Hyperlexia, a Case Study

When the Co-occurrence of Developmental Disorders Favors Language Talent

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List of Abbreviations

AS - Asperger's Syndrome

ADHD - Attention Deficit Hyperactivity Disorder

AD - Autism Disorder

ASD - Autism Spectrum Disorder

CLIC - Checklist for Language Impaired Children

CCC - Children's Communication Checklist

EEG - Electroencephalogram

EPF - Enhanced Perceptual Functioning

EF - Executive Function

fMRI - Functional Magnetic Resonance Imaging

GCC - General Communication Composite

GSLI - Grammatical Specific Language Impairment

HFA - High Functioning Autism

IQ - Intelligence Quotient

LA - Language Acquisition

LD - Language Disorder

LI - Language Impairment

MEG - Magnetoencephalogram

PET - Positron-emission tomography

PLI - Pragmatic Language Impairment

SCQ - Screening Questionnaire

SPD - Semantic-Pragmatic Disorder

SIDC - Social Interaction Deviance Composite

SLI - Specific Language Impairment

SLI+H - Specific Language Impairment comorbid with Hyperlexia

ToM - Theory of Mind

TD - Typical Development group

UG - Universal Grammar

VIQ - Verbal Intelligence Quotient

WCC - Weak Central Coherence

WISC - Wechsler Intelligence Scale for Children

WS - William's Syndrome

Abstract

This study investigates a specific cognitive and behavioral phenotype associated to language talent in Asperger's syndrome. Recent studies have regarded AS individuals' uneven profile of competence and performance as a cognitive style rather than a cognitive deficit. The study of AN's cognitive and language profile was carried out in order to investigate specific traits of his development, which could explain his language talent. The SCQ for talent in ASD and the CCC-2 were used as tools to screen AN's profile. Our research results are in line with earlier studies on language talent in AS. Talent in AS is associated with a cognitive style for processing information in a local bias. In addition, results from the test of the participant's communicative abilities suggested that his communicative skills are marked by patterns of weaknesses and strengths. Moreover, AN's language difficulties are related to the comorbidity of AS with other developmental conditions, namely SLI and PLI.

Chapter 1 - Rationale of the Case Study

This chapter introduces the aim, the importance, and the background assumptions of this study. In addition, it explains the reason why choosing a conducting a cases study as the research method. This chapter also describes the participant, presents the research questions and the thesis structure.

1.1. Introduction

The aim of this master's thesis is to study the case of AN, a talented seven-year-old boy in the context of Asperger's syndrome (AS). This study investigates distinctive traits of AN's outstanding skills for decoding sounds from letters, which are associated with a specific cognitive and behavioral phenotype. A comprehensive assessment of AN's profile was provided, and the data received from parental reports, screening questionnaire for talent in ASD, and communication checklist were scrutinized.

The investigation of language talent in individuals with AS is rather difficult. Cases of giftedness and/or AS are of rare occurrence and no single individual is alike. These individuals display an uneven cognitive profile marked by peaks and troughs in competence and performance. In addition, the risk of comorbidity of developmental disorders is at above chance level. For instance, AS might overlap with other developmental disorders, such as Specific Language Impairment (SLI) and Pragmatic Language Impairment (PLI). Moreover, aspects of language talent might hinder the identification of a co-occurring condition, for they might be seen as underlying problems. Finally, measuring individuals' language performance in a standardized way is difficult because language use involves use of contextual cues.

Many studies have been conducted aiming to investigate aspects related to individuals' cognitive and linguistic development (Bennett & Heaton, 2012; Bishop, 2003; Neihart, 2000; Saldaña, Carreiras, & Frith, 2009; Seymour & Evans, 1992). Some of the studies are of interest to the development of this master's thesis, for they have focused on the investigation of (1) distinctive traits of talented individuals with and without ASD, (2) patterns of hyperlexic individuals' language development, (3) language in AS, (4) communicative abilities of children within the ASD, and (5) comorbid developmental conditions.

The investigation of cases of comorbid developmental disorders with language talent contributes to the area of linguistics, for it provides an insight of how language evolves in the human brain. More specifically, this research contributes to the investigation of the early stages of atypical language acquisition (LA). Some theoretical accounts have tried to explain

the pathway to LA of children with atypical language development. This thesis discusses two of these accounts, namely the weak central coherence account (WCC) and the modularity of language. These hypotheses explain AN's atypical patterns of LA, i.e., his outstanding decoding skills and his deficits in contextualizing information.

1.2. Why Conducting a Case Study?

Case studies of selectively impaired individuals, such as those with AS and/or hyperlexia, are a valuable research method for observing individual's cognitive development within the fields of psycholinguistics and neuropsychology (Caramazza, 1986; Caramazza & McCloskey, 1988). Although case studies are time demanding and vulnerable to the participants' willingness to cooperate with the project, they allow researchers to observe inter-individual variation. In other words, each case study has its own peculiarities because no single individual is alike (Caramazza, 1986; Caramazza & McCloskey, 1988). In the instance of single case studies of impaired individuals, researchers can learn more about the cognitive processes of a normal brain based on the analysis of the one with cognitive disorder (Caramazza, 1986; Caramazza & McCloskey, 1988). Therefore, this inductive research method allows researchers to make valid inferences about the structure of human cognitive system in order to support a given theoretical approach.

1.3. Case Description: Who is AN?

AN is a seven-year-old boy with a special talent for decoding sounds from letters in the context of AS. He received the AS diagnosis at the age of two. According to the child's mother, AN went through a long mute period at that time. She reported that AN spent more than two years without actually speaking. During this mute period, he could only say simple utterances like "this or that one" when pointing at what he wanted. The participant of this study started speaking again recently, but he still speaks very little in comparison to other children at his age. He developed a special interest in letters during this mute period.

AN has shown an outstanding ability for learning alphabets since the age of two and half. AN has been learning alphabets on his own by watching YouTube tutorials. This child's unusual talent for learning alphabets was documented with pictures and videos of him writing and reading in alphabets of more than ten languages (cf. appendix 1). AN knows how to write and read in Norwegian, English, Indonesian, Swedish, Spanish, Arabic, Korean, Cyrillic, Chinese, and two Japanese alphabets. AN's language talent is clear at the level of phonology. He displays disadvantages for comprehending language in context. AN's patterns of language

acquisition are rather unusual due to subtle dissociations within his language modules. His linguistic profile is considerably uneven as it is shown in figure 1 in section 4.3.

Some factors might have triggered AN's special interest in alphabets. For instance, the multi linguistic environment in which he lives: his father is a native speaker of Norwegian and his mother of Indonesian. English is the language the N family communicates. Although AN may change his preferred language to communicate from time to time, AN speaks Norwegian better than the other two languages to which he is exposed on a daily basis. A second hypothesis is that aspects typical of AS cognitive profile might have triggered his special interest in alphabets (cf. section 4.2). Furthermore, AN might have a special talent for decoding sounds from letters despite poor comprehension skills (cf. section 4.2). The above-mentioned factors will be discussed thoroughly in the course of the present master thesis (cf. section 2.1 and chapter 4).

1.4. Research Questions

The present study aims to answer some of the following questions: (1) are there any distinctive cognitive and behavioral traits associated with language talent in AS? (2) How does language talent evolve in children with developmental disorders? (3) What is the communicative profile of a language talented child? (4) Are there specific patterns of communication associated with AS?

1.5. Structure of the Thesis

This thesis is structured as follows. Chapter 2 consists of a detailed description of the conditions related to AN's profile, namely hyperlexia, AS, SLI, and PLI. This chapter also discusses issues related to the co-occurrence of the above-mentioned developmental disorders. Chapter 3 presents the theoretical framework relevant to the discussion of language development in talented individuals with AS. Chapter 4 outlines the skeleton of the assessment tests used to elucidate data of AN's profile. This chapter also scrutinizes, discusses, and creates links between the available data and related theoretical accounts. Chapter 5 summarizes the study's findings.

Chapter 2 - Definition of the Developmental Disorders and Coexisting Conditions

The objectives of this chapter are to present the current definition of hyperlexia and the developmental disorders associated with AN's uneven cognitive profile, namely Asperger's Syndrome, Specific Language Impairment, Pragmatic Language Impairment. This chapter also discusses the possible coexistence of these disorders.

2.1. What is Asperger's Syndrome?

This section aims to provide the current definition of AS, an overview of its symptoms and other factors involved in this developmental condition. I will start with some historical information of AS. Then, I will present a discussion of the current definition and diagnostic criteria of AS. Subsequently, the discussion will focus at the correlation of AS with other developmental conditions. Finally, I will present an overview of the etiological factors and available intervention.

In 1944, the Austrian pediatrician Hans Asperger first described a group of boys with normal intelligence, who displayed qualitative impairments in reciprocal social interaction, odd behavior, and no apparent language delay. In addition, some of these children had poor coordination skills, clumsiness, and intense interest in bus and train schedules. At that time, Asperger suggested that individuals with these symptoms had "autistic psychopathy." Later on, Asperger's "autistic psychopathy" became known as Asperger's Syndrome or Asperger's disorder. Asperger's description of this group of boys with "autistic psychopathy," was similar to what Leo Kanner described as "early infantile autism," also called autism disorder, in 1943. Leo Kanner observed a triad of qualitative impairments in a group of children, which affected their social interaction, communicative skills, restrictive interests, and stereotyped behaviors.

Until the 1970's, AS did not receive proper attention from the scientific society. Consequently, scientific literature lacked systematic studies on AS, which could distinguish AS from autism disorder. Studies from the late 70's and 80's debated the relation between autism disorder and AS. Clinicians were then aware of the existence of children who shared similar characteristics with autism disorder, but did not quite meet the criteria to be diagnosed as such. For instance, they noticed that AS differed from autism disorder to the extent that AS individuals have relatively spared communicative skills (Gillberg, 1992). Thus, they referred to these children as being either within the "autistic spectrum disorders" (ASD) or as a subtype of a Pervasive Developmental Disorder (PDD) (Gillberg, 1992; Wing and Gould, 1979). Bearing in mind disagreement among researchers concerning the definition of AS, the

criteria for meeting AS diagnosis considered in this thesis are the ones published in the *International Classification of Diseases* (ICD-10) and in the *Diagnostic and Statistical Manual of Mental Disorders* (DSM-IV)[1] as shown in tables 1 and 2.

Table 1 ICD-10 Research Diagnostic Criteria for AS

Criterion A. Lack of any clinically significant general delay in language or cognitive development. Diagnosis requires that single words should have developed by 2 years of age or earlier and that communicative phrases be used by 3 years of age or earlier. Self-help skills, adaptive behavior, and curiosity about the environment during the first 3 years should be at a level consistent with normal intellectual development. However, motor milestones may be somewhat delayed and motor clumsiness is usual (although not necessary diagnostic feature). Isolated special skills, often related to abnormal preoccupations, are common, but are not required for diagnosis.
Criterion B. Qualitative impairments in reciprocal social interaction (criteria for autism).
Criterion C. Restricted, repetitive, and stereotyped patterns of behavior, interests, and activities (criteria for autism).
Criterion D. The disorder is not attributed to the other varieties of pervasive developmental disorder; schizotypal disorder; simple schizophrenia; reactive and disinhibited attachment disorder of childhood; obsessional personality disorder; obsessive-compulsive disorder.
Reprinted from World Health Organization. Classification of Mental and Behavioural Disorders Clinical Description and Diagnostic Guidelines. Geneva, Switzerland: World Health Organization, 1992.

Table 2: DSM IV – Diagnostic Criteria of AS

Criterion A. Qualitative impairments in social interaction might be manifested by at least two of these criteria:
A1. Impairments in the use of multiples nonverbal behaviors, i.e. eye gaze, facial expression, body postures, and gestures.
A2. Failure to develop peer relationship appropriate to his/her age.
A3. Lack of spontaneous seek to share enjoyment, interests and achievements with others.
A4. Lack of social and emotional reciprocity rather than indifference, i.e. AS individuals may pursue a conversational topic regardless the interlocutor's interest in it.
Criterion B. Development of restrictive, repetitive patterns of behaviors, interests, and activities might be manifested by one of these criteria:

[1] AS is no longer classified as a separate condition in itself since it was included in the ASD in the DSM-V, the latest version of the manual.

B1. Intense preoccupation with circumscribed topic of interest.

B2. Inflexibility to change of routines and rituals

B3. Motor mannerisms

B4. Persistent preoccupation/interest with parts of objects

Criterion C. Significant impairments in social adaptation, which impact on self-sufficiency, occupational, and other areas of functioning.

Criterion D. No significant delays in LA, although social aspects of communication might be affected (i.e. turn-taking). Their communicative difficulties might be related to their social-dysfunctions. AS individuals have an unusual vocabulary related to their interests, they make no use of conversational overtures, verbal cues, and self-monitoring.

Criterion E. No significant delay in cognitive development other than in social interaction, in age-appropriate self-skills, adaptative behavior, and curiosity about the environment during the three first years of life.

Criterion F. No coexistence with other specific PDD or schizophrenia.

Adapted from Diagnostic and Statistical Manual of Mental Disorder 4th Edition (DSM-IV). Washington, DC: American Psychiatric Association, 1994.

AS is a PDD falling within the ASD as published in the DSM-IV (2000). This condition involves impairments in multiple areas of functioning. Individuals diagnosed with AS display socio-communication deficits and repetitive patterns of behavior, and circumscribed, idiosyncratic patterns of interests (Neihart, 2000). Unlike children with autism disorder, AS children present relatively spared spoken and receptive language skills. AS individuals may talk incessantly about one specific topic of interest without noticing a listener's disinterest in it. Additionally, they tend to have no significant delay in cognitive development (Ehlers, Gillberg, & Wing, 1999). Most of these individuals function within a normal to superior level of intelligence. Other common symptoms observed in these individuals are motor clumsiness and delay, difficulty in social interaction, idiosyncratic and unusual interests. AS idiosyncratic and unusual interests were associated with giftedness by Neihart (2000) and Bennett & Heaton (2012). The relation between AS and giftedness is further discussed in section 4.2.

AS is a lifelong developmental disorder. Its first symptoms appear as early as the age of three (ICD-10) or within preschool years (Khouzam, El-Gabalawi, Pirwani & Priest, 2004; Neihart, 2000). AS symptoms vary across individuals and within the same individual throughout the course of their development. For instance, AS individuals' circumscribed area of interest is one of the areas likely to change, although the childhood interest may provide

ground to adulthood interest (Khouzam et al., 2004). For this reason, Khouzam et al. (2004) and Bennett & Heaton (2012) emphasized the need for a multidisciplinary evaluation of each individual before initiating a treatment. A comprehensive assessment of AS level of functioning should include assessing individuals' social abilities and interaction, emotional abilities and behaviors, neuropsychological assessment, communication assessment, stereotyped behavior and special interests, motor difficulties, sensory and adaptive functioning (Khouzam et al., 2004).

AS is not realized in the shape of "pure" disorder; therefore, its symptoms cannot be easily separated from all the other conditions with which AS might co-occur, such as Tourette's disorder and ADHD (Gillberg & Billstedt, 2000). Language is the differential criterion between AS and autism disorder. Autistic individuals' language skills are severely impaired while AS individuals exhibit relative lack of language delay. Although language impairment is a typical feature of autism, AS children might also be regarded as "language-disordered." Khouzam et al. (2004) reported that one third of the children with AS presented some delays in language acquisition. Both AS and autistic children have difficulties in processing pragmatic information, but these difficulties are less severe in AS children (Khouzam et al., 2004). These findings are of scientific relevance and will be discussed in section 4.3.

The precise cause of AS is still unknown, but some factors have been suggested as possible etiologies. For instance, genetic factors, right-hemisphere dysfunction, structural brain abnormalities have been implicated as the cause of AS (Khouzam et al., 2004). Thus, more research needs to be conducted in order to support them as etiological factors of AS. AS is a rare condition, although it occurs more frequently than autism disorder (Khouzam et al., 2004). Epidemiological studies have indicated the prevalence rate of AS is higher in boys than in girls (Grossman, Klin, Carter & Volkmar, 2000; Khouzam et al., 2004). There is an average of 3.6 cases of AS per 1,000 children with a ratio of 4:1 male-to-female prevalence (Khouzam et al., 2004). However, this ratio varies according to the stringency of the diagnostic criteria (Ehlers et al., 1999; Neihart, 2000; Khouzam et al., 2004; Bennett, Szatmari, Bryson, Volden, Zwaigenbaum, Vaccarella, & Boyle, 2008).

