conceptual. An informal example is given in (1).

(1) types of lexical information:

phonological: [li:v] (=leave)
morphological: ‘left’ (=irregular participle morphology)
syntactic: V: A1 (A2) (=verb with two arguments; one being optional)
conceptual: “X go away (from Y)”

The phonological part specifies the information relevant for its articulatory realization; the morphological part contains information about various word forms and stores irregular forms (e.g. irregular participle forms); the syntactic part specifies the categorical and combinatorial properties; and the conceptual part specifies the semantic properties. One crucial aspect needs to be added to this simplified example: the mapping relation between the conceptual
information and the combinatorial properties. It is obvious that the variables X and Y must be uniquely associated with their syntactic argument counterparts. This aspect of lexical structure is usually referred to as argument structure. The argument structure expresses the mapping relation between conceptual structure and syntactic structure.

The following example illustrates the function of the *syntactic structure component*. German and English differ with respect to the structure of the main clause. German is a verb second language. This means that the main clause provides an initial position for an arbitrary, single constituent, followed by the finite verb. In generative grammar, the verb second position and the clause-initial position are understood as derived positions. The co-indexed e-positions in (2) are the base positions. These are the positions in which the fronted elements would occur if they were not fronted.

(2) \[
\begin{array}{l}
XP_i \ [ \ V_j [ \ ...e_i ... e_j \ ] ] \\
\end{array}
\]

The basic position of the verb is clause final, that is the position of the finite verb in embedded clauses with a complementizer (e.g. *hat* ‘has’ in 3a), and of non-finite verbal elements in non embedded clauses (e.g. the past participle *angerufen*, ‘phoned’ in 3b)

(3) a. daß \[ er sie gestern angerufen hat \]

‘that he has phoned her up yesterday’

b. \[ er_i [ \ hat_j [ \ e_i sie gestern angerufen e_j ] ] ]

‘he has phoned her up yesterday’

c. \[ er_i [ \ rief_j [ \ e_i sie gestern an-e_j ] ] \]

‘he phoned her up yesterday’
Declarative clauses – like the examples in (3b), (3c) and (4) – are verb second, which means the finite verb follows a single arbitrary constituent. The variants in (4) differ pragmatically, in terms of the information structure.

(4) a. [er, hat [e, sie gestern angerufen e]]] (= 3b )
   b. [sie, hat [er e, gestern angerufen e]]]
   c. [gestern, hat [er sie e, angerufen e]]
   d. [angerufen, hat [er sie gestern e, e]]]

Morphological case marking rather than serialization is the clue for the identification of the grammatical relation of an NP, as illustrated in the examples in (5).

(5) a. sie:ACC hat er:NOM gestern angerufen
   her has he yesterday up-phoned
   ‘he has phoned her up yesterday’
   b. sie:NOM hat ihn:ACC gestern angerufen
   she has him yesterday up-phoned
   ‘she has phoned him up yesterday’
   c. ihn:ACC hat er:NOM gestern angerufen
   him has he yesterday up-phoned
   ‘he has phoned him up yesterday’

German has a morphological case system with four cases (nominative, accusative, dative, and genitive). Case is marked on the head noun / pronoun, the attribute, and the determiner. Because of syncretisms and defective paradigms, case morphology does not always uniquely identify the grammatical relations: In (5a, b), ‘sie’ (nominative or accusative) is disambiguated once the uniquely identifiable forms ‘er’ (nominative, 5a) or ‘ihn’ (accusative, 5b) is encountered. However, in (5c), case uniquely identifies the subject and the object respectively.
As indicated in (2), the verb second property involves two antecedent gap relations. The phrasal constituent in the first position is the antecedent of a phrasal gap position \(e_i\) and the finite verb is the antecedent of an empty verbal head position \(e_j\).

The formal grammatical relations that constrain the antecedent gap relations are of a format that is found with all sorts of genuine grammatical dependency relations. Koster (1987:105) introduced the term *configurational matrix* for this invariant set of properties (cf. Neeleman & van de Koot 2002). These relations are defined by the following four properties:

(6) B depends on A,

a. obligatorily
b. uniquely
c. locally (i.e. within the same, single, minimal domain)
d. with A as structurally prominent element.

Linguistic implementations of this core relation are manifold. Prototypical cases are: *agreement* (esp. subject-verb agreement; reflexive-antecedent agreement) and *filler-gap relations* (e.g. the relation between a fronted constituent and its base position).

The agreement relation between the finite verb and the subject in German (a language with a richer morphological system than English) is the crucial cue for identifying the subject. The verbal paradigms distinguish number and person (as in 7), tense (present, preterit) and modality (indicative, subjunctive).

(7)      sein ‘be’   haben ‘have’  lieben ‘love’  sehen ‘see’
 a. 1.sg.  bin habe liebe sehe
 b. 2.sg.  bist hast liebst siehst
 c. 3.sg.  ist hat liebt sieht
 d. 1.pl.  sind haben lieben sehen
 e. 2.pl.  seid hast liebt seht
 f. 3.pl.  sind haben lieben sehen
Another case is the dependency between a reflexive and its antecedent. German reflexives are clause bound, that is, the antecedent of the reflexive must be a clause mate of the reflexive. In infinitival complements, the antecedent of the reflexive is the phonetically silent subject of the infinitival (PRO), whose own antecedent – the so-called controller – is in the matrix clause. The choice of the controller is verb-specific, i.e. determined by the semantics of the matrix verb. So, in (8a), the controller is the matrix subject, in (8b) the controller is the matrix object. Notice that the reflexive is not marked for gender in German.

