Comprehension of Passives in Persian Speaking Children with ASD – An Investigation of Grammar in Autism

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“Think of it: a disability is usually defined in terms of what is missing … But autism …is as much about what is abundant as what is missing, an over-expression of the very traits that make our species unique.”
— Paul Collins, Not Even Wrong: Adventures in Autism

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Abstract

Most research on finding the underlying causes of social and communicative impairment in autism spectrum disorders (ASD) has been devoted to pragmatic aspects of language. The present research is exploring the syntactic knowledge as a probable underlying mechanism of language deficit in ASD. Three groups comprising high-functioning ASD, low-functioning ASD, and typically developing (TD) Persian-speaking children were tested on comprehension of passive sentences. Results suggest that while low-functioning autistic children might be impaired in the area of grammar, high-functioning autistic children are not. The results suggest slower than normal development of passive in high-functioning autistic children, while there is grammatical impairment in low-functioning autistic children. The new results are compared to those of two recent studies on comprehension of passives in Greek-speaking and English-speaking subjects with ASD (Perovic et al., 2007; Terzi, et al., to appear).

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List of Abbreviations

2	Second person
3	Third person
COMP	Comparative
DUR	Durative aspect
Ez	denotes certain relationships between Persian words. Here it denotes possession among words
indf	Indefinite
ipfv	Imperfective
neg	Negative
OB	Object marker
OBJ	Object
PL	Plural
PTCP	Past participle
SG	Singular
SUBJ	Subject

1. Introduction

Autism Spectrum Disorders (ASD) have communicative disorders as their defining characteristic. The most evident communicative difficulties in the autistic population regarding the language domain are pragmatic deficits, such as echolalia, problems in turn taking, miscomprehension of non-literal speech, and lack of sensitivity to emotional states in others (theory of mind). Since apparent signs of autism are mostly social and appropriate communication difficulties, pragmatics is thought to be the main impaired part in the language domain in autism. The focus on impairment in the pragmatic abilities of children with ASD has caused that less attention is given to the role of syntax in language dysfunctionalities of this population. Therefore, the main goal of my thesis is to explore the language abilities of autistic children on a grammatical dimension.

This thesis is concerned with the comprehension of passive voice in Persian speaking, typically developing children (TD) and children with ASD. The aim of the study is to draw a comparison with earlier cross-linguistic studies in the comprehension of passives done so far on children with ASD, in order to get a better picture of the morpho-syntactic abilities of the a ASD population. Based on the heterogeneity of the language skills of children on the autism spectrum, the current study compares not only children with ASD's comprehension of passives with that of the TD group, but there is also a comparison between low-functioning and high-functioning children with autism. This is done by replicating an experiment designed under the auspices of COST ACTION A33 on the comprehension of passives (Armon-Lotem, Haman, Jensen de López et al., submitted) previously carried out on children speaking various languages, in a new population with a language never tested before, Persian (Farsi)[1].

The outline of the dissertation is as follows. Sections 2 and 3 include the literature review. Section 2 is a general description of characteristics of the ASD population, with special emphasis on the studies on the morpho-syntactic abilities of children with autism. Section 3 is devoted to cross-linguistic findings on the acquisition of passives, and the passive structure of Persian. In Section 4 the hypotheses and directions of the current study are discussed. Section 5 describes the methodology of the experiment carried out on Persian speaking children with autism and

[1] "Farsi" (an Arabic adaptation of the word "Parsi"), is the indigenous name of the Persian language. Just as the Greek speaking people refer to Greek as 'Ellinika', the Persians use 'Farsi' or 'Parsi' to identify their native form of verbal communication. In English, however, this language has always been known as "Persian" (Akbarzade, 2005).

typically developing children, and Section 6 presents the results, as well as the error analysis. Section 7 is a discussion of the findings and, finally, Section 8 is a conclusion of this study.