There are therapies developed in order to increase AS individuals' quality of life. Khouzam et al. (2004) claimed that such strategies focus on promoting learning and reducing behaviors, which negatively interfere with their social integration and interpersonal interactions. Similarly, these strategies should be tailored with attention to the individuals'

age. Likewise, they should be based on a comprehensive view of individuals' strengths and difficulties. Khouzam et al. (2004) and Neihart (2000) suggested the use of a multidisciplinary approach to the treatment of AS. According to these authors, this approach should include educational approaches, behavioral interventions, psychotherapy, and psychopharmacological interventions if needed (Khouzam et al., 2004; Neihart, 2000). For instance, available clinical data have suggested that some AS individuals were capable of overcoming some of their social difficulties and consequently, establish marital relationship and become a self-sufficient adult (Khouzam et al., 2004; Varney, 2013).

2.2. What is Hyperlexia?

Reading development is a process through which every child goes at about five years old, when they start attending school. What many would expect from literate children is that they would acquire the ability to decode sounds from letters and understand what they read simultaneously. However, the process of reading development is not as simple as it seems to be. Cases of children who teach themselves to read at very young age are rare; therefore, such cases are of great importance for the study of atypical language development. In this section, I provide the definition of hyperlexia. It also discusses how hyperlexia overlaps with ASD. Furthermore, it briefly describes hyperlexic readers' cognitive profile.

Hyperlexia is an atypical reading behavior characterized by excellent word-recognition skills in relation to individuals' mental age and other cognitive and linguistic abilities (Nation, 1999). This behavioral reading pattern, which in rare cases may occur on its own, is often observed as a symptom of an underlying disorder, such as AS, ASD, and specific SLI[2] (Glosser, Grugan, & Friedman, 1997; Nation, 1999; Saldaña et al., 2009). Nation (1999) suggested that hyperlexic and ASD individuals (with and without hyperlexia) exhibit similar qualitative reading behavior in addition to linguistic and cognitive patterns of development, which may predispose them to develop exceptional reading skills.

Hyperlexic readers follow an unusual pattern of reading because they tend to process information in local bias (cf. section 3.1 and chapter 4). These individuals are reported as excellent decoders, albeit their difficulties in using meaning to integrate information (Saldaña et al., 2009). In fact, hyperlexic individuals develop an outstanding ability for decoding sounds from letters from early age without receiving formal instruction. In spite of excellent decoding skills, hyperlexic individuals are known as poor comprehenders, for they are unable to understand the meaning of what they read (Saldaña et al., 2009).

[2] Cf. section 2.3 for more information on hyperlexia comorbid with SLI.

Intense preoccupation with print is a common feature shared by hyperlexic individuals with and without ASD (Bennett & Heaton, 2012; Nation, 1999; Saldaña et al., 2009). Because of this intense interest in print, hyperlexic children spend a great deal of time engaged in reading and writing activities. Nation (1999) has claimed that this extensive practice and exposure to print in addition to other linguistic and cognitive aspects provides evidence of the development of excellent reading system and word-recognition skills. Bennett & Heaton (2012) observed that cognitive aspects, such as excellent general memory and attention to details are typical of ASD individuals. For this reason, they tend to become absorbed in topics of their interest due to their superior attention control (cf. section 4.2).

According to Nation (1999), the combination of intense interest in print and local processing bias explains the hyperlexic reading behavior. They "provide an ideal learning environment for the development of excellent decoding skills for those children who have reasonable phonological, orthographic, and associative memory skills" (p. 346). Observations of AN's behavior provided evidence supporting Nation's (1999) and Bennett & Heaton's (2012) findings. He focuses exclusively on reading and writing letters, and his ability to extract meaning from context is hindered. It is therefore important to conduct a study in order to further investigate AN's linguistic and behavioral development.

2.3. Developmental Language Disorders: Specific Language Impairment and Pragmatic Language Impairment

2.3.1. Specific Language Impairment

In this section, I will discuss relevant aspects related to Specific Language Impairments. First, I will provide the definition of SLI and address issues related to it. In addition, this section contains a description of SLI individuals' heterogeneous linguistic and cognitive profile. Subsequently, I will examine available literature on the overlap of SLI with other conditions, such as hyperlexia and ASD. Understanding common traits shared by children with SLI provides ground for discussion of AN's linguistic profile, for I presume his linguistic development follows such patterns. I will support this claim after conducting a comprehensive assessment of AN's cognitive and linguistic skills in chapter 4.

SLI is a language disorder characterized by children's delay in acquiring language skills. The diagnostic criteria of SLI exclude children with hearing loss or other developmental delays (Bishop, 2003). Although the cause of SLI is still unknown, research findings have suggested strong genetic link (Bishop, North, & Donlan, 1995; Bishop, 2008). Children with SLI present delayed speech onset, for they may not start to produce words until

approximately the age of two. Symptoms of SLI include difficulties in using verbs, which is its hallmark.

SLI is a set of neurobiological disorders, which affect children's language subsystems in different degrees. More specifically, deficits in structural aspects of language characterize children's atypical oral language outcomes. SLI hinders children from acquiring language at the same rate as their TD peers. However, they gradually overcome these linguistic deficits throughout the course of their development (Tomblin, 2011). SLI is more prevalent in boys than in girls with a 3:1 ratio. SLI as well as all other disorders affecting LA cannot be observed at birth. Most of the children with atypical language development have linguistic difficulties identified within the pre-school age (Bishop, 2008). Usually, parents, caregivers, and teachers notice that there is something wrong happening with their young pupil. However, identifying children with SLI is not as easy as it might seem.

Throughout the course of the LA process, the linguistic development of children with SLI changes greatly due to their different levels of strengths and weaknesses within linguistic domains. For this reason, no individual follows the exactly same pathway to language. Researchers interested in the language outcome of these individuals found out that some children persisted in having language difficulties in the course of their childhood, while others overcame them by the time they started attending school (Hulme & Snowling, 2009). In both cases, children's condition changed throughout their development (Williams, Botting, & Boucher, 2008). Hulme & Snowling (2009) noted that some of these children were at risk of developing reading difficulties at later stages of development. Due to the heterogeneousness of this LD, it is considerably difficult to predict what SLI individual's linguistic outcomes are going to be (Hulme & Snowling, 2009; Williams, Botting, & Boucher, 2008).

A second relevant explanation for difficulties in defining SLI concerns individuals' heterogeneous linguistic profile. Language development in cases of SLI varies greatly in levels of severity between individuals and across linguistic domains, such as vocabulary, grammar, and phonology. In general, children with SLI have marked late speech onset and slow rate of cognitive development. These characteristics make their language development fall behind according to their age expectations (Tomblin, 2011). Researchers regard deficits in language production as common linguistic features of children with SLI, especially at the grammatical level (morphological and morphosyntactic domains) (Karmiloff & Karmiloff-Smith, 2001; Tomblin, 2011). However, these individuals might have language comprehension difficulties at the lexical and pragmatic domains.

A third reason for the difficulty in providing an adequate definition of SLI is due to whether it is that "specific" to language, as it has been claimed (Pennington & Bishop, 2009). Studies with focus on linguistic and cognitive deficits as well as in perceptual deficits in children with SLI suggested that these children show deficits in other general cognitive domains in addition to deficits in a domain-specific area (Pennington & Bishop, 2009). For instance, research findings have suggested that language aspects of SLI in individuals within the ASD[3] (Botting & Conti-Ramsden, 2003; Matson & Neal, 2010; Norbury & Bishop, 2002; Tomblin, 2011). Therefore, Pennington & Bishop (2009) suggested that SLI is not "specific" to language, for research findings suggested that these children develop deficits in more than one area, which underlies their language impairments. A clear diagnostic condition is still under debate due to the difficulties in separating language problems from other symptoms seen within the ASD (Bishop, 2003, 2008, 2010).

Regarding the heterogeneity of SLI profile, many researchers have attempted to classify SLI into subtypes (Williams, Botting, & Boucher, 2008; Hulme & Snowling, 2009). They have classified subtypes of SLI according to each different hindered domain. However, other researchers question the validity of subtypes of SLI due to the lack of consensus about the delineation of these groups. Hulme & Snowling (2009) claimed that these studies did not take into consideration the nature of speech and structural language problems, which may lead to diagnosis other than SLI (2010). For the purpose of this research, I will consider only structural language deficits as SLI and deficits in the use of language in context as PLI (cf. section 2.3.2).

2.3.1.1. SLI Comorbid with Other Conditions

The risk of co-occurrence of developmental disorders, such as SLI and ASD, is at above chance (Bishop, 1998, 2003). They represent rather heterogeneous conditions because individuals' profiles may change over the course of their lives. There are even cases of overlap of more than two disorders. Due to the high probability of comorbidity of disorders, many researchers have devoted their studies to the investigation of the cognitive and linguistic profile of children with overlapping diagnosis (T. Bennett et al., 2008; Gillberg & Billstedt, 2000; Bishop, 2003; Cohen, Hall, & Riccio, 1997; Newman, Macomber, Naples, Babitz, Volkmar, & Grigorenko, 2007). Children with SLI are part of a diagnostic group at high risk of being comorbid with other disorders, such as hyperlexia and ASD (Bishop, 2003; Cohen et

[3] SLI comorbid with ASD will be discussed in section 2.3.1.1.2.

al., 1997). The evidence from research supports the hypothesis of this case study. I presume that AN displays language talent comorbid with SLI and AS.

2.3.1.1.1. Comorbid SLI and Hyperlexia

A number of studies have defined hyperlexia as a type of reading behavior in which individuals have superior ability for word recognition in relation to their intellectual skills (Cohen et al., 1997; Nation, 1999). Despite their outstanding ability for decoding sounds from letters, these individuals have difficulties in comprehending spoken and written language (Cohen et al., 1997). Cohen and colleagues predicted that the underlying aspect of hyperlexia was SLI rather than the believed reading comprehension disability. They conducted a number of neuropsychological tests aiming to assess the performance of children with SLI and those with SLI comorbid with hyperlexia (SLI+H). The authors believed SLI to be one of the essential features of hyperlexia because hyperlexic individuals had language difficulties typical of SLI. In other words, hyperlexia would be a variant of SLI.

Qualitative analysis of the results showed that the participants of the SLI and the SLI+H had similar performance in most tasks (Cohen et al., 1997). The level of performance of both groups of participants decreased in auditory and verbal memory tasks when the semantic demands increased. Their decreased performance was due to their limited capacity for immediate verbal processing. In addition, the authors claimed reading comprehension deficits to be consequent of deficits in expressive and repetitive language in both groups. However, the SLI+H group outperformed the SLI group in neuropsychological measures (Cohen et al.: 1997, 225). The SLI+H group exhibited better visuo-spatial memory and average perceptual skills in relation to their SLI counterparts (Cohen et al., 1997). The authors highlighted that SLI+H group performance in these tasks was better than the expected for their non-verbal IQ (Cohen et al., 1997). Strengths in visuo-spatial memory and average perceptual skills supported SLI+H elevated word recognition and spelling abilities (Cohen et al., 1997; Nation, 1999).

These findings supported the authors' prediction that SLI would be a cognitive feature of hyperlexia (Cohen et al., 1997). Hyperlexic individuals present the same difficulties as those diagnosed with SLI, for they are unable to process, organize, and comprehend language despite their oral reading fluency. However, their skills distinguish from those with SLI because they have superior ability to word recognition, verbal memory, and visual perceptual skills in relation to their IQ, which are by far the hyperlexic individuals' strengths. The limitation of this study is due to its small sample; thus, it is necessary to replicate this test in

order to consider the results scientifically valid. The evidence that SLI is related to hyperlexia is relevant to the present case study. AN's uneven linguistic profile combines severe deficits in comprehending oral, written information and outstanding decoding skills (cf. section 4.3). Due to his uneven linguistic profile, it may be argued that AN has SLI with comorbid hyperlexia and AS, according to his diagnosis.

2.3.1.1.2. ASD Co-occurs with SLI

Advance in etiological studies proposed major changes in the conceptualization of SLI and ASD (Bishop, 2010). Development in etiological studies revealed that the co-occurrence of ASD and SLI were at above chance levels. The high probability of comorbidity of these conditions suggests that the diagnostic criteria, such as the DSM-IV and ICD-10, do not reveal clinical reality (Bishop, 2010). The purpose of this section is to contrast diagnostic criteria of both conditions based on evidence from studies supporting the overlap of ASD and SLI. I believe that deficits in structural aspects of language interfere with individuals' socio-communicative abilities. Therefore, I suggest that structural language difficulties might be the cause of pragmatic deficits observed in some children with ASD.

Earlier, researchers regarded SLI and ASD as unrelated conditions with distinct causes (Bishop, 2010). In this view, the diagnostic criteria of SLI excluded any chance of co-occurrence with ASD. As discussed in section 2.3.1., the definition of SLI concerned individuals' failure in developing spoken language for no apparent reason, such as hearing loss, physical handicap, and low cognitive abilities. These individuals, according to this view, displayed major deficits in structural aspects of language. For instance, they could not make age-appropriate use of syntax (i.e. word order and inflectional endings) and phonology (identification and production of speech sounds) despite age-appropriate social interaction and nonverbal communication (Bishop, 2010). Pragmatic abilities were regarded as intact in SLI individuals. As opposed to SLI, communication problems are more pervasive in ASD individuals. Their communication impairments affected the use of language in context (pragmatics) and non-verbal communication in addition to problems with social interaction, unusual interests, and stereotyped behavior. Under this perspective, SLI and ASD could never overlap each other.

Not satisfied with these criteria, some researchers went further in their investigations of the relationship of the language and communication difficulties of children with ASD and children with SLI (Tomblin, 2011). Three major studies of language development in SLI and ASD show results contrary to the exclusionary criteria of SLI and ASD (Bartak, Rutter, &

Cox, 1975; Kjelgaard & Tager-Flusberg, 2001; Tager-Flusberg & Joseph, 2003). Research findings suggested that language performance in children with ASD vary substantially even among children with ASD who are verbal (Tomblin, 2011). Test results demonstrated that many of these children have poor structural and functional aspects of communication (Bartak et al., 1975). For instance, Tager-Flusberg & Joseph (2003) observed that many children with ASD performed poorly in repeating nonsense words, made morphosyntactic errors, and omitted inflectional verb endings. These are the same pattern of mistakes seen in SLI (Tager-Flusberg & Joseph, 2003). The resemblance of language features between SLI and ASD are an indicative of the co-occurrence of these two conditions (Bartak et al, 1975; Kjelgaard & Tager-Flusberg, 2001; Tager-Flusberg & Joseph, 2003). Bishop (2010) referred to this group as ASD+LI.

These findings are evidence that SLI and ASD individuals have similar language difficulties. Bishop (2010) claimed that these results did not explain whether similar language difficulties are indicative of shared etiology. In addition, these findings did not explain why only a subset of children with ASD had similar language difficulties to those with SLI. Tomblin (2011) suggested that the ASD+LI group is more likely to have related or shared etiology with SLI than the pure ASD group. In time, Tomblin (2011) pointed out that although ASD and SLI are likely to share some etiological factors, there are also specific factors associated with each of these conditions, as already mentioned above. The possible overlap of ASD and SLI generates a complex mixture of similarities and differences of these conditions. According to Tomblin (2011), SLI diagnostic criteria definitely exclude ASD; however, ASD diagnostic criteria do not exclude SLI.

Bishop (2010) raised an important point concerning how language in ASD and SLI had been assessed in most studies. She noticed that the evaluation of these individuals' language is incomplete, for most of the standardized test assessed either their vocabulary or their syntax knowledge. Bishop (2010) stressed the need to investigate individuals' use of language in communicative context in addition to structural language skills in order to fully assess their language profile. Because current research findings have not answered all the gaps, further research on the genetic and neural basis of language in ASD and SLI is necessary. Therefore, more children could receive accurate diagnosis and treatment (Bishop, 2010). Again, I suggest that structural language deficits might underlie pragmatic deficits observed in some children with ASD, as seems to be the case with the participant of this study. For this reason, I used the CCC-2 developed by Bishop (2003). This checklist helps on

the investigation of traits of ASD, structural (grammar and vocabulary) and pragmatic use of language in AN (cf. section 4.3).

2.3.2. Pragmatic Language Impairment

In everyday communication, individuals need to rely on context in order to understand their interlocutor intentions, for the meaning of an utterance may not be explicitly stated (Norbury, 2012; Saeed, 2009). Language is a very complex system in which words have more than one meaning as well as sentences may sound ambiguous. In everyday communication, speakers need to contextualize in order to make inferences. Pragmatics is the linguistic domain related to the ability to construct meaning by connecting contextual information, which is beyond sentential level (Ben-Yizhak, Yirmiya, Seidman, Alon, Lord, & Sigman, 2011). Thus, it includes individuals' understanding of conversational overtures and extended discourse, narrative abilities, and politeness (Ben-Yizhak et al., 2011). Typical pragmatic development presupposes adequate functioning of all other domains of language, such as semantics, phonology, morphology, and syntax.