(8)   
(a)  sie$_{1}:$Nom hat ihm$_{2}:$Dat versprochen [PRO$_{1}$sich$_{1}$ zu frisieren]
      she$_{1}$ has promised him [PRO$_{1}$ to comb herself, / *himself$_{1}$]
(b)  sie$_{1}:$Nom hat ihm$_{2}:$Dat geraten [PRO$_{1}$sich$_{1}$ zu frisieren]
      she$_{1}$ has advised him$_{2}$ [PRO$_{1}$ to comb himself$_{1}$, / *herself$_{1}$]

In German, it is easy to see that the reflexive is only indirectly construed with the NP in the matrix clause, because a reflexive does not accept a dative object as antecedent. In (8b) the dative NP ‘ihm’ serves as the antecedent for the silent subject of the infinitival clause, which in turn serves as the required antecedent for the reflexive. The direct antecedent of the reflexive is the subject of the infinitival (PRO), and not the dative.

The control properties interact with the complementary distribution of reflexives and personal pronouns. Clause internal coreference requires a reflexive (8), clause external coreference a personal pronoun (9b). Therefore, in (9a), the pronoun in the infinitival clause cannot be coreferent with the matrix subject, since it controls the infinitive subject. As a consequence, the pronoun in the infinitival clause would incorrectly end up as coreferent with a clause mate antecedent. In (9b), control does not interfere. So, the personal pronoun ‘sie’, ‘her’ in (9a) can only refer to an external referent in the discourse.
A third case of unique, local and obligatory dependency relations is the filler-gap relation between a displaced element and its gap at the base position. For each displaced element – as exemplified in the case of German verb second structures in (2)-(4) – there must be a unique, local base position (the gap signified by a coindexed ‘e’), for which the displaced element serves as the structurally prominent antecedent element. In these cases, the dependent element is a phonetically silent syntactic entity. The dependency relation links the displaced element to its original position. Note that any German declarative clause instantiates this dependency relation for the clause-initial phrase and for the fronted finite verb. If a child has mastered these core characteristics of a German clause, she has mastered a complex antecedent-gap pattern.

3. Williams syndrome - a case report

3.1 Method

Participant

Kathy is a twelve-year old girl with WS. Her clinical features are typical of WS. Diagnosis was confirmed by positive results for the genetic deletion implicated in WS. At the age of 10;2 years, her IQ (Hamburg-Wechsler Intelligence Scale for Children - Revised HAWIK-R, Tewes 1983) indicated a full scale IQ of 46, a verbal IQ of 53, and a performance IQ of 51. At
the age of 12, mental age on the German version of the Stanford-Binet Intelligence Test S-I-T (Terman & Merrill 1965) was 5:8. Her digit span was 3. She did not pass tests of conservation. At the same age as the syntactic abilities presented in this study have been examined, Kathy’s morphological and lexical skills show the following interesting characteristics:

First, asymmetries between regular and irregular morphological abilities were neither attested for past participles nor for plurals in Kathy’s data. Her correctness rate for existing past participles was nearly 100%. On a 42 items task (half regular, and half irregular forms), she committed a single mistake: geleget instead of gelegt, ‘laid’. So, Kathy’s morphological behaviour does not show a prevalence of regulars over irregulars, as Clahsen and Almazan (1998, 2001) report for English adolescents with WS. Kathy’s good performance on past participles rather matches the results of Pléh and his colleagues, who found in their Hungarian data, that only younger WS children (under ten years of age) with a low verbal memory span were prone to overgeneralize (cf. Lukács, Racsmány & Pléh 2001; Pléh, Lukács & Racsmány 2003).

Noun plurals were correct in two thirds of the 45 items on a balanced task.¹ She was performing at the level of four- to five-year old typically developing children. She was using all the different German plural markers. There were no wrong plural forms in the sense of overgeneralized or overregularized forms. All incorrect answers were of one single type, namely a combination of a plural numeral and the test noun in its non marked (=singular) form, e.g. zwei Auto, zwei Radio, viele Tasche (‘two car, two radio, many bag’), instead of zwei Auto-s, zwei Radio-s, viele Tasche-n (‘two cars, two radios, many bags’).

The fact that Kathy did not overgeneralize any plural forms is not surprising, given that German plural morphology is highly idiosyncratic and dependent on lexical information for the correct choice among the various plural allomorphs (-e, -er, -en, -s, and Umlaut). There is
no simple rule that could be overgeneralized.\textsuperscript{2} Therefore, this finding does not per se contradict Clahsen and Almazán’s (1998, 2001) dissociated dual route proposal for WS. They assume an intact rule system, but limited access to lexical information. Since there is no default plural morphology for German, Kathy has no chance to overgeneralize it.

Second, her performance on an expressive language test on local prepositional phrases showed severe semantic problems with spatial prepositions on the one hand, but intact abilities in morphosyntactic agreement marking of gender and case governed by the prepositions. Kathy used only the prepositions \textit{in}, \textit{auf}, and \textit{unter} (‘in, on, under’). As for more elaborated spatial conditions and prepositions like \textit{hinter}, \textit{vor}, \textit{neben}, \textit{zwischen} (‘behind, in front of, next to, in between’) were concerned, she failed totally and did not react at all or inappropriately (e.g. \textit{draußen}, ‘outside’ instead of \textit{neben dem Sessel}, ‘next to the chair’).

These preliminary data match the findings on spatial relations in Hungarian-speaking WS individuals as well (cf. Racsmány, Lukács, Pléh & Király 2001).

\textit{Materials}

Kathy was tested with two sentence-picture-matching tasks. Both were designed for, and used in, previous studies with typically developing children. More detailed information is available elsewhere (Schaner-Wolles 1989; Schaner-Wolles & Haider 1987).

\textit{Passive-active test.} This test, first used in Schaner-Wolles (1989), explores children’s ability to understand German reversible passive and active sentences. The test includes a total of twenty sentences with agentive verbs, i.e. six full passives, six agentless passives, and eight active sentences with an ‘object:ANIMATE < verb < subject:ANIMATE’ order (cf. 5a, 5c) and

\textsuperscript{1} See Schaner-Wolles (2001) for a description of the plural test and results of typically developing children.

