Knowledge of Binding in Down Syndrome:
Evidence from English and Serbo-Croatian

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Za Stevu
Abstract

Research on Down syndrome (DS), a genetic disorder caused by a chromosomal abnormality, has uncovered unusual disparities between linguistic and cognitive development in this population. Dissociations between language and cognition are further reflected in the linguistic system itself, particularly between the computational components of the language faculty, such as morphosyntax and phonology on the one hand, and modules associated with the general processing systems, namely lexical knowledge, pragmatics and semantics, on the other.

In an attempt to further elucidate the relationship between different linguistic modules in what seems to be a selective grammatical deficit in DS, this study focuses on the knowledge of binding, a module of grammar known to pose particular difficulties to children during the course of typical language acquisition. Performance of two groups of young adults with DS, English and Serbo-Croatian (SC) speakers, was compared to that of typically developing children at different stages of linguistic development. It was found that both English and SC-speaking subjects with DS had specific difficulties assigning an appropriate interpretation to reflexives, traditionally claimed to be governed by Principle A of standard Binding Theory (Chomsky, 1981; 1986), as opposed to pronouns, constrained by Principle B in the same framework.

Not previously evidenced in the literature, this pattern is the reverse of the well-known ‘Delay of Principle B Effect’ attested in typical acquisition, at least in English-speaking children (Jakubowicz, 1984; Chien & Wexler, 1990; amongst others). Typically developing SC-speaking children showed mastery of both Principle A and Principle B, in line with reports on the acquisition of languages that use clitic forms as well as full pronouns in the object constructions tested.

The findings suggest that the process of acquisition of binding in DS may be qualitatively different from typical linguistic development, rendering the
traditional 'delayed but non-deviant' characterisation of language development in DS no longer tenable. In view of the well-known problems with standard Binding Theory, the analysis was couched within the Reflexivity framework of Reinhart & Reuland (1993). It is argued that the pattern shown in DS crosslinguistically is not caused by the unavailability of a binding principle but rather by a specific deficiency in establishing a binding relation between an anaphor and its antecedent. This contrast is one which is more readily characterised in the Reflexivity framework that in standard Binding Theory, thereby lending some support to the former. Moreover, the fact that the same deficit is found in both English and Serbo-Croatian speakers with DS adds considerable weight to the claim that grammar is selectively impaired in this disorder.
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List of Abbreviations

AE age equivalent
BPVS British Picture Vocabulary Scales
BT Binding Theory
CA chronological age
DPBE Delay of Principle B Effect
DS Down syndrome
MA mental age
MLU Mean Length of Utterance
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<td>mental retardation</td>
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<td>NPM</td>
<td>name pronoun match</td>
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<td>NPMcl</td>
<td>name pronominal clitic match</td>
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<tr>
<td>NPX</td>
<td>name pronoun mismatch</td>
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<tr>
<td>NPXcl</td>
<td>name pronominal clitic mismatch</td>
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<td>NRM</td>
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<td>QRXcl</td>
<td>quantifier reflexive clitic mismatch</td>
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<td>R&amp;R</td>
<td>Reinhart &amp; Reuland (1993)</td>
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<td>RWFV</td>
<td>Renfrew Word Finding Vocabulary Test</td>
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<td>SLI</td>
<td>Specific Language Impairment</td>
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<td>TD</td>
<td>typically developing</td>
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<td>TROG</td>
<td>Test of Reception of Grammar</td>
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<td>UG</td>
<td>Universal Grammar</td>
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<td>VITI</td>
<td>Vekslerov Individualni Test Inteligencije – Yugoslav</td>
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<td>WAIS</td>
<td>Wechsler Adult Intelligence Scales</td>
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1 Introduction

1.0 Overview

One of the central issues surrounding the study of language development in Down syndrome (DS), as well as other cognitively or language-impaired populations, is that of modularity. If the language faculty is independent from cognition (in the sense of Fodor, 1983), it should be possible to find cases where an intellectual impairment is accompanied by relatively preserved language. Cases where a selective language disorder is displayed, with the cognitive abilities intact, are equally possible. Furthermore, since the components of the linguistic system itself are also assumed to be relatively autonomous (Chomsky, 1980), we can plausibly expect variation in the development of the distinct language components within the language faculty.

Both types of dissociations have been found in the DS population, but perhaps not in the commonly expected direction. Despite the generally depressed cognition of individuals with DS, language in this population is more noticeably affected than cognitive abilities, which sets DS apart from other types of intellectual disorders. In addition, different aspects of the language faculty seem to be impaired to differing degrees, suggesting a selective grammatical deficit. Research has shown that the modules of the computational system, such as morphosyntax and phonology, are relatively more impaired than those associated with the general processing system, namely lexical knowledge, semantics and pragmatics.

Despite the observed dissociations, comparisons of linguistic development in DS and in the typical population usually come to the conclusion that DS children acquire language just like typically developing children, the only difference being that the process of acquisition occurs at a much slower pace. However, this 'slow but normal' characterisation of language development in DS does not fit easily with reports of the ultimate level of linguistic attainment in this population, which is comparable to that
of a typically developing 2 or 3 year old (Fowler, 1988; Fowler, Gelman & Gleitman, 1994; Rondal, 1995).

How we answer the question of whether or not language development in DS is merely delayed, as opposed to being fundamentally different, bears directly on the issue of ‘intermediate grammars’ in the process of typical acquisition before the child has reached his/her ‘end’ state. If it is really the case that language in DS is ‘arrested’, then the point at which the arrest occurs must match that of an intermediate stage of typical language development. This would provide the perfect opportunity to observe and thus learn more about processes which are so easily missed due to the speed of development in the typical population. On the other hand, if it happens that a stage is observed in the grammar of DS which is absent in typical development, such a finding would constitute evidence against the claim that language in DS is simply delayed, and lead us to hypothesise that it must also be deficient in important respects.

In view of the fascinating issues surrounding the development and the end linguistic achievement in DS, it is surprising that language in DS has hardly received any attention in the generativist framework. Linguistically motivated accounts of other linguistic impairments, developmental (e.g. SLI) or acquired (e.g. aphasia), have proved vital in furthering our knowledge of both the language disorders and the study of linguistic theory. Our linguistic theories should be neurologically plausible, thus the testing of principled theoretical accounts by applying them to language impairments is invaluable. One of the purposes of the present study is to rectify this neglect.

In order to further elucidate the relationship between different linguistic modules in what seems to be a selective language impairment, this study investigates the knowledge of a syntactic module, that of Binding Theory (BT), in highly functioning young adult DS girls, whose grammatical development is considered complete. As
Chapter 1

we are interested in language impairment in this population universally, hence
crosslinguistically, the study is conducted with both English and Serbo-Croatian (SC)
speakers with DS. The majority of the literature has centred on the English-speaking
DS population, with the notable exception of several studies on Dutch, French and
Italian subjects. The present study, however, offers a comparison of the knowledge of
binding in two distinct languages - English and SC, in an atypical population such as
that with DS, and in this respect is the first of its kind within the generative
framework. In addition, no Slavic speakers with DS have been examined before.

Binding Principles guide the distribution and interpretation of nominal expressions,
and as such constitute a major component of adult syntactic knowledge (Chomsky,
1981, 1986). In standard BT, Principle A governs the distribution and interpretation
of reflexives, whereas Binding Principle B is concerned with pronominals. It is well
known that typically developing children acquire Principle A early and with few
difficulties, whilst their acquisition of Principle B is significantly delayed. It has
been shown that children as old as 5 or 6 would accept (1) as grammatical around
50% of the time:

(1) * Mary is washing her.

This phenomenon, often referred to as the ‘Delay of Principle B Effect’ (DPBE), has
been reported for a variety of languages: English (Jakubowicz, 1984; Chien &
Wexler, 1990), Dutch (Philip & Coopmans, 1996), Russian (Avrutin & Wexler,
1992), Icelandic (Sigurjónsdóttir, 1992).

If language development in DS is merely delayed, then investigations of the
availability of the Binding Principles in this population should demonstrate parallels
with normal language development – Principle A should pose few problems, but
Principle B should yield interpretive difficulties until later stages of development.
This prediction is proven incorrect by the present study, which found that DS subjects
have specific difficulties assigning appropriate interpretation to reflexives; in contrast, none of the subjects showed difficulties assigning interpretation to pronouns. Whilst this unique pattern has not been evidenced in typically developing children crosslinguistically, it has recently been replicated in much younger English-speaking children with DS (Ring & Clahsen, 2003).

On the basis of the accounts for the DPBE in typical development, I will argue that a satisfactory account of these findings cannot be provided within the framework of standard BT. I argue that the pattern shown in DS is not caused by the unavailability of a Binding Principle but by a specific deficiency in establishing binding relations. The proposed dissociation between binding, as the expression of referential dependencies, and the ability to establish the syntactic relation of binding in DS, can be accounted for within the Reflexivity framework of Reinhart & Reuland (1993). That the same deficient pattern was observed in two only distantly related languages, English and SC, strengthens the hypothesis that there is a selective grammatical deficit at play in the population with DS, a finding which presents a convincing case for the sub-modularity of the language faculty.

The pattern displayed by the young adults with DS in this study has not been documented in the literature on typical language development, suggesting that the acquisition process of a particular syntactic module in the DS population is qualitatively different to that of the typical population. The implication is that traditional 'slow-but-normal' characterisation of language development in DS is no longer tenable.

1.1 Down syndrome: general and cognitive characteristics

Down syndrome is one of the most common types of mental retardation (MR), affecting 1 in 700-1000 babies of both sexes, and accounting for 30% of all individuals diagnosed with moderate to severe MR (Comblain & Rondal, 1994;
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Steele, 1996; Beamount, Kenealy & Rogers, 1996). It is a genetically based neurodevelopmental disorder caused by a chromosomal abnormality, where the chromosome 21 carries three instead of the usual two copies of the chromosome.\(^1\)

The disorder is accompanied by specific physical and facial characteristics, e.g. slanting eyes, small ears, flattened nasal bridge, short stature. Life expectancy is low, but has improved in recent decades, now reaching about 55 years (Rondal & Comblain, 1996). Individuals with DS have an increased risk of developing heart defects, vision and hearing impairments and immunodeficiencies that may result in respiratory diseases, whilst after the age of 35 signs of dementia typical of Alzheimer's are common (Thase, 1988; Nadel, 1999). DS affects a range of cognitive abilities, such as conceptual development, information processing, attention capacity, reaction time, number knowledge, memory, auditory-vocal processing, visuospatial abilities and perceptual discrimination (see Carlesimo, Marotta & Vicari, 1997; Gelman & Cohen 1988; Nadel, 1999; Pueschel, 1988; Wisnieski, Miezejeski & Hill, 1988; amongst others).

For typical trisomy 21,\(^2\) the average IQ is around 50 (Kemper, 1988). Nonverbal mental age (MA)\(^3\) is generally reported to be 5 years (Gibson, 1978), although recent studies report a slightly higher MA of 6-7 in young adults and adolescents (Fowler et al, 1994). Intellectual maturation is complete at 12-15 years, but the end cognitive achievement is characterised by wide individual differences (Carr, 1985; Morss 1985; Rondal & Edwards, 1997, amongst others). Interestingly, females with DS are reported to have a higher IQ than males with DS (Carr, 1985). Parents and teachers

\(^1\) There are three types of DS, depending on whether the whole copy of the chromosome is present, or just a part of it. Standard trisomy, which accounts for 95% of cases of DS, refers to cases where there is a whole extra copy of the chromosome 21 in each cell of the body. The second type, translocated DS, occurs when an extra copy of the chromosome 21 is attached to some other chromosome, accounting for 3-4% of cases of DS. In mosaic DS some, but not all, cells have an extra chromosome; this type is the rarest, occurring in only 1-2% of cases.

\(^2\) Only standard trisomy causes the severe cognitive deficits associated with DS, both translocated and mosaic DS exhibit less impaired cognitive profiles (Gibson, 1973). In case of mosaic DS, studies have reported near-normal or normal intellectual achievement for some individuals (de Moreira, San Juan, Pereira & de Souza, 2003; Wisnieski et al. 1988). No data is available on linguistic abilities of different types of DS, however.
often rate the language of DS girls to be more advanced than that of boys (Buckley & Sacks, 1987), but it has been argued that this claim has not been documented adequately and cannot therefore be substantiated (see Rondal & Edwards, 1997).

Importantly, DS is characterised by an uneven profile of abilities, rather than an across-the-board retardation (Nadel, 1999). Some cognitive abilities are selectively spared, whilst others are more severely affected. Although both visual and auditory processing are known to be impaired, Pueschel (1988) has shown that some functions of auditory processing are more affected than those of visual processing, e.g. auditory-motor and auditory-vocal processing as opposed to visual-motor and visual-vocal processing. Uneven profiles of abilities may be a reflection of varying mental and brain organisations. Although there is not much difference between the brains of DS and non-MR infants at birth, by 6 months of age, a range of anatomical, physiological and neurochemical abnormalities in the brains of babies with DS are observable (Nadel, 1999; Rondal & Edwards, 1997). These abnormalities usually concern differential rates of development and final realization of particular brain structures, e.g. reduction in the growth of the frontal lobes, smaller brain stem and cerebellum; however, it is far from conclusive in what ways these differences affect cognitive and other functions in DS. In addition, claims have been made that language and reading are handled by the right hemisphere in individuals with DS (Buckley, 1985); yet other studies suggest the usual left hemisphere language dominance (Rondal & Edwards, 1997).

1.2 Language abilities in DS

Speech in individuals with DS is encumbered by a number of mechanical problems, such as hypotonia of speech muscles, a small mouth cavity, a protruding tongue,

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3 Measures of MA reflect the developmental achievements of non-MR populations.
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which, in addition to dysarthria\(^4\) and dyspraxia,\(^5\) considerably reduce its intelligibility. It is hard not to agree with Rondal: “Given the number and severity of the factors that militate against them, it is surprising that individuals with Down’s syndrome develop language at all.” (1993:166). While it is now generally accepted that mechanical problems of speech common in DS cannot account for the observed language difficulties, a strikingly poor linguistic achievement is one of the characteristics of this condition that sets it apart from other genetic disorders. A sample from a narrative told by an adolescent girl with DS is given below:

“It’s Tuesday day today. No, Tuesday evening now. Still sleeping in the evening with the dog on the bed. He sleeps like a log. Middle of the night frog squeeze out and go outside to swimming. It be Tuesday morning. Boy out of bed and dog wakes. They see frog gone. Now Monday evening he’s gone and see the friends. And boy and dog go walking to park.”

(‘The Frog Story’, as told by one of the participants in our study. The first picture described shows a boy and a dog sleeping, and a frog climbing out of a jar. The second picture shows the boy and the dog awake, the frog having leapt out of the jar and through the window.)

The excerpt above serves well as an illustration of typical characteristics of language in DS. Inconsistent use of grammatical morphemes such as articles, auxiliaries, copulas, pronouns, conjunctions, prepositions, verbal and nominal inflection has earned the speech of individuals with DS the characteristic ‘telegraphic’. Usually only simple syntactic structures are present, with complex structures such as passives, possessive forms, negation or interrogatives being out of reach for both children and

\(^4\) Difficulty in speech production, caused by defects in the mechanisms of larynx, pharynx or tongue (Beamont et al, 1996).

\(^5\) An inability to carry out purposeful movement in the absence of a sensory loss or motor weakness. (Beamont et al, 1996).
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adults (Fowler, 1990; Rondal, 1995). Speech intelligibility is reduced by inappropriate phonological processes such as final consonant deletion, consonant cluster reduction, various substitutions and omissions (Dodd, 1976). Given this plethora of handicaps, it is not surprising that the end linguistic achievement in DS has been described as comparable to a typically developing (TD) three-year-old child (Fowler, 1990). As with cognitive abilities, however, wide individual variation in linguistic proficiency in DS is more of a rule than an exception.

1.2.1 Delay or deviance?

Despite the strikingly limited linguistic achievement of DS individuals, a traditional characterisation of linguistic development in DS is that language in this population is a slowed down version of typical development, equivalent to it in structure and organisation, but reaching a lower ceiling (Lenneberg, 1967; Rosenberg, 1982). Proponents of this view base their argument on observations that DS children go through identical stages in the process of acquisition of linguistic knowledge as typically developing children, albeit with a considerable delay (Bridges & Smith, 1984; Fowler, 1988; Fabretti et al, 1997; Beeghley & Chicchetti, 1990; Oliver & Buckley, 1994; Rutter & Buckley, 1994). Other authors, however, emphasise the asynchronies in the development of aspects of the language faculty which, they claim, renders the delay hypothesis at best inaccurate (Chapman, 1995; Miller; 1992; Rondal & Edwards, 1997).

In research on mental retardation generally, the question of ‘delay’ vs. ‘deviance’ is a long-standing issue. As with language, the cognitive processes in an individual affected by an intellectual disorder are held to be either different from those of non-disordered, or basically similar, yet developmentally delayed (Illingworth, 1980). However, recall from section 1.1 that cognition in DS is characterised by uneven profiles: recent reviews argue for both qualitative and quantitative differences in the learning strategies in this population, revealing selective deficits in particular areas of
cognition (Gelman & Cohen, 1988; Jarrold & Baddeley, 1997; Nadel 1999; Morss, 1985; Stratford, 1985; Wishart 1988). The paradox of referring to cognitive development in DS children as ‘slow’ and the final developmental achievement in DS adults as ‘different’, pointed out by Morss (1985), can also be used to characterise the literature on the language profiles in DS. As Rondal & Comblain (1996) note, it is odd to describe linguistic proficiency of a 15 year-old as ‘delayed, but normal’, if this proficiency is comparable to that of a typically developing 3-year old. Yet, if language components are looked at separately, they are likely to be equivalent to those of a younger TD child, with no obvious deviance observable.

While the issue of delay vs. deviance in the language of DS still attracts considerable attention, since no solid evidence for its confirmation or disconfirmation has yet been given, it continues to raise fascinating questions for all interested in language development, typical and atypical. If language is largely genetically predetermined, its development should follow the same course in human language acquisition, and be constrained by the same biological factors. In the Chomskyan framework, this set of constraints, referred to as Universal Grammar (UG), is given as a part of our biological endowment, and there is no reason to doubt that it is also available to individuals with DS. Such a claim presupposes that children with DS should acquire language in the same way as typically developing children do, following the same developmental milestones, thus whether this process is initially delayed is not so relevant. However, if their acquisition process is the same as that of TD children, why is the end achievement so limited? This inexplicable plateau that a large number of individuals with DS may never exceed inevitably points to the conclusion that language development in DS must be different. But then still more questions arise: in what ways is their language different? How do we define what is different? How would these differences fit in with the idea of a genetically predetermined language system, namely UG?
A full answer to any of these questions is beyond this thesis, let alone this chapter, however, we shall take a little stab at some of them in the ensuing sections, in order to prepare the scene for our own study that will be presented in subsequent chapters. First, we shall explore whether it is possible that cognitive impairments in DS could be responsible for the language deficits in this population. A brief review of the literature on linguistic profiles in DS, as compared to other intellectual disorders, will expose the fallacy of such an assumption. And once we discuss the reported linguistic profiles of DS individuals in relation to typically developing population, we will see that some aspects of the language faculty in DS seem to be more deficient than others, thereby forcing the conclusion that language in this population seems to be prone to a selective, grammatical, deficit.

1.2.2 Evidence for modularity: Dissociations between language and cognition

In accounting for the severity of linguistic impairment in DS, an obvious link to be made is that between cognitive impairment and poor language abilities. However, there are several arguments against the idea that the limited linguistic achievement in DS is a result of depressed cognition. The main argument concerns cases of reported dissociations, either between language and cognition, or between the components of the language faculty itself.

Disparities between language and cognition have been widely reported in the literature, in either direction. A striking example is found in language and cognitive profiles in Williams syndrome (WS), another genetic disorder that affects cognitive abilities (Bellugi, Marks, Bihrlé & Sabo, 1988). Despite attaining IQ levels comparable to individuals with DS, language skills in WS are known to well exceed their level of cognitive abilities. Following the same pattern, cases of language savants with preserved language but mild to moderate intellectual impairment have recently been documented by Yamada (1990), Rondal (1995) and Smith & Tsimpli (1995). In the latter study, the linguistic abilities of a savant involve a mastery of
some 15-20 foreign languages, whilst Rondal (1995) details a case of an individual with DS, with cognitive abilities typical of the DS population, yet in possession of ‘exceptional’ (well-preserved) language skills.

Conversely, language disorders have been evidenced in typically developing children who have no known cognitive impairment, yet show difficulties in language development and attain very limited level of linguistic achievement. The best documented is specific language impairment (SLI) (see Clahsen, 1991, Rice & Wexler 1996, van der Lely, 1994).

Both types of dissociations provide powerful evidence for the argument of modularity of the mind, in the sense of Fodor (1983), where language and cognition are viewed as independent components in a highly organised system, each of them further compartmentalised into smaller modules dedicated to specific functions.

Importantly, dissociations can be observed between cognition and language in the majority of population with DS itself. Disparities between measures of MA and measures of linguistic abilities have been recognised in both children and adults with DS (Byrne, Buckley, MacDonald & Bird, 1995; Fowler, et al 1994; Miller, 1988; Rondal & Comblain 1996; Smith, von Tetzchner & Michalsen, 1988; Vicari, Caselli & Tonucci, 2000). The studies typically report aspects of language abilities in DS individuals to be much poorer than their MA predicts. For example, Chapman, Schwartz & Kay-Raining Bird (1998) calculate the minimum length of utterance (MLU) in children between 5 and 8 as equivalent to a typically developing two-year-

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6 IQ does appear to be related to the linguistic achievement of individuals with DS, as observed originally by Lenneberg, 1967, and recently by Fowler (1988), amongst others: in individuals whose IQ is over 50, language skills are perceived to be better. This, however, is not an argument against the (relative) independence of the language faculty and cognition, but can be interpreted as the requirement for possession of some cognitive-semantic basis on which the linguistic development must be based (Rondal & Comblain, 1996). The language impairment discussed in the literature largely involves individuals who do have that basis, as reflected in the MA scores reported.

7 MLU is calculated by counting the number of morphemes in a child's utterance (Brown, 1973). It is a good predictor of linguistic achievement in typical language development and is widely used in comparisons of MR children to those who are typically developing. Its usefulness for older children
old child (MLU 2.00). The situation does not seem to change much in later life, as the same study reports the MLU of adolescents to be comparable to a non-disordered three-year old (MLU 3.15).^8

A further argument against the idea that general cognitive impairment is responsible for poor linguistic achievement in DS concerns the fact that this syndrome is generally considered to be more detrimental to language development than other intellectual disorders are (Gunn, 1985; Fowler, 1990; Kernan, 1990; Rondal, 1993). A number of studies have shown that the language skills of individuals with Williams syndrome far exceed the language skills of individuals with DS who have been matched on cognitive measures. Bellugi and colleagues conducted a series of tests comparing the language of children and adolescents with WS and DS, matched on IQ and chronological age. Their findings were that on nearly every language measure, individuals with WS outperformed those with DS (Bellugi, Wang & Jemigan, 1994; Singer Harris, Bellugi, Bates & Rossen, 1997). In a study of early language development, Singer Harris et al (1997) compared parental reports and showed that, despite the initial delay of expressive language in both populations, children with WS quickly gained advantage over those with DS (although the latter were better at gesturing).^9 Comparing children with DS to those with autism, Tager-Flusberg (1994) reports that while DS children have better command of the pragmatic functions of specific categories, their spontaneous language contains more grammatical errors than that of autistic children.

The same pattern is documented in late childhood and adult years. Adolescents and adults with DS show consistently poorer performance on linguistic measures than

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^ It is interesting that the disparity between linguistic and non-linguistic abilities in DS seems to increase with chronological age. Children younger than 3 or 4 have been found to develop language consistent with their cognitive skills, but beyond this point, their language skills decrease in comparison to other cognitive skills (Miller, 1988, 1992).

^8 This can be interpreted as an indication that language skills in DS are not developing adequately, forcing DS children to resort to gesturing as a compensatory strategy (Singer Harris et al, 1997).
individuals with other types of intellectual disorders, matched on chronological and mental age (Keman & Sabsey, 1996; Marcell, Ridgeway, Sewell & Whelan 1995). Comparing French speakers with DS and those with MR of unidentified aetiology, Rondal & Lambert (1983) emphasise that only half of all sentences produced by DS adults in their study were grammatical.

The last study openly proclaims the point we would like to make: in most studies that show linguistic abilities to be poorer than cognitive abilities in DS, or worse in comparison to MR individuals with other aetiologies, a closer look at the ‘linguistic abilities’ examined reveals that they are all crucially aspects of grammatical knowledge. Individuals with DS achieve limited MLU, perform poorly on sentence imitation tasks, which are known to tap into grammatical knowledge (Marcel et al 1995) as well as tasks of comprehension and elicitation of grammatical morphemes and more complex syntactic structures (Kernan & Sabsey, 1996; Rondal & Comblain, 1996). Differences between linguistic and cognitive abilities in DS, or between individuals with DS and those with other aetiologies, are not reported for pragmatic, semantic or lexical knowledge. In fact, Tager-Flusberg (1994) explicitly points out that the DS children in her study (matched both on chronological age and MLU) did better on pragmatic aspects of language than autistic children, but typically showed grammatical errors not made by autistic children.

These findings all point to an asynchrony in the development of the linguistic system in DS itself, thus constituting a convincing argument against the ‘slow but normal’ characterisation of language development in DS. More importantly, the findings suggest that there may be a selective deficit in the language of DS, targeting grammar specifically, rather than other modules of language. In the following sections we review studies that focus on the comparisons of language in DS and non-disordered

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10 The link between MLU and mastery of grammar has often been pointed out; see Fowler et al (1994), Tager-Flusberg (1994).
1.2.3 Dissociations within language

Recent research on language development in DS suggests that asynchronies in the development of specific aspects of language are typical of DS. Deficits in expressive language are more apparent than in language comprehension, but most significantly, modules of the computational system, such as morphosyntax and phonology, seem to be more severely impaired than the modules associated with the general processing system, such as lexical knowledge, semantics and pragmatics.

Studies have consistently shown that individuals with DS achieve considerably higher scores on measures of vocabulary comprehension, than on measures of receptive or expressive syntax, both in English and the few other languages in which linguistic profiles of DS have been examined (Chapman, Schwarz & Kay-Raining Bird, 1991; Fowler, 1990; Fowler et al 1994; Miller 1988, 1992; see Vicari et al, 2000 and Fabretti et al 1997, for Italian; a series of studies by Rondal and colleagues for French; and Bol & Kuiken, 1990 for Dutch). In line with reports that measures of MA successfully predict lexical development in both intellectually disabled and TD children, these studies reveal that receptive vocabulary is rather consistent with the general cognitive levels in the population with DS. It has been reported that receptive vocabulary may even exceed MA in adolescents and adults with DS, as a result of educational experiences (Facon, Grubar & Gardez, 1998), further supporting the dissociation between computational and conceptual modules in DS.

The other two linguistic modules associated with the conceptual system, semantics and pragmatics, have also been reported to be relatively spared, i.e. in line with the cognitive abilities associated with DS (see Rondal & Edwards, 1997; Rosenberg & Abbeduto, 1993 for reviews). Interestingly, while pragmatic skills that are
independent of language proficiency seem to be comparable to those in non-impaired individuals of the same language level (i.e. non-verbal social interaction, expression of communicative intent and socially appropriate responding), linguistic cohesion, which is more dependent on expressive language and grammar, is limited (Chapman, 1995).

Phonology and morphosyntax, on the other hand, have been reported to be more vulnerable to deficits in the language of DS. Early phonological development is delayed, following that of TD developing children, yet deficient phonology remains a characteristic of DS (Dodd, 1976, Rondal, 1993). Deletion of unstressed syllables, errors on syllable-final sounds, reduction of consonant clusters, substitutions, omissions and additions of particular sounds persist into late childhood and are often present in adulthood. These features cannot be explained away by appealing to anatomical factors such as a larger tongue, irregularities in the mouth cavity or dentition, because assessments of speech intelligibility before and after partial glossectomy (tongue reduction) for cosmetic appearances show no significant change (Dodd, 1976). Moreover, the phonological impairments present in DS are not recorded in other types of MR, but have more in common with those of phonologically impaired children with no known cognitive defects (Dodd & Thompson, 2001). Although it has been suggested that phonological disorders in individuals with DS may be associated with the hearing loss that often accompanies this condition, there is no conclusive evidence that intelligibility and hearing greatly influence their knowledge of syntax, morphology or vocabulary (Chapman, 1995; Jarrold & Baddeley, 1997).

We turn now to a brief overview of studies on the knowledge of morphosyntax in DS, with the purpose of illustrating the severity of the impairment of the grammatical component in this population.
1.2.4 Knowledge of morphosyntax in DS

Studies investigating acquisition of morphology and syntax in children with DS usually employ observational measures, based on spontaneous speech elicited through conversation or a narrative. In line with the traditional 'slow but normal' characterisation of linguistic abilities in DS, the few longitudinal studies that observed the emergence and development of language in this population typically come to the same conclusion: children with DS build up their MLU incrementally and progress through the same stages in the acquisition of grammatical morphemes as that of TD children, only at a slower pace (Fowler, 1988; Rutter & Buckley, 1994; Tager-Flusberg, 1994).

During the course of an observational study of a child aged between 4 and 9, Fowler (1988) noted how unremarkably regular her acquisition process looked: during the first year of observation, the linguistic achievements of this girl at any moment were comparable to those of a TD child at the same language level. This confirms the observation in the traditional literature that regardless of a linguistic delay, or a lack of linguistic proficiency, children with DS never produce a structure that cannot be heard in a TD (but much younger) child (Miller, 1992). Nevertheless, there are issues even in these few studies that are not in accord with the delay hypothesis. Crucially, none of these studies observed the point at which a DS child caught up with a TD child in linguistic development. Whilst Rutter & Buckley (1994) confirm that the order of acquisition of bound grammatical morphemes in 12 young children with DS (aged 1-3 years at the beginning of the study) mirrored that found in typical development, their data show that only half of their subjects ever produced the copula 'be', only three children used an auxiliary, and not one of them was using the agreement marker 's' at the completion of the study (when children's ages ranged between 3.5 and 5.5). This did not prevent the authors from concluding that language in DS is merely delayed however. In contrast, on the basis of the stalled progress a DS child showed at the age of 5.5 in her longitudinal study, Fowler (1988) concludes
that the stage III of Brown (1973) (MLU 3-3.5, characteristic of a typically developing 3 or 3.5-year-old child) seems to be the ceiling that not many children (or adults) with DS can surpass.\textsuperscript{11}

Cross-sectional studies typically compare the correct use of bound and free morphemes in the spontaneous speech of DS and control TD children, matched either on a measure of productive grammar or mental age. While these studies also report similar levels of grammatical achievement as measured by MLU consistent with the plateau observed by Fowler (1988) and Fowler et al (1994), their findings reveal that children and adults with DS in fact exhibit poorer levels of productive morphosyntax than TD children matched on MLU\textsuperscript{12} or mental age (Fowler et al 1994; O’Neill & Henry, 2001). In the spontaneous speech of 48 children and adolescents with DS, aged 5-20, Chapman et al (1998) found more inconsistent use of both bound morphemes (plural -s, possessive -s, third person singular, contractible auxiliaries and copulas, present progressive -ing, regular past tense -ed) and free function words (copulas, auxiliaries, modal auxiliaries, articles, prepositions, pronouns, adverbial adjuncts, conjunctions and infinitive ‘to’), than in mental age matched TD controls. Similar rates of omission of grammatical morphemes in individuals with DS were reported in other languages (Vicari et al (2000) and Fabretti, Pizzuto, Vicari & Volterra (1997) for Italian, Bol & Kuiken (1990) for Dutch).

\textsuperscript{11} Reporting that adolescents in their study showed an MLU around 4.5, Chapman et al (1998) dispute the claim that MLU in DS is limited to stage III of Brown (1973). While other studies also sometimes show higher MLUs for individuals with DS over 16 years old (Rondal & Comblain, 1996), the majority of them report that in children below this age MLU tends to cluster around 3-3.5, as observed by Fowler (1988). Furthermore, the longer MLU reported by Chapman et al (1998) for adolescents need not necessarily mirror grammatical complexity of their language: many have argued that MLU is not an accurate predictor of morphosyntactic development in older children and adults (Tager-Flusberg, 1994). Finally, when more complex syntactic structures are involved, both children and adults with DS score equally poorly (Rondal & Comblain, 1996). We shall come back to this last point later on.

\textsuperscript{12} If relying on matching procedures on the basis of MLU, differences in the use of grammatical morphemes between DS and TD control children may not always occur. This is not surprising, as in these matched controls are usually much younger - confirming observations that the ceiling MLU for DS individuals rarely surpasses that of a typically developing three year old child. However, several studies reported higher omission of grammatical and bound morphemes in DS individuals even when matched to TD controls on MLU (Chapman, Schwartz & Kay-Raining Bird, 1992; Fabretti et al 1997).
A number of studies also report that complex syntactic structures are rarely mastered by either children or adults with DS. Fowler (1988) found a total lack of auxiliary inversion and do-support in the attempted question formation of a child who was 9 at the end of her study; similar findings were confirmed in Tager-Flusberg (1994). Subordinate and relative clauses, negated and passive constructions proved out of reach for a large group of French speakers with DS, aged between 7 and 20 (Rondal & Comblain, 1996), whilst deficient comprehension and production of passives in both children and adult English speakers with DS has been reported by Bridges & Smith (1984), Eriks-Brophy, Stojanović & Goodluck (2002), Fowler (1990), Perovic (2002), Ring & Clahsen (2003).

1.2.5 A grammatical deficit in the language of DS?

The patterns reviewed above reveal that the language profiles of the majority of individuals with DS invariably involve malfunction of the grammatical components of language, suggesting a selective language deficit in this population. However, in the vast literature on the language in DS, a selective linguistic deficit has not often been put forward: the accounts of language difficulties in DS usually rely on different processing limitations reported in this population (Rondal & Comblain, 1996; see Rondal & Edwards, 1997, and Chapman, 1995, for reviews). A general processing deficit invokes the known limitations in short and long term memory in DS as the main reason for the inability of children and adults to use grammatical forms appropriately, whilst specific types of processing deficits often appeal to the malfunctions in auditory short-term memory, in line with reports of a selective impairment of auditory processing in DS (Chapman, 1995).

Such accounts fall short of explaining the stark differences in the mastery of lexical as opposed to functional categories in DS, for instance, but the main problem for these types of accounts is the study presented by Woll & Grove (1996), who investigated the linguistic abilities of 11-year-old twins with DS, bilingual in British
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Sign Language (BSL) and English. Corresponding impairments in morphosyntax were found in both modalities, as measured by the test of receptive grammar for English and an examination of aspects of BSL that require obligatory marking of morphology (spatial relations and number/distribution). It is unlikely that a deficit in grammatical morphology in both modalities would be related to a deficit in auditory processing. In addition, while Françoise, a woman with typical trisomy 21, had perfect language skills, her short-term memory was not found to be different from levels generally reported for DS (Rondal, 1995).

In the modular view of language we adopt, a selective language deficit targeting grammar is not unusual. The literature abounds with studies detailing linguistic impairments in another developmental disorder, SLI, which is known to selectively affect aspects of the language faculty in the absence of observed cognitive impairments (Clahsen, 1991; Rice & Wexler, 1996; van der Lely 1994). In contrast to the descriptive nature of the vast majority of literature on DS, studies discussing SLI often rely on current theoretical frameworks in an attempt to provide an account of linguistic deficits in this population.

Yet, as pointed out in recent reviews, the parallels between the linguistic profiles in DS and SLI are quite striking (Clibbens, Guijarro-Fuentes & Powell, 2002; Tager-Flusberg, 1999). In both DS and SLI lexical knowledge is relatively well preserved, in accordance with mental age. Grammatical morphology, we have seen, is especially vulnerable in DS, and the same has been reported for SLI: in fact, inconsistent use and omission of tense and agreement markers has been hailed as a clinical marker of (English) SLI (Rice & Wexler, 2001). Not surprisingly, the few studies that have directly compared SLI and DS children, report more similarities than differences between the two populations. In the earlier mentioned Dutch study, Bol & Kuiken (1990) compared aspects of grammatical knowledge in DS, SLI and hearing impaired children, finding that the only major difference between the three groups was that of degree, with children with DS producing less complex structures and omitting the
highest number of grammatical morphemes out of the three groups. Recent studies comparing English speaking children with SLI and DS, matched on non-verbal MA measures, report equally poor scores on phonological memory tasks for the two populations, but generally poorer performance of children with DS on tasks eliciting grammatical morphology (Hick, 2002; Laws & Bishop, 2002).

Our argument here is not that the linguistic deficit in SLI and DS, or any other population that exhibits disordered patterns in their knowledge of morphosyntax, is caused by the same underlying factors. The parallels displayed in the grammatical deficits in clinical populations however provide some evidence for the generativist view that our grammar, the computational basis of language, is neurologically identifiable. Whilst we are a long way away from being able to state that language deficits in DS or SLI can be associated with malfunctions of particular neural structures responsible for language, we can hope that future research will shed more light on the relationship between grammar and developmental disorders with or without the presence of a cognitive impairment.

Note that the characterisation of language impairment in terms of a grammatical deficit in DS is in contrast to the traditional 'delayed' view of language development in this population. Recall that the main bases for the delay hypothesis were the observed similarities in the language development of DS and typical populations. However, similarities in the process of language acquisition in DS and TD are inevitable on the view that our language faculty is constrained by biological constraints such as UG. The issue of delay vs. deviance really relates only to the computational aspects of language in DS. As mentioned earlier, the computational components of the language faculty are also vulnerable to deficit in other developmental and acquired disorders. Labels such as 'telegraphic' or 'agrammatic', originally associated with language impairments caused by brain damage in

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13 In this study, children with SLI generally did best on all measures, but, like those with DS, they showed poor mastery of determiners, pronouns, and verb agreement markers.
intellectually non-impaired individuals, are often used to characterise language in DS (Singer Harris et al, 1997; Rondal, 1993). Obviously, the language of agrammatic aphasics is never characterised as ‘delayed’, despite some similarities in their language profiles to those of young TD children, such as the omission of function words and bound morphemes, or poor comprehension of complex grammatical structures.

1.2.6 Language in DS and the Critical Period Hypothesis

One issue related to the vulnerability of the computational component of the language system observed in DS is that of a critical period for language acquisition, first proposed by Lenneberg (1967). The observed ceiling in the linguistic attainment in DS has been associated with the idea that, due to the initial delay and the slow progress in the acquisition of the grammatical component of language, children with DS in fact miss the critical window of opportunity during which this process must take place. Basing their claim on the cases of linguistically accomplished individuals who developed their excellent language skills between the ages of 4 and 10, Rondal & Comblain (1996) argue that the limited achievement in the phonological and morphosyntactic development in DS may be due to the fact that ‘moderately and severely intellectually impaired individuals are squeezed, so to speak, between two constraining time parameters: (1) late onset of development (for brain-maturational reasons, and because of the longer time necessary to set a sufficient cognitive-semantic basis from which computational language can proceed), (2) the ending of the critical period for basic structural development.’ (Rondal & Comblain, 1996:9).

The idea that the poor linguistic achievement in DS may be related to a missed window of opportunity for the acquisition of structural aspects of language is supported by reports of rare cases of individuals (regardless of intellectual ability) who fail to be exposed to an appropriate linguistic input during the important first years of their lives. In these cases too it is the computational component of language,
the morphosyntax, that is affected, rather than the modules associated with the conceptual system, e.g. lexical knowledge. In the framework of Principles and Parameters, all parametric variation between languages is restricted to functional categories, and parameter setting has to take place within the first few years of life, i.e. the critical period (see Smith, 1999). That is, only some aspects of the language faculty are subject to parametric variation – syntax but not pragmatics, for instance – and it is supposed to be precisely those aspects which are impaired in DS.

However, some research has contradicted the claim that linguistic development in DS is constrained within a short space of time that ends after puberty. On the basis of the longer MLU recorded for adolescents in their study, Chapman et al (1998) argue that language in DS continues to develop after puberty. Other studies reporting cross-sectional and longitudinal data seem to support such a conclusion: Rondal & Comblain (1996) found higher MLUs in French-speaking teenagers and adults than in children below 12 years of age; Fowler (1988) reported a growth of MLU for at least some of her teenage subjects.

Whilst MLU has proved to be a successful predictor of morphosyntactic development in young TD children, its usefulness has been questioned with regard to adults and adolescents, with or without MR. The usual clustering point of MLU of around 3.-3.5 may be limited to DS children younger than 14-15 in some studies, but a large body of literature has shown that, regardless of MLU, both children and adults with DS invariably fail on most measures of grammar comprehension and production typically mastered by 4 or 5 year old non-disordered children (see references in section 1.2.5). Rondal & Comblain (1996), for instance, report that French speaking children, adolescents and adults with DS, all scored equally poorly on a task eliciting the correct use of articles, pronouns, relative clauses and passives, with the youngest group (5-8 year olds), in fact, scoring best on passives.

Given the evidence for the role of biological constraints in first language acquisition, (see e.g. Smith, 1999), it is unlikely that language maturation in DS is not similarly
biologically constrained, but missing the critical period for individuals with DS cannot be fully responsible for the poor levels of linguistic knowledge characteristic of this population. Clearly, more research is needed to uncover the nature of the linguistic disorder in DS, but the notion of a selective grammatical deficit in DS is not incompatible with the idea of a missed critical period for the development of some computational aspects of linguistic knowledge in DS.

1.3 Overview of the new study: Binding in DS crosslinguistically

In subsequent chapters we present an experimental investigation into aspects of syntactic knowledge in both English and Serbo-Croatian (SC)-speaking young adults with DS. In view of the long-standing debate on whether language in DS is essentially normal but severely delayed, or whether it is also deficient in important respects, the study focuses on the knowledge of binding, a module of grammar known to pose particular difficulties to typically developing children during the course of language acquisition. Taking into the account the controversies about whether, and which, aspects of linguistic knowledge may develop after puberty in DS, we concentrate on the adult grammatical knowledge of DS.

While a great deal can be learnt from observing the natural course of language development and its culmination by looking at spontaneous speech, if we are to obtain a more accurate picture of language abilities in this population we must depart from these methods, which thus far have formed the basis of research into DS. It is only through controlled experiments that we can tap into knowledge easily missed through observational measures. The experimental paradigm to be used, a truth-value judgement task eliciting yes-no answers to questions associated with picture stimuli, has been long been depended on as reliable measure of the acquisition of this aspect of grammar in both typical and atypical populations.
In order to gain insight into the knowledge of binding that typically developing children possess at various stages of development crosslinguistically, we offer an overview of the literature on the acquisition of binding in chapter 2, along with an outline of the theoretical framework we adopt. The chapter also presents a brief discussion of the literature on the knowledge of this module in Williams syndrome and SLI, since the linguistic profile of the two clinical populations have often been compared to those of DS.

Chapter 3 presents the experimental study of the four DS English speakers (aged 18-21), matched individually to control subjects on measures of receptive vocabulary, known to be consistent with measures of mental age in both typical and atypical population. In chapter 4 we report the version of the same experiment with six SC-speaking subjects with DS (aged 19-29). If there is a grammatical deficit in this population, it is valuable to find out how it surfaces in two distantly related languages. The performance of the SC speakers with DS will be compared to several groups of TD children, at different stages in language development. The aim of these comparisons is to compensate for the lack of literature on the acquisition of the pronominal system in this language, and thereby provide a necessary reference point against which the patterns observed in DS population can be gauged.

We maintain that our results have theoretical implications for both the study of language in atypical development and current research into Binding Theory, crosslinguistically. In the final chapter we discuss the deficit revealed in the two populations with DS, based on the model of anaphoric relations couched within the Reflexivity framework of Reinhart & Reuland (1993) and Grodzinsky & Reinhart (1993).
Chapter 2

2 Theory and acquisition of binding

2.0 Introduction

This chapter introduces binding phenomena in natural languages and investigates the acquisition of binding in typical and atypical development, in preparation for our own investigation of the knowledge of this module in the population with Down syndrome (DS). The chapter begins with a brief introduction to standard Binding Theory (BT) (Chomsky 1981), followed by a more detailed exploration of the Reflexivity framework of Reinhart and Reuland (1993). In section 2.2 I turn to the acquisition of binding in typical development crosslinguistically, concentrating on English and the clitic languages. A brief overview of existing research into the knowledge of binding in atypical development, namely SLI and Williams syndrome, is also given. I conclude with some predictions on the knowledge of binding in the population with DS, both English and Serbo-Croatian (SC)-speaking.

2.1 Binding phenomena: Theoretical background

The phenomenon of anaphora refers to a relationship between two specific elements, namely, an anaphoric element and its antecedent, where the interpretation of the anaphoric element is dependent on the interpretation of its antecedent. A number of elements can be in an anaphoric relation with their antecedent; our main concern here will be reflexives1 (‘true anaphors’) and personal pronouns and the various factors involved in determining their distribution. Different modules of the language faculty interact in governing the distribution of anaphoric elements: syntax, pragmatics and semantics, but theories disagree in how much weight should be attributed to the influence of factors from each of these three modules. The most influential approach

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1Our discussions will be limited to reflexive pronouns, e.g. himself/herself/themselves; reciprocals e.g. each other, will not be discussed.
in the generativist tradition, developed by Chomsky (1981, 1986), argues that syntactic constraints are solely responsible for the distribution of anaphoric elements. Notions of locality and structure are of utmost importance in standard Binding Theory (BT) and its principles have been designed to capture the distribution of anaphoric elements in strictly structural terms:

(1) Principle A: an anaphor must be locally bound in its governing category.  
Principle B: a pronoun must be locally free in its governing category.\(^2\)

An anaphor is bound when it is coindexed\(^1\) and c-commanded by an appropriate argument antecedent. A standard definition of c-command is assumed: A c-commands B iff i) A does not dominate B; ii) B does not dominate A; iii) the first branching node dominating A also dominates B.

In the (1981) framework a governing category is defined as follows:

(2) \(\beta\) is a governing category for \(\alpha\) iff \(\beta\) is the minimal category containing \(\alpha\), a governor of \(\alpha\), and a SUBJECT accessible to \(\alpha\).\(^4\)

One effect of the binding principles is that they encapsulate the complementary distribution of reflexive and pronominal elements, as illustrated in the following examples: Principle A excludes a coreferential pronoun but allows a reflexive in (3), whilst Principle B rules out the reflexive and permits the pronoun in (4).

\(^2\) Principle C will not be discussed here as many have argued that it is not part of core grammar (Chomsky, 1982; Koster & Reuland, 1991; Reinhart, 1983). In Reinhart (1983) Principle C is subsumed under a distinct inferential module, along with the coreference effects of Principle B.

\(^3\) All NPs are freely assigned indexes from the set of natural numbers. Two NPs corefer if they are coindexed. Coindexed elements must agree in person, gender and number features. Note, however, the arbitrariness of the notion of an index. In recent frameworks, it has been pointed out that there is no independent motivation for having indexes in our computational system (Chomsky, 1995; Reuland, 2001).

\(^4\) 'A is an accessible subject/SUBJECT for B if the coindexation of A and B does not violate any grammatical principles. Subject: NP in [Spec, XP]. SUBJECT corresponds to finite AGR.' Haegeman,
(3) a. Mary<sub>i</sub> adores herself<sub>i</sub><sup>*</sup><sub>j</sub>
   b. Anna<sub>j</sub> thinks that Mary<sub>i</sub> adores herself<sub>i</sub><sup>*</sup><sub>j</sub>

(4) a. Mary<sub>i</sub> adores her<sub>i</sub><sup>*</sup><sub>j</sub>
   b. Anna<sub>j</sub> thinks that Mary<sub>i</sub> adores her<sub>i</sub><sup>*</sup><sub>j</sub>

That the anaphoric element must be c-commanded by its antecedent is seen below:

(5) a. Mary<sub>i</sub>'s mother<sub>j</sub> adores herself<sub>i</sub><sup>*</sup><sub>j</sub>.
   b. Mary<sub>i</sub>'s mother<sub>j</sub> adores her<sub>i</sub><sup>*</sup><sub>j</sub>.