2. Review of the Literature. Autism Spectrum Disorders

Only by looking at the title of this section, it is noted that the word "disorder" is plural. Under this name, Autism Spectrum disorders (ASD) involve separate disorders "autistic disorder, Asperger's disorder, childhood disintegrative disorder, or the catch-all diagnosis of pervasive developmental disorder not otherwise specified" (American Psychiatric Association's diagnosis of disorders within autism, 2013). ASD is often referred to as a neurodevelopmental disorder with a variety of symptoms and characteristics.

Let us now briefly look at the history of ASD and its general characteristics. The term autism was coined by the Swiss psychiatrist Paul Eugen Bleuler, and was known as a form of childhood schizophrenia (Levisohn, 2007). In 1943, Dr. Leo Kanner used the expression "early infantile autism" after studying 11 children suffering from similar symptoms. His paper "Autistic Disturbances of Affective Contact", published in a medical publication, reports "fascinating peculiarities" of children, who according to Kanner have come to this world with innate disability to perform social interactions with others. "Happiest when he was alone... drawing into a shell and living within himself... oblivious to everything around him" (Kanner, 1943). These are the words of a father of one of the 11 children that Kanner studied. He was describing his son, with what Kanner called "the common characteristic" among all of the 11 children he examined. Previously, many individuals with autism were misdiagnosed with schizophrenia.

Today, when we talk about autism, we often talk about a pervasive developmental disorder (PDD-NOS), Asperger's syndrome (AS) (sometimes referred to as high-functioning autism), and also childhood disintegrative disorder. Individuals who fall within these ASDs have difficulties in social interaction, communication, and different areas of behavior. In terms of social interaction, difficulties of the ASD population include difficulties in:

(i) Knowing how to move their body or moving their body in ways that endear them socially with their peers.
(ii) Maintaining and establishing eye-contact
(iii) Reading facial expressions
(iv) Emotional signaling, knowing when emotions are triggering certain kinds of responses or being aware of their own emotional status.

(v) Acting in reciprocity, experiencing give and take in social situations with others.

(vi) Sharing interest or enjoyment with others, therefore experiencing introspective, solo kind of enjoyment.

(vii) Understanding other people's feelings.

(viii) Being comforted by touch.

Communication: Difficulties in both verbal and non-verbal domains including:

(ix) Delay/lack of talk. In many cases language never develops.

(x) Difficulty in remaining engaged in conversations.

(xi) Stereotyped kind of communication. They often repeat a sound, or a word. Echolalia is also part of the stereotypical behavior of this population.

(xii) Inability in taking the listener's perspective

(xiii) Difficulty in understanding and responding to humor

(xiv) Tendency to focus on their self-needs as opposed to the needs of others around them.

In terms of their behavior, individuals of ASD:

(xv) Focus on parts, pieces, and details as opposed to the wider picture

(xvi) Show preoccupation

(xvii) Show need for sameness and routines. Transitions tend to be very difficult.

(xviii) Rocking behavior. Moving back and forth of the whole body, and flapping behavior, such as arms and legs.

(xix) Hypersensitivity to certain things. They may also show a lack of awareness to certain things.

Turning to variability, individuals with ASD can have pretty significant cognitive and intellectual challenges, with low IQ levels. On the other hand, they can be gifted in certain skills. There are features of ADHD that we see in many ASD individuals. Anxiety and depression are often complicating factors in this set of disorders. Some individuals with ASD present Savant-like skills. They are incredibly capable of remembering lists, maps, dates, music, etc. It is often seen that some individuals with ASD may have difficulties with modulation of pain, and often with certain textures. Also seen in the population are difficulties with sleep, and daily activities (NCLD, 2013).

In the late 1980s and early 1990s, it became possible for scientists to observe brain activity with new technologies. Since the late 1990s (when the National Institute of Health in the U.S began funding the research on autism), scientists started applying functional MRI scan and PET scans to observe brain activity while individuals participated in a variety of mental tasks. What they

found different about the brain of individuals with autism was that there seemed to be a lack of synchrony between different areas of their brain. In other words, different parts of the brain of an autistic person seem not to work together and synchronize the way the brain of a normal person does, especially the frontal areas with the posterior areas. Most of the time, there is less coordination between the visual and emotional information in the brain of an autistic person. Although this theory was at first rather controversial, in recent years more evidence in its support has come to light (Hamilton, 2013).