\textsuperscript{2} Cf. Schaner-Wolles (2001) for a more detailed discussion, and arguments against the proposals of Clahsen, Rothweiler, Woest & Marcus (1992) about the German plural system and its acquisition, who claim -\textit{s} to be a default plural marker.
For each test sentence, three pictures were presented (as exemplified in figure A in the appendix): one picture shows the action as described by the test sentence (e.g. picture a for the test sentence “das Mädchen wird von der Mutter frisiert”, ‘the girl is combed by the mother’); a second one shows the same action with the protagonists reversed (reverse role distractor, picture b); and the third picture serves as a lexical distractor, showing either another protagonist as in the test sentence (picture c) or another action.

As in English, the reduction of the active subject in the passive construction is coded in the verbal morphology, namely by combination of the auxiliary werden with the past participle. So, the mastering of passive consists of two tasks. First, the function of the auxiliary in combination with the past participle must be understood as the signal for the missing subject argument. Only then, the shift of the object to the subject position (in English), or to subject case, i.e. nominative (in German) can become transparent to the child. Notice that – unlike in English – there is no fixed subject position in German, as exemplified in (4), (5), and in (11).

Pronominal dependency test. The second test was adopted from Schaner-Wolles and Haider (1987). It tests the grammatical constraints on coreference relations between pronouns and their antecedents in eight simple clauses and in twelve clauses with infinitival complements: In simple clauses, a reflexive is used for coreference and a pronoun for disjoint reference (example: Kevin introduced him vs. himself). In an infinitival complement (see examples 8 and 9), the interpretation of the silent subject of the infinitival clause, i.e. PRO, interacts with the coreference relation of a pronoun of the infinitival clause (example: John promised/asked Kevin PRO to introduce him/himself): If the intended coreferent is the controller of the silent subject (‘ask’), the silent subject necessarily is coreferent, too. So a reflexive is required, otherwise (‘promise’) the personal pronoun is needed. In order to master

\[\text{If one of the two arguments is ambiguously case-marked (e.g. sie in 5a), the other one is unambiguously case-marked (er in 5a), guaranteeing an effective inference on the actual case of the ambiguously case-marked one.}\]
the coreference relations for pronouns in infinitival clauses, the child must be able to combine two sets of conditions, namely i) the coreference relations for pronouns and reflexives and ii) the construal of the silent subject. It must be able to apply i) in the context of ii). In this task, the child has to select from four pictures. For the test sentence in (10), for example, pictures a, b, d, and e of figure A in the appendix are offered, with picture d as the appropriate one, picture a as a distractor for the reflexive / pronoun alternation (i.e. the mother; has promised Susi; [PRO, to comb her]), picture e as a distractor for the silent subject PRO interpretation (i.e. the mother has asked Susi; [PRO, to comb herself]), and picture b as the most distant distractor.

(10) die Mutter;NOM hat der Susi;DAT versprochen [PRO, sich; zu frisieren]

the mother; has promised Susi; [PRO, to comb herself] 

Procedure

Kathy was tested individually in her school. The two tests reported here were done at different sessions within one month. Sentences and pictures were randomly ordered within each test. The pictures were displayed in front of the child, who was asked to watch them carefully. Then the child heard the test sentence. Her task consisted of choosing one of the three / four pictures that matches the sentence best. If the child hesitated or indicated that she had not understood the sentence, it was repeated once more. The child was given as much time as she wanted. However, Kathy was usually making her choice immediately. As the results will confirm, Kathy did not give the impression that she had specific problems with the procedure of picture-based comprehension tasks.
3.2 Results and discussion

Passive-active test

Kathy did not make a single mistake in the interpretation of the reversible passive sentences. It seems safe, therefore, to claim that she knows how to handle the grammar of the passive construction. She was even better than the five-year old typically developing children, who were successful in 86.2 % only, as table 1 shows.

--- Table 1 here ---

For children acquiring English, the passive construction is difficult for quite some time, because they apply a strict word order strategy, i.e. a ‘first noun as agent’-strategy, which results in a misinterpretation of the derived subject as agent (cf. Bever 1970). In German, the effect of word order can be tested systematically – in active sentences as well –, since any phrase may be topicalized and can appear in sentence-initial position. As for the active test sentences, Kathy was mistaken in two thirds of all cases. Here, all errors were systematically based on a word order bias. They occurred especially in those OVS test sentences, in which the first NP could have been a potential subject as well, i.e. an animate NP, ambiguously marked for accusative/nomminative as in (11a), contrary to (11b), (cf. table A in the appendix for the paradigm of the German definite article):

(11) a. das\;ACC\,(=\textit{NOM})\;Mädchen\;frisiert\;der\;NOM\;Bub
    \textit{the}\;ACC\,(=\textit{NOM})\;girl\;combs\;\textit{the}\;NOM\;boy
    ‘it is the girl, the boy is combing’

b. den\;ACC\;Vater\;fotografiert\;der\;NOM\;Bub
    \textit{the}\;ACC\;father\;photographs\;\textit{the}\;NOM\;boy
    ‘it is the father, the boy is photographing’
In the comprehension of German passives, however, the role of a word order strategy turned out to be insignificant, both for our typically developing children and for Kathy. The verb second property of German (cf. (3)-(5) above) proved to be the crucial cue which blocks a word order strategy in German. As soon as a child has mastered the principles governing the distribution of the finite verb, she has recognized that the sentence-initial position is not a functionally unique one, i.e. not the subject position. Typically developing children are able to handle the distribution of the finite verb properly at the age of three. So, already the four-year old children were successful in about 80% of the reversible passive test sentences.

