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The production of null subjects by children with Autism Spectrum Disorder

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ABSTRACT

This dissertation presents a study concerning the production of null subjects by English children diagnosed with Autism Spectrum Disorder (ASD). More specifically, their production will be compared to that by typically developed children (TD) considering a selection of data from both groups of children obtained from spontaneous productions in corpora from the CHILDES project. The analysis of null subjects is focused on three different aspects: the overall production of subjects, the grammatical status of subjects, and the length of the null subject stage. The results obtained in this study reveal that i) ASD children produce a lower number of subjects than TD children; ii) they tend to produce more null subjects (grammatical and ungrammatical) than overt subjects compared to TD children; and, iii) their null subject stage is longer than in TD children. These results lead us to conclude that ASD children encounter difficulties and suffer delays in the production of null subjects in English compared to TD children.

KEYWORDS: Autism Spectrum Disorder (ASD), null subject, typically developed (TD), language acquisition, null subject stage.

RESUMEN

Este trabajo presenta un estudio sobre la producción de sujetos nulos en niños de habla inglesa diagnosticados con trastorno de espectro autista (TEA). Más específicamente, se compara su producción con la de niños de desarrollo típico (DT). Los datos de producción espontánea se han seleccionado de distintos corpus del proyecto CHILDES. El análisis de los sujetos nulos se centrará en tres aspectos diferentes: la producción total de sujetos en niños TEA, el estatus gramatical de los sujetos, y la duración de la etapa del sujeto nulo. Los resultados que se han obtenido revelan que i) los niños TEA producen un número menor de sujetos que los DT; ii) suelen producir más sujetos nulos (gramaticales y agramaticales) que explícitos comparados con los DT; y iii), su etapa de sujeto nulo es más larga que en niños de desarrollo típico. Estos resultados nos llevan a concluir que los niños con TEA encuentran dificultades y sufren atrasos en la producción de sujetos nulos en inglés en comparación con niños DT.

PALABRAS CLAVE: trastorno del espectro autista (TEA), sujeto nulo, desarrollo típico (DT), adquisición del lenguaje, etapa del sujeto nulo.

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List of Abbreviations

ASD	Autistic Spectrum Disorder
CHILDES	Child Language Data Exchange System
CLAN	Computerized Language Analysis
DP	Determiner Phrase
EPP	Extended Projection Principle
FREQ	Frequency
GRAM	Grammatical
KWAL	Key Word And Line
MLU	Mean Length of Utterance
MLUw	Mean Length of Utterance by words
NP	Noun Phrase
NSP	Null Subject Parameter
TD	Typically Developed
UNGRAM	Ungrammatical
VP	Verb Phrase
PDD-NOS	Pervasive Developmental Disorder-Not Otherwise Specified

1. Introduction

Language acquisition can be described as the process by which children achieve progressively a fluent control of their mother tongue (Hutauruk, 2015). This takes place because children are born with a capacity that is inherited genetically that enables them to acquire a language thanks to a constant exposure to it. Children then start to conform unconscious hypothesis about the formation of the language while they go through different stages. This happens until they set the different parameters of each language and therefore, acquire the grammar of the adult language. However, there are specific cases in which language acquisition suffers delays or deficits due to developmental impairments (Eigsti et al., 2010). These phenomena happen to people with Autism Spectrum Disorder (ASD), a condition that will be examined in this dissertation, in consequence of a lack of social interaction and communicative skills.

The present dissertation reveals empirical research based on the production of null subjects by English children with ASD taking L1 English typically developed (TD) children as control in order to make a comparison. As ASD children tend to suffer delays and encounter difficulties in the acquisition of language, we aim at analyzing the production of null subjects in comparison to TD children to observe if these difficulties are also found in this linguistic area. This topic of research, as far as we know, has not been studied before. Therefore, we consider that the continuous investigations on ASD children are needed to open ground for further research, since a better comprehension of language acquisition by ASD children can be useful for a possible understanding of their linguistic behavior.

This dissertation is divided into seven core sections, followed by an introductory section 1, section 2 establishes a theoretical background on the grammatical properties of subjects as well as on the production and problems faced by TD children when acquiring English subjects; section 3 presents empirical background on the acquisition of language by ASD children and it also reviews some previous research done regarding the acquisition of syntactical categories; section 4 establishes the main objectives of the dissertation. In section 5, the methodological process followed to analyze the data and select the participants is explained. Section 6 discusses the results obtained after the analysis of the data. And finally, section 7 presents the different conclusions reached in this dissertation.

2. Theoretical Framework

This section presents some general grammatical properties of subjects specific to English, as well as a brief description of the main approaches proposed in the literature on the acquisition of English subjects.

2.1 Grammatical properties of subjects in English

The subject can be defined as a functional element in a clause that can indicate the thematic role of agent in the sentence, and the status of the topic (Huddleston, 2002). The agent of a sentence is a participant that is being described by the verb as doing some action or causing an action intentionally or not (Andrews, 2007). Additionally, Huddleston (2002) states that subjects mainly appear in the form of a Noun Phrase (NP)[1] as in (1), in which the identification of the subject, and therefore the agent performing the action, is given by this form (i.e. *The girl*); or by a subordinate clause in (2), where the embedded clause (i.e., *That they played baseball*) also refers to the topic addressed by the predicate of the sentence.

(1) The girl eats an ice cream.

(2) That they played baseball was clear to their friends.

Regarding of the position occupied by the subject, it is usually referred to as the external argument of the verb, which means that the subject is external to the core of the Verb Phrase (VP) structure (Huddleston, 2002). Although the subject is usually placed at the front of a sentence, as in (1) and (2), this is not always the case, as can be observed in sentences where there is an inversion between the subject and the auxiliary verb in order to form a question, as in (3) (Huddleston, 2002), or if part of the information is focused or emphasized as in (4).

(3) Can I open the window?

(4) Yesterday he went to the park.