Standard BT attempted to present a simple and elegant picture of binding facts in natural languages. However, concerns were raised early on about its ability to account for the rich variety of anaphoric elements and their distributional properties crosslinguistically. Languages with a more intricate typology and distribution of reflexive elements presented a problem for this framework, starting from the distinction between simple and complex anaphors in languages closely related to English, e.g. Dutch (‘zich’ vs. ‘zichzelf’) to the more complicated patterns of verbal reflexive marking in unrelated languages, e.g. Kannada. Opponents of the theory usually direct their criticisms towards three particular areas: the lack of complementarity between anaphors and pronouns, violations of Principle A (where anaphors are found in non-local domains), and violations of Principle B (where pronouns appear in local domains). These are illustrated in the examples (6) – (8).

(6) John put the box behind him/himself.

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(7) Bill, remembered that The Times had printed a picture of himself; in the Sunday edition.

(Pollard & Sag, 1992)

(8) I know what Bill and Mary have in common.
Mary adores Bill and Bill adores him too.

(Reinhart, 1983)

It is not our intention to give an exhaustive list of the problems that standard BT has encountered (for a detailed overview of theoretical and empirical issues see e.g. Reuland & Everaert, 2001). Issues arising from (6) and (7) and the proposed solutions within the framework adopted here can be found in the original work by Reinhart & Reuland (1993), but these will not be relevant for our discussion; the reader is referred to the text itself for further elaboration. The example in (8), however, is highly pertinent as it reveals the limits of a syntactic approach to interpretive dependencies. Here pragmatic context makes it possible for the two NPs to corefer without being in a binding relation, yielding a grammatical structure, despite the violation of Principle B. We shall see later that the distinction between syntactic binding and coreference looms large in the inability of standard BT to capture important facts in the acquisition of binding.

The binding theory we adopt incorporates the central notion of Reinhart (1986), namely, that the reference of a pronoun can be determined in one of two ways: syntactically and extrasyntactically. The former is in the province of the syntax/semantics interface, whilst the latter is determined at the semantics/discourse interface. Syntactic binding pertains to bound variable anaphora only, where the anaphoric relation involves a dependency mediated by grammar internal processes. We assume this relation to be regulated by conditions proposed by Reinhart and Reuland (1993) (henceforth R&R), on the reflexivity of predicates and the formation
of syntactic chains. Non-syntactic binding, i.e. coreference, is a dependency that relies on extralinguistic knowledge and cannot be reduced to coindexing of nominal expressions. It is not subject to syntactic constraints, but to a constraint outside syntax proper, formulated as Rule I, of Grodzinsky & Reinhart (1993). A review of the central tenets of the modular approach to binding we adopt is given below. More detailed discussion of relevant points will be introduced subsequently, where necessary.

2.1.1 Syntactic vs. Interpretive Dependencies: Coreference and Rule I

In the framework of standard BT interpretive dependencies crucially rely on structural conditions, which, if satisfied, allow for the coindexing of nominal expressions, with Binding Principles presupposing binding relations. However, as noted, example (8) above shows a dependency that cannot be regulated by locality conditions. The distinction between the two types of anaphoric relation, binding and coreference, is best illustrated in examples involving VP deletion. Here the interpretation of the second conjunct depends on the interpretation of the first, giving rise to the ambiguity between the coreferential ('strict') reading and bound variable ('sloppy') reading:

(9)  [Bill liked his cat] and [Charlie did too].
   a. Bill λx (x liked a's cat) & Charles λx (x liked a's cat)
   b. Bill λx (x liked x's cat) & Charles λx (x liked x's cat)
      (Reinhart, 1986)

(9a) represents the strict reading, where his is interpreted coreferentially: the value of a can be freely chosen, it can refer to anybody in the universe, including Bill. (9b) represents the sloppy reading: his is locally bound, so in the first conjunct it refers to Bill, and in the second conjunct, to Charles. Unlike binding, coreference crucially does not involve structural conditions on coindexing. Note that in VP deletion
constructions the bound variable (sloppy) reading is not available if there is no c-command:

(10) [Most of her friends adore Lucie] and [Zelda too]
     (Lucie \( \lambda x \) (x's friends adore x)
     but NOT Zelda's friends adore Zelda (Zelda (\( \lambda x \) (x's friends adore x)))
     (Reinhart, 1986)

It is argued that the two types of anaphoric relations are subject to constraints originating in distinct modules of the language faculty. In contrast to variable binding, coreferential interpretation of pronouns is subject to a constraint outside syntax proper, one that operates at the semantics/discourse interface. Adopting Grodzinsky & Reinhart (1993), this constraint is stated as follows:

(11) Rule I (Intrasentential Coreference)
     NP \( A \) cannot corefer with NP \( B \) if replacing \( A \) with \( C \), \( C \) a variable \( A \)-bound by \( B \), yields an indistinguishable interpretation.
     (Grodzinsky & Reinhart, 1993)

Assuming that definite expressions can serve as variable binders, Grodzinsky & Reinhart argue that two semantic interpretations of a construction such as (12) are possible, a bound variable interpretation, and the coreferential one:

(12) Bill, adores him\(_k\).
    a. Bill \( \lambda x \) (x adores x)
    b. Bill \( \lambda x \) (x adores \( a \)) \( (\text{where } a=\text{Bill}) \)

As the coreferential reading in (12b) is semantically identical to the bound variable reading (12a), Rule I applies and coreference is ruled out. This is not the case in the
Evans–style example in (8), repeated here as (13), where the pragmatic context makes it possible for the two NPs to corefer without being in a binding relation:

(13) I know what Bill and Mary have in common.
Mary adores Bill and Bill adores him too.

Here the coreferential reading contributes a different semantic meaning: the property of ‘Bill-adoration’ is not the same as ‘self-adoration’, thus Rule I does not apply.

2.1.2 Reflexivity (R&R, 1993): Conditions on Binding, the Chain Condition and the typology of anaphoric elements

Having established that coreference is a type of dependency external to syntax proper, we return now to syntactic binding, which, according to Reinhart (1986), includes only bound variable anaphora. Anaphors are always interpreted as bound variables, whereas pronouns can be bound or free: when a pronoun is syntactically bound, its interpretation is dependent on its antecedent; when it is free, its reference is determined at the LF/discourse interface, as we have seen earlier. In R&R (1993) the syntactic binding of anaphors and bound pronouns is regulated by two types of conditions, neither of which include any restrictions on their structural domains: conditions on reflexivity of predicates, and the (revised) condition on A-chains. The standard Binding Principles A and B of Chomsky (1981) are thus replaced with the following conditions on reflexivity of predicates:

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5 The term originates with examples cited in Evans, (1990), variations of which have been used extensively.

(i) I know what John and Bill have in common.
    John thinks that Bill is terrific and Bill thinks that Bill is terrific.

(ii) Everyone has finally realized that Oscar is incompetent.
    Even he has finally realized that Oscar is incompetent.
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(14) Condition A: A reflexive marked predicate must be reflexive.\(^6\)
    Condition B: A reflexive predicate must be reflexive marked.

The Chain Condition is defined in (15).

(15) A maximal A-chain \((a_1, \ldots, a_n)\) contains exactly one link - \(a_1\) - that is both [+R] and Case-marked (where an NP is [+R] iff it carries a full specification for phi features and structural Case)

To be reflexive, a predicate must have two of its arguments covalued. Note that the notion of argument is prominent – conditions on reflexivity are defined over arguments. Coindexation, or more adequately, covaluation, is not crucial however. The central notion of R&R is that reflexivity of predicates must be linguistically licensed, i.e. ‘reflexive-marked’. Transitive predicates as in (16) are reflexive-marked in the syntax with the aid of the complex anaphor SELF, whilst inherently reflexive predicates, (17), are marked as such in the lexicon.\(^7\)

(16) Johni hates himselfi.

(17) John behaves.

\(^6\) The original definitions involve the notion of ‘syntactic’ and ‘semantic’ predicate:
(i) Condition A: A reflexive marked syntactic predicate must be reflexive
    Condition B: A reflexive semantic predicate must be reflexive marked.

The distinction between syntactic predicates and semantic predicates will not feature in our discussion, but is given below:

“The syntactic predicate formed of (a head) P is P, all its syntactic arguments and an external argument of P (subject). The syntactic arguments of P are the projections assigned \(0\)-role or Case by P. The semantic predicate formed of P of P is P and all its arguments at the relevant semantic level.” (R&R, 1993:678)

\(^7\) Independent evidence that inherently reflexive predicates are so marked in the lexicon comes from Dutch nominalization (Everaert, 1986):
(i) Wassen is gezond.
    washing (oneself) is healthy
(ii) Haten is niet gezond.
    hating (only someone else) is unhealthy
Highlighting the distinction between simplex (SE) and complex (SELF) anaphors present in a number of languages, R&R argue that only complex anaphors have the function of reflexive-marking, [+SELF]. Neither simplex anaphors (e.g. Dutch ‘zich’) nor pronouns have the reflexivizing function and consequently cannot be arguments of a transitive reflexive predicate:

(18) *Johni hates himi.

(19) *Jani haat zichi/hemi (Dutch)
    Johni hates selfi/him
    ‘John hates himself.’

In English, inherently reflexive predicates are intransitive,8 whilst other languages may overtly realise their internal 0-role through a syntactic argument, e.g. the simplex anaphor ‘zich’ in Dutch.

(20) Johni behavesi/*himi.9

(21) Jani gedraagt zichi/*zichzelfi/*hemi (Dutch)
    Johni behaves selfi/* himselfi/*him

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8 We follow Everaert (1986) in assuming that both the transitive and inherently reflexive form of a predicate are listed as separate entries in the lexicon. Double reflexive marking – in the lexicon and in syntax simultaneously – is excluded for reasons of economy.

9 Note that Condition B does not rule out the pronoun here: what is important is that the predicate is reflexive marked, and here it is lexically/inherently reflexive; however it is the Chain Condition that rules out the pronoun. In absence of the simplex anaphor, the anaphoric systems of some languages, e.g. Frisian, allow pronouns to appear as syntactic arguments of inherently reflexive verbs, in the same way as simplex anaphors do:

(i) Max, håld him/*himsels,
    Max behaves him/*himself. (Everaert, 1986)

This pronominal form is argued not to be marked for structural Case, thereby it is allowed to occupy the foot position of the chain in R&R’s sense (see footnote below and R&R for a detailed discussion).
The second component responsible for the distribution of pronominal elements in the R&R framework is the Chain Condition. The chain is very broadly defined however: ‘Any sequence of coindexation that is headed by an A-position and satisfies antecedent government is an A-chain.’ (R&R, 1993). This chain thus may contain more than one theta role, in contrast to the traditional framework, where only one theta role is shared between the two elements in a chain, e.g. in passive constructions (‘Mary was kissed t’).

As given in (15), the constraint on the formation of chains allows only elements underspecified for the referential \([R]\)\(^{10}\) feature to occupy the tail position of a chain. Being referential, [+R], pronouns are fully specified for grammatical features, including gender, number, person and structural Case and so are excluded from this position. Anaphors, on the other hand, may occupy the foot position of a chain, as they lack referential features, [-R]. This is illustrated in (22) for English and (23) for Dutch:

(22) John\(_i\) hates himself\(_i\)/*him\(_i\).

(23) Jan\(_i\) haat zichzelf\(_i\)/*hem\(_i\). \quad \text{(Dutch)}

John\(_i\) hates himself\(_i\)/*him\(_i\)

Note that the construction containing the pronoun is excluded both by the Chain Condition and Condition B: in addition to being [+R] and so unable to appear in the foot of the chain, pronouns cannot reflexive-mark transitive predicates. The sole effect of the Chain Condition is more clearly seen in ECM constructions. As the pronoun is not an argument of the predicate, Condition B does not apply; however,

\(^{10}\) Note that \([R]\) is a syntactic property: it is not related to reference, but rather, the syntactic properties of an element determine its reference. The general property of anaphors is that they do not have a full specification for structural Case: although anaphors can be marked for a full paradigm of inherent case in some languages, they are not marked for Nominative.
the pronoun is excluded from the subject position of the small clause by the Chain Condition:


(25) Jan, zag [zichzelf/*hem,] dansen.  (Dutch)

John, saw [himself/*him] dance

Binding Conditions and the Chain Condition thus together account for the distribution of anaphors and pronouns without explicitly stating any restrictions on their structural domains. The combined effect of the two types of conditions are summed up in the following examples:

(26) 

a. John, hates himself,
b. *John, hates himself,
c. *John, hates him,
d. *Jan, haat zich,
e. John, considers himself, intelligent.
f. *John, considers him, intelligent.

In (26a) the anaphor appears as a coargument of a reflexive predicate, which ‘reflexive-marks’ it in the syntax, in accordance with Condition A. The structure in (26b) is ruled out by the same constraint, as the arguments of the predicate are not covalued. The Chain Condition is satisfied in (26a), because the tail of the chain is an anaphor, [-R], whilst in (26b) no chain is formed at all. (26c) violates both Condition B and the Chain Condition: the argument is not reflexive-marked, in the syntax or the lexicon, since the pronoun is not a reflexive-marker. In addition, pronouns are barred from occupying the foot of the chain by the condition on chain formation. Note that
this structure is additionally ruled out by Rule I. In the Dutch example (26d) however
only Condition B is violated, because although the SE anaphor is not a reflexive-
marker, it is [-R] so does not fall foul of the Chain Condition. Binding Conditions do
not apply to (26e) and (26f) as the subject of the small clause is not a coargument of
the predicate. Here the Chain Condition rules in the structure in (26e) because the tail
of the chain is an anaphor, [-R], whilst it rules out (26f) because the tail position is
occupied by a pronoun [+R].

Utilising the two properties of pronominal elements in the framework of R&R, [+/-
SELF] and [+/-R], enables us to classify anaphors and pronouns crosslinguistically.
English anaphors have the function of reflexive-marking a predicate and are thus
[+SELF]; they are also referentially deficient, [-R], and, therefore, able to occupy a
foot position in a chain. Pronouns are not reflexive markers [-SELF], and are [+R],
hence excluded from the foot of the A-chain. Similarly, Dutch complex anaphors are
[+SELF] and [-R] whilst pronouns are [-SELF] and [+R]. The same restrictions on
their position in the chain apply. The Dutch SE anaphor, ‘zich’, is a pronominal
anaphor, [-R], but, like a pronoun, it has no reflexivizing function.11

11 Although this is not crucial for our review of the acquisition of binding in the following sections, it is
worth noting that the framework of R&R copes successfully with the long-standing problem of long-
distance anaphora. Recall that Binding Conditions only constrain dependencies between coarguments.
As Condition A of R&R is only concerned with anaphors that have the function of a reflexive marker,
all other instances of anaphors are claimed to be logophoric. In the following constructions, the
antecedent of the anaphor is too far away from the anaphor to be in a binding relation with it, or is
absent altogether, in flagrant violation of Principle A of standard BT.
(a) It angered him that she tried to attract a man like himself. (Zribi-Hertz 1989)
(b) There were five tourists in the room apart from myself. (R&R, 1993)
(c) Max boasted that the queen invited Lucie and himself for a drink. (R&R, 1993)
(d) She wanted to see the picture herself.
In all the above constructions, the SELF anaphor is not a syntactic argument of the predicate and
therefore cannot reflexive-mark it. In a. and b. it is in an adjunct position, whereas in c. it is embedded
within an argument, which does not reflexive mark the predicate. In d. the anaphor is used in a focus
function, which exempts it from Condition A: this condition applies at LF, and focus anaphors, as is
generally assumed, move at LF, leaving a trace that does not reflexive-mark a predicate. This
distinction seems to be supported by data from language acquisition (Avrutin & Cunningham, 1997)
and ERP studies (Harris, Wexler & Olcomb, 2002).
2.1.3 Summary

So far we have introduced the formal apparatus to be used in our exploration of binding. We have seen that anaphoric relations cannot be understood in terms of solely syntactic dependencies as presupposed in the standard BT. For this reason a modular approach to binding is adopted, one that attaches importance to lexical, syntactic, semantic as well as discourse factors in the theory of anaphora. The Binding Conditions of R&R, formulated as conditions on reflexivity, in addition to the condition on chain formation, regulate the distribution of anaphors and pronouns when bound variables. Rule I governs the distribution of pronouns when they are free variables whose reference is determined at the LF interface. In the following section it will be shown that such modular approach is in fact supported by the acquisition patterns of binding, found to hold crosslinguistically.

2.2 Acquisition of binding in typical development

The conditions on binding and the Chain Condition, as given in (14) and (15), are considered to be universal. The child cannot deduce them from direct evidence given the impoverished input in the course of language acquisition. Applying the now famous lack of negative evidence argument, it is unlikely that the input children receive contains unacceptable sentences which indicate to them what constitutes a violation of a binding condition. Thus, assuming that the apparatus of binding theory as discussed here is innate, children should demonstrate an awareness of the restrictions on the distribution of anaphors and pronouns early on, that is as soon as they acquire lexical properties of pronominal elements. Adopting a theoretical framework such as the one introduced in sections 2.1.1 and 2.1.2, also helps generate predictions about which aspects of binding may present more difficulties in the course of this module being acquired. Children should obey conditions on binding as soon as they categorize pronominal elements according to whether they reflexive-mark a
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predicate [+/-SELF],\(^{12}\) and acquire the morphological properties of elements that reflect their referential features [+/-R], relevant for the restrictions on their distribution. Although the condition on A-chains is given, accurate application of this condition will depend on the correct classification of pronominal elements into [-R] or [+R].

In contrast to the knowledge of constraints that is given, mastery of the pronominal system also depends on the maturity of cognitive abilities which are independent of syntax. Recall that coreference has been claimed to be governed by an extragrammatical constraint, Rule I. As it depends on the maturity of general cognitive/processing abilities, it is possible that such a constraint will be subject to failure in young children.

Investigating knowledge of anaphoric relations in systems that are underdeveloped or impaired thus provides a valuable testing ground for the assessment of purely syntactic approaches to binding relations, such as standard BT, as opposed to modular approaches, such as the one proposed by R&\(^{R}\) we are adopting. In the following sections we explore patterns in the acquisition of binding crosslinguistically in typical development, their purpose being to provide reference points in our exploration of binding in Down syndrome, the topic of this thesis.

2.2.1 Acquisition of anaphors

Research has shown that English children as young as 3 obey Condition A, rejecting violations of this principle and accepting the following structures as grammatical in appropriate contexts (Jakubowicz, 1984; Wexler & Chien, 1985; Chien & Wexler,

\(^{12}\) Similarly, having acquired appropriate vocabulary, children should be able to identify inherently reflexive predicates in their languages, and work out whether or not a reduced argument would surface, as it does in Dutch in the form of 'zich', or not at all like in English.
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1990; Grimshaw & Rosen, 1990):

(27) Mama Bear is touching herself. (herself = Mama Bear)

(28) *Mama Bear is touching herself. (herself ≠ Mama Bear)

Using a variety of experimental techniques, these findings have been replicated for Danish (Jakubowicz & Olsen, 1988), Spanish (Padilla, 1990; Baauw, Escobar & Philip, 1997), Russian (Avrutin & Wexler, 1992), Italian (McKee, 1992), French (Jakubowicz, 1993; Hamann, Kowalski & Phillip, 1997), Dutch (Sigurjónsdóttir & Coopmans, 1996), Catalan (Escobar & Gavarro, 1999), Icelandic (Sigurjónsdóttir, 1992), Norwegian (Hestvik & Philip, 2000) and Greek (Varlokosta, 2001).

In terms of standard BT, these findings show that children obey Principle A, the constraint that states that anaphors must be bound in a particular binding domain. However, translated into terms of the binding theory adopted here, such data reveal that children can interpret predicates as reflexive, whether reflexive-marked in the syntax or the lexicon, in accordance with Condition A of R&R.

2.2.2 Acquisition of pronouns: Delay of Principle B Effect (DPBE)

In contrast to findings on the acquisition of reflexive pronouns, structures containing personal pronouns present a strikingly different picture: children have been reported to accept violations of Condition B 50% of the time:

(29) *Mama Bear is touching her,

In terms of standard BT, children here violate the principle that states that pronouns must not be locally bound. Translated into the framework of R&R, children seem to
accept a violation of the condition that says that reflexive predicates must be reflexive-marked: since ‘touch’ is not a lexically reflexive predicate, it must be reflexivized with the aid of the ‘SELF’ anaphor.¹³

This phenomenon, dubbed ‘Delay of Principle B Effect’ (DPBE), has been reported in children as old as 6, in a variety of languages: English (Jakubowicz, 1984; Wexler & Chien, 1985, Chien & Wexler, 1990; Grimshaw & Rosen, 1990), Dutch (Koster, 1993; Philip & Coopmans, 1996), Danish (Jakubowicz & Olsen, 1988), Russian (Avrutin & Wexler, 1992), Korean (Lee & Wexler, 1987), Icelandic (Sigurjónsdóttir, 1992).¹⁴

If the conditions on binding are innate and available at the onset of acquisition, it is surprising that children show difficulties implementing their knowledge of Condition B, as opposed to Condition A. However, drawing on the distinction between binding and coreference (cf. section 2.1.1), researchers have argued that children do possess the knowledge of condition B early on, but their performance on the tasks in studies reported is masked by other factors.¹⁵

Chien & Wexler (1990) and Grodzinsky & Reinhart (1993) explicitly argue that the children’s error in (29) is due to the immaturity of their pragmatic and/or general

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¹³ Note that in intrasentential contexts, such as (29) the local, bound variable interpretation is constrained by both the Chain Condition (ruling out elements with the property [+R] from the foot of the chain) and Binding Condition B (which states that ‘a reflexive predicate must be reflexive-marked’), whereas the coreferential interpretation is ruled out by Rule I. As the findings and accounts of DPBE precede the framework of R&R, only violations of Condition B are discussed in the early literature: for the constructions involving object pronouns tested in the majority of studies cited, the effects of the two ‘B’ conditions from standard BT and R&R overlap. Children’s performance on ECM constructions is relevant to their mastery of A-chains as given by R&R, this will be discussed in the section on crosslinguistic differences with regard to DPBE.

¹⁴ See Kaufman (1988) for results on similar constructions that seem not to show this effect.

¹⁵ Grimshaw & Rosen (1990) argue that DPBE is nothing but an artefact of the experimental techniques used, combined with particular strategies children employ in their performance. As a result, they claim that in the studies reporting the effect, children’s knowledge of constraints governing anaphors is overrated, and that of pronouns underrated. There are a number of important issues Grimshaw & Rosen raise, nonetheless, the DPBE has since been reported in a wide variety of
processing system, which is independent of syntax proper.

Recall that, following Reinhart (1986), it was argued earlier that all sentences containing a pronoun are ambiguous between a coreferential and a bound variable reading. The construction in (30) therefore has two interpretations:

(30) Mama Bear is touching her

a. Mama Bear $\lambda x$ (x is touching a)  
   $(a=Mama Bear)$

b. Mama Bear $\lambda x$ (x is touching x)

When the coreferential reading is not available, i.e. in contexts where the pronoun is bound by a quantified antecedent, no difficulties are observed. Quantifiers, like other operators, have no definite referents to be accidentally coindexed with. Chien & Wexler report that children reach 84% correct performance on constructions involving a quantified antecedent, in contrast to 50% performance on structures where the pronoun refers to the referential antecedent:

(31) Is every bear touching her?  
    $(her=every bear)$

This pattern has been replicated both for English and other languages where children have been shown to accept illicit coreference between a pronoun and a local referential antecedent, e.g. Russian, Dutch (Avrutin & Wexler, 1992; Philip & Coopmans, 1996).

The distinct pattern in children's performance on constructions involving pronouns in a local relation with a referential and a quantified antecedent provides support for the theoretical claim that different constraints are responsible for ruling out syntactic binding and excluding illicit coreference (Reinhart, 1983; 1986). Different proposals languages and with a range of experimental techniques that makes it unlikely to be only an artefact.
have been put forward concerning the nature of the constraint that governs coreference. In Chien & Wexler (1990) it is formulated as a pragmatic principle, Principle P. Importantly, as a pragmatic principle, it is subject to maturation and becomes available to children only later on in development, with an effect such as DPBE being a natural outcome.

(32) Principle P: Contraindexed NPs are noncoreferential unless the context explicitly forces coreference.

In the framework of Grodzinsky & Reinhart (1993), the constraint that is in charge of coreference is argued to be innate and thus available at the onset of linguistic development. However, it still is dependent on children’s cognitive capacities: it requires that both the bound variable and the coreferential interpretations are maintained and compared in short-term memory. Due to limitations on children’s processing systems, Rule I cannot be implemented, which results in their guesswork performance. The processing breakdown is not possible in contexts involving quantified constructions – here only the bound variable is available, there is no competition and Rule I is not invoked.

The main independent argument against a developmental constraint such as Principle P, and in support of a processing constraint such as Rule I, comes from research on aphasia. Grodzinsky, Wexler, Chien, Marakovitz & Solomon (1993) report a pattern resembling the ‘delay’ of condition B in adult aphasics, suggesting that its cause is more likely to be a processing breakdown than the maturation of a pragmatic principle.16 For the sake of the ensuing discussion we shall adopt the view that

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16 Principle P and Rule I would evidently yield different predictions with regard to their application in the child grammar. As Avrutin & Wexler (1992) point out, Grodzinsky & Reinhart’s account predicts the same guesswork performance in contexts such as (i), as it is the limitations on children’s processing resources that render the comparison of the two interpretations impossible.


Chien & Wexler’s pragmatic principle, or the lack of knowledge of it, predicts that children would
coreference is governed by Rule I.

2.2.2.1 Crosslinguistic variation of Delay of Principle B Effect (DPBE)

If Rule I (or Principle P) is all there is to the DPBE, we would expect children acquiring all languages to show it. However, DPBE is not a universal phenomenon as was originally assumed. There seems to be interesting variation across a number of languages concerning both its extent and severity, as well as its presence altogether. In the examples of the type of (29) above, Philip & Coopmans (1996), Sigurjónsdóttir & Coopmans (1996) reported Dutch 4-6 year olds to perform much below the reported chance performance of English children on object pronoun constructions (33), as well as show exceptionally poor performance on ECM constructions (34).

(33) Pakt het meisje, haar, bij de enkel vast? \(36\% \text{ correct} \)
    ‘Is the girl holding her by the hand?’
    Philip & Coopmans (1996)

(34) Ziet het meisje, haar, touwtje springen? \(10\% \text{ correct} \)
    ‘Does the girl see her jump-roping?’
    Philip & Coopmans (1996)

On the other hand, in languages with pronominal clitics, children successfully reject

perform reasonably well on such examples in pragmatically licit contexts, since it is expected that children over-accept referential possibilities for pronouns, and do not under-accept them. To my knowledge, no experimental investigations have been carried out to test children’s performance on constructions such as (i) that could help decide between Rule I and Principle P. Both (types of) constraints are relied upon in the literature on the acquisition of pronominal reference, the processing constraint such as Rule I in its original form, and a pragmatic constraint, variants of which have been further developed by Heim (1998), Avrutin (1994), Thornton & Wexler (1999).

Note however that Principle P and Rule I would yield different predictions with regard to their application in the grammar of DS. As a maturational pragmatic constraint, Principle P should be available to individuals with DS, if their pragmatics is relatively unimpaired as is claimed in the literature. On the other hand, Rule I relies on working memory resources, an area well known to be problematic for individuals with DS. We shall return to this point later.
illicit coreference in the object constructions (35), but allow it in ECM constructions (36).

(35) La fille, la, sèche.
the girl her-clitic drying
'The girl is drying her off'.

90% correct
Hamann, Kowalski & Phillip (1997)

(36) La niña, la, ve bailar.
the girl her sees dance
'The girl sees her dance.'

50% correct
Baauw, Escobar & Philip (1997)

Such crosslinguistic differences imply that processing (or maturational) limitations cannot be the sole cause of DPBE but must be due to properties of grammar. Whilst there is a widespread consensus that the failure of Rule I is the cause of DPBE in the object constructions in English and other languages, it has been claimed that incomplete acquisition of lexical properties of pronominals, crucial for the application of A-chains, affects children’s performance in constructions such as (34) and (36).^^

Our present aim is to gain insight into the patterns shown by typically developing children acquiring binding in English and SC, in order to make predictions for the population with DS, so let us explore the differences between English and clitic languages with regard to the presence of DPBE.

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^58^ This phenomenon has been reported in Spanish (Baauw et al. 1997), French (Hamann et al 1997), Catalan (Escobar & Gavarro, 1999) Norwegian (Hestvik & Philip 2000), Greek (Varlokosta, 2001). One analysis maintains that the effect is caused by children’s overgeneration of A-chains, in R&R’s (1993) sense, where they misanalyse the pronominal element as referentially deficient, [-R], allowing it to occupy the foot position of the chain (Baauw et al 1997). See Hamann (2001) however for an alternative pragmatic-based account.
2.2.2.2 Lack of DPBE with clitic forms

It has been reported that children acquiring Italian (McKee, 1992), Spanish (Padilla, 1990; Baauw, Escobar & Philip, 1997), Catalan (Escobar & Gavarro, 1999), French (Jakubowicz, 1993; Hamann, Kowalski & Phillip, 1997), Norwegian (Hestvik & Philip, 2000) Greek (Varlokosta, 2001) and Serbo-Croatian (Kudra/Stojanović, 1994) do not show DPBE at least in standard object constructions equivalent to (29) above. What seems to be at stake are the distinct properties of pronominal elements involved in the object structures commonly tested in studies investigating children’s acquisition of reference: the constructions tested in languages where the absence of DPBE is reported involve clitics, as opposed to full pronouns\(^\text{18}\), tested in English and other languages where DPBE has been exhibited.

(37) Lo gnomolo lava. (Italian)  

the gnome him-clitic washes  

‘The gnome washes him.’ (McKee, 1992)

The main distinction between the full and clitic pronominal forms is claimed to be clitics’ inability to allow accidental coreference (Avrutin & Wexler, 1992; Cardinaletti & Starke, 1995; Thornton & Wexler, 1999; Varlokosta 2001).\(^\text{19}\) Relying on the referential deficiency of clitics, Avrutin & Wexler (1992) argue that clitics are subject to binding, and not coreference, the consequence being that the pragmatic/processing constraint that rules out illicit coreference is not operative (and

\(^{18}\) We leave aside the issue of whether full pronouns are in fact ambiguous between strong and weak pronouns in terms of Cardinaletti & Starke (1999), thus using the term ‘full pronoun’ to refer to the form only. It is feasible that the distinction between strong and weak pronouns does have some effect on the lack of DPBE with full pronominal forms in some languages to be discussed later.

\(^{19}\) See McKee (1992) for an account invoking distinct binding domains for clitics in Italian (IP) and full pronouns in English (VP). As English pronouns occupy a VP internal position, she argues that English children take the VP to be the smallest governing category for the Principle B of standard BT to be satisfied. Since Italian clitics are obligatorily situated in INFL Italian children do not make this error. The crucial flaw of this analysis concerns its prediction that English children would accept violations of principle B with quantified antecedents, contrary to findings reported by a number of studies.
subsequently not prone to failure) in child grammar. Unlike full pronouns, clitics are not able to refer deictically: in (38) the clitic cannot be accompanied by pointing to its referent.

(38) *(Io) I'amo. (pointing) (Italian)
    I him like
    'I like him.' (Avrutin & Wexler, 1992)

In order to be interpreted, the clitic has to be associated with an appropriate coindexed referent, in the sentence or in discourse. Coindexation of the clitic with the local subject antecedent is ruled out independently by Principle B, the constraint children know, as they were shown to successfully reject full pronouns bound by quantified expressions (Chien & Wexler, 1990). A specific aspect of referential deficiency of clitics proposed to be responsible for their bound status, and therefore resistance to accidental coreference, concerns their underspecification for a particular feature, namely, [human] (Baauw et al, 1997). The fact that clitics can refer to both human and non-human referents may be interpreted as a signal of underspecification for the feature [+/-human]: in order to receive the value for this feature, clitics have to be bound, either in syntax or in discourse. In contrast, full pronouns are fully specified for this feature and need not undergo binding.

The prediction these accounts make is that all referentially deficient elements should be exempt from DPBE. However, an immediate problem is presented by Dutch: in this language, weak pronouns cannot be used deictically, nor can they refer to both human and non-human referents (which would require them to be bound in order to receive a positive value for the feature in question), but they are still reported to be

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20 Clitics can of course be associated with a referent outside the sentence – referential dependence is not restricted to the clausal domain:

(i) John e' qui. Lo ho visto.
    John is here. him-cl have seen
subject to DPBE (Baauw, 1999).

Consequently, shifting the focus from referential deficiency of clitics to their syntactic properties, Baauw argues that clitics are resistant to accidental coreference due to their head-movement to, (Baauw, 1999), or position in (Baauw, 2000), the functional domain. Assuming that clitics head their own functional projection, he argues that clitic movement should be viewed as movement of an empty variable to the spec position of a clitic phrase, creating a variable chain that is headed by a \( \lambda \) operator (see Baauw (2000) for specific details). The gist of this argument is that clitics can only be interpreted as bound variables, akin to pronouns in quantified constructions, which automatically excludes them from being subject to Rule I. Strong and weak pronouns can on the other hand be interpreted as either free or bound: it is when they are free variables that they are subject to a constraint regulating coreference, which may fail to apply in child grammar.\(^{21}\)

2.2.2.3 Lack of DPBE with full pronouns

What the studies on Romance clitics and non-Romance full pronouns seem to show is that wherever accidental coreference is not an option, e.g. in clitic or quantified constructions, as a consequence of which the processing/pragmatic constraint is not invoked, children perform in an adult-like fashion. When coreference is possible, e.g. with full pronouns, this constraint is operative and subsequently subject to failure in the processing systems of young children. Italian best illustrates this neat distinction between the absence of DPBE with clitics and its existence with full pronouns. As Spanish, Catalan and French either use only clitics in object constructions, or obligatorily double the full pronoun, there is no opportunity to independently assess children’s performance with full pronominal forms in these languages. In a pilot study by Berger (1999) cited in Baauw (1999; 2000), Italian children were reported to allow

\[^{1}\) John is here. I’ve seen him.\]

\[^{21}\) To avoid the problem Dutch weak pronouns present, since they show DPBE, Baauw adopts Neeleman’s (1994) non-scrambling, base generation account of Dutch pronouns.
coreference in constructions involving full pronouns (39a) more often than in those involving clitics (39b).22

(39)  a. Il ragazzo sta indicando lui. \(\text{full pronoun}\)
    b. Il ragazzo lo sta indicando. \(\text{clitic}\)

   ‘The boy is pointing at him.’ (Berger, 1999 in Baauw, 2000)

Although at first this seems to be an adequate generalisation, the prediction it makes is that all languages should show DPBE with full pronominal forms. As a matter of fact, this is not the case. Languages that defy this prediction are Norwegian, Greek and Serbo-Croatian (SC). Hestvik & Philip (2000) report that even the youngest group of Norwegian children in their study correctly rejected coreference between the object pronoun and the local antecedent 91% of the time:23

(40) Driver piken og klapper henne?
    do-Pres girl-Def and pat-Pres her

   ‘Is the girl patting her?’ (Hestvik & Philip, 2000)

For Greek, Varlokosta (2001) found children to show an absence of DPBE with both clitics and full forms of pronouns. Greek children ruled out illicit coreference between the pronoun and the local antecedent constructions 87% of the time:24

(41) O Goofy, skepase afton,
    the Goofy covered him

   ‘Goofy covered him.’ (Varlokosta, 2001)

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22 No details of statistical significance are given.

23 Although Norwegian also has a contrast between weak, strong and (phonological) clitic pronouns, only constructions containing full pronominal forms in the object position were tested.

24 The Greek results were replicated in a study on bilingual children, where the contrast between a ‘DPBE language’ such as English and a ‘non-DPBE’ Greek is shown in the very same subjects. In Sanoudaki (2002), a group of 5 year-old Greek-English bilingual children rejected local coreference
Relying on an act-out task, Kudra/Stojanović (1994) showed that 4-6 year old SC-speaking children achieved 87% correct on constructions involving the full pronoun:

(42) Saša kaže da je Piter na njega skočio.
Saša says that aux Peter on him jumped
‘Saša says that Peter jumped on him.’ (Kudra/Stojanović, 1994)

How are these patterns to be explained?

To account the absence of DPBE in Greek, Varlokosta (2001) analyses Greek pronouns as demonstratives, on the basis of some properties that demonstratives also share (identical morphology and underspecification for the feature [human]). Demonstratives have been claimed not to be able to establish accidental coreference (Cardinaletti & Starke, 1999) thus the lack of DPBE with Greek pronouns is due to their demonstrative nature. It is not clear that Norwegian and SC pronouns could be treated as demonstratives, however.

The other possible account of the absence of DPBE with pronouns in these languages could be construed in terms of Baauw (1999; 2000), extending his analysis of clitic exemption effect to full pronouns. If it is the syntactic position of clitics that is responsible for their exemption from coreference and hence also the DPBE, perhaps the syntactic position of pronouns in languages tested above is a clue. As heads of a variable chain, clitics occupy a position external to VP, in contrast to full pronouns in English and other DPBE languages. This analysis may in fact account for the data reported in Kudra/Stojanović (1994), since the actual constructions tested in this study contained pronouns that are moved outside the VP.²⁵ Norwegian and Greek

²⁵ Interestingly, Avrutin & Wexler (1992) report that the position of pronouns seems to play some role in Russian children allowing illicit coreference: although these results were not statistically significant,
constructions above employed pronouns in the argument position, so some LF movement to a preverbal position would have to be invoked to account for the lack of DPBE in these languages. Baauw's analysis is attractive as it seems to offer a unified account of clitics and pronominals, however, it is not clear what mechanisms can be constructed for the variable movement of clitics and full pronouns in languages as different as Greek, SC and Norwegian.

It is likely that the position of the pronominal element plays some role, however: it has been argued that the argument position for pronouns automatically receives stress, which is incompatible with accidental coreference. That children correctly ruled out constructions containing pronouns, coreferential with a local antecedent, could be due to the fact that accidental coreference is incompatible with stressed position and so ungrammatical in child grammar. Furthermore, the general requirement that most deficient forms should be used in contexts with non-prominent discourse referents may also play some role (Cardinaletti & Starke, 1999). In languages that have the clitic vs. full pronoun distinction, it is generally required that most deficient forms should be used in contexts with non-prominent discourse referents. Accordingly, at least for the Greek and Italian study, the pattern of rejecting the covaluation between a pronoun and a local antecedent could be due to children's preference for the use of clitics, as opposed to full pronouns, in the object constructions tested.

The crucial problem that casts doubt on all accounts of the absence of DPBE with clitics, as opposed to pronouns, concerns claims related to the (im)possibility of accidental coreference with clitics. It could be argued that neither clitics nor full pronouns in Greek, Norwegian & SC allow accidental coreference: at least for some speakers, in SC, Greek (Irene Sanoudaki, p.c.) and Norwegian (Oystein Nilsen, p.c.) it seems that both pronouns and clitics allow coreference in appropriate contexts. It is remarkable that this fact is largely ignored in the literature. Many native speakers of Russian children were slightly better with rejecting coreference with preverbal pronoun in contrast to
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SC agree that accidental coreference is in fact acceptable with pronominal clitics, more so than with structures containing full pronouns: in the following SC structures, the majority of speakers agree that accidental coreference is most readily acceptable with structures containing clitics, marginally so with fronted full pronouns and unacceptable with full pronouns in the argument position:

(43)

(a) clitic

Svi vole Oskara. Čak ga i Oskar voli.  
everyone love Oscar. even him-cl and Oscar loves  
‘Everyone loves Oscar. Even Oscar loves him.’

(b) fronted pronoun

?Svi vole Oskara. Čak i Oskar njega voli.  
everyone love Oscar. even and Oscar him loves  
‘Everyone loves Oscar. Even Oscar loves him.’

(c) pronoun in situ

*Svi vole Oskara. Čak i Oskar voli njega.  
everyone love Oscar. even and Oscar loves him  
‘Everyone loves Oscar. Even Oscar loves him.’

The situation is less clear for Romance. In contexts similar to (45) above, Hamann (2001) claims that French clitics do allow accidental coreference; Baauw (2000) suggests that some speakers may allow it for Spanish whilst Escobar & Gavarro (1999) seem adamant that accidental coreference is not at all possible with Catalan clitics. Coreference also appears possible for Italian clitics, at least marginally so (Marco Tamburelli, p.c.). Finally, it is worth noting that many English speakers allow the pronoun in the argument position (both are possible in adult Russian).
accidental coreference with English phonological clitics (Neil Smith, p.c.).

Before any conclusions with regard to the lack of DPBE in Greek, SC and Norwegian can be made, more research is needed on languages in which full pronouns and clitics can appear in the same object position. Recall that most languages that reported the lack of DPBE with clitics in object position either do not allow full pronouns in the same position, or only allow pronouns that are doubled by the clitic in that position. Although Italian seems to have shown a contrast between full pronouns and clitics in the object position, these results were reported only as a pilot study and thus need to be replicated. Studies in Greek, Norwegian & SC should be replicated to establish if the lack of DPBE would be shown in constructions containing pronouns in different position.

2.2.3 Summary

In previous sections we reviewed findings reported in studies on the acquisition of binding in different languages. The pattern that emerged shows that children do have the principles of binding but have difficulties implementing the constraint that governs coreference. Crucially, these findings support the proposed fractionation of the module of binding into linguistic and extralinguistic components in the theoretical framework we adopted. Processes involved in the interpretation of anaphoric elements are constrained to syntax proper; in contrast, coreferential interpretation involves processes that relate linguistic expressions to elements outside grammar. This division of labour between syntax and general processing systems/pragmatics in the interpretation of pronouns has significant implications for our exploration of the linguistic abilities in DS. If children with DS go through identical stages of acquiring syntactic principles to typically developing children, even if these processes get arrested at distinct points in their development, it should be possible to identify at least some stages in the grammar of adults with DS that match the patterns of typical
acquisition processes. Before making specific predictions about the knowledge of binding in DS, let us first explore what is known on the acquisition of binding in atypical development.

2.3 Acquisition of binding in atypical population: SLI and Williams syndrome

Research on the knowledge of binding in populations other than typically developing children is very sparse. Here we shall review the results of several studies that investigated the knowledge of this module in children with Williams syndrome (WS) and SLI. These two populations are of particular interest to us as grammatical development in both populations has often been contrasted to that in DS. As noted in chapter 1, WS is commonly cited as an instance of a dissociation between language and cognition: as in DS, their cognition is impaired, however, their language abilities are known to be relatively spared, and thus considerably better than in DS (Bellugi et al, 1988; Tager-Flusberg, 1999; Zukowski, 2001). At the other end of the spectrum is SLI: in this population cognition is not impaired, but syntactic deficits reported in a large body of literature have recently been claimed to be reminiscent of those found in DS (Clibbens et al, 2002; Hick, 2002; Laws & Bishop, 2002; Tager-Flusberg, 1999).

In their study on grammatical abilities in WS, Clahsen & Almazan (1998) report intact knowledge of binding in a small sample of children with WS, aged between 11-15. In a judgment comprehension task, extensively used in research on binding in TD children, their subjects showed a 100% correct performance on experimental conditions involving reflexives and pronouns in a local relation with a referential or quantified antecedent. These results can be interpreted as revealing knowledge of the syntactic constraints which govern the distribution of anaphors and pronouns when bound variables, i.e. conditions on binding and the Chain Condition, in the framework of R&R, as well as processing abilities indicative of the availability of the constraint governing illicit coreference, i.e. Rule I (Grodzinsky & Reinhart, 1993).
Patterns shown by children with SLI present a different picture. In van der Lely & Stollwerck (1997), a group of 6-9 year old SLI children showed results comparable to those of younger TD children reported for English, allowing illicit coreference for pronouns with local antecedents around 36% of the time. In contexts where coreference is not allowed, i.e. where the pronoun is a variable bound by a quantified antecedent, their performance reached 90% correct. These children, however, showed chance performance in interpreting constructions that contain reflexives bound by quantified antecedents.26

Studies using similar experimental paradigms to investigate binding in SLI in other languages also report interesting patterns. Jakubowicz, Nash, Rigaut & Gerard (1998) found that a group in their sample of 5;7-13 year old French children with SLI allowed illicit coreference with pronominal clitics 50% of the time. The same children showed no problem interpreting French reflexive clitic ‘se’. Varlokosta (2001) reports parallel findings for both full pronouns and clitics in 5-8 year old Greek children with SLI, who allowed illicit coreference between a full pronoun and a local referential antecedent 50% of the time, and between a pronominal clitic and the same antecedent 38% of the time. If it is the case that accidental coreference is not possible in contexts involving clitics, the pattern shown by Greek and French SLI cannot be caused by a failure of a processing constraint governing coreference.27

26 Van der Lely & Stollwerck report their SLI children to show particularly poor scores on a specific condition that involved reflexive pronouns only, whose aim it was to provide children with an opportunity to choose an incorrect antecedent for the reflexive:

(i) Mowgli says Baloo Bear is tickling himself. (A tickles A)

We suspect, however, that the processing complexity of such examples played an important role in the low scores reported: typically developing children also seem to have found this structure difficult. Note that the SLI children showed significantly better performance with standard structures involving reflexives bound by a referential antecedent, given in (ii) and (iii), scoring 98.6% and 80.5% correct, respectively:

(ii) Is Mowgli tickling himself? (A tickles B)

(iii) Mowgli says Baloo Bear is tickling himself. (A tickles B)

27 In the same study, Jakubowicz et al (1998) report high omission rates of object clitics for all subjects, including the ones who showed no difficulties on the comprehension task. Object clitics have
Recall that studies reviewed in section 2.2.2.1 reported absence of DPBE with clitic object constructions in typical development crosslinguistically. DPBE was not reported with full pronouns in Greek either.

The findings on SLI show additional support for the modular approach to binding we adopt. English speaking children with SLI follow the pattern of TD children by showing knowledge of syntactic constraints governing the distribution of pronouns, but reveal a tendency to accept illicit coreference, which is interpreted as a failure to implement Rule I. Their performance on anaphors bound by referential antecedents indicates that knowledge of conditions on reflexivity is also available. On the other hand, a residue of some deficit - syntactic in nature - may be responsible for their difficulties with interpreting structures involving a reflexive pronoun bound by a quantified antecedent. In French and Greek, SLI children show patterns that at first sight resemble a failure of a coreference rule/Rule I. However if pronominal clitics are not subject to coreference but only to binding, these patterns must be interpreted as revealing some deficit not related to their processing abilities. Rather, the deficit must be syntactic in nature, and likely to be associated with grammatical properties of clitics and their inflectional/functional status. Recall that in French & Greek TD children no failure of the Rule I was detected. Unfortunately these studies did not provide us with an opportunity to independently assess knowledge of conditions on binding in the grammar of French SLI, as constructions involving quantified

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28 Jakubowicz et al (1998) argue that difficulties shown with (especially the production of) pronominal clitics in SLI can be attributed to an inability to merge arguments in non-canonical positions, i.e. in a functional domain.

29 Support for the idea that difficulties shown in the interpretation of pronouns in English and French SLI cannot be due to the same causes (i.e. in English, it is due to a failure of a processing constraint/coreference rule such as Rule I, whilst French SLI children have a problem with the interpretation of pronominal clitics independently) comes from the acquisition data reported in Paradis et al (2003) on French/English bilingual children with SLI. Both TD and SLI bilinguals were shown to omit French (clitic) pronouns much more often than English pronouns. This suggests that the difficulties with pronouns shown in comprehension tasks by SLI children are not related to the
antecedents were not tested. In the French study, however, it was shown that SLI children showed no difficulty interpreting constructions involving the reflexive clitic, supporting the claim that Condition A as a condition on reflexivity is available in this population. Reflexive structures were not tested in the Greek study.