In languages like English, word order is a direct reflex of the structural coding of grammatical relations. This situation must be distinguished strictly from the tendency of the subject to occur in sentence-initial position in free order languages. In German, this is just one variant among other grammatically equivalent variants (cf. 4a vs. 4b-d). However, it is the preferred variant in an unmarked situation like the one in the test, in which each of the test clauses was presented out of context. This preference is the combinatorial result of various factors, including pragmatic ones. The many mistakes with the active test sentences seem to result from this preference. The oldest control children at the age of four and five behaved much like Kathy, as table 1 shows. They achieve their poorest results with active sentences like (11a) by misinterpreting the first NP as the subject in 50% of these cases. So, it seems that the expectation to find the subject in a pragmatically unmarked position, namely in the sentence-initial position, overrides conflicting cues, i.e. the presence of a NOM-marked clause internal noun phrase (e.g. *der Bub* in 11), which necessitate a revision of the preliminary interpretation. This shows that pragmatic factors like marked patterns of word order provoke more mistakes than unmarked ones. Obviously, the specific test situation is equally responsible for the bad results with these marked active sentences, since test sentences are presented in isolation and therefore the unmarked order is expected (since there is no context
that legitimates the marked information structure). Even in German-speaking adults, an increased tendency to accidentally misinterpret an unmarked noun phrase in initial position as subject can be observed under circumstances like these (cf. Bayer, de Bleser & Dronsek 1987).

**Pronominal dependency test**

Kathy’s results were generally poor, both for simple sentences and sentences with infinitival complements, with a ratio of correct answers less than 35%, in each case. Quantitatively her scores were far behind those of the youngest group of six-year old typically developing children tested in the original investigation of Schaner-Wolles and Haider (1987). Although they had problems with the tasks as well, they were successful in at least 60%. The 80% level of correct answers was not reached before the age of seven. It turns out that Kathy’s main difficulties concerned the interpretation of reflexives vs. personal pronouns. She was not able to apply the grammatical constraints on coreference relations between pronouns and their antecedents yet – neither in clauses with infinitival complements, nor in simple clauses.

A qualitative analysis shows that she does not apply a minimal distance strategy for the interpretation of the PRO subject, as it is known from children acquiring English. In English, a language with strict word order, children tend to choose the nearest NP as the controller of the silent subject of the infinitival clause (cf. Sherman & Lust 1986) and thereby overgeneralize the pattern of object control verbs. This strategy is known as the *minimal distance principle* (MDP). According to the MDP, English-speaking children will systematically misinterpret subject control contexts (cf. 12b), and at the same time, they will be successful in object control contexts (cf. 12a). For example, they will decide on *Mary* to be the controller of *PRO* in both contexts (12a) and (12b).

(12) a. Paul told Mary [PRO to leave]

    b. Paul promised Mary [PRO to leave]
Since German is a verb second language with free word order, MDP would not be a reliable strategy, and German does not mislead a learner to assume a positional strategy. German-speaking children do not apply this strategy, nor does Kathy. What this indicates at least is that she does not overgeneralize a positional strategy but follows the same pattern as typically developing children.

3.3 Interim conclusions of the WS case study

Two aspects of Kathy’s linguistic profile are worth re-emphasizing. First, her command of passive is perfect. Since this was tested with a sentence-picture matching task, this shows that sentence-picture matching does not imply specific inherent difficulties per se for WS individuals, contrary to what Karmiloff-Smith et al. (1998) hypothesize.4

Second, the results of binding and control in the pronominal dependency test are clearly behind age equivalent typically developing children. Since, in the study by Clahsen and Almazan (1998), syntactic binding was no problem for two English-speaking WS girls with nearly the same chronological and mental age as Kathy, it is not sufficiently clear yet whether Kathy’s results reflect a particular difficulty of the test or a difficulty of the tested linguistic phenomenon, or both. A difficulty of the test could be the length and complexity of the test sentences. A difficulty of the phenomena may be the computing of the interaction of a rule of interpretation on the one hand (interpretation of pronouns and of PRO) and an obligatory (for reflexives) or conditioned (for pronouns) grammatical dependency relation on the other hand. Further research will be necessary here.

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4 Cf. Karmiloff-Smith et al. (1998: 347): “The sentence-picture matching task revealed an across-the board impairment. [...] In the sentence-picture matching task, for example, the participant has to listen to and decode the sentence, maintain it in their memory (when it is spoken), process the pictures and compare the sentence to each one of the pictures, eventually selecting the one that best matches. [...] Because WS individuals have clear cognitive impairments, tasks which rely heavily upon general cognitive abilities may overestimate the extent of the linguistic impairment.”
4. The Vienna Down syndrome project

The results reported here are part of a cross-sectional study on the language abilities of German-speaking children, adolescents and adults with Down syndrome (DS) that started some fifteen years ago. A comprehensive language test battery consisting of 24 subtests was assembled. The subtests cover the relevant language components namely phonology, morphology, syntax, semantics, lexicon and the textual level. Moreover, the components are tested in different modalities, in the sense that there are subtests on comprehension, imitation and spontaneous production. In the next sections, I will refer to results of the sentence repetition tasks only. For various reasons it seems justified to concentrate exclusively on imitative productions here. First of all, it turned out that for the grammatical aspects under consideration, imitative and spontaneous productions do not differ. Moreover, the data base of the sentence repetition tasks is larger and suitably arranged for comparison among subjects. The data of spontaneous sentence productions are less homogeneous, for obvious reasons.

But before going into detailed results of the sentence repetition tasks, it seems worthwhile to summarize some of the main general findings of the study:

1. No qualitative differences in terms of the linguistic inventory and processes were established between the DS and the typically developing groups, in looking at each subtest type separately. The development per linguistic subcomponent is delayed in DS, but not deviant.

2. However, comparisons of the results from different subtests with each other demonstrated asynchronies in the acquisition of various components of the language system. It turned out that delays are not uniform across domains, but greater in some domains than in others. What we have found in DS is therefore best characterized as an asynchronous or disharmonious

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5 This project has been funded by grants (no. P3632 and P5517) of the Austrian Science Fund (FWF).
language delay. So, the overall language of an individual with DS will never be fully parallel to the language of one particular typically developing child, even not of a younger one.

3. As it was attested for other languages in other studies too, it turned out that morphological and morphosyntactic skills are the most deficient ones in our German-speaking DS subjects. This supports the hypothesis „that the vast majority of persons with Down syndrome suffer from a specific deficit that interferes more with the acquisition of grammatical morphemes than with the mastery of basic sentence structures“ (Rosenberg & Abbeduto 1993: 91-92).