Finally, the last two properties of subjects in English deal with the uniqueness of the subject and its obligatoriness (Huddleston, 2002). The former has to do with the fact that

[1] Although in the dissertation we will use the term DP (Determiner Phrase) to refer to the form Determiner + Noun, in this case we are using the term NP because it is the term used by the author of the article.

there cannot be more than one subject per clause, because each subject must agree with one verb within the clause. The latter property discusses that in all clauses there must be a subject, so the subject is an obligatory element in the sentence. In English, subjects must be overt although null subjects are a grammatical option in some cases like imperative sentences or the subjects in subordinate clauses (Huddleston, 2002), as in (5) and (6), respectively.

(5) [You] Close the door!

(6) He expected PRO to pass the exam.

However, the question of grammaticality of null subjects in English is more complex than the two situations described by Huddleston (2002) in (5) and (6). Scholars such as Hyams (1989) had already proposed what is known as the Null Subject Parameter (NSP) or 'pro-drop' parameter, which "derives from the idea that clauses in all languages have subjects", (Camacho, 2013, p. 13). At the same time, this parameter is related to the Extended Projection Principle (EPP), which states that all clauses have subjects, being these overt or null, and that, like any other lexical item, they must be validated and licensed in each language, (Chomsky, 1982). That is, even though the subject is obligatory in all languages, the possibility of producing it phonetically or not, depends on the specific properties of each language (Hyams, 1989). This variation among languages is what links these two parameters, the obligatoriness of having a subject (EPP), and the possibility of producing it or not (NSP).

The NSP classifies languages based on whether the subject can be phonologically omitted or not in tensed sentences (Hyams, 1989). They are divided into [+ null subject] languages, if the subject can be elided, and [- null subject] languages, where the subject cannot be elided (Hyams, 1989). English is a [- null subject] language since one of the properties of subjects seen above is that subjects must be phonetically produced, as in (6a), because English verbs lack of rich verbal inflection, so an empty category in the subject position cannot be licensed (Hyams, 1989). Therefore, null subjects in English tensed sentences are not a grammatical option (Hyams & Wexler, 1993), as shown in (6b). However, in Spanish, both subject omission and subject overtness are grammatically accepted since it is a [+ null subject] language (Liceras & Fernández Fuertes, 2021), as seen in examples (7a) and (7b).

(6a) They visit London each year.

(6b) *Saw my father yesterday at the library.

(7a) [Él/ Ella] Dibuja paisajes todos los días.

(7b) Ella dibuja paisajes todos los días

Even though it has been mentioned that English is a [- null subject] language and subjects have specific properties, there are specific linguistic situations in which English accepts the possibility of having a null subject. These cases are imperative sentences, non-tensed subordinate clauses, and coordinated clauses (Falk, 2009). Imperative sentences allow subject omission because the addressee of an imperative sentence is a subject and therefore can be omitted since it can be easily identified by the speakers (Falk, 2009).

In the case of non-tensed subordinate clauses, as in (8), when both the main clause and the non-tensed clause share coreferential subjects, the subject in the subordinate clause is not overt since PRO (i.e., the null category) occupies this position and it is already identified by the subject (i.e., *they*) in the main clause (Falk, 2009).

(8) They wanted PRO to participate in the race.

Finally, it is possible to omit the subject in coordinated sentences, as in (9), if the referent of both clauses is the same, and it can be omitted in the second clause (Falk, 2009).

(9) He watches the TV and [he] eats pizza.

The different properties of English subjects have received remarkable attention from English acquisition literature. Since the main purpose of our study is to observe if Autistic Spectrum Disorder (ASD) monolingual children differ from Typically Developed (TD) monolingual children in the process of acquisition of English subjects, we will take into consideration a brief review on some of the research that has been done on this topic in the following sections.

2.2 The production of subjects by L1 English children

The production of both overt and null subjects by L1 English children has been widely studied (e.g., Karimouy, 2014; Hyams & Wexler, 1993; Hyams, 2011; Bloom, 1990; Hughes and Allen, 2006). More specifically, some scholars have focused their research on the period known as the null subject stage, that is in which children tend to omit subjects even when it is not a grammatical option in their mother tongue, as in the case

of English. This is mostly encountered in TD children from 2 to 3 years approximately (Karimouy, 2014). Many scholars support different theories to explain this issue. Due to the great number of different perspectives by researchers on English subjects, and due to the length restrictions of the present dissertation, we have selected some of the most important works on the null subject production by English children.

According to Karimouy (2014), whose work is centered on the study of null subjects in L1 English children, there are three main approaches that aim to illustrate why TD children tend to drop subjects in a language like English where a null subject is not a grammatical option in tensed clause (see section 2.1). These proposals are the Grammatical Account, the Processing Account, and the Discourse-Pragmatic Account, which will be described briefly as follows.

1) Grammatical Account (Hyams & Wexler, 1993):

According to this account, the child grammar is different from the adult grammar and that is what allows children to produce null subjects, because in their specific grammar, null subjects are a grammatical option (Hyams & Wexler, 1993). In other words, having a different grammar means that children seem to have different linguistic rules and principles than those in adults' grammar (Karimouy, 2014). Within this approach there are several hypotheses to explain the children's grammatical behavior, but in this dissertation the most interesting for our purposes is the *Pro-Drop Hypothesis*: proposed by Hyams (1986). This hypothesis supports the idea that children start using a language with the possibility of dropping subjects, but as they receive more and more input, they start to reset the parameters of their L1 producing more overt subjects due to the impossibility of producing null subjects in English.

2) Processing Account (Bloom, 1990):

This second approach states the opposite view from the Grammatical Account as an explanation for subject dropping in children as it claims that children and adults follow the same grammatical rules, but children tend to omit subjects due to processing and memory limitations (Bloom, 1990, as cited in Karimouy, 2014). Within this theoretical framework, Bloom (1991, as cited in Hyams, 2011) proposes three reasons for young children to omit subjects in their linguistic production. i) "null subjects are not a grammatical option for young English-speaking children and so do not appear in the grammatical representation of the sentence" (p. 30); ii) lexical subjects mean a greater

processing load than pronouns, so this difference in "heaviness" is what makes children to omit lexical subjects more probably than pro nouns; and iii) subjects at the beginning of the sentence suppose a major load than at any other position in a sentence.

3) Discourse-Pragmatic Account (Hughes and Allen, 2006):

This approach is based on the study of Hughes and Allen (2006) who claim that children are aware whether certain information has been previously mentioned in a conversation or not. This suggests that children will likely omit subjects with a referent that is highly accessible or recoverable to them, and they will likely produce overtly those subjects which are inaccessible or not easy recoverable.