Most children learn how to make use of context gradually, as they develop their language skills. Their comprehension of contextual cues becomes more sophisticated as their ability to link contextual information from different sources develops. However, there is a group of children whose language develops atypically. These children are known for having PLI, also labeled as Social-Communication Disorder and Semantic-Pragmatic Disorder. The term PLI refers to children who have difficulties in understanding language in context (Norbury, 2012).

In time, Norbury (2012) noted that researchers and clinicians still disagree whether PLI is a category of language impairments. Some believe that children with pragmatic difficulties should receive the diagnosis of either ASD or SLI (Norbury, 2012). According to Norbury (2012), the diagnosis criteria depend on how one defines ASD, PLI, and SLI. Botting & Conti-Ramsden (1999) and Norbury & Bishop (2002) noticed that children with PLI share some linguistic traits of children with ASD, AS, SLI. However, some children with PLI do not have marked social withdrawal and restricted interests as their ASD peers (Botting & Conti-Ramsden, 1999). ASD is an exclusionary criterion of PLI. In time, researchers claim that ASD diagnosis criteria include linguistic characteristics of PLI (Ben-Yizhak et al., 2011; Bishop, 2003; Loukusa, Leinonen, Kuusikko, Jussila, Mattila, Ryder, Moilanen, 2007, and Tager-Flusberg, 1999). I will further discuss ASD with comorbid PLI below.

Over-literal understanding of language is the hallmark of children with PLI. For instance, it is considerably difficult for these children to understand figurative language. In addition, it is arduous for them to maintain a topic and follow a conversation. Language difficulties observed in children with PLI involve inability to use context to aid comprehension and take into account the interlocutors' perspective (defective use of conversational cues and turn-taking). Understanding conversational context seems to be more challenging than understanding single sentences due to their poor inferential skills (Norbury & Bishop, 2002). For instance, children with PLI are unable to understand a simple statement like "it's raining," which in the context of people getting ready to go outside means, "we should wear a raincoat and rubber boots" (Norbury, 2012). Despite problems with pragmatic language, Botting & Conti-Ramsden (2003) described these children as having relatively normal language development, for they are able to produce complex sentences with minor errors. They tend to be verbose and make unusual language constructions and word choice. Children with PLI enjoy talking despite their difficulties in understanding what others say, especially in context. For this reason, they might find it quite stressful to deal with social situations because they make mistakes, which people may find funny and laugh at them (Norbury, 2012).

As previously mentioned in section 2.3.1.1.2., it is difficult to measure pragmatic difficulties in a standardized way (Bishop, 2003; Norbury, 2012). Bishop (2010) noticed that evaluation methods of language skills are incomplete, for most of the standardized tests assessed either vocabulary or syntax knowledge. She stressed the need to investigate individuals' use of language in a communicative context. In addition, structural language skills should also be assessed in order to better describe the language profile of PLI individuals. Children with PLI may exhibit some problems with structural language, especially at the syntactic level (Botting & Conti-Ramsden, 1999). This evidence suggests that difficulties with structural use of language might underlie deficits in pragmatic skills. However, this topic is still under investigation. Norbury (2012) suggested that the best way to rate how children communicate is by rating their everyday conversation. Concerned with this matter, Bishop (2003) developed the CCC-2 in order to assess communicative aspects of language in children at risk of SLI, PLI, and ASD (cf. section 4.3).

2.3.2.1. PLI overlaps with ASD

Pragmatic deficits have been reported as significant element of ASD triad (Ben-Yizhak et al., 2011). Studies on the co-occurrence of PLI with ASD have suggested a correlation of difficulties in pragmatics aspects of language and social relations in ASD individuals (Tager-Flusberg, 1999). This author observed that ASD individuals with PLI have deficient use of vocabulary and understanding of utterances because they require individuals' ability to make inferences from context (Tager-Flusberg, 1999). Literal interpretation of utterances hinders ASD individuals' ability to understand idioms, humor, mental states, and processing ambiguous information. Deficits in pragmatics and in any other linguistic domain in comorbidity with ASD have been believed to worsen individual's social skills (Toppelberg & Shapiro, 2000).

Loukusa et al. (2007) were interested in investigating pragmatic language in children within the ASD. The authors conducted a study with 42 children with AS and HFA, for they have similar language skills. Loukusa et al. (2007) tested children's ability to derive answers from context and to answer different types of contextually complex questions. Results indicated that AS children have impaired abilities to derive information from context (utterance meaning) despite average language skills. In Loukusa et al.'s (2007) study, AS/ HFA group performance demonstrated difficulties in answering basic implicature questions and routine questions. These children had difficulties in providing explanations for their answers. Interestingly, the research results suggested that AS and HFA individuals had difficulties rather than deficits in processing information in context. Pragmatic difficulties in AS and HFA individuals may decrease with time, but they may remain fragile in comparison to control group. These results led researchers to claim that the AS/HFA group was inefficient rather than unable to comprehend language in context (Loukusa et al., 2007).

Further research envisaging the linguistic development of children with signs of co-occurrence of ASD and PLI is necessary. I will discuss pragmatic aspects of AN's language in section 4.3. Future research of PLI comorbid with ASD should gather a larger sample of individuals with these symptoms in order to increase studies' reliability.

Chapter 3 - Theoretical Framework

The objective of this chapter is to present the two theoretical accounts associated with language talent in individuals within the ASD and with language disorders. More specifically, the WCC hypothesis accounts for a specific cognitive style, which favors individuals' language talent; the modularity of mind accounts for the existence of a language module in the brain, which functions independently of other cognitive modules. Understanding the above-mentioned theories provided grounds for discussion of the present research findings. A detailed presentation of these accounts is presented below.

3.1. The Weaker Drive for Central Coherence

Many studies have observed the atypical cognitive development of ASD children (Noens & Berckelaer-Onnes, 2005; Vulchanova, Talcott, Vulchanov, & Stankova, 2012a; Vulchanova, Talcott, Vulchanov, Stankova, & Eshuis, 2012b). These studies contributed to the discussion of the distinctive traits and causes of ASD. In the past 25 years, many psycholinguistic and cognitive researchers focused their studies on language and communication in ASD based on the Weak Central Coherence hypothesis (WCC) (Baron-Cohen, Ashwin, Ashwin, Tavassoli, & Chakrabarti, 2009; Grossman et al., 2000; Frith, 1989; Happé & Frith, 2006; Happé, 1997; Noens & Berckelaer-Onnes, 2005; Vulchanova et al., 2012a, 2012b). In this section, I will provide a discussion of the WCC. Additionally, I will discuss its relevance to the study of language talent in ASD and present a summary of the latest research findings supporting the relation of WCC and language talent in ASD (Vulchanova et al., 2012a, 2012b).

The central coherence hypothesis (CC) was introduced by Frith (1989). It postulated that typically developing individuals naturally process new information "globally and in context, pulling information together to acquire high-level meaning" (Noens & Berckelaer-Onnes: 2005, 125) in spite of loss of attention and memory for details. Conversely, the CC accounts for a weaker drive for ASD individuals, for they tend to process incoming information in a local bias rather than in global bias (Frith, 1989). Originally, researchers considered the difficulty of processing the global information a deficit (Frith, 1989). In 2006, Happé & Frith reformulated their original suggestion of the WCC. The newer concept of the WCC accounts for individuals' superior detail-focused cognitive style or a local processing bias rather than a deficit in extracting global information, as suggested before. The WCC hypothesis explains areas of strengths (talent) and weaknesses (lack of generalization) that earlier accounts could not explain (Happé & Frith, 2006).

Aware that small parts of information build up global coherence, Happé & Frith (Happé & Frith, 2006) claimed that some autistic individuals might be able to connect some types of information. These individuals process information by chaining item-to-item or by making intra-domain coherence. Some of the types of information that they are able to connect are facts within a narrow domain, such as gathering elements from daily routine, joining visual elements when drawing, and calendrical calculation (Happé & Frith, 2006). The authors suggested that the level of coherence used in calendrical calculation is equivalent to grammatical processing, which is relatively intact in some ASD people, AS in particular (Happé & Frith, 2006). Autistics' ability to connect grammatical information in peace-meals reinforces the evidence of the language modules, which I will scrutinize in section 3.2. Under this new perspective, the WCC represents a cognitive style, which underpins local processing, instead of a deficit for processing global information. For this reason, ASD individuals may make an effort to shift their attention to details when required to extract general information, especially on open-ended tasks (Happé & Frith, 2006).

A distinctive aspect of the WCC hypothesis is that it accounts for both strengths and weaknesses of a specific cognitive style that earlier accounts could not explain. Some have claimed that the WCC even facilitates the onset of giftedness (Noens & Berckelaer-Onnes, 2005; Vulchanova et al., 2012a, 2012b). These evidences are presented in three domains and perceptual levels: visual, auditory perception, and in verbal semantics (Noens & Berckelaer-Onnes, 2005). Research findings showed that ASD children's performance in visual and auditory tasks was uneven. On the one hand, they displayed poor abilities to process visual information (i.e. detect coherent motion and counting dots tasks) and auditory information (i.e. pitch) (Noens & Berckelaer-Onnes, 2005). On the other hand, ASD children had superior level of visuo-spatial coherence as in block design and embedded figures tasks (Noens & Berckelaer-Onnes, 2005).

In the past 20 years, researchers have conducted a great number of studies in favor of the WCC. Although findings supported the principles of the WCC as a cognitive style for processing information in a local bias, the WCC cannot explain which cognitive and neural mechanisms underlie individuals' detail-focused processing style. Other accounts attempted to answer some of the limitations of the WCC, such as the "theory of mind" (ToM), executive function (EF), enhanced perceptual functioning (EPF), and empathizing-systemizing account of ASD. However, not one of these hypotheses answer whether central coherence is a single mechanism integrating information from other neural-cognitive systems or a property of each subsystem of the brain (Happé & Frith, 2006). Despite these unanswered questions, many

studies have tested the validity and applicability of the WCC account of ASD (Happé & Frith, 2006; Noens & Berckelaer-Onnes, 2005; Vulchanova et al., 2012a, 2012b). Researchers agree that patterns of strengths and weaknesses vary among these individuals (idem). Noens & Berckelaer-Onnes (2005) emphasized that "individuals with autistic disorder are generally more impaired than those with AS, but the later still exhibit more difficulties with complex information processing than control groups" (p. 129).

3.1.1 The WCC, a Cognitive Style in favor of Language Competence in ASD

In order to scrutinize this discussion of language competence in ASD, it is necessary to briefly explain the typical development of language competence. There is a consensus among researchers that language competence requires the speaker to develop combinatorial skills for processing sound, meaning, and patterning (Chomsky, 2011; d'Souza & Karmiloff-Smith, 2011; Kounios, 2007; Van der Lely, 1997; Levy, 1996; Poeppel, 2012; Ramus, 2006). In other words, language use, and comprehension depend on the speaker's ability to capture sounds and to map them into acoustic segments to meaning representations (Vulchanova et al., 2012b). In addition, the speaker needs to be exposed to context, have access to word learning mechanisms, and store lexical items from the working memory into the long-term memory in order to successfully complete the LA process. Bearing in mind cross-linguistic variations, speakers of a language X may acquire morphological aspects of their language faster than speakers of language Y, who tend to acquire syntactic aspects first.

In addition, language is a system divided in subsystems (formal, semantic, and pragmatic). These subsystems develop continuously and simultaneously in typically developing individuals (Vulchanova et al., 2012a). However, they are dependent of each other, for they are in constant interaction (Vulchanova et al., 2012a). For this reason, many researchers have been investigating patterns of atypical language acquisition in individuals within the ASD (Happé, 1997; Noens & Berckelaer-Onnes, 2005; Vulchanova et al., 2012a, 2012b). The WCC hypothesis explains these individuals uneven linguistic profile, which is marked by strengths and weaknesses. Studies in language and communication in ASD have suggested that these individuals develop relatively spared structural and semantic aspects of language but impaired pragmatic skills (Happé, 1997; Noens & Berckelaer-Onnes, 2005; Vulchanova et al., 2012a, 2012b). These findings suggested that these individuals have difficulties in understanding meaning from context. Interested in the topic, researchers have focused their observations in light of a major theoretical framework, the WCC hypothesis

(Noens & Berckelaer-Onnes, 2005; Norbury & Bishop, 2002; Tager-Flusberg, 1999; Vulchanova et al., 2012a, 2012b).

The WCC hypothesis accounts for the existence of a cognitive style common among ASD individuals due to their great attention to detail and ability to process information in piecemeal to the expense of integrating information globally (Happé & Frith, 2006). Research has showed evidence supporting the applicability of the WCC account to explain language competence in ASD individuals (Happé & Frith, 2006; Noens & Berckelaer-Onnes, 2005; Norbury & Bishop, 2002; Vulchanova et al., 2012a, 2012b). The WCC provides an account for the co-occurrence of patterns of strengths and weaknesses among these individuals, which could explain the onset of special talents in ASD. Vulchanova et al. (2012a) claimed that the WCC cognitive style favors the acquisition of morphological aspects of language and hinders individuals' ability to process language in context. Thus, the authors pointed out the need of "explanatory accounts that rely on broader and less domain-specific cognitive mechanisms and traits" (p. 2) that would explain the dissociation between formal and pragmatic domains of language.

Regardless qualitative differences in the level of functioning among individuals with ASD, deficits in verbal and non-verbal communication are the core symptoms of the spectrum (Noens & Berckelaer-Onnes, 2005). Interestingly, even verbal individuals with ASD, like those with AS, develop a heterogeneous linguistic profile. Researchers have noticed a prominent dissociation within structural language (strengths) and pragmatics (weakness), although there is an interrelation in their development (Noens & Berckelaer-Onnes, 2005). For example, there may be some delay in the acquisition of phonology and syntax, but the outcome does not deviate much from the TD group. Similarly, they have difficulties with use of pronoun, metaphors, neologisms, and figurative language at the semantic level, but vocabulary seems to be their strength in spite of comprehension difficulties (Noens & Berckelaer-Onnes, 2005). In fact, pragmatic abilities are these individuals' weakness because they involve global coherence. These individuals have significant difficulties in conversational discourse and narrative (Noens & Berckelaer-Onnes, 2005).

The key for a successful communication requires individual's cognitive abilities to process and integrate information within context; in other words, communication requires one's ability to make sense. Studies done in the last decade have identified difficulties in understanding language in context (perceiving intentionality and symbols' comprehension and use) as the core communicative deficit in ASD children (Noens & Berckelaer-Onnes, 2005; Norbury & Bishop, 2002; Vulchanova et al., 2012a, 2012b). Noens & Berckelaer-Onnes

(2005) claimed that WCC account better explains these difficulties. During the early stages of language acquisition, verbal ASD children develop a very peculiar language style (Noens & Berckelaer-Onnes, 2005). For instance, echolalia, pronoun reversal, and use of cliché characterized language in ASD (Noens & Berckelaer-Onnes, 2005). The use of these linguistic resources indicate that children with ASD tend to memorize and reproduce language in chunks without understanding them, for they are unable to interrelate pieces of information and connect them to previous experiences (Noens & Berckelaer-Onnes, 2005).

Noens & Berckelaer-Onnes (2005) were also interested in the investigation of language strengths in AS individuals. They highlighted the lack of research on the advantage of structural language, especially to competencies across linguistic subsystems (morphology, phonology, etc.). In recent research, Vulchanova et al. (2012a, 2012b) conducted two case studies investigating the advantage of structural language in the context of AS. Research findings provided evidence that the WCC hypothesis explains language talent in ASD (Vulchanova et al., 2012a, 2012b).

Vulchanova et al. (2012b) studied the case of an eighteen-year-old-boy native speaker of Bulgarian with AS and talent for foreign languages. The authors tested their participant's linguistic strengths and weaknesses in light of the WCC. More specifically, they discussed how the local processing bias favored his acquisition of morphology and grammar. The WCC accounted for an advantage for acquisition of structural language due to the participant's preference for processing information locally, as the researchers had predicted. Despite the peaks in grammar, results demonstrated a weak ability to derive information from context, which weakened gradually as language structure became more complex (2012b). Vulchanova et al. (2012b) pointed out that weak pragmatic language skills (i.e. figurative language, idioms, and semantic integration) are a common characteristic shared by ASD individuals. Pragmatic language skills are consistently hindered even in cases of apparently spared structural language (phonology and grammar) (Vulchanova et al., 2012b). Nevertheless, these results supported the WCC, as a plausible explanation for language talent within ASD. In this view, language is hierarchical, systematic, and full of details, which are also highly dependent on context (Vulchanova et al., 2012b).