The findings reported in studies on binding in WS and SLI are relevant for our investigation of the knowledge of this module in DS for several reasons. First, they point to areas of grammar that may be more vulnerable to impairment in populations with language deficits. If it is the case that parallels between linguistic deficits in SLI and DS can be drawn, as some researches have suggested, data from SLI should be informative. In addition, it is instructive to investigate crosslinguistic differences in the population sharing the same language disorder, such as SLI, as they reveal aspects of a language deficit dependent on grammatical properties that are language-specific. This leads us to expect crosslinguistic differences with regard to the knowledge of binding in English and SC-speaking individuals with DS. On the other hand, comparisons with WS are helpful as these two populations have been known to function on similar cognitive levels: even if direct comparisons of their language abilities may not be revealing, because the two conditions are very different, it is useful to establish that individuals with WS can cope with similar experimental paradigms that will be used in our study on binding in DS.

In the following section we generate predictions about the knowledge of binding in the population with DS in English and SC, based on the patterns reviewed in the research on the acquisition of binding in typical and atypical development. The testing of these predictions will be the topic of chapters 3 and 4.

anaphoric properties of clitic pronouns but their grammatical properties.
2.4 Predictions for the knowledge of binding in Down syndrome

The characterisations of language impairment in DS discussed in chapter 1 generate different predictions about the knowledge of binding and coreference in the grammar of DS. According to the 'delay with no deviance' hypothesis, linguistic development in DS adheres to the course of development shown by typically developing children, but is severely delayed in important respects. If this is the case, we should be able to pinpoint specific stages in the grammar of adults with DS that match the patterns seen in typically developing children.

Before making predictions with recourse to typical development, it may be helpful to briefly review patterns presented in atypical acquisition. Although it is not realistic to make any precise predictions about the knowledge of binding in DS on the basis of language development in unrelated disordered populations, it is valuable to learn which particular aspects of grammar may be susceptible to deficits. Whilst children with Williams syndrome showed intact knowledge of binding and coreference (Clahsen & Almazan, 1998), findings reported by the few studies on SLI may be relevant. English speaking children with SLI showed performance on pronouns resembling a DPBE but also some difficulty with anaphors bound by quantified antecedents (van der Lely & Stollwerck, 1997). Whereas the first pattern can be interpreted as a result of limited processing abilities, analogous to what has been claimed for younger TD children, difficulties with interpreting anaphors can only be related to some sort of a syntactic deficit. Similarly, the main findings reported for French and Greek SLI concern acceptance of illicit local antecedents for object clitics. If clitics are analysed as no more than bundles of phi features, incomplete acquisition

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There are two reasons why we cannot generate predictions for DS on the basis of findings reported for atypical development: first, research on binding and coreference in impaired populations is too sparse for any precise predictions to be made. The second, crucial, reason is that it is difficult to argue that whatever parallels may arise in the abilities of SLI/WS and DS, would be due to the same underlying deficits in clinical populations that are very different in all other respects (despite similarities found at the level of cognitive functioning in WS and DS or parallels in language abilities
of these elements strongly suggests a language deficit that is syntactic in nature. We shall come back to these points in chapters 3 and 4.

As for the delay hypothesis the course of typical development is crucial, let us briefly summarise the patterns found in typical linguistic development. It was reported that TD children generally showed no difficulties interpreting full and clitic reflexive pronouns in either referential or quantified contexts, in accordance with the Binding Condition A of R&R. By ruling out pronouns bound by quantified antecedents in local contexts, children are shown to obey both Condition B and the Chain Condition in the same framework. In contrast to their knowledge of these principles, research has uncovered an immaturity of children’s pragmatic/processing abilities. This was revealed in their performance involving pronouns in non-quantified contexts: English children, amongst others, have shown a tendency to allow illicit coreference between pronouns and local referential antecedents, revealing a failure of a processing constraint formulated as Rule I (Grodzinsky & Reinhart, 1993), termed ‘Delay of Principle B Effect’ (DPBE) or ‘Rule I failure’.

In languages such as SC, which can employ clitics in place of full pronouns in the object constructions tested, this effect is found to be absent: clitics have been claimed not to be subject to coreference but only to binding, and as a result, the processing constraint does not apply, allowing children to again show their knowledge of constraints on binding only. A handful of languages, including SC, show the same exemption effect with full pronouns in object constructions, presumably not invoking the processing constraint, enabling children to show their mastery of constraints that govern the distribution of pronouns in both quantified and non-quantified contexts.

By accepting the ‘delayed but not deviant’ characterisation of language development in DS, the following patterns are predicted in English-speaking individuals with DS:
if they are in possession of the knowledge of constraints on anaphors and pronouns when bound variables, we should expect no difficulties in their interpretation of anaphors, bound by referential or quantified antecedents, nor with pronouns when bound variables, i.e. bound by quantified DPs. In contrast, taking into an account the well-evidenced limitations on the processing abilities in the DS population, a failure of a processing constraint such as Rule I is predicted to emerge, perhaps even to a higher extent than in the TD population. Relying on the processing-based framework of Goodluck (1990), the overall impairment in processing abilities in DS motivated Scott (2001) to make an explicit prediction that Rule I failure/DPBE will certainly be present in DS population, perhaps even permanently. This prediction was made with no recourse to experimental data: our study presented in chapters 3 and 4 will provide direct evidence for its support or disconfirmation.

If linguistic development in DS is delayed only, this should apply crosslinguistically: the SC-speaking population with DS is thus expected to exhibit patterns similar to those evidenced in typically developing children acquiring SC. Individuals with DS should show no difficulties with the interpretation of full and clitic reflexive pronouns, in accordance with the R&R’s Condition A. Note that full reflexive forms have not been tested by Kudra/Stojanović (1994) in SC, but on the basis of data reported for TD children in English and other languages, it is assumed that constraints governing their distribution pose no difficulties to TD children. In contrast to English-speakers with DS, the SC-speaking population with this condition should show no difficulties with full pronouns in object constructions, parallel to TD children acquiring SC. Thus if coreference is not involved in either full pronouns or clitics, individuals with DS should rule out local binding of these elements in both quantified and non-quantified contexts, just as TD children do.\(^{31}\)

\(^{31}\) Kudra/Stojanović (1994) tested full pronouns when complements of prepositions; to test for the knowledge of Condition B of R&R it is necessary to use constructions containing pronouns when coarguments.

\(^{32}\) Recall that the lack of accidental coreference (and consequently DPBE) with clitics and full pronouns has proven to be a contentious issue. Speakers disagree on whether strong/full pronouns and
Our predictions are therefore formulated as follows:

(44a) English-speaking individuals with DS will show no difficulties with anaphors or bound variable pronouns. They will, however, show difficulties in ruling out illicit coreference.

(44b) SC-speaking individuals with DS will have no difficulties with anaphors or the reflexive clitic. They will also show no difficulties ruling out bound variable pronouns, or full personal pronouns and pronominal clitics, as these latter two are not subject to Rule I failure/DPBE in SC.

2.5 Summary

In this chapter we have set the grounds for our investigation into binding in both English and SC-speaking populations with DS. In the opening sections, the basic tenets of a theoretical approach to anaphoric relations were introduced, as proposed in R&R (1993) and Grodzinsky & Reinhart (1993). In this framework, syntactic binding is regulated by conditions on reflexivity of predicates and the Chain Condition, whereas coreference is governed by Rule I. Such a modular approach to binding has received substantial support from findings reported in studies on language acquisition: young children seem to exhibit distinct patterns in their acquisition of binding and coreference. They find it harder to rule out illicit coreference, the type of anaphoric relation regulated by constraints outside syntax proper, than to implement Binding Conditions and the Chain Condition, argued to be part of the computational system. Interesting variation emerged in the acquisition patterns of pronouns, however, as a result of the different grammatical and semantic properties of clitics disallow accidental coreference in Romance, although more robust judgements are available for SC. Our experimental investigation of constructions involving both full and clitic pronouns in both TD children and the population with DS in SC will hopefully shed more light on this issue.
pronominal forms crosslinguistically.
In languages that possess clitic pronominal forms children showed no problem ruling out illicit coreference. Clitics seem to be resistant to accidental coreference, and thus not subject to a failure of the extrasyntactic constraint regulating coreference. A puzzle was presented by a handful of other languages, amongst them SC, as here children successfully ruled out full pronouns from illicit local relations. This suggests that these elements were more akin to clitics in Romance, than to full pronouns in English and other languages where children were prone to failure of Rule I, the coreference rule.
A brief review of the acquisition of binding in atypical development was given, focussing on SLI and WS, the two impaired populations that have often been contrasted with DS. Interesting crosslinguistic differences emerged in the acquisition of binding in SLI, thus indicating that distinct patterns may be expected in our crosslinguistic investigations of binding in DS. We concluded by making predictions for the DS population’s knowledge of binding in both English and SC, based on the patterns observed in the acquisition of binding crosslinguistically. Our null hypothesis stated that there would be no differences between the knowledge of binding in TD children and in DS, in accordance with the ‘delayed’ characterisation of language in DS. In the following chapters we present our two experiments that will put these predictions to the test.
Chapter 3

3 Binding in DS: English experiment

3.0 Introduction

The 'delay, without deviance' characterisation of language development in Down syndrome (DS) predicts the course of linguistic development in this population to parallel that of typically developing (TD) children. Focussing on the knowledge of binding, this means that English-speaking individuals with DS would show difficulties with ruling out illicit coreference but their knowledge of binding principles would be intact. Since the present study only investigates the end linguistic achievement in adult individuals with DS, it is also possible that no delayed patterns will be observable.

The question of how to gauge whether or not an acquisition pattern is 'delayed' is contentious. Typically developing children may follow different paths at different stages of language acquisition, showing individual variability whilst still converging on the same adult grammar, hence the 'idealisation to instantaneity' see e.g. Smith (1999:13). However, huge individual variation is characteristic of cognitively impaired populations, and is well evidenced in DS (Chapman, 1995; Miller, 1988; Rondal, 1995). If language in DS is delayed, it is not clear what the adult grammar would look like, or whether it would ever reach the stage of the adult grammar: it is certainly plausible that in different individuals with DS language development may get arrested at different stages in the course of language acquisition.

The present study will stick closely to the experimental paradigm of Chien & Wexler (1990). Their basic design, involving the elicitation of yes-no answers to experimental questions accompanying picture stimuli, has been used extensively in studies on the acquisition of pronominal reference across languages and populations during the past decade: van der Lely & Stollwerck (1997) for English speaking children with SLI, Clahsen & Almazan (1998) for English speaking children with

3.1 Experiment I: English

3.1.1 Participants

Experimental subjects

Four young adult girls with DS, aged between 17 and 21, participated in our study. They were recruited from a Learning Support Unit at a further education college in Greater London. The aetiological subtype of DS was not confirmed, but was suspected to be standard trisomy 21. For a general picture of the subjects' cognitive and language abilities, their scores on standardised grammar, vocabulary and intelligence tests are given in Table 3.1. All subjects were highly functioning individuals and were regarded as having abilities higher than average for a typical person with DS by tutors at their college. Their performance IQ ranged from 55 to 65, as measured on the Wechsler Adult Intelligence Scales. In line with the widely reported dissociations between grammar and vocabulary, there seems to be present a disparity between their scores on both receptive and expressive vocabulary and the test of comprehension of grammar. There is at least one (chronological) year gap between their grammar (as tested on TROG) and vocabulary scores (as tested on BPVS), with highest disparity seen in S1, whose receptive vocabulary is at the level of a typically developing 8 year-old child, whilst her grammar is at the level of a 4;9 year-old. Again in line with reports in the literature, the subjects showed poor performance on all the complex syntactic structures tested in the TROG: passives, relative clauses, clefts.

1 Recall also that it has been argued that this condition is less debilitating for the cognitive abilities of females as opposed to those of males (Carr, 1985).
2 Our subjects also showed a dismal performance on passive structures (Perovic, 2002), tested independently on a measure developed specifically to tap into the knowledge of passivization (van der Lely, 1996).
There is no noticeable disproportion between the subjects’ age equivalent scores on receptive vocabulary and scores on cognitive abilities test, confirming the reports that receptive vocabulary is comparable to the level of cognitive maturity as measured by a performance scale such as Raven’s Progressive Matrices. Conversely, there is a noticeable contrast between the subjects’ Raven’s scores and the grammar scores, as measured by TROG.

Table 3.1: DS subjects’ scores on IQ, language and grammar tests

<table>
<thead>
<tr>
<th>Age</th>
<th>Receptive vocabulary</th>
<th>Expressive vocabulary</th>
<th>Grammar comprehension</th>
<th>Performance IQ</th>
<th>Cognitive ability</th>
</tr>
</thead>
<tbody>
<tr>
<td>SI</td>
<td>17;9</td>
<td>8;1 (83)</td>
<td>7;3-7;5</td>
<td>4;9</td>
<td>65</td>
</tr>
<tr>
<td></td>
<td></td>
<td>AE</td>
<td>AE</td>
<td></td>
<td>7;8 (21)</td>
</tr>
<tr>
<td>S2</td>
<td>17;2</td>
<td>6;6 (66)</td>
<td>5;7-7;9</td>
<td>5;3</td>
<td>55</td>
</tr>
<tr>
<td></td>
<td></td>
<td>AE</td>
<td>AE</td>
<td></td>
<td>6;6 (17)</td>
</tr>
<tr>
<td>S3</td>
<td>19;3</td>
<td>7;0 (71)</td>
<td>&gt;8.6</td>
<td>4;5</td>
<td>57</td>
</tr>
<tr>
<td></td>
<td></td>
<td>AE</td>
<td>AE</td>
<td></td>
<td>5;6 (15)</td>
</tr>
<tr>
<td>S4</td>
<td>20;7</td>
<td>5;0 (51)</td>
<td>5;7-5;9</td>
<td>4;0</td>
<td>62</td>
</tr>
<tr>
<td></td>
<td></td>
<td>AE</td>
<td>AE</td>
<td></td>
<td>6;0 (16)</td>
</tr>
</tbody>
</table>

Note: AE = Age Equivalent; raw sc = raw score

Subjects came from families of average to high economic status, and have attended primary and secondary schooling for children with learning disabilities in Greater London. Three subjects came from monolingual English backgrounds, whereas S3 was also exposed to Hindi at home. Their present day-to-day environment was highly stimulating, they attended daily classes at a further education college, with S1 undergoing training for a vocational diploma.

3 Receptive vocabulary: British Picture Vocabulary Scales (BPVS).
4 Expressive vocabulary: Renfrew Word Finding Vocabulary Test (RWFV).
5 Grammar comprehension: Test for the Reception of Grammar (TROG).
6 Performance Scale of Wechsler Adult Intelligence Scales (WAIS).
7 Raven’s Coloured Progressive Matrices (CPM). This version is recommended for use with young children and adults with learning disabilities, in contrast to Standard Progressive Matrices (SPM), often used in studies with language-disordered children in the UK.
Three more subjects of similar ages were originally included in the study. One was excluded as it appeared that she had a mosaic form of DS, rather than standard trisomy 21 (the mosaic form is known to give rise to less severe cognitive and possibly linguistic impairments). Two subjects were excluded after having consistently failed control questions testing their attention and their understanding of the experimental task to be discussed below.

Control subjects
For our control subjects, we chose four typically developing children, recruited from a primary school in Greater London, aged between 5;11 and 7;10 years. Of average academic abilities, they were individually matched to subjects with DS on the raw scores of the receptive vocabulary measure, BPVS.\(^8\)\(^9\) Matching was achieved within 2 or 3 points of the raw score. Attempts were made to match the control subjects to the DS girls on sex, however, one boy had to be included as his vocabulary score was nearest to the one required.

A group of 4 adult control subjects was also tested. These were undergraduate students at UCL, who were matched to the subjects with DS in age, sex and exposure to a mono or bilingual home environment.

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\(^8\) Traditionally, cognitively impaired individuals are matched to controls on the basis of their MA or linguistic measures such as comprehension of vocabulary, grammar or MLU, however, ideal matching is far from feasible. Recall from chapter 1 that MLU in adults and adolescents with DS is often inaccurate in reflecting the level of grammatical knowledge present: longer MLUs in older subjects with DS do not correspond with their limited abilities revealed on more subtle syntactic measures. A measure of receptive grammatical knowledge such as TROG proved to be inadequate as it seemed to be overestimating the abilities of subjects that took part in our pilot study: TD 3-year-olds consistently achieved scores consonant with those of older TD children. The measure decided upon, BPVS, has been found to correlate highly with measures of verbal MA, both in typical and atypical populations.

\(^9\) Although individual matching of a small number of subjects is not ideal, much is known about the acquisition of pronominal reference in English children, from the original studies by Chien & Waxler (1990) which involved more than a 100 children so it was deemed unnecessary to include larger groups of typically developing children in the English study discussed here.
3.1.2 Materials and procedure

The task used in the study was the Picture Truth Value Judgement task, involving the elicitation of yes-no answers to experimental questions accompanying picture stimuli adapted from the 4th experiment by Chien & Wexler (1990). Four different types of experimental sentences were included: name-reflexive (NRM and NRX), name-pronoun (NPM and NPX), quantifier-reflexive (QRM and QRX) and quantifier-pronoun (QPM and QPX). Each condition was tested twice, in the match (e.g. NRM) and mismatch form (e.g. NRX), eliciting both ‘yes’ and ‘no’ responses in order to control for a positive or negative bias (opting for ‘yes’ answers in order to please the (adult) experimenter is well documented in research on typical language acquisition). The name-reflexive or name-pronoun conditions included a proper name in the subject (antecedent) position and a reflexive or a pronoun in the object position. The quantifier-reflexive and quantifier-pronoun conditions involved a quantified DP in the subject position, with the pronoun or a reflexive in the object position.

Control conditions aimed to uncover children’s knowledge of assignment of reference independently of pronominal elements: condition name-name match and mismatch (CNNM and CNNX) included proper names only: *Is Cinderella washing Snow White?* whilst name-quantifier condition (CQNM and CQNX) aimed to test subjects’ knowledge of quantifiers: *Is every bear washing Peter Pan?*. This sentence would be accompanied by a picture showing two bears washing Peter Pan, and one bear standing by. To control for the well-known attention deficits in individuals with DS, two additional conditions were included, mismatch only: name-name action (CNAX) included a picture of characters performing an action different to the action mentioned in the experimental question: a question such as ‘*Is Peter Pan drying Mickey Mouse?*’ was accompanied by a picture depicting Peter Pan washing Mickey Mouse. Attention condition (CAX) involved questions such as ‘*Is Father Christmas sleeping?*’ accompanied by a picture depicting Father Christmas standing next to a bed.
Examples of questions for each of the conditions are given in table 3.2 and a full list of questions is given in the Appendix I. For each condition there were eight questions that matched the picture and eight questions that did not match the picture; the only exceptions are the name-action control question (CNNX) and the attention control question (CAX) which were used only in mismatch form, and amounted to 8 and 16 questions respectively.

Table 3.2: Examples of test sentences for experimental and control conditions

<table>
<thead>
<tr>
<th>Experimental conditions</th>
<th>match</th>
<th>items</th>
<th>mismatch</th>
<th>items</th>
<th>example</th>
</tr>
</thead>
<tbody>
<tr>
<td>name-reflexive</td>
<td>NRM</td>
<td>8</td>
<td>NRX</td>
<td>8</td>
<td>Is Snow White washing herself?</td>
</tr>
<tr>
<td>name-pronoun</td>
<td>NPM</td>
<td>8</td>
<td>NPX</td>
<td>8</td>
<td>Is Snow White washing her?</td>
</tr>
<tr>
<td>quantif.-reflexive</td>
<td>QRM</td>
<td>8</td>
<td>QRX</td>
<td>8</td>
<td>Is every bear washing himself?</td>
</tr>
<tr>
<td>quantif.-pronoun</td>
<td>QPM</td>
<td>8</td>
<td>QPX</td>
<td>8</td>
<td>Is every bear washing him?</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Control conditions</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>name-name</td>
<td>CNNM</td>
<td>8</td>
<td>CNNX</td>
<td>8</td>
<td>Is Snow White washing Cinderella?</td>
</tr>
<tr>
<td>quantifier-name</td>
<td>CQNM</td>
<td>8</td>
<td>CQNX</td>
<td>8</td>
<td>Is every bear touching Peter Pan?</td>
</tr>
<tr>
<td>name-name action</td>
<td>----</td>
<td>---</td>
<td>CNAX</td>
<td>8</td>
<td>Is Snow White drying Cinderella?</td>
</tr>
<tr>
<td>Attention</td>
<td>----</td>
<td>---</td>
<td>CAX</td>
<td>16</td>
<td>Is Father Christmas sleeping?</td>
</tr>
</tbody>
</table>

Total items: 120

As in Chien & Wexler (1990), test sentences contained of the three action verbs: wash, dry or touch, accompanied by pictures depicting popular TV/cartoon characters (Peter Pan, Cinderella, Snow White), recognisable to children and adults of different ages and across different cultures.

---

10 Two different quantifiers, all and every, were used in the experiment (4 instances of each for all conditions involving quantifiers). However, since no differences were found in the subjects’ performance, the results presented here will be collapsed for ease of reference.
(1) Experimental condition: name-pronoun
a. NPM (match)
   'Is Red Riding Hood washing her?' correct answer: 'yes'
   (context setting input: This is Red Riding Hood. This is Goldilocks.)

b. NPX (mismatch)
   'Is Snow White washing her?' correct answer: 'no'
   (context setting input: This is Snow White. This is Little Mermaid.)
Experimental condition: *name-reflexive*

a. **NRM** (match)
   ‘Is Goldilocks washing herself?’ correct answer: ‘yes’
   (context-setting input: This is Goldilocks. This is Cinderella.)

b. **NRX** (mismatch)
   ‘Is Snow White washing herself?’ correct answer: ‘no’
   (context-setting input: This is Snow White. This is Little Mermaid.)
(3) Experimental condition: *quantifier-reflexive*

a. **QRM** (match)
   
   'Is every witch touching herself?' correct answer: 'yes'
   
   (context-setting input: This is Fairy. These are the witches.)

b. **QRX** (mismatch)
   
   'Is every mermaid touching herself?' correct answer: 'no'
   
   (context-setting input: This is Goldilocks. These are the mermaids.)
(4) Experimental condition: *quantifier-name*

a. **QPM** (match)
   ‘Is every witch touching her?’ correct answer: ‘yes’
   (context-setting input: This is Fairy. These are the witches.)

b. **QPX** (mismatch)
   ‘Is every kitten drying him?’ correct answer: ‘no’
   (context-setting input: This is Duffy Duck. These are the kittens.)
(5) Control condition: *quantifier-name*

a. **CQNM** (match)
   ‘Is every penguin touching Sylvester?’ correct answer: ‘yes’
   (context-setting input: This is Sylvester. These are the penguins.)

b. **CQNX** (mismatch)
   ‘Is every bear washing Peter Pan?’ correct answer: ‘no’
   (context-setting input: This is Peter Pan. These are the bears.)
After introducing characters in a picture, e.g. ‘This is Cinderella. This is Snow White’, subjects were presented with an experimental question, e.g. ‘Is Cinderella washing her?’ Their answers were coded onto an answer sheet, along with any other comments. In order to accommodate the attention deficits in the population with DS, the 120 experimental items were administered in the course of four sessions. In each session, subjects were presented with 30 pictures and 30 questions. To ensure that subjects understood the task, four trial questions were used at the beginning of each session. Subjects received no feedback about their performance. Experimental sessions were conducted in an empty classroom at the subject’s school/college.

3.1.3 Results

The match and mismatch versions of the experimental and control conditions were examined separately, in order to expose any positive or negative bias present in the data. In the match conditions the question corresponds to the scenario depicted in the picture presented to the subject, thus the correct answer to such question is ‘yes’. In the mismatch conditions the question does not correspond to the picture shown hence the correct answer is ‘no’. Before reporting the findings of the subject populations, note that the 4 non-impaired adult controls, matched to the DS subjects on chronological age, sex and mono or bilingual home environment, showed a ceiling performance on all conditions. Only one subject scored 7 out 8 of on one of the control conditions, CNAX.

3.1.3.1 Control conditions: control subjects and subjects with DS

Individual and group mean scores for the control subjects are shown in table 3.3, whilst table 3.4 gives the same scores for the subjects with DS.

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11 Stradford (1985) notes that individuals with DS cannot concentrate for longer periods of time without a dramatic decline in accuracy.
Table 3.3: Mean scores for control subjects on control match and mismatch conditions

<table>
<thead>
<tr>
<th></th>
<th>S1</th>
<th>S2</th>
<th>S3</th>
<th>S4</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>CNNM</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>0.00</td>
</tr>
<tr>
<td>CQNM</td>
<td>8</td>
<td>6</td>
<td>8</td>
<td>8</td>
<td>7.50</td>
<td>1.00</td>
</tr>
<tr>
<td>CNNX</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>0.00</td>
</tr>
<tr>
<td>CQNX</td>
<td>8</td>
<td>8</td>
<td>7</td>
<td>8</td>
<td>7.75</td>
<td>0.50</td>
</tr>
<tr>
<td>CNAX</td>
<td>7</td>
<td>8</td>
<td>7</td>
<td>7</td>
<td>7.25</td>
<td>0.50</td>
</tr>
<tr>
<td>CAX</td>
<td>16</td>
<td>16</td>
<td>16</td>
<td>16</td>
<td>16</td>
<td>0.00</td>
</tr>
</tbody>
</table>

Notes: Maximum score of 8 for each condition except for CAX, 16; $SD = \text{standard deviation}$

Table 3.4: Mean scores for DS subjects on control match and mismatch conditions

<table>
<thead>
<tr>
<th></th>
<th>S1</th>
<th>S2</th>
<th>S3</th>
<th>S4</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>CNNM</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>0.00</td>
</tr>
<tr>
<td>CQNM</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>0.00</td>
</tr>
<tr>
<td>CNNX</td>
<td>7</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>7.75</td>
<td>0.50</td>
</tr>
<tr>
<td>CQNX</td>
<td>2</td>
<td>8</td>
<td>8</td>
<td>0</td>
<td>4.5</td>
<td>4.12</td>
</tr>
<tr>
<td>CNAX</td>
<td>8</td>
<td>7</td>
<td>7</td>
<td>7</td>
<td>7.25</td>
<td>0.50</td>
</tr>
<tr>
<td>CAX</td>
<td>16</td>
<td>16</td>
<td>16</td>
<td>15</td>
<td>15.75</td>
<td>0.50</td>
</tr>
</tbody>
</table>

Notes: Maximum score of 8 for each condition except for CAX, 16; $SD = \text{standard deviation}$

Control subjects performed at ceiling level on both the match and mismatch control conditions, whereas the performance for DS subjects was more varied. Whilst all subjects scored a minimum of 7, or the maximum 8 out of 8 correct on all other control conditions, two DS subjects performed exceptionally poorly on the quantifier-name mismatch questions, CQNX. S1 gave only 2 correct answers, whereas S4 provided no correct answers at all. This brings down the group percentage score
considerably, to 56% correct, as seen in figure 3.1. There we see the percentage of correct responses on each of the control conditions for both the control subjects and subjects with DS.

Figure 3.1: Percentage correct for DS subjects and control subjects (CS) on control conditions

3.1.3.2 Experimental conditions

Control subjects
Tables 3.5 and 3.6 present data shown by control subjects on the experimental conditions.

Table 3.5: Mean scores for control subjects on experimental match conditions

<table>
<thead>
<tr>
<th>match</th>
<th>S1</th>
<th>S2</th>
<th>S3</th>
<th>S4</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>NPM</td>
<td>3</td>
<td>7</td>
<td>8</td>
<td>7</td>
<td>6.75</td>
<td>2.22</td>
</tr>
<tr>
<td>NRM</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>0.00</td>
</tr>
<tr>
<td>QPM</td>
<td>7</td>
<td>7</td>
<td>8</td>
<td>8</td>
<td>7.5</td>
<td>0.58</td>
</tr>
<tr>
<td>QRM</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>0.00</td>
</tr>
</tbody>
</table>

Notes: Maximum score of 8 for each condition; $SD$ = standard deviation
Table 3.6: Mean scores for control subjects on experimental mismatch conditions

<table>
<thead>
<tr>
<th>mismatch</th>
<th>S1</th>
<th>S2</th>
<th>S3</th>
<th>S4</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>NPX</td>
<td>4</td>
<td>5</td>
<td>8</td>
<td>7</td>
<td>6</td>
<td>1.83</td>
</tr>
<tr>
<td>NRX</td>
<td>7</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>7.75</td>
<td>0.50</td>
</tr>
<tr>
<td>QPX</td>
<td>5</td>
<td>6</td>
<td>8</td>
<td>8</td>
<td>6.75</td>
<td>1.50</td>
</tr>
<tr>
<td>QRX</td>
<td>5</td>
<td>5</td>
<td>8</td>
<td>8</td>
<td>6.5</td>
<td>1.73</td>
</tr>
</tbody>
</table>

Notes: Maximum score of 8 for each condition; SD = standard deviation

Control subjects performed well on the match experimental conditions, reaching ceiling scores on conditions name-reflexive (NRM), quantifier-reflexive (QRM) and quantifier pronoun match (QPM). Their mean was slightly lower on the name-pronoun match condition (NPM), but a closer inspection reveals its source to be in the performance of S1: this subject scored only 3 out of 8 correct on this condition.

A similar trend is seen in control subjects’ performance on the mismatch experimental conditions. Whilst the group mean is reasonably high on NRX, QPX and QRX, individual data display a contrast between S3 and S4, who score at ceiling level, and S1 and S2 who show a lower performance on NPX and QRX. On condition name-pronoun mismatch NPX, these two subjects perform at or slightly above chance level, with their performance on the quantified version of this condition being slightly better. The same subjects also show slightly lower performance on quantifier-reflexive mismatch, QRX.

Subjects with DS

The performance of subjects with DS is characterised by more stark contrasts. Their data are presented in tables 3.7 and 3.8.
Table 3.7: Mean scores for DS subjects on experimental match conditions

<table>
<thead>
<tr>
<th>match</th>
<th>S1</th>
<th>S2</th>
<th>S3</th>
<th>S4</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>NPM</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>0.00</td>
</tr>
<tr>
<td>NRM</td>
<td>2</td>
<td>6</td>
<td>5</td>
<td>6</td>
<td>4.75</td>
<td>1.89</td>
</tr>
<tr>
<td>QPM</td>
<td>8</td>
<td>8</td>
<td>6</td>
<td>8</td>
<td>8</td>
<td>1.00</td>
</tr>
<tr>
<td>QRM</td>
<td>1</td>
<td>4</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>1.41</td>
</tr>
</tbody>
</table>

Notes: Maximum score of 8 for each condition; SD = standard deviation

Table 3.8: Mean scores for DS subjects on experimental mismatch conditions

<table>
<thead>
<tr>
<th>mismatch</th>
<th>S1</th>
<th>S2</th>
<th>S3</th>
<th>S4</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>NPX</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>0.00</td>
</tr>
<tr>
<td>NRX</td>
<td>1</td>
<td>3</td>
<td>8</td>
<td>8</td>
<td>4.5</td>
<td>3.11</td>
</tr>
<tr>
<td>QPX</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>0.00</td>
</tr>
<tr>
<td>QRX</td>
<td>1</td>
<td>2</td>
<td>7</td>
<td>5</td>
<td>3.75</td>
<td>2.75</td>
</tr>
</tbody>
</table>

Notes: Maximum score of 8 for each condition; SD = standard deviation

The performance of DS subjects on the experimental conditions does not correspond at all with that of the control subjects. Specifically, the general trend in the data presented reveals that whilst DS subjects had no difficulties with conditions involving pronouns, they had severe difficulties on conditions involving reflexives.

On the experimental conditions involving pronouns, in a local relation with either a referential or quantified antecedent (NPM, NPX, QPM, QPX), the subjects with DS performed near or at ceiling level. On all four conditions, they correctly rejected locally bound pronouns in the mismatch condition and accepted a referent distinct from the local subject for the pronoun in the match condition 100% of the time. The exception is S3 who scored 6 out of 8 on QPM, showing a score still close to being significantly above chance (p= 0.1445).
On conditions involving a reflexive pronoun, the pattern shown by the DS subjects is strikingly different. A look ahead at figure 3.2 below shows that with regard to the match conditions, the mean performance on NRM reaches 59%, on the quantified version of this condition, QRM, it is 25%. The trend is not different on the mismatch conditions: 56% correct on NRX and 47% on QRX.

Returning now to tables 3.7 and 3.8, notable individual variation is revealed in the data of subjects with DS. SI and S2 perform poorly on all conditions involving reflexives, match and mismatch, whilst S3 and S4 show an exceptionally poor performance on at least one condition involving a reflexive element bound by a referential or a quantified antecedent. Their performance on reflexives bound by quantified antecedents showed much less individual variation: on QRM, only subject S2 reached a chance performance, 4 out of 8 correct, whilst the others scored even less: 1 correct for S1 and S3, and 2 correct for S4. On QRX their scores were comparably poor, 1, 2 and 5 correct for S1, S2, S4 respectively and 7 for S3 (all out of 8).

The contrasts between the performance patterns of the two subject groups are clearly seen in figures 3.2 and 3.3 which show the average group performances of DS and control subjects for the match and mismatch experimental conditions. The patterns observed are statistically significant: on the *name-pronoun* conditions, both match and mismatch (NPM and NPX), the control subjects were found to perform significantly worse than the DS subjects (p<0.006). In contrast, on the conditions involving reflexives, subjects with DS performed significantly worse than the controls, both on the non-quantified conditions, NRM and NRX (p<0.002), and the quantified conditions, QRM (p<0.001) and QRX (p<0.005). No other between-subjects differences reached significance.

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12 The p values were obtained using a binomial distribution, on the assumption that subjects were guessing in a random, unbiased way.
13 The p values were calculated by using Fisher Exact test procedure.
Figure 3.2: Percentage of average correct responses for control subjects (CS) and subjects with DS on experimental match conditions

Figure 3.3: Percentage of average correct responses for control subjects (CS) and subjects with DS on experimental mismatch conditions

3.1.3.3 Summary of results

The results obtained reveal a number of clear patterns. Typically developing children showed good performance on all the experimental and control conditions except for the conditions NPM and NPX. The difficulties with interpreting these constructions
can, however, be pinned down to two subjects in the group. In the data presented by DS subjects, a strikingly different pattern emerged: these subjects showed difficulties with experimental conditions involving reflexive pronouns, both in quantified and non-quantified contexts: NRM, NRX and QRM and QRX. In contrast, no difficulties with any of the conditions involving pronouns were observed. Two subjects with DS also struggled to interpret the quantified control mismatch condition, CQNX.

3.2 Discussion

In what follows we discuss the observed results from the perspective of a delayed characterisation of language in the population with DS, but the main discussion of the pattern exhibited by DS subjects on the conditions involving the reflexive pronouns will be postponed until chapter 5.

**DPBE and the control subjects**

Our findings did not wholly confirm the existence of a Delay of Principle B Effect (DPBE)/Rule I failure in the control children. Recall from our review of the acquisition literature in chapter 2 that DPBE/Rule I failure signals children’s inability to constrain illicit coreference, revealed in their poor performance on an experimental condition such name-pronoun mismatch, NPX. Here TD children are found to incorrectly rule in constructions involving a pronoun in a local relation with a referential antecedent NP. In contrast, as illicit coreference is not possible with quantified antecedents, children successfully reject constructions QPX as ungrammatical. Two of our control subjects displayed a pattern that could be interpreted as revealing this effect: S1\(^4\) and S2 were more successful in rejecting the

\(^{14}\) It is interesting that S1 also showed difficulties interpreting the match condition, NPM, that involves a pronoun in a local relation with a referential NP. Typically developing children usually show a positive bias and thus perform better on match conditions. Nevertheless, it may be the case that this subject was more uncomfortable with the testing situation, showing lower scores across the board, thus exacerbating the shown DPB effect.
ungrammatical constructions on the condition QPX than NPX. On the basis of a modular approach to binding, this pattern would be explained by a failure of a processing rule whose responsibility it is to govern coreference, as formulated by Grodzinsky & Reinhart (1993). That the knowledge of binding conditions is intact, is supported by the children’s successful performance on the QPX type of conditions, where a constraint such as Rule I does not apply because coreference is not one of the competing interpretations.

S2 and S4 showed no traces of DPBE. Yet, the absence of this effect in their scores can be accounted for by their age: research has shown that this phenomenon is less commonly exhibited in children between 6 and 8 (see references and discussion in chapter 2).

**DPBE and subjects with Down syndrome**

In accordance with the ‘slow but normal’ characterisation of language development in DS, the general prediction made in chapter 2 is that our DS subjects would show acquisition patterns comparable to those found in TD children. Since we are investigating linguistic knowledge in adult individuals with DS whose linguistic achievement is considered complete, it is of course also feasible that no delay patterns will be found.

In the case of the knowledge of binding, the ‘delayed’ hypothesis generates the prediction that English-speaking individuals with DS should exhibit some pattern resembling the DPBE/Rule I failure, also present in two of the control subjects in this study. Note however that if children are prone to accept illicit coreference due to limitations on their processing abilities, we may in fact expect worse consequences of this effect in DS, bearing in mind the exceptional limitations on working memory in this population. Precisely this pattern for the population with DS was predicted by Scott (2001), although no experimental data were reported in this paper. The other

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15 The same subjects (S1 and S2) showed lower performance on the conditions involving a reflexive bound by a quantified antecedent. A similar effect for TD children has been reported in Chien &
logical possibility is that no effect comparable to DPBE/Rule I failure would be shown if the linguistic development in our adult DS subjects is complete. Recall that two of the control children in this study, aged 5;11 and 7;10, showed no such effect.

A question to be answered is whether the data reported in this study fit in with these predictions. It is immediately clear that no effect such as DPBE/Rule I failure is present in the data. The subjects with DS achieved maximum scores on all the conditions involving pronouns, including the crucial condition, NPX, thus showing that their knowledge of constraints governing the distribution of pronouns is intact. They rejected local coreference between the pronoun and a referential antecedent when the picture showed a reflexive action (X washing X). On the match version of this condition, NPM, they accepted the correct interpretation of the transitive picture (X washing Y). Furthermore, their performance is as faultless on questions containing a pronoun bound by a quantified antecedent, QPM and QPX. Since these patterns indicate no presence of a DPBE, the prediction that knowledge of binding in DS reflect patterns reported in typical development is not borne out. Note, however, that this still does not invalidate the ‘delay’ hypothesis itself. It is conceivable that we just caught the four subjects with DS at a point past the DPBE stage.\(^{16}\) But, a different pattern observable in the DS data to be examined next suggests that the ‘delay’ hypothesis cannot be upheld.

‘Delay of Principle A Effect’ in Down syndrome
The data presented in the results section for the subjects with DS reveal an unexpected pattern in the subjects’ performance on conditions involving reflexive pronouns. On the name-reflexive condition, match and mismatch, subjects achieved only 59% correct for NRM, and 56% correct for NRX. On the quantified version of

\(^{16}\) In view of reported processing limitations in the DS population the fact that a processing constraint such as Rule I poses no difficulties to our DS subjects is unexpected, if not problematic. Recall that Grodzinsky et al (1993) report a DPBE-like effect to be present in adult aphasics. This issue will be discussed in chapter 5, in relation of a proposed model of constraining coreference relations that circumvents this problem.
these conditions, a similar, if not poorer, pattern emerged: 25% correct for QRM and 47% correct for QRX. Individual data show that each of the four subjects performed below chance level on at least one (match or mismatch) or both conditions involving an anaphor bound by a quantified or a referential antecedent, which points to a systematic misinterpretation of these constructions. No consistent positive or negative bias was displayed, thus a low score on either match or mismatch condition can be interpreted as evidence for their failure to master this particular construction. Recall that this pattern is in striking contrast to DS subjects’ near perfect performance on control conditions, or conditions involving pronouns.

No similar pattern was present in the results shown by typically developing control subjects in this study, who were matched to the DS subjects on a measure of receptive vocabulary.\(^\text{17}\) Such a pattern is not documented at any stage of typical language development either, as reported for English in Jakubowicz (1984), Wexler & Chien (1985) Chien & Wexler (1990), Grimshaw & Rosen (1990) or other languages in studies which focussed on typical acquisition of binding, as we saw in the previous chapter. Importantly, this pattern has recently been replicated in a group of young (5 and 6 year old) English speaking children with DS (Ring & Clahsen, 2003). Using the experimental paradigm of van der Lely & Stollwerck (1997) (similar to ours; originally used for children with SLI and a large group of TD children of different ages), this study reports that children with DS had more difficulties interpreting experimental questions containing reflexives, bound either by a referential or a quantified antecedent, than those containing pronouns in the same contexts. Our findings thus provide strong evidence against the characterisation of language

\(^{17}\) Note that it has been reported that especially younger TD children sometimes show slight difficulties with the QRX type of condition; two of the control subjects in this study also seem to reveal this pattern by showing a 62.5% correct performance on this condition. No adequate explanation is given in the literature, however, interpreting quantified structures is known to present difficulties to TD children: children also score lower on quantified structures involving personal pronouns. The pattern shown by the DS subjects in this study cannot be related to this particular pattern in typical development, as the difficulties with reflexive pronouns are all-pervasive and present in all conditions involving reflexives. In fact, our subjects showed the worst performance with the match condition of this condition, with only 25% correct. This is not the pattern reported in typical language acquisition.
development as severely delayed but essentially non-deviant. Moreover, they point to some kind of a syntactic deficit in the population with DS.

On the face of it, this pattern can be interpreted as revealing some deficiency in the grammar of DS which causes a ‘delay’ in the acquisition of a syntactic principle, e.g. Principle A of standard Binding Theory (revealing a “Delay of Principle A Effect”), which states that ‘anaphors must be bound’. Such an explanation would in fact be in line with the delayed characterisation of linguistic development. But note that if Principle A of standard BT were unavailable in the grammar of DS subjects, they would be expected to rule in all the sentences violating the principle, whilst not rejecting any constructions with reflexives as ungrammatical. The fact that our subjects did not show such a pattern: they said ‘yes’ to experimental questions of the mismatch condition as often as they said ‘no’ to questions of match conditions involving reflexives, rules such an explanation out.

In the framework of R&R (1993) we adopt, the distribution of pronouns and anaphors is regulated by the binding conditions A and B and the Chain Condition. Conditions A and B do not state any restrictions on the structural domain of pronominal elements themselves, only the Chain Condition restricts formation of the chain. Is it then conceivable that the subjects do not have one of the binding conditions at their disposal? Since the binding conditions of R&R are in fact conditions on the reflexivity of predicates we do not want to suggest that knowledge of semantics is unavailable to them. They have in fact shown that they are able to interpret reflexive predicates: recall that they correctly ruled out structures of the NPX and QPX condition where the predicate is reflexive but the pronoun does not reflexive-mark it in the syntax. What is important is that for the anaphor to be interpreted, a binding relation between the anaphor and its antecedent must be established, a relation syntactic in nature. Our argument will be that the pattern revealed exposes difficulties
in establishing the syntactic relation between the anaphor and its antecedent. This argument will be substantiated in chapter 5, where we present a more technical analysis of our findings which will be couched in the framework of R&R. This framework will answer for both the English and the Serbo-Croatian data.

Quantifiers in the performance of subjects with DS

Two of the DS subjects showed exceptionally poor performance on the control condition *quantifier-name* mismatch, CQNX, a result that, at first sight, questions the validity of these subjects’ performance on the experimental conditions involving pronouns and reflexives and their quantified antecedents, QRM/QRX and QPM/QPX. Following the original design of Chien & Wexler (1990), this control question was aimed at probing subjects’ knowledge of quantifiers, independently of their interpretation of pronouns or reflexives. However, the ensuing discussion will reveal that this experimental question in fact did not successfully ‘control’ for the knowledge of quantifiers in the experimental conditions containing pronouns and reflexives in a local relation with the quantified DP. There was a crucial difference between the pictures used in control as opposed to experimental conditions involving quantifiers. The control question CQNX was accompanied by a picture showing only 2 of the 3 characters involved in an action, e.g. two bears washing Peter Pan, with one bear standing by (see picture 5b above). The match counterpart of this condition, CQNM, showed all three characters involved in an action of washing/touching/drying, directed to another character, with no character left out (e.g. three penguins washing Sylvester in picture 5a). In contrast, both match and mismatch experimental conditions involving quantified DPs as antecedents of pronouns or reflexives were accompanied by pictures showing either all three

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18 Interestingly, recall from chapter 2 that some similar pattern, affecting only quantified reflexive constructions, was found in another language-impaired population, children with SLI (van der Lely & Stollwerck, 1997). Language deficit in SLI has also been claimed to be syntactic in nature (Clahsen, 1991; van der Lely, 1994). While we do not claim that the pattern shown in SLI and DS is due to some common underlying deficit, this parallel can be interpreted as a signal that binding is a syntactic module susceptible to deficit in language impairments, in the same vein as passives have been found to be problematic in aphasics, as well as SLI, and DS.
characters involved in an action (pictures 3b, 4a) or none (pictures 3a, 4b). This contrast in 'symmetry', with CQN X pictures being 'asymmetric' (i.e. only two out of three characters involved in an action) and all other pictures being 'symmetric' (either all or none of the characters involved in an action) seems to be the clue to S1 and S4's performance. Literature on the acquisition of quantification in typical development abounds with reports of young children being unable to interpret universal quantifiers such as 'every', 'each' and 'all' in contexts where there is a mismatch between the number of agents and objects presented visually (Donaldson & Lloyd, 1974; Inhelder & Piaget, 1964; Phillip, 1995; amongst others). When asked a question such as 'Is every boy holding a truck?', accompanied by a picture showing three boys holding a toy truck each, with one truck not being held, children often reply 'no'. Similarly, the same answer is given when this question is accompanied by a picture showing three boys with only two boys holding a toy truck and the third boy holding nothing – the situation depicted in experimental pictures used with condition CQN X in this study. Referring to this phenomenon as 'quantifier spreading', Philip and colleagues argue that children spread the scope of the quantifier to both subject and object NP in a sentence when there is an absence of one-to-one correspondence between agents and objects depicted, thus quantifying over entire events rather than just individuals or objects involved. It is thus likely that the poor performance on the quantified control condition shown by two of our subjects with DS is a sign of an incomplete knowledge of quantified constructions, parallel to what is reported for younger TD children in the literature.

Though the typically developing control subjects in the present study showed good performance on this construction, other studies using an identical experimental paradigm have reported younger TD children showing difficulties in interpreting this particular question. The youngest group in Chien & Wexler's experiment 4 (1990)

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19 Drozd (2001) refers to the two types of errors as 'exhaustive pairing error' and 'underexhaustive pairing error' - the latter error being the one observed in our subjects.

20 See Crain, Thornton, Boster, Conway, Lillo-Martin & Woodams (1996) for an argument that it is the experimental design to blame for the quantifier spreading effect rather than children's incomplete knowledge of quantified structures.
showed dismal performance on the quantifier 'every': under 4-year-olds achieved a rate of only 33% correct, whilst children one year older got 72% correct. The good performance of our control subjects could be explained by their age – they are of similar age or older than the eldest group of children in Chien & Wexler's study.

In any case, it seems safe to conclude that the DS subjects' performance on pronouns and reflexives bound by quantified NPs performance in this study cannot be correlated with their performance on the control condition CQNX. Subjects S1 and S4 who scored poorly on CQNX still achieved faultless performance on experimental conditions involving pronouns bound by quantified antecedents. Conversely, subjects S2 and S3, whose performance was 100% correct on CQNX, reached only 50% and 12.5% correct on the match condition involving reflexives bound by a quantifier.

3.3 Summary

In this chapter we reported findings of an experimental study on the knowledge of binding in four English-speaking, highly functioning young adults with DS. With the aid of a version of the truth-value judgment task, a task extensively used in studies on typical acquisition of this aspect of grammar, we uncovered a severe deficiency in the DS subjects' ability to interpret constructions involving anaphors. In our view, this performance presents firm evidence that the deficit in the language of DS is syntactic in nature. Such a pattern was not reported either in our control subjects or in typically developing children elsewhere, but was recently confirmed in a sample of much younger children with DS (Ring & Clahsen, 2003). While we leave the main discussion of the nature of the deficit for chapter 5, these findings present a powerful argument against the traditional claim that syntactic development in DS essentially follows that of non-impaired children. The subjects' performance on conditions involving pronouns also contradicts this view, as they showed no trace of the famous DPBE/Rule I failure, characteristic of young TD children acquiring English and some other languages (see chapter 2). Moreover, our results disconfirm the prediction that
the failure of a processing constraint such as Rule I of (Grodzinsky & Reinhart, 1993) will have an even graver effect on the performance of DS subjects (Scott, 2001), in the face of reported processing limitation in this population.