As stated by Karimouy (2014), all these approaches that aim to find an explanation for the production of null subjects in English by monolingual children, contribute with a different perspective on this linguistic phenomenon. However, neither of them separately can fully explain factors surrounding the null subject production since they only focus on some parts of the issue, and they do not provide a whole picture of all of them. For this reason, Karimouy (2014) proposes that all these three approaches are correlated, and they complement each other.

All these approaches attempt to provide an explanation to the process of subject dropping in English acquisition in TD children. However, it would be interesting to find out if any of these approaches could be used to explain the production of null subjects in atypically developed children, as they may follow a different behavior in the acquisition of English subjects. A brief overview of language acquisition studies on specifically Autism Spectrum Disorder (ASD) children will be presented in the following section.

3. Autism Spectrum Disorder (ASD) children and language acquisition

As addressed in section 2.2, at certain stages in their linguistic development TD monolingual children produce null subjects in English, which is a language that does not allow them since it is a non-pro drop language and therefore null subjects are ungrammatical. As the purpose of the present dissertation is to observe if this is also the case of children with ASD when acquiring English as their L1, we will take into consideration what has been stated about ASD children regarding language acquisition and their production of null and overt subjects.

3.1. ASD children and language acquisition

ASD is a neurodevelopmental syndrome that causes a lack in social reciprocity and difficulties in communication development, as well as unusual restricted, and repetitive behaviors (American Psychiatric Association, 2000, as cited in Lord et al., 2000). In most of the cases, ASD begins in childhood, at three years old the latest. This condition is usually detected at first because of a delay in the communication by the child, but as the child gets older, the symptoms become more perceptible.

ASD is heterogeneous since every person can demonstrate different symptoms from others in terms of social interaction, difficulties in communication, and a narrow set of interests and behaviors (Reber, 2012). Researchers of this condition (Lord et al., 2000 among others) have identified several types of disorders within the spectrum: Autistic Disorder, Childhood Disintegrative Disorder, Asperger's Disorder, Pervasive Developmental Disorder-Not Otherwise Specified (PDD-NOS), and Rett's Syndrome, which seems to be more differentiable, so it is often studied apart as a different disorder. Each of these different types of ASD shows specific responses regarding communication skills. In the case of the Autistic Disorder there are communication impairments such as delay or lack of spoken language, or impairment when having a conversation. Children with Childhood Disintegrative Disorder show similar impairments as those with the Autistic Disorder, but they also show a loss of expressive or receptive language, which may be especially acute in the case of children with Rett's Disorder. The Asperger's Syndrome does not cause a significant delay on children's language, while PDD-NOS children may show a communication impairment.

Therefore, ASD in general (and in each of the different disorders) affects children's linguistic development in one way or another. More specifically, as Eigsti et al. (2010) point out, children with ASD demonstrate pragmatic deficits when expressing themselves either with low or high-functioning ASD since they may lack a conscious awareness about the social context of communication. A common feature that tends to occur in ASD children is known as "echoing", which can be described as the immediate repetition of what others surrounding the child have just said, but this does not mean that the communicative skills of the child have improved into a more advanced range. Additionally, there have been findings of non-appropriate use of prosody in these children (e.g., "misplaced lexical stress, slowed phrasing, and less appropriate resonance qualities" p. 684), and a lower Mean Length of Utterances (MLU) in children with ASD compared

to that in TD (Eigsti et al., 2010). Other studies (Durrleman & Zufferey, 2009, among others) have analyzed the production of syntactic elements by ASD children such as the tense phrase, in which children with ASD tend to omit the past tense inflection more than TD children, and even more than children with Down Syndrome. There is also evidence that proves that children with ASD show delay when producing Wh-questions since they produce less than TD children. *What* and *where* tend to appear earlier in their speech and regarding relative clauses and structures that involve embedding, ASD children show delay, they do not produce them.

In conclusion, ASD children show a delay or an impairment in their lexical and syntactic development, which is seen mainly as a result of the deficit in social and cognitive abilities (Eigsti et al., 2010).

3.2 Previous studies on ASD children's production of subjects

Within language acquisition literature there are various studies where it is explored how children with ASD show certain difficulties when acquiring general syntactic knowledge related to, for instance, their use of pronouns in [- null subject] languages like English (e.g., Novogrodsky and Edelson, 2016; Durrleman & Zufferey, 2013)) or in [+ null subject] languages like Greek (Terzi et al., 2019). More specifically, Novogrodsky and Edelson (2016) studied the production of pronouns by 24 children with ASD and compared it to that by 17 TD children functioning as the control group. Both groups were matched considering their age, (ASD children (6;1–14;3) and TD children (5;11–14;4)), and their verbal cognitive abilities. The study was based on two tasks: a story retelling and a story creation from a set of images. The main results showed that L1 English children with ASD tend to "produce more ambiguous pronouns than do TD children in the story-generation task" (Novogrodsky & Edelson, 2016, p. 246); but children with ASD also produced more utterances than TD children in the same task. The results from the second task showed that there were not many differences among groups in terms of number of words. Therefore, the conclusion reached was that children with ASD produced more ambiguous pronouns in a story-telling task than TD children.

Regarding the study of Terzi et al. (2019), the main aim was to investigate about the use of subject and object pronouns in ASD children in a [+ null subject] language like Greek.

The participants were 20 children with ASD compared to 20 TD children as control group. Both groups had to narrate a story from a book with only images. The results obtained showed that both groups used more null than overt subject pronouns, which could be an expected result for the Greek [+ null subject] language children, and that children with ASD produced significantly more null pronouns than overt pronouns. The main conclusion reached was that Greek ASD children are able to distinguish between the use of overt and null use of pronouns, and that they mainly omit overt pronouns.