2.1 Language Specific Research in ASD

One of the most well known defining characteristics of ASD is impairment in communicative behavior (American Psychiatric Association, 2000). For this reason, investigating the mechanisms of communicative behavior in ASD population has become a crucial research line. The use of the system of language is one of the key factors of making communication happen among people, and keeping them engaged in social interactions. On that account, impairment in cognitive and language development are thought to be a major factor in the ASD population. Throughout the past couple of decades, linguists have carried out a great amount of work to find out the reasons behind diagnostic findings related to language impairment in ASD. Yet, to date, the literature has not identified the exact area of the language system as the underlying cause of communication dysfunctionalities in children with ASD. However, impairments in pragmatics aspect of language are thought to be primary causes of language dysfunctionality in this population.

Pragmatic impairments in autism include comprehension difficulties with the intention involved in communication. Other ASD characteristics associated with pragmatic deficit are "failure to view conversations as a means of modifying and extending the cognitive environment of a conversational partner; and failure to view narratives as a means for communicating about both events and psychological states" (Baron-Cohen et al. 2000). Rappin and Dunn (1989) described the language disorders in children with autism as follows: "Lower level mixed receptive/expressive disorders involve phonological and syntactical processing, whereas higher level processing disorders involve semantics and formulation of discourse. Verbal inabilities and mutism (50-75% of affected individuals), delayed language development, abnormal production of language hallmarks (echolalia and producing non-sense words) suggest significant impairment in Pragmatic aspect of language" (p. 88).

2.2 Specific Language Impairment and Autism

Specific Language Impairment (SLI) is another developmental disorder that has some features of language in common with ASD (Leyfer et al. 2008). SLI also has heterogeneous symptoms, and paucities are likely to be in both expressive and receptive domains. Some children are exposed to both expressive and receptive language difficulties, and others are exposed to either one or the other (Leyfer et al., 2008). An early study investigating the similarities between ASD and SLI found that 40% of SLI participants did not use gesture as a means of nonverbal communication, a characteristic known for ASD children (Bartak, Rutter, & Cox, 1975). The recent study by Leyfer et al. (2008) comparing 43 autistic children within the age range of 6-15 and 45, 6-13, non-verbally matched children with SLI, found that autism and SLI share etiological factors, and suggested that both disorders are due to the interaction of several genes. However, there are also studies that try to show otherwise. For instance, studies on infants at risk for SLI suggest that gradual loss of social communication skills, what is mostly known as regression, is a feature linked to all children with ASD (Ozonoff et al., 2010). This characteristic of children with ASD differentiates them from SLI children (Pickles et al., 2009).

Difficulty with nonsense word repetition is a clinical marker in individuals with SLI that is observed in some of the population with autism (Kjelgaard and Tager–Flusberg, 2001). This subgroup is thought to have many similarities with the SLI population. Relying on standardized assessments measuring verbal and non-verbal abilities, it has been observed that some of the children with ASD have language skills similar to normal children when performing the tests, yet others show similar responses to responses of children with SLI (Roberts, Rice, & Tager-Flusberg 2004).

To further investigate probable homologous language impairments between children with ASD and children with SLI., a study by Roberts et al. (2004) tested a subgroup of children with autism who have difficulties on tense marking. Tense marking has been found to be deficient in children with SLI in a study by Rice, Wexler & Hershberger (1998) and, therefore, a clinical marker of SLI in English-speaking children. Tense marking, especially past tense, was also claimed to be an area of difficulty in children with autism, yet along with shifting references, it was assigned to semantic-pragmatic difficulties in ASD (Szatmari et al., 1989). In this study, elimination of tense marking was found in children with ASD, similar to the performance of children with SLI, yet children with autism also performed echolaliac responses and tended to

perseverate on previous responses. These behaviors are part of the core autism deficits. Roberts et al. interpreted them as the autistic children's struggle to understand the tasks they were presented with. These autistic participants had low scores on non-verbal IQ, unlike the SLI group they were compared with, who had non-verbal IQ within norms. As Terzi et al. (to appear) pointed out in her paper on grammatical abilities in Greek speaking children with autism (which will receive further attention in the next subsections), it is not clear how non-verbal IQ level differences may have affected the specific performance differences among the two groups of SLI and ASD. This factor is taken into account in the current study.