If our claim that syntactic binding is deficient in the grammar of DS is correct, it should be replicated in populations with DS crosslinguistically. We test this claim in the following chapter, repeating the study with DS speakers of a language unrelated to English, namely Serbo-Croatian.
4 Binding in DS: Serbo-Croatian\textsuperscript{1} experiment

4.0 Introduction

In this chapter I present the experimental investigation of binding in Serbo-Croatian (SC)-speaking individuals with DS. A brief overview of the pronominal system in SC is given to familiarize the reader with basic facts needed for understanding the task presented to children in the acquisition of binding in this language. The experimental study that follows is a version of the English experiment introduced in the previous chapter with English speakers with DS. The data obtained in the experiment will be discussed in terms of the 'delay, with no deviance' characterisation of language development in DS. As research is relatively sparse on the acquisition of SC, here I spend more time exploring the patterns in typically developing (TD) children before discussing the patterns shown by the individuals with DS and comparing them to those found in typical acquisition.

4.1 Properties of the pronominal system in SC

Unmarkedly SVO, SC is known for extensive scrambling. The word order freedom is correlated with a rich inflectional system: each argument is marked by morphological case affixes, which denote the argument's function in a clause, and each modifier agrees with its head with regard to case, gender and number features. Not surprisingly, it is a (subject) pro drop language. Both tensed verbs and participles agree with the subject in gender and number, whilst verbs also agree with the subject in person. There is no participle/object agreement.

Table 4.1 presents the complete paradigm of full and clitic forms of personal and reflexive pronouns in SC.

\textsuperscript{1} Since the 1990's, the official term 'Serbo-Croatian' has been referred as either Bosnian, Croatian or Serbian.
4.1.1 Full pronouns and pronominal clitics

Both full pronouns and pronominal clitics are fully specified for Case, person, gender and number features. Full and clitic forms have been argued to have a different X’ status: full pronouns are generally considered to be XPs and clitics X^s. However, the issue of the X’ status of pronouns and clitics, as well as their base generation, is a contentious one. Basing her claim on the distribution of full pronouns when modified by a particular adjective, Progovac (1998) claims that SC full pronouns are heads, generated in a lower (N) head projection and then moved to D.\textsuperscript{3} With SC having a

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\textsuperscript{2} It can be argued that SC possesses the three-way distinction between strong, weak and clitic pronouns as proposed by Cardinaletti & Starke (1994). The morphological form of full pronouns is ambiguous between weak and strong, but the phonological and syntactic properties of the two types of pronouns differ: e.g. weak forms are usually found in a derived position (Stojanović, 1997).

\textsuperscript{3} A Dative form of the reflexive clitic, ‘si’, is used in Croatian.

\textsuperscript{4} A different form, ‘ju’, is often used in Bosnian and Croatian.

\textsuperscript{5} In the examples below the adjective ‘sama’ (alone) appears before a proper name, but after a pronoun:

(i) Ni sama Marija ne zna šta da radi.
not alone Mary not knows what pro to do
‘Not even Mary knows what to do.’

(ii) Ni ona sama ne zna šta da radi.
Not she alone knows what pro that do
‘Not even she knows what to do.’
rather flexible word order, the distribution of full pronouns seems virtually unrestricted. It is interesting however that they rarely surface in the theta position itself, save for purposes of deictic use or contrastive stress (see 1). In unmarked contexts, they are usually found scrambled to the left of the verb, a circumstance presented in 2.6

(1) Marija često zove njega (contrastive stress)
‘Mary often calls him.’

(2) Marija njega, često zove ti (unmarked)
Mary him often calls
‘Mary often calls him.’

(3) Njega, Marija često zove ti (unmarked)
him Mary often calls
‘Mary often calls him.’

In traditional discourse-functional terms, such organisation of the sentence involves the NP in the base-generated position carrying information focus, which refers to

Since pronouns carry more overt morphology than nouns, Progovac (1998) argues that the overt movement of a pronoun to D is motivated by its need to check some pronominal feature e.g. referential.

6 Stojanović (1997) points out that this movement is clause-bounded, unless the pronoun is in the external topic position (iii):

(i) Marija tvrdi da je njega, često zvala ti,
Mary claims that aux him often called
‘Mary claims that she often called him.’

(ii) *Marija tvrdi njega, da je često zvala ti,
Mary claims him that aux often called

(iii) Njega, Marija tvrdi da je često zvala ti,
‘Him, Mary claims that aux often called’

Only subjunctives are known to allow long distance extraction:

(iv) Marija njega, hoče da upozna ti,
Mary him wants that pro meet
‘Mary wants to meet him.’

The same constraints seem to apply to pronominal clitics, see Progovac (1994).
'new information', whereas the fronted NP refers to 'old information'. Stojanović (1997) treats this as object shift, in the fashion of Scandinavian. However, she adopts semantic, rather than morphological motivation (Holmberg, 1986; Vikner, 1991) for this movement, as proposed by Diesing & Jelinek (1995), who argue that all definite/specific nominal elements that do not introduce novel referents must scope out of the VP.

In contrast to the full pronouns, the distribution of pronominal (and other types of) clitics is highly restricted in SC: they occupy a rigidly fixed 'second position' in a clause. In fact the clitic can either follow a full constituent, (4), or appear after the first 'word', even if the latter involves 'splitting' a syntactic constituent, as seen in (5). The obligatory 2\textsuperscript{nd} position requirement implies that SC clitics are never found in the argument position, (6), or clause initially (7).

(4) \textit{Ovaj \v{c}ovek ga poznaje.}  
\textit{this man him-cl knows}  
'\textit{This man knows him.'}

(5) \textit{Ovaj ga \v{c}ovek poznaje.}  
\textit{this him-cl man knows}  
'\textit{This man knows him.'}

(6) \textit{*Ovaj \v{c}ovek poznaje ga.}  
\textit{this man knows him-cl}  
'\textit{This man knows him.'}

(7) \textit{*Ga ovaj \v{c}ovek poznaje.}  
\textit{him-cl this man knows}  
'\textit{This man knows him.'}
The phenomenon of second position clitic placement, especially their apparent ability to split a constituent, has attracted a great deal of attention, mainly over which components of grammar have greater influence in determining clitic placement: morphology, syntax or/and phonology. Whatever weight is given to each of the components, it is generally accepted that second position cliticization is motivated by a phonological requirement for the clitic to be attached to a host on its left, whilst the actual movement happens in syntax (Čavar & Wilder, 1994; Mišeska Tomić, 1996; Progovac, 1996). Following the standard approach(es), we thus assume that pronominal clitics in SC are heads, base-generated in the argument position and head-moved to some topmost position in the clause, e.g. $C^0$, where they form a cluster with other types of clitics. The claim that SC pronominal clitics are arguments generated within VP, rather than just verbal inflection, is supported by the fact that SC does not allow clitic doubling (Halpem & Fontana, 1994; Franks & Holloway King, 2000).

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7 For an overview of clitic phenomena and different accounts of their distribution in Slavic, see Bošković 1997, Franks (1998), Franks & King (2000), Halpem & Zwicky (1996), amongst others.

8 Wilder & Čavar (1994) claim that pronominal clitics are D heads of DP arguments that move via some functional projections that the DP raises to before the movement of the clitic takes place. See Franks & Holloway King (2000) for an argument that clitics are ambiguous between being XPs and X's: although functional heads, South Slavic 2nd position clitics are generated in an argument position, and Halpem & Fontana (1994) for an argument that 2nd position clitics in SC are $X^{\text{max}}$, in contrast to verb-adjacent clitics in closely related Macedonian & Bulgarian that they consider to be $X^0$.

9 The original consensus that clitics are in $C^0$ (or Comp) seems now a contentious issue: though Wilder & Čavar (1994), Mišeska Tomić (1996), Progovac (1996), amongst others, argued that clitics are located under $C^0$ or some 'C-related' position (Rivero, 1994), Halpem (1995) claims that clitics are left-adjointed to a phrase between I and C, Franks & Holloway King (2000) that clitics occupy Agr, and others argue for an unfixed structural position (Bošković, 2000; Stjepanović, 1998).

10 The clitic cluster comprises a whole range of categories: pronominals, the reflexive clitic, auxiliaries and the question particle $li$. The order within a cluster is fixed: $li$ - auxiliary – pronominal (Acc-Dat-Gen) - reflexive - aux je. See Progovac (1996) for a discussion on the forming of the cluster:

(i) Da li mu ga je Marko poslao?
    Comp Q-prt-li him-cl-Dat him-cl-Acc aux-cl Marko sent
    Has Marko sent it to him?
### 4.1.2 The full reflexive pronoun and reflexive clitic

In striking contrast to the pronominal paradigm, there is only one reflexive form, 'sebe'. Although it is marked for Case (it has no Nominative form), the reflexive is not marked for gender, person or number, and is thus able to take a range of antecedents.

(8) Marija, sebej vidi u ogledalu.
Marija self-Acc sees in mirror
'Marija sees herself in the mirror.'

(9) Vi, sebei vidite u ogledalu.
You-pl self-Acc see in mirror.
'You see yourselves in the mirror.'

The SC anaphor is subject oriented: it can only relate to an antecedent that bears the grammatical relation of subject.\(^{11}\)

(10) Marija je pričala Suzani o sebi|/*|.
Marija aux told Susan about self
'Marija told Susan about herself.'

Similar to full pronouns, 'sebe' can be found in a variety of overt positions, with the position to the left of the verb being least marked (cf. 1, 2, 3 and 8, 9).

---

\(^{11}\) In terms of Pica (1987), subject orientation of the SC anaphor can be explained by its movement at LF: morphologically simple anaphors move at LF, are subject oriented and allow long distance antecedents, in contrast to complex anaphors, such as those in English. See Progovac (1992) for an account of anaphor distribution of SC without invoking movement: she captures the same properties of SC anaphors (morphological simplicity, subject orientation and some long distance characteristics) in terms of her ‘Relativized SUBJECT’ analysis, where the binding domain for a reflexive pronoun must contain a potential antecedent which has to be X-bar compatible with the reflexive in order to bind it.
Turning now to the clitic form of the reflexive, again there is a single form used for all persons, number and gender:

(11) Marko se brije.
Marko se shaves
‘Marko shaves.’

(12) Vi se bribete.
You se shave-pl.
‘You shave yourselves.’

The ‘se’ clitic also occupies the second position all SC clitics are restricted to, all other position are ungrammatical:

(13) *Marko brijse.
Marko shaves se
‘Marko shaves.’

(14) *Se Marko brijse.
se Marko shaves
‘Marko shaves.’

Like in Romance and other Slavic languages, ‘se’ can also appear with a number of other constructions e.g. unaccusatives (15), impersonals (16), passives (17), middles (18).¹²

¹² Some researchers have tried to give a unified account for all different types of ‘se’ clitic, e.g. Manzini (1986), where others have argued for different derivations of the constructions employing ‘se’ (Kayne, 1975; Grimshaw 1982; Zubizaretta, 1982). Other constructions employing the reflexive clitic do not concern us here, although an approach capturing the similarities between these different types of predicates in terms of absorption of a theta role, internal or external, seems attractive (Wehrli, 1986; Chierchia, 1989; Reinhart 1996).
Following the traditional approaches to reflexive cliticization (Kayne, 1975), we assume that ‘se’ is not derived in an argument position and subsequently moved (which is the view we take for pronominal clitics), but base generated as a head in some position left of the verb, from which it moves to the second position. With regard to its use with inherently reflexive predicates, it has been argued that the reflexive clitic is associated with internal (object) theta role reduction/absorption, in the sense of Wehrli (1986), Chierchia (1989) or Reinhart (1996). Reinhart (1996) argues that reflexive clitic ‘se’ signals that the predicate has undergone a valency reduction in the lexicon. In her framework, inherent reflexive marking is viewed as a lexical operation of reducing the internal theta role, where a two-way relation, $\lambda x \lambda y (xRy)$, is reduced to a property, $\lambda x(xRx)$, rendering the predicate intransitive.\(^{13}\)

\(^{13}\) Some unaccusative analyses of SC reflexive predicates may also be argued for, employing the process of saturation of the predicate’s external argument in the fashion of Marantz (1984) and Grimshaw (1982; 1990), or Kayne (1998) and Sportiche (1995). Which account is adopted has no consequences for our discussion.
Languages differ as to how they mark lexical reflexivity processes: through the inflection system – via the clitic se/si (SC, Romance), on verb morphology as in Hebrew, on the argument, as in Dutch ('zich'), or absence of marking altogether as in English.

4.1.3 Serbo-Croatian pronouns in the typology system of R&R (1993)

In R&R’s framework of Reflexivity, discussed in chapter 2, anaphors and pronominals are classified according to two characteristics: referential independence [+/-R], and their ability to reflexive-mark a predicate, [+/-SELF]. Referential properties reflect whether an element is fully specified for grammatical features of gender, number, person and structural Case; these properties determine whether the element can enter the chain formation. Elements lacking in referential features, [-R], can occupy the foot of an (extended) A-chain, whilst those with full specification for referential features, [+R], are excluded from this position. Elements that have the function of reflexive-marking, [+SELF], are able to reflexivize transitive predicates, those that are not reflexive-markers cannot appear as arguments of transitive, lexically non-reflexive predicates.

On the basis of these properties, the full SC anaphor ‘sebe’ is [-R]. It lacks most referential features, not being marked for number, person or gender. Despite a full paradigm of inherent case, it is not fully specified for structural case: like all anaphors, it lacks Nominative. Thus being [-R], it is able to occupy the foot of the A-Chain. The reflexive-marking function makes ‘sebe’ a SELF anaphor, which means that it can appear as a coargument of a transitive reflexive predicate. Both are illustrated in (19).

(19) Marko sebe voli.
Marko self loves
‘Marko loves himself.’
Chapter 4

The SC clitic ‘se’ is not an argument but an inflectional element. It occurs with inherently reflexive predicates and is unable to reflexive-mark a transitive predicate in syntax the way ‘sebe’ can:

(20) Marko *se/sebe voli.

Marko se loves
‘Marko loves himself.’

Note that the status of the clitic as a reflexive-marker may look unclear in some contexts; in certain constructions, a pragmatic context, or a syntactic context, e.g. PP, may force a reflexive reading with only the clitic. The example below seems to allow both the clitic and the full anaphor:

(21) Marko se/sebe vidi u ogledalu.

Marko se/self sees in mirror
‘Marko sees himself in the mirror.’

However, if the PP is changed the effect disappears.¹⁵

(22) Marko *se/sebe vidi u direktorskoj fotelji za godinu dana.

Marko se/self sees in chairman’s armchair in year days
‘Marko sees himself in a chairman’s position in a year’s time.’

Classification of SC personal pronouns and pronominal clitics along the R&R parameters is more straightforward. None of these elements have a reflexive-marking function, being [-SELF], and so cannot appear as arguments of reflexive predicates:

Both full pronouns and pronominal clitics have full gender, person, number and case paradigms. In accordance with the Chain Condition, these properties exclude them from appearing in the foot of the chain (even if Binding Conditions of R&R do not prevent them from occurring as arguments of inherently reflexive predicates).

This brief introduction to the pronominal system in SC and its characteristics within the typology of R&R (1993) will be relied upon in the second part of this chapter where we present the experimental study which tests knowledge of binding and coreference in the SC-speaking population with Down syndrome (DS). It will also feature in chapter 5 where we present an analysis of patterns found in individuals with DS, this time both English and SC.

4.2 Experiment II: Serbo-Croatian

The second part of this chapter focuses on the experimental investigation of the knowledge of binding in SC-speaking individuals with DS and typically developing children. In order to learn more about the patterns shown by children acquiring binding in SC, we conducted a study on a larger number of TD children of different ages. This enabled us to get a more accurate range of possible patterns across age groups. A larger set of test constructions was investigated, i.e. involving both full and
clitic forms of personal and reflexive pronouns. The experimental paradigm adapted in the English experiment in chapter 3, the truth value judgment task, was used once again.

4.2.1 Participants

i. Subjects with DS

Six female adults with DS, aged 19-29, and thirty-seven typically developing (TD) children, aged 3;3-6;11, participated in the study. Subjects with DS were recruited with the help of the Down Syndrome Association of Yugoslavia, Belgrade, and the secondary school for students with learning disabilities ŠŠ ‘Milan Petrović’ in Novi Sad, Serbia. Control subjects came from a kindergarten in Novi Sad.

Four subjects with DS were (approximately) matched according to their age and level of cognitive functioning to the four English subjects with DS in Experiment I. Two more, somewhat older subjects (23 and 29), of similar cognitive and language levels, were included in the experimental group. The purpose of this was to exhaust the population available in the two establishments where the testing was being conducted. The aetiological subtype of DS is not confirmed, but is suspected to be standard trisomy 21. All are considered by their tutors to be highly functioning in comparison to average adults with DS. Their cognitive abilities ranged from average to high with regard to the range typical for individuals with DS, as shown in Table 4.2. Their performance on the measure of cognitive ability, the Raven’s Coloured Progressive Matrices, is comparable to that of English DS subjects, with a raw score ranging from 13 to 22 (equivalent to scores obtainable for children aged between 5 – 8 years). Their performance IQ as measured by the Yugoslav standardisation of Wechsler Adult Intelligence Scales, VITI, ranged between 57 and 59, whilst their verbal IQ ranged from 61 to 64.
Table 4.2: SC-speaking DS subjects' MLU and scores on standardised IQ tests

<table>
<thead>
<tr>
<th>Age</th>
<th>MLU$^{16,17}$</th>
<th>Performance IQ$^{18}$</th>
<th>Verbal IQ$^{19}$</th>
<th>Cognitive ability$^{20}$</th>
<th>Age Equivalent (raw score)</th>
</tr>
</thead>
<tbody>
<tr>
<td>S1</td>
<td>22;3</td>
<td>4.48</td>
<td>64</td>
<td>59</td>
<td>8 (22)</td>
</tr>
<tr>
<td>S2</td>
<td>20;4</td>
<td>5.5</td>
<td>61</td>
<td>57</td>
<td>5;6 (15)</td>
</tr>
<tr>
<td>S3</td>
<td>23;1</td>
<td>3.41</td>
<td>62</td>
<td>58</td>
<td>5;6 (15)</td>
</tr>
<tr>
<td>S4</td>
<td>19;11</td>
<td>4.89</td>
<td>62</td>
<td>58</td>
<td>7 (18)</td>
</tr>
<tr>
<td>S5</td>
<td>19;6</td>
<td>4.78</td>
<td>64</td>
<td>59</td>
<td>8 (22)</td>
</tr>
<tr>
<td>S6</td>
<td>29;4</td>
<td>5.84</td>
<td>68</td>
<td>57</td>
<td>&gt;5;6 (13)</td>
</tr>
</tbody>
</table>

The noticeable disparity between verbal and non-verbal IQ is reminiscent of the pattern in the English subjects with DS, however no details of their mastery of grammar and vocabulary are given since no standardised tests of grammar and vocabulary comparable to TROG or BPVS are available. Like the English subjects in the previous experiment, all subjects lived with their families, who are of average to high social status background. Five out of six subjects came from a monolingual background; S3 has undergone schooling in SC whilst also exposed to Slovak at home. Recall that one of the English subjects, S3, also came from a bilingual home environment, English-Hindi. All subjects attended primary and secondary schooling for students with learning disabilities in Serbia. Their present day-to-day environment was comparably stimulating to that of the English subjects: S1, S2 and S5 attend a creative arts workshop, set up especially for young adults with DS. S3, S4 and S6 attended a

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$^{16}$ The speech sample was elicited with the aid of the picture book 'Frog, where are you', used in narrative elicitation in both English and languages other than English (Slobin & Berman, 1994). In highly inflected languages, MLU is best calculated in words, as counting all the morphemes would overestimate the complexity of an utterance (see Vicari et al. 2000 and Fabretti et al. 1997 for Italian, and Rivero & Goledzinowska, 2001, for Polish).

$^{17}$ On the same measure (narrative elicitation), the word MLU for a non-impaired SC-speaking adult was 6-7. For 3-7 year old children it ranged between 3.5 and 7.

$^{18}$ Performance scale of VITI (Veklserov Individualni Test Inteligencije), Yugoslav standardisation of Wechsler Adult Intelligence Scales (WAIS).

$^{19}$ Verbal scale of VITI, as above.

$^{20}$ Raven's Coloured Progressive Matrices.
attend a Centre for people with learning disabilities, where they are encouraged to engage in activities such as drawing, sewing, embroidering, or ceramics.

ii. Control subjects

Thirty seven typically developing (TD) children, aged between 3;3 and 6;11 were included as control subjects and split into four age groups. Because the topic of pronominal reference has not received much attention in SC, we included a far greater number of TD subjects in the SC version of the study. Before any conclusions about the knowledge of binding in DS can be drawn, it is essential to establish what occurs in typical language development. Inclusion of several larger groups of controls with differing ages, i.e. at different stages of language development, also helps circumvent the issue of matching: recall that the English subjects were individually matched to control subjects on vocabulary scores. Such matching was not possible with the SC-speaking population due to the lack of standardised vocabulary and grammar tests. To ensure consistency between the two experiments in English and SC, subjects with DS were individually matched to typically developing children on the basis of their raw scores on a cognitive measure such as Raven’s Coloured Progressive Matrices. This measure has been used in the literature to match individuals with DS to both typically developing children and those with Specific language impairment (Laws & Bishop, 2002). The group of control SC-speaking children, individually matched to DS subjects on the basis of raw scores on Raven’s Matrices, is similar in age to the group of controls matched to the English subjects with DS. Additionally, the performance of DS subjects is to be compared to that of the youngest group of TD children, as these may be the closest match with regard to their language abilities. Details of the children’s ages in each of the groups, and cognitive measure scores for children older than 5, are given below.
Table 4.3: Typically developing controls

<table>
<thead>
<tr>
<th>Number of subjects</th>
<th>Mean age</th>
<th>Age range</th>
<th>Cognitive ability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group 1</td>
<td>9</td>
<td>3;7</td>
<td>3;3-3;11</td>
</tr>
<tr>
<td>Group 2</td>
<td>11</td>
<td>4;5</td>
<td>4 - 4;11</td>
</tr>
<tr>
<td>Group 3</td>
<td>9</td>
<td>5;4</td>
<td>5 - 5;7</td>
</tr>
<tr>
<td>Group 4</td>
<td>8</td>
<td>6;6</td>
<td>6;1 - 6;11</td>
</tr>
</tbody>
</table>

Finally, six adult control subjects were also included in the study. They were aged between 19-27, they were native SC speakers, and were recruited from an English beginners class at a language school in Novi Sad, Serbia.

4.2.2 Materials and procedure

The task used in the study was a SC version of the truth-value judgement task used in Experiment I with English speaking subjects. Extra test conditions involving clitic forms for each of the original conditions in the English version was created, thus doubling the number of experimental conditions in the SC version. The same verbs were used, ‘dirati’ (touch), ‘prati’ (wash) and ‘brisati’ (dry). One of the attention control conditions (CNAX) was abandoned in this version, to reduce the already inflated number of testing items. Sentences were constructed to reflect the unmarked order in SC, with full pronouns and full reflexives in the unmarked preverbal position. The clitic forms occupied the obligatory second position. For some examples of the experimental and control questions, the reader can turn to Table 4.4, but the full list is given in the appendix.

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21 Raven’s Coloured Progressive Matrices.
22 Scores were not available for all subjects. Only 6 out of 9 subjects in group 3, and 7 out of 8 subjects in group 4 were tested on this measure. The test is not applicable to children younger than 5 i.e. all children in groups 1 and 2.
Table 4.4: Example questions used in the SC test (full list in SC given in the appendix)

<table>
<thead>
<tr>
<th>Experimental conditions</th>
<th>match items</th>
<th>mismatch items</th>
<th>example</th>
</tr>
</thead>
<tbody>
<tr>
<td>name-pronoun</td>
<td>NPM 8</td>
<td>NPX 8</td>
<td>Is Snow White her washing?</td>
</tr>
<tr>
<td>name-pron. clitic</td>
<td>NPMcl 8</td>
<td>NPXcl 8</td>
<td>Is her-cl Snow White washing?</td>
</tr>
<tr>
<td>name-reflexive</td>
<td>NRM 8</td>
<td>NRX 8</td>
<td>Is Snow White self washing?</td>
</tr>
<tr>
<td>name-reflexive clitic</td>
<td>NRMcl 8</td>
<td>NRXcl 8</td>
<td>Is se Snow White washing?</td>
</tr>
<tr>
<td>quant-pronoun</td>
<td>QPM 8</td>
<td>QPX 8</td>
<td>Is every bear him washing?</td>
</tr>
<tr>
<td>quant-pron clitic</td>
<td>QPMcl 8</td>
<td>QPXcl 8</td>
<td>Is him-cl every bear washing?</td>
</tr>
<tr>
<td>quant-reflexive</td>
<td>QRM 8</td>
<td>QRX 8</td>
<td>Is every bear self washing?</td>
</tr>
<tr>
<td>quant-refl clitic</td>
<td>QRMcl 8</td>
<td>QRXcl 8</td>
<td>Is se every bear washing?</td>
</tr>
<tr>
<td>Control conditions</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>name-name</td>
<td>CNNM 8</td>
<td>CNNX 8</td>
<td>Is Snow White washing Cinderella?</td>
</tr>
<tr>
<td>quant.-name</td>
<td>CQNM 8</td>
<td>CQNX 8</td>
<td>Is every bear touching Peter Pan?</td>
</tr>
<tr>
<td>Attention</td>
<td>----</td>
<td>-- CAX 16</td>
<td>Is Father Christmas sleeping?</td>
</tr>
<tr>
<td>Total No. of items:</td>
<td>176</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Every effort was made to ensure that, wherever possible, the procedure used mirrored that of the English version of the experiment. After introducing characters in a picture, e.g. ‘This is Cinderella. This is Snow White’, subjects were presented with an experimental question, e.g. ‘Is Cinderella washing her?’. Answers were coded onto an answer sheet, together with any other comments provided by the subject. Four trial questions were used at the beginning of each experimental session to ensure that the task was understood. Again, no feedback was given about subjects' performance. Due to the larger number of experimental items in the SC version of the experiment, experimental questions were presented in the course of 5 experimental sessions, with 32 questions administered in each of the 4 sessions, and 44 questions in one session.
Experimental sessions were conducted in an empty classroom at the child's school/college. The procedure for adult control subjects differed slightly in that only two experimental sessions were needed to administer experimental items. Subjects were aware that the experimental material was being tested for a study on very young or language impaired children.

4.2.3 Results: Control subjects

The data provided by the four TD groups will be analysed first. This will enable us to identify which patterns in the acquisition of binding and coreference in SC by typically developing children are relevant for our investigation of this knowledge in DS. The performance of the subjects with DS will then be compared to the individually matched sample of TD children, as was done in the English experiment. It should be noted first that the six adult non-impaired controls, aged between 19 and 27, showed a ceiling performance.

Details of the mean scores for each of the four groups of typically developing children are given in tables below. A mixed repeated measures ANOVA revealed significant effects of age ($F(3, 33)=14.415$, $p<0.001$) and test condition, i.e. sentence type ($F(20, 660)=55.304$, $p<0.001$), but no significant interaction between these two variables. The post-hoc Tukey test revealed that only the mean scores of the youngest group, G1, were statistically significantly different from each of the other three groups ($p<0.001$). There were no statistically significant differences between the three older groups’ scores, G2, G3 and G4.

4.2.3.1 Control conditions

Mean scores and standard deviations for the four groups of control children on each of the control conditions, match and mismatch, are presented in Table 4.5.
Table 4.5: Mean scores for control subject on control match and mismatch conditions

<table>
<thead>
<tr>
<th>Match</th>
<th>Group 1 age &lt;4</th>
<th>SD</th>
<th>Group 2 age 4-5</th>
<th>SD</th>
<th>Group 3 age 5-6</th>
<th>SD</th>
<th>Group 4 age 6-7</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>CNNM</td>
<td>7.89</td>
<td>0.33</td>
<td>7.91</td>
<td>0.30</td>
<td>7.89</td>
<td>0.33</td>
<td>8.00</td>
<td>0.00</td>
</tr>
<tr>
<td>CQNM</td>
<td>7.67</td>
<td>0.70</td>
<td>7.73</td>
<td>0.46</td>
<td>7.78</td>
<td>0.66</td>
<td>7.88</td>
<td>0.35</td>
</tr>
<tr>
<td>mismatch</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CNNX</td>
<td>7.56</td>
<td>0.72</td>
<td>7.82</td>
<td>0.60</td>
<td>8.00</td>
<td>0.00</td>
<td>8.00</td>
<td>0.00</td>
</tr>
<tr>
<td>CQNX</td>
<td>4.44</td>
<td>2.96</td>
<td>5.64</td>
<td>2.42</td>
<td>6.11</td>
<td>2.42</td>
<td>7.63</td>
<td>0.51</td>
</tr>
<tr>
<td>CAX</td>
<td>11.56</td>
<td>0.88</td>
<td>11.73</td>
<td>0.46</td>
<td>11.67</td>
<td>0.70</td>
<td>12.00</td>
<td>0.00</td>
</tr>
</tbody>
</table>

Notes: Maximum score of 8 for each condition except for CAX, 12; SD = standard deviation

As seen in Figure 4.1, all children achieved over 95% correct on nearly all control conditions. The big exception, however, is the condition involving a quantified DP, quantifier-name mismatch, CQNX. Groups 1, 2 and 3 scored 55%, 70% and 76.25% correct, respectively, whilst only the oldest children, in group 4, reached 95% correct.

Figure 4.1: Percentage of correct responses for four groups of control subjects on control match and mismatch conditions
4.2.3.2 Experimental conditions

i. Match conditions

Table 4.6 gives the mean scores for the match experimental conditions involving full and clitic forms of pronouns and reflexives, with either a referential or a quantified antecedent.

Table 4.6: Mean scores for control subjects on experimental match condition, non-clitic and clitic forms

<table>
<thead>
<tr>
<th>match pronouns</th>
<th>Group 1 age &lt;4 SD</th>
<th>Group 2 age 4-5 SD</th>
<th>Group 3 age 5-6 SD</th>
<th>Group 4 age 6-7 SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>NPM</td>
<td>7.33 1.00</td>
<td>7.64 0.67</td>
<td>7.78 0.44</td>
<td>7.75 0.46</td>
</tr>
<tr>
<td>NRM</td>
<td>7.00 1.00</td>
<td>7.45 0.82</td>
<td>7.67 0.70</td>
<td>8.00 0.00</td>
</tr>
<tr>
<td>QPM</td>
<td>7.22 0.83</td>
<td>7.82 0.40</td>
<td>7.67 0.70</td>
<td>8.00 0.00</td>
</tr>
<tr>
<td>QRM</td>
<td>7.22 0.83</td>
<td>7.55 0.52</td>
<td>7.89 0.33</td>
<td>7.88 0.35</td>
</tr>
<tr>
<td>Clitics</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NPMcl</td>
<td>7.67 0.50</td>
<td>7.91 0.30</td>
<td>7.89 0.33</td>
<td>7.50 0.53</td>
</tr>
<tr>
<td>NRMcl</td>
<td>7.22 0.66</td>
<td>7.45 0.68</td>
<td>7.67 0.70</td>
<td>7.88 0.35</td>
</tr>
<tr>
<td>QPMcl</td>
<td>7.33 0.70</td>
<td>7.64 0.92</td>
<td>7.44 0.88</td>
<td>7.88 0.35</td>
</tr>
<tr>
<td>QRMcl</td>
<td>7.44 0.52</td>
<td>7.73 0.46</td>
<td>7.56 0.72</td>
<td>7.75 0.70</td>
</tr>
</tbody>
</table>

Notes: Maximum score of 8 for each condition; SD = standard deviation

Children's performance on the match conditions does not vary across groups or conditions, as demonstrated in figures 4.2 and 4.3. The scores for all groups cluster around 90% correct or higher, with the scores belonging to the youngest group, G1, usually being the lowest. This tendency is evident in all conditions, match or mismatch.
Figure 4.2: Percentage of correct responses for four groups of control subjects on experimental match conditions with non-clitic forms

Figure 4.3: Percentage of correct responses for four groups of control subjects on experimental match conditions with clitic forms
ii. Mismatch conditions

Results for the control subjects on the mismatch conditions involving the full and clitic forms of pronouns and the reflexive are given in Table 4.7 below.

Table 4.7: Mean correct response for control subjects on experimental mismatch condition, non-clitic and clitic forms

<table>
<thead>
<tr>
<th>mismatch</th>
<th>Group 1</th>
<th>SD</th>
<th>Group 2</th>
<th>SD</th>
<th>Group 3</th>
<th>SD</th>
<th>Group 4</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>age &lt;4</td>
<td></td>
<td>age 4-5</td>
<td></td>
<td>age 5-6</td>
<td></td>
<td>age 6-7</td>
<td></td>
</tr>
<tr>
<td>NPX</td>
<td>7.11</td>
<td>0.92</td>
<td>7.64</td>
<td>0.67</td>
<td>7.89</td>
<td>0.33</td>
<td>8.00</td>
<td>0.00</td>
</tr>
<tr>
<td>NRX</td>
<td>7.78</td>
<td>0.66</td>
<td>7.82</td>
<td>0.40</td>
<td>7.89</td>
<td>0.33</td>
<td>8.00</td>
<td>0.00</td>
</tr>
<tr>
<td>QPX</td>
<td>6.89</td>
<td>0.92</td>
<td>7.64</td>
<td>0.92</td>
<td>8.00</td>
<td>0.00</td>
<td>7.88</td>
<td>0.35</td>
</tr>
<tr>
<td>QRX</td>
<td>7.33</td>
<td>0.86</td>
<td>7.91</td>
<td>0.30</td>
<td>7.56</td>
<td>0.52</td>
<td>7.88</td>
<td>0.35</td>
</tr>
</tbody>
</table>

Clitics

<table>
<thead>
<tr>
<th>mismatch</th>
<th>Group 1</th>
<th>SD</th>
<th>Group 2</th>
<th>SD</th>
<th>Group 3</th>
<th>SD</th>
<th>Group 4</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>age &lt;4</td>
<td></td>
<td>age 4-5</td>
<td></td>
<td>age 5-6</td>
<td></td>
<td>age 6-7</td>
<td></td>
</tr>
<tr>
<td>NPXcl</td>
<td>6.89</td>
<td>1.36</td>
<td>7.73</td>
<td>0.46</td>
<td>7.89</td>
<td>0.33</td>
<td>8.00</td>
<td>0.35</td>
</tr>
<tr>
<td>NRXcl</td>
<td>6.33</td>
<td>0.70</td>
<td>7.00</td>
<td>1.18</td>
<td>6.78</td>
<td>1.09</td>
<td>7.25</td>
<td>0.88</td>
</tr>
<tr>
<td>QPXcl</td>
<td>6.00</td>
<td>2.23</td>
<td>7.91</td>
<td>0.30</td>
<td>7.67</td>
<td>0.50</td>
<td>8.00</td>
<td>0.00</td>
</tr>
<tr>
<td>QRXcl</td>
<td>6.44</td>
<td>1.42</td>
<td>7.45</td>
<td>0.68</td>
<td>6.89</td>
<td>1.36</td>
<td>7.63</td>
<td>0.74</td>
</tr>
</tbody>
</table>

Notes: Maximum score of 8 for each condition; SD = standard deviation

Figure 4.4 shows that on the full (non-clitic) forms, the three eldest groups maintained scores around 95% correct or higher. The youngest group, G1, showed negligibly lower scores on the condition involving full pronoun in a local relation with the quantifier, 85% correct for QPX, and 89% on the non-quantified version of this condition, NPX.
Figure 4.4: Percentage of correct responses for four groups of control subjects on experimental mismatch conditions, non-clitic forms

The most varied, but still very high performance, is observed on the mismatch clitic conditions. A look back at Table 4.7 reveals that the youngest group, G1 (under four year olds) again attained lower scores and higher standard deviations than the other three groups. On the conditions involving pronominal clitics, NPXcl and QPXcl, they scored 85% and 75% correct, respectively. With reflexive clitic conditions, similar scores were achieved: 79% correct on NRXcl, and 80% correct on QRXcl. These scores are displayed in Figure 4.6.

Children in the oldest group, G4, aged between six and seven years, maintained highest performance, with minimum score on any condition being 90% correct (NRXcl). G2, four to five year olds, also showed a strong performance, with 87.5% correct being their lowest score, again on NRXcl. G3, five to six year olds, achieved over 95% correct with pronominal clitics (NPXcl and QPXcl), and slightly less with the conditions involving the reflexive clitic: 84% with NRXcl and 85% with QRXcl.
4.2.3.3 Summary of results

The four groups of SC-speaking typically developing (TD) children showed high performance across test conditions. Children in the eldest group, G4 (6-7 years olds), consistently showed adult-like performance, scoring over 95% correct on most conditions, with their performance ranging between 90% and maximum 100% correct. Similar results were achieved by the two younger groups, with scores for G2 (4 - 5 year olds) ranging between 87.5% to 99% correct, and G3 (5 - 6 year olds), between 84% - 100% correct on all experimental and most control conditions. Although the youngest group, G1 (3-4 year olds), performed worse relative to the older groups on most conditions, their performance still rarely dipped below 80% correct on the experimental conditions, ranging between 75% -97.5% correct.

4.2.4 Discussion: Control subjects

In the following discussion, we examine the patterns displayed by TD children acquiring SC, focussing on their interpretation within the framework adopted here. It
will be shown that SC speaking children show knowledge of binding early on, in line with reports for other languages, as seen in chapter 2.

i. Control conditions

While performing well on all control conditions, younger control subjects showed difficulties interpreting constructions involving quantified DPs on the control condition *name-quantifier* mismatch, CQNX. The eldest group aside, the 3 younger groups, G1, G2 and G3 showed scores considerably lower than on any other condition, control or experimental. Recall from our discussion of the English version of this experiment that this control condition aimed to test children’s knowledge of quantifiers independently from their knowledge of pronominal elements, therefore containing only proper names. However, recall also that the experimental design used in the present study seems to have elicited some sort of a quantifier spreading error (Philip, 1995) (or ‘underexhaustive pairing error’, in terms of Drozd, 2001) as the picture involved a mismatch in the number of characters involved in an action: the question ‘Is every bear washing Peter Pan?’ was presented along with the picture depicting only 2 out of 3 bears doing so. In line with reports from the literature crosslinguistically (French – Inhelder & Piaget, 1968; Dutch – Philip & Verrips, 1994; Japanese – Takahashi, 1991; Korean – Kang, 2002), this effect was most apparent with youngest SC-speaking controls, and it seems to gradually fade away as the groups get older.

Similarly, in the study that we modelled our experimental design on, Chien & Wexler (1990), of the four groups tested children under 4 scored less than 35% on the same condition, while 4 to 5 year olds reached 70% correct.\(^{23}\)

\(^{23}\) The marked difference between the performance of Chien & Wexler’s youngest group and group 1 in this study (35% vs. 55% correct) may be due to the age difference between the groups. Some of the children in Chien & Wexler group were as young as 2, whereas children in Group 1 in our study were all older than 3, with ages ranging from 3;3 to 3;11.
Whilst the effect of quantifier spreading shown by the young children acquiring SC certainly merits further investigation, the poor performance on this condition clearly did not affect the control children’s scores on other experimental conditions involving quantifiers. All children showed considerably higher performance on constructions containing pronouns or reflexives, clitic or full forms, bound by quantified DPs. For instance, four to five year olds in G2, who scored 70% correct on CQNX, showed a minimum of 93.75% correct on all other conditions involving a pronominal element bound by a quantified DP. These discrepancies suggest that the control condition CQNX did not adequately gauge the knowledge of quantified constructions in the study.

ii. Experimental conditions

The consistently high performance on experimental conditions shown by TD children acquiring SC in our study supports the claim that the constraints governing the distribution of anaphors and pronouns are in place early and seem to be fully acquired by the age of 4. These findings are in line with reports that the binding principles are acquired early on in other languages, as discussed in chapter 2. Recall that in the framework of R&R (1993), knowledge of binding refers to the conditions on the reflexivity of predicates and the condition on A-chains, whereas coreference is regulated by an extrasyntactic constraint. For a recap, the binding conditions state that a) A reflexive predicate must be reflexively interpreted; and b) A reflexive predicate must be reflexive-marked. The Chain Condition states that only [-R] elements are restricted to the foot position in the chain, therefore excluding pronouns and pronominal clitics but allowing anaphoric elements in this position. This theoretical framework generates specific predictions about the performance children should show on particular experimental conditions. We now review those patterns that shed light on children’s knowledge of binding, after which we turn to those that concern their knowledge of coreference.
Knowledge of Condition A of R&R is evident from children’s performance on the match and mismatch conditions involving the full anaphor ‘sebe’. They correctly interpreted reflexive predicates as reflexive when the predicate was reflexive-marked in syntax by the anaphoric coargument. This was proved by their ability to provide positive answers to questions containing the anaphor when the picture accompanying the sentence showed a reflexive action (*name-reflexive, NRM, and quantifier-reflexive* match, QRM), and negative answers to the same question when a transitive action was depicted (*name-reflexive, NRX, and quantifier-reflexive* mismatch, QRX). Comprehension of constructions involving the full form of the anaphor in SC have not been tested in the study by Kudra/Stojanović (1994), but a similar pattern is commonly reported in English and other languages (Jakubowicz, 1984; Chien & Wexler, 1985; 1990; Philip & Coopmans, 1996; see chapter 2).

**Reflexive clitic**

Note that SC provides further opportunity to test for knowledge of Condition A, by generating conditions with a reflexive clitic: *name-reflexive clitic* match (NRMcl) and mismatch (NRXcl), *quantifier-reflexive clitic* match (QRMcl) and mismatch (QRXcl). Here the predicate is lexically reflexive, i.e. marked as reflexive in the lexicon. Children provided correct answers to the match conditions involving the clitic, showing that they did indeed interpret the predicate reflexively. However, their performance showed greater variance on the mismatch type condition, *name-reflexive clitic* mismatch, NRXcl, and *quantifier-reflexive clitic* mismatch, QRXcl. Here they were required to provide a negative reply to the question when the picture showed a transitive action. The performance of groups G2 and G3 also showed a very slight dip on at least one of these two conditions: on the NRXcl condition G2 achieved an average score of 87.5% correct and G3 84% correct. On the QRXcl condition G3 gave a correct response 86% of the time (although these scores did not reach statistical significance: a score of 87.5% indicates 7 out of 8 correct). These findings are not in line with Romance studies, which typically show that children acquiring Romance achieve their highest performance on reflexive clitics relative to other
pronominal elements. However, Kudra/Stojanović (1994) also reports slightly lower results from her SC-speaking children on the reflexive clitic constructions, at 81% correct. This is lower than their performance for pronouns and pronominal clitics, where they attained 88% correct responses (these differences were not statistically significant however). How can these results be interpreted? We have seen that children have the working knowledge of conditions on reflexivity of predicates: their faultless performance on conditions involving the full anaphor, 'sebe'. Upon closer examination of the results, we found that the small percentage of incorrect positive answers with the predicates containing the reflexive clitic involved constructions with the verb 'touch', rather than 'wash' or 'dry': for the youngest group, G1, the error rate on the condition NRXcl involving constructions with 'wash' and 'dry' was only 2.7%, whilst it was 39% for 'touch'. This contrast is likely to be caused by different properties of the predicates in question: note that 'prati' (wash) and 'brisati' (dry) can be either inherently reflexive, when they are accompanied by the clitic 'se', or transitive, when they are reflexive-marked by the full anaphor 'sebe'. 'Touch' is not inherently reflexive but a regular transitive verb that can be reflexive-marked in syntax only with the aid of the anaphor 'sebe'. Although the clitic is not a reflexive marker, it is possible to get the reflexive reading with the clitic alone, rather than the anaphor, given an appropriate pragmatic context. In our experimental design, the reflexive context was highly salient: all test pictures depicted either reflexive or transitive actions. This is why the adult controls and the eldest group of TD children rejected the conditions NRXcl and QRXcl as unacceptable. Why then did the youngest children reply 'yes' to these questions? From the ensuing discussion, we shall see that the 'yes' responses for mismatch questions involving the verb 'touch' should not in fact be treated as errors. When used with a reflexive clitic, verbs like 'touch' acquire a reading opposite to the reflexive reading: the patient of the action is not the subject, but someone else. This is illustrated by an example from the spontaneous speech of a three year old, reported in Stojanović (2002):
(25) Tukla sam se i Natasa se tukla kad je bila mala.  
hit aux se and Natasa se hit when aux been little 
I was fighting (others) and Natasa would fight (others) when she was little.  

(Vasić corpus, in Stojanović (2002))

This unusual use of the clitic ‘se’, where it refers to some null object was first discussed by Rivero (1999), who notes that such a reading is not available in Romance, yet is possible in most Slavic languages. Rivero argues that the clitic in these constructions is a pronominal anaphor, in the sense of R&R (1993), referring to a syntactically present object that is not phonologically realised. Stojanović (2002) reinterprets the errors with reflexive clitic constructions by young children acquiring SC in Kudra/Stojanović (1994) as an indication that children are sensitive to this use of ‘se’ early on: they erred more on constructions which combined a clitic with verbs that promote a null object reading, i.e. ‘uštinuti se’ (pinch) and ‘ogrebati se’ (scratch). In contrast, verbs such as ‘umiti se’ (wash one’s face), where the use of a clitic does not invite such a reading, proved less problematic for the children: for the inherently reflexive ‘wash one’s face’, they showed only a 9% error rate. For ‘scratch’ they showed 14%, whilst the highest error rate was found for ‘pinch’, 33%. In a study investigating the different uses of ‘se’ in SC, Stojanović (2002) found that in a sentence picture matching task, which provided appropriate pictures for all the possible (ambiguous) uses of ‘se’, children chose the null object reading for verbs such as tickle, hug, kiss, as often as the reflexive reading. Adults invariably chose the reflexive reading.

The example in (i) illustrates the fact that the reflexive interpretation with a verb like ‘fight’ or ‘touch’ is also available with the clitic (rather than the full form of the anaphor) in appropriate contexts, either syntactic, in the form of a PP, or pragmatic:

(i) On se tuče u glavu.  
He se hits in head

‘He is hitting himself in the head.’

An example of a situation where the pragmatic context forces the reflexive reading is our experimental situation, where subjects were given a picture showing a reflexive action, accompanied by a question using the verb ‘touch’ and the reflexive clitic (interchangeably with the full anaphor).

Rivero (1999) also discusses another use of the reflexive clitic in null subject contexts, found in Spanish, Italian, Polish, Slovenian, as well as some dialects of SC (Danijela Stojanović, p.c.).
These findings suggest that children’s lower performance on the verb ‘touch’ in our study is due to their occasional preference for the null object reading with these types of verbs, and not to difficulties implementing their knowledge of Condition A. It must be noted, however, that the name-reflexive clitic mismatch (NRXcl) construction, requiring a ‘no’ answer, happened to be the very first experimental item (of the 176) in the test administered, making it easier for children to make that first error and provide an incorrect positive reply. Importantly, later on in the test, having seen that only reflexive or transitive contexts were depicted, children typically rejected this construction.

Knowledge of Condition B can be observed in children’s high rate of correct ‘no’ answers to experimental questions containing full and clitic pronoun forms when the action depicted is reflexive (NPX, QPX, NPXcl, QPXcl). Aware that a reflexive predicate must be reflexive marked, they ruled out constructions when a pronoun or a pronominal clitic is a coargument of a reflexive predicate.