Finally, it is worth to mention the research conducted by Durrleman and Zufferey (2013) that aimed to study complex syntax in English monolingual children with ASD, more specifically the construction at the Complementizer Phrase (CP) layer. They selected three children with ASD from a longitudinal corpus with spontaneous productions from *Tager-Flusberg Corpus* (2000) that is available on CHILDES (MacWhinney, 2000). Even though their main objective was to analyze complementizer phrases, they also examined the production of null subjects. The results obtained were that the "omission of the subject in question contexts is dramatically lower than in root declarative contexts" (Durrleman & Zufferey, 2013, p. 5). These scholars also pointed out that even though the children omit subjects in specific contexts, the number of null subjects drops over time.

According to our understanding, there has been scarce research conducted on the production of subjects (either null or overt) in children with ASD, who speak a [-null subject] language like English. Therefore, more investigations on this topic would be helpful to be able to understand the complexities of linguistic development in ASD children and their production of subjects. This is the main objective of our research, which will be described in the following section.

4. Objectives

The main aim of this dissertation is to open ground for further research on null subject production by L1 English children with ASD, in view of the limited investigation dedicated to this topic that has been observed through the review of previous studies. The main research questions we aim to address are the following.

Research Question 1: Do ASD children produce a higher or a lower production of subjects compared to that of TD children?

The comparison of the production of subjects in English by ASD children with that by TD children is necessary to find out if ASD children experience some deficits when acquiring different syntactic categories. It is expected that ASD children will produce a lower number of subjects since they tend to have a lower MLU than TD children (Eigsti et al., 2010; see section 3.1).

Research Question 2: Do ASD children produce more grammatical or ungrammatical null subjects?

The observation of the typology of subjects ((un)grammatical null and overt) produced by ASD children compared to TD children is required to determine if ASD children tend to lack behind and encounter difficulties in the acquisition of grammatical subjects in English (Durrleman & Zufferey, 2013; Eigsti et al., 2010; see also section 3).

Research Question 3: Is the ASD children's null subject stage longer than TD children's?

The second purpose of this paper is to recognize if the duration of the null subject period will be longer or similar to that stated in TD children (from 2 to 3 years approximately, see section 2.2). It is expected that the null subject period may be longer than in TD children, since ASD children tend to face more difficulties when acquiring a language due to the deficits in communication and social skills, and delays in their development (Lord et al., 2000; see section 3).

In order to find an answer to these research questions, a methodological process based on the analysis of spontaneous data from L1 English ASD and TD children is followed, as it is portrayed in the following section.

5. Methodology

This section describes the process followed to collect the data used in this study as well as its classification. It will be divided into five parts: data selection (how the participants were selected, and the criteria used to choose the children), the description of the participants (the main background information of the children chosen), the data extraction (how the data was obtained), the data classification (how the data was organized for the analysis), and finally the discarded cases (the productions that were not analyzed since they were considered as invalid).

5.1. Data selection

The data used in this study was obtained from the CHILDES project (MacWhinney, 2000). CHILDES is a database that compiles and collects mostly children's oral productions with transcripts either through experimental or spontaneous studies done by researchers. It includes productions organized by language groups like English (British or American), Spanish, or German among others, as well as by the type of data (i.e., spontaneous, storytelling, experimental tests, etc.). CHILDES is also a component of the TalkBank system, which is a very large open access repository of child spoken data.

All the information used in this study has been obtained from 2L1 English ASD children corpora and 2L1 English TD children corpora in CHILDES, i.e., *Rollins* (2003) and, *Tager-Flusberg* (1990); and *Sachs* (1983), and *Kuczaj* (1973), respectively. There is detailed information about the corpora used in table 1.

Table 1. Corpora information[2]

Corpus	Child group	Age range
Rollins	ASD (5 children)	2;2-3;11
Tager-Flusberg	ASD (3 children)	3;5-6;9
Sachs	TD (1 child)	1;02 - 4;09
Kuczaj	TD (1 child)	2;04 - 5;00

[2] There are 3 children in the *Tager-Flusberg Corpus* that are not going to be analyzed since their age goes beyond the 4 years of age until 9, and we considered that their age was not so relevant for the aim of this study taking into consideration the null subject stage.

The corpora used for ASD children were obtained from the *Clinical-Other* collection, more specifically, from the ASDBank in CHILDES. The two corpora selected for the study of American English monolingual ASD children were the *Rollins* and *Tager-Flusberg* corpora and the following corpora were discarded because their focus differ from ours: *Nadig Corpus* (the participants are ASD French bilinguals); *Quigley-McNalley Corpus* (only the mother's speech to ASD children is transcribed); and *Eigsti Corpus* (it is not a longitudinal study, so the acquisition of subjects cannot be seen over time).

The *Rollins Corpus* was compiled to study the pragmatic production in children with ASD. This study contains 21 files from 5 different children with autism. The age range of these children is between 2;2 and 3;11 years. The collection of this data was made through the ASD children's spontaneous interactions with toys while playing with their parents. Regarding the *Tager-Flusberg Corpus*, it aims to study language acquisition in children with ASD and Down Syndrome. This corpus compiles the oral production of 6 children with ASD from 3;4 to 6;9 years of age containing 64 files, also in the context of playing with toys. All the information was obtained through spontaneous production while the children play with their parents as well. All the corpora are longitudinal, so most of the participants were studied over time.

The *Sachs* and *Kuczaj* corpora were chosen for the study of American English monolingual TD children functioning as control participants: the former contains spontaneous production of a TD child aged from 1;1 to 5;1, who is the daughter of the researcher; and the later includes spontaneous data from a TD child aged from 2;4 to 4;1, and he is the son of the investigator as well.

5.2. Participants

The main objective of this study is to analyze ASD children's oral production of subjects in order to compare it to TD children's production.

Taking into account the data available from ASD children on CHILDES, we had to find TD children that could share similarities in terms of age with the autistic children, so the data selection depended on the availability of ASD children's data on CHILDES. Since the age range of the children selected was from 2;2 to 4;10, we decided to divide all the

participants into two groups based on their age, as well as based on the length of the null subject stage previously pointed out in section 2.2. (i.e.., from 2 to 3 years approximately).