This is exactly what our data show: the individuals with DS have a lot of problems with morphology in general and they are doing worse on morphosyntax. As was attested in individuals with WS (cf. Clahsen & Almazan 1998), there is a discrepancy between regular and irregular morphology in DS as well. For example, they are doing much better on the regular comparative marking of adjectives than on the fairly irregular plural marking of nouns in German – despite of the inverse cognitive complexity of comparative and plurality.

Highly relevant in this respect are the data concerning verbal morphology, subject-verb agreement and verb placement, on which I will focus in the following.

4.1 Method - Sentence Repetition Tasks

Participants

Eighty-two individuals with Down syndrome of the standard trisomy 21 type participated in this study. There were forty-five male and thirty-seven female participants. Their chronological age ranged from 7;3 to 41;10 years (M=17;0, SD=9;3). Their full scale mental age measured by the German version of the Stanford-Binet Intelligence Test S-I-T (Terman & Merrill 1965), ranged from 2;5 to 7;4 years (M=4;11, SD=1;3). Four mental age groups with approximately the same number of individuals have been assembled: MA1 (n=21) 2;5-3;11 years, MA2 (n=19) 4;0-4;11 years, MA3 (n=23) 5;0-5;11 years, and MA4 (n=19) 6;0-7;4
years. Forty typically developing children (twenty males, twenty females) aged between 2;3 and 6;6 years (M=4;1, SD=1;3) formed the control group. They have been grouped into the following four age groups: A1 (n=10) 2;3-2;11 years, A2 (n=10) 3;0-3;11 years, A3 (n=10) 4;0-4;11 years, and A4 (n=10) 5;0-6;6 years. All the control children attended a kindergarten. The DS children went to specials schools for intellectually disabled children; the adults spent the day in special workshops. All participants, both DS and controls, were monolingual speakers of German and lived at home with their own families.

Materials

The language test battery included four sentence imitation subtests which examine the ability to repeat sentences of different length and complexity. Participants had to repeat a total amount of fifty-two sentences, ranging from very short, simple sentence like those under (13a-d) to quite long, more complex ones, as under (13e-f).

(13) a. Mama schläft       mommy sleeps       ‘mommy is sleeping’
    b. der Bub läuft      the boy runs        ‘the boy is running’
    c. Papa hat Hunger   daddy has hunger     ‘daddy is hungry’
    d. sie ist müde       she is tired         ‘she is tired’
    e. die Mutter schenkt der Tochter eine Puppe
       the:fem:nom mother gives the:fem:dat daughter a:fem:acc doll
       ‘the mother gives the daughter a doll’
    f. im Park kauft die Mutter dem Kind ein Eis
       in the:masc:dat park buys the:fem:nom mother the:neut:dat a:neut:acc ice-cream
       ‘in the park, the mother buys the child an ice-cream’

Procedure. The language testing took place in the kindergarten, the school or the workshop which the subjects were visiting, i.e. in a familiar environment. All participants were tested
individually in a quiet room. Administration of the four subtests was done in four sessions of about half an hour each in the course of one week as part of the comprehensive language test battery. Subtests as well as test sentences were presented in a fixed order, with increasing sentence complexity within each test session. The test procedure was the same for each participant. The experimenter introduced the repetition tasks as a kind of parrot game, saying something like ‘Listen very carefully. I will say something and when I am ready you have to repeat just what I said. Say everything what I say. Can you say ...’. Most participants had no problem to understand the task, but some of them were hardly to be talked out of shadowing immediately. Reactions of this kind were excluded as not analyzable. All responses were audio taped, transcribed and double-checked before they were analysed.

4.2 Results and discussion

Global characterization of the reactions

It seems worthwhile to have a brief look at the global reaction patterns first. Three main types of imitations have been differentiated: (a) verbatim imitation of the test sentence, (b) imitation with changes, i.e. non-verbatim repetitions with omissions and/or all sorts of changes or mistakes (including ungrammatical serializations, missing or wrong agreement, etc), and (c) no answer (also including repetitions of the last syllable or last word of the test sentence only, shadowed imitations, and unintelligible reactions). Figure 1 shows the distribution of these types of imitation for each of the (mental) age groups in the typically developing group (TD) and the Down syndrome group (DS).
In general, the ratio of verbatim repetitions is significantly lower in DS than in TD. t-Tests indicated that the DS and TD groups differed at each age (for all t-tests p<.05). Especially DS subjects of the first mental age group often failed completely, and were repeating only the last syllable or the last word of the test sentence – especially with longer sentences. Within DS the two lower age groups were significantly behind age groups 3 and 4 with respect to correct verbatim repetitions (t-tests p<.05). The ratio of repetitions with changes, on the other hand, stays nearly constant across the age groups in DS (t-tests p>.05). Even in the higher age groups, more than one third of the answers were of this category. In the group of typically developing children, non-verbatim repetitions are diminishing with age.

In further analysis, the non-verbatim repetitions were scanned for different types of changes. In the next sections, I will deal with some types of omissions, ungrammatical serializations, and missing or wrong agreement markers more closely. Different mistakes of this kind may, of course, co-occur in one answer.

Viewed from the vantage point of modular organization of grammar, the general impression of the poor behavior of the DS group might be misleading. It does not necessarily reflect an equally general deficit in each of the components of grammar. It is much more plausible to assume that the overall picture reflects the combinatorial effects of the interaction of components of grammar, some of which are more and some of which are less developed, according to the general patterns of development in language acquisition. Since the overall language output depends on successful interaction among the components, small differences in one of the components multiplied into apparently gross differences on the surface. These
have not to correspond to gross differences in any of the components per se. The next sections will illustrate these issues on the basis of an analysis of (a) the subject-verb agreement and verb placement data, and (b) the omission patterns.