Note that the understanding of the Chain Condition is also involved in their being able to rule out these constructions. Pronouns in a local relationship with referential or quantified antecedents are in addition ruled out by the A-chain condition, being [+R] (recall that only [-R] elements are allowed in the foot of the chain).

26 This is why many children in the older groups, G2, G3 and G4 showed 7 out of 8 correct on the condition name-reflexive mismatch, NRXcl.

27 Children’s performance on the object constructions tested in this study does not allow us to tease apart their knowledge of Condition B and the Chain Condition. In order to test for the knowledge of the A-chain condition independently, constructions involving the application of the Chain Condition only should be used, i.e. ECM constructions.

(i) *Marija, je/nju, smatra inteligentnom.
Marija her-cl/her considers intelligent.
*Marija, considers her, intelligent.'

As discussed in chapter 2, studies investigating the knowledge of pronominal elements in ECM constructions in Romance and Greek found that children in fact did accept ungrammatical sentences with the pronoun in the subject position of the small clause (Hamann et al, 1997; Baauw et al, 1997; Varlokonta, 2001; Escobar & Gavarró, 1999 - see these authors for the different accounts of this phenomenon). It would be interesting to see whether children acquiring SC would show a parallel pattern.
Condition B and pronominal clitics

Despite a generally good performance on full and clitic forms of pronouns when bound variable, the youngest group, G1, scored worst on the quantified condition involving a pronominal clitic, QPXcl, at 75% correct. Examination of individual scores shows that 4 of the 9 children in this group, aged 3.5-3.9, accepted local binding between pronominal clitics and a quantified antecedent 47% of the time, bringing down the group correct percentage to 75%.

This pattern cannot be due to failure to rule out illicit coreference, because coreference is not possible in bound variable contexts. Moreover, it is implausible that such a pattern signals a problem with the binding of the clitic, since children demonstrated knowledge of binding on a number of other constructions. This requires us to look elsewhere for a possible explanation for these results. Interestingly, pronominal clitics are acquired late, that is, later than the reflexive clitic or subject clitics. This has been claimed for a number of languages, including Croatian.28

Stiasny (2003) reports that Croatian children, aged 3-5, avoided the use of pronominal object clitics in an elicited production task significantly more often than the reflexive clitic.29 In a study on the acquisition of pronominal reference using several different experimental paradigms, Jakubowicz (1993) reports that 3-4 year-old French children show considerably lower rates of comprehension and production of object clitics as opposed to subject and reflexive clitics. Similarly, recall from chapter 2 that Romance children have been reported to show chance performance on ECM constructions where the pronominal clitic is the subject:

(26) La niña la ve bailar.

the girl her-clitic sees dance

The girl sees her dance. Baauw et al (1997)

28 In our view, the results for Croatian in this study can be generalised to Serbo-Croatian – no discernible syntactic differences with respect to pronominal clitics exist between the variants of SC.

29 Note however that no breakdown for the different uses of the clitic is given. Recall that 'se' is used in a number of different constructions, e.g. unaccusatives, passives, impersonals (see examples 13-16).
Studies investigating knowledge of these constructions in French (Hamann et al., 1997)\textsuperscript{30} and Spanish children (Baauw et al., 1997) claimed that this effect is due to incomplete acquisition of morphosyntactic features of clitics. The property in question is [-R]. According to these authors, the children are misanalysing pronominal clitics as [-R] elements, allowing them to sit in the foot position of the chain, thus essentially treating them as a reflexive clitic. Their argument is based on the fact that Romance uses first and second person pronominal clitics in reflexive contexts (French: ‘Je me lave’) whilst the reflexive clitic is only used for 3\textsuperscript{rd} person, leaving enough room for confusion in the process of the acquisition of these elements. Similar analysis has been proposed for Dutch to account both for the Dutch children’s dismal performance on the standard object ‘DPBE’ constructions, dubbed as ‘Double Dutch Delay of Principle B’ and their chance performance on the ECM constructions (Philip & Coopmans, 1996). However, for these authors, it is the incomplete acquisition of a Case feature that makes children misanalyse pronouns as [-R], with the same consequence of A-chain overgeneration, that is responsible for the problem.

It is plausible that one of these explanations could be extended to account for the performance of some of the youngest SC-speaking children on the object clitic constructions. The former, namely that pronoun clitics are misanalysed as [-R] because both first and second person pronominal clitics are used in both reflexive and non-reflexive context, cannot be appealed to for SC because in this language the reflexive clitic is obligatorily used for all persons and numbers. However, the idea that an incomplete Case feature causes children to treat pronouns as [-R] is certainly worthy of exploration.

\textsuperscript{30} Results reported in Hamann et al (1997) show that the youngest group of children acquiring French shows a lower performance on clitics generally: with reflexive clitic, on constructions equivalent to NRXcl and QRXcl they scored 74% correct; on pronominal clitics, NPXcl and QPXcl they score 78% and 70% correct respectively. Jakubowicz (1993), however, shows that 3-4 year olds make a distinction between different clitics, showing considerably more accurate performance on the reflexive and subject clitics in contrast to pronominal clitics.
One simple reason for the poorer performance on condition QPXcl by the few children in our study may be related to children's knowledge of quantification. As quantification is known to be problematic for young children, it is plausible that poorer performance on QPXcl is due to some cumulative difficulty, involving incomplete knowledge of quantification, combined with the reported difficulties with acquiring the morphosyntactic features of clitics. Three of these four children were more successful at rejecting a clitic in a local relation with a referential antecedent, on condition NPXcl.

The issues raised by the poorer performance on pronominal clitics by some of the youngest children certainly warrant further investigation. Future research might pursue this aim by testing for knowledge of these elements in a sample of children younger than those in the present study. In addition, the constructions used must go beyond the simple object constructions relied upon here, whilst quantified structures should be tested independently.

Coreference

Pronominal clitics have been claimed not to allow coreference, only binding (Avrutin & Wexler, 1992; Baauw 2000), and we have seen that children have the constraints on binding at their disposal. Not surprisingly, all SC-speaking children over 4 years of age in this study showed excellent performance with pronominal clitics, in line with reports for Romance.

Full pronouns were not found to be problematic for any of the four groups of TD children. The results reveal no difficulties on name-pronoun mismatch, NPX, the condition where English-speaking children and those acquiring many other languages have been consistently reported to show chance performance. This chance performance has been assigned to a failure to rule out illicit coreference, due to an inability to implement a processing constraint, Rule I (Grodzinsky & Reinhart, 1993). Since it is highly unlikely that SC-speaking children's processing systems are more mature than those of English speaking children of equal age, an alternative
explanation must be sought. The obvious route to follow is to claim that full pronouns in SC do not allow accidental coreference, the consequence of which is that Rule I does not apply (and thereby its failure cannot occur). Since the constructions tested here contained pronouns fronted to a preverbal, unmarked position, we avoided the problem of the incompatibility of the argument position with accidental coreference (recall that in other languages where absence of Rule I failure was shown with full pronouns - Italian, Greek, Norwegian – full pronouns were in the postverbal theta position, which is claimed to disallow accidental coreference for independent reasons). Capitalizing on the obligatory preverbal position of the SC full pronoun, it is possible that the account proposed by Baauw (2000) could be extended to explain the absence of the Rule I failure in the data presented by our SC-speaking children. Recall that in Baauw (2000) it was argued that the fact that clitics occupy a position external to the VP, heading a variable chain, is associated with their inability to allow coreference, and consequently, their exemption from the failure of Rule I. Note, however, that the problem for this, and any other account that relies on the failure of Rule I as a reason for children allowing illicit coreference, is the fact that both fronted full pronouns and clitics in SC allow accidental coreference in appropriate pragmatic contexts in the adult grammar. This is an important issue, undeservedly ignored in the literature on languages reporting the absence of Rule I failure with clitic or full pronouns, warranting an in-depth exploration by future research.

4.2.5 Results: Subjects with DS

In the ensuing sections we report the results obtained from the six SC speakers with DS. Their individual scores and group means for each of the test conditions are given in tables 4.8-4.11, along with the mean scores for the control TD group, which were matched to DS subjects on a cognitive measure (see section 4.2.1). A mixed repeated measures ANOVA revealed significant effects for both the group \( (F(1,10)=13.99, \ p=0.004) \) and test condition (sentence type) \( (F(20,200)=12.89, \ p<0.001) \), and a significant interaction \( (F(20,200)=2.27, \ p=0.002) \) between the two groups.
As it became apparent that the scores of the matched TD group revealed no difficulties on any of the experimental conditions, it was decided to make an additional comparison between DS subjects' scores and those of the youngest control group, G1. Although they were not matched formally, comparing the DS group with G1 may be informative because G1 (3-4 year olds) revealed performance slightly lower than the 3 older control groups (4-7 year olds) across test conditions. From the comparison of scores of the DS groups and the youngest group, an analysis of variance revealed significant effects for the group \((F (1,13)=1.410, p<0.001)\) test condition \((F (20,260)=13.496, p<0.001)\), and a significant interaction \((F (20,260)=2.41, p=0.001)\) between the two. We do not give mean scores for the youngest group here (they are given in the results section of the control subjects), but percentages of their correct scores are presented in figures 4.6-4.10, along with those of the DS and TD matched groups.

### 4.2.5.1 Control conditions

Table 4.8 presents individual scores, group means and standard deviations for DS subjects on control conditions, match and mismatch. Means and standard deviations for the matched control group (TDm) are also given in the two rightmost columns of the table. Individual scores for the matched control children in TDm group are included in the appendix.

**Table 4.8:** Scores for DS subjects and control TD matched group on control match and mismatch conditions

<table>
<thead>
<tr>
<th>match</th>
<th>S1</th>
<th>S2</th>
<th>S3</th>
<th>S4</th>
<th>S5</th>
<th>S6</th>
<th>DS mean</th>
<th>SD</th>
<th>TDm mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>CNNM</td>
<td>8</td>
<td>6</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>7.67</td>
<td>0.81</td>
<td>8</td>
<td>0.00</td>
</tr>
<tr>
<td>CQNM</td>
<td>8</td>
<td>4</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>7.33</td>
<td>1.63</td>
<td>7.83</td>
<td>0.40</td>
</tr>
</tbody>
</table>
Figure 4.6 depicts the performance level of the DS group, and the two control groups, namely, the matched TDm and the youngest group, G1. Subjects with DS, as well as the matched TD controls performed well on all the control conditions. DS subjects' performance ranged from a minimum of 83% correct (CQNX), to a maximum of 100% (CNNX). An independent samples t-test revealed no statistically significant differences between these groups on any of the control conditions. The comparison of DS subjects with the youngest group, G1, revealed that the difference between their scores on condition CQNX only approached significance: t(9.72)=2.132; p=0.06

Figure 4.6: Percentage correct for DS subjects and two groups of TD controls (matched TDm and youngest G1) on control conditions

Table 4.8 reveals that individual scores of subject 2 are relatively lower than all other subjects in the DS group. This will prove to be the pattern across all conditions. It
was decided to keep her scores in the presentation of results for several reasons. Our already small sample would shrink still more without her, and, even though her performance was lower, she still showed patterns that followed the pattern of the rest of the group. Most importantly, although her scores may have brought down the mean score of the DS group, when this subject and her matched control were omitted from the data, the differences between the two groups remained significant. The analysis of variance carried out for the matched DS and control subjects without S2 and her matched control reached significance for the group (F(1,8)=41.378, p<0.001), condition (F(20,160)=13.048, p<0.001) and the interaction between the two (F(20,160)=2.902, p<0.001). Importantly, we shall see that the differences between the rest of the DS group and TDm group remained significant on exactly the same experimental conditions as when S2 and her matched control were included.

4.2.5.2 Experimental conditions

Results of the match and mismatch experimental conditions are presented separately.

i. Match conditions

Table 4.9: Scores for DS subjects and control TD matched group on experimental match condition, full pronouns and clitics

<table>
<thead>
<tr>
<th>match pronouns</th>
<th>S1</th>
<th>S2</th>
<th>S3</th>
<th>S4</th>
<th>S5</th>
<th>S6</th>
<th>DS mean</th>
<th>SD</th>
<th>TD mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>NPM</td>
<td>8</td>
<td>4</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>7</td>
<td>7.17</td>
<td>1.60</td>
<td>7.83</td>
<td>0.40</td>
</tr>
<tr>
<td>NRM</td>
<td>7</td>
<td>5</td>
<td>7</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>7.17</td>
<td>1.16</td>
<td>8.00</td>
<td>0.00</td>
</tr>
<tr>
<td>QPM</td>
<td>8</td>
<td>6</td>
<td>8</td>
<td>6</td>
<td>8</td>
<td>8</td>
<td>7.33</td>
<td>1.03</td>
<td>8.00</td>
<td>0.00</td>
</tr>
<tr>
<td>QRM</td>
<td>8</td>
<td>4</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>7.33</td>
<td>1.63</td>
<td>7.67</td>
<td>0.51</td>
</tr>
<tr>
<td>NPMcl</td>
<td>8</td>
<td>4</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>6</td>
<td>7.00</td>
<td>1.67</td>
<td>7.83</td>
<td>0.40</td>
</tr>
<tr>
<td>NRMcl</td>
<td>7</td>
<td>5</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>7</td>
<td>7.17</td>
<td>1.16</td>
<td>8.00</td>
<td>0.00</td>
</tr>
</tbody>
</table>
Table 4.9 gives individual and mean scores for the DS subjects, as well as mean scores for the TD matched controls, on the match experimental conditions involving non-clitic and clitic pronominal forms. Both groups showed consistently high performance on all conditions; no statistically significant differences between their scores were revealed. DS subjects’ performance clustered at around 90%, the lowest score being 87.5% correct. Figures 4.7 and 4.8 show percentages of correct scores for the DS group and the two control groups, TD matched and the youngest G1.

Table 4.9 gives individual and mean scores for the DS subjects, as well as mean scores for the TD matched controls, on the match experimental conditions involving non-clitic and clitic pronominal forms. Both groups showed consistently high performance on all conditions; no statistically significant differences between their scores were revealed. DS subjects’ performance clustered at around 90%, the lowest score being 87.5% correct. Figures 4.7 and 4.8 show percentages of correct scores for the DS group and the two control groups, TD matched and the youngest G1.

<table>
<thead>
<tr>
<th>QPM</th>
<th>8</th>
<th>4</th>
<th>8</th>
<th>8</th>
<th>7</th>
<th>8</th>
<th>7.17</th>
<th>1.60</th>
<th>8.00</th>
<th>0.00</th>
</tr>
</thead>
<tbody>
<tr>
<td>QRMM</td>
<td>7</td>
<td>5</td>
<td>8</td>
<td>8</td>
<td>7</td>
<td>8</td>
<td>7.17</td>
<td>1.16</td>
<td>7.50</td>
<td>0.83</td>
</tr>
</tbody>
</table>

Notes: Maximum score of 8 for each condition; SD = standard deviation

**Figure 4.7:** Percentage correct for DS subjects and two groups of TD controls (matched TDm and youngest G1) on experimental match conditions, non-clitic
Figure 4.8: Percentage correct for DS subjects and two groups of TD controls (matched TDm and youngest G1) on experimental match conditions, clitic forms

ii. Mismatch conditions

A different picture emerges on the mismatch conditions: on several conditions, the differences between the two groups reached statistical significance for the first time. The data on conditions involving non-clitic and clitics forms will be presented separately. Individual scores for DS subjects, their group means and means for the matched TD group on mismatch non-clitic experimental conditions are presented in Table 4.10.

Table 4.10: Scores for DS subjects and control TD matched group on mismatch conditions, non-clitic forms

<table>
<thead>
<tr>
<th>mismatch</th>
<th>S1</th>
<th>S2</th>
<th>S3</th>
<th>S4</th>
<th>S5</th>
<th>S6</th>
<th>DS mean</th>
<th>SD mean</th>
<th>TD mean</th>
<th>SD mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>NPX</td>
<td>8</td>
<td>7</td>
<td>7</td>
<td>8</td>
<td>7</td>
<td>7</td>
<td>7.33</td>
<td>0.51</td>
<td>8.00</td>
<td>0.00</td>
</tr>
<tr>
<td>NRX</td>
<td>6</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>7</td>
<td>7</td>
<td>4.83</td>
<td>2.04</td>
<td>8.00</td>
<td>0.00</td>
</tr>
<tr>
<td>QPX</td>
<td>8</td>
<td>6</td>
<td>8</td>
<td>8</td>
<td>7</td>
<td>6</td>
<td>7.17</td>
<td>0.98</td>
<td>7.83</td>
<td>0.40</td>
</tr>
<tr>
<td>QRX</td>
<td>6</td>
<td>5</td>
<td>5</td>
<td>3</td>
<td>8</td>
<td>5</td>
<td>5.33</td>
<td>1.63</td>
<td>7.83</td>
<td>0.40</td>
</tr>
</tbody>
</table>

Notes: Maximum score of 8 for each condition; $SD = \text{standard deviation}$
If we now turn to Figure 4.9, a clear pattern can be observed: subjects with DS show a distinct performance between conditions involving pronouns and those involving the reflexive pronoun. On mismatch conditions involving full pronouns, NPX and QPX, they achieved high 92% correct and 90% correct, respectively. However, their performance on NRX and QRX, mismatch conditions involving the full reflexive, is markedly different: they attain only 60.4% correct for NRX, and 66.6% correct for QRX.

Figure 4.9: Percentage correct for DS subjects and two groups of TD controls (matched TDm and youngest G1) on experimental mismatch conditions, full pronouns and reflexive.

Not surprisingly, the independent samples t-tests revealed that these scores were significantly different to those of the TD matched group: t(5)= -3.8, p=0.01 for name-reflexive mismatch, NRX, and t(5)= -3.63, p=0.01 for quantifier-reflexive mismatch, QRX. Furthermore, the differences between the DS group and the youngest group, G1, also reach statistical significance on the same conditions: (t(5.7)= -3.4, p=0.01 for NRX, and t(6.89)= -2.75, p=0.008 for QRX.
Despite the high score of 92% that the DS group achieved on name-pronoun mismatch, NPX, independent samples t-test shows a statistically significant difference between the group with DS and the matched TD group on this condition (t (5)= -3.16, p=0.025). No other statistically significant differences between the DS group and two control groups were revealed.

In Figure 4.10 we can see that the results for the mismatch clitic conditions again reveal lower performance on several experimental conditions for the group with DS in comparison to control children. On the pronominal clitic conditions, DS subjects’ mean score is 83% for NPXcl, and 71% for QPXcl. On conditions involving the reflexive clitic, their score is 66.62% correct for both NRXcl and QRXcl.

**Figure 4.10:** Percentage correct for DS subjects and two groups of TD controls (matched TDm and youngest G1) on experimental mismatch conditions, clitic forms

No significant differences were found between the DS and the youngest G1 group on the two mismatch reflexive clitic conditions, but DS subjects’ scores on these
conditions did significantly differ to those of the (older) TD matched group: \( t (9.5) = -3.7, p = 0.004 \) for NRXcl, and \( t (6.8) = -4.3, p = 0.004 \) for QRXcl.\(^{31}\)

The mismatch conditions have revealed interesting individual variation in the group with DS, not detected by statistical analyses. Individual scores for DS subjects given in Table 4.10 show wide differences on conditions NRX and QRX. Although the group score for both conditions is just above 60% correct, subjects S2, S3 and S4 hover below or just above chance on these conditions, whereas S5 and S6 seem to show a stronger performance. Whilst S2 does not perform badly, scoring 6 out of 8, or 75% correct, note that this is the first drop recorded in her performance, which had thus far been exclusively 100%.

<table>
<thead>
<tr>
<th>mismatch</th>
<th>S1</th>
<th>S2</th>
<th>S3</th>
<th>S4</th>
<th>S5</th>
<th>S6</th>
<th>DS mean</th>
<th>SD mean</th>
<th>TD mean</th>
<th>SD mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>NPXcl</td>
<td>8</td>
<td>7</td>
<td>8</td>
<td>8</td>
<td>4</td>
<td>5</td>
<td>6.67</td>
<td>1.75</td>
<td>7.83</td>
<td>0.40</td>
</tr>
<tr>
<td>NRXcl</td>
<td>5</td>
<td>5</td>
<td>6</td>
<td>5</td>
<td>4</td>
<td>7</td>
<td>5.33</td>
<td>1.03</td>
<td>7.33</td>
<td>0.81</td>
</tr>
<tr>
<td>QPXcl</td>
<td>8</td>
<td>6</td>
<td>8</td>
<td>8</td>
<td>1</td>
<td>3</td>
<td>5.67</td>
<td>3.01</td>
<td>7.83</td>
<td>0.40</td>
</tr>
<tr>
<td>QRXcl</td>
<td>6</td>
<td>7</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>4</td>
<td>5.33</td>
<td>1.21</td>
<td>7.67</td>
<td>0.51</td>
</tr>
</tbody>
</table>

Notes: Maximum score of 8 for each condition; \( SD = \) standard deviation

In contrast, while all subjects reveal a poor performance on mismatch conditions involving the reflexive clitic (NRXcl and QRXcl), as seen in Table 4.11 above, it is S5 and S6 who show considerable difficulties on mismatch conditions involving pronominal clitics, NPXcl and QPXcl. The performance of these two subjects barely

\(^{31}\) The differences between the DS group and the matched controls remain significant on the same experimental conditions even when S2 and her matched control are excluded from the analysis; independent samples 2-tailed tests revealed that the two groups differ on NRX: \( t (4) = -3.055, p = 0.038 \); QRX: \( t (4.48) = -2.869, p = 0.04 \); NRXcl: \( t (8) = -2.846, p = 0.022 \) and QRXcl: \( t (8) = -5.099, p = 0.001 \).
reached chance on these conditions, with S5 scoring only 1 out of a possible 8 on QPXcl.

4.2.5.3 Summary of results

The results reported here revealed that Serbo-Croatian-speaking subjects with DS achieved high scores on a number of test conditions. No differences on the control conditions were found between the subjects with DS and typically developing children, either those in the matched group, or the youngest group, G1. Similarly, on all match conditions, the scores of DS subjects did not statistically differ from those of TD children. However, it was found that DS subjects’ scores were statistically significantly different from those of the matched group on mismatch conditions NPX, NRX, QRX, NRXcl and QRXcl. When compared with the youngest group, G1, the difference between the two groups was significant only on two of these conditions, NRX and QRX. Some individual variation was reported on the conditions involving the full reflexive (NRX and QRX), where S1, S2, S3 and S4 performed worse than S5 and S6. In contrast, on conditions involving pronominal clitics, NPXcl and QPXcl, S5 and S6 performed worse than S1, S2, S3 and S4.

4.2.6 Discussion

The ensuing discussion will focus on the comparisons between the patterns found in the subjects with DS and TD children, however, the main analysis of the performance displayed by DS subjects will be taken up in chapter 5.

Is language in DS ‘delayed, but essentially non-deviant?’

In earlier chapters we discussed the popular characterisation of linguistic development in the DS population in terms of the ‘delay, with no deviance’ hypothesis. If correct, this hypothesis predicts that acquisition patterns of particular linguistic modules in individuals with DS should be comparable to those found in TD
children at different stages of language development. The 'delay' hypothesis should also hold crosslinguistically, thus the same prediction is made for SC-speaking individuals with DS. The question we now wish to address is how do the patterns observed in the performance of subjects with DS match those of TD children.

The experimental data reported for typically developing children acquiring SC, aged 3-7, revealed that their knowledge of the constraints governing the distribution of pronouns and anaphoric elements is fully acquired by the age of four. No observable difficulties with any of the constructions tested were present in control groups G2, G3 and G4 (children aged four or over). However, some of the children in the youngest group, G1 (under four years of age), showed two interesting patterns. They allowed a particular non-reflexive reading with constructions containing the reflexive clitic and the predicate 'touch' (conditions NRXcl and QRXcl), as well as local binding between a pronominal clitic and a quantified antecedent (condition QPXcl). One child (out of 37) allowed binding between a pronominal clitic and both quantified and referential antecedents (QPXcl and NPXcl).

If the delayed hypothesis is valid, similar patterns are to be expected in our group of individuals with DS. Let us adopt the 'delay' hypothesis for a moment and explore how closely the patterns exhibited in the results of the DS subjects follow those of the younger TD subjects.

In the control conditions there were no differences between the DS subjects' performance and that of the matched TD controls. The same holds for the match experimental conditions, whether clitic or non-clitic, pronominal or reflexive, in either referential or quantified contexts (see Table 4.9 and figures 4.7 and 4.8). In

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32 The other logical possibility of course is that the knowledge of binding in our subjects with DS would be complete, and be comparable to that of non-impaired adult speakers of SC.

33 The only difference concerns the quantifier spreading effect, as revealed by poor performance on condition CQNX, shown by youngest control children but not observed in the data of subjects with DS. This is in contrast to the data of English subjects with DS: recall from chapter 3 that two subjects with DS showed an extremely poor performance on this condition.
addition, there were no discernible differences between DS subjects’ performance on the mismatch conditions involving full pronouns in referential or quantified contexts. Recall that a chance performance on the name-pronoun mismatch (NPX) condition was taken to signal a failure in TD English children to implement a constraint that rules out illicit coreference (Delay of Principle B Effect – DPBE, or Rule I failure). SC was found not to belong to the group of languages exhibiting this effect, as neither of the groups of TD control children, aged 3-7, exhibited DPBE. Importantly, DPBE/Rule I failure was absent in the data of individuals with DS, parallel to what we found in TD children acquiring SC. Note that the reported processing limitations in DS in effect increase the likelihood of DPBE in this population, thereby lending weight to the ‘delayed’ characterisation of language in DS.

The first difference that arises in the performance of the DS and matched TD subjects concerns conditions involving the reflexive clitic in both referential and quantified contexts. Our data reveal that DS subjects struggled with both NRXcl and QRXcl. Although this pattern was not observed in the group of matched TD controls, lower performance on these particular conditions was also displayed by the youngest group, Gl. It was claimed earlier that lower scores on NRXcl and QRXcl in young children should not be interpreted as an erroneous performance, but as a preference for a non-reflexive interpretation available with a particular type of predicate (Rivero, 1999; Stojanović, 2002). Table 4.12 below indeed shows that on condition NRXcl DS subjects showed a higher error rate with the ‘verb’ touch (58.4%) than with the other two verbs, ‘wash’ and ‘dry’ (12.5%). Whatever the underlying reason for this...

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34 Recall that independent samples t-test in fact did show a statistically significant difference between the group with DS and the matched TD group on the NPX condition (t(5) = -3.16, p=0.025). However, the DS groups’ performance of 91.25% correct cannot suggest that they have difficulties interpreting this condition. The statistical significance is an effect of this performance being still ‘worse’ than the matched TD controls’ scores of 100%.
performance, it turns out that this pattern in DS is again not different to what happens in typical acquisition.\textsuperscript{35}

Table 4.12: Number of errors (out of possible 4) on verbs ‘touch’ and ‘wash’& ‘dry’\textsuperscript{36} for NRXcl condition

<table>
<thead>
<tr>
<th>Verb</th>
<th>S1</th>
<th>S2</th>
<th>S3</th>
<th>S4</th>
<th>S5</th>
<th>S6</th>
<th>total</th>
<th>error rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>‘wash’&amp;‘dry’</td>
<td>0/4</td>
<td>1/4</td>
<td>0/4</td>
<td>1/4</td>
<td>1/4</td>
<td>0/4</td>
<td>3/24</td>
<td>12.5%</td>
</tr>
<tr>
<td>‘touch’</td>
<td>3/4</td>
<td>2/4</td>
<td>3/4</td>
<td>2/4</td>
<td>3/4</td>
<td>1/4</td>
<td>14/24</td>
<td>58.3%</td>
</tr>
</tbody>
</table>

Thus far, the patterns revealed in the data of our DS subjects are in accord with the delayed characterisation of language in this population: just like TD matched controls, they showed no difficulties with control conditions, or any of the match experimental conditions. In the fashion of younger controls they showed a preference for a specific interpretation of the reflexive clitic in particular contexts.

Against the ‘delay’ hypothesis

The individual performance of two of the subjects with DS displayed a pattern, which, on the face of it, seems to further support the ‘delay’ hypothesis. Although not detected in statistical comparisons of the DS group and control groups, individual data presented in Table 4.11 reveal that subjects S5 and S6 showed poor comprehension of pronominal clitics on conditions NPXcl and QPXcl. While they incorrectly allowed covaluation between the clitic and the referential antecedent in NPXcl around half of the time, their error rate on the quantified version of this

\textsuperscript{35} A separate issue is why this particular reading is preferred by the youngest TD children and adult individuals with DS, and not by non-impaired adult controls and older control children. A possible interpretation is that this heightened ‘sensitivity’ to semantic properties of ambiguous predicates in young control and DS subjects is a result of not being influenced by the pragmatic context, that clearly plays a role in non-impaired adult performance. In effect, by providing the correct ‘no’ answer to the NRXcl and QRXcl experimental questions adult controls and older control children were repairing the fault in the experimental design where a verb such as ‘touch’ is used with the clitic ‘se’, whilst the clitic is not a reflexive marker, but can be licensed by particular pragmatic or syntactic contexts.

\textsuperscript{36} The eight questions belonging to the NRXcl condition contained four instances of the verb ‘touch’, and two instances of ‘wash’ and ‘dry’ each.
condition was even higher: 77.5% and 63% for S5 and S6, respectively. These scores resemble the pattern observed in the youngest TD group: individual data from three control children indicate that they incorrectly accepted local antecedents for QPXcl between 62.5% and 37% of the time, and one child did so with both NPXcl and QPXcl around half of the time. We claimed earlier that this pattern cannot be associated with the subjects not being able to rule out illicit coreference in local contexts since coreference is not possible in quantified contexts. This applies to both DS and TD subjects and is confirmed by their good performance on conditions involving full pronouns in a local relation with both referential and quantified antecedents. Thus at first sight, the pattern shown can be characterised as a simple 'delay'. Delayed acquisition of object clitics in typical development, with respect to reflexive or subject clitics, has been documented in many languages, and was recently shown in Croatian (Stiasny, 2003). An in-depth discussion of the various accounts proposed for this phenomenon is beyond this section but typical explanations invoke incomplete lexical/morphosyntactic features of these pronominal elements (e.g. Jakubowicz, 1993). We doubt, however, that the severe problem exhibited by the two subjects with DS, who seemed unable to comprehend clitics, can be put down to the 'delayed acquisition' of these particular elements. This is not only because our subjects are unlikely to ever acquire them in their adult years (S6 was 29 whilst S5 was 19 years old at time of testing), but also because omission and poor comprehension of object clitics seems to be an area exceptionally vulnerable to deficit in language impaired populations. Recall from our review of atypical development in chapter 2 that comprehension of object clitics was severely deficient in Greek children with SLI (Varlokosta, 2001). Similar findings are reported for French (Jakubowicz et al, 1998; Hamann, Ohayon, Dubé, Frauenfelder, Rizzi, Starke & Zesiger, 2003), which prompted some researchers to view object clitic omission as a clinical marker of French SLI (Paradis et al, 2003)). If clitics are characterised as functional heads that consist of pure grammatical features, difficulties with these

37 Jakubowicz et al (1998) found the production of object clitics to be more severely affected than their comprehension in this study.
elements should be treated as symptomatic of a specific grammatical/morphosyntactic deficit, both in SLI and DS.

Our main argument against the delayed characterisation of linguistic abilities in DS is based on the pattern that emerged from the data of subjects with DS on conditions involving the anaphor 'sebe', not observed in any of our control TD groups. On the mismatch conditions involving 'sebe', both when bound by a referential (NRX) or quantified antecedent (QRX), the average scores of our subjects with DS dropped to the lowest recorded in this study: 60% correct for NRX and 66.6% correct for QRX. In stark contrast, the lowest performance for any of the 4 TD groups of control children was 97% correct for NRX, and 91% correct for QRX.

The high rate of incorrect answers to questions containing the anaphor, accompanied with a picture showing a transitive action taking place, signals that the correct grammatical interpretation of the anaphor is not available to our DS subjects. This pattern cannot be accounted for by relying on the standard 'delay' view of linguistic competence in DS as it has not been reported in typical language development crosslinguistically. The crucial point, however, is that results comparable to these were reported in our experiment with English speaking subjects with DS: recall that individuals with DS, but not TD children, showed considerable difficulties interpreting constructions involving anaphors, but no other pronominal element. Furthermore, a similar pattern, at least with regard to anaphors bound by quantified antecedents, was reported in another language-impaired population, namely, English-speaking children with SLI (van der Lely & Stollwerck, 1997). Although we do not want to claim that the pattern is a result of some underlying deficit common to both DS and SLI, it does suggest that some aspect of anaphoric dependencies is vulnerable to a deficit in a population known to exhibit grammatical impairment – the implication being that whatever language deficits we are uncovering in DS are grammatical in nature.
Our claim will be that difficulties with the comprehension of anaphors demonstrated by the DS subjects both in the English and SC version of the study reveal a specific syntactic deficit in this population. The deficit lies in their inability to establish a syntactic dependency between an anaphor and its antecedent. This issue deserves a proper examination and will form the central topic of our next chapter. There we discuss the reported deficit in detail, together with its interpretation, within a theoretical framework which can account well for our observed results. We will also dedicate time to understanding this, syntactic, deficit from a crosslinguistic (SC vs. English) perspective.

4.3 Summary

In this chapter we reported data from a study of binding in a SC-speaking population with DS. A larger sample of TD children of different ages was tested first in order to gain better understanding of the course of the acquisition of this particular module in non-impaired development, so that the data obtained in the DS sample could be compared against these. Performance observed in TD children acquiring SC showed that by the age of 4 children are in full command of the constraints which govern the distribution of pronouns and reflexives in SC. No Delay of Principle B Effect (DPBE)/Rule I failure has been reported in any of the TD control groups, thus confirming reports that languages with pronominal clitic do not exhibit this phenomenon. Remarkably, absence of DPBE showed up with both full and clitic forms of pronouns, contradicting the claim that there is a clear-cut distinction between full pronouns allowing coreference and clitics resisting it. Other interesting patterns emerged in the data of TD SC-speaking children, raising a number of issues that warrant further research: specific difficulties with quantified constructions, difficulties with pronominal clitics and a specific null object reading associated with the reflexive clitic not easily available to adults. However, the main focus of the study was the knowledge of this linguistic module in individuals with DS. The ‘delay’ characterisation of language development in DS anticipates that knowledge of
binding in DS would be comparable to that of TD children at particular stages of language development. In line with this hypothesis, one pattern observed in the individuals with DS was also found in TD children: DS subjects showed a preference for a null object reading with one of the tested verbs. Further parallels were seen in the difficulties exhibited by two of the DS subjects and some of the youngest control children on the conditions involving the interpretation of pronominal clitics. However, similar performance is also reported in language impaired children in French and Greek, suggesting that deficient comprehension of clitics is symptomatic of a grammatical impairment rather than a simple delay in the acquisition of these elements. A unique pattern was found in the data of DS subjects, not observed in typically developing children acquiring SC or another language. Subjects with DS showed specific difficulties interpreting constructions containing the anaphoric element 'sebe'. Crucially, the same difficulties were reported earlier in our study on the knowledge of binding in English-speaking individuals with DS. These data suggest that the 'delayed' view is flawed, at least in this area of grammar, since it seems that a serious deficit is present along with delays in different domains. In the following chapter we explore in more detail the nature of the deficit found in the DS population from a crosslinguistic perspective.
5 The nature of the deficit in Down syndrome

5.0 Introduction

This chapter focuses on the nature of the deficit observed in the data from the experiments with English and Serbo-Croatian (SC)-speaking individuals with DS. Recall that the only constructions that posed difficulty for the English DS subjects in Experiment I, presented in chapter 3, were those involving reflexive pronouns. In the SC version of the experiment, presented in chapter 4, four of the SC-speaking subjects with DS also showed poor comprehension of constructions containing reflexive pronouns, in contrast to constructions involving personal pronouns or referential expressions. Abstracting away from individual differences, the observed patterns strongly suggest that the deficit displayed by individuals with Down syndrome (DS) concerns the interpretation of anaphors. We hypothesise that this problem does not extend to their knowledge of variable binding or coreference, nor to the conditions on binding as given by Reinhart & Reuland (1993) (R&R). In this chapter we spell out the model of anaphoric relations in DS, based on R&R, and generate predictions about how the unavailability of anaphoric binding interacts with principles that are available in the grammar of DS. These predictions are tested against the performance shown by the subjects with DS on individual test conditions, in two experiments with English and SC-speaking subjects. An additional experiment is carried out to investigate the knowledge of binding with inherently reflexive predicates in English-speaking DS. A discussion is presented on crosslinguistic differences found in the ways English and SC speakers with DS interpret anaphoric elements due to distinct grammatical properties of the anaphors in the two languages. The chapter concludes with a summary of the observed patterns found in the two groups of subjects with DS that present evidence for a deficit in syntactic binding in this population.
5.1 Anaphoric relations in DS: The hypothesis

The model of anaphoric relations in the grammar of DS that we propose is couched within the framework of R&R (1993) and Grodzinsky & Reinhart (1993). Here we shall briefly review the basic tenets of this framework, introduced in chapter 2.

R&R’s version of Binding Theory argues for two types of conditions on A-binding: conditions on binding as conditions on reflexivity of predicates, and the condition on chain formation. Together they account for the distribution of pronominals and anaphors crosslinguistically. Conditions on binding are given again in (1), and the generalised condition on A-chains in (2).

(1) Condition A: A reflexive marked syntactic predicate must be reflexive.
Condition B: A reflexive semantic predicate must be reflexive marked.
(where the predicate is reflexive iff two of its arguments are co-indexed).

(2) A maximal A-chain \((a_1, \ldots, a_n)\) contains exactly one link - \(a_1\) - that is both [+R] and case-marked (fully specified for pronominal features, including structural Case).

Relying on the two properties of pronominal elements, namely the reflexivizing function and [R]eferential independence, R&R propose the following crosslinguistic typology of pronominal elements.

(3)\[
\begin{array}{ccc}
\text{SELF} & \text{SE} & \text{PRONOUN} \\
\text{Reflexivizing function [SELF]} & + & - & - \\
\text{Referential independence [R]} & - & - & +
\end{array}
\]
Since English lacks SE (simplex) anaphors, only the distinction between the complex anaphor (e.g. himself) and personal pronouns (e.g. him) is relevant. Only complex anaphors are able to reflexive-mark transitive predicates, and only complex anaphors, being [-R], are allowed to occupy the foot position of a chain. Taking these properties of pronominal elements into account, the following examples in English illustrate how Binding Conditions and the Chain Condition interact in regulating the distribution of English pronouns and reflexives in referential and quantified contexts.

(4)

(a) Peter Pan, likes himself,
(b) *Peter Pan, likes himself,
(c) Every boy, likes himself.
(d) *Every boy, likes himself,
(e) *Peter Pan, likes him,
(f) *Peter Pan, shaves him,
(g) *Every boy, likes him,
(h) *Every boy, shaves him,
(i) Every boy, likes his mother.

The structure in (a) satisfies Condition A: the anaphor and its antecedent are covalued, creating a reflexive predicate; the predicate is reflexive marked, as one of the arguments is the complex anaphor SELF. Condition A rules out (b) since the predicate is reflexive marked, but as the anaphor and its antecedent are not covalued, they cannot be interpreted reflexively. The structures in (c) and (d) involve the anaphor as a coargument of a quantified expression. The predicate in (c) is interpreted as a reflexive, being reflexive marked, and the sentence is acceptable; whereas (d) is ruled out as the anaphor and its antecedent are not covalued, and no reflexive

1 The [-R] property of anaphors is related to their incomplete specification for structural case, i.e. the lack of Nominative.
predicate is created.

In (e) the predicate is not reflexive marked, either in syntax (via SELF) or in the lexicon (the verb is not inherently reflexive), in violation of Condition B. This construction also disobeys the Chain Condition: being [+R], pronouns are ruled out from the foot of the chain. Although the structure in (f) satisfies both Condition A or B as the predicate is reflexive marked in the lexicon, it is ruled out by the Chain Condition. Similarly, (g) violates both Condition B and the Chain Condition, whereas (h) violates only the Chain Condition, since the predicate is reflexive-marked in the lexicon. The structure in (i) is grammatical, as no conditions are violated: the pronoun is not an argument of a reflexive predicate and no chain is created.

In the examples above only syntactic binding is illustrated. Following Reinhart (1983), and what is now assumed to be the standard approach, a distinction is made between syntactic binding and coreference. The two types of anaphoric relations are subject to constraints originating in distinct modules of grammar. Syntactic binding subsumes both anaphoric and variable binding: anaphors are obligatorily syntactically (and semantically) bound; and thus always interpreted as bound variables, whether covalued with a referential or a quantified antecedent as shown in (a) and (c) respectively. Pronouns, however, can be either bound or coreferential. When they are syntactically bound, they must be interpreted as bound variables, as in (e), (f), (g), (h), (i), where both the Binding Conditions and the Chain Condition apply. Coreferential interpretation of pronouns is not subject to syntactic constraints, but to constraints outside syntax proper. Assuming that both quantified and referential NPs can serve as variable binders, Reinhart (1983) argues that the structure in (5) below is ambiguous between a bound variable (5a) and coreferential reading (5b).

(5) Peter Pan likes him
(a) Peter Pan \( \lambda x \) (\( x \) likes \( x \))
(b) Peter Pan \( \lambda x \) (\( x \) likes \( a \)) where \( a = \) Peter Pan
The two interpretations are subject to different principles of grammar: in intrasentential contexts, the local bound variable interpretation is constrained by both the Chain Condition (ruling out elements with the property [+R] from the foot of the chain) and Binding Condition B (a reflexive predicate must be reflexive-marked), whereas the coreferential interpretation is ruled out by some extrasyntactic constraint. This constraint is repeated in (6) (Grodzinsky & Reinhart, 1993):

(6) Rule I (Intrasentential Coreference)
NP A cannot corefer with NP B if replacing A with C, C a variable A-bound by B, yields an indistinguishable interpretation.

(Grodzinsky & Reinhart, 1993)

The intuition behind Rule I is that it is preferable to use anaphors in order to express intended coreference: in the event of two competing interpretations, a bound variable reading is favoured if the two interpretations are indistinguishable. The use of pronouns to express coreference is only motivated by some special pragmatic contexts e.g. Evans-style situations.

It is assumed that, being unlearnable in the absence of negative evidence, Rule I is innate; yet recall from our review of the studies on Delay of Principle B Effect (DPBE) in chapter 2 that typically developing children had difficulties ruling out examples such as (5). This phenomenon was argued to be due to an inability to execute Rule I when comparing two indistinguishable interpretations, bound variable and coreferential, owing to limitations on children’s processing systems. A sketch of this modular approach to anaphoric relations, based on R&R (1993) and Grodzinsky & Reinhart (1993), is given in (7).

---

2 As pointed out in chapter 2, typically developing children are able to rule out illicit bound variable reading but not illicit coreferential reading. Recall the report by Chien & Wexler (1990) that children successfully rejected illicit binding in (i), a quantified construction which by definition contains no ambiguity, allowing only the bound variable interpretation:

(i) *Every bear, is washing him,
How different is the knowledge of anaphoric relations in the population with DS? It has already been suggested that knowledge of anaphoric binding is not available in DS, but that knowledge of coreference is available. In view of the competition between two distinct interpretations regulated by a constraint such as Rule I, the issue of the knowledge of constraints on coreference in DS seems contentious at best. Recall that Rule I prescribes that the anaphoric/bound variable reading is favoured when there is a competition between the bound variable and coreferential interpretation in local contexts such as (5), repeated here as (8). Since LF interpretations of anaphoric binding and local variable binding in such contexts are identical, the crucial implication is that one of the competing representations is excluded in the grammar of DS from the very start. If one of the competitors is missing, namely that of anaphoric binding, only the coreference option, (8b), remains available.

(8) Peter Pan likes him
(a) Peter Pan \( \lambda x \) (x likes x)
(b) Peter Pan \( \lambda x \) (x likes a) where a = Peter Pan

\(^3\) Bound variable (i) and anaphoric binding (ii) interpretations have the same representations at LF (iii):
(i) * Peter Pan, likes him,
(ii) Peter Pan, likes himself.
At first sight, this state of affairs leads to the conclusion that Rule I, the constraint that rules out illicit coreference is altogether absent in DS. If this were the case, individuals with DS should always accept illicit coreference interpretations in contexts such as (8). This is not confirmed in the data reported in Experiment I, presented in chapter 3: recall that subjects with DS correctly ruled out illicit coreference nearly 100% of the time. This strongly suggests that some kind of mechanism governing coreference must exist in the grammar of DS. The option left to us is to argue that it is not Rule I, but some other constraint of grammar that takes over the role of regulating coreference in DS.

Rather than inventing an ad hoc, case-specific constraint, it seems more economical to appeal to an already available, perhaps more general constraint present in the grammar. Departing from R&R (1993), we propose that it is in fact Binding Conditions of R&R that apply to all covalued arguments, whether bound or coreferential, in both non-impaired and impaired grammar. Rule I is not abandoned, however. It is argued that, whilst Binding Conditions apply to covaluation of all arguments, Rule I still applies to arguments covalued through coreference only (in non-impaired grammar). In effect, the Binding Conditions and Rule I overlap in their function of governing coreference. However, Rule I, being a more specific constraint, takes precedence over the more general Binding Conditions (in line with the 'elsewhere' principle). The figure in (9) sketches our revised model on anaphoric

(iii) Peter Pan \(\lambda x (x \text{ likes } x)\).

Although this claim may seem unorthodox and in a sense a departing from the spirit of R&R (1993), in principle, nothing hinges on proposing that conditions on reflexivity are involved in ruling out illicit bound variable reading along with illicit coreferential reading. Binding conditions could apply to all covalued elements. Creation of reflexive predicates occurs whenever two elements are covalued. When one of the covalued arguments (the element in the foot of the created chain) is an anaphor, no constraint is violated (anaphors are reflexive-markers and allowed in the foot of the chain). If the argument is a pronoun, its bound variable interpretation is subject to both the Chain Condition and the Binding Conditions. If the pronoun is coreferential with another element, the Chain Condition does not apply, but Binding Condition B will rule out structures that are not reflexive marked

(i) *John likes him where him=John

Instances of accidental coreference forced by pragmatic context are still allowed, since in (i) below a reflexive predicate cannot be created - it is not the property of 'self-hate' that is attributed to the arguments, but something like 'hate John':

relations in non-impaired grammar.

(9) The revised model of anaphoric relations in non-impaired grammar

\[
\begin{align*}
\text{anaphoric binding} & \quad (\text{anaphors: bound}) \\
\text{Binding Theory} & \quad \rightarrow \quad \text{variable binding} \quad (\text{pronouns: bound}) \\
\text{Rule I} & \quad \rightarrow \quad \text{coreference} \quad (\text{pronouns: coreferential})
\end{align*}
\]

The model shows that both Binding Conditions and Rule I apply to coreference in non-impaired grammar: both constraints are linked to coreference through an arrow. However, the dotted arrow linking Binding Theory to coreference implies that conditions on binding do not govern coreference, as that role is taken over by the more specific Rule I: Rule I is linked to coreference by a full arrow. The application of the two constraints with regard to their application to coreference in non-impaired grammar can be viewed as a competition between a more general and a more specific constraint, with the specific constraint winning. The link between Binding Theory which constrains anaphoric binding and variable binding remains unchanged.

Thus with respect to the mechanisms governing variable binding and coreference in non-impaired grammar, the additional responsibilities of Binding Conditions have no implications, as Rule I is still in charge. The issue that requires further consideration is the role of Rule I in impaired grammar, i.e. in the population with DS. As suggested earlier, with anaphoric binding absent, Rule I can have no empirical consequences in the grammar of DS: there will be no competition between the anaphoric/bound variable and coreferential interpretations that Rule I is called upon to regulate in non-impaired grammar. Since both Rule I and Condition B are in effect able to rule out illicit coreference in non-impaired populations, when Rule I is inapplicable, Binding Conditions take over. Such a conceptualisation of the
mechanisms of constraining binding and coreference is in fact not as unorthodox as it may first look: from a biological point of view, if one constraint cannot apply, it is plausible that another constraint, even though cross-modular, will maximise its potential. A simple comparison could be made to a stage in typical language development where some rule is not as yet acquired, e.g. wh-movement, but children bypass this problem by over-applying the option of forming wh-questions in situ.