Therefore, as shown in table 2 and 3 the first group of ASD children (Group 1) range from 2;2 to 3;5 years and includes 6 children (Carl, Josh, Marshall, Roger, Sid, and Stuart); and the second ASD group (Group 2) ranges from 3;5 to 4,10 years of age and includes 5 children (Marshall, Carl, Stuart, Roger, and Rick). There are 3 children (*Marshall, Carl, and Stuart*) that belong to both groups since part of their production is included in Group 1 and the other part in Group 2, depending on their age in each file. Hence, the division of ASD children into two groups, and one TD child within each group functioning as control (Naomi and Abe, respectively), would correspond to two different stages in their linguistic development, i.e., Group 1 would correspond to the null subject stage and Group 2 would correspond to a post-null subject stage. This will allow us to observe if there is an evolution in the production of null subjects in ASD children as well as if there is a delay. The average of the MLUw of each child is also shown in tables 2 and 3, as this information provides a more accurate indicator of their linguistic development than only age. The total number of utterances are also included in order to observe the linguistic productivity of each child in each group.

Table 2. GROUP 1 (2;2-3;5) participants[3]

ASD children					
Name (corpus age range)	**Corpus**	**Age range selected**	**Average MLUw**	**# files**	**Total # of utterances**
Carl (2;8-3;7)	Rollins	2;8-3;0	1.423	3	238
Josh (2;5-3;01)	Rollins	2;5-3;01	2.023	4	46
Marshall (3;01-3;11)	Rollins	3;01-3;03	1.203	2	33
Roger (2;06-3;03)	Rollins	2;06-3;03	1.248	4	51
Sid (2;02-3;05)	Rollins	2;02-3;05	1.057	4	103
Stuart (3;04-4;07)	Flusberg	3;04	1.247	1	170
TD child (control)					
Naomi (1;02-5;1)	Sachs	2;2-3;05	3.077	7	974

Table 3. GROUP 2 (3;5-4;10) participants[3]

ASD children					
Name (corpus age range)	**Corpus**	**Age range selected**	**Average MLUw**	**# files**	**Total # of utterances**
Marshall (3;01-3;11)	Rollins	3;06-3;11	1.360	3	235
Carl (2;8-3;7)	Rollins	3;07	2.636	1	110
Stuart (3;04-4;07)	Flusberg	3;06-4;07	1.510	7	1316
Roger (3;09-5;06)	Flusberg	3;09-4;10	2.389	7	2315
Rick (4;07-7;05)	Flusberg	4;07	1.517	1	267
TD child (control)					
Abe (2;4- 4;1)	Kuczaj	3;05-4;10	5.348	7	915

As observed in tables 2 and 3, there are 10 children in total, 8 of them are ASD children and 2 of them are TD children who will be used as control children to compare the ASD children's production of null subjects. All 8 ASD children have been diagnosed with autism, but the type of autism within the autism spectrum (section 3.1) is not specified either in *Rollins* or *Tager-Flusberg* corpora. This could be the explanation for the great variety in the MLUw among the ASD children, since the degree of autism is not specified in each case.

We decided to make this division because the first group of ASD children (2;2-3;5) is in the middle of the null subject stage (between 2 and 3 years of age) considering their age. But, since ASD children tend to encounter some difficulties when acquiring a language, and therefore, they experience some delays (see section 3.1), the study was extended with Group 2's children (3;5-4;10) and, therefore, including an age range subsequent to that of the null subject stage. There are also 3 children in the *Tager-Flusberg Corpus* that are not going to be analyzed since their age goes beyond the 4 years of age until 9, and we considered that their age was not so relevant for the aim of this study taking into consideration the null subject stage.

Regarding the number of transcriptions, there are 19 files from each group of ASD children, and 7 files from each TD child. Since the ASD children's files have a separation of 2 or 3 months among them, the TD children's files have been selected following the

[3] In tables 2 and 3 there are two children (Stuart in Group 1; Rick in Group 2), in which there is only one age point indicated. This is so because there is only one file of the child within the age range of the group selected.

same time separation among files with the aim of being as close as possible to the ASD children's data available.

Having described in detail the participants and the prerequisites for their selection, the analyzed data has been extracted in a specific way with different processes.

5.3 Data extraction.

The extraction of subjects from the children's production has been performed partially thanks to the CLAN program which is available on CHILDES. The tools used from this program have been MLU, FREQ, and KWAL. However, due to i) the lack of consistency in the codifications of null subjects by CLAN in the lines of %gram or %mor (i.e., lines of transcription where grammatical and morphological information is provided for each utterance produced), ii) the absence of %gram and %mor lines in the ASD corpora selected, and iii) the importance of the context due to the ambiguity of some of the productions of the children, we had to search all the subjects manually in all the corpora, but also all the subjects (overt and null) in those corpora where %gram or %mor were not available.

In any case, MLU has been used to calculate the ratio of words over utterances instead of calculating the ratio of morphemes over utterances. This is due to the absence of the *%mor* in both *Tager-Flusberg* and *Rollins* corpora. Therefore, the ratio of morphemes over utterances could not be calculated even though it is more accurate. The syntax line used was *mlu +t*CHI -t%mor @.*

Then, FREQ has been used to calculate the number of subjects that were in each file in order to estimate how many subjects were produced by each child. The syntax line used was *freq +t*CHI +s"*|SUBJ*" +t%gra @.* This was possible only for overt subjects in the TD corpora (where the *%mor line* and the *%gram line* were included), while in the case of null subjects, this search was done manually. In *Flusberg Corpus* and *Rollins Corpus* these two lines were not included, so in these cases, all the subjects (overt and null) were searched manually.

Finally, the KWAL program has been used to observe the selected items in context. In our case, we used KWAL to see the sentential context of both the overt and null subjects produced by the children. The syntax line used was the following: *kwal +t*CHI*

+s"|SUBJ*" +t%gra @*, except in those corpora where the %gram line was not included, in which case, we had to read the context of use of the null subjects as it may provide information about the referent of the null subjects produced.

5.4 Data classification

This section will describe the way in which the data obtained has been classified and organized for the subsequent analysis. As shown in table 4, different points of information and variables were taken into account for the present dissertation: the identification of all the participants who produce grammatical subjects, and the background information about the location of each case (i.e., name, corpus, age, group pf analysis, file, number of utterances, MLUw, and the case produced), and also the *Subject Form* and the *Grammatical status* of each of the subjects produced. According to the subject form, a pronoun, a DP (determiner phrase), or a Null Subject have been distinguished (in bold in table 4). In the case of the grammaticality of subjects (see section 2.1) null subjects were classified as either grammatical (e.g., the subject of imperatives) or ungrammatical (a tensed sentence as *want water* would require an explicit subject in English).