Overall, it is clear that certain characteristics of autism and SLI overlap, which may follow from the same linguistic deficit in both populations.

2.3 Morpho-syntactic abilities

Around three decades ago, studies on different aspects of language in ASD led psycholinguists to conclude that there is no specific language impairment in the area of syntax and lexical knowledge per se (Baron-Cohen, 1989; Happé, 1995; Tager-Flusberg, 1991). Since the late 1980s, the notable heterogeneity observed in the language skills of children on the autism spectrum required more attention and more variation of language testing designs.

As previously mentioned, low-functioning children with ASD usually have difficulty with sentence production. Focusing on this characteristic, McGonigle-Chalmers et al. (2013) tested syntactic awareness in low functioning children with ASD through a computer task non-speech route. This study displayed complete syntactic awareness in all participants.

A study by Bartak, Rutter & Cox (1975) on the comparison between children with autism and children with acute receptive language disorder found that both groups, which were matched on non-verbal IQ, had serious language comprehension problems. The researchers measured the participants' language abilities by the Peabody Picture Vocabulary Test (PPVT) and a natural language sample. The results of the study showed no differences in production measures, although the autistic group did worse on PPVT score. The conclusion of the study was that comprehension in ASD is much more deficient than production, and so research on comprehension requires more attention.

Tager-Flusberg, a well-known scholar in the field of ASD, mostly has focused her research on understanding the relationship among different aspects of language in ASD, in order to characterize the heterogeneity of language abilities in the autistic population. Her studies showed that there is a striking relationship between IQ levels and language abilities (Kjelgaard

and Tager-Flusberg, 2001).

In a study inspired by Tager-Flusberg's (1981) work on the semantics of children with ASD, Naito and Nagayama (2004) tested Japanese-speaking children with autism. They compared them to two other groups, namely one of TD children, and another of mentally retarded children. The main purpose of this follow-up study was to help identify the differences in comprehension of passives, responsiveness to different semantically biased plausibility levels, and false belief performance among the three groups, while verbal intelligence (VMA) remained the same. The results showed that participants with autism were sensitive to event plausibility levels, which means that they can use semantic common sense to comprehend sentences. Naito et al. concluded that theory of mind is independent of sentence comprehension, and claimed that specific language disorders in autism involved pragmatics aspect of language rather than semantics.

Concerning whether grammatical knowledge is defective or just delayed in ASD, Perovic, Modyanova and Wexler (2012) examined the knowledge of the constraints on the interpretation of personal and reflexive pronouns in both English speaking children with ASD and typically developing group with similar cognitive levels, but a younger age range. Since ASD is a broad spectrum, it is important to mention that the children with ASD tested by Perovic et al. had lower than average non verbal IQ (67). They compared the results of the two groups (autistic and TD), which revealed that the children with autism had a low score on the interpretation of reflexives compared to that of the TD group. On the other hand, children with autism performed at a similar level of comprehension of personal pronouns as the TD group, which was still with some difficulty, yet predictable based on pragmatic deficits seen in the age range tested. Therefore, from this study they concluded that grammatical abilities in children with ASD is impaired, and not necessarily delayed (Perovic et al., 2012).

2.4 Passive Comprehension in Children with ASD

Very recently, two studies have focused on the comprehension of passives in children with ASD. It is worth restating that the present study work is motivated by these two studies. They both compared performance of children with ASD to TD children. The two groups were matched on different measures of verbal and/or non-verbal abilities.

One of these two studies on the comprehension of passives in ASD was conducted by Perovic, Wexler and Modyanova (2007). The study used actional and non-actional verbs, as well as

binding, to test comprehension of passives and binding in English speaking children with ASD. There were twelve 6-17 year old participants with autism (mean age: 11;06), eight 6-18 year old participants with Asperger's Syndrome (AS) (mean age of 13;01 months), and three control groups of TD for each autistic and AS group, matched on verbal and non-verbal IQ levels. The assignment included a two-choice sentence picture-matching task, with 6 conditions and 6 sentences per condition (and a total of 36 items).