Thus in the grammar of DS, Binding Condition B takes over in ruling out both the bound variable and the coreferential interpretation (‘the reflexive predicate must be reflexive marked’), with the bound variable interpretation additionally being subject to the Chain Condition. The model of anaphoric relations in this population can therefore be sketched as in (10):

(10) Model of anaphoric relations in DS

\[
\begin{align*}
\text{Binding Theory} & \rightarrow \text{variable binding} \\
\text{Rule I} & \rightarrow \text{coreference}
\end{align*}
\]

The model above can be read as follows: Rule I, although given, cannot apply in the grammar of DS, in contexts where one of the competing interpretations is absent, i.e. the anaphoric/bound variable interpretation. Leaving aside the issue of processing limitations, in theory, Rule I could apply in other, non-local variable contexts that have not been tested. This is symbolised by the dotted arrow that links Rule I to the coreference module that it governs in non-impaired grammar. Coreference and variable binding are available in the grammar of DS, which is shown by full arrows that link them to Binding Theory. Anaphoric binding is not available, therefore the link between it and Binding Theory is missing. The issue of unavailability of
anaphoric binding in DS is the focus of the remainder of this chapter.

With the previous discussion in mind, our hypothesis is formulated below.

(11) **Hypothesis:** The deficit in the grammar of DS concerns the relation of anaphoric binding. The knowledge of constraints regulating variable binding and coreference are intact. Knowledge of principles of binding as conditions on reflexivity of predicates is intact, as is the knowledge of the Chain Condition. Coreference is subject to R&R's Binding Conditions, but in a non-impaired population Rule I takes precedence and is responsible for regulating coreference. Rule I cannot apply, thus coreference is regulated by default constraints, namely the Binding Conditions.

This hypothesis will be evaluated against data obtained in the experiment into binding in individuals with DS in two languages, English and Serbo-Croatian, reported previously in chapters 3 and 4.

5.2 **Supporting the Hypothesis: Knowledge of binding in English grammar of Down syndrome**

We shall first examine the general pattern of performance in the English-speaking subjects with DS in order to assess whether the main hypothesis, that anaphoric binding is not available in DS, is borne out. The following sections will investigate the effects that the stated deficit in anaphoric binding may have, in combination with the principles of grammar that are available in DS (as given by our hypothesis), on individual patterns of subjects' performance. A prediction for each individual experimental condition will be generated and evaluated against the data obtained in Experiment 1.

Before outlining the predictions, one issue that requires more attention is the
interpretation of the anaphoric element, the actual lexical item used in the test sentences presented. Our claim that anaphoric binding is not available in DS implies that it is not possible to compute the syntactic relation between the anaphor and the antecedent. However, it does not say anything about how individuals with DS interpret the anaphoric element in this relation. In order to give some interpretation to the anaphor, it is possible that subjects may adopt a strategy of treating the anaphor as some other lexical item, e.g. a pronoun. Should this be the case, constructions containing the anaphor would then be subject to constraints that typically regulate the distribution of pronouns. This possibility will be explored in our discussion of subjects’ performance on individual experimental conditions. Another possibility of course is that subjects make no attempt at interpreting anaphors presented in the input constructions and merely resort to guessing.

Let us clarify once again the patterns expected for ‘match’ and ‘mismatch’ questions for each experimental condition: the correct answer to ‘match’ conditions is ‘yes’, whereas the correct answer to ‘mismatch’ condition is ‘no’. Except for the pattern of appropriate ‘yes’ and ‘no’ answers that reveals subjects’ understanding of the construction presented, note that the following patterns are also possible: for the match conditions, if the construction is not understood, both ‘yes’ and ‘no’ answers are possible - ‘yes’ if the subject is just accepting a question (positive bias), or ‘no’, if the structure heard does not match the structure construed in the subject’s grammar. In similar vein, on mismatch conditions requiring ‘no’ as a correct answer, a positive answer may be given if the structure is not understood, whereas a negative answer may be given if the structure does not match the interpretation available in the subject’s grammar, giving a false impression that the subject is providing a correct

---

5 Note that our claim that anaphoric binding is unavailable in the grammar of DS need not apply to contexts where the anaphor is not an argument of a reflexive predicate, and therefore not in a binding relation. It is possible that subjects with DS will be able to interpret or even use the anaphor in logophoric contexts or when focussed (see R& R 1993 for a discussion of logophors in this framework):

(i) There were five tourists in the room apart from myself.
(ii) She wanted to see him herself.
answer.

5.2.1 Predictions and data: unavailability of anaphoric binding

Table 5.1 shows average scores for each experimental condition for all four DS subjects, reported in chapter 3.

Table 5.1: Percentage correct for DS subjects on experimental conditions, match and mismatch

<table>
<thead>
<tr>
<th>match</th>
<th>Code</th>
<th>Question</th>
<th>% correct</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. name-reflexive</td>
<td>NRM</td>
<td>Is Snow White washing herself?</td>
<td>59</td>
</tr>
<tr>
<td>2. quantifier-reflexive</td>
<td>QRM</td>
<td>Is every bear washing himself?</td>
<td>25</td>
</tr>
<tr>
<td>3. name-pronoun</td>
<td>NPM</td>
<td>Is Snow White washing her?</td>
<td>100</td>
</tr>
<tr>
<td>4. quantifier-pronoun</td>
<td>QPM</td>
<td>Is every bear washing him?</td>
<td>94</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>mismatch</th>
<th>% correct</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. name-reflexive</td>
<td>NRX</td>
</tr>
<tr>
<td>2. quantifier-reflexive</td>
<td>QRX</td>
</tr>
<tr>
<td>3. name-pronoun</td>
<td>NPX</td>
</tr>
<tr>
<td>4. quantifier-pronoun</td>
<td>QPX</td>
</tr>
</tbody>
</table>

On all conditions involving anaphors (NRM, QRM, NRX, QRX) subjects score around or below chance. To experimental questions that require the construal of a reflexive interpretation, when the anaphor is bound by a referential or quantified antecedent, subjects correctly provide a positive reply to the name-reflexive match condition (NRM) 59% of the time, whereas on the quantifier-reflexive match condition (QRM) they do so 25% of the time. To experimental questions containing an anaphor bound by a referential or a quantified antecedent, accompanied by a picture depicting a transitive action, subjects correctly provide a negative reply 56% of the time to the name-reflexive mismatch condition (NRX), and 47% of the time to quantifier-reflexive mismatch (QRX).
Subjects’ performance on conditions involving anaphors is in stark contrast to their scores on conditions involving pronouns: as the table above shows, the average performance for name-pronoun match (NPM), name-pronoun mismatch (NPX) and quantifier-pronoun mismatch (QPX) is 100% correct, with their scores on quantifier-pronoun match (QPM) only slightly lower, at 94% correct.

The subjects’ poor performance on all conditions involving anaphors, bound by either referential or quantified antecedents, unambiguously points to a deficit with anaphoric binding.

In the following section we make predictions for individual experimental conditions and individual performance patterns, whilst bearing in mind the effects of the interaction of difficulties in anaphoric binding and the availability of other principles, such as the Chain Condition and conditions on reflexivity of predicates as given in (11).

5.2.2 Predictions for individual experimental conditions: Interaction of unavailability of anaphoric binding with available principles in grammar of DS

If anaphoric binding is not available, a structure containing a syntactically bound anaphor will be uninterpretable. How would this show up in the performance of our subjects? There are several possible patterns. One option is that subjects simply guess when encountering a question containing an anaphor. Guessing should result in 50% correct performance, with subjects giving equal number of ‘yes’ and ‘no’ replies. The average group scores presented in table above point to such a conclusion: on NRM, NRX and QRX subjects’ average performance clusters around chance: 59%, 56% and 47% correct respectively. However, we shall see in the individual data discussed in the following section that subjects in fact very rarely showed a chance pattern on individual experimental conditions. Another possibility is that, when not able to interpret the anaphor, subjects would show a positive or a negative bias, opting for
either a 'yes' or 'no' answer (positive bias is well evidenced in studies on typical acquisition). Such a strategy would result in a higher percentage of positive or negative answers on particular conditions. Individual performance that we shall examine in a moment reveals no consistent bias for any of the subjects, discounting this option as well.

An interesting possibility, and the one that we shall explore in more detail, is that in order to give some interpretation to the anaphor, subjects may adopt a strategy of treating the anaphor as some other pronominal element, e.g. a regular pronoun. Such a strategy would, if verified, provide more insight into the knowledge of binding phenomena in this population: if anaphors are treated as pronouns, they should be subject to constraints that typically regulate the distribution of pronouns. For example, being [+R], pronouns are excluded from the foot of the chain by the Chain Condition of R&R; if our DS subjects treat an anaphor as a pronoun, they will not allow it to occupy the foot position of the chain. Thus to the experimental question of the type quantifier-name match (QRM) in (12), requiring a positive reply, subjects with DS would answer 'no'.

(12) Is every boy drying himself? reflexive context: every X dries X
correct answer: yes

Another property of pronouns, as argued by R&R, is their inability to reflexive-mark transitive predicates. To be reflexive, a predicate must be reflexive-marked (either in syntax or in the lexicon), otherwise the Binding Conditions rule the construction out. Since the above structure is not reflexive-marked in the grammar of DS, the subjects should rule it out both on the grounds of violations of the Binding Condition B and the Chain Condition.

———

6 Note that subjects may treat this construction differently if the predicate were reflexive-marked in the lexicon. We shall explore this line at much greater length in section 5.3.
When generating predictions and interpreting the data, the following assumptions about the knowledge of anaphoric relations in DS discussed earlier should be borne in mind:

a) Anaphoric binding is not available. In order to give some interpretation to the anaphor, subjects may treat it as a regular pronoun, but then constraints on the regulation of pronouns should be obeyed.

b) The Chain Condition of R&R is available. This constraint applies to variable binding only.

c) Binding Conditions A & B are available. They apply to variable binding as well as coreference.

d) Rule I is not applicable; as stated in (c) it is the responsibility of Binding Conditions to regulate coreference.

In the following sections predictions will be generated for each of the experimental condition, starting with conditions involving anaphors.

i. Experimental conditions containing anaphors, reflexive context (match)

On condition name-reflexive match (NRM) subjects are presented with a picture showing one character performing a reflexive action e.g. Snow White drying herself, with another character, e.g. Cinderella, standing by. Both characters are introduced as possible referents (see section 3.1.2 for more details on the procedure employed in the task). The quantified condition quantifier-reflexive match (QRM) involves three characters performing a reflexive action, e.g. three bears washing themselves, and another character, e.g. Peter Pan, standing by. The correct answer to both questions, illustrated in (13) and (14), is ‘yes’.

(13)
NRM (name-reflexive match) Is Snow White drying herself? reflexive action: X dries X correct answer: yes
What pattern of performance can we expect from our subjects with DS? If anaphoric binding is not available in the grammar of DS, the reflexive pronoun cannot be interpreted as syntactically bound to its local antecedent. As suggested earlier, in order to give some interpretation to the anaphor, subjects may adopt an alternative strategy and treat the anaphor as a pronoun. The implication is however that constraints on the distribution of pronouns should be obeyed. Recall from our discussion from section 5.1 that pronouns can be interpreted both as bound variable and as coreferential with another element. The structure in (13) above, assuming that the anaphor is viewed as a pronoun in DS, should be subject to Binding Conditions that in our model govern illicit coreference. Binding Condition B rules out structures where the pronoun is an argument of a reflexive predicate: ‘dry’ is not reflexive-marked in the lexicon (it is not an inherently reflexive predicate), or syntax (pronouns are not reflexive markers). Hence it is predicted that in order to respect Binding Condition B, subjects will give a negative answer to the experimental question name-reflexive match.

Condition quantifier-reflexive match (QRM) by definition involves variable binding only, no coreference is possible. If our subjects interpret the anaphor in the experimental question as a pronoun, conditions on the distribution of pronouns as bound variables should be obeyed. Binding Condition B rules out structures in (14), as the predicate is not reflexive-marked; this structure will be additionally ruled out by the Chain Condition which excludes pronouns from the foot of the chain.

\[ (14) \]

QRM (quantifier-reflexive match) Is every bear drying himself?  
reflexive action: every X dries X  
correct answer: yes

\[ ^7 \text{A more detailed discussion on the nature of constraints ruling out illicit coreference in DS will be given in the section on experimental condition name-pronoun mismatch (NPX), illustrated in the example in (13) below.} \]
Table 5.2 gives percentages for experimental conditions involving anaphors in reflexive contexts, reported in chapter 3.

Table 5.2: percentage of correct responses on conditions involving anaphors (match)

<table>
<thead>
<tr>
<th>Match</th>
<th>Code</th>
<th>S1</th>
<th>S2</th>
<th>S3</th>
<th>S4</th>
<th>group score %</th>
</tr>
</thead>
<tbody>
<tr>
<td>name-reflexive</td>
<td>NRM</td>
<td>25</td>
<td>75</td>
<td>62.5</td>
<td>75</td>
<td>59</td>
</tr>
<tr>
<td>quantifier-reflexive</td>
<td>QRM</td>
<td>12.5</td>
<td>50</td>
<td>12.5</td>
<td>25</td>
<td>25</td>
</tr>
</tbody>
</table>

On the name-reflexive match (NRM) condition, all subjects provide a certain percentage of (incorrect) 'no' replies. With only 25% correct (i.e. giving a 'no' reply 75% of the time), S1 shows a most persistent pattern. S2, S3 and S4 are better at providing correct 'yes' answers, 75%, 62.5% and 75% of the time, respectively, but the rate of the 'no' answers (25%, 37.5% and 25%, upon conversion of the scores in the table) is not negligible.

On the quantified version of this condition, quantifier-reflexive match (QRM), the rates of incorrect 'no' replies is higher: the correct scores in the table above can be converted to 87.5%, 50%, 87.5% and 75% of 'no' answers for S1, S2, S3 and S4 respectively. The reason for this difference in the rate of negative replies may be due to the cumulative effect of the constraints violated: in NRM only the Condition B is violated whilst the quantified construction of QRM contains the violation of both the Chain Condition and Binding Condition B in the grammar of DS.

ii. Experimental conditions containing anaphors, non-reflexive context (mismatch)

An experimental question from the condition name-reflexive mismatch (NRX), illustrated in (15), is accompanied by a picture showing one character performing a transitive action on another character, e.g. Snow White drying Cinderella. In the quantified version of this condition, (16), three characters perform a transitive action
on one other character: e.g. three bears drying Peter Pan. In non-impaired grammar the anaphor can refer only to the sentence-internal antecedent, thus the correct answer to both questions is ‘no’.

(15)
NRX (name-reflexive mismatch) Is Snow White drying herself?
transitive action: X dries Y (Y = Cinderella)
correct answer: no

(16)
QRX (quant.-reflexive mismatch) Is every bear drying himself?
transitive action: every X dries Y (Y = P. Pan)
correct answer: no

If the anaphor is interpreted as a pronoun in the grammar of DS, Binding Conditions do not rule out the above structures: the pronoun is not a reflexive-marker thus no reflexive predicate is created. In contexts depicting a non-reflexive action, this pronominal element would therefore be interpreted deictically, predicting a ‘yes’ answer from our DS subjects.

This prediction seems confirmed to varying extents. As shown in table 5.3, S1 and S2 seem to exhibit the expected pattern: they both provide a ‘yes’ answer more often than a ‘no’, displaying the strategy of treating the anaphor as if it were a pronoun. S1 gives the correct ‘no’ answer only 12.5% of the time on both NRX and QRX, whereas S2 does so 37.5% and 25% of the time, respectively. Performance shown by S3 and S4 does not fit as easily into this pattern however. S3 provides the correct ‘no’ answer most of the time: 75% for NRX and 87.5 for QRX. S4 shows a similar pattern, providing the correct ‘no’ answer 100% of the time for NRX and 62.5% of the time for QRX.
Is there any evidence that the subjects are not interpreting the anaphors as pronouns, that the anaphoric element is just uninterpretable? How would this surface? It was suggested earlier that if anaphors are totally uninterpretable in the grammar of DS, subjects may resort to guessing. However, there is no consistent chance pattern in the data, the occasional score that is near chance (S2 reaching 50% correct on QRM, S3 reaching 62.5% on NRM and S4 scoring 62.5% on QRX) does not render this explanation generally feasible. Similarly, the possibility that subjects are displaying a positive or a negative bias strategy when faced with a construction containing the anaphoric element that is uninterpretable does not seem to be supported. Closer examination of data in tables 5.2 and 5.3 reveals no such bias, as none of the subjects consistently chooses a ‘yes’ or ‘no’ reply to any of the four experimental questions involving anaphors. An interesting pattern emerged in the performance of S2 however. S2 did not just provide incorrect answers to the experimental questions involving transitive predicates reflexive-marked by the self anaphor: she often could not provide any answer at all (this was subsequently coded as incorrect), showing a great deal of hesitation and frustration as a result. This seems to reveal an inability to bind the anaphor to the antecedent, with the anaphor remaining uninterpreted. The individual variation in patterns shown on conditions involving anaphors need not

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Note that such reaction was not observed when the subject was presented with experimental conditions containing pronouns or referential NPs. This frustration seems to be her typical reaction when faced with a task she could not solve, such as the block design subtest on WAIS cognitive abilities test, or when unable to match one of the more difficult words to the appropriate picture on BPVS, test of receptive vocabulary. S2's reaction is in line with reports of ‘cognitive avoidance’ strategies where children with DS employ both positive and negative tactics when presented with a task that is developmentally too difficult. Those involve either different forms of ‘diversionary’ social interactions, or simple switching off in protest. As soon as the task is brought down to an appropriate developmental level, the child starts cooperating again (Wishart, 1988). The same was observed in S2.
cause concern with regard to our original hypothesis, namely that knowledge of anaphoric binding is lacking, but that other principles of grammar are present in the population with DS. Recall our discussion in chapter 1 that the population with DS is notorious for wide individual variation both in their spontaneous abilities and on test performances. Two points are worth noting however: first, the deficit in anaphoric binding proposed in the grammar of DS is expected to show its effects on a continuum, showing up to a greater extent in some individuals, and to a lesser extent in others. Second, although different strategies of interpreting anaphors may be to blame, it is more than striking that all subjects show intense difficulties in at least one of the conditions involving anaphors: 25% correct is the maximum S1 achieves on any condition that contains an anaphor, S2 ranges between 12.5% to 50% correct on NRX, QRM and QRX, whilst S3 scores 12.5% correct and S4 achieves 25% correct on QRM. These scores are in stark contrast to those shown on conditions involving pronouns, discussed next, where the subjects show hardly any individual variation: the lowest score is 75% correct, with 100% correct reached by all four subjects.

iii. Experimental conditions containing pronouns, non-reflexive context (match)

Experimental questions name-pronoun match (NPM) and quantifier-pronoun match (QPM) accompany pictures showing one (NPM) or three characters (QPM) involved in an action of drying, touching or washing one other character: e.g. Snow White washing Cinderella, three ducks washing Goldilocks. The transitive action depicted requires a deictic interpretation of the pronoun used in the question, thus a positive answer is required in adult grammar.

(17)

NPM (name-pronoun match) Is Snow White drying her? transitive action: X dries Y (Y= Cinderella) correct answer: yes
QPM (quantifier-pronoun match)  
Is every bear drying him?  
transitive action: every X dries Y (Y = P. Pan)  
correct answer: yes

With no anaphoric binding involved and no room for ambiguous interpretations, it is predicted that subjects with DS will have no difficulties assigning a deictic reading to the pronoun in structures (17) and (18). This is confirmed by figures in table 5.4: on both NPM and QPM all subjects achieved a correct 'yes' answer 100% of the time, with the exception of S3 who reached 75% correct performance on QPM but 100% on NPM.

### Table 5.4: Percentage of correct responses on conditions involving pronouns (match)

<table>
<thead>
<tr>
<th>match</th>
<th>Code</th>
<th>S1</th>
<th>S2</th>
<th>S3</th>
<th>S4</th>
<th>group score %</th>
</tr>
</thead>
<tbody>
<tr>
<td>name-pronoun</td>
<td>NPM</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>quantifier-pronoun</td>
<td>QPM</td>
<td>100</td>
<td>100</td>
<td>75</td>
<td>100</td>
<td>94</td>
</tr>
</tbody>
</table>

### iv. Experimental conditions containing pronouns, reflexive context (mismatch)

Conditions name-pronoun mismatch (NPX) and quantifier-pronoun mismatch (QPX) involve reflexive, non-transitive contexts. When presented with a question of NPX type, subjects are shown a picture with one character performing a reflexive action e.g. Snow White drying herself, with another character, e.g. Cinderella, standing by. In the quantified version of the condition, QPX, three characters are performing a reflexive action on themselves, e.g. three bears washing themselves, and another character, e.g. Peter Pan, standing by.
NPX (name-pronoun mismatch)  Is Snow White drying her?
reflexive action: X dries X
correct answer: no

QPX (quant.-pronoun mismatch)  Is every bear drying him?
reflexive action: X dries X
correct answer: no

As pointed out in section 5.1 and in connection with the experimental condition name-reflexive match (NRM) (as illustrated in 13 earlier), the structure in (19) accompanied by a picture depicting a reflexive action may be ambiguous between a bound variable (reflexive) reading and a coreferential reading. In non-impaired grammar, Rule I governs the competition of the two readings, favouring the bound variable/anaphoric reading if the two readings are indistinguishable. With one of the competitors, anaphoric variable binding, not present in the grammar of DS, we argued that Rule I cannot have any empirical consequences in DS. Two possible options were presented with regard to governing illicit coreference in DS: either there is no constraint that can rule out illicit coreference in this population, or there exists another constraint that has this responsibility. The two options make different predictions: if there are no constraints present in DS, subjects are expected to rule in all structures like (20). However, if coreference is governed by some other constraint, and we argued that Binding Conditions in our revised framework of R&R should fulfil that role, subjects should show no difficulties ruling out this ungrammatical structure.

As illustrated in table 5.5, subjects showed a perfect performance, ruling out local coreference on condition NPX 100% of the time, confirming our prediction that some constraint on illicit coreference is present in the grammar in DS, though of different
origin to that in the non-impaired population: the Binding Condition B of R&R.⁹

Table 5.5: Percentage of correct responses on conditions involving pronouns (mismatch)

<table>
<thead>
<tr>
<th>mismatch</th>
<th>Code</th>
<th>S1</th>
<th>S2</th>
<th>S3</th>
<th>S4</th>
<th>group score %</th>
</tr>
</thead>
<tbody>
<tr>
<td>name-pronoun</td>
<td>NPX</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>quantifier-pronoun</td>
<td>QPX</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

In quantifier-pronoun mismatch condition (QPX), only the bound variable reading is available, leaving no room for issues related to constraints on illicit coreference. When locally bound, pronouns are subject to the Chain Condition, and being [+R], they will be ruled out from the foot of the chain in structure (20). This structure also violates Condition B, since the predicate is not reflexive-marked in the lexicon (it is not inherently reflexive) or syntax (pronouns are not reflexive markers). Subjects are therefore expected to correctly reject the covaluation of a pronoun with a local quantified antecedent, which is confirmed by their perfect performance. This is shown in table 5.5 above.

Note that the pattern on QPX is related to the pattern shown by the DS subjects on quantifier-reflexive match, QRM, where the structure was also ruled out by two constraints, the Chain Condition and the Binding Condition B (assuming that subjects with DS treat the anaphor as a pronoun). Recall that QRM was the condition that posed most difficulties to our subjects with DS, with their average performance being 25% correct.

⁹ Another argument against the presence of Rule I in the grammar of DS is related to processing limitations in this population. Typically developing children are found to perform at chance on constructions such as (19), unable to execute Rule I due to the limitations on their working memory. In view of the notoriously limited processing system in DS, it is even less reasonable to expect that subjects with DS would be able to cope with a processing constraint such as Rule I, as predicted by Scott (2001), holding two different representations in their short term memory before discarding the inappropriate one.
Finally, bearing in mind the perfect performance of subjects with DS on all the conditions involving pronouns, it is clear that the guessing strategy or opting for ‘yes’ or ‘no’ answer is not at play here.

5.2.3 Summary

Examination of our subjects’ data (both group and individual scores) on each of the test conditions in Experiment I reveals several clear patterns that seem to confirm our hypothesis as formulated in (11) above. Their performance on conditions involving pronouns in reflexive and non-reflexive contexts uncovered knowledge of constraints that govern binding and coreference in our framework, namely Binding Condition B and the Chain Condition. Their performance on conditions involving anaphors disclosed that the anaphoric relation of binding is unavailable. Individual data patterns suggest that at least some of the subjects may be treating the otherwise uninterpretable anaphor as a pronoun, in effect displaying regard for the same constraints on governing pronouns.

5.3 Knowledge of Binding in English grammar of Down syndrome (inherently reflexive predicates)

Experiment I showed that subjects with DS obey constraints on the distribution of pronominal elements as well as Condition B on reflexivity of predicates, but cannot establish the syntactic relation of binding.

Since the knowledge of Binding Conditions in Experiment I was tested with predicates that were transitive, i.e. non-inherently reflexive, the question now is whether individuals with DS would show knowledge of Binding Conditions with predicates that are inherently reflexive. In this way Condition A can be tested (‘A reflexive-marked predicate should be interpreted as reflexive’), without recourse to anaphoric binding, which we have seen is not available in the grammar of DS. If it is
the case that our DS subjects are not able to use reflexives as arguments of a reflexive predicate, but obey the conditions on reflexivity of predicates, our prediction is that they would accept coreference between a pronoun and a local antecedent if the pronoun is an argument of an inherently reflexive verb.\(^{10}\)

In the framework of R&R (1993) inherently reflexive predicates are so marked in the lexicon. Languages adopt different strategies in dealing with the internal argument: in English it may not be realised as in (21) below.

(21)  John shaves.\(^{11}\)

Since the predicate is inherently reflexive and hence interpreted reflexively, both Conditions A & B are satisfied. In principle, a pronoun also seems possible in place of a null argument in examples such as (21): since the predicate is lexically reflexive, covaluation between the pronoun and a referential antecedent would not violate Condition B.\(^{12}\)

(22)  John shaves him.

Despite being allowed by Condition B, in non-impaired grammar the construction in (22) is excluded by Rule I. However, in the grammar of DS, a different pattern may be expected. With Rule I inapplicable, it was argued earlier, coreference in DS is governed by conditions on binding only – thus (22) would not be a violation of a binding principle in DS either way. In addition, since the pronoun in (22) is not a

\(^{10}\) This is in contrast to the results obtained in Experiment I, where subjects rejected local coreference with pronouns as arguments of non-inherently reflexive verbs.

\(^{11}\) The argument would of course be realised with the transitive, non-inherently reflexive entry of ‘shave’, in the form of a reflexive-marker, the complex anaphor SELF, in line with Everaert (1986).

\(^{12}\) This is in fact the option Frisian takes. Personal pronouns are used in place of a simplex reflexive SE/’zich’:

\[(i)\] Max, hâld him/*himsels,
Max behaves him/*himself \hspace{2cm} (R&R, 1993)

R&R argue that Frisian pronouns lack some case specification and are therefore allowed to occupy the
bound variable, this structure does not violate the Chain Condition either. For both reasons, it is expected that our subjects with DS would rule in a constructions such as (22).

Our predictions are stated as follows:

i) With predicates that are inherently reflexive, the use of a pronoun coreferential with the antecedent does not result in a violation of a binding condition as given in our adjusted Reflexivity framework. Hence it is predicted that constructions such as (23), accompanied by a picture depicting a reflexive action, will be allowed.

(23) NPX Is Peter Pan shaving him? reflexive action: X shaves X  
correct answer: ‘no’

ii) With constructions involving pronouns as bound variables, even with inherently reflexive predicates, subjects should not accept local covaluation between the pronoun and the quantified antecedent since here the pronoun is ruled out by the Chain Condition, (24).

(24) QPX Is every boy shaving him? reflexive action: every X shaves X  
correct answer: ‘no’

The following section presents details of Experiment III, followed by a discussion on whether the results obtained support our prediction and how they relate to results from Experiment I.
5.3.1 Experiment III

5.3.1.1 Participants

Four girls with DS who took part in Experiment I also participated in Experiment III (details of their cognitive and language abilities on various standardised language and cognition tests are given in section 3.1.1.).

5.3.1.2 Materials and procedure

Similar experimental materials and procedure were used to that of Experiment I. The material included pictures of the same popular TV/cartoon characters (*Peter Pan, Cinderella, Snow White*), in different situations. Using the Picture Truth Value Judgement task, yes-no answers were elicited on test conditions *name-pronoun* mismatch (NPX) and *quantifier-pronoun* mismatch (QPX), for three verbs: *shave*, *wash* and *dry*. Each verb was tested separately, to control for possible differences on a scale of ‘inherent reflexivity’.\(^{13}\) Questions of the type QPX were tested twice for each verb, with the quantified DP headed by ‘all’ or ‘every’. For each experimental condition there were eight questions for each of the three verbs. Experimental conditions were mismatch only, i.e. the picture did not match the question: a question such as ‘Is Postman Pat shaving him?’ would be accompanied by a picture showing Postman Pat shaving himself, and another character, e.g. Peter Pan, standing by. Note that the two conditions tested in this experiment are nearly identical to the conditions NPX and QPX in Experiment I: experimental questions containing pronouns which are in a local relation with the referential or quantified antecedent, are accompanied by pictures depicting reflexive, non-transitive actions, eliciting a negative reply in adult grammar. The only difference is that the verbs used in

\(^{13}\) On some scale of inherent reflexivity, ‘shave’ can be considered more inherent than ‘wash’ or ‘dry’. Intuitively, ‘shave’ may be used more often in its inherently reflexive form: ‘John shaves’, whereas ‘wash’ would be used in its syntactically reflexive-marked form: ‘John washes himself’
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Experiment III are intended to be inherently reflexive.\textsuperscript{14}

As in Experiment I, to control for the attention deficits in individuals with DS, two control conditions were included: \textit{name-name attention} match (CAM) and \textit{name-name attention} mismatch (CAX). To balance for the number of mismatch questions (requiring a ‘no’ answer) and match questions (requiring a ‘yes’ answer), more match than mismatch control questions were included. Examples of questions for each of the conditions are presented in table 5.6 below, with the full list of questions given in Appendix III.

\textbf{Table 5.6:} Examples of test sentences used for Experiment III

<table>
<thead>
<tr>
<th>Experimental conditions</th>
<th>items</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>name-pronoun</td>
<td>NPX</td>
<td>8 x 3 verbs</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Is Snow White washing her?</td>
</tr>
<tr>
<td>quant.-pron (all)</td>
<td>QaPX</td>
<td>8 x 3 verbs</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Is every bear washing him?</td>
</tr>
<tr>
<td>quant-pron (every)</td>
<td>QePX</td>
<td>8 x 3 verbs</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Are all the bears washing them?</td>
</tr>
<tr>
<td>Control conditions</td>
<td></td>
<td></td>
</tr>
<tr>
<td>action</td>
<td>CNPX</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Is Snow White washing her?</td>
</tr>
<tr>
<td>attention mismatch</td>
<td>CAX</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Is Mickey Mouse hoovering?</td>
</tr>
<tr>
<td>attention match</td>
<td>CAM</td>
<td>48</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Is Pinocchio watching TV?</td>
</tr>
<tr>
<td>Total No. of questions:</td>
<td></td>
<td>136</td>
</tr>
</tbody>
</table>

The experimental procedure differed in one important respect from that of Experiment I: prior to administration of the experimental questions, the following context, depicting only inherently reflexive actions, was introduced: “This is the

\textsuperscript{14} The only new verb used in Experiment III is ‘shave’; two of the verbs are in fact the same as in Experiment I: ‘wash’ and ‘dry’ - some of the experimental pictures used in Experiment I were also used here (those depicting action of washing or drying). As outlined in the ensuing section, the crucial difference concerns the availability of inherently reflexive context: endorsing Everaert (1986)’s argument that verbs such as ‘wash’ have separate lexical entries for transitive as opposed to inherently reflexive reading, we believe that in Experiment I ‘wash’ was used in its non-inherently reflexive, transitive sense only, whilst in this experiment we attempted to force the inherently reflexive reading. It is unlikely that the Experiment I influenced the scores on the current study in any way (elicitation of the transitive vs. inherently reflexive reading using similar experimental materials), as the gap between
house which Postman Pat shares with Clown, Mowgli, Peter Pan, Winnie the Pooh and Piglet. Sometime they have their friends staying over, Minnie Mouse, Snow White etc. Every morning the boys get up and get ready for work. They all have to wash, dress, and shave. Here Postman Pat is having breakfast...”. After introducing characters in a picture, e.g. ‘This is Peter Pan. This is Mowgli’, subjects would be presented with an experimental question, e.g. ‘Is Peter Pan shaving him?’ Three trial questions were used before the test questions were administered. All answers were coded onto an answer sheet, along with any other comments. Subjects received no feedback about their performance. A total of 136 questions were presented to all subjects over three sessions.

5.3.1.3 Results

Scores for DS subjects on the control and experimental conditions are given in tables 5.6 and 5.7, respectively. Subjects with DS achieved near-perfect scores on all control conditions.

Table 5.7: Individual and mean scores for DS subjects on control conditions, match and mismatch

<table>
<thead>
<tr>
<th>Control conditions</th>
<th>Code</th>
<th>S1</th>
<th>S2</th>
<th>S3</th>
<th>S4</th>
<th>Mean score</th>
</tr>
</thead>
<tbody>
<tr>
<td>action mismatch</td>
<td>CNPX</td>
<td>12</td>
<td>11</td>
<td>12</td>
<td>10</td>
<td>11.25</td>
</tr>
<tr>
<td>attention mismatch</td>
<td>CAX</td>
<td>4</td>
<td>4</td>
<td>3</td>
<td>3</td>
<td>3.5</td>
</tr>
<tr>
<td>attention match</td>
<td>CAM</td>
<td>48</td>
<td>48</td>
<td>48</td>
<td>47</td>
<td>47.75</td>
</tr>
</tbody>
</table>

Note: Maximum score of 12 for CNPX; maximum score of 4 for CAX, maximum score of 48 for CAM.

the administration of the two was one chronological year.
Table 5.8: Individual and mean scores for DS subjects on experimental conditions, all mismatch

<table>
<thead>
<tr>
<th>Experimental conditions mismatch</th>
<th>Code</th>
<th>S1</th>
<th>S2</th>
<th>S3</th>
<th>S4</th>
<th>Mean score</th>
</tr>
</thead>
<tbody>
<tr>
<td>name-pronoun</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shave</td>
<td>NPXs</td>
<td>3</td>
<td>5</td>
<td>0</td>
<td>7</td>
<td>3.75</td>
</tr>
<tr>
<td>Wash</td>
<td>NPXw</td>
<td>2^15</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>5</td>
</tr>
<tr>
<td>dry</td>
<td>NPXd</td>
<td>3^16</td>
<td>6</td>
<td>6</td>
<td>8</td>
<td>5.75</td>
</tr>
<tr>
<td>quant-pron. every</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>shave</td>
<td>QePXs</td>
<td>8</td>
<td>8</td>
<td>7</td>
<td>8</td>
<td>7.75</td>
</tr>
<tr>
<td>wash</td>
<td>QePXw</td>
<td>7</td>
<td>8</td>
<td>7</td>
<td>8</td>
<td>7.5</td>
</tr>
<tr>
<td>dry</td>
<td>QePXd</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>quant-pron. all</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>shave</td>
<td>QaPXs</td>
<td>7</td>
<td>8</td>
<td>6</td>
<td>8</td>
<td>7.25</td>
</tr>
<tr>
<td>wash</td>
<td>QaPXw</td>
<td>7</td>
<td>7</td>
<td>5</td>
<td>8</td>
<td>6.75</td>
</tr>
<tr>
<td>dry</td>
<td>QaPXd</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>8</td>
</tr>
</tbody>
</table>

Note: Maximum score of 8 for each condition.

Table 5.8 above presents DS subjects' individual scores on the experimental questions. These scores will be analysed in more detail in the ensuing sections.

5.3.2 Predictions and data: Interaction of unavailability of anaphoric binding with available principles in grammar of DS (inherently reflexive predicates)

The following section will discuss how the data obtained in Experiment III fit in with the further two predictions about the knowledge of binding in DS outlined in section 5.3, repeated here as (i) and (ii):

^15 p<0.05
^16 p=0.3632
i) With predicates that are inherently reflexive, the use of a pronoun coreferential with the antecedent does not involve a violation of a binding condition as given in our adjusted Reflexivity framework.

ii) With constructions involving pronouns as bound variables, even with inherently reflexive predicates, subjects should not accept local covaluation between the pronoun and the quantified antecedent since here the pronoun is ruled out by the Chain condition.

In order to examine whether the two predictions can be supported, we shall look into the data for each of the individual experimental conditions tested in Experiment III.

i. Experimental conditions containing pronouns covalued with a referential antecedent, reflexive context (mismatch)

Similarly to the conditions of the same name in Experiment I, condition NPX presents subjects with a picture showing one character performing a reflexive action e.g. Postman Pat shaving himself, with another character, e.g. Peter Pan, standing by. Both characters are introduced as possible referents. The correct answer to this question, illustrated in (25), is ‘no’.

(25) NPX Is Peter Pan shaving him? reflexive action: X shaves X
correct answer: ‘no’

Recall that our first prediction was that subjects would allow local coreference between the pronoun and its antecedent in inherently reflexive contexts. This prediction is borne out by the data in Table 5.9.
Table 5.9: Percentage of correct responses for DS subjects on experimental conditions

<table>
<thead>
<tr>
<th>mismatch</th>
<th>Code</th>
<th>Question</th>
<th>group score %</th>
</tr>
</thead>
<tbody>
<tr>
<td>name-pronoun</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>shave</td>
<td>NPXs</td>
<td>Is Postman Pat shaving him?</td>
<td>47</td>
</tr>
<tr>
<td>wash</td>
<td>NPXw</td>
<td>Is Snow White washing her?</td>
<td>62.5</td>
</tr>
<tr>
<td>dry</td>
<td>NPXd</td>
<td>Is Goldilocks drying her?</td>
<td>72</td>
</tr>
</tbody>
</table>

For all three verbs, subjects allowed coreference between the pronoun and the predicate to a certain extent: their mean score for *shave* is 47% correct, for *wash* 62.5% correct, and for *dry* 72% correct.¹⁷

ii. Experimental conditions containing pronouns covalued with a quantified antecedent, reflexive context (mismatch)

Our second prediction was concerned with quantified contexts, where pronouns are variables bound by the quantified NP. The quantified condition QPX involves three characters performing a reflexive action, e.g. three bears washing themselves, and another character, e.g. Peter Pan, standing by. The correct answer to the question in (26) is 'no'.

(26) QPX  Is every boy shaving him?  reflexive action: every X shaves X  
          correct answer: ‘no’

Although the same inherently reflexive context forced subjects to allow local covaluation with pronouns on *name-pronoun* condition, the Chain Condition rules out pronouns that are covalued with quantified antecedents. Table 5.10 shows correct

¹⁷ Although the context aimed to facilitate inherently reflexive readings for all three verbs, *shave*, *wash* and *dry*, it is clear that subjects show difficulties in rejecting local coreference with predicates that more readily allow an inherently reflexive interpretation, i.e. *shave* and *wash*, in contrast to *dry*. This hierarchy is reflected in subjects’ mean scores (cf. Table 5.8).
percentage of responses for quantified experimental conditions for our DS subjects.

Table 5.10: Percentage of correct responses for DS subjects on experimental conditions (all mismatch).

<table>
<thead>
<tr>
<th>mismatch</th>
<th>Code</th>
<th>Question</th>
<th>group score</th>
</tr>
</thead>
<tbody>
<tr>
<td>quant.-pronoun every</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>shave</td>
<td>QePXs</td>
<td>Is every boy shaving him?</td>
<td>97</td>
</tr>
<tr>
<td>wash</td>
<td>QePXw</td>
<td>Is every bear washing him?</td>
<td>94</td>
</tr>
<tr>
<td>dry</td>
<td>QePXd</td>
<td>Is every duck drying her?</td>
<td>100</td>
</tr>
<tr>
<td>quant.-pronoun all</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>shave</td>
<td>QaPXs</td>
<td>Are all the boys shaving them?</td>
<td>91</td>
</tr>
<tr>
<td>wash</td>
<td>QaPXw</td>
<td>Are all the bears washing them?</td>
<td>84</td>
</tr>
<tr>
<td>dry</td>
<td>QaPXd</td>
<td>Are all the ducks drying her?</td>
<td>100</td>
</tr>
</tbody>
</table>

The data presented in Table 5.10 support the prediction outlined in (ii): in accordance with the Chain condition, subjects correctly rejected local covaluation on all three verbs. For the quantifier 'every', they correctly ruled out coreference 97%, 94% and 100% of the time for *shave*, *wash* and *dry* respectively. Similarly, on constructions involving the quantifier 'all': subjects correctly ruled out coreference 91%, 84% and 100% of the time for *shave*, *wash* and *dry* respectively.

The table below presents individual data. Whilst all subjects show a certain degree of acceptance of local coreference, S1 and S3 seem to do so more than S2 and S4, at least with some verbs.
Table 5.11: Percentage of correct responses for DS subjects on non-quantified experimental conditions

<table>
<thead>
<tr>
<th>mismatch</th>
<th>Code</th>
<th>S1</th>
<th>S2</th>
<th>S3</th>
<th>S4</th>
<th>group score %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name-pronoun</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>shave</td>
<td>NPXs</td>
<td>37.5</td>
<td>62.5</td>
<td>0</td>
<td>87.5</td>
<td>47</td>
</tr>
<tr>
<td>wash</td>
<td>NPXw</td>
<td>25</td>
<td>62.5</td>
<td>75</td>
<td>87.5</td>
<td>62.5</td>
</tr>
<tr>
<td>dry</td>
<td>NPXd</td>
<td>37.5</td>
<td>75</td>
<td>75</td>
<td>100</td>
<td>72</td>
</tr>
</tbody>
</table>

S1 correctly rejected local coreference between the pronoun and the predicate only 25% to 37.5% of the time, and S2 between 62% and 75% of the time. In line with the pattern shown in Experiment I, S4 performs best, accepting illicit local coreference only 12% of the time, in other words, reaching 87.5% correct. S3 correctly rejected coreference between the pronoun and the predicate 75% of the time on wash and dry, but, interestingly, accepted illicit coreference with shave 100% of the time.

In contrast, the subjects' performance on the quantifier-pronoun condition is much more uniform. As presented in Table 5.12, all subjects ruled out illicit covaluation between the pronoun and the antecedent headed by the quantifier 'every' between 87.5% and 100% of the time. Their performance on the quantifier 'all' was similar, between 87.5% and 100% for subjects S1, S2 and S4, with S3 reaching 62.5% and 75% correct on shave and wash, respectively, and 100% on dry. Note that the subjects' high performance on quantifiers further confirms that their poor performance on conditions that involved reflexives bound by quantifiers in Experiment I, revealed the lack of mastery of reflexives, rather than quantifiers themselves.

---

18 It was argued earlier that shave is the most 'inherently reflexive' – predicting that subjects may treat this predicate differently to others, i.e. show higher acceptance rates with constructions involving the covaluation between the pronoun and the antecedent with shave. This prediction seems to be born out.

19 The poorer performance on these questions S3 displays cannot be accounted for at present. Although the pattern of her performance leans in the right direction, in line with our prediction and the results shown by other subjects, her scores may be due to an a temporary dip in attention, tiredness, or some other factors not related to the experimental set up.
Table 5.12: Percentage of correct responses for DS subjects on non-quantified experimental conditions

<table>
<thead>
<tr>
<th>Experimental conditions</th>
<th>Code</th>
<th>S1</th>
<th>S2</th>
<th>S3</th>
<th>S4</th>
<th>group score</th>
</tr>
</thead>
<tbody>
<tr>
<td>quant.-pron. <em>every</em></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>shave</td>
<td>QePXs</td>
<td>100</td>
<td>100</td>
<td>87.5</td>
<td>100</td>
<td>97</td>
</tr>
<tr>
<td>wash</td>
<td>QePXw</td>
<td>87.5</td>
<td>100</td>
<td>87.5</td>
<td>100</td>
<td>94</td>
</tr>
<tr>
<td>dry</td>
<td>QePXd</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>quant.- pron. <em>all</em></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>shave</td>
<td>QaPXs</td>
<td>87.5</td>
<td>100</td>
<td>75</td>
<td>100</td>
<td>91</td>
</tr>
<tr>
<td>wash</td>
<td>QaPXw</td>
<td>87.5</td>
<td>87.5</td>
<td>62.5</td>
<td>100</td>
<td>84</td>
</tr>
<tr>
<td>dry</td>
<td>QaPXd</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

Experiment III confirms our prediction that DS subjects may incorrectly accept local coreference with pronouns when used as arguments of inherently reflexive predicates but only in accordance with conditions on reflexivity. This pattern is expected if they are unable to use reflexives as arguments of a predicate, which is shown in Experiment I, but obey the conditions on reflexivity of predicates. When interpreting pronouns as bound variables, it was predicted that subjects would reject bound variable interpretations both with quantifier ‘every’ and ‘all’ in order to avoid the violation of the Chain Condition. Except for S4, the results seem to support our hypothesis.

5.3.3 Summary

The previous section describes a further attempt at probing the knowledge of binding in the four English subjects with DS, testing the hypothesis argued for in (11). Experiment III was designed to test the prediction that in the absence of anaphoric binding, subjects will display their knowledge of other principles of grammar available to them. Abstracting away from individual variation in the data, and the scale of inherent reflexivity for each tested predicate, by accepting illicit local
coreference between a pronoun and a referential antecedent with inherently reflexive predicates, subjects showed that they obey conditions on binding, given in R&R as conditions on reflexivity of predicates. By ruling out illicit covaluation of the pronoun with the quantified antecedent, in contexts where no coreference is possible, subjects showed that they obey the Chain Condition of R&R.

Although it is not possible to give more illuminating reasons for the level of individual variation displayed by the same subjects who took part in Experiment I and III, it is important to stress that there is a distinct correlation between individual subjects’ scores on the two experiments. If we were to establish some sort of ranking between the subjects’ individual performance, S1 would show the poorest scores, whereas S4 would show most accurate scores on both experiments, as presented in the tables below.

Table 5.13: Ranking of DS subjects’ individual scores (percentage correct) in Experiment I

<table>
<thead>
<tr>
<th>Experimental conditions</th>
<th>Code</th>
<th>S1</th>
<th>S2</th>
<th>S3</th>
<th>S4</th>
</tr>
</thead>
<tbody>
<tr>
<td>name-reflexive match</td>
<td>NRM</td>
<td>25</td>
<td>75</td>
<td>62.5</td>
<td>75</td>
</tr>
<tr>
<td>Rank:</td>
<td>I III II III</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>quantifier-reflexive match</td>
<td>QRM</td>
<td>12.5</td>
<td>50</td>
<td>12.5</td>
<td>25</td>
</tr>
<tr>
<td>Rank:</td>
<td>I IV III II</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>name-reflexive mismatch</td>
<td>NRX</td>
<td>12.5</td>
<td>37.5</td>
<td>75</td>
<td>100</td>
</tr>
<tr>
<td>Rank:</td>
<td>I II III IV</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>quant.-reflexive mismatch</td>
<td>QRX</td>
<td>12.5</td>
<td>25</td>
<td>87.5</td>
<td>62.5</td>
</tr>
<tr>
<td>Rank:</td>
<td>I II IV III</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 5.14: Ranking of DS subjects’ individual scores (percentage correct) in Experiment III

<table>
<thead>
<tr>
<th>Experimental conditions</th>
<th>Code</th>
<th>S1</th>
<th>S2</th>
<th>S3</th>
<th>S4</th>
</tr>
</thead>
<tbody>
<tr>
<td>all mismatch</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>name-pronoun mismatch</td>
<td>NPX</td>
<td>33.3</td>
<td>66.6</td>
<td>50</td>
<td>91.6</td>
</tr>
<tr>
<td>Rank:</td>
<td></td>
<td>I</td>
<td>III</td>
<td>II</td>
<td>IV</td>
</tr>
<tr>
<td>quant.-pron. (every) mismatch</td>
<td>QePX</td>
<td>95.8</td>
<td>100</td>
<td>91.6</td>
<td>100</td>
</tr>
<tr>
<td>Rank:</td>
<td></td>
<td>II</td>
<td>III</td>
<td>I</td>
<td>III</td>
</tr>
<tr>
<td>quant.-pron. (all) mismatch</td>
<td>QaPX</td>
<td>91.6</td>
<td>95.8</td>
<td>79</td>
<td>100</td>
</tr>
<tr>
<td>Rank:</td>
<td></td>
<td>II</td>
<td>III</td>
<td>I</td>
<td>III</td>
</tr>
</tbody>
</table>

S2 and S3 are closer in performance: although S3 shows very poor performance on experiment I, S3 shows exceptionally high over-acceptance of local coreference between a pronoun and the referential antecedent with the predicate shave on Experiment III, which results in the change of ranking order between the two subjects on the two experiments.