Table 4. Classification of data.

Child	Corpus	Age	Group	File	# of utterances	MLUw	Case	Subject Form	Grammatical Status
Roger	Flusberg	4;00	2	40028	255	2.943	**I** want Mickey Mouse	Pronoun	GRAM
Carl	Rollins	3;07	2	30700	110	2.636	**his ears** are broken	DP	GRAM
Sid	Rollins	3;05	1	30500	100	1.170	**[]** help me	Null	GRAM
Stuart	Flusberg	3;08	2	30806	184	1.495	**[]** want water	Null	UNGRAM

Table 4 is, therefore, a representation of the compilation of all the data and the necessary information functioning as a database that was stored in the Excel program, which will allow us to show the statistical results derived from our analysis.

5.5. Discarded cases

Some cases such as repetitions, or echoings (see section 3.1) as in (10), songs, as in (11), and fixed expressions, as in (12) and (13), have been discarded because they cannot be

considered as productive language of the child in terms of the spontaneous subject production.

(10) *MOT: take your blocks out.

*CHI: take your blocks out. [Roger, 031020, 3;10;29, ASD, Flusberg]

(11) *MOT: alright, sing We_Are_The_World.

%com: c sings

*CHI: we are the world.

*CHI: we are the children.

*MOT: turn around.

%com: m starts singing

*MOT: we are the ones.

*CHI: we are the world xxx xxx day.

*MOT: so let's start +/.

*CHI: ear+ring. [Roger, 040309, 4;03;09, ASD, Flusberg]

(12) *MOT: what do you say?

*CHI: thank you. [Stuart, 040029, 4;00;29, ASD, Flusberg]

(13) *CHI: get set.

*CHI: go. [Roger, 020600, 2;06, ASD, Rollins]

6. Results and Discussion

The description of the results will revolve around the research questions put forward in section 4: the number of English subjects produced by ASD children compared to TD children and their form; the production of grammatical or ungrammatical null subjects by ASD children in comparison with that by TD children; and finally, the length of the null subject stage in ASD children, taking into account its duration in TD children (from 2 to 3 years old, see section 2.2).

6.1. Research Question 1: Do ASD children produce a higher or a lower production of subjects compared to that of TD children?

ASD children tend to experience some delays and difficulties when acquiring a language compared to TD children, as commented on section 3.1. Due to this, it could be expected that in terms of the number of subjects produced, they would produce less subjects at the beginning (Group 1) than TD children, and as they grow up, the production of subjects would increase and be more similar to TD children's production.

Considering Table 5, the ASD Group 1 children, (2;2-3;5) produce a total of 52 subjects, while the TD 1 child produces a total of 594 subjects, being this difference quite significant. This difference could be related to the fact that ASD children have a lower MLUw than TD children and that the number of utterances (see table 2 in section 5.2) are much lower in the case of ASD children (Eigsti et al. (2010).

Table 5. Subjects produced by ASD and TD children.

	PRONOUN	**DP**	**NULL**		**TOTAL**
			GRAM	**UNGRAM**	
GROUP 1	12 (23%)	2 (3.8%)	33 (63.4%)	5 (9.6%)	52
TD 1	405 (68.2%)	50 (8.4%)	96 (16.1%)	43 (7.2%)	594
GROUP 2	417 (40.9%)	70 (6.9%)	282 (27.6%)	251 (24.6%)	1020
TD 2	648 (83.5%)	84 (10.8%)	40 (5.1%)	4 (0.5%)	776
TOTAL	**1483** (60.5%)	**206** (8.4%)	**764** (31.1%)		**2453**

Within the subjects produced, 14 overt subjects (26.8%) and 38 null subjects (73%) are produced by Group 1. The difference could be accounted as ASD children in the corpora produce a high number of imperative verbal forms which are preceded by grammatical null subjects. By contrast, the TD 1 child produces 455 overt subjects (76.7%) and 139 null subjects (23.3%), most of them grammatical as well.

The production of DPs in both Group 1 of children is similar, (3.8% vs. 8.4%). However, a more refined analysis of the other types of subjects shows that while the ASD Group 1 produces only 12 pronouns (23%), the TD 1 child produces 405 pronouns (68.2%), which

may demonstrate again the ASD children's difficulties in the acquisition of pronouns compared to TD children. This significant difference is also reflected in the production of null subjects, as ASD children produce a greater number of these subjects than the TD 1 child (73% vs. 23.3% respectively), This result supports Terzi et al.'s (2019) (see section 3.2) as they concluded that ASD children produced more null pronouns than TD children.

Regarding Group 2 (3;5-4;10), it can be observed that there has been a development in the production of subjects in ASD children as they show a sharp increase in the total production of subjects (from 52 to 1020 cases), while in the case of the TD 2 child, the increase is not so dramatic (from 594 to 776). However, the ASD Group 2 children produce 487 overt subjects (47.8%), and 533 null subjects (52.2%), while the TD 2 child's production of subjects corresponds mostly to overt subjects (732, 94.3%).

Focusing on overt subjects, and more specifically on the production of pronouns, there is still a great difference between the ASD Group 2 children and the TD 2 child, since 83.5% of the subjects uttered by the TD 2 child are pronouns while this amounts to only 40.9% in the case of the ASD Group 2 children. This difference points one more time to the fact that, although ASD children show a development in the production of pronouns, they seem to lag behind in the acquisition of this type of subjects, as already proven by Terzi et al. (2019) (see section 3.2).

6.2. Do ASD children produce more grammatical or ungrammatical null subjects than TD children?

Regarding the grammatical status of the null subjects produced by the ASD Group 1 children, as shown in table 5.1, most of them are grammatical null subjects (33, 63.4%) which, as reported above, could be due to them producing a higher number of imperative sentences like "help me" when playing with their parents. In the case of ungrammatical null subjects, both groups of children show a similar behavior (9.6% of the total production by Group 1 children *vs*. 7.2% by the TD Group 1 child).

Table 5.1. Null subjects produced by ASD and TD children.