In another study, Vulchanova et al. (2012a) investigated both L1 (Bulgarian) and L2 (German) skills of a ten-year-old-girl with AS. The participant of this study acquired her L2 by watching cartoons in German. The research team aimed to illustrate patterns of strength, which promoted her language talent. They proposed that the WCC account facilitated the acquisition of certain aspects of language within the ASD. In their view, the WCC account

explained the co-occurrence of cognitive weaknesses and strengths in the Bulgarian girl's profile. This uneven cognitive profile, more specifically, the pattern of strengths, promoted the emergence of language talent. Vulchanova et al. (2012a) hypothesized that the WCC hypothesis accounted for the participant's language profile in two ways. On the one hand, local processing enhanced structural language performance (i.e. morphology, syntax, and phonology). On the other hand, global processing hindered individuals understanding of language in context (i.e. pragmatics). These findings indicated the dissociation of functional aspects of language consistent with the girl's uneven cognitive profile (Vulchanova et al., 2012a). This evidence is also supportive of the WCC account in relation to ASD.

Compelling evidence from recent studies of language in ASD was consistent with the WCC theoretical framework (Noens & Berckelaer-Onnes, 2005; Vulchanova et al., 2012a, 2012b). The WCC account explains patterns of weaknesses and strengths in language learning within subgroups of ASD individuals. These parallel dissociations in global and local aspects of language may assist in the acquisition of structural linguistic aspects to the expense of the contextual ones. These findings not only explained the possible causes of the emergence of language talent, but also suggested a relative independence within language modules in the brain (cf. section 3.2). Findings from this range of studies were convergent and provided evidence that the WCC hypothesis supports the prediction of this case study. AN has an atypical cognitive style for acquiring language. I presume that peaks and troughs characterize his language skills. For instance, his linguistic strengths are in local and structural linguistic aspects (i.e. phonology), on the one hand, and weaknesses in comprehending language in use (i.e. pragmatics), on the other. Because AN is still very young, it is not possible to foresee how his linguistic skills are going to develop. However, it is already possible to say that it is far from being typical.

3.2. The Functional Modularity of Language

Chomsky's early study of the faculty of language dates back to the 1950's when he proposed that language is innate to human beings (Chomsky, 2011). From his perspective, language is genetically encoded. Therefore, the human brain is endowed with an apparatus, which supports the language faculty, the so-called "Universal Grammar" (UG). Much scientific research concerning how language evolves in the human brain has taken place since then. Subsequent research found it necessary to reduce the UG assumptions to a minimum in order to seek for detailed explanations of unanswered questions (Chomsky, 2011; Fodor, 1983; Kounios, 2007; Poeppel, 2012; Ramus, 2006). Cognitive science is the dominant theoretical approach in investigating the faculty of language. It relies on cognitive processes involved in LA. More specifically, cognitive researchers presupposed that cognitive processes happen within modules in the human brain and mind, and language is among these modules (Chomsky, 2011).

In this section, I will describe the core concepts of the modularity of the human mind and the faculty of language. Fodor's publication *The Modularity of Mind* in 1983 revived this theoretical perspective, and it has been under discussion since then. I will provide core concepts of this cognitive theory, such as functional modularity, localization, lateralization, and double dissociation. In addition, I will discuss research results supporting the existence of language modules. More importantly, the modularity of mind is a theoretical perspective of scientific relevance to this case study, for recent cognitive research has provided evidence of impaired and spared language modules dissociated from cognitive functions in children with developmental disorders (Saldaña et al., 2009; Vulchanova et al., 2012a, 2012b).

In his monograph *The Modularity of Mind*, Fodor (1983) claimed that the human mind is divided in modules. Each of these modules has a functional role in the cognitive system. Fodor described the functional modules as domain-specific computational mechanisms. It means that they are rather specialized because they only process certain kinds of input. The functional modules are innately specified, for there is no need of any sort of learning process to build such structures. In addition, Fodor described the functional modules as hardwired; they are associated with "specific, localized, and elaborately structured neural systems" (p. 37). Likewise, these modules are autonomous (encapsulated), in other words, they operate independently of other cognitive domains. Moreover, the cognitive modules are not assembled. It means that they are fixed architectures (ontogenic).

These functional modules are associated with cognitive and language information processing. In Fodor's view, the language module is formed by structures in the cognitive

system, which possesses an innate capacity for language. The language module is informational-encapsulated because it does not process information associated with language. In time, Fodor explained that his notion of functional modules does not mean physical modules, just like a heart or a liver. The author suggested that functional modules are not placed in one specific area of the brain. They are rather represented by different areas of activation in the brain[4] (Fodor, 1983).

d'Souza and Karmiloff-Smith (2011) criticized the modularity of mind theory, for it explained how the modular functions were organized in the adult brain, which was on its final developmental state. According to these authors, the modularity of mind theory cannot explain the cognitive processes the infant brain goes through because it is in its initial state of development. According to d'Souza and Karmiloff-Smith (2011), the human brain develops over time as it undergoes a gradual process of complex and dynamic changes. In its initial state, the infant brain structures are highly interconnected. The gradual specialization and localization of the infant's brain is due to several dynamic and complex interactions. These interactions are responsible for the brain development and its functional flexibility. Once the brain has reached its end state (adult brain), its structures have become highly specialized/modularized.

Scholars have long been trying to understand the basic properties of the human brain and mind (Chomsky, 2011; d'Souza & Karmiloff-Smith, 2011; Fodor, 1983; Kounios, 2007; Poeppel, 2012; Ramus, 2006; Saldaña et al., 2009; Willems, de Boer, de Ruiter, Noordzij, Hagoort, & Toni, 2010). Neurocognitive studies use brain-imaging methods for elucidating data. Commonly used methods are positron-emission tomography (PET), magnetoencephalogram (MEG), electroencephalogram (EEG), and functional magnetic resonance imaging (fMRI). In experimental research, researchers collect images of selected areas of the brain. These selected areas are also called functional modules. These functional modules are functional independent population of neurons, which generate electric fields in the scalp. Researchers observe their activation by focal differences in cerebral metabolism or blood volume after a given input. Experimental control condition selectively influences these brain areas or modules while others remain unaffected. Due to these focal differences, it is possible to detect, isolate, and analyze functional neural modules. This is an evidence of the specialization and localization of brain modules. In this view, functional modularity is a dynamic and emergent property of processing information in the brain (see Kounios, 2007).

[4] I will discuss below in this section evidences from neuroimaging studies of different areas of the brain being involved in language processing.

Neurocognitive researchers are eager to explore how some cognitive functions tend to occur in one side of the brain. Researchers considered the left hemisphere of the brain the dominant area for language processing (d'Souza & Karmiloff-Smith, 2011; Kounios, 2007; Poeppel, 2012; Ramus, 2006). Two areas of the left side of the brain have been regarded as classical language modules, the Broca's and the Wernicke's area (d'Souza & Karmiloff-Smith, 2011; Kounios, 2007; Poeppel, 2012; Ramus, 2006). These two areas were believed to be responsible for language production and comprehension, respectively. As neurocognitive studies advanced, researchers observed the implication of other brain areas with language processing (Poeppel, 2012). The evidence of activation of neural areas (submodules) not directly related to language for processing language tasks challenge the discussion of lateralization of the neural functions in the context of brain mapping.

In this context of mapping brain areas related to language, research findings have presented evidence that the early visual cortex process visually presented linguistic materials, syntax, and semantic cues although it is not a truly language area (Poeppel, 2012). In addition, the author suggested a relation between linguistic representations and sensory representations in vision (text), hearing (speech), and touch (Braille) (p.40). He claimed that the activation of putatively domain-general areas (early visual cortex) - submodules - reflect the nature of online language processing. These domain-general areas and the classical language areas are implicated in different forms of language tasks (Poeppel, 2012). These research findings are evidence that language does not constitute a single module on its own, but it is rather represented in many submodules activated in different areas of the brain and mind.

Furthermore, there is a growing body of evidence suggesting that some aspects of language are processed in the right hemisphere while others are bilaterally mediated. This evidence challenges the left hemisphere dominance for language processing and makes the discussion of cerebral asymmetry even more complicated (Poeppel, 2012). Poeppel claimed that different results are observed when analyzing language as a whole and when language is decomposed into its constituents and operations. For instance, speech perception and lexical processing are bilaterally executed (p.43). Conversely, syntactic processing and production are strongly lateralized to the left hemisphere (p.43). According to Poeppel, these findings suggested that cortical regions of the both brain hemisphere may encode stored linguistic information, and submodules computations may be lateralized (p.43). Despite a growing body of research on brain mapping and lateralization of function, there is no compelling evidence supporting that distinctive language features are selectively lateralized. Hence, further investigation is necessary.

In the past three decades, many researchers sought to investigate the architecture of language modules in language impaired and language talented individuals (d'Souza & Karmiloff-Smith, 2011; Saldaña et al., 2009; Vulchanova et al., 2013; Yamada, 1990). According to Kounios (2007), one may have severely impaired cognitive abilities while other neural functions may remain relatively intact. In addition, Yamada (1990) suggested that selective impaired individuals demonstrate evidence of the separability of several components of language from one another in aspects of cognition (p. 5).This is evidence of the modular construction of the human mind and brain. After having observed dissociations between linguistic and cognitive skills, researchers are interested in understanding the interfaces within these models rather than across them. After all, I consider this theoretical perspective relevant to my project, for I have observed dissociation within language and cognitive abilities in the participant of this case study. As I have suggested before, this seven-year-old boy presents an asymmetry between language decoding and comprehension in relation to his cognitive abilities; this child has an outstanding ability for decoding sounds from letters without being able to comprehend what he reads.

3.2.1. The Dissociation between Functional Modules

Studies have long been focusing on the ability of the human cognitive system to make dissociations (Ehlers et al., 1997; Saldaña et al., 2009; Seymour & Evans, 1992; Lely, 1997; Willems et al., 2009). In other words, researchers are interested in the neural substrate of a particular brain function, which might be impaired in some individuals and spared in others (d'Souza & Karmiloff-Smith, 2011; Willems et al., 2009). For instance, neuro- and psycholinguists have manipulated experiments in order to observe effects of two dependent variables in the participants' brain (Willems et al., 2009). They observed that one manipulation in a certain area of the brain might affect one variable and not the second. Similarly, a second manipulation in another area of the brain may affect the second variable but not the first one. Consequently, these affected areas in the brain might be either impaired or spared in two different groups of individuals. This is the so-called double dissociation.

Evidence supporting this hypothesis comes from comparative studies between hyperlexia and dyslexia, SLI and William's syndrome (WS), and Broca's and Wernicke's aphasia. These groups exhibit an uneven profile characterized by peaks and troughs of cognitive and linguistic abilities (Ehlers et al., 1997; Saldaña et al., 2009; Seymour & Evans, 1992). One can observe subtle dissociation by comparing two clinical groups, i.e. SLI and WS. In the SLI group, language is severely damaged despite normal cognitive abilities. In the

WS group, cognitive abilities are impaired although language remains relatively intact. A similar pattern is found between individuals with SLI and AS. AS individuals display relatively spared language despite impaired cognitive abilities. The double dissociation relates to the impairment or spareness of a certain brain function, i.e. language and cognitive abilities, in two groups of individuals. The evidence of two groups of individuals with impaired and spared language and cognitive performance supports the independence of functional modules of the brain.

The dissociation between functional modules of the brain is of importance for psycholinguistic investigation of language and other cognitive modules of the brain. By investigating the dissociations of brain functions between two groups of individuals, psycholinguists can make inferences about brain function and function localization (Kounios, 2007). Consequently, they can understand more about how language production and comprehension function in relation to other cognitive skills within the same individual (Kounios, 2007).

Interested in the topic, Willems et al. (2010) conducted a study on the dissociation between communicative and linguistic abilities between individuals with normal language cognitive skills. Their aim was to investigate whether linguistic and communicative abilities were linked by 'mentalizing' processes or were related to distinct parts of the cortex sensitive to linguistic variables. In order to test their hypothesis, they checked the cerebral activity of twenty participants (~22 years-old) while performing verbal communication tasks. As a result, the research team observed that two cerebrally distinct mechanisms generated communicative and linguistic abilities: the dorsal prefrontal cortex and the left inferior frontal cortex, respectively. Quoting Willems et al.'s (2010), "the generation of communicative utterances relies on a neurocognitive system that is involved in understanding the intentions of others (mentalizing), and that is distinct from the language system" (p. 13). However, these researchers do not deny that these distinct systems of the brain interact closely during discourse comprehension.

Willems et al. (2010) results confirmed the hypothesis of the existence of dissociation between language production and comprehension, which relied on a cerebrally distinct mechanism. They suggested that the dissociation might also be evident in individuals suffering from language impairments despite spared cognitive abilities. In fact, earlier studies in hyperlexic individuals done by Seymour & Evans (1992), Ehlers et al. (1997) and Saldaña et al. (2009) confirmed their suggestion. The findings from these three studies supported the evidence of the functional independence of cognitive processes, such as language and

intelligence. In addition, these research findings demonstrated dissociations within language abilities. The participants of these studies developed an outstanding ability for decoding sounds from letters. Nevertheless, these individuals displayed low IQ and poor communicative/comprehension abilities, which were relatively impaired.

The study done by Seymour & Evans (1992) aimed to prove the existence of the developmental modularity of the orthographic and the semantic system. In other words, they believed in the possibility of a "normal" literacy development despite the presence of a severe semantic impairment. The authors claimed that the effect of teaching approach on literacy could influence the way children learn to read. In this view, hyperlexic readers follow different patterns of reading than normal readers. The authors followed children who were learning to read by using the same method of literacy over the course of the three first years of schooling. Seymour & Evans (1992) tested a six-year-old hyperlexic boy and his 17 classmates' (control group) reading and spelling skills, semantic and sentence processing, and spelling and morphology knowledge. They identified patterns of normal reading among the control group. The hyperlexic boy followed a different pattern of reading, which deviated from the norm. They found out that he had difficulties in language production and comprehension, but spared orthographic system. In addition, he showed precocious reading abilities in relation to his nonverbal IQ and to his peers. These findings support the evidence of the dissociation of the cognitive system and the language module in hyperlexic individuals. Similarly, these findings suggest possible dissociations within the language module.

More recently, Saldaña et al. (2009) aimed to investigate the processes involved in hyperlexic reading. For this reason, they considered important to match ASD participants IQ level and compare ASD individuals to a control group. After a battery of tests, they observed that ASD participants followed a phonological route in order to read words, which was exactly how typically developing participants did. However, those with discrepant verbal IQ showed strong orthographic representation and limited oral vocabulary. Likewise, ASD s did not show the same level of proficiency in text comprehension tasks. The results of this study supported the evidence of double dissociation hypothesis. In other words, Saldaña and colleagues (2009) observed that hyperlexic decoding ability for reading words is well above individuals' mental age and VIQ. Test results indicated that hyperlexic readers have difficulties to comprehend the meaning of what they read. Finally, the research team suggested that the truly hyperlexic reader, those in the reading-discrepant VIQ group, showed stronger lexical representation of words. The reason for their outstanding skills might have been due to special interest and extensive practice in reading print materials (cf. section 4.2).

Many other research findings have provided empirical evidence of the modular aspects of language theory and the dissociation of language and cognitive modules (Van der Lely, 1997; Vulchanova et al., 2012a, 2012b). All of these studies share in common that each of the children studied displayed an uneven linguistic profile with subtle dissociations within language and cognitive abilities (Vulchanova et al., 2012a, 2012b). In addition, these children's uneven linguistic profile is consistent with the cognitive profile of skills and abilities (Vulchanova et al., 2012b). Van der Lely (1997) investigated the linguistic and cognitive abilities of a ten-year-old boy diagnosed with grammatical SLI (GSLI). This child displayed severe impairments in morphosyntactic abilities despite average and above average abilities in other aspects of language and cognitive skills (Van der Lely, 1997).

Vulchanova et al. (2012a) reported the case a Bulgarian girl who is language talented combined with AS. The participant's linguistic profile was rather uneven, for both of her first and second language displayed subtle dissociations in competence and performance. In another recent study, Vulchanova et al. (2012b) looked into the profile of an eighteen-year-old boy who developed a language talent in the context of AS. He demonstrated a rather uneven profile with advantages at the level of morphology and syntax and troughs at the level of advanced syntax, processing suprasegmental phonology, and figurative language. Despite the cognitive problems typical of AS, their participant had an overall high intelligence "distributed unevenly across competences" (p. 588). All of these results provided empirical evidence of subtle dissociations within the language module in relation to individual's uneven cognitive abilities.

The modularity of language and mind theory is relevant to the investigation of AN's linguistic and cognitive skills. The prediction of this study is that AN processes linguistic information in an atypical fashion. This child has great interest in letters and spends a great deal of time engaged in related activities; however, his ability to decode sounds from letters far surpasses his performance in other areas of cognitive development. His ability to comprehend the meaning of what he reads is also relatively impaired.