The results of this study showed that children with AS performed almost at ceiling and not significantly different than the three TD children control groups, as shown in Table 1. On the other hand, children with autism had a much lower score in the comprehension of all types of passives, as can be seen in Table 2:

group	Act Active	ActLong Passive	ActShort Passive	Psych Active	PsychLong Pass	PsychShort Pass
Asperger's	1.00	0.83	0.83	0.83	0.67	1.00
K-BIT controls	0.87	0.83	0.67	1.00	0.67	0.87
PPVT controls	0.96	0.95	0.98	1.00	0.98	0.94
TROG controls	0.98	0.92	0.96	0.98	0.82	0.83

Table 1. Results of AS children (Perovic & Wexler, 2007)

group	Actional Active	ActLong Passive	ActShort Passive	Psych Active	PsychLong Passive	PsychShort Passive
Autism	0.78	0.36	0.39	0.67	0.26	0.30
K-BIT controls	0.98	0.88	0.93	0.97	0.65	0.67
PPVT controls	0.92	0.82	0.88	0.91	0.55	0.55
TROG controls	0.96	0.69	0.79	0.89	0.28	0.42

Table 2. Results of autistic children (Perovic, Modyanova & Wexler, 2007)

With respect to binding, as found in the previous study of Perovic et al. (2012), there were major difficulties interpreting reflexives in the autistic population, and some difficulty interpreting personal pronouns. The autistic population in their study performed very poorly on comprehension of passives. Perovic et al. concluded that grammar is severely impaired in autism.

Although we see mixed results here, as pointed out by Terzi et al. (2012), there are apparent differences in the two studies.

Another study that involved research on comprehension of passives was one completed by Terzi, Francis, Marinis, and Kotsopoulou (to appear). They investigated Greek-speaking high-functioning children with autism. The main purpose of this study was to recognize the domain of grammar in which Greek speaking children with high-functioning autism have the most problems. They looked at pronoun references and non-active morphology, using a picture selection task. The task included such elements as strong pronouns, clitic pronouns, and reflexive pronouns. The non-active verbal morphology part of the experiment included passive verbs that have passive interpretation, reflexive verbs with passive interpretation, and reflexive verbs that have reflexive interpretation. The subjects of this study included twenty 5-8 year old high-functioning children with autism (mean age: 6.08 months) and twenty TD children of similar chronological age, as a control group. The experiment was designed with 6 conditions, and a total of 36 sentences (6 sentences per condition). These conditions were strong pronouns, clitic pronouns, reflexive pronouns, passive verbs with passive interpretation, reflexive verbs with reflexive interpretation, and finally, reflexive verbs with passive interpretation. There is an example of each condition in (1). Each sentence was presented with three pictures: one is the target answer, and the other two are foils.

(1) a. I Maria pleni aftin. Strong pronoun
the Mary wash.3s she.acc.full.pronoun
'Mary is washing her.'

b. I mama tin pleni. Clitic pronoun
the mom she.acc.clitic wash.3s
'Mom is washing her.'

c. O Giorgos skepazi ton eafto tu. Reflexive pronoun
the George cover.3s the self his.
'George is covering himself'

d. O papus taizete. Passive verbs with passive interpretation
the grandpa feed.3s.non-act
'Grandpa is being fed.'

e. O Petros skepazete. Reflexive with reflexive interpretation
the Petros cover.3s.non-act

'Petros is covering himself.'

f. O Giorgos skepazete. Reflexive with passive interpretation
the George cover.3.s.non-act
'George is being covered.'

The results from this study suggest that, among all the conditions included in the experiment, clitics was the only condition in which the high-functioning autistic group performed significantly different than the TD group. Therefore, reflexive pronouns, which were an area of deficiency in Perovic, Modyanova and Wexler's (2012) experiment for English, did not identify any problems in Greek-speaking autistic children. The result of passive interpretation also showed similar performance in TD and ASD groups. Both groups performed much worse in comprehension of passive verbs with passive interpretation compared to the other conditions. Table 3 provides Terzi et al's results on passive verbs and reflexive verbs with passive comprehension in both ASD and TD groups.