	NULL	
	GRAM	**UNGRAM**
GROUP 1	33 (63.4%)	5 (9.6%)
TD 1	96 (16.1%)	43 (7.2%)
GROUP 2	282 (27.6%)	251 (24.6%)
TD 2	40 (5.1%)	4 (0.5%)
TOTAL	**764** (31.1%)	

As for the null subject production by the ASD Group 2 and the TD 2 child, even though there is a decrease in the production of both groups of children in comparison with those of Group 1, the higher number of ungrammatical null subjects produced by the ASD Group 2 children (251, 24.6%) in contrast with the TD 2 child (44, 0.5%) could be due to two reasons: i) the ASD children's pragmatic deficits because they rely excessively on the context (as pointed out by Hughes and Allen (2006) following the Discourse-Pragmatic Account, see section 2.2); and/or, as we propose, ii) the lengthening in terms of time (longer than 3 years of age) of the null subject stage in the case of ASD children, which is a statement that, to the best of our knowledge, has not been proposed by other scholars.

Comparing Group 2 of ASD children to the TD 2 child, there has also been a development in the case of the ASD children because the difference in the production between Group 2 and TD 2 is not as significant as that in the Group 1 and TD 1. In fact, ASD children even produce a much greater number of null subjects than TD 2, but at this stage the percentage of grammatical *versus* ungrammatical null subjects in Group 2 is similar (27.6% vs. 24.6%, respectively). This similarity makes the difference between TD and ASD children because the production of ungrammatical null subjects increases as ASD children grow older, which causes the difference between grammatical and ungrammatical null subjects to be lower. In the case of the TD 2 child, the production of ungrammatical null subjects decreases as they grow older, and the difference between grammatical and ungrammatical null subjects is greater. This proposal is developed in the next section as part of the answer to research question 3.

6.3. Will ASD children's null subject stage be longer than in TD children?

The null subject stage is known as the period when children tend to omit the subjects of the sentences even when the grammatical properties of the language acquired does not allow it. This period is usually found on TD children from 2 to 3 years approximately (Karimouy, 2014). Regarding ASD children, it can be predicted that their null subject stage would be longer due to the difficulties and delays in communication they suffer in consequence of their lack of interest on social interaction (Reber, 2012).

In Figure 6, it can be observed the production of ungrammatical null subjects by the different participants analyzed. The evolution of ASD children goes from the production of 9.6% instances of ungrammatical null subjects by Group 1 (2;2-3;5), to 24.6% of instances of ungrammatical null subjects in the case of Group 2 (3;5-4;10). In this case, the number of cases has increased which indicates that even though Group 2 of ASD children have finished (supposedly) their null subject stage, this is not reflected in their production when they are older since their production of ungrammatical null subject does not decrease as in TD children, but the opposite.

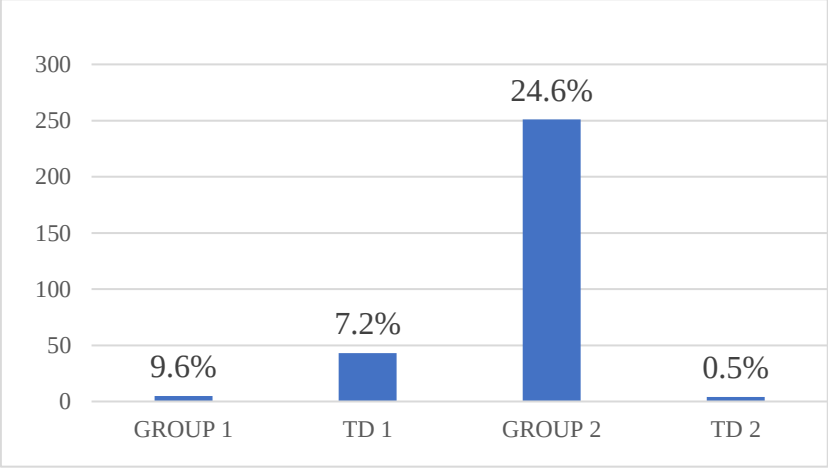

Figure 6. Evolution of ungrammatical null subjects' production in ASD and TD children.

Regarding the evolution of TD children analyzed in this dissertation, there has been a decrease in the production of ungrammatical null subjects. TD children go from 7.2% of ungrammatical null subjects produced by the TD 1 child (2;2-3;5), to 0.5% of ungrammatical null subjects by the TD 2 child (3;5-4;10). This decrease in the production indicates that the TD 2 child has ended the null subject stage, and that the omission of

subjects is reduced to almost to 0 because they have understood that in English it is not permitted to omit subjects because it is a [- null subject] language.

Comparing ASD children with TD children in regards of Figure 6, the evolution of the production of ungrammatical null subjects is the opposite: while TD children produce less ungrammatical null subjects, ASD children increase their production of ungrammatical null subjects as they become older. This means that the null subject stage of the ASD children of our study is indeed longer because it does not end when they are 3 years old, but it is prolonged. As we hypothesized in section 4, since ASD children have some difficulties when acquiring certain grammatical properties and/or communicative skills (see section 3.2), we can confirm that one of these difficulties is related specifically to the acquisition of English subjects, as a delay in the end of the null subject stage has been observed in comparison with TD children. That is, following the Grammatical Account (Hyams & Wexler, 1993, see section 2.2), ASD children seem to take more time than TD children to reset the null-subject parameters of their L1.

7. CONCLUSION

This dissertation has focused on the production of null subjects in ASD English children in comparison with that by TD English children. ASD children face difficulties in the acquisition of English subjects compared to TD children which, according to some authors (Eigsti et al., 2010; Lord et al., 2000 among others), could be due to a lack of social interaction and communication difficulties. Our main aim was to provide evidence that certain difficulties could be found in their acquisition of subjects in the case of a [- null subject] language like English. Therefore, we analyzed the production of subjects by ASD children belonging to two different stages or ages in their linguistic development. A comparison with TD children shows that ASD children do experience delays and encounter difficulties when acquiring subjects as well as when they produce null subjects in English.