Moreover, it is likely that domain-general cognitive abilities may have affected the results as well. In a comparative study, Marcell, Ridgeway, Sewell & Whelan (1995) compared the sentence imitation performance of adolescents and young adults with DS with that of age- and IQ-matched non-DS individuals with other causes of intellectual disability (ID). It turned out, that the DS sentence repetition accuracy was equivalent to the ID group only for two-word sentences and was poorer for every other sentence length. Sentence imitation was related to grammatical comprehension, auditory short-term memory and IQ in both groups. In our data, the DS group with the lowest mental age showed more severe difficulties with sentences longer than two or three words as well. The prevalence of the category ‘no answer’ in this group is the result of the fact that they often failed completely with longer, and more complex sentences. In comparing the results according to the complexity of the test sentences, it became clear that only individuals with a lower mental age (i.e. in the MA1 and MA2 groups with MA < 5 years) are concerned. Table B in the appendix displays the mean percentages of ‘no answer’ according to sentence complexity and mental age groups. Indeed our subjects did much better in dealing with the repetition of even longer sentences than expected on the basis of the low auditory short-term memory spans.

Verbal morphology, subject-verb agreement, and verb placement

As discussed earlier, German is a verb second language with great superficial freedom of clause internal word order. The verb second position is a derived position. As for the acquisition of these properties, German is a root infinitive language. Notwithstanding massive counterevidence from different children (e.g. Clahsen & Penke 1992; Fritzenschaft,
Gawlitzek-Maiwald, Tracy & Winkler 1990; Schaner-Wolles 1994), it is nevertheless a widely accepted view that children during the so-called root infinitive stage place non-finite verbs at the end of the clause and finite verbs into the verb second position. It has been claimed that the finiteness morphology is the trigger for verb movement (cf. e.g. Poeppel & Wexler 1993). However, there is an indisputable case of a verb second language that does not display any finiteness morphology on the verb at all. This is Afrikaans. In this language, verb second cannot be ascribed to a property that distinguishes between morphological identifiable verbal elements. Hence, on the level of grammar theory, the verb second property can be captured in purely structural terms. This property must be acquired by Afrikaans-speaking children on purely structural grounds without any morphological cues.

This is precisely what some of the DS subjects do. In table 2, the data of the sentence repetition task have been classified according to the four patterns: 1) finite verb in final position; 2) verb in final position without finiteness / agreement marking; 3) verb in second position without finiteness / agreement marking; and 4) finite verb in second position. In adult German, pattern 1) is typical for embedded clauses, and pattern 4) is the declarative main clause pattern. In the unimpaired acquisition of German, pattern 2) is claimed to be typical at the root infinitive stage. Contrary to prevalent claims in the literature (cf. e.g. Poeppel & Wexler 1993), pattern 3) is attested in the data of individual typically developing German children at this stage as well, as mentioned before (cf. e.g. Schaner-Wolles 1994).

Only unambiguous verb second utterances have been counted as verb second structures here. Undecidable utterances, that is, simple sentences consisting of just the verb and a single preceding constituent have been omitted here. Such structures would simultaneously qualify as possible verb second and verb final structures.

--- Table 2: here ---
What is most remarkable in table 2 is the high frequency of the verb second pattern in the DS data. They perform as well as the controls: The proportions of verb second structures out of all unambiguous answers are 98.4 % for the DS group and 99.6 % for the control group. The second remarkable result in table 2 is the relatively high frequency of non-finite marked verbs in second position in the DS data. Typically developing children demonstrate this pattern only in 15 cases – all of these are from six two-year old children at a syntactically less advanced level (cf. examples in 14).

(14)  

a. Papa fahren weg papa drive:INF away ‘papa is driving away’

b. Bub haben Ball boy have:INF ball ‘the boy has a ball’

c. Mama geh weg mom go:STEM away ‘mom is going away’

DS subjects are not only using this pattern more frequently (cf. examples in 15). They are using it in syntactically more complex answers as well, as (15c,d) show.

(15)  

a. Mama gehen weg mom go:INF away

b. Vogel flieg weg bird fly:STEM away

c. die Mutter schenken Tochter die Puppe the mother give:INF daughter the puppet

d. die Puppe sitz auf dem Sessel the puppet sit:STEM on the chair

It is worth emphasizing that the pattern in (14) and (15) is a correct serialization pattern with respect to verb placement in main clauses in German. What is missing in the examples in (14) and (15) is just the verbal ending that is the finiteness / agreement marker. Given the persistent problems with morphology and morphosyntax in DS, these non marked verb forms do not wonder. Figure 2 shows this distribution of finite and non-finite marked verb forms across the four age groups in the typically developing children and in the individuals with Down syndrome. It is striking how parallel they are. Since wrong serializations of the verb, like placing it in non-second position, do not occur in any significant number in the DS
material either, this indicates that DS subjects are able to master the rule for verb placement without having access to or using the morphological distinctions.

--- Figure 2 here ---

Clear evidence for the fact that DS subjects manage the two complementary positions for the verb comes from utterances with verb-participle combinations, like the examples (15a-b). Lexically, the particle is a prefixed part of the verb. In the syntactic structure, however, the particle is stranded when the verb is fronted (cf. 3c). The fact that verb particles are stranded precisely when the verb is in second position clearly shows that the individuals with DS are able to master some of the intricacies of the German verb second rule without being aware of the concomitant morphological distinctions. Hence the morphological distinctions cannot be seen as the exclusive trigger of the verb second structure. Data from omissions discussed in the next section support this point.

**Omissions**

That individuals with DS are aware of structural properties of a clause is demonstrated in their omission patterns, too. In repeating the test sentences, the participants with DS as well as the typically developing children made a lot of omissions. There is no qualitative difference in the omission patterns of the two populations. Function words like articles, auxiliaries, prepositions and pronouns tend to be omitted frequently - both in the younger control children and in the individuals with DS. Figure 3 shows the percentages of dropped arguments in both populations. For obvious reasons, obligatory arguments (i.e. subjects and part of the accusative objects) and optional arguments (i.e. some accusative objects and all dative
objects) are separated in figure 3. In fact, there are neither statistically significant differences (all p>.05) nor qualitative differences between both populations.