Much has to be investigated in AN's case. The difficulty in studying AN's case is due to his young age. Most of the standardized tests were developed to screen older children's profile. For this reason, it was not possible to investigate his understanding of language in context thoroughly. In our first trial of the WISC, AN showed severe oral comprehension problems. Consequently, he could not understand tasks procedures, which resulted in his failure in completing the test. Furthermore, AN is still undergoing the early stages of literacy and development of his special skills; it is not possible to draw inferences about his patterns

of reading, yet. Further research his case will be of great contribution to the understanding of the development of hyperlexic reading and the dissociations of the brain cognitive functions and language processing.

Chapter 4 - Comprehensive Assessment

This chapter presents how AN's profile was comprehensively assessed: the method chosen, the material used, the participants, and the research design. Then, it analyzes the assessment tests and their results.

4.1. Design

4.1.2. Method, Material, Participants, and Experimental Design

This study used parental reports to elucidate data. The advantage of using parental reports was that they provided the study a more realistic picture of the child's everyday behavior and communicative skills because the respondents were able to observe and rate their child's development in a natural context. Respondents completed two parental reports: the screening questionnaire for talent in ASD and the Children's Communication Checklist-2. The factors investigated in both parental reports were pulled out from relevant literature as classic features associated with the ASD phenotype.

Both the SCQ and the CCC-2 consider non-family members observations of the participant's performances and competences as long as they know the child very well. This is a technique used for controlling for respondents' over- and under- estimation of the child's cognitive and behavioral development. These two parental reports were developed within the past ten years, and have shown high inter-rater reliability. Many studies, using these materials, have found valid results (Bishop, 2003; Bishop et al., 2006; Bennett & Heaton, 2012; Norbury et al., 2004).

This study was conducted over the period of eight months. The comprehensive assessment of AN's profile was conducted as follows: his parents were asked to fill in the SCQ for talent in ASD and the CCC-2 in their home environment. Each of these checklists takes 10-15 minutes to complete. All answers were analyzed and compared (1) to the research team's observations of AN's behavior in our meeting, (2) to videos and pictures of AN's engaged in activities related to his special interest, and (3) to AN's drawings (cf. appendix 1). Detailed information of the completion of these parental reports and the analysis of results will be provided in sections 4.2 and 4.3.

4.2. Screening Questionnaire for Talent in ASD (Bennett & Heaton, 2012)

4.2.1. Rationale of the Conducted Study

The aim of this section is to assess the distinctive traits of AN's cognitive and behavioral phenotype, which could explain his outstanding abilities for decoding sounds from letters. The prediction of this study is that AN is a gifted child within the context of AS. AN's cognitive and language profiles reveal patterns of strengths and weaknesses typical of language talented children with AS, as discussed in section 1.3. If the prediction of this study is confirmed, the findings will foster research on specific traits related to language talent and AS (cf. section 4.2).

I. Background assumption

Research in ASD has largely focused on the triad of impairments characteristic of this spectrum of developmental disorders, and little attention was devoted to the investigation of special skills in these individuals (Neihart, 2000). In the paper *Gifted Children with Asperger's Syndrome,* Neihart (2000) investigated cognitive and behavioral similarities seen in the profile of gifted children, which hinder the identification of AS. Neihart attributed the difficulty in identifying AS symptoms in gifted children to their unusual behavior. These children's unusual behavior is believed to be an underlying symptom of either their special skills or learning difficulties (Neihart, 2000).

It is important to parents to observe their children's atypical development as early as the first difficulties arise. Identifying whether the cause of their unusual behavior is due to giftedness, AS, or a combination of both is imperative. The earlier gifted children are identified with AS, the sooner they will receive an appropriate education plan (Neihart, 2000). Neihart proposed that ordinary gifted children should be differentiated from gifted children with AS in speech patterns, response to routine, awareness of differences, disturbance of attention, humor, motor clumsiness, inappropriate affect, insight, and stereotypy. Although this list may be helpful, Neihart observed that these aspects were pulled from the shared literature and clinical experience. These aspects should be tested in a controlled group (Neihart, 2000).

Identifying AS in gifted children may not be an easy task. Therefore, the cooperation of parents with an interdisciplinary, experienced team of professionals is necessary. Parents are responsible for providing information about the child's developmental history. Similarly, specialists are responsible for investigating the motivation of the child's unusual behaviors,

conducting formal testing, observing the child's social reciprocity in a variety of situations, including his pragmatic use of language (Neihart, 2000).

II. Previous Research

Bennett & Heaton (2012) developed a screening questionnaire for talent in ASD (SCQ). Their aim was to investigate cognitive and behavioral traits associated with giftedness in ASD. During the development of the SCQ, the authors draw factors related to talent in ASD largely discussed in literature (Cf. section 4.2.3 and appendix 2). They conducted two studies, which envisaged the reliability of the SCQ. First, they conducted an ascertainment study, which tested 125 individuals with AS, ASD, and PDD. These individuals were divided into groups according to individuals' age (3-20 years). Forty-two percent of Bennett & Heaton's cohort was identified as gifted. They differed from the non-gifted individuals because of their higher memory skills, tendency to become absorbed by topics of interest, and special interests (2012).

A case study tested the validity of the ascertainment study results. Three boys ages 10 and 11 had their profile screened for special skills. They had talent for music, arts, and math within the context of AD, ASD, and AS, respectively. Results were congruent with the ascertainment study. Bennett & Heaton observed that skilled individuals tended to become absorbed by topics of interest and have enhanced attention. The results of both studies failed to suggest increased local processing in talented individuals. In sum, results of both studies suggested that distinctive traits of talented individuals within the ASD are centered on their exceptional memory and intense interest (2012).

Bennett & Heaton (2012) result analysis was problematic, for they did not take into account in their analysis any behavioral or cognitive aspects specific to each group of participants (ASD, PDD (nos), and AS). In addition, their project did not provide a complete analysis of the cognitive and behavioral profile of gifted individuals. In their case study, each of the three skilled children were identified with different disorders (autism, AS, and ASD) and different talents (music, math, and arts). Each of these disorders and exceptional skills affect individuals in different aspects. I suggest that future studies should compare these individuals (1) to talented and non-talented individuals who have the same developmental condition and (2) to talented individuals who have the same skills.

4.2.2. Design

I. Participants and Material

AN was 5 years and 7 months old at the time of the SCQ completion. His parents answered the SQC for talent in ASD. The SCQ is of scientific relevance, for it investigates factors related to talent in ASD highlighted in research literature, such as local bias, memory skills, obsessional behavior/repetitive interests, and sensory abnormality (Bennett & Heaton, 2012). Bennett & Heaton's SCQ is a valid tool for assessing distinctive traits in the profile of talent children with ASD. Respondents were welcomed to write notes of characteristics specific to their child. The SCQ controls for respondents' over or underestimation of their children's abilities by asking whether people outside the family unit have ever noticed children's special skills.

II. Method and Experimental Design

The SCQ for special skills in ASD contains two sections: (1) a profiling section and (2) special skills section. The profiling section contains forty-two items. These items were divided into five factors related to general aspects of ASD well discussed in the literature. These five factors are related to children's (1) socialization and communication, (2) repetitive behavior and unusual interests, (3) sensory sensitivity, (4) obsession and special interests, and (5) memory (cf. section 4.2.3).

Six of the forty-two items did not correspond to any of these five factors above-mentioned (2, 10, 17, 20, 21, and 35). Five of these items were used as filling to conceal the research objective from the respondents. Item 17, which probed a local processing bias, was kept in the final analysis on theoretical grounds. Local processing bias is typically related to exceptional skills in ASD (cf. section 3.1). This item investigated children's abilities to focus on details, i.e. tendency to become interested in parts of objects rather than in the whole object. It is genetically underlined and presents an advantage for language talented individuals (Vulchanova et al., 2012a).

In order to further investigate AN's special skills and interests that stand out in his profile, his parents were asked to answer nine open questions. They also had to rate their level of agreement to these questions according to the 7-point Likert scale and provide details. A distinctive aspect of this questionnaire is that it considers non-family members' awareness of the child's skills.

For the validity of the results, some of the questions were written in reverse order, in relation to what was actually sought (Cf. appendix 2). In addition, the profiling items were randomized in both parts of the questionnaire for psychometric validity. In addition, all items were adjusted to a 7-point Likert scale, where 1 means strong disagreement, 4 is neutral, and 7 means strong agreement. Items, in which respondents' answers were in the middle of the scale, were considered a sign that the respondents were not sure about the child's behavior. To a certain extent, it does not present a major problem for a general description of distinctive traits between ASD individuals with and without exceptional talent. However, I will draw comments on these neutral answers when I consider necessary.

Bennett & Heaton (2012) considered ASD individuals as talented those whose respondents agreed or strongly agreed that their child possess one or more skills. Results from their study revealed that significant differences among skilled and non-skilled participants with ASD were related to (1) obsessions and special interest and (2) memory factors. The authors included in their analysis comments about item 17 although it did not show significant difference in their participants' profile.

4.2.3. Analysis of Results

The analysis of results is composed of two parts, (I) the profiling section and (II) the special skills section.

I. Profiling Section

Socio-Communicative abilities

This factor consisted of nine items (4, 9, 14, 19, 24, 27, 29, 34, and 39) regarding individual's perception of feelings of others, ability to interact with others or be alone, responsiveness to others initiations, communication with others, and imaginative/creative skills.

Repetitive Behavior and Unusual Interests

This factor was composed of three items (7, 30, and 37), which focus on change in his routine, ordering objects, rituals, mannerisms, and obsessions.

Sensory Sensitivity

Consisting of eight items (1, 6, 11, 16, 26, 31, 36, and 41), this section observed individuals reaction (hyper- and hypo- sensitivity) to diverse sensory stimuli.

Obsession and Special Interests

This factor observed six items (5, 12, 22, 25, 30, and 32) related to age appropriateness, unusualness, degree of intensity and preoccupation identified to a special interest. Bennett & Heaton (2012) suggested that "Skilled individuals do not show increased levels of rigidity (item 12), obsessional behavior (item 32), or ritualistic behavior (item 22) (indeed these items were non-significant), but they do tend become absorbed in topics that capture their interest (item 25)" (n.p.). This is a very important result, which I will discuss in this study.

Memory

The memory factor consisted of eight items (3, 8, 13, 18, 23, 28, 33, and 38) related to individuals' memory for facts, dates, places, autobiographical events, general information, things that have happened to others, and general memory skills. In Bennett and Heaton's study, skilled individuals were distinguished from their peers because they were better at remembering dates (item 28), facts (item 3), and things that interest them (item 8). They also demonstrated having exceptional memory overall (item 23) (2012).

II. Special Skill Section

The special skills section analyzes nine structured and open questions about the children's outstanding abilities in contrast to their overall cognitive profile. Respondents were invited to write comments about the child's behavior whenever they considered relevant.

4.2.4. Summary of Results & Discussion

I. Profiling Section Results

The aim of this study is to provide an overview of the profile of a talented child with AS. For the purpose of this project, I will also analyze the results of all the five profiling factors tested in AN's parental report. However, I will discuss thoroughly the two factors, which revealed significant differences between skilled and non-skilled individuals with AS, namely, obsessions and special skills, and memory. Most importantly, item 17 (local bias) will also be considered in the analysis of AN's profile, for it has long been reported to play an important role in language talented individuals (Vulchanova et al., 2012a).

Socio-Communicative Deficits

This factor contained nine items focusing on the participant's socio-communicative skills to interact with his peers. The results confirmed the expectations: AN does not like to interact with other children of his age (item 9). He is not responsive when other children try to interact with him (items 19). He does not start interacting with his peers (item 34). According to his parents, AN does not seem to comprehend his peers' thoughts and feelings (item 4). Our participant prefers to play on his own rather than with other children (item 24). The participant is not sensitive to the feelings of his peers (item 39). His parents could not agree nor disagree on how well or badly AN is at expressing his own feelings (item 14); equally, they could not judge whether AN engages in imaginative activities and talk to his peers (items 27 and 29). These last data were not considered in the analysis of the results.

Repetitive Behavior and Unusual Interests

This section contained three items related to participants' behavior and interests. The respondents could not answer whether AN has mannerisms (item 7). In addition, they disagreed that their child has any type of mannerisms like making complex movements with his body (item 37) (datum not relevant for the analysis of results). More importantly, the respondents strongly agreed that AN has special interests, which seem unusual to other people (item 30).

Sensory Sensitivity

This factor was composed of eight items, which seven of them were about the participant's over or under sensory sensitiveness (auditory, olfactory, tactile, and visual). I do not have any results of AN's sensory sensitivity because the respondents' answers were in the middle of the scale to every item. Such type of answers is not informative; they are actually a safe choice for when the respondents are not sure of what was asked or whether the AS child presents such characteristics. To the extent that sensory sensitivity is not relevant to language talent, there is no need to investigate this further.

Bennett & Heaton (2012) found in their study that obsessions and special interests factors, and memory factors distinguished skilled and non-skilled individuals with ASD. Additionally, they noticed that the item linked to the local information processing bias did not distinguish these two groups of individuals. This finding is not consistent with the WCC hypothesis. It is been discussed in literature, the local processing bias does influence on the development of special skills in autistic individuals (Happé & Frith, 2006). The remaining

two factors associated with ASD behavioral and cognitive phenotype and item 17 - local processing bias, will be analyzed in detail. AN's performance in the above mentioned factors are in line with the research done by Bennett & Heaton (2012), as I discuss them below.

Memory

This profiling section contained eight items focusing on the participant's memory skills. His parents agreed or strongly agreed with six out of eight items. AN seems to have exceptional memory skills because he is good at remembering any kind of information, especially those that interest him such as dates and places he visited (items 3, 8, 18, 23, 28, and 33). It is important to note that he is not good at recalling things that happened to other people (item 13); this fact also reinforces his deficit in social skills. Last of all, the fact that he is not good at remembering things that happened to him intrigues me (cf. question 38). Could it be related to his deficit in socialization? Could he remember things that happened to him if they were of interest to him?

Obsessions and Special Interests

This section contained five items. The respondents strongly agreed that AN has special interests within a wide range of topics (item 5). Other people considered these interests unusual in intensity (items 25 and 30). For instance, his parents strongly agreed that AN has at least one special interest with which he is constantly preoccupied (item 15). He does not have any rituals that he makes his parents go through (item 22). The participant's parents were unsure whether AN objects to change his routine or not (item 12) (datum discarded from the analysis). When AN visited our department to participate in our first meeting, he immediately asked for chalk in order to write on the blackboard. During the WISC test, AN lost interest in it several times, for the activities were not related to alphabets. He constantly asked when he could either to start reading or writing on the blackboard again.

In their analysis of the distinction between talented and non-talented individuals with ASD, Bennett & Heaton (2012) found that skilled individuals did not show increased levels of rigidity, ritualistic behavior, and obsessional behavior. Therefore, they did not consider these aspects significant for the distinction between these individuals. Since they highlighted these aspects in their result analysis, I decided to compare this information to the information provided by the respondents of the present case study. First, I had to leave out consideration item 12 because his parents could neither agree nor disagree that their child objects in changing his routine; secondly, they disagreed that AN has ritualistic behavior; and lastly, this

boy showed some signs of obsessional behavior just like the three boys in the validation study did (Bennett & Heaton, 2012). In essence, these items are not as significant for identification of skilled individuals as item 25 is. Therefore, AN's test results are in line with the ascertainment and validation study conducted by Bennett & Heaton (2012).

Finally, item 5 investigated the child's interest in a large range of topics. The respondents agreed that AN is curious about topics other than letters. In fact, his parents said he is also good at music and tones, drawing explanations, and computer skills. This answer validates the hypothesis that talented individuals with ASD have a tendency to become absorbed in topics of their interest rather than being obsessed with it.

Local Processing Bias

AN's parents could not decide whether their child is interested in parts of objects rather than the whole object. Even though this result is congruent with Bennett & Heaton (2012) research, AN's ability to process information in a local bias needs to be checked in more details; this result is inconsistent with the WCC hypothesis. Research in AS and language skilled individuals has largely proved that local processing bias plays an important role on the profile of these individuals (Vulchanova et al., 2012a). It is, therefore, necessary to test this individual local bias more accurately rather than rely only on parental report. Hypothetically, AN's interest in writing letters rather than words and sentences is a sign of processing language in a local fashion. The easy AN learns complex alphabets might be due to his ability to pay great attention to letter detail.

As it has been widely suggested in literature of AS, this population has an illegible handwriting (Henderson and Green, web). Henderson and Green (web) suggested that teachers and parents should encourage AS individuals to use typewriters and computers instead of using paper and pencil. Despite the fact that AN is also interested in using computers in order to learn alphabets, his handwriting is excellent, especially in relation to children of the same age. His beautiful scripts might be due to intense practice and time engaged in related activity whenever there is no computer available (cf. appendix 2).