5.4 Supporting the hypothesis: Knowledge of binding in SC grammar of Down syndrome

In the following sections we examine data from the Serbo-Croatian (SC) version of Experiment I, reported in chapter 4, in view of our claim that anaphoric binding is deficient in the grammar of DS, but conditions on binding, as given in our (adapted) framework of Reflexivity, are available to this population. As seen earlier, the data from English experiments I and III confirmed our claim that subjects possess knowledge of Condition B of R&R (1993), but lack the ability to establish the binding relation between the anaphor and its antecedent. In the SC data to be reviewed, knowledge of both Condition A and Condition B of R&R will be uncovered, as well as further evidence for the absence of anaphoric binding in the DS population. That Condition A is present will be supported by subjects’ accurate
performance on experimental conditions involving the reflexive clitic 'se' with inherently reflexive verbs: assuming that the clitic is not an argument, no anaphoric binding is involved (Condition A: 'a reflexive-marked syntactic predicate must be reflexive'). Knowledge of Condition B will be reflected in subjects' good performance on experimental conditions which contain reflexive predicates with pronominal arguments (Condition B: 'a reflexive semantic predicate must be reflexive-marked'). Specific difficulties with experimental conditions involving the anaphor 'sebe' will be interpreted as providing additional support for the claim that anaphoric binding seems deficient in the population with DS crosslinguistically. The differences that arise in the responses of English and SC-speaking subjects will be attributed to distinct grammatical properties of anaphors in the two languages, which force the subjects to employ distinct strategies while they attempt to give some interpretation to the anaphoric elements in their language. The knowledge of constraints that rule out illicit coreference in the SC-speaking population DS will be explored within the model of anaphoric relations proposed for English, in section 5.1 of this chapter. Here it was argued that Binding Conditions have an additional responsibility of regulating coreference because Rule I is not applicable in the grammar of DS.

Before outlining the specific predictions for the patterns found in the data of SC-speaking subjects with DS, which, we argue, are a product of the interaction of knowledge of conditions on reflexivity of predicates and lack of anaphoric binding, we shall briefly review the typology of the SC pronominal system, discussed in chapter 4. We have seen that SC possesses a rich paradigm of personal and reflexive pronouns, allowing for both full and clitic pronominal forms, as seen in Table 4.9 in chapter 4, repeated here as 5.15. The difference between personal and reflexive pronouns is palpable however: only one reflexive form is available for the reflexive full and clitic pronouns, whilst distinct forms of personal pronouns and clitics are used for all persons and number.
Relying on the two independent modules of R&R (1993), which dictate the distribution of anaphors and pronouns in a language, the generalised Chain Condition and the conditions on reflexivity of predicates, the following typology emerges. The two properties along which the pronominal elements are categorized are their referential properties [+/-R] and the ability to reflexive-mark a predicate [+/-SELF]. Referential properties decide whether an element is fully specified for grammatical features of gender, number, person and structural Case. Elements underspecified for referential features, [-R], can appear in the foot of A-chains, but those fully specified for these features, [+R], cannot. The ability to reflexive-mark a predicate, [+/-SELF], is a property that defines whether an element can appear as an argument of (transitive) predicates that are reflexivized in the syntax.

According to these criteria, the SC anaphor ‘sebe’ is [+SELF] and [-R]: it is the only true anaphor in this language, being able to reflexive-mark a transitive predicate. In addition, ‘sebe’ lacks most referential features: although marked for case (but not Nominative), it is not marked for number, person or gender features, and can refer to antecedents which are plural or singular, masculine or feminine, first, second or third person.

We have seen in chapter 4 that the reflexive clitic occurs with inherently reflexive
predicates and is unable to reflexive-mark a transitive predicate syntactically the way 'sebe' can. Assuming that 'se' is not an argument (whilst pronominal clitics are) we adopt Reinhart (1996; 2000), in considering 'se' to be a morphological marker of inherent reflexivity. In her framework, the reflexive clitic signals that a lexical operation has taken place, where a two-way relation, $\lambda x \lambda y (xRy)$, is reduced to a property, $\lambda x(xRx)$, rendering the predicate intransitive. The distinction between inherent reflexive predicates and those that are reflexive-marked in the syntax will have interesting consequences for our investigation into the knowledge of binding in the DS population. Recall that our claim is that subjects with DS lack knowledge of anaphoric binding; but, importantly, their knowledge of reflexivity of predicates is intact.

Personal pronouns and pronominal clitics in SC have no reflexive-marking function, they are [-SELF] and thus cannot appear as arguments of (non-inherently) reflexive predicates. Since they are fully specified for referential features, [+R], having full gender, person, number and case paradigms, pronouns and pronominal clitics are excluded from appearing as arguments of inherently reflexive predicates, a restriction consonant with the Chain Condition.

As SC has a relatively flexible word order, full forms of pronouns and the anaphor can be found in a variety of overt positions, although positions to the left of the verb are the least marked. All SC clitics are restricted to the 'second' position (see chapter 4 for details).

With both the morphological and syntactic properties of SC pronouns and reflexives kept to the fore, together with their reflexivizing capabilities, we can illustrate the Binding and Chain Condition in practice. The examples below demonstrate the way

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20 See Reinhart (1996; 2000) for a discussion of how languages differ with regard to marking the lexical reflexivity processes.
21 Recall that we assume that pronominal clitics in SC are arguments, not verbal inflections as in Romance or South Slavic clitic doubling languages, such as Macedonian and Bulgarian.
in which these principles interact, regulating the distribution of these elements, in both referential and quantified contexts.

(27)

(a) Petar Pani, sebi, voli.  
    Peter Pan self likes  
    ‘Peter Pani, likes himselfi,’

(b) *Petar Pani, sebij, voli.  
    Peter Pan self likes  
    ‘*Peter Pani, likes himselfi’

(c) Svaki dečakj, sebej, voli.  
    every boy self likes  
    ‘Every boyj, likes himselfj.’

(d) *Svaki dečakj, sebej, voli.  
    every boy self likes  
    ‘*Every boyj, likes himselfj’

(e) Petar Pan se brije. (where PP shaves himself)  
    Peter Pan se shaves  
    ‘Peter Pan is shaving.’

(f) * Petar Pan se brije. (where PP shaves someone else)  
    Peter Pan se shaves  
    ‘*Peter Pan is shaving.’

(g) *Petar Pani, ga/njega, voli.  
    Peter Pan him-cl/him likes  
    ‘*Peter Pani, likes himi-cl/himi,’
In example (a), the anaphor and its antecedent are covalued, creating a reflexive predicate; this predicate is reflexive marked, because one of the arguments is the anaphor 'sebe' that has the property [+SELF]. Condition A rules out (b) since the predicate is reflexive-marked, but due to the absence of covaluation between arguments, it cannot be interpreted reflexively. Examples (c) and (d) are parallel to (a) and (b), differing only in that the anaphor is a coargument of a quantified expression. Condition A rules in (c), as the predicate is interpreted as reflexive, with 'sebe' being a coargument. The same condition rules out (d), however, because the anaphor and its antecedent are not covalued, and no reflexive predicate is created.

The Chain Condition is satisfied in all constructions (a)-(d) since the anaphor is referentially deficient, [-R].

Condition A is also relevant for structures (e) and (f) containing the reflexive clitic 'se'. The lexically reflexive predicate in (e) must be reflexively interpreted; the only argument of the predicate is the subject NP that is involved in a reflexive action, thus satisfying Condition A. The lexically reflexive predicate in (f) cannot be interpreted as reflexive, however, because the subject NP is not engaged in a reflexive action. Example (g) violates Condition B as the predicate is not reflexive marked, either in
syntax (via ‘sebe’) or in the lexicon (the verb is not inherently reflexive). This construction also violates the Chain Condition: being [+R], pronouns and pronominal clitics are ruled out from the foot position of an A-chain. Although (h) does not violate Condition A or B, the fact that the predicate is reflexive marked in the lexicon, means it contravenes the Chain Condition. Similarly, (i) violates both Condition B and the Chain Condition, whilst (j) violates only the Chain Condition, since the predicate is reflexive-marked in the lexicon.

The above constructions all involve syntactic binding - both anaphoric and variable binding - however, the issue of coreference also requires attention. As discussed earlier, pronouns (but not anaphors)\(^{22}\) that are in a local relation with their antecedent can be interpreted both as variables bound by, and coreferential with, the local antecedent.

(28) Petar Pan njega voli.
Peter Pan him likes
Peter Pan \(\lambda x (x \text{ likes } a)\) accidental coreference: where \(a = \text{Peter Pan}\)

Following Grodzinsky & Reinhart (1993), in a non-impaired population it is the responsibility of Rule I to rule out illicit coreferential interpretation. Nevertheless, in the early sections of this chapter we were compelled to argue that it is Condition B and not Rule I that constrains coreference in the population with DS. This explanation is expected to account for the knowledge of coreference in the DS population crosslinguistically, including speakers of SC. Due to the lack of one of the competing interpretations - anaphoric binding - there can be no competition between the anaphoric/bound variable and coreferential interpretations in the grammar of DS subjects. Yet the distinction present between lexically/inherently (intransitive) reflexive and non-inherently reflexive (transitive) predicates in SC\(^{23}\) raises interesting

\(^{22}\) Anaphors are always interpreted as bound variable, thus no coreferential interpretation is available.

\(^{23}\) Comparable issues of course arise in English, but structures containing lexically reflexive predicates
issues: if our claim is that one of the competitors, the anaphoric binding (=reflexive) interpretation, is missing in this population, which of the two interpretations, inherently reflexive or non-inherently reflexive, is the missing competitor? It is commonly assumed that the truth conditions for transitive and inherently reflexive predicates are identical, despite differences in (surface) structure. Whilst transitive reflexive predicates have the anaphor ‘sebe’ as a coargument, lexically/inherently reflexive predicates are intransitive, with their internal theta role reduced (Reinhart 1996); in clitic languages, ‘se’ is not a coargument, and thus not an anaphor. Reinhart (1996) points out that even if the semantics of these two types of predicates may be equivalent, their use is not: syntactically reflexive predicates are used usually for purposes of focus. This may not be so apparent in English, but is palpable in SC:

(29) Marko se brije svaki dan.
    Marko se shaves every day
    ‘Marko shaves every day.’

(30) ??? Marko sebe brije svaki dan.
    Marko self shaves every day
    ‘Marko shaves himself every day.’

(31) Marko prvo sebe brije pa onda dedu.
    Marko first self shaves and then granddad
    ‘Marko shaves himself first and then his granddad.’

(32) *Marko se prvo brije pa onda dedu.24
    Marko first se shaves and then granddad
    ‘Marko shaves himself first and then his granddad.’

---

24 Clitics cannot be focussed in SC for independent reasons.

were not tested in our English version of Experiment I.
These contrasts make it unlikely to consider the inherently reflexive interpretation as a possible competitor to the coreferential interpretation in contexts allowing accidental coreference. A more mundane reason for excluding the inherently reflexive interpretation as one of the competitors is the ungrammaticality of the clitic ‘se’ in contexts where accidental coreference between the subject and the object pronoun is licit. The clitic ‘se’ is only used with lexically reflexive predicates; not being a reflexive-marker, it cannot be used with transitive reflexive verbs that permit coreference between the pronoun and the subject NP.

(33) Petar Pan njega/*se voli.
    Peter Pan him/se likes
    ‘Peter Pan likes him/se.’

Having established that none of the two reflexive interpretations can compete with the coreferential interpretation further supports our claim that Rule I cannot have empirical consequences in the grammar of DS, leaving Condition B to take over the role of constraining coreference.

5.4.1 Predictions and data: Interaction of unavailability of anaphoric binding with available principles in the grammar of DS

A brief summary of the key characteristics of SC anaphors and pronouns, in terms of properties that govern their distribution, is provided below:

a. the only ‘true’ anaphoric element that has the function of reflexive marking in

---

25 When forced by appropriate pragmatic contexts, it is possible to get the reflexive reading with the clitic ‘se’. We saw in chapter 4 that adult speakers of SC accepted the reflexive reading of a transitive verb (e.g. ‘touch’) even when not reflexive-marked by the full anaphor and only accompanied by a reflexive clitic. Children however preferred the non-reflexive, null-object reading with transitive verbs of this type, thus in effect showing a greater sensitivity to different uses of ‘se’ and semantic properties of predicates than adults. Similar pattern was recorded in the DS subjects. We argued that adult controls and the eldest control children accepted the clitic as a reflexive marker in these constructions as the reflexive reading was forced by highly salient context, i.e. experimental pictures depicting reflexive actions.
syntax and lacks referential features is 'sebe'([-R] and +SELF);
b. the clitic 'se' is not an anaphor but a lexical marker of inherent reflexivity and
does not enter anaphoric relations;
c. full pronouns and pronominal clitics do not reflexive-mark predicates in
syntax, and are fully specified for referential features ([+R] and -SELF).

With these properties of the SC pronominal system in mind, we can make concrete
predictions about the patterns our SC-speaking subjects will exhibit, parallel to those
found in the English subjects with DS. Recall that in the English version of this
experiment subjects revealed knowledge of Binding Condition B but revealed a lack
of the relation of anaphoric binding. This deficit in anaphoric binding made it
unfeasible to probe for any awareness of Binding Condition A using our testing
paradigm: this condition states that reflexive predicates have to be interpreted
reflexively - and our subjects were not able to use the anaphoric elements that can
reflexive-mark transitive reflexive predicates.\(^{26}\) Note however that the SC version of
Experiment I tested lexically reflexive predicates, via constructions involving the
reflexive clitic, thus providing an opportunity to test for Condition A without
resorting to anaphoric binding. On the basis of the interaction between the presence
of binding principles and the absence of anaphoric binding, the following predictions
concerning the patterns which SC-speaking subjects will show, can be made:

i. Knowledge of Condition A: Subjects are expected to correctly interpret
constructions containing inherently reflexive predicates accompanied by the reflexive
clitic 'se', as reflexive.

ii. Knowledge of Condition B and the Chain Condition: Subjects are expected to
rule out constructions depicting reflexive action but containing predicates that are not

\(^{26}\) Experiment I did not test inherently reflexive predicates and sentences of the type:
(i) Max shaved.
As these structures do not involve anaphors, they would be the only structures to test knowledge of
Condition A in English subjects with DS.
reflexive-marked, where the argument is either a strong pronoun or a pronominal clitic. Furthermore, their knowledge of constraints on illicit coreference (i.e. Condition B) is an additional reason for ruling out pronouns in a local relation with their antecedent.

iii. An inability to use anaphoric binding: Subjects are expected to show difficulties interpreting constructions containing the strong reflexive form, the true anaphor ‘sebe’. However, due to distinct grammatical properties of SC and English anaphors, attempts to interpret the anaphor may result in different strategies. Consequently, performance patterns different to those employed and shown by English subjects may be expected.

In short, if the principles of binding are available, but the relation of anaphoric binding is not, subjects will struggle to interpret the anaphor ‘sebe’, but will have no difficulties interpreting constructions containing the reflexive clitic ‘se’, strong pronouns, or pronominal clitics.

In the following sections, we shall review the predictions for each individual experimental condition in the SC version of Experiment I and establish whether they are supported by the data obtained, as reported in chapter 3 and repeated here. The three sections will deal with a) experimental conditions involving the reflexive clitic – assessing knowledge of Condition A; b) experimental conditions involving strong pronouns and pronominal clitics – assessing knowledge of Condition B and constraints governing illicit coreference; and c) experimental conditions involving the anaphor ‘sebe’ – gauging the knowledge of anaphoric binding.

i. Experimental conditions containing reflexive clitic ‘se’ (match & mismatch): Knowledge of Condition A

Experimental conditions involving the reflexive clitic ‘se’ bear directly on our
subjects’ knowledge of Condition A. The clitic occurs with inherently reflexive predicates in SC as a morphological marker of inherent reflexivity, thus correct interpretation of name-reflexive and quantifier-reflexive match and mismatch constructions, requires subjects to recognise that inherently ‘reflexive predicates must be interpreted reflexively’ (Condition A). Since the clitic is not an anaphor, the relation of anaphoric binding is irrelevant here.

As our claim is that knowledge of Condition A is available in DS grammar, our subjects are predicted to provide a correct ‘yes’ answer to the experimental name-reflexive (NRM) and the quantifier-reflexive (QRM) match type of questions. For NRM, subjects are presented with a picture showing one character performing a reflexive action e.g. Snow White drying herself, with another character, e.g. Cinderella, standing by. Both characters are introduced as possible referents. The picture accompanying QRM, depicts three characters also performing a reflexive action, e.g. three ducks washing themselves, and another character, e.g. Cinderella, standing by.

(34)
NRMcl (name-refl. clitic match) Da li se Snežana briše?
comp prti. li se Snow White drying
‘Is Snow White drying herself?’
reflexive action: X dries X
correct answer: yes

(35)
QRMcl (quantifier-refl. clitic match) Da li se svaka patka briše?
comp prti. li se every duck drying
‘Is every duck drying herself?’
reflexive action: every X dries X
correct answer: yes
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The mismatch experimental questions, NRXcl and QRXcl, use constructions which contain an inherently reflexive verb and the reflexive clitic ‘se’ accompanied by a picture showing a non-reflexive, transitive action (one character, e.g. Snow White (NRXcl), or three characters, e.g. three ducks (QRXcl) perform the action of drying another character, e.g. Cinderella). As they are aware that reflexive constructions cannot apply to a transitive action, subjects are expected to provide a negative reply to these experimental questions.

(36)
NRXcl (name-refl. clitic mismatch) Da li se Snežana briše?
comp prt.cl se Snow White drying
‘Is Snow White drying herself?’
transitive action: X dries X
correct answer: no

(37)
QRXcl (quant-refl. clitic mismatch) Da li se svaka patka briše?
comp prt.cl se every duck drying
‘Is every duck drying herself?’
transitive action: every X dries Y
correct answer: no

The tables below support our predictions. Subjects demonstrate their awareness of Condition A by correctly ruling in constructions that involve inherently reflexive predicates accompanied by the clitic in the match constructions 100% of the time. In the mismatch conditions, depicting non-reflexive action, the same construction is rejected 90% of the time for the referential DP and 80% for quantified DP.
A remaining question is whether or not our data support the prediction that SC-speaking subjects possess knowledge of Condition B. This is the focus of the next section.

ii. Experimental conditions containing full and clitic forms of pronouns (match & mismatch): Knowledge of Condition B, Chain Condition and constraints governing coreference

Experimental conditions containing pronouns enabled us to probe into knowledge of both grammatical and pragmatic aspects of anaphora in our sample of SC-speaking individuals with DS. Recall that Condition B regulates reflexivity of predicates, as well as illicit coreference (as given in our model) whereas the Chain Condition is in charge of configurationality effects.

Table 5.16: Percentage of correct responses for the reflexive clitic conditions

<table>
<thead>
<tr>
<th>match</th>
<th>Code</th>
<th>Question</th>
<th>group score %</th>
</tr>
</thead>
<tbody>
<tr>
<td>name refl-cl</td>
<td>NRMcl</td>
<td>Is se-cl Snow White washing?</td>
<td>100</td>
</tr>
<tr>
<td>quant. refl-c.</td>
<td>QRMc1</td>
<td>Is se-cl every bear washing?</td>
<td>100</td>
</tr>
<tr>
<td>mismatch</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>name refl-cl</td>
<td>NRXcl</td>
<td>Is se-cl Snow White washing?</td>
<td>90</td>
</tr>
<tr>
<td>quant. refl-cl</td>
<td>QRXcl</td>
<td>Is se-cl every bear washing?</td>
<td>80</td>
</tr>
</tbody>
</table>

A remaining question is whether or not our data support the prediction that SC-speaking subjects possess knowledge of Condition B. This is the focus of the next section.

27 Recall from our discussion in the previous chapter that both DS and the youngest TD subjects were shown to allow for a non-reflexive, null object reading, with the verb ‘touch’, also available in adult grammar. These answers should not be treated as incorrect, thus in all tables presented in this section, experimental questions involving occurrences of the clitic ‘se’ with the verb ‘touch’ have not been counted. Only the percentage of correct answers with verbs ‘wash’ and ‘dry’ is given for each individual condition. Note however that the number of possible correct answer per condition may be different: for instance, there are 4 occurrences of ‘non-touch’ verbs with the clitic on NRMcl condition, and 6 on QRXcl condition. Thus e.g. S1 has 4 out of 4 correct on NRMcl, whilst S3 has 4 out of 6 correct on QRXcl.

28 In order to get a clearer picture of patterns emerging in our subjects’ performance, the data reported here exclude the results of the outlier subject S2 whose consistently poor scores on all conditions bring down the group score considerably. Recall from chapter 4 that even when this subject and her matched control are omitted from the data, the differences between the DS group and the matched controls remain significant on exactly the same experimental conditions, NRX, QRX, NRXcl and QRXcl, proving that the differences were not due just to S2’s scores, generally the lowest in the DS group.
Let us first review the performance of our subjects on the match conditions. These conditions involve transitive contexts only and thus tap into subjects’ understanding of deictic interpretation of pronouns and pronominal clitics. Experimental questions *name-pronoun* (NPM) and *quantifier-pronoun* match (QPM) accompany pictures showing one or three characters involved in an action of drying, touching or washing one other character: e.g. Snow White touching Cinderella, three ducks touching Goldilocks. The transitive action depicted requires a deictic interpretation of the pronoun used, necessitating a positive answer.

(38)  
NPM (name-pronoun match)  
Da li Snežana nju briše?  
comp prt.cl Snow White her drying  
‘Is Snow White drying her?’  
transitive action: X dries Y  
correct answer: yes

(39)  
QPM (quantifier-pronoun match)  
Da li svaki medved njega briše?  
comp prt.cl every bear him drying  
‘Is every bear drying him?’  
transitive action: every X dries Y  
correct answer: yes

Identical contexts and questions are used in the conditions involving pronominal clitics, NPMcl and QPMcl, with one difference, namely that of the obligatory second position of the clitic in the experimental question presented.

(40)  
NPMcl (name-pron.cl. match)  
Da li je Snežana briše?  
comp prt.cl her-cl Snow White drying
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‘Is Snow White drying her?’
transitive action: X dries Y
correct answer: yes

(41)

QPMcl (quantifier-pron.cl.match)  Da li ga svaki medved briše?
comp prt.cl him-cl every bear drying
‘Is every bear drying him?’
transitive action: every X dries Y
correct answer: yes

With no anaphoric binding involved, it is hypothesised that subjects with DS will have no difficulties in assigning a deictic reading to the pronominal elements in the above constructions. This seems to be confirmed by the figures in Table 5.17: subjects’ average scores on match experimental questions involving both strong pronouns and pronominal clitics range between 90 and 97.5% correct responses.

Table 5.17: Percentage of correct responses on conditions involving full and clitic pronouns (match)

<table>
<thead>
<tr>
<th>match</th>
<th>Code</th>
<th>Question</th>
<th>group score %</th>
</tr>
</thead>
<tbody>
<tr>
<td>name pronoun</td>
<td>NPM</td>
<td>Is Snow White her washing?</td>
<td>97.5</td>
</tr>
<tr>
<td>quant. pronoun</td>
<td>QPM</td>
<td>Is every bear him washing?</td>
<td>95</td>
</tr>
<tr>
<td>match</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>name pron-cl</td>
<td>NPMcl</td>
<td>Is her-cl Snow White washing?</td>
<td>95</td>
</tr>
<tr>
<td>quant pron-cl</td>
<td>QPMcl</td>
<td>Is him-cl every bear washing?</td>
<td>90</td>
</tr>
</tbody>
</table>

Of special interest are mismatch experimental conditions involving a pronoun covalued with a referential or quantified antecedent. The correct answer to both is ‘no’, since the picture accompanying the experimental question depicts a reflexive, transitive context: for name-pronoun mismatch (NPX), subjects are shown a picture with one character performing a reflexive action e.g. Snow White drying herself, with
another character, e.g. Cinderella, standing by. In the quantified version of the condition, *quantifier-pronoun* mismatch (QPX), three characters are performing a reflexive action on themselves, e.g. three bears washing themselves, and another character, e.g. Peter Pan, standing by. Both types of questions involve violations of Condition B and the Chain Condition: pronouns cannot reflexive-mark transitive predicates, nor can they occupy the foot position of an A-chain. In addition, Condition B rules out the possibility of illicit coreference in NPX, given the assumption that its scope is larger in the grammar of this population.

(42)
NPX (name-pronoun mismatch)  
Da li Snežana nju briše?
comp prt.cl Snow White her drying?
‘Is Snow White drying her?’
reflexive action: X dries X
correct answer: no

(43)
QPX (quant-pronoun mismatch)  
Da li svaki medved njega briše?
comp prt.cl every bear him drying
‘Is every bear drying him?’
reflexive action: X dries X
correct answer: no

Since we argue that Condition B and the Chain Condition are available in the DS grammar, it is may be expected that subjects would show no difficulties ruling out ungrammatical questions of the type NPX and QPX. This prediction is confirmed by the data shown in the figure below: for both NPX and QPX the subject reach an average accuracy of 92.5%.
Table 5.18: Percentage of correct responses on conditions involving full pronouns (mismatch)

<table>
<thead>
<tr>
<th>mismatch</th>
<th>Code</th>
<th>Question</th>
<th>group score %</th>
</tr>
</thead>
<tbody>
<tr>
<td>name pronoun</td>
<td>NPX</td>
<td>Is Snow White her washing?</td>
<td>92.5</td>
</tr>
<tr>
<td>quant.pronoun</td>
<td>QPX</td>
<td>Is every bear him washing?</td>
<td>92.5</td>
</tr>
</tbody>
</table>

Experimental questions name-pronominal clitic (NPXcl) and quantifier-pronominal clitic (QPXcl) mismatch again utilise experimental contexts identical to the NPX and QPX.

(44)
NPXcl (name-pron.cl. mismatch) Da li je Snežana briše?
comp prt.cl her-cl Snow White drying?
‘Is Snow White drying her?’
reflexive action: X dries X
correct answer: no

(45)
QPXcl (quant.-pron. cl. mismatch) Da li ga svaki medved briše?
comp prt.cl him-cl every bear drying?
‘Is every bear drying him?’
reflexive action: X dries X
correct answer: no

As is the case with strong pronouns, the properties [-SELF] and [+R] exclude clitics from being coarguments of transitive reflexive predicates, in accordance with Condition B and the Chain Condition. Yet since accidental coreference is not possible in constructions involving pronominal clitics, Condition B need not be called upon for the additional task of ruling out illicit coreference in these constructions. Our DS subjects are therefore expected to show a good performance with experimental questions NPXcl and QPXcl. At first sight, such a prediction seems to be confirmed.
only to a certain extent. The mean scores presented in the table below reveal some
difficulties with interpreting the conditions involving constructions with pronominal
clitics.

**Table 5.19**: Percentage of correct responses on conditions involving pronominal
clitics (mismatch)

<table>
<thead>
<tr>
<th>mismatch</th>
<th>Code</th>
<th>Question</th>
<th>group score %</th>
</tr>
</thead>
<tbody>
<tr>
<td>name prn-cl</td>
<td>NPXcl</td>
<td>Is her-cl Snow White washing?</td>
<td>82.5</td>
</tr>
<tr>
<td>quant prn- cl</td>
<td>QPXcl</td>
<td>Is him-cl every bear washing?</td>
<td>70</td>
</tr>
</tbody>
</table>

Although still above chance, the mean of 82.5% correct on NPXcl and 70% correct
on QPXcl are the lowest scores shown by our subjects so far. However, after
examining subjects’ individual scores, presented in Table 5.20, it is clear that the
difficulties with the mismatch pronominal clitic conditions are only shown by
subjects S5 and S6, bringing the group’s mean score down.

**Table 5.20**: Percentage of individual correct responses on conditions involving
pronominal clitics (mismatch)

<table>
<thead>
<tr>
<th>mismatch</th>
<th>Code</th>
<th>S1</th>
<th>S3</th>
<th>S4</th>
<th>S5</th>
<th>S6</th>
<th>group score %</th>
</tr>
</thead>
<tbody>
<tr>
<td>name prn-cl</td>
<td>NPXcl</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>50</td>
<td>62.5</td>
<td>82.5</td>
</tr>
<tr>
<td>quant prn- cl</td>
<td>QPXcl</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>12.5</td>
<td>37.5</td>
<td>70</td>
</tr>
</tbody>
</table>

The other three subjects achieve the maximum correct performance, 100%. The
pattern shown by S5 and S6 requires special attention however. Ostensibly, it
resembles the famous Delay of Principle B Effect found in typical acquisition, where
children as old as 6 or 7 have difficulties ruling out illicit covaluation between a
pronoun and a local antecedent. However, DPBE has not been reported with
pronominal clitics (in object constructions), the explanation being that clitics do not
allow accidental coreference (see references in Chapter 2). It is left open whether the
difficulties in interpreting pronominal clitics could be traced to some morphosyntactic
features of these elements. Without going into detail here, we suggest that this pattern reveals a separate deficit, one that cannot be a consequence of the lack of knowledge of Condition B (inability to rule out coarguments that are not reflexive-marked) – we saw earlier that all subjects successfully ruled out constructions containing strong pronouns covalued with a local antecedent.

iii. **Experimental conditions containing the anaphor ‘sebe’:**

   **Deficit in anaphoric binding**

Our claim that anaphoric binding is deficient in the DS population is based on the English subjects’ poor comprehension of anaphors in the English version of Experiment I. Anticipating this deficit to be present crosslinguistically, the prediction is that SC-speaking subjects with DS will display difficulties interpreting the full anaphor ‘sebe’. Examples of experimental questions involving the anaphor ‘sebe’ are given below. The match and mismatch conditions are equally important as both require subjects to construct an anaphoric binding relation in order to interpret the structure. Condition A is also involved, but subjects need to be able to establish the relation of anaphoric binding first in order to be able to reflexive-mark the predicate. The Chain Condition rules all the constructions in, as the anaphor is referentially defective [-R].

The experimental contexts are identical to those of conditions involving reflexive clitics, explained earlier in section (i). Our hypothesis is that interpret subjects will have difficulties interpreting any of the following type of construction.

---

29 It is interesting to note that S5 has significantly less difficulties interpreting constructions that require knowledge of anaphoric binding (as discussed in the ensuing section on the experimental conditions involving the anaphor ‘sebe’), in contrast to the other subjects who do poorly on anaphoric binding but seem to have no problem with pronominal clitics. We have no suggestions as to whether an inability to interpret pronominal clitics can be associated with (un)availability of anaphoric binding, or whether the two patterns could be viewed as independent signs of some broader grammatical deficit. Recall however that difficulties with pronominal clitics (clitic omission) have been reported to be a
(46)
NRM (name-reflexive match)  Da li Snežana sebe briše?
comp prt.cl Snow White self drying
‘Is Snow White drying herself?’
reflexive action: X dries X
correct answer: yes

(47)
QRM (quantifier-reflexive match)  Da li svaki medved sebe briše?
comp prt.cl every bear self drying?
‘Is every bear drying himself?’
reflexive action: every X dries X
correct answer: yes

The mismatch conditions involve a transitive, non-reflexive action:

(48)
NRX (name-reflexive mismatch)  Da li Snežana sebe briše?
comp prt.cl Snow White self drying
‘Is Snow White drying herself?’
transitive action: X dries Y
correct answer: no

(49)
QRX (quant.-reflexive mismatch)  Da li svaki medved sebe briše?
comp prt.cl every bear self drying?
‘Is every bear drying himself?’
transitive action: every X touches Y
correct answer: no

Table 5.21 displays results for the SC-speaking subjects with DS on experimental clinical marker of French SLI (Paradis, Crago Genesee, 2003).
conditions that involve the strong (non-clitic) reflexive 'sebe'. The data on personal pronouns are given again, for the sake of providing a contrast to the subjects' performance on the anaphor (the same forms were tested in the English version of Experiment I).

Table 5.21: Percentage of correct responses on experimental conditions involving the full pronouns and the anaphor sebe

<table>
<thead>
<tr>
<th>match</th>
<th>Code</th>
<th>Question</th>
<th>group score</th>
</tr>
</thead>
<tbody>
<tr>
<td>match</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. name reflexive</td>
<td>NRM</td>
<td>Is Snow White sebe washing?</td>
<td>95</td>
</tr>
<tr>
<td>2. quant. reflexive</td>
<td>QRM</td>
<td>Is every bear sebe washing?</td>
<td>100</td>
</tr>
<tr>
<td>3. name pronoun</td>
<td>NPM</td>
<td>Is Snow White her washing?</td>
<td>97.5</td>
</tr>
<tr>
<td>4. quant. pronoun</td>
<td>QPM</td>
<td>Is every bear him washing?</td>
<td>95</td>
</tr>
<tr>
<td>mismatch</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. name reflexive</td>
<td>NRX</td>
<td>Is Snow White sebe washing?</td>
<td>65</td>
</tr>
<tr>
<td>2. quant. reflexive</td>
<td>QRX</td>
<td>Is every bear sebe washing?</td>
<td>67.5</td>
</tr>
<tr>
<td>3. name pronoun</td>
<td>NPX</td>
<td>Is Snow White her washing?</td>
<td>92.5</td>
</tr>
<tr>
<td>4. quant. pronoun</td>
<td>QPX</td>
<td>Is every bear him washing?</td>
<td>92.5</td>
</tr>
</tbody>
</table>

As seen in Table 5.21, all subjects showed very strong performance on the match version of both the pronoun and reflexive conditions. However, their scores reveal a great disparity between the conditions involving reflexives as opposed to pronouns on the mismatch version of these conditions. On the name-reflexive mismatch (NRX) and quantifier-reflexive mismatch (QRX) their mean score was 65% and 67.5% correct, respectively. This performance is considerably lower than their performance on conditions involving pronouns: on the mismatch conditions involving pronouns, they correctly rejected covaluation between a pronoun and a local antecedent on the name-pronoun mismatch (NPX) and quantifier-pronoun mismatch (QPX) 92% of the time. In our view such a performance points to a deficit in anaphoric binding, parallel to that found in the English-speaking individuals with DS.

The wide variation in individual scores, as presented in Table 5.22 also resembles the English pattern. As we suggested earlier, the deficit in anaphoric binding proposed in
the grammar of DS is expected to show its effects on a continuum, thus showing up to a greater extent in some individuals, and to a lesser extent in others.

Table 5.22: Percentage of individual correct responses on conditions involving pronouns and anaphors, mismatch

<table>
<thead>
<tr>
<th>mismatch pronouns</th>
<th>Code</th>
<th>S1</th>
<th>S3</th>
<th>S4</th>
<th>S5</th>
<th>S6</th>
<th>group score %</th>
</tr>
</thead>
<tbody>
<tr>
<td>name pronoun</td>
<td>NPX</td>
<td>100</td>
<td>87.5</td>
<td>100</td>
<td>87.5</td>
<td>87.5</td>
<td>92.5</td>
</tr>
<tr>
<td>quant. pronoun</td>
<td>QPX</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>87.5</td>
<td>75</td>
<td>92.5</td>
</tr>
<tr>
<td>reflexive sebe</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>name reflexive</td>
<td>NRX</td>
<td>75</td>
<td>37.5</td>
<td>37.5</td>
<td>87.5</td>
<td>87.5</td>
<td>65</td>
</tr>
<tr>
<td>quant. refl.</td>
<td>QRX</td>
<td>75</td>
<td>62.5</td>
<td>37.5</td>
<td>100</td>
<td>62.5</td>
<td>67.5</td>
</tr>
</tbody>
</table>

As with the English subjects, there is a much greater variation within the anaphor conditions than on the pronoun or any other experimental condition. All subjects, except S5, had significant difficulties with at least one of the conditions involving anaphors: S3 and S4 showed only 37.5% correct on NRX, whereas S6 achieved 87.5%. In the QRX condition S4 showed 37.5%, S3 and S6 reached 62.5%. The 75% correct by S1 may seem high, but note that this subject scored 100% on every other experimental condition, and only on conditions involving the anaphors does her performance dip to 75% correct.\(^{30}\) The subjects' performance is much more uniform on conditions involving pronouns, where the lowest score was 75% correct.

One issue requiring further attention concerns our subjects' successful performance on the match version of the conditions involving the reflexive pronoun, NRM and QRM. Recall that English subjects showed difficulties interpreting anaphors in both match and mismatch conditions. At first sight, the SC-speaking subjects' high scores

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\(^{30}\) With her performance ranging between 87.5 and 100% correct, S5 obviously does not share the difficulties in the interpretation of reflexive elements with the other subjects. However, whether her poor interpretation of pronominal clitics (not observed in other subjects), is revealing some other deficit, unrelated to the deficit in the interpretation of reflexives, remains to be answered.
on the match conditions involving the anaphor 'sebe' suggest that the deficit in anaphoric binding may not be present in SC-speaking individuals with DS to the same extent as it is in the English population. A closer look will call for this line of argumentation to be rejected, however. Our argument will be that the parallel deficit in the knowledge of anaphoric binding is present in both English and SC-speaking population with DS. SC-speaking subjects' high scores on the match conditions will be shown to be a result of a particular strategy the subjects use in order to give some interpretation to the (otherwise uninterpretable) anaphor. We discuss these strategies next.

5.4.2 Crosslinguistic differences in anaphor interpretation

Earlier in section 5.2.2, we saw that, in their attempt to give some interpretation to the anaphor, English subjects with DS seemed to have adopted specific strategies that showed up as distinct patterns in their performance. Unable to interpret anaphoric elements, English-speaking subjects treated the anaphor as a pronoun. As well as incorrectly accepting the non-local interpretation for the anaphor on mismatch conditions NRX and QRX, they also incorrectly rejected the local interpretation of the anaphor on match conditions NRM and QRM. This second pattern in fact reveals English subjects' knowledge of Condition B: assuming that they treat the anaphor as

31 It could be argued that SC-speaking subjects with DS were just showing a positive bias, a well-known phenomenon in the research on typical acquisition. This strategy could explain the subjects' near perfect performance on the match conditions, NRM and QRM. Although this has not been shown for the English-speaking DS subjects, in principle, it is feasible that SC-speaking subjects with DS showed more of a positive bias than their English counterparts. Due to both cultural differences and circumstances of conducting the experimental sessions, SC-speaking subjects with DS may have been more likely to perceive the experimenter as a figure of authority than English subjects, resulting in a more prominent positive bias. Testing sessions in Yugoslavia were conducted over a period of two weeks, leaving less room for the experimenter to establish familiar contact with the SC-speaking subjects. In contrast, the examiner was much more familiar with the English subjects, having visited them a number of times over a longer time period to administer a range of language and cognitive abilities tests. Yet again this account falls short of explaining subjects' individual performance on the mismatch conditions, NRX and QRX: had the subjects favoured 'yes' answers whenever presented with a construction containing an anaphor, their individual results on the these conditions would be more uniform than the range shown: between 37% and 100% correct. Such variation sharply contrasts with that shown on the match conditions NRM and QRM: between 75% and 100% correct.
a pronoun, this pattern shows that the subjects know that a) pronouns are not reflexive-markers; and that b) local covaluation of a pronoun and a referential antecedent must be ruled out.

Could we claim that our SC-speaking subjects treated the anaphor as if it were a pronoun, in the fashion of their English counterparts? One counterargument is based on their performance on the match conditions involving the anaphor 'sebe': employing this strategy would result in a high percentage of negative answers to NRM and QRM, as these questions would have to be interpreted as violations of both Condition B and the Chain Condition. This was not the pattern shown by our SC-speaking subjects with DS, but only by our English subjects. More importantly, English anaphors are complex SELF anaphors, consisting of both the 'self' element and the pronoun marked for all phi features. As a result, English subjects could have been ignoring the 'self' element and merely paying attention to the pronoun (ruling it out in accordance with the Condition B and the Chain Condition). In contrast to English SELF anaphors, the SC anaphor is morphologically simplex. It does not contain a pronoun and is totally devoid of referential features. In addition, although marked for case, it is not marked for number, person or gender. These properties of 'sebe' make it impossible for the SC-speaking subjects with DS to treat it as a pronoun.

The lack of phi features of the SC anaphors is an important property of another type of pronominal elements that seem to have more in common with the SC anaphor than pronouns: logophoric elements. Underspecified for phi features like an anaphor, but able to refer to a non-local DP despite a legitimate antecedent DP in close proximity, like a pronoun, logophors are not subject to Condition B. They can appear in contexts involving a local legitimate antecedent DP but refer to a different, non-local antecedent. One lexical item that fits this description is the Japanese reflexive element 'zibun'. It resembles SC 'sebe' in the sense that it is morphologically simple
and subject oriented, but its distribution is not that of a classical anaphor.\textsuperscript{32} Crucially, it is able to appear in a local relation with a DP that is not its antecedent, in violation of Condition B:

\begin{equation}
\text{Mary}_i\text{-}ga \text{ Anna}_j\text{-}ga \text{ zibun}\text{-}o_{ij} \text{ semeta to omotta.}
\end{equation}

\begin{footnotesize}
\begin{align*}
\text{Mary}_i\text{-NOM Anna}_j\text{-NOM self-ACC blamed COMP thought} \\
't \text{Mary}_i \text{ thought } \text{Anna}_j \text{ blamed her}_ij' \\
\text{(Hitoshi Shiraki, p.c.)}
\end{align*}
\end{footnotesize}

One way of interpreting the pattern shown by the SC-speaking DS subjects could be that they treat the anaphor ‘sebe’ as if it were Japanese ‘zibun’: not subject to Condition B, ‘zibun’ need not be ruled out from contexts involving a local legitimate antecedent DP. Our subjects rarely ruled out ‘sebe’ from contexts involving a local antecedent, thus showing a high percentage of (correct) ‘yes’ answers on the NRM and QRM conditions. Such an explanation of course relies on the assumption that anaphoric and logophoric binding are distinct grammatical dependencies.

The issue to be addressed still is how this logophoric element is interpreted in the grammar of DS. It is likely that the subjects would resort to some kind of strategy in order to determine the reference for ‘sebe’. Their performance on the match and mismatch conditions discussed above provides a clue: it can be interpreted as a strategy where an antecedent is chosen on the basis of its accessibility in the discourse (in terms of hierarchy of the discourse prominence of the antecedent of Ariel, 1990). The subjects select the most accessible antecedent – the one that has been provided in the experimental question. Recall that there were two possible

\textsuperscript{32} In addition to the regular, local, c-commanding antecedent, ‘zibun’ can appear with a range of possible antecedents:

i. with a long distance antecedent
ii. with an antecedent that need not be c-commanding
iii. with a discourse antecedent (sentence external)
iv. with a grammatical antecedent absent altogether (‘point of view’ structures).

\textsuperscript{33} A strategy on the basis of linear proximity also seems possible, however, the current experimental
referents provided in the experimental set up: the experimental picture depicted two characters, one performing the action and one standing by, both of which were introduced immediately before the test question is presented: ‘This is Snow White. This is Cinderella. Is Snow white drying herself?’ However, the nearest antecedent is given in the actual experimental question, either match or mismatch:

(51) NRM: Da li Snežana sebe briše?
    comp prt.cl Snow White self drying
    ‘Is Snow White drying herself?’ (picture: SW drying herself)

(52) NRX: Da li Petar Pan sebe briše?
    comp prt.cl Peter Pan self drying
    Is Peter Pan drying himself? (picture: PP drying X)

This strategy would explain both the high rate of incorrect ‘yes’ answers on the mismatch conditions, NRX and QRX, and the high rate of seemingly correct answers on the match conditions involving the anaphor, NRM and QRM: their acceptance of a local antecedent for the anaphor need not reveal the knowledge of anaphoric binding, but the same strategy of choosing the most accessible/discourse prominent antecedent. Our SC-speaking subjects therefore reveal the same deficit in anaphoric binding as their English counterparts, but distinct grammatical properties of anaphors in SC and English force them to adopt different strategies in attempting to interpret the anaphoric element, resulting in slightly different performance patterns on our experimental task.

setting only provided one possible antecedent.

34 It is of course possible that the most accessible antecedent is the ‘nearest’ antecedent. To determine whether the subjects are relying on some linearity strategy, examples similar to (i) could be tested: (i) The boy near the bear is washing himself.
5.4.3 Summary

The last piece of evidence for our hypothesis that the deficit in the grammar of DS concerns lack of anaphoric binding has been uncovered in the data of SC speakers with DS. Here we analysed the results of the SC version of the English experiment I, aimed at uncovering the knowledge of binding in DS in light of the claim that anaphoric binding is unavailable, but that principles of binding, as conditions on reflexivity of predicates, are at their disposal.

Subjects’ performance on experimental conditions involving the reflexive clitic revealed that subjects possess the knowledge of Condition A, which states that ‘reflexive predicates have to be interpreted reflexively.’ Recall that in the English experiment we were unable to directly probe for the knowledge of this principle, prevented by the subjects’ inability to interpret anaphoric relations involving reflexives in the first place. Subjects also showed knowledge of Condition B, ‘reflexive predicates have to be reflexive marked’, by their successful performance on experimental questions involving full and clitic pronouns (two subjects allowed pronominal clitics, non-reflexive markers, as arguments of a reflexive predicate, but their performance on full pronouns suggests this pattern cannot be due to a violation of Condition B). Finally, the subjects’ performance on test conditions involving the anaphor ‘sebe’ revealed a specific pattern that can only be characterised as a deficit in anaphoric binding. Four out of six subjects showed an inability to establish the syntactic relation of binding between the anaphor and its grammatical antecedent. Their performance on the match experimental condition involving the anaphor at first sight seemed to contradict this claim, as here the subjects achieved high scores in providing a seemingly correct ‘yes’ answer. This, we argued, cannot be interpreted as a signal of their knowledge of anaphoric binding (as it would contradict their poor performance on the mismatch conditions), but as a particular strategy in attempting to interpret the otherwise uninterpretable anaphoric element. Due to referential and grammatical underspecification of SC anaphors, we argued that subjects relied on a
strategy akin to Ariel's (1990) hierarchy of the discourse prominence of the antecedent, and chose the most accessible antecedent provided in the experimental question presented to them.

5.5 Concluding remarks

This chapter investigated our claim that the data obtained in the experiments on binding in the populations with DS revealed a specific deficit in establishing the syntactic dependency of anaphoric binding. The claim was supported by three different types of evidence: from English-speaking individuals with DS on constructions involving transitive and inherently reflexive predicates (Experiments I and III) and the SC version of the Experiment I testing both types of predicates. The fact that we have seen the same deficit in two distantly related languages adds considerable weight to our hypothesis about the knowledge of binding in DS. The data for the English subjects with DS have recently been replicated by Ring & Clahsen (2003) who found a similar pattern in two groups of teenage children with DS.