--- Figure 3 here ---

Figure 4 shows the mean percentages of imitated phrases (nominative, accusative, and dative phrases) across the different age groups for typically developing children (TD) and individuals with DS. The developmental paths are parallel for both populations. The results of the individuals with DS are staying behind the typically developing children in the first two mental age groups only. From MA3 on, i.e. from a mental age of five years on, the DS have caught up with the typically developing children for the most part. Exclusively for the dative phrases, they are still lagging behind. The same pattern shows up in the younger TD children as well. It does not wonder, that the datives turned out to be the most popular candidates for omission: the dative phrases in the test were exclusively optional arguments, which moreover occurred in longer sentences only.

--- Figure 4 here ---

A remarkable feature of the omission patterns in the DS data is the fact that omissions of whole phrases lead to restructuring in order to restore the serialization restrictions. If the initial constituent of the sentence was omitted, it was in most cases replaced by another constituent of the clause in order to restore the verb second requirement. Examples of restructuring out of the DS data are given under (16). For comparison, an ungrammatical answer without restructuring of a control child aged 2;10 is given in (17).
If the DSs are able to restore the grammatical pattern, this reflects the mastering of some of the essential syntactic principles that govern the well-formedness of a German clause.

4.3 Interim conclusions of the DS study

Inflection and verb placement in German reflect the modular interaction between syntax and morphology. However, contrary to a widespread belief, there is good evidence that the acquisition of verb second is not necessarily dependent on morphological features attached to functional positions in the sentence structures. The morphological distinction reflects a structural relation. It identifies the structurally most prominent verbal element. The morphological distinctions provide cues for the identification of the relevant element, but they cannot be the unique trigger of the verb second phenomenon in the acquisition process, as the DS data show.

The data from DS provide clear evidence for a discrepancy between the acquisition of the morphological distinctions – and consequently of the subject-verb agreement marking – on
the one hand, and the distributional regularities of verb placement on the other. The verb placement regularity is mastered despite severe limitations in the acquisition of the finiteness morphology and in the morphosyntactic abilities.

The results are in line with the view that individuals with DS have specific difficulties with grammatical morphology and morphosyntax, and fewer problems with the mastering of basic sentence structures (Chapman et al. 1992; Rosenberg & Abbeduto 1993). They contradict Fowler’s (1990) assumption that there is a primary deficit in syntax and a ceiling on rudimentary syntactic development in DS. Our study shows that the vast majority of individuals with DS is quite successful in mastering the basic sentences structures and argument structures. Moreover, even the adults with DS showed continuing syntactic development. This did not only turn out in the analyses of our data according to chronological age, but also in the tailor-made language training programs that were carried out in the course of the project. For space reasons, I cannot go into detail here. It turned out that especially the adolescents and adults with DS benefited a lot from this language training.

To put it in a nutshell, the primary deficits in the expressive language of DS are most likely located in the morphological and morphosyntactic subcomponents. The apparently deviant grammatical behavior in DS is the result of the modular interaction of non-deviant developmental patterns in each of the interacting modules. It is the *asynchronous* acquisition of morphological and distributional regularities that produces results that look deviant in comparison to typical acquisition. Upon closer scrutiny, however, the very same patterns can be found, with much lower frequency though, in the data of typically developing children as well.
5. General conclusions

If analysed systematically, DS and WS provide evidence for a relatively spared language faculty within an ensemble of partially low-level non-linguistic cognitive capacities. Moreover, within-language dissociations are characteristic of both syndromes. That means that certain verbal abilities develop at a faster rate than others, possibly with the existence of delays which cannot catch up on.

As for the syntactic and morphosyntactic components of grammar, common patterns became evident in both syndromes, and these patterns are attested for typically developing children as well. The general structure of the within-language dissociations are of the same kind for both syndromes: Once the analysis is focused on the level of the relevant modules rather than on the general overall impressions, differences between the grammatical abilities in DS and in WS turn out to be quantitative rather than qualitative, or relative rather than absolute.

The syntactic structure component, as well as syntactic features of the lexicon and the argument structure, are relatively spared in both DS and WS. But each group has difficulties with grammatical dependency relations: for DS, all types of grammatical dependency relations are clearly difficult. This is not only true for the agreement relation between the finite verb and the subject, but also for NP internal agreement. This gives rise to even more pronounced and persistent problems in German, since determiners and adjectives have to agree with the head noun in gender, number, and case; and as mentioned before, there is a lot of syncretism in the paradigms, as exemplified for the definite article in table A in the appendix.

Individuals with WS on the other hand seem to handle grammatical dependency relations more easily. However, less pronounced difficulties may nevertheless persist in these areas as
well, as some studies have reported before (cf. Karmiloff-Smith, Grant, Berthoud, Davies, Howlin & Udwin 1997; Pezzini et al. 1994; Volterra et al. 1996; and Schaner-Wolles 2000a for a discussion). The WS girl studied here had the same difficulties with more complex dependency relations (interaction of binding and control) as typically developing children have before the age of about seven.

Both in DS and WS, the patterns of errors in grammar are within the range of the patterns of typical language acquisition: the same types occur, but with higher frequency and longer persistence. In all, these findings suggest that the individual sequence of the grammatical development is fairly uniform for all three groups, DS, WS, and typically developing children. At least from the point of view of the grammatical development, there is no evidence in support for Vicari, Caselli, Gagliardi, Tonucci and Volterra’s (2002) assumption that “[...] the two syndromes develop differently along distinct trajectories”.

This notwithstanding, individuals with DS are more delayed in their overall language development than individuals with WS, and they are more out of step with particular linguistic subcomponents, such as grammatical morphology and morphosyntax, than it is the case in WS. So, having put the emphasis on the relatively spared language faculty in both syndromes so far, a crucial question remains to be answered: What accounts for the difference between the linguistic behavior in DS and WS?