II. Special Skills Section Results

The results of the special skills section were striking: this seven-year-old boy has shown outstanding skills since he was two and half years old. AN is exceptionally good at letters and languages. He is also good at music and tones, drawing explanations, and computer skills. For example, this child has been using computers all by himself since the age of three without receiving formal training. However, the fact that his father has a BSc in IT might have initially influenced on AN's ability to use computers and search on the Internet.

Furthermore, this child has an outstanding interest in letters. The most compelling evidence is that he has been learning alphabets on his own by watching YouTube tutorials and has learned at least ten different alphabets (Cf. section 1.3). Although AN spends a great part of his time engaged in activities related to his special interest, his parents do not consider that it could possibly affect his development in other areas. The N. family suggested that their child's intense interest in letters might have been influenced by multilingual environment where he lives. There is no one in their family who has similar skills.

Evidence supporting that AN has exceptional skills come from parental reports about his overall behavior. AN wrote and read in a variety of alphabets on his own initiative while going through a long mute period. AN started speaking again at about two and half years ago. His speech is still very premature (cf. section 1.3). Even though no one has tested his language skills yet, everyone around him can notice his great interest in it. AN's family supported this evidence by recording videos and taking pictures of their son while he was engaged in activities related to alphabets.

The SCQ was important for identifying AN as a talented child. Consequently, the subsequent component of this project can take place. Bearing in mind that AN has shown interest in learning alphabets, it is therefore necessary to further study his language skills. The prediction of this study is that there is a discrepancy between this child outstanding ability for decoding letters in relation to his ability to comprehend languages. In other words, I suggest that AN has a good phonological awareness and a deficit in communication skills. This prediction is in line with (2009) work in hyperlexic children. In order to check AN's communicative skills, the CCC-2 (Bishop, 2003) questionnaire also based on parental report will be applied.

4.3. The Children's Communication Checklist - 2 (Bishop, 2003)

4.3.1. Rationale of the Conducted Study

The aim of using the CCC-2 was to investigate AN's communication skills. In essence, this study investigates his strengths and weaknesses in language. Earlier studies (Norbury & Bishop, 2002; Bishop, 2003, 2010; Norbury et al, 2010) have shown that children with similar profiles usually present language and communication problems, such as SLI and PLI. These studies support the hypothesis of language modularity and dissociation within language modules.

I. Background Information

Bishop (2003) devised the CCC-2 based on her initial idea of creating a tool for assessing qualitative aspects of children's communicative impairments. Bishop developed two editions of the Checklist for Language Impaired Children (CLIC) and one edition of the CCC until she got to the latest version named CCC-2. In order to understand how the CCC-2 works, I will provide a short explanation of problems found in earlier checklists for communication impairments devised by Bishop (2003).

The first of the communication checklists was the CLIC - first edition. Its results were considered rather unsatisfactory, for its five multiple-choice format did not quite apply to the participants' behavior (Bishop, 2003). Therefore, the second edition of the CLIC was devised as an attempt to acquire results that would be more accurate. However, the data retrieved from a large-scale sample did not correspond with the researchers' expectation of identifying subgroups of children with language impairments (LI). The CLIC 2 data suggested that a large number of children had a combination of pragmatic and structural LI. Similarly, items investigating children's semantic skills did not identify subgroups of children with LI; these items suggested that deficits in semantic aspects of language are common among children with LI (2003).

In 1998, Bishop devised the first edition of the CCC. Having its core concepts based on the CLIC-2, Bishop's idea was to develop a checklist, which not only could generate reliable results, but could also identify subtypes of LI in children with psychiatric disorders (Bishop, 2003). The first edition of the CCC was considered reliable for probing s in a wide age range and broader clinical context. In addition, it was regarded as effective in screening communication problems and identifying pragmatic difficulties. Nevertheless, the CCC rating method ("definitely applies," "applies somewhat," and "does not apply") was deemed subjective and its double negative statements were reported as difficult to cope with. The

above reported problems led to the development of the CCC-2. The CCC-2 is still subject of investigation in order to prove its reliability. Many studies have been conducted in order to support its validity in screening children at risk of communicative difficulties who should be referred to further investigation (Bishop, 2003; Bishop et al., 2006; Norbury et al., 2004; Tager-Flusberg & Joseph, 2003).

II. Previous research

Since the development of the CLIC and its successors CLIC 2, CCC, and CCC 2, many studies have been conducted in order to further investigate and better identify children at risk of LD and etiological overlaps with ASD (Bishop, 2003; Bishop et al., 2006; Norbury et al., 2004; Tager-Flusberg & Joseph, 2003). As means to further investigate AN's linguistic profile and identify to which LD he is at risk, an overview of Bishop validation study will be provided below.

Bishop (2003) conducted the standardization study, which aimed to derive the CCC-2 norms and test its reliability. She gathered data from a large number of respondents. The selection criteria chosen by Bishop followed the traditional assumption within child psychiatry, which claims that "one needs to combine information from several informants; to get a realistic picture of a child's functioning" (p. 36). Therefore, Bishop collected data from the parents of children at risk of LD and ASD living in the UK and Australia. The results indicated that the Australian sample scaled scores fell one point below in comparison to the UK sample, but both groups had similar performance on the social interaction deviance composite (SIDC) and on the general communication composite (GCC). The above-mentioned findings suggested the need of using different cutoff points for each cultural setting in consideration.

Bishop (2003) tested the CCC-2 reliability according to its internal consistency and inter-rater agreement. In order to verify the checklist reliability, Bishop investigated whether respondents' ratings for all items within each scale were coherent. Subsequently, inter-rater agreement was assessed. Both parents and language therapists completed the CCC-2. Interestingly, inter-rater agreement was quite low within the pragmatic scales and relatively high in structural aspects of language. The author suggested two points that favor the reliability of the CCC-2 despite low inter-rater agreement. First, the scaled scores found in the pragmatic items related coherently to the child's diagnostic groups (Bishop, 2003; Bishop & Baird, 2001). Second, both raters were able to distinguish children's communicative features characteristic of ASD from those of SLI (Bishop, 2003).

Bishop (2003) conducted a validation study, which aimed to compare the performance of three clinical groups of children at risk of communicative problems with and without ASD features (PLI, SLI, PLI+, HFA, AS) in relation to their TD peers. Results from the validation study suggested the GCC and SIDC were sensitive to identifying the general group of LI. However, these composites were not as sensitive for the purpose of identifying specific subgroups of LI due to the high percentage of overlapping conditions within the same individual. Significant differences between s with and without ASD features were found on the SIDC (p. 41). Furthermore, the AS group achieved relatively high scores on the GCC, but they performed poorly on the SIDC. They had disproportionately good structural language in relation to their pragmatic functioning (43). Finally, Bishop (2003) concluded that the CCC-2 is a useful instrument for screening the uneven communication profile of children at risk of communication disorders as well as that it is sensitive to ASD. These children should be referred to further assessment of their language skills.

III. Importance and Prediction

Due to the rare occurrence of cases of AS and hyperlexia, this study is important for understanding the development of atypical language. The further this investigation progressed, the more evidence was found supporting the hypothesis of the existence of dissociation within language modules. On the basis to the literature review and findings from earlier research on comorbid conditions, this study's expectations on the tests results were to find a more complex profile. It was expected to find the co-occurrence of AS and LD in AN profile. AN has an apparent deficit in oral communication, which prevented him from understanding oral and written instructions during the WISC session. For this reason, it was not possible to measure his IQ.

Bishop et al. (2006) highlighted a lack of clinical instruments suitable for assessing pragmatic aspects of communication. Norbury & Bishop (2002; Norbury, 2012) advised that children's communicative skills should be observed in natural settings. Therefore, parents and caregivers should rate their pupil's communication in everyday contexts.

4.3.2. Design

I. Participants

AN was 6 years and 3 months old when the CCC-2 was completed. At that time, AN exhibited signs of communication difficulties. AN has a rather unusual and complex linguistic profile due to his rare developmental condition. He has an apparent deficit in understanding oral communication despite his talent for learning languages, mainly decoding sounds from letters.

Observation of AN's behavior and parental reports provided evidence of communicative deficits. Despite AN's intense interest in learning alphabets, he does not communicate as expected for a child in his age. His parents reported that AN has been having problems in communicating well since very young. For instance, he passed through a long mute period, which started when he was two years old and lasted until he was 4 to 5 years old (cf. section 1.3). In addition, AN and his family have spent extended periods abroad visiting relatives in Indonesia. For instance, AN preferred to communicate in Norwegian before his last trip to Indonesia, which lasted for three months approximately. After his return to Norway, he preferred to communicate in Indonesian. Apparently, the multi-linguistic environment where he lives may have a negative effect in his language development even though it may also be the source of his intense interest in alphabets. More research is necessary on the effect of bilingualism on AN's language abilities.

II. Material

In order to screen AN's communication skills, the CCC-2 (Bishop, 2003) was used. The CCC-2 was chosen because it is a reliable tool for screening for communication disorders and deficits in pragmatics and social interaction (Norbury et al., 2004). This checklist set contains one parental checklist, scoring overlays, a summary sheet, and the scoring manual. The total time to complete the checklist and scoring by hand varies from 5 to 15 minutes each of them.

III. Method

The CCC-2 was designed for screening individuals between 4 and 16 years old, who are able to produce utterances and come from English-speaking homes (Bishop, 2003). The CCC-2 consists of 70 statements, which seek to investigate the occurrence of certain aspects of communication by asking questions about their frequency. Each of these aspects is assessed under 10 scales: speech, syntax, semantics, coherence, inappropriate initiation,

scripted language, use of conversational context, nonverbal communication, social relations, and interests. Each scale was composed of seven items. These items were randomized and divided into two sets: weaknesses (5 statements) and strengths (2 statements). Respondents must grade each statement according to the frequency of occurrence of such behavior. This frequency ranges from 0 to 3 in which 0 means less than once a week or never; 1 means at least once a week, but not every day; 2 means once or twice a day; finally, 3 means several times (more than twice) a day (or always) (Bishop: 2003, 26).

The final scores were also analyzed in a composite of the sum of the communication scales (A-H), called GCC, the sum of the social skills scales (I and J), and the sum of scales E, H, I, J minus the sum of scales A-D, called the SIDC. The first of these composites, the GCC, distinguishes children with clinical diagnosis from typical developing children. Similarly, the SIDC discriminates children with SLI from those with PLI. In order to explain better how the CCC-2 works, a full analysis of AN's checklist result will be provided.

IV. Experimental Design

The CCC-2 is composed of ten scales with seven items each. Two of these seven items checked s' communicative strengths and the other five of them investigated children's communicative difficulties. All of the items checking individuals' communicative difficulties were grouped in the first section of the checklist while all of the strengths items were grouped in the last section of the checklist. Each of these sections had an introductory statement identifying these items and explaining the procedures to the respondents. The CCC-2 contains a GCC and a SIDC. The GCC helps in distinguishing children with communication problems from those of typical development (TD). The SIDC, more specifically, helps to identify children at risk of SLI from those presenting pragmatic difficulties. Last of all, the CCC-2 identifies children at risk of ASD who should be referred to further investigation (Bishop, 2003).

In order to be eligible to participate in this test, the participant must be between 4 and 16 years old, not have hearing loss, not be handicapped, or have had any chronic illness (Bishop, 2003). In addition, the child must be able to produce utterances, and English is supposed to be the only language spoken at home (2003). Although AN lives in a multilingual environment, English is the main language spoken at his home. The research team judged the CCC-2 respondents to have a good command of English. Therefore, they could interpret the checklist items according to AN's Norwegian skills, which is his preferred and most used language to communicate. Bishop (2003) and Norbury et al. (2004) recommended the

combination of the CCC-2 results with other data. In this respect, the participant's family provided us the formal diagnosis of their child and other important information prior to the beginning of this study.

This particular study was based on a detailed interview with AN's parents and observation of AN's behavior and communicative abilities. First, respondents were asked to answer the CCC-2. Then, the research team revised the respondents' answers based on their observation of the participant linguistic behavior. Their goal was to reduce the risk of parents' subjectiveness (cf. Bishop, 2003). The results of the test represent a compilation of the respondents' answers and the research committee's observation of AN's behavior. The research team could revise the respondents' answers to the CCC-2 and change the score value whenever they considered the respondents' answers to over or underestimate AN's linguistic skills. Thus, Bishop (2003) supported this experimental design; she recommended the CCC-2 (1) to be filled by an independent rater who knows the child for more than three months and has frequent contact with the child, and (2) to rely on informal observation of the child in order to support the information and supplement the parental report (2003).

4.3.3. Analysis of Results

The scores were analyzed by hand twice in order to assure its correctness. The CCC-2 worksheet, the summary sheet, and the scoring manual (Bishop, 2003) were used as a guides. The first step in analyzing the scores was pairing up the positive items (51-70) according to the scale to which they belong. Subsequently, the scoring numbers of the negative statements were reversed[5] and had their values added up to the scores of the positive statements. Next, 3 points were subtracted from the total of each scale with missing data. Then, 6 points were subtracted from the total of each scale. Lastly, the positive sum of all scales was added up.

The negative items were analyzed slightly differently. They were first grouped according to the scales to which they belonged. Each scale was composed of five negative items. Secondly, these items had their scores added up. Then, the total of all negative scales was recorded. Since the negative sum of AN's checklist was less than 30, no further procedure was needed. Missing data were then annotated. Finally, the negative and the positive sum for all scales were added up, and the sum of each scale with missing items was pro-rated (multiplied by 7/6). With the help of the manual, the scaled scores were derived from the sum of the negative and positive scales, and the percentile ranks were derived from each of the corresponding scaled scores. In order to obtain the GCC sum, the total scaled

[5] Positive items reverse values: 0 = 3, 1 = 2, 2 = 1, 3 = 0.

score for scales A to H were added, and its percentile was derived from this total. Last of all, the SIDC value was derived from the total sum of scaled scores from scales E, H, I, J subtracted by the sum of scales A to D.

Once I had filled in the summary sheet, I could interpret the results as follows; first, scales with percentile at or above 15th percentile were considered within the normal limits. Second, scores at about 10th percentile were considered cause of concern if they were seen in more than three scales. Third, scores as low as the fifth percentile in two or more scales was considered an indication of communication problems of clinical significance. Next, GCC below 55 was taken as an indication of SLI or autism, especially when coupled with scores below sixth percentile in scales I and J. Then, the SIDC could only be interpreted in cases of GCC below 55. Cases of children with SIDC below zero were considered to be at risk of having PLI, autism, or AS. Finally, three items were deleted from the checklist due to the fact that respondents did not answer the item and researchers were unable to draw a conclusion, for they have not had the opportunity to observe the child in other environments (at school, i.e.). Thus, missing data were discarded from the analysis.

The results of the CCC-2 were used in the analysis of areas of concern of AN's communication skills, such as phonology, pragmatics, and behaviors commonly impaired in children within the autistic spectrum. In essence, these aspects were analyzed based on four criteria: (1) Scaled scores, which investigated the participant's performance in every scale; (2) GCC, which compares children's performance in the same age group, and assists in the identification of communication problems; (3) SIDC, which helped with the identification of language impairments; and (4) the percentile ranks, which compared children in the same age performance.

Judging from the current results, AN's case is extremely rare. Not only is he a hyperlexic child with AS, but he also has communicative problems and lives in a bilingual environment. Therefore, it is difficult to find tests, which suit the investigation of his profile. For this reason, we opted for using the CCC-2 by compiling parents' responses and researchers' observations after a detailed interview with parents. Thus, it was possible to reinterpret the CCC-2 statements in order to best screen his communicative profile. Although the CCC-2 was originally designed for testing children from English-speaking home with no bilingual background, it apparently did not cause any problems in studying AN's case. Further research on the impact of bilingualism/multilingualism in individuals with developmental disorders is, therefore, necessary.

4.3.4. Summary of Results and Discussion

AN's performance in the CCC-2 was very uneven as was predicted (fig. 1). According to Bishop's (2003), the cutoff point of fifteenth percentile is the minimum for a child to be considered within the normal limits. AN, however, scored above this threshold only on the speech scale, which he achieved thirtieth percentile. This scale analyzed phonological aspects of language. For example, simplifying or leaving out sounds or parts of words. Speech / phonological awareness is a common linguistic characteristic shared by those with AS and hyperlexia (Saldaña et al., 2009). Speech is clearly AN's linguistic strength, for he is very much interested in letters and sounds. As it has already been mentioned, AN taught himself how to read, write, and pronounce the alphabet of more than ten languages. AN's high score on the speech scale confirms his giftedness as suggested by the results of Bennett & Heaton's (2012) screening questionnaire.