Firstly, ASD children produce a lower number of subjects than TD children in consequence of a lower MLUw, but as they grow up the production of subjects increases. Regarding the type of subjects produced, both ASD and TD children produce more pronouns than DPs. In contrast, ASD children produce much fewer pronouns than TD children, which shows the difficulty of ASD children when acquiring pronouns. In

addition, ASD children tend to produce more null than overt subjects, this also supporting the idea that ASD children lag behind when acquiring English subjects compared to TD children. In terms of the grammaticality of subjects, as they grow up, ASD children increase the production of ungrammatical null subjects, being this process the opposite to what happens in TD children.

Finally, after the analysis of the null subject stage in ASD and TD children, it can be observed that while TD children reduce their production of ungrammatical null subjects when they are 3 years old, ASD children increase their production at this age. This means that the null subject stage is indeed longer in ASD children than in TD children. Therefore, ASD children suffer delays when acquiring subjects and producing null subjects in English compared to TD children, which, to the best of our knowledge, has never been stated in any previous studies.

To end, we would like to point that our study could be the point of departure to research further on the lengthening of the null subject stage in ASD children. In this sense, it would be necessary to collect data from older ASD children and find out the age they stop producing ungrammatical null subjects, and therefore, detect how long it takes ASD children to realize that subjects have to be phonetically produced in English since it is a [- null subject] language.

8. BIBLIOGRAPHY

Andrews, A. (2007). The major functions of the noun phrase. In T. Shopen (Ed.), *Language Typology and Syntactic Description* (pp. 132-223). Cambridge: Cambridge University Press. doi:10.1017/CBO9780511619427.003

Camacho, J. (2013). The Null Subject Parameter: Introduction. In *Null Subjects* (Cambridge Studies in Linguistics, pp. 13-38). Cambridge: Cambridge University Press. doi:10.1017/CBO9781139524407.002

Chomsky, N. (1982). *Lectures on government and binding: the Pisa lectures* (2nd rev. ed.). Foris Publications.

Durrleman, S., & Zufferey, S. (2009). The nature of syntactic impairment in autism. *Rivista di Grammatica Generativa*, *34*, 57-86.

Durrleman, S., & Zufferey, S. (2013). Investigating complex syntax in autism.

Eigsti, I.-M., de Marchena, A. B., Schuh, J. M., & Kelley, E. (2011). Language acquisition in autism spectrum disorders: A developmental review. *Research in Autism Spectrum Disorders, 5*(2), 681–691. https://doi.org/10.1016/j.rasd.2010.09.001

Falk, Y. N. (2006). On subjects and explanation. In *Subjects and Universal Grammar: An Explanatory Theory* (pp. 1–29). Cambridge: Cambridge University Press.

https://doi-org.ponton.uva.es/10.1017/CBO9780511486265

Tager-Flusberg, H., Calkins, S., Nolin, T., Bamberger, T., Anderson, M., & Chandwick-Dias, A. (1990). A longitudinal study of language acquisition in autistic and Down syndrome children. *Journal of Autism and Developmental Disorders, 20*, 1–21.

Huddleston, R. (2002). The clause: Complements. In R. Huddleston & G. Pullum (Authors), *The Cambridge Grammar of the English Language* (pp. 213-322). Cambridge: Cambridge University Press. doi:10.1017/9781316423530.005

Hutauruk, B. S. (2015). Children first language acquisition at age 1-3 years old in Balata. *IOSR Journal of Humanities and Social Science (IOSR-JHSS)*, *20*(8), 51-57. DOI: 10.9790/0837-20855157

Hyams, N. (1989). The Null Subject Parameter in Language Acquisition. In O. Jaeggli, & K. J. Safir (Eds.), *The Null Subject Parameter* (pp. 215-238). Dordrecht: Springer Netherlands.

Hyams, N. (2011). Missing subjects in early child language. In *Handbook of generative approaches to language acquisition* (pp. 13-52). Dordrecht: Springer Netherlands.

https://doi.org/10.1007/978-94-007-1688-9_2

Karimouy, M. H. (2014). *The Null Subject Stage and Children's Referential Choice: A Case Study of an English-Speaking Monolingual.* [Master dissertation, The Artic University of Norway] https://munin.uit.no/bitstream/handle/10037/7057/thesis.pdf?sequence=2&isAllowed=y

Kuczaj, S. (1977). The acquisition of regular and irregular past tense forms. Journal of Verbal Learning and Verbal Behavior, 16, 589–600.

Liceras, J. M. & Fernández Fuertes. (2021). On the nature of crosslinguistic influence: Root infinitives revisited. In Avram, L., A. Sevcenco and V. Tomescu (Eds.), *L1 Acquisition and L2 Learning*. (pp. 203-228). John Benjamins. https://doi.org/10.1075/lald.65.08lic

Lord, C., Cook, E. H., Leventhal, B. L., & Amaral, D. G. (2000). Autism Spectrum Disorders. *Neuron*, *28*(2), 355-363. https://doi.org/10.1016/s0896-6273(00)00115-x

Nina Hyams, & Wexler, K. (1993). On the Grammatical Basis of Null Subjects in Child Language. *Linguistic Inquiry*, *24*(3), 421–459.

Novogrodsky, R., & Edelson, L. R. (2016). Ambiguous pronoun use in narratives of children with Autism Spectrum Disorders. *Child Language Teaching and Therapy*, *32*(2), 241-252. DOI: 10.1177/0265659015602935

Rollins P. R. (1999). Pragmatic accomplishments and vocabulary development in pre-school children with autism. *American Journal of Speech-Language Pathology: A Journal of Clinical Practice, 8*, 85–94.

Sachs, J. (1983). Talking about the there and then: The emergence of displaced reference in parent–child discourse. In K. E. Nelson (Ed.), *Children's language, Vol. 4*, Hillsdale, NJ: Lawrence Erlbaum Associates.

Terzi, A., Marinis, T., Zafeiri, A., & Francis, K. (2019). Subject and Object Pronouns in High-Functioning Children With ASD of a Null-Subject Language. *Frontiers in psychology*, *10*, 1301. https://doi.org/10.3389/fpsyg.2019.01301

What We Know about Autism and How We Know It. (2012). In M. Reber (Ed.), *The Autism Spectrum: Scientific Foundations and Treatment*. Cambridge: Cambridge University Press.