This question concerns the influence of other cognitive capacities on the developmental process of language acquisition. As touched upon in the introduction, there is much to be said for the verbal short-term memory as one crucial factor in this connection. Verbal short-term memory is a particular strength in WS, and an area of particular weakness or selective impairment in DS (cf. Wang & Bellugi 1994; Vicari et al. 1996; Karmiloff-Smith et al. 1997; Jarrold et al. 1999, 2001).
Such syndrome-specific cognitive limitations may deprive the language faculty of the necessary support for getting a tight grasp on grammar. As demonstrated above, they may affect specific subcomponents to a different extent. Thus, the submodules of grammar show module-specific, differential delays, and develop at different rates, i.e. in an asynchronously delayed way. This results in within-domain dissociations. Given that such limitations prevent the learner from passing a certain stage in one of the submodules of grammar, this has overall consequences for the whole system. The causal effect is local, however. One might want to call this local difference a qualitative difference, in the sense that typically developing children do pass this level at which individuals with DS or WS stagnate. Even if this ceiling effect shows “that WS language follows a different path to normal acquisition [...]” (Karmiloff-Smith et al. 1997: 258), it does not warrant the conclusion that the underlying system of grammar is qualitatively different. In terms of inventory and processes, the system components have the same features one finds at various stages of typical development. On the local level of components, the patterns of acquisition do not differ from typical development. It is the developmentally asynchronous assembly of components that gives rise to a linguistic profile that appears to be qualitatively different. But the different quality is not significant in itself, once one understands its origin. The asynchrony is not caused by the linguistic system itself, but rather a by-product of the general cognitive environment the linguistic system is embedded in.

ACKNOWLEDGMENTS

I am very grateful to all the participants who took part in the studies reported here, to their parents, and to the staffs of the schools and kindergartens where the investigations were done. I would also like to thank two anonymous reviewers, the audience of the ISES2 conference in May 2002 at the University of Potsdam, and Hubert Haider for helpful comments and suggestions. The responsibility for remaining shortcomings is of course mine.
Table 1: Passive-active test: percentages of correct reactions as a function of sentence types

<table>
<thead>
<tr>
<th>Sentence Type</th>
<th>Kathy 4-year-olds</th>
<th>Kathy 5-years-olds</th>
<th>Typically Controls 4-year-olds</th>
<th>Typically Controls 5-years-olds</th>
</tr>
</thead>
<tbody>
<tr>
<td>reversible full passives</td>
<td>100.0 %</td>
<td>77.8 %</td>
<td>86.2 %</td>
<td></td>
</tr>
<tr>
<td>reversible agentless passives</td>
<td>100.0 %</td>
<td>83.3 %</td>
<td>96.3 %</td>
<td></td>
</tr>
<tr>
<td>OVS-actives (with unambiguously marked O and S)</td>
<td>60.0 %</td>
<td>61.1 %</td>
<td>88.9 %</td>
<td></td>
</tr>
<tr>
<td>OVS-actives (with ambiguously marked O but unambiguously marked S)</td>
<td>33.3 %</td>
<td>50.0 %</td>
<td>50.0 %</td>
<td></td>
</tr>
</tbody>
</table>
Table 2: Subtests ‘sentence repetition’: verb positions and verb forms

<table>
<thead>
<tr>
<th></th>
<th>Down syndrome</th>
<th>Controls</th>
</tr>
</thead>
<tbody>
<tr>
<td>*Vfinal [marked finite]</td>
<td>13 (0.7)</td>
<td>5 (0.3)</td>
</tr>
<tr>
<td>Vfinal [marked non-finite]</td>
<td>15 (0.9)</td>
<td>1 (0.1)</td>
</tr>
<tr>
<td>*V2 [marked non-finite]</td>
<td>138 (7.8)</td>
<td>15 (1.0)</td>
</tr>
<tr>
<td>V2 [marked finite]</td>
<td>1600 (90.6)</td>
<td>1436 (98.6)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>1766 (100.0)</td>
<td>1457 (100.0)</td>
</tr>
</tbody>
</table>
Figure 1: Distribution of participant’s types of imitation, by group TD (typically developing children) - DS (Down syndrome), and (mental) age group.
Figure 2: Distribution of verb forms by age groups for DS and TD

![Figure 2: Distribution of verb forms by age groups for DS and TD](image-url)
Figure 3: Percentages of dropped arguments for typically developing children (TD) and individuals with Down syndrome (DS)
Figure 4: Mean percentages of imitated phrases (nominative, accusative, and dative phrases) across age groups for typically developing children (TD) and individuals with DS.
Figure A: Pictures a, b, c are examples taken from the passive-active test for the test sentence “das Mädchen wird von der Mutter frisiert” (‘the girl is combed by the mother’). Test pictures a, b, d, e illustrate the pronominal dependency test sentence in (10): “die Mutter hat der Susi versprochen, sich zu frisieren” (‘the mother has promised Susi to comb herself’).
Table A: Inflection paradigm for the definite article in German

<table>
<thead>
<tr>
<th>Case</th>
<th>NOM</th>
<th>ACC</th>
<th>DAT</th>
<th>GEN</th>
</tr>
</thead>
<tbody>
<tr>
<td>masc.sg.</td>
<td>der</td>
<td>den</td>
<td>dem</td>
<td>des</td>
</tr>
<tr>
<td>neuter.sg.</td>
<td>das</td>
<td>das</td>
<td>dem</td>
<td>des</td>
</tr>
<tr>
<td>fem.sg.</td>
<td>die</td>
<td>die</td>
<td>der</td>
<td>der</td>
</tr>
<tr>
<td>plural</td>
<td>die</td>
<td>die</td>
<td>den</td>
<td>der</td>
</tr>
</tbody>
</table>
Table B: Mean percentages of ‘no answer’ in the individuals with DS by mental age group and by complexity of the test sentences. The complexity types are varying from two-three-word sentences (= complexity 1), to long sentences with two objects and an adverbial phrase (= complexity 6).

<table>
<thead>
<tr>
<th></th>
<th>complex1</th>
<th>complex2</th>
<th>complex3</th>
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REFERENCES