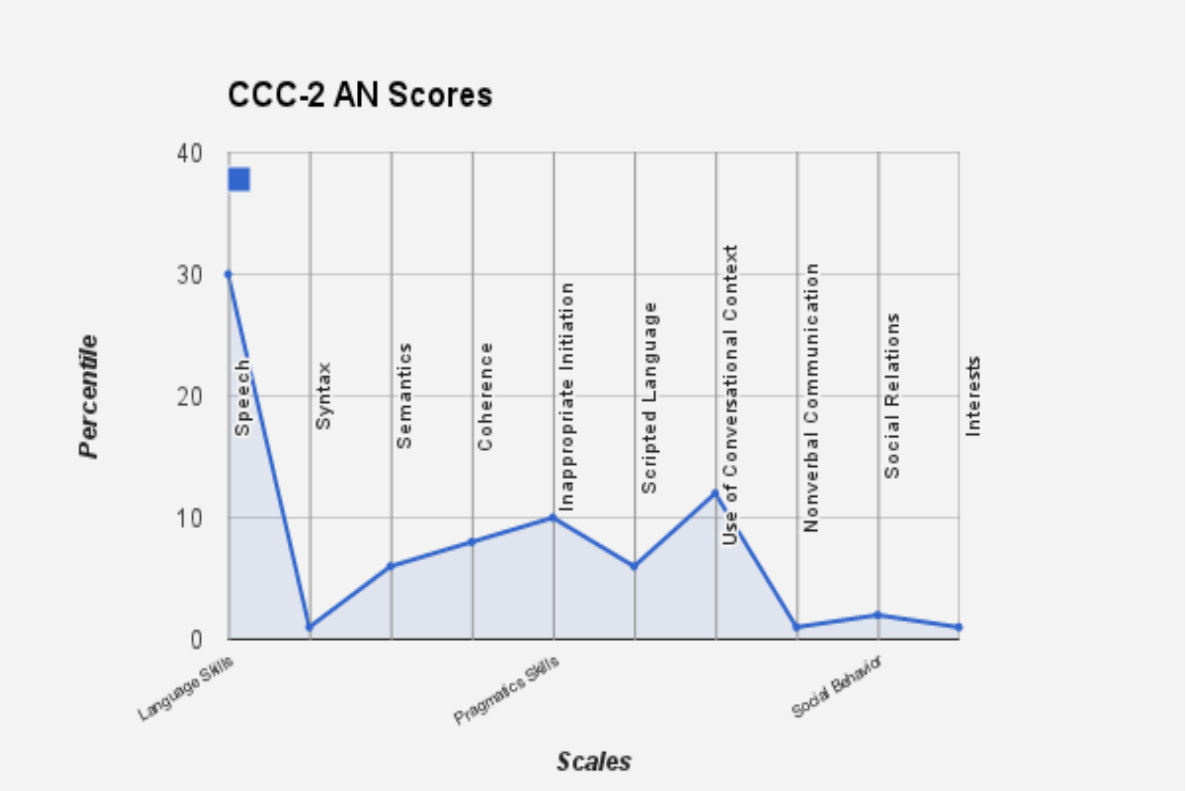


Figure 1: Line chart showing distributions of the number of percentile scored in each scale by AN (75 months).

The scales with percentile scores at or above 15th percentile were considered within the normal limits. Scores at about the 10th percentile were considered a cause of concern if they were seen in more than three scales, and scores as low as the 5th percentile in two or more scales were considered an indication of communication problems of clinical significance. Pursuing the analysis of the performance in the CCC-2, AN's scores in five

scales were below the threshold of the tenth percentile (roughly within a scaled score of five). This is to say, coherence (8% ile), inappropriate initiation (10% ile), and conversational context (12%), semantics and scripted language (6% ile ~ 5 scaled score each). In the CCC-2 manual (Bishop, 2003), Bishop suggested the need of further investigation when three or more scale presents scores this low, for this child may be of communication deficits (fig. 1).

The fifth percentile is the lowest of the cutoff points, which when present in two or more scales is indicative of communication problems of clinical significance (p. 20). Not surprisingly, AN scored below the fifth percentile in syntax, nonverbal communication and interests (1% ile each) and social relation (2% ile) scales. Scores below the fifth percentile in nonverbal communication, interests, and social relation are indicative of a child being at risk of ASD. This evidence is in accordance with AN's diagnosis of AS.

The GCC score is the sum of the scaled scores of scales A to H. This composite assists in the assessment of children with communication problem. Bishop's study (2003) suggested that any GCC score below 55 is evidence of SLI or autism, AN's score was 43. Since he has already been diagnosed with AS, this is indicative of him being at risk of having SLI. Moreover, AN's GCC percentile rank was the third percentile, and any percentile rank at or below the third percentile in the GCC supports the evidence of severe communication problems. This result reinforces the evidence that AN is at risk of having SLI. Furthermore, Bishop (2003) claimed that children at risk of having ASD score below the sixtieth percentile in scales I and J in combination with a GCC below 55. As mentioned above, AN's GCC was 43<55 and 1 and 2 percentile in scales J and I, respectively. This composite score confirms AN's condition as an Asperger's child.

Pursuing this investigation, the analysis of the SIDC was necessary, for AN's GCC was below 55. As mentioned before, the SIDC is the total sum of scaled scores of scales E, H, I, J subtracted by the total sum of scaled scores of scales A to D. The SIDC has an important role in sub-grouping children with communication impairments, i.e. those with SLI from the other clinical groups (Bishop, 2003). AN's SIDC score was -4. Bishop (2003) claimed that SIDC scores below zero is an indication of PLI and AS. This result confirms his former AS diagnostic and suggests the need of further investigate his pragmatic skills.

Last of all, three items were excluded from the checklist:

13. Is babied, teased, or bullied by other children

28. Ability to communicate varies from situation to situation: e.g. may cope well when talking one-to-one with a familiar adult, but have difficulties expressing him/her in a group of children.

64. Uses abstract words that refer to general concepts rather than something you can see e.g. “knowledge,” “politics,” “courage” (Bishop, 2003).

Both respondents and the research team decided on excluding these items, for not being able to judge them relevant or observing them as part of AN’s behavior.

AN’s performance on the CCC-2 confirmed the prediction of this study. AN displays severe language difficulties. The CCC-2 was good at identifying AN’s communicative difficulties, but it was not as good at distinguishing to which LD AN is at risk. The CCC-2 results suggested the overlap of many developmental conditions, such as AS, PLI, and SLI. The diagnostic criteria of each of these conditions exclude symptoms of other conditions (cf. chapter 2). Therefore, AN should be referred to further assessment of his language skills and difficulties.

Chapter 5- Final Discussion

This study investigated distinctive cognitive and behavioral features associated with AS, specifically, how these features supported language talent in these individuals. This study also hypothesized that language disorders would be an underlying feature of hyperlexia (cf. section 2.2). Likewise, the overlap of conditions would hamper the identification of distinctive disorders (cf. chapter 2). In order to verify the validity of these predictions AN's profile was comprehensively assessed.

This case study began by investigating AN's cognitive and behavioral features, which underpin his language talent. Results of the SCQ for talent within ASD were in line with Bennett & Heaton's study (2012). AN's exceptional memory and tendency to become absorbed by topics of his interest confirmed his language talent. In addition, his interest solely for alphabets suggests that he processes language in a local bias (cf. figure 1), although his parents' answer to the item related to local processing bias was negative (cf. item 17). The local processing bias is a typical cognitive style associated with language talent within ASD; therefore, it was considered in the analysis of results on theoretical grounds (cf. section 3.1).

After having identified AN's outstanding skills for language, this study went further in investigating his communicative abilities related to his hyperlexic profile. A compilation of his parents' and the research team's answer to the CCC-2 demonstrated that AN has an uneven linguistic and cognitive profile. His performance in the scales checking his social-behavior confirmed his already known AS condition. AN's performance in the language and pragmatic scales revealed my prediction that his linguistic profile was very uneven. On the one hand, his language strengths were at the level of phonology (speech). On the other hand, his language troughs were clear at the level of syntax, although he performed below the average in semantic, coherence, and within the pragmatic scales (cf. figure 1). His excellent performance in the speech scale in combination with his poor performance in the other language scales confirmed the evidence pointed out above.

Moreover, the CCC-2 results suggested that AN is at risk of both SLI and PLI comorbid with AS. Chapter 2 explained that the chance of PLI and SLI overlap with AS is quite high, although SLI symptoms exclude PLI symptoms, and vice-versa. Although AN's communicative abilities are very poor, his difficulties are more evident in the language scales than in the pragmatic scales. This study predicts that AN's pragmatic difficulties are consequent of poor structural language skills seen in individuals with SLI. This result

suggests that AN is at risk of language disorder; therefore, he should be referred to further investigation.

CCC-2 test results suggested that AN displays deficits in both structural and pragmatic aspects of language. This is such an interesting finding because it is not expected to find language problems other than comprehension in hyperlexic individuals (cf. section 2.2). This is evidence that hyperlexia comorbid with SLI. In this view, deficits in structural aspects of language typical of SLI may lead to problems in pragmatic use of language typical of hyperlexic individuals. This finding is in line with Cohen et al.'s study in which they suggested SLI to be an essential feature of hyperlexia (1997).

AN's uneven linguistic and behavioral profile as seen in the CCC-2 contradicts Fodor's (1983) modularity of the mind account. In this view, language and cognitive abilities evolve independently in the human brain as two distinct functional modules (cf. section 3.2). Earlier studies on hyperlexic individuals with AS have also questioned the validity of this hypothesis (Saldaña et al., 2009; Seymour & Evans, 1992; Vulchanova et al., 2012a, 2012b). These studies suggested subtle dissociations within individuals' language and cognitive abilities. Further research AN's cognitive abilities are important in order to find out what his cognitive strengths and weaknesses are.

The difficulty in explaining AN's language and cognitive profile was due to his young age. AN is still undergoing the early stages of language development. AN underwent a long mute period typical of children with AS, and he has recently started speaking again. His language skills are very immature in comparison to other children of his age (cf. section 1.3). Many of the standardized language tests measure language abilities of older children. In addition, these tests measure children's language competence outside context. Norbury (2012) claimed that the best way to test children's language abilities is by rating their speech in everyday situations. Parental reports have been the preferred method in investigating children's use of language. The use of technological gadgets has also helped parents and speech therapists to rate AS children's language in spontaneous situations, i.e., Google glass[6], video camera, and recorders.

[6] Cf. http://www.ubergizmo.com/2013/10/google-glass-used-by-mom-to-help-her-autistic-son/

Conclusion and Future Research

This study is in line with recent research findings of language in AS. This study results support the WCC hypothesis, according to which language talented children tend to become absorbed by topics of interest and to process linguistic information in a local bias. The result analysis suggested that AN is a language talented child with AS. His passion for alphabets is undeniable. Besides knowing how to write and read in several alphabets, he has even created his own alphabet, which he named "karda."

Another interesting finding regards language abilities of AS individuals. A typical distinctive feature between AS and autism disorder children is that AS children have relatively spared language abilities. Recent studies have demonstrated that AS individuals do present some language difficulties. For this reason, they should be referred to further assessment. AN's performance in the CCC-2 demonstrated a uneven linguistic profile. He has difficulties in both structural and pragmatic aspects of language; however, he displayed linguistic strengths at the level of phonology (cf. figure 1, section 4.3), which confirms his hyperlexic profile. In addition, AN's weakness in formal and pragmatic aspects of language is evidence of AS co-occurring with LD, such as SLI and PLI. Therefore, AN should be referred to further assessment.

In the view of the functional modularity of the brain hypothesis, language is a single module that develops independently of the other cognitive brain functions, as already discussed in section 3.2. Results of the investigation of AN's language profile did support this hypothesis. Despite typical cognitive difficulties seen in children with AS, AN displays subtle dissociations within the language modules. His language strengths are at the level of phonology and his weaknesses are at the level of syntax and pragmatics. These results are in line with Vulchanova et al.'s studies, in which they observed dissociations within the language and cognitive modules (2012 a, b). These authors suggested that AS individuals' performance in certain aspects of language is directly related to their performance in certain cognitive domains.

Future studies should test AN's IQ, and his preference for processing information in a local bias. Then, the investigation should proceed by assessing his knowledge of English, Indonesian, and Norwegian. It will help on the identification of which specific LD he is at risk, and consequently, provide him appropriate therapies in order to support his language development. In addition, it would be possible to correlate his cognitive abilities to his

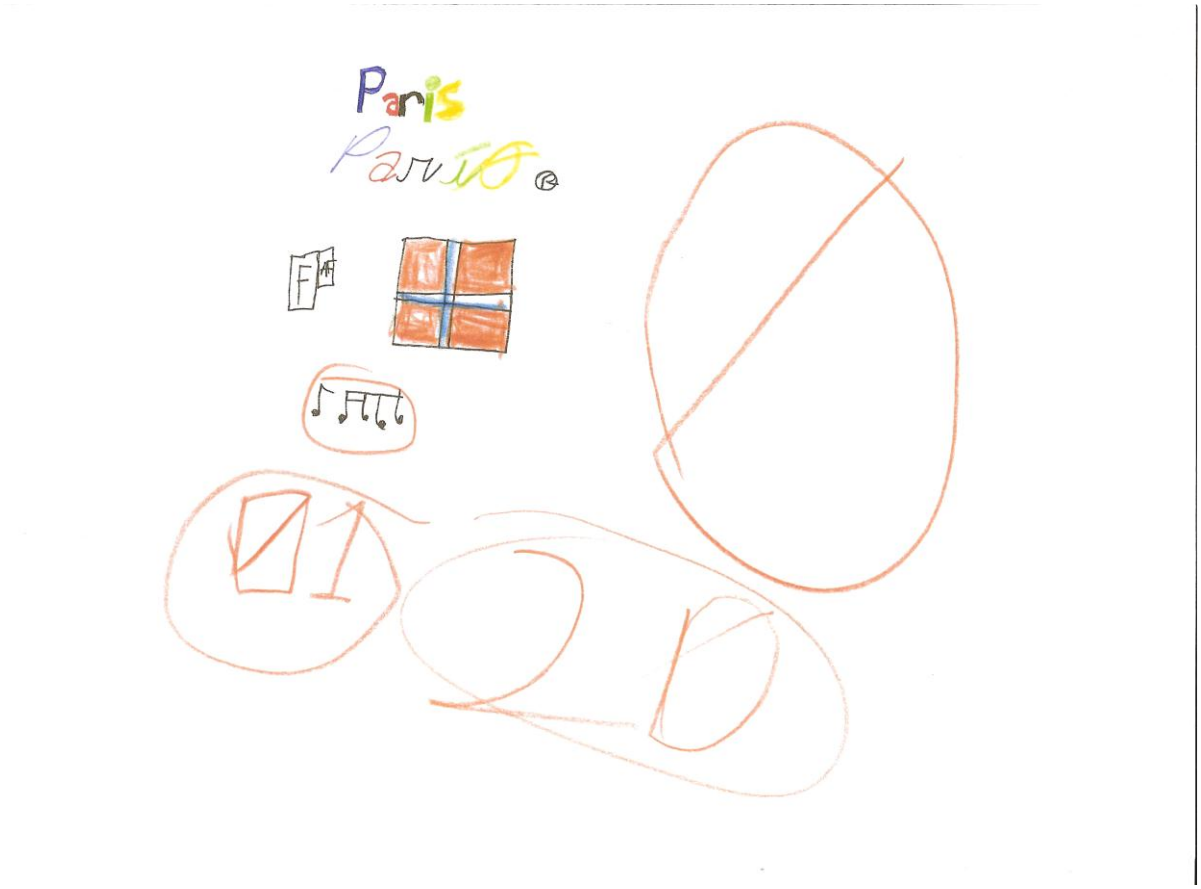
exceptional skills for decoding sounds from letters. Moreover, assessing AN's competence and performance in his first and second language will provide grounds for the investigation of the effects of bilingualism in individuals with AS.

Language talent in individuals with AS is an interesting topic of research. The study of the early stages of atypical language development contributes to the understanding of brain functions related to language. More research needs to be done in order to investigate the underlying causes of atypical language development and AS. Therefore, it will help researchers to develop therapies that would help these individuals to better develop their language and cognitive abilities.

Appendices

Appendix 1

This appendix contains two samples of AN's drawings and handwriting.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Appendix 2

Appendix 2 contains a copy of the screening questionnaire developed by Bennett and Heaton (2012).

J Autism Dev Disord

Appendix: Special Skills in Autism Questionnaire

Thank you for taking the time to complete this questionnaire. Please answer the following questions. Where there are given choices, please circle as appropriate.

- Today's date: _____
- Child's gender: _____
- Child's date of birth and age: _____
- Your relation to the child: Mother/Father/Other. If other, please specify: _____
- Are you the parent/guardian whom spends the most time with the child? YES/NO
- What is your child's formal diagnosis? Autism/Autism spectrum/High functioning autism/Aspergers syndrome/PDD/PDD not otherwise specified/MLD/SLD/developmental delay/other. If other please detail:
- Who diagnosed your child? Clinician/GP/Speech and Language Therapist/other. If other, please detail: _____
- Have any other family members ever been diagnosed with a psychological disorder or disability? YES/NO
- If YES, please specify the family member in relation to your child, their diagnosis, and when their diagnosis was made: _____

Please answer each statement below by putting a circle around the number that best reflects your degree of agreement or disagreement with that statement. There are no right or wrong answers. Rate each item from 1 (strongly disagree) to 7 (strongly agree), where 4 indicates that you neither agree nor disagree.