The main question of what exactly is the nature of the deficiency in the grammar of DS remains to be answered. More research is needed in order to determine whether there are other areas of grammar in DS that are deficient and how these deficiencies could be related to the impairment in establishing the binding relation observed in this study. Some hints have been provided by our subjects' performance on other complex syntactic structures: recall that they all showed poor performance on passives, relative clauses and clefts on standardized language tests. On an additional measure that was developed to tap into the knowledge of passive structures in language impaired children (children with SLI - van der Lely, 1996), our subjects showed scores that were near chance (Perovic, 2002), however, whatever deficit

35 Subjects were poor on TROG, reported in chapter 3, but also ITPA (Illinois Test of Psycholinguistic Abilities) and CELF (Clinical Evaluation of Language Fundamentals).
seems to be present in this aspect of grammar, it does not seem to be related to the observed deficit in binding. Individual ranking of scores on the passive test did not correlate with the scores observed on the binding test: e.g. S4, who showed the best performance on binding, achieved poorest scores on the passive test.

The final point concerns the implications of the exposed deficit for the organisation of grammar in DS. Recall that the English and DS subjects employed different strategies in their attempt to interpret the anaphor, due to distinct grammatical properties of these lexical elements in the two languages. English-speaking subjects sometimes interpreted the anaphor as a pronoun, while SC speakers with DS treated 'sebe' as if it were a logophoric element. The strategy used by the SC speakers is in fact in line with how other languages treat elements that are referentially defective, e.g. Japanese 'zibun'. Note that the subjects did not, at any point, violate a syntactic principle. The 'deviance' in their grammar only concerned a lack of a syntactic principle, but not its violation, revealing that their grammar is still constrained by the UG.
6 Conclusions

The cross-linguistic study presented in the previous chapters had as its aim the uncovering of an aspect of grammatical knowledge in individuals with Down syndrome (DS), namely knowledge of binding. Relying on an experimental paradigm which has been widely used in research on the acquisition of this module in typical development, we compared knowledge of binding in English and Serbo-Croatian (SC) speakers with DS to that of typically developing (TD) children at distinct stages of language development. Markedly different patterns were obtained in the DS and control subjects. While the TD English children displayed remnants of the famous ‘Delay of Principle B Effect’, showing difficulties in the interpretation of pronouns in a coreferential relation with a local antecedent, the SC-speaking control children showed no signs of difficulties with either full pronouns, pronominal clitics or the full reflexive and reflexive clitic. However, both English and SC-speaking subjects with DS had difficulties interpreting anaphoric elements, a pattern not found in the control TD children, either here or in other studies reported in the literature. It is argued that these results point to a specific deficit in the grammar of DS, a deficit which prevents individuals with DS from establishing a syntactic relationship of binding between an anaphor and its antecedent. Other principles of grammar, such as conditions on reflexivity of predicates in the framework adopted (Reinhart & Reuland, 1993), were argued to be intact, on the basis of the individual patterns displayed by our subjects in the three experiments conducted.

The findings constitute an argument in support of a selective grammatical deficit in DS, a population known to show limited attainment in morphosyntax. They also confirm the proposed dissociation between the computational modules of the language faculty and those related to conceptual knowledge in DS. This is in addition to the observed contrast of the (English) subjects’ scores on measures of receptive vocabulary as opposed to receptive grammar. Our results are at odds with the proposal that the limited grammatical achievement in DS is related to a severe slowing down of linguistic development, which in turn causes many
individuals to miss the critical period within which knowledge of morphosyntax could be acquired. As the pattern shown by the majority of DS participants in our study has not been evidenced in typical populations, and there is no reason to assume that different maturational constraints apply in DS, this cannot be the full explanation for the observed pattern in our study. An account that invokes a selective grammatical deficit seems better able to describe the pattern of a deficiency in anaphoric binding, as recently confirmed in the data of Ring & Clahsen (2003), who report similar findings for DS children aged between 10 and 15. Finally, the deficit revealed in DS argues against the delayed characterisation of language development in this population. This conclusion is reinforced by the fact that such a deficit has not been observed during any stage of the development of language acquisition in the typical population, as reported in the literature.

Our findings also have important implications for the linguistic theory of binding. In effect, they support the proposed fractionation of binding into syntactic and extra-syntactic components, as proposed in Reinhart & Reuland (1993) and Grodzinsky & Reinhart (1993). Here the interpretation of anaphoric elements is limited to syntax proper, whereas the coreferential interpretation of pronouns is governed by an extra-grammatical constraint, related to the general, non-linguistic system. While the literature on the acquisition of binding in typical development supports this fractionation in one direction, by documenting that TD children have difficulties in applying the extra-grammatical constraint, the data presented in this study run in the opposite direction: our DS subjects revealed an inability to interpret anaphoric elements, a task in the realm of syntax proper. This is a remarkable outcome, because it confirms that we can successfully test competing linguistic theories in the field of language disorders, and crucially, that the grammar proposed is psychologically and perhaps neurologically feasible. If the conclusions drawn here about UG and the organization of grammar are correct, the present research shows that work on disordered populations can reveal facts about the language faculty that ordinary linguistic inquiry cannot.
Conclusions

The goal of this study was to gain at least some insight into the important issues surrounding the grammatical knowledge of an atypical population such as DS crosslinguistically. But it is hoped that the study has also raised new issues that will motivate further fruitful research into the area of language in DS, which has so far been largely ignored in the generativist framework. Here we only got a glimpse of a deficit in the grammar of DS individuals, crosslinguistically, but we hope that more in-depth research into other aspects of grammatical knowledge in DS will provide a clearer picture of the selective language impairment that seems to be prevalent in this population.
References


Bodreaux & Chapman, 2000


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APPENDICES

Appendix i
List of questions used in the English experiment I

PART I

<table>
<thead>
<tr>
<th>Item</th>
<th>Practice questions</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1</td>
<td>This is Captain Hook. This is Peter Pan. Is Captain Hook touching Peter Pan?</td>
<td>TNM</td>
</tr>
<tr>
<td>P2</td>
<td>This is Captain Hook. This is Peter Pan. Is Captain Hook touching Peter Pan?</td>
<td>TNX</td>
</tr>
<tr>
<td>P3</td>
<td>This is Pinocchio. This is Clown. Is Pinocchio drying Clown?</td>
<td>TNX</td>
</tr>
<tr>
<td>P4</td>
<td>This is Pinocchio. This is Clown. Is Pinocchio drying Clown?</td>
<td>TNM</td>
</tr>
<tr>
<td>P5</td>
<td>This is Mowgli. These are the monkeys. Is every monkey touching Mowgli?</td>
<td>TNM</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Item</th>
<th>Test questions</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>This is Tigger. This is Father Christmas. Is Tigger drying Father Christmas?</td>
<td>CNNX</td>
</tr>
<tr>
<td>2</td>
<td>This is Silvester. This is Daffy Duck. Is Silvester drying him?</td>
<td>NPM</td>
</tr>
<tr>
<td>3</td>
<td>This is Clown. This is the table. Is Clown under the table?</td>
<td>CAX</td>
</tr>
<tr>
<td>4</td>
<td>This is Goldilocks. These are the mermaids. Is every mermaid touching herself?</td>
<td>QRX</td>
</tr>
<tr>
<td>5</td>
<td>This is Goldilocks. This is Tweetie. Is Goldilocks touching Tweetie?</td>
<td>CNNX</td>
</tr>
<tr>
<td>6</td>
<td>This is Pinocchio. These are the kittens. Is every kitten drying him?</td>
<td>QPX</td>
</tr>
<tr>
<td>7</td>
<td>This is Fairy. These are the witches. Is every witch touching Fairy?</td>
<td>CQNX</td>
</tr>
</tbody>
</table>
8 This is Snow White. This is Little Mermaid. NRX
   Is Snow White washing herself? 2
9 This is Little Mermaid. This is Snow White. NPX
   Is Little Mermaid drying her? 12
10 This is Bugs Bunny. This is Tigger. CNNM
   Is Bugs Bunny washing Tigger? 35
11 These are the bears. These are the beds. CAX
   Are the bears jumping? 44
12 This is Goldilocks. This Snow White. CAX
   Do they both have black hair? 46
13 This is Winnie the Pooh. This is Father Christmas. NRM
   Is Winnie the Pooh washing himself? 3
14 This is Peter Pan. This is Aladdin. NPM
   Is Peter Pan washing him? 9
15 This is Little Red Riding Hood. This is Fairy. NPX
   Is Little Red Riding Hood touching her? 10
16 This is Peter Pan. These are the bears. QPM
   Is every bear washing him? 25
17 This is Father Christmas. These are the pigs. QRM
   Is every pig drying himself? 17
18 This is Aladdin. These are the bears. QPX
   Is every bear drying him? 26
19 This is Piglet. These are the bears. CNAX
   Is every bear drying him? 37
20 This is Bugs Bunny. These are the witches. CQNX
   Are all the witches touching Bugs Bunny? 42
21 This is Piglet. This is Bugs Bunny. NRX
   Is Piglet touching himself? 4
22 This is Daffy Duck. These are the kittens. QRM
   Is every kitten drying himself? 19
23 This is Cinderella. These are the pigs. CQNM
   Is every pig drying Cinderella? 39
24 This is Little Red Riding Hood. This is Tarzan. CNAX
   Is Little Red Riding Hood washing Tarzan? 38
25 This is Silvester. These are the penguins. QPM
Is every penguin touching him? 27

26 This is Clown. These are the ducklings.
Is every duckling touching himself? QRX 20

27 This is Tweetie. This is the cage.
Is Tweetie on the cage? CAX 45

28 This is Tarzan. These are the mermaids.
Are all the mermaids drying Tarzan? CQNM 41

29 This is Goldilocks. This is Cinderella.
Is Goldilocks washing herself? 1

30 This is Mickey Mouse. This is Bugs Bunny.
Is Mickey Mouse drying Bugs Bunny? CNNM 33

PART II

Practice questions

<table>
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<tr>
<th>Code</th>
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<tr>
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</tr>
<tr>
<td>TNM</td>
<td>P2 This is Captain Hook. This is Peter Pan. Is Captain Hook touching Peter Pan?</td>
</tr>
<tr>
<td>TNX</td>
<td>P3 This is Pinocchio. This is Clown. Is Pinocchio drying Clown?</td>
</tr>
<tr>
<td>TNM</td>
<td>P4 This is Pinocchio. This is Clown. Is Pinocchio drying Clown?</td>
</tr>
<tr>
<td>TNX</td>
<td>P5 This is Mowgli. These are the monkeys. Is every monkey touching Mowgli?</td>
</tr>
</tbody>
</table>

Test questions

<table>
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<tr>
<th>Code</th>
<th>Test questions</th>
</tr>
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<tbody>
<tr>
<td>NPX</td>
<td>1 This is Tigger. This is Father Christmas. Is Tigger drying him?</td>
</tr>
<tr>
<td>CAX</td>
<td>2 This is Clown. This is the table. Is Clown under the table?</td>
</tr>
<tr>
<td>CNNM</td>
<td>3 This is Mickey Mouse. This is Donald Duck. Is Mickey Mouse washing Donald Duck?</td>
</tr>
</tbody>
</table>
4 This is Goldilocks. These are the mermaids. Is every mermaid touching her? QPM
5 This is Minnie Mouse. This is Daisy Duck. Is Minnie Mouse washing Daisy Duck? CNNX
6 This is Goldilocks. This is Tweetie. Is Goldilocks touching herself? NRM
7 This is Mickey Mouse. This is Donald Duck. Is Mickey Mouse drying himself? NRM
8 This is Pinocchio. These are the kittens. Is every kitten drying himself? QRM
9 This is Fairy. These are the witches. Are all the witches touching Fairy? CQNX
10 This is Snow White. This is Little Mermaid. Is Snow White washing Little Mermaid? CNNM
11 This is Bugs Bunny. This is Tigger. Is Bugs Bunny washing himself? NRX
12 These are the bears. These are the beds. Are the bears standing? CAX
13 This is Goldilocks. This is Snow White. Is Goldilocks wearing a black dress? CAX
14 This is Minnie Mouse. This is Daisy Duck. Is Minnie Mouse drying her? NPM
15 This is Peter Pan. These are the bears. Is every bear washing himself? QRX
16 This is Father Christmas. These are the pigs. Is every pig drying him? QPX
17 This is Aladdin. These are the bears. Is every bear drying himself? QRM
18 This is Bugs Bunny. These are the witches. Is every witch touching Bugs Bunny? CQNX
19 This is Daffy Duck. These are the kittens. Is every kitten drying him? QPX
20 This is Cinderella. These are the pigs. Are all the pigs drying Cinderella? CQNM
21 This is Little Red Riding Hood. This is Tarzan. CNAX
Is Little Red Riding Hood washing Tarzan?

22 This is Silvester. These are the penguins. QRX
Is every penguin touching himself?

23 This is Clown. These are the kittens. QPM
Is every kitten touching him?

24 This is Tweetie. This is the cage. CAX
Is Tweetie in the cage?

25 This is Mowgli. This is Baloo Bear. CNNX
Is Mowgli touching Baloo Bear?

26 This is Tarzan. These are the mermaids. CQNM
Is every mermaid drying Tarzan?

27 This is Goldilocks. This is Cinderella. NPX
Is Goldilocks washing her?

28 This is Minnie Mouse. This is Daisy Duck. CNAX
Is Minnie Mouse drying Daisy Duck?

29 This is Mowgli. This is Baloo Bear. NPM
Is Mowgli touching him?

30 This is Mickey Mouse. This is Bugs Bunny. NRX
Is Mickey Mouse drying himself?

PART III

Practice questions

P1 This is Bugs Bunny. This is Tigger. TNM
Is Buggs Bunny washing Tigger?

P2 This is Tigger. This is Father Christmas. TNX
Is Tigger drying Father Christmas?

P3 This is Piglet. This is Bugs Bunny. TNM
Is Piglet touching Bugs Bunny?

P4 This is Little Red Riding Hood. This is Fairy. TNX
Is Little Red Riding Hood touching Fairy?

Test questions


1. This is Pinocchio. This is Clown. Is Pinocchio drying Clown?
2. This is Minnie Mouse. This is Snow White. Is Minnie Mouse washing herself?
3. This is Mickey Mouse. This is a table. Is Mickey Mouse under the table?
4. This is Donald Duck. These are the penguins. Is every penguin touching Donald Duck?
5. This is Little Mermaid. This is Snow White. Is Little Mermaid washing her?
6. This is Mickey Mouse. This is Donald Duck. Is Mickey Mouse touching himself?
7. This is Mowgli. These are the monkeys. Is every monkey touching him?
8. This is Daisy Duck. These are the mermaids. Is every mermaid drying Daisy Duck?
9. This is Little Mermaid. This is Fairy. Is Little Mermaid drying herself?
10. This is Goldilocks. These are the ducks. Is every duck washing herself?
11. This is Peter Pan. These are the bears. Are all the bears washing Peter Pan?
12. This is Pinocchio. This is a chair. Is Pinocchio sitting in the chair?
13. This is Mickey Mouse. This is Peter Pan. Is Mickey Mouse washing Peter Pan?
14. This is Little Red Riding Hood. This is Goldilocks. Is Little Red Riding Hood washing her?
15. This is Cinderella. This is Daisy Duck. Is Cinderella touching her?
16. This is Fairy. These are the witches. Is every witch touching her?
17. This is Captain Hook. This is Peter Pan. Is Captain Hook washing Peter Pan?
18. This is Mowgli. These are the monkeys. Is every monkey touching him?
Is every monkey drying himself?

19 This is Captain Hook. This is Peter Pan. CNNX
Is Captain Hook touching Peter Pan?

20 This is Little Red Riding Hood. This is Fairy. CAX
Is Little Red Riding Hood wearing a blue dress?

21 This is Pinocchio. This is Clown. NPX
Is Pinocchio drying him?

22 This is Minnie Mouse. These are the ducks. QRM
Is every duck washing herself?

23 This is Mowgli. This is Balloo Bear. CNAX
Is Mowgli washing Balloo Bear?

24 This is Father Christmas. This is a bed. CAX
Is Father Christmas sleeping?

25 This is Minnie Mouse. These are the ducks. QPM
Is every duck washing her?

26 This is Fairy. These are the witches. QRX
Is every witch touching herself?

27 This is Pinocchio. This is Father Christmas. CNNX
Is Pinocchio drying Father Christmas?

28 This is Pinocchio. This is Donald Duck. NRX
Is Pinocchio washing himself?

29 This is Cinderella. These are the mermaids. QPX
Is every mermaid drying her?

30 This is Captain Hook. These are the boys. CQAM
Are all the boys touching Captain Hook?

**PART IV**

<table>
<thead>
<tr>
<th>Practice questions</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1 This is Bugs Bunny. This is Tigger.</td>
<td>TNM</td>
</tr>
<tr>
<td>Is Buggs Bunny washing Tigger?</td>
<td></td>
</tr>
<tr>
<td>P2 This is Tigger. This is Father Christmas.</td>
<td>TNM</td>
</tr>
<tr>
<td>Is Tigger drying Father Christmas?</td>
<td></td>
</tr>
<tr>
<td>P3 This is Piglet. This is Bugs Bunny.</td>
<td>TNX</td>
</tr>
</tbody>
</table>
Is Piglet touching Bugs Bunny?

This is Little Red Riding Hood. This is Fairy.  
Is Little Red Riding Hood touching Fairy?

Test questions

<table>
<thead>
<tr>
<th>Code</th>
<th>Question</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>This is Pinocchio. This is Clown. Is Pinocchio washing Clown?</td>
</tr>
<tr>
<td>2</td>
<td>This is Minnie Mouse. This is Snow White. Is Minnie Mouse washing her?</td>
</tr>
<tr>
<td>3</td>
<td>This is Mickey Mouse. This is a table. Is Mickey Mouse standing on the table?</td>
</tr>
<tr>
<td>4</td>
<td>This is Donald Duck. These are the penguins. Are all the penguins touching Donald Duck?</td>
</tr>
<tr>
<td>5</td>
<td>This is Little Mermaid. This is Snow White. Is Little Mermaid washing herself?</td>
</tr>
<tr>
<td>6</td>
<td>This is Mickey Mouse. This is Donald Duck. Is Mickey Mouse touching him?</td>
</tr>
<tr>
<td>7</td>
<td>This is Mowgli. These are the monkeys. Is every monkey touching himself?</td>
</tr>
<tr>
<td>8</td>
<td>This is Daisy Duck. These are the mermaids. Are all the mermaids drying Daisy Duck?</td>
</tr>
<tr>
<td>9</td>
<td>This is Little Mermaid. This is Fairy. Is Little Mermaid drying her?</td>
</tr>
<tr>
<td>10</td>
<td>This is Goldilocks. These are the ducks. Is every duck washing her?</td>
</tr>
<tr>
<td>11</td>
<td>This is Peter Pan. These are the bears. Is every bear washing Peter Pan?</td>
</tr>
<tr>
<td>12</td>
<td>This is Pinocchio. This is a chair. Is Pinocchio asleep in the chair?</td>
</tr>
<tr>
<td>13</td>
<td>This is Mickey Mouse. This is Peter Pan. Is Mickey Mouse washing him?</td>
</tr>
<tr>
<td>14</td>
<td>This is Little Red Riding Hood. This is Goldilocks. Is Little Red Riding Hood washing herself?</td>
</tr>
<tr>
<td>15</td>
<td>This is Cinderella. This is Daisy Duck. Is Cinderella washing Daisy Duck?</td>
</tr>
</tbody>
</table>
Is Cinderella washing Daisy Duck?

16 This is Fairy. These are the witches. QRM
Is every witch touching herself?

17 This is Captain Hook. This is Peter Pan. NRX
Is Captain Hook touching himself?

18 This is Mowgli. These are the monkeys. QPX
Is every monkey drying him?

19 This is Captain Hook. This is Peter Pan. CNNX
Is Captain Hook touching Peter Pan?

20 This is Little Red Riding Hood. This is Fairy. CAX
Is Little Red Riding Hood wearing a black dress?

21 This is Pinocchio. This is Clown. CNNX
Is Pinocchio drying Clown?

22 This is Minnie Mouse. These are the ducks. QPX
Is every duck washing her?

23 This is Mowgli. This is Balloo Bear. CNNM
Is Mowgli touching Balloo Bear?

24 This is Father Christmas. This is a bed. CAX
Is Father Christmas lying in the bed?

25 This is Minnie Mouse. These are the ducks. QRX
Is every duck washing herself?

26 This is Fairy. These are the witches. QPM
Is every witch touching her?

27 This is Pinocchio. This is Father Christmas. NRM
Is Pinocchio drying himself?

28 This is Pinocchio. This is Donald Duck. CNNM
Is Pinocchio washing Donald Duck?

29 This is Cinderella. These are the mermaids. QRM
Is every mermaid drying herself?

30 This is Captain Hook. These are the boys. CQEM
Is every boy touching Captain Hook?
Appendix ii  
List of questions used in the Serbo-Croatian Experiment II

**PART I**

<table>
<thead>
<tr>
<th>Practice questions</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1 Ovo je Pinokio. Ovo je Klovn.</td>
<td>TNM</td>
</tr>
<tr>
<td>Da li Pinokio briše Klovnja?</td>
<td></td>
</tr>
<tr>
<td>P2 Ovo je Pinokio. Ovo je Klovn.</td>
<td>TNX</td>
</tr>
<tr>
<td>Da li Pinokio briše Klovnja?</td>
<td></td>
</tr>
<tr>
<td>P3 Ovo je Mini Maus. Ovo je Pata.</td>
<td>TNX</td>
</tr>
<tr>
<td>Da li Mini Maus pere Patu?</td>
<td></td>
</tr>
<tr>
<td>P4 Ovo je Klovn. Ovo su dečaci.</td>
<td>TNM</td>
</tr>
<tr>
<td>Da li dečaci diraju Klovnja?</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Test questions</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Ovo je Mogli (dečak iz džungle). Ovo je Meda.</td>
<td>NRXcl</td>
</tr>
<tr>
<td>Da li se Mogli dira?</td>
<td></td>
</tr>
<tr>
<td>2 Ovo je Petar Pan. Ovo je Klovn.</td>
<td>CNNX</td>
</tr>
<tr>
<td>Da li Petar Pan pere Klovnja?</td>
<td></td>
</tr>
<tr>
<td>3 Ovo je Snežana. Ovo je Mala Sirena.</td>
<td>NRX</td>
</tr>
<tr>
<td>Da li Snežana sebe pere?</td>
<td></td>
</tr>
<tr>
<td>4 Ovo je Dobra Vila. Ovo su veštice.</td>
<td>QRX</td>
</tr>
<tr>
<td>Da li svaka veštica sebe dira?</td>
<td></td>
</tr>
<tr>
<td>5 Ovo je Zlatokosa. Ovo je Snežana.</td>
<td>CAX</td>
</tr>
<tr>
<td>Da li Zlatokosa nosi crnu haljinu?</td>
<td></td>
</tr>
<tr>
<td>6 Ovo je Mogli (dečak iz džungle). Ovo su majmuni.</td>
<td>QPXcl</td>
</tr>
<tr>
<td>Da li ga svaki majmun briše?</td>
<td></td>
</tr>
<tr>
<td>7 Ovo je Dobra Vila. Ovo su veštice.</td>
<td>CQNX</td>
</tr>
<tr>
<td>Da li svaka veštica dira Dobru Vilu?</td>
<td></td>
</tr>
<tr>
<td>8 Ovo je Zlatokosa. Ovo je ptićica Tweetie.</td>
<td>NPXcl</td>
</tr>
<tr>
<td>Da li je Zlatokosa dira?</td>
<td></td>
</tr>
<tr>
<td>9 Ovo je Pata. Ovo su sirene.</td>
<td>QRMcl</td>
</tr>
<tr>
<td>Da li se svaka sirena pere?</td>
<td></td>
</tr>
</tbody>
</table>

11. Ovo je mačak Silvester. Ovo su pingvini. Da li ga svaki pingvin dira?

12. Ovo je Pata. Ovo su sirene. Da li svaka sirena briše Patu?


15. Ovo je Paja Patak. Ovo su mačići. Da li svaki mačić sebe briše?


17. Ovo je Duško Dugouško. Ovo su mačići. Da li se svaki mačić briše?


20. Ovo je Mogli. Ovo su majmuni. Da li ga svaki majmun pere?


22. Ovo su medvedići. Ovo su kreveti. Da li medvedići stoje?


24. Ovo je Mogli. Ovo su pačići. Da li ga svaki pačić dira?

25. Ovo je Dobra Vila. Ovo su veštice. Da li svaka veštica sebe dira?


27. Ovo je Pepeljuga. Ovo su svinje. Da li svaki mačić njega briše?
Da li je svaka svinja briše?
28 Ovo je Miki Maus. Ovo je Petar Pan. CNNM
Da li Miki Maus pere Petra Pana?
29 Ovo je Silvester. Ovo je Patak Dača. NRX
Da li Silvester sebe briše?
30 Ovo je Paja Patak. Ovo su mačiči. QPX
Da li svaki mačić njega pere?
31 Ovo je prasence Piglet. Ovo je Duško Dugouško. NPMcl
Da li ga Piglet dira?
32 Ovo je Zlatokosa. Ovo su sirene. QPM
Da li svaka sirena nju dira?
33 Ovo je Piglet. Ovo su paćići. QRMcl
Da li se svaki paćić dira?
34 Ovo je Mogli. Ovo je Meda. NPX
Da li Mogli njega dira?
35 Ovo je Mini Maus. Ovo su patke. QRM
Da li svaka patka sebe pere?
36 Ovo je Miki Maus. Ovo je Duško Dugouško. NRXcl
Da li Miki Maus briše?
37 Ovo je Tigar. Ovo je Deda Mraz. NRMcl
Da li se Tigar briše?
38 Ovo je Klovn. Ovo je sto. CAX
Da li Klovn sedi ispod stola?
39 Ovo je Mogli. Ovo su majmuni. QRX
Da li svaki majmun sebe dira?
40 Ovo je Mini Maus. Ovo je Snežana. NPX
Da li Mini Maus nju pere?
41 Ovo je Mini Maus. Ovo su patke. QPM
Da li svaka patka nju briše?
42 Ovo je Miki Maus. Ovo je Duško Dugouško. CNNM
Da li Miki Maus briše Duška Dugouška?
43 Ovo je Kapetan Kuka. Ovo su dečaci. CQNM
Da li svaki dečak dira Kapetana Kuku?
44 Ovo je Paja Patak. Ovo su pingvini. CQNM
Da li svaki pingvin dira Paju Patka?
45 Ovo je Mini Maus. Ovo je Pata. Da li je Mini briše?
46 Ovo je Pepeljuga. Ovo su sirene. Da li se svaka sirena briše?
47 Ovo je Kapetan Kuka. Ovo je Petar Pan. Da li se Kapetan Kuka dira?
48 Ovo je Petar Pan. Ovo su medvedići. Da li svaki medvedić pere Petra Pana?
49 Ovo je Tweetie. Ovo je kavez. Da li je Tweetie u kavezu?
50 Ovo je Duško Dugouško. Ovo je Tigar. Da li Duško Dugouško njega pere?
51 Ovo je Zlatokosa. Ovo su patke. Da li se svaka patka pere?
52 Ovo je Pinokio. Ovo je Klovn. Da li Pinokio njega briše?
53 Ovo je Mini Maus. Ovo su patke. Da li svaka patka sebe pere?
54 Ovo je Zlatokosa. Ovo je Pepeljuga. Da li Zlatokosa sebe pere?
55 Ovo je Pepeljuga. Ovo je Pata. Da li Pepeljuga nju dira?
56 Ovo je Tigar. Ovo su majmuni. Da li ga svaki majmun pere?
57 Ovo je Piglet. Ovo je Vini Pu. Da li Piglet dira Vini Pua?
58 Ovo je Klovn. Ovo su pačići. Da li svaki pačić dira Klovna?
59 Ovo je Vini Pu. Ovo su pačići. Da li se svaki pačić briše?
60 Ovo je Miki Maus. Ovo je Paja Patak. Da li ga Miki Maus pere?
61 Ovo je Kapetan Kuka. Ovo je Petar Pan. Da li se Kapetan Kuka dira?
62 Ovo je Petar Pan. Ovo su medvedići. Da li se svaki medvedić dira?
Da li svaki medvedić njega pere?

63 Ovo je Vini Pu. Ovo je deda Mraz. Da li ga Vini Pu pere?

64 Ovo je Crvenkapica. Ovo je Zlatokosa. Da li Crvenkapica sebe pere?

**PART II**

**Practice questions**

<table>
<thead>
<tr>
<th>Code</th>
<th>Practice questions</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>TNM</td>
<td>Ovo je Pinokio. Ovo je Klovn. Da li Pinokio briše Klovna?</td>
<td>TNM</td>
</tr>
<tr>
<td>TNX</td>
<td>Ovo je Pinokio. Ovo je Klovn. Da li Pinokio briše Klovna?</td>
<td>TNX</td>
</tr>
<tr>
<td>TNX</td>
<td>Ovo je Mini Maus. Ovo je Pata. Da li Mini Maus pere Patu?</td>
<td>TNX</td>
</tr>
<tr>
<td>TNM</td>
<td>Ovo je Klovn. Ovo su dečaci. Da li dečaci diraju Klovna?</td>
<td>TNM</td>
</tr>
</tbody>
</table>

**Test questions**

<table>
<thead>
<tr>
<th>Code</th>
<th>Test questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>CNNM</td>
<td>Ovo je Mogli (dečak iz džungle). Ovo je Meda. Da li Mogli dira Medu?</td>
</tr>
<tr>
<td>NPXcl</td>
<td>Ovo je Petar Pan. Ovo je Klovn. Da li ga Petar Pan pere?</td>
</tr>
<tr>
<td>NRXcl</td>
<td>Ovo je Snežana. Ovo je Mala Sirena. Da li se Snežana pere?</td>
</tr>
<tr>
<td>QPMcl</td>
<td>Ovo je Dobra Vila. Ovo su veštile. Da li je svaka veštica dira?</td>
</tr>
<tr>
<td>CAX</td>
<td>Ovo je Zlatokosa. Ovo je Snežana. Da li Zlatokosa nosi plavu haljinu?</td>
</tr>
<tr>
<td>QRM</td>
<td>Ovo je Mogli. Ovo su majmuni. Da li svaki majmun sebe briše?</td>
</tr>
<tr>
<td>CQNX</td>
<td>Ovo je Kapetan Kuka. Ovo su dečaci. Da li svi dečaci diraju Kapetana Kuku?</td>
</tr>
</tbody>
</table>
8 Ovo je Zlatokosa. Ovo je Ptičica Tweetie. Da li se Zlatokosa dira? NRMcl
9 Ovo je Pata. Ovo su sirene. Da li svaka sirena nju pere? QPX
10 Ovo je Pinokio. Ovo je Klovn. Da li Pinokio njega briše? NPX
11 Ovo je mačak Silvester. Ovo su pingvini. Da li se svaki pingvin dira? QRXcl
12 Ovo je Mogli (dečak iz džungle). Ovo su majmuni. Da li svi majmuni brišu Moglija? CQNX
13 Ovo je Mala Sirena. Ovo je Dobra Vila. Da li je Sirena briše? NPXcl
14 Ovo je Mala Sirena. Ovo je Snežana. Da li Sirena sebe briše? NRM
15 Ovo je Paja Patak. Ovo su mačići. Da li ga svaki mačić briše? QPXcl
17 Ovo je Duško Dugouško. Ovo su mačići. Da li ga svaki mačić briše? QPMcl
18 Ovo je Klovn. Ovo je Miki Maus. Da li ga Klovn dira? NPXcl
19 Ovo je Pinokio. Ovo su mačići. Da li se svaki mačić briše? QRMcl
20 Ovo je Mogli. Ovo su majmuni. Da li svaki majmun sebe pere? QRM
21 Ovo je Pinokio. Ovo je Deda Mraz. Da li se Pinokio briše? NRMcl
22 Ovo su medvedići. Ovo su kreveti. Da li medvedići skuču? CAX
23 Ovo je Crvenkapica. Ovo je Dobra Vila. Da li Crvenkapica nju dira? NPX
24 Ovo je Mogli. Ovo su pačići. Da li svaki pačić sebe dira? QRM
Da li je svaka veštica dira?

26 Ovo je Patak Dača. Ovo su mačići. Da li se svaki mačić briše? QRMcI

27 Ovo je Pepeljuga. Ovo su svinje. Da li se svaka svinja briše? QRXcI


29 Ovo je Silvester. Ovo je Patak Dača. Da li Silvester njega briše? NPM

30 Ovo je Paja Patak. Ovo su mačići. Da li se svaki mačić pere? QRMcI


32 Ovo je Zlatokosa. Ovo su sirene. Da li svaka sirena sebe dira? QRX

33 Ovo je Piglet. Ovo su pačići. Da li svaki pačić njega dira? QPX

34 Ovo je Mogli. Ovo je Meda. Da li Mogli sebe dira? NRM

35 Ovo je Mini Maus. Ovo su patke. Da li je svaka patka pere? QPXcI

36 Ovo je Miki Maus. Ovo je Duško Dugouško. Da li ga Miki Maus briše? NPMcI

37 Ovo je Tigar. Ovo je Deda Mraz. Da li Tigar briše Deda Mraza? CNNX

38 Ovo je Klovn. Ovo je sto. Da li Klovn sedi na stolu? CAX


40 Ovo je Mini Maus. Ovo je Snežana. Da li Mini Maus sebe pere? NRM

41 Ovo je Mini Maus. Ovo su patke. Da li svaka patka sebe briše? QRX

42 Ovo je Miki Maus. Ovo je Duško Dugouško. Da li Miki Maus sebe briše? NRX
43 Ovo je Klovn. Ovo su dečaci. Da li svi dečaci diraju Klovna?
44 Ovo je Silvester. Ovo su majmuni. Da li svi majmuni peru Silvestera?
45 Ovo je Mini Maus. Ovo je Pata. Da li Mini Maus sebe briše?
46 Ovo je Pepeljuga. Ovo su sirene. Da li svaka sirena nju briše?
47 Ovo je Kapetan Kuka. Ovo je Petar Pan. Da li Kapetan Kuka dira Petra Pana?
48 Ovo je Zlatokosa. Ovo su patke. Da li sve patke peru Zlatokosu?
49 Ovo je ptičica Tweetie. Ovo je kavez. Da li Tweetie stoji na kavezu?
50 Ovo je Duško Dugouško. Ovo je Tigar. Da li ga Duško Dugouško pere?
51 Ovo je Zlatokosa. Ovo su patke. Da li je svaka patka pere?
52 Ovo je Pinokio. Ovo je Klovn. Da li Pinokio briše Klovna?
53 Ovo je Mini Maus. Ovo su patke. Da li svaka patka nju pere?
54 Ovo je Zlatokosa. Ovo je Pepeljuga. Da li Zlatokosa nju pere?
55 Ovo je Pepeljuga. Ovo je Pata. Da li se Pepeljuga dira?
56 Ovo je Tigar. Ovo su majmuni. Da li se svaki majmun pere?
57 Ovo je Piglet. Ovo je Vini Pu. Da li ga Piglet dira?
58 Ovo je Mogli. Ovo su pačići. Da li svi pačići brišu Moglija?
59 Ovo je Vini Pu. Ovo su pačići. Da li svaki pačić njega briše?
60 Ovo je Miki Maus. Ovo je Paja Patak. Da li svi majmuni pere?
Da li Miki Maus sebe pere?

61 Ovo je Kapetan Kuka. Ovo je Petar Pan. Da li Kapetan Kuka njega dira?

62 Ovo je Petar Pan. Ovo su medvedići. Da li svaki medvedić sebe pere?

63 Ovo je Vini Pu. Ovo je Deda Mraz. Da li se Vini Pu pere?

64 Ovo je Crvenkapica. Ovo je Zlatokosa. Da li Crvenkapica pere Zlatokosu?

PART III

Test questions

1 Ovo je Zlatokosa. Ovo je Pepeljuga. Da li Zlatokosa pere Pepeljugu?

2 Ovo je Mogli (dečak iz džungle). Ovo su pačići. Da li ga svaki pačić briše?

3 Ovo je Mogli. Ovo je Deda Mraz. Da li ga Mogli briše?

4 Ovo je Miki Maus. Ovo je sto. Da li Miki Maus sedi ispod stola?

5 Ovo je Pepeljuga. Ovo su svinje. Da li sve svinje brišu Pepeljugu?

6 Ovo je prasence Piglet. Ovo je Duško Dugouško. Da li Piglet sebe dira?

7 Ovo je Vini Pu. Ovo su pačići. Da li svaki pačić njega pere?

8 Ovo je Tigar. Ovo je Miki Maus. Da li Tigar sebe pere?

9 Ovo je Miki Maus. Ovo je Paja Patak. Da li Miki Maus njega pere?

10 Ovo je Klovn. Ovo su pačići. Da li svaki pačić sebe dira?

11 Ovo je Crvenkapica. Ovo je Doba Vila. Da li Crvenkapica pere Zlatokosu?
Da li Crvenkapica nosi žutu haljinu?
12 Ovo je Pata. Ovo je Zlatokosa. Da li se Pata pere?
13 Ovo je Mini Maus. Ovo je Pata. Da li je Mini Maus pere?
14 Ovo je Aladin. Ovo su medvedići. Da li ga svaki medvedić briše?
15 Ovo je Zlatokosa. Ovo su sirene. Da li je svaka sirena dira?
16 Ovo je Mogli. Ovo su majmuni. Da li se svaki majmun pere?
17 Ovo je Mogli. Ovo su majmuni. Da li se svaki majmun dira?
18 Ovo je Miki Maus. Ovo su medvedići. Da li svaki medvedić sebe pere?
19 Ovo je Miki Maus. Ovo je Paja Patak. Da li Miki Maus njega dira?
20 Ovo je Vini Pu. Ovo su pačići. Da li svaki pačić sebe briše?
21 Ovo je mačak Silvester. Ovo su pingvini. Da li svaki pingvin njega dira?
22 Ovo je Pinokio. Ovo je stolica. Da li Pinokio sedi na stolici?
23 Ovo je Tigar. Ovo je Mogli. Da li Tigar briše Moglija?
24 Ovo je Pata. Ovo je Snežana. Da li se Pata briše?
25 Ovo je Mini Maus. Ovo su patke. Da li se svaka patka pere?
26 Ovo je Snežana. Ovo je Mala Sirena. Da li Snežana pere Malu Sirenu?
27 Ovo je Mogli. Ovo su pačići. Da li svi pačići brišu Moglija?
28 Ovo je Mogli. Ovo su majmuni. Da li se svaki majmun briše?
29 Ovo je Mala Sirena. Ovo je Snežana. Da li je Sirena pere?
30 Ovo je Piglet. Ovo je Vini Pu. Da li Piglet njega pere?
31 Ovo je Duško Dugouško. Ovo su veštice. Da li svaka veštica dira Duška Dugouška?
32 Ovo je Dedu Mraz. Ovo su dečaci. Da li svaki dečak njega briše?
33 Ovo je Petar Pan. Ovo je Aladin. Da li se Petar Pan pere?
34 Ovo je Mogli. Ovo je Meda. Da li se Mogli dira?
35 Ovo je Petar Pan. Ovo su medvedici. Da li svaki medvedić pere Petra Pana?
36 Ovo je Mini Maus. Ovo je Pata. Da li Mini Maus sebe briše?
37 Ovo je Pepeljuga. Ovo je Pata. Da li Pepeljuga dira Patu?
38 Ovo je poštar Panta. Ovo su dečaci. Da li ga svaki dečak pere?
39 Ovo je Kapetan Kuka. Ovo je Petar Pan. Da li ga Kapetan Kuka dira?
40 Ovo je Pinokio. Ovo je Vini Pu. Da li Pinokio njega briše?
41 Ovo je Dedu Mraz. Ovo je krevet. Da li Dedu Mraz spava u krevetu?
42 Ovo je Mini Maus. Ovo je Pata. Da li Mini sebe briše?
43 Ovo je Vini Pu. Ovo su pačići. Da li svaki pačić sebe briše?
44 Ovo je Silvester. Ovo su majmuni. Da li svaki majmun njega pere?
Appendix iii

List of questions used in the English experiment III

Note: Each experimental session is introduced with the following paragraph, accompanied by a picture showing a big house the characters live in.

'This is the house which Postman Pat shares with Clown, Mowgli, Peter Pan, Winnie the Pooh and Piglet. Sometime they have their friends staying over, Minnie Mouse, Snow White etc. Every morning the boys get up and get ready for work. They all have to wash, dress, and shave. Here Postman Pat is having breakfast....''

(All questions preceded with a sentence introducing the characters in the picture: e.g. ‘This is Daisy Duck. This is Minnie Mouse’.)

Part I

1. Is Daisy Duck painting the wall? CAM
2. Is Pinocchio drying him? CNPX
3. Is Mowgli shaving him? NPX
4. Is Donald Duck eating? CAM
5. Is Peter Pan washing him? NPX
6. Is Goldilocks playing the piano? CAX
7. Is Mickey M washing him? CNPX
8. Is Pinocchio drying him? NPX
9. Is Mermaid sitting on the chair? CAM
10. Is Tigger drying him? NPX
11. Donald Duck making a phone call? CAM
12. Are all the mermaids washing them? QAPX
13. Is every kitten washing him? QEPX
15. Are all the monkeys drying them? QAPX
16. Is every boy shaving him? QEPX
17. Is Mermaid sitting in the chair? CAM
18. Are all the mermaids drying them? QAPX

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20. Is every monkey shaving him? QEPX
21. Is Mickey Mouse hoovering? CAM
22. Is every boy drying him? QEPX
23. Is Red Riding Hood ironing? CAM
24. Are all the boys washing them? QAPX
25. Are all the bears shaving them? QAPX
27. Is every monkey drying him? QEPX
28. Are all the monkeys drying them? QAPX
29. Is Cinderella cooking? CAM
30. Are all the ducklings drying them? QAPX
31. Is Clown playing the flute? CAM
32. Is Donald Duck ironing? CAM
33. Are all the monkeys washing them? QAPX
34. Is Pinocchio having breakfast? CAM
35. Is Mowgli washing him? CNPX
36. Is Mermaid drying her? NPX
37. Is Clown reading? CAM
38. Is Winnie the Pooh washing him? NPX
39. Is Snow White writing? CAM
40. Is Clown shaving him? NPX
41. Is Minnie Mouse playing the piano? CAM
42. Is Santa Clause shaving him? NPX
43. Is Mermaid washing her? NPX
44. Is every monkey drying him? QPEX
45. Are all the ducks drying them? QPAE

Part II

1. Is Clown playing the piano? CAX
2. Is Daisy Duck washing her? NPX
3. Is Mickey Mouse hoovering? CAM
4. Is every kitten drying him? QEPX
5. Is Postman Pat shaving him? NPX
6. Is Mickey Mouse cooking? CAM
7. Is Mowgli drying him? NPX
8. Is Mickey Mouse washing him? CNPX
9. Is Pinocchio playing the piano? CAM
10. Is Donald Duck drying him? NPX
11. Are all the boys drying them? QAPX
12. Is Mickey Mouse painting? CAM
13. Is every pig shaving him? QEPX
14. Are all the bears washing them? QAPX
15. Are all the pigs drying them? QAPX
16. Are all the ducklings drying them? QAPX
17. Is Mickey Mouse watering the flowers? CAM
18. Is every kitten shaving him? QEPX
19. Is Clown reading a paper? CAM
20. Is every duckling drying him? QEPX
21. Is Piglet watching TV? CAM
22. Is every bear washing him? QEPX
23. Is Mickey Mouse cooking? CAM
24. Are all the kittens shaving them? QAPX
25. Is every duckling washing him? QEPX
26. Is Mickey Mouse mowing grass? CAM
27. Are all the boys shaving them? QAPX
28. Is Piglet watering the flowers? CAM
29. Is every pig drying him? QEPX
30. Is Pinocchio playing the piano? CAM
31. Is every boy washing him? QEPX
32. Are all the monkeys shaving them? QAPX
33. Is Clown shaving him? CNPX
34. Is every mermaid drying her? QEPX
35. Is Little Red Riding Hood ironing? CAM
36. Is Piglet washing him? NPX
37. Is every duck washing her? QEPX
38. Is Mowgli painting the wall? CAM
39. Is Postman Pat drying him? CNPX
40. Is Postman Pat drying him? NPX
41. Is Pinocchio shaving him? NPX
42. Is Goldilocks writing? CAM
43. Is every piglet drying him?  QEPX
44. Is Peter Pan shaving him?  NPX
45. Is Clown drying him?  CNPX
46. Is Tigger washing him?  NPX

Part III

1. Is Donald Duck ironing?  CAM
2. Is Goldilocks washing her?  NPX
3. Is Mini Mouse drying her?  NPX
4. Is Mickey Mouse hovering?  CAM
5. Are all the monkeys washing them?  QAPX
6. Is Postman Pat cooking?  CAX
7. Is Donald Duck shaving him?  CNPX
8. Is Mickey Mouse cooking?  CAM
10. Is Pinocchio having breakfast?  CAM
11. Are all the boys washing them?  QAPX
12. Is Piglet watering flowers?  CAM
13. Is Mickey Mouse painting?  CAM
15. Is every kitten shaving him?  QEPX
16. Are all the kittens washing them?  QAPX
17. Is Pinocchio playing the piano?  CAM
18. Is Mermaid ironing?  CAX
19. Is Mickey Mouse washing him?  CNPX
20. Is Clown hovering?  CAM
21. Is every mermaid washing her?  QEPX
22. Is Piglet watching TV?  CAM
23. Is every boy shaving him?  QEPX
24. Is Mini Mouse washing her?  NPX
25. Is Red Riding Hood ironing?  CAM
26. Is every duckling shaving him?  QEPX
27. Is every boy washing him?  QEPX
28. Is Mowgli painting the wall yellow?  CAM
29. Are all the boys shaving them?  QAPX
30. Are all the ducklings washing them?  QAPX
31. Is Postman Pat making a phone call? CAM
32. Is Winnie the Pooh drying him? CNPX
33. Is Daisy Duck drying her? NPX
34. Is Mowgli watering the grass? CAM
35. Is Mickey Mouse shaving him? CNPX
36. Are all the ducklings shaving them? QAPX
37. Is Goldilocks writing? CAM
38. Is every pig shaving him? QEPX
39. Is Pinocchio ironing? CAM
40. Is Goldilocks playing the flute? CAM
41. Are all the bears shaving them? QAPX
42. Is Clown mowing the grass? CAM
43. Is every monkey washing him? QEPX
44. Is Santa Claus reading paper? CAM
45. Are all the pigs shaving them? QAPX
### APPENDIX IV: Raw scores for SC-speaking control subjects (Experiment II)

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**Experimental conditions**

- **Name reflexive**
  - NRM: 7 6 7 8 6 8 8 8 6
  - NRX: 8 6 8 8 8 8 8 8 8

- **Name reflexive cl**
  - NRMcl: 7 6 7 7 8 7 8 7 8
  - NRXcl: 8 5 6 7 7 6 7 7 6

- **Name-pronoun**
  - NPM: 8 8 8 6 6 8 8 6 8
  - NPX: 8 7 6 8 8 8 6 6 7

- **Name pron cl**
  - NPMcl: 8 8 7 8 8 7 8 8 7
  - NPXcl: 8 6 8 4 8 8 7 6 7

- **Quant. reflexive**
  - QRM: 7 7 8 8 8 8 6 6 7
  - QRX: 8 7 6 8 8 7 6 8 8

- **Quant. refl. cl**
  - QRMcl: 7 8 8 7 7 8 7 7 8
  - QRXcl: 8 8 4 6 8 6 5 7 6

- **Quantifier-pron.**
  - QPM: 8 6 7 8 8 7 7 6 8
  - QPX: 8 7 7 7 8 6 5 7 7

- **Quant. pron. cl**
  - QPMcl: 7 6 7 8 7 7 8 8 8
  - QPXcl: 7 3 3 5 8 4 8 8 8

**Control conditions**

- **Name-name**
  - CNNM: 8 8 8 8 7 8 8 8 8
  - CNNX: 8 6 8 8 8 8 7 8 7

- **Quantifier-name**
  - CQNM: 7 8 8 8 6 8 8 8 8
  - CQNX: 8 3 3 2 5 0 8 8 3

- **Attention**
  - CAX: 10 10 12 12 12 12 12 12 12
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