	SD			N			SA
1. My child is under sensitive to auditory stimuli	1	2	3	4	5	6	7
2. My child has had an object (other than a blanket or soft toy) that he/she has had to carry around with him/her	1	2	3	4	5	6	7
3. My child is good at remembering facts	1	2	3	4	5	6	7
4. My child does not seem able to understand the thoughts and feelings of his/her peers	1	2	3	4	5	6	7
5. My child is interested in a range of topics	1	2	3	4	5	6	7
6. My child is over sensitive to olfactory stimuli	1	2	3	4	5	6	7
7. My child has mannerisms or atypical ways of moving his/her fingers (e.g., flapping, moving fingers in front of eyes)	1	2	3	4	5	6	7
8. My child is good at remembering things that interest him/her	1	2	3	4	5	6	7
9. My child enjoys playing/interacting with his/her peers	1	2	3	4	5	6	7
10. My child has had an intense interest that was appropriate for his/her age and peer group (e.g., trains, dinosaurs)	1	2	3	4	5	6	7
11. My child is over sensitive to visual stimuli	1	2	3	4	5	6	7
12. My child objects to changes in his/her routine	1	2	3	4	5	6	7
13. My child is good at remembering things that happened to other people	1	2	3	4	5	6	7
14. My child is good at expressing his/her own feelings	1	2	3	4	5	6	7
15. My child has a special interest or hobby but he/she is not preoccupied with it	1	2	3	4	5	6	7

Springer

	SD			N			SA
16. My child is over sensitive to auditory stimuli	1	2	3	4	5	6	7
17. My child seems more interested in parts of a toy or object rather than whole objects	1	2	3	4	5	6	7
18. My child is good at remembering any kind of information	1	2	3	4	5	6	7
19. My child is responsive to the initiations of his/her peers to play/interact	1	2	3	4	5	6	7
20. My child has had an interest that occupied a great deal of his/her time	1	2	3	4	5	6	7
21. My child is under sensitive to tactile stimuli	1	2	3	4	5	6	7
22. My child has had rituals that he/she insisted I go through	1	2	3	4	5	6	7
23. My child appears to show exceptional memory	1	2	3	4	5	6	7
24. My child prefers to do things on his/her own rather than with peers	1	2	3	4	5	6	7
25. My child has a special interest that is unusual in intensity	1	2	3	4	5	6	7
26. My child seems to be usually aware of the sight, feel, sound, taste or smell of things or people	1	2	3	4	5	6	7
27. My child engages in imaginative activity	1	2	3	4	5	6	7
28. My child is good at remembering dates	1	2	3	4	5	6	7
29. My child enjoys talking to his/her peers	1	2	3	4	5	6	7
30. My child has had a special interest that might seem unusual to other people (e.g., drainpipes, bus time-tables, traffic lights)	1	2	3	4	5	6	7
31. My child is under sensitive to olfactory stimuli	1	2	3	4	5	6	7
32. My child has a tendency to be obsessional	1	2	3	4	5	6	7
33. My child is good at remembering things about places that he/she has visited	1	2	3	4	5	6	7
34. My child initiates play/interaction with his/her peers	1	2	3	4	5	6	7
35. My child's interests are focused on a narrow range of topics	1	2	3	4	5	6	7
36. My child is under sensitive to visual stimuli	1	2	3	4	5	6	7
37. My child makes complex movements with his/her whole body (e.g., repeatedly bouncing up and down, spinning)	1	2	3	4	5	6	7
38. My child is good at remembering things that happened to him/her	1	2	3	4	5	6	7
39. My child is sensitive to the feelings of his/her peers	1	2	3	4	5	6	7
40. My child has had an intense interest that was not appropriate for his/her age group	1	2	3	4	5	6	7
41. My child is over sensitive to tactile stimuli	1	2	3	4	5	6	7
42. My child likes to order toys and/or objects	1	2	3	4	5	6	7

Please answer these questions with regards to any outstanding skill that your child may currently have (that is, any marked ability that stands in contrast to his/her overall disability). Please answer each statement below by putting a circle around the number that best reflects your degree of agreement or disagreement with that statement. There are no right or wrong answers. Rate each item from 1 (Strongly Disagree) to 7 (Strongly Agree), where 4 indicates that you neither agree nor disagree. If your child does not currently have a skill that you consider to be outstanding, please leave this section blank and go to the next.

	SD			N			SA
1. My child currently has a skill that I consider to be outstanding against his/her usual pattern of everyday ability	1	2	3	4	5	6	7
Please detail if you circled 5, 6 or 7:							
2. My child currently has multiple skills that I consider to be outstanding against his/her usual pattern of everyday ability	1	2	3	4	5	6	7
Please list the skills:							
3. My child developed this skill(s) from an early age	1	2	3	4	5	6	7
Please specify at what age your child was when she/he developed the skill(s):							
4. Some people outside of the family have remarked on this skill(s) that my child has	1	2	3	4	5	6	7
5. My child has received formal training or tutoring to encourage this skill	1	2	3	4	5	6	7
If so please specify the type of training or tutoring and the duration:							
6. My child spends a lot of time in activities related to this skill	1	2	3	4	5	6	7
7. Other family members possess a similar skill	1	2	3	4	5	6	7
If so, how much training has this family member had in this skill area? Please specify:							
8. My child has encountered training indirectly by bearing witness to this relative's own training	1	2	3	4	5	6	7
9. I think that this skill and the time my child currently spends on it interferes with my child's development	1	2	3	4	5	6	7

Please use this section to tell us anything further that you may wish to with regards to any current skill your child may have:

- What is the maximum level of education that you have received? (Please circle)

GCSE/A-level/Undergraduate degree/Postgraduate/Masters degree/Doctoral study/other
If other, please specify:

_____

- What is the maximum level of education that your child's other parent has received? (Please circle)

GCSE/A-level/Undergraduate degree/Postgraduate/Masters degree/Doctoral study/other
If other, please specify:

_____

- Is your household yearly income:

Between £0 and £15,000	YES/NO
Between £15,000 and £25,000	YES/NO
Between £25,000 and £35,000	YES/NO
Between £35,000 and £45,000	YES/NO
£45,000 plus	YES/NO

- Please specify your current occupation: _____
- Please specify the occupation of your child's other parent: _____

Are you willing to be contacted again for future follow -up research purposes: YES/NO

If yes, please provide your details here:

- Your name: _____
- Your telephone number: _____
- Your email address: _____

References

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Appendix 3

This appendix contains a copy of the Children's Communication Checklist developed by Bishop (2003).

The Children's Communication Checklist
Second Edition

CCC-2

By D.V.M. Bishop

INSTRUCTIONS

The CCC-2 was developed to help us understand more about communication strengths and difficulties in children. Although we can get an idea of how a child communicates by using language tests, it is helpful to also find out how the child behaves in an everyday setting. You can help us do this by completing the items on the next three pages.

This checklist contains a series of statements describing how children communicate. For each statement, you are asked to give information about the child whose name (or code number) appears below. You are asked to judge whether you have observed that behaviour:

0. less than once a week (or never)
1. at least once a week, but not every day
2. once or twice a day
3. several times (more than twice) a day (or always)

Please write the number in the box for each item, choosing the response that, in your judgement, best describes the child. If you find it hard to make up your mind, think over the last week, and try to remember how often you have observed the child behaving this way.

Please read each item carefully. Do not leave any items blank. If you are really unable to make a judgement, please put an X against that item, and add a comment if you wish.

Name or code number of child: _____ Gender: _____

Date of birth: _____ Today's date: _____ Age: _____

Your name (person completing the checklist): _____

Your relation to the child (i.e. parent, speech therapist, etc.): _____

(For respondents other than parents) How long have you known this child? _____

Has s/he ever had a permanent hearing loss diagnosed? YES ☐ NO ☐
If YES, please give further details below.

Has s/he any permanent physical handicap or chronic illness? YES ☐ NO ☐
If YES, please give further details below.

Is English the main language spoken at home? YES ☐ NO ☐
If NO, please give further details below.

Is s/he able to string words together in sentences? YES ☐ NO ☐
The CCC-2 is intended to be used with children who can talk in simple sentences, so if you have ticked NO, please do not complete any further questions

Additional details:

Children's Communication Checklist (CCC-2) by D.V.M. Bishop

Please enter a number in the ☐ box in the right hand column, as follows:
0 = less than once a week (or never); 1 = at least once a week, but not every day
2 = once or twice a day; 3 = several times (more than twice) a day (or always)

1 Gets mixed up between he and she so might say "he" when talking about a girl, or "she" when talking about a boy	
2 Simplifies words by leaving out some sounds, e.g. "crocodile" pronounced as "cockodile", or "stranger" as "staynger"	
3 Appears anxious in the company of other children	
4 Makes false starts, and appears to grope for the right words; e.g., might say "can I – can I – can – can I have an – have an ice-cream"	
5 Talks repetitively about things that no-one is interested in	
6 Forgets words s/he knows – e.g. instead of "rhinoceros" may say "you know, the animal with the horn on its nose..."	
7 With familiar adults, seems inattentive, distant or preoccupied	
8 Looks blank in a situation where most children would show a clear facial expression – e.g. when angry, fearful or happy	
9 When given the opportunity to do what s/he likes, chooses the same favourite activity (e.g. playing a specific computer game)	
10 Uses terms like "he" or "it" without making it clear what s/he is talking about. For instance, when talking about a film, might say "he was really great" without explaining who "he" is	
11 Says things that s/he does not seem to fully understand (may appear to be repeating something s/he's heard an adult say). So, for instance, a 5-year-old may be heard to say of a teacher "she's got a very good reputation"	
12 Mixes up words of similar meaning. e.g., might say "dog" for "fox", or "screwdriver" for "hammer"	
13 Is babied, teased, or bullied by other children	
14 Does not look at the person s/he is talking to	
15 Misses the point of jokes and puns (though may be amused by nonverbal humour such as slapstick)	
16 Is left out of joint activities by other children	
17 Gets mixed up between he/him or she/her, so might say "him is working" rather than "he is working", or "her have a cake" rather than "she has a cake"	
18 Uses favourite phrases, sentences or longer sequences in rather inappropriate contexts. E.g., might say "all of a sudden" rather than "then", as in "we went to the park and all of a sudden we had a picnic". Or might habitually start utterances with "by the way"	
19 Gets confused when a word is used with a different meaning from usual: e.g. might fail to understand if an unfriendly person was described as "cold" (and would assume they were shivering!)	
20 Stands too close to other people when talking to them	
21 Talks to people too readily: e.g. without any encouragement, starts up a conversation with a stranger	
22 Talks about lists of things s/he has memorised e.g., the names of the capitals of the world, or the names of varieties of dinosaurs	
23 Pronounces words in an over-precise manner: accent may sound affected or "put-on", as if child is mimicking a TV personality rather than talking like those around him/her	
24 Pronounces words in a babyish way, such as "chimbley" for "chimney" or "bokkle" for "bottle"	
25 Can be hard to tell if s/he is talking about something real or make-believe	
26 Moves the conversation to a favourite topic, even if others don't seem interested in it	

Children's Communication Checklist (CCC-2) by D.V.M. Bishop

Please enter a number in the ☐ box in the right hand column, as follows:
0 = less than once a week (or never); 1 = at least once a week, but not every day
2 = once or twice a day; 3 = several times (more than twice) a day (or always)

27 Produces utterances that sound babyish because they are just 2 or 3 words long, such as "me got ball" instead of "I've got a ball" or "give dolly" instead of "give me the dolly"	
28 Ability to communicate varies from situation to situation – e.g. may cope well when talking one-to-one with a familiar adult, but have difficulty expressing him/herself in a group of children	
29 Leaves off beginnings or ends of words, e.g. says "roe" instead of "road" or "nana" instead of "banana"	
30 Repeats back what others have just said. For instance, if you ask, "what did you eat?" might say, "what did I eat?"	
31 Ignores conversational overtures from others (e.g. if asked, "what are you making?" does not look up and just continues working)	
32 Mixes up words that sound similar. e.g. might say "telephone" for "television" or "magician" for "musician"	
33 Hurts or upsets other children without meaning to	
34 Takes in just 1-2 words in a sentence, and so misinterprets what has been said. E.g. if someone says "I want to go skating next week", s/he may think they've been skating, or want to go now	
35 It's difficult to stop him/her from talking	
36 Leaves off past tense – ed endings on words, so might say "John kick the ball" instead of "John kicked the ball", or "Sally play over there" instead of "Sally played over there"	
37 Tells people things they know already	
38 Makes mistakes in pronouncing long words; e.g. says "vegebable" rather than "vegetable" or "trellistope" rather than "telescope"	
39 Fails to recognise when other people are upset or angry	
40 Gets the sequence of events muddled up when trying to tell a story or describe a recent event. E.g. if describing a film, might talk about the end before the beginning	
41 Is over-literal, sometimes with (unintentionally) humorous results. E.g., a child who was asked "Do you find it hard to get up in the morning" replied "No. You just put one leg out of the bed and then the other and stand up." Another child who was told "watch your hands" when using scissors, proceeded to stare at his fingers.	
42 Includes over-precise information (e.g. exact date or time) in his/her talk, e.g. when asked "when did you go on holiday" may say "13th July 1995" rather than "in the summer"	
43 Leaves out "is", and so says "Daddy going to work" rather than "Daddy's going to work" or "Daddy is going to work". Or might say "The boy big" rather than "The boy is big"	
44 Mispronounces "th" for "s" or "w" for "r". E.g. says "thoap" instead of "soap" or "wabbit" instead of "rabbit"	
45 Asks a question, even though s/he has been given the answer	
46 Is vague in choice of words, making it unclear what s/he is talking about, e.g. saying "that thing" rather than "kettle"	
47 Shows interest in things or activities that most people would find unusual, such as traffic lights, washing machines, lamp-posts	
48 Doesn't explain what s/he is talking about to someone who doesn't share his/her experiences; for instance, might talk about "Johnny" without explaining who he is	
49 Surprises people by his/her knowledge of unusual words – uses terms you'd expect to hear from an adult rather than child	
50 It is hard to make sense of what s/he is saying (even though the words are clearly spoken)	

Please enter a number in the ☐ box in the right hand column, as follows:
0 = less than once a week (or never); 1 = at least once a week, but not every day
2 = once or twice a day; 3 = several times (more than twice) a day (or always)

The questions so far have asked about difficulties children may have that affect communication. The remaining questions ask about communicative strengths.

Please respond 0 to 3, as before, but remember that now a 0 response would mean that a child lacks this strength, and a 3 would indicate good communicative skill.

51 Speaks clearly so that the words can easily be understood by someone who doesn't know him/her very well	
52 Reacts positively when a new and unfamiliar activity is suggested	
53 Talks clearly about what s/he plans to do in the future (e.g. what s/he will do tomorrow, or plans for going on holiday)	
54 Appreciates the humour expressed by irony. Would be amused rather than confused if someone said "isn't it a lovely day!" when it is pouring with rain	
55 Produces long and complicated sentences such as: "When we went to the park I had a go on the swings"; "I saw this man standing on the corner"	
56 Makes good use of gestures to get his/her meaning across	
57 Shows concern when other people are upset	
58 Speaks fluently and clearly, producing all speech sounds accurately and without any hesitation	
59 Keeps quiet in situations where someone else is trying to talk or concentrate (e.g. when someone else is watching TV, or during formal occasions such as school assembly or a religious ceremony)	
60 Realises the need to be polite – would pretend to be pleased if given a present s/he did not really like, and would avoid making personal comments about strangers	
61 When answering a question, provides enough information without being over-precise	
62 You can have an enjoyable, interesting conversation with him/her	
63 Shows flexibility in adapting to unexpected situations: e.g. does not get upset if s/he planned to play on the computer, but has to do something else because it isn't working	
64 Uses abstract words that refer to general concepts rather than something you can see – e.g. "knowledge", "politics", "courage"	
65 Smiles appropriately when talking to people	
66 Uses words that refer to whole classes of objects, rather than a specific item. E.g. refers to a table, chair and drawers as "furniture", or to apples, bananas and pears as "fruit"	
67 Talks about his/her friends; shows interest in what they do and say	
68 Explains a past event (e.g. what s/he did at school, or what happened at a football game) clearly	
69 Produces sentences containing "because" such as "John had a cake because it was his birthday"	
70 Talks to others about their interests, rather than his/her own	

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CCC-2

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