Group	Passive verbs with passive interpretation	Reflexive verbs with passive interpretation
ASD children	66.6	93.3
TD children	70	94.9

Table 3. Mean percentage correct of ASD and TD participants (Terzi et al. to appear)

As we know, heterogeneity existing in ASD suggests that testing low functioning and high functioning children may give different results. Perovic et al.'s participants with autism performed poorly, and Terzi et al.'s high-functioning participants did well on reflexive pronouns. Here I will pursue the work of Terzi et al. (to appear) and Perovic et al. (2007) in the investigation of passive in ASD. The development of passives is known to be delayed in children. The next section focuses on this phenomenon, and is followed by a description of the passive structure of Persian, the language considered in the current study.

3. The Acquisition of Passive

It is interesting that passives happen to be delayed in first language acquisition. Almost all cross-

linguistic data so far have suggested that children have difficulties in comprehending passives. In many languages, from diverse language families in which actual experiments have been performed, the same conclusion, that there is a delay in the acquisition of passive, is reached. Some of the languages investigated are: French (Sinclair, Sinclair, and Marcellue, 1971 cited in Suzman, 1985), German (Mills, 1985; Bartke, 2004), Hebrew (Berman, 1985), Mandarin Chinese (Chang, 1986), Dutch (Verrips, 1996), Japanese (Sugisaki, 1998), Spanish (Pierce, 1992), Brazilian Portuguese (Gabriel, 2001), Greek (Terzi & Wexler, 2002), Russian (Babyonyshev & Brun, 2003), Serbian (Djurkovic, 2005), and Catalan (Gavarró & Parramon, 2011). Therefore, universal passive delay is strongly supported by experimental studies around the world, in different languages. Yet, there have been no such experiments run on a Persian-speaking population.

The attested delay has led to the rise of many theoretical hypotheses, mainly trying to answer the following questions: What makes learning and comprehending passives take longer than other grammatical aspects of language in children? Among all the unique properties of the passive voice, which is causing this delay?

The next sub-section describes some of recent approaches to this phenomenon. (See also Deen (2011) for a recent summary). The theories fall into two classes. One class takes into account performance factors (Input-based accounts) (Pinker et al. 1987). The other considers development of language, and delays in certain features of child grammar being based on grammatical differences of the child with the adult (grammar-based accounts) (Wexler 2004; Hyams & Snyder 2005).

3.1 In-put based accounts

There are accounts that associate delay in any language development to the structure given as an input to children. Demuth (1989) related acquisition of passive's timetable in children to how frequently adults use passive sentences, and the degree to which children are exposed to the passive input. The more frequent use of passives in adult language, the earlier development of passives in children, and vice versa. Demuth's argument is based on her results on Sesotho, a language in which passives are common in the input and, Demuth claims, children acquire passive early.

Another input-based theory is the one proposed by Lau (2011). This account argues that the timing of the acquisition of a structure is not only due to frequency, but also consistency of the input. In Cantonese, for instance, Lau tested children on bei-passive construction, rarely used in

the language, yet children acquired it early. The author argues that the ability of children to learn bei-passives early is because such structure is obligatory in Cantonese, unlike the use of by-phrases that are optional in English passives.

3.2 Grammar-based accounts and studies

De Villiers and de Villiers (1973) and Baldie (1976) were among the first scholars to test a large number of young children. Compared to active sentences, the passive was notably delayed. Comprehension of passives was claimed to be around the age 6;0, and finally comes the development of the ability to produce passive sentences by themselves (almost 7;6). Some of the well-known studies on finding the reason behind comprehending passives in general were looking at verbal differences used in passive sentences. When a verb designates an action, it is called actional verb, and when it designates an experience, it is called non-actional/psychological verb. Trying to find verbal semantics reasons behind delay in comprehension of passives, Maratsos et al. (1985) and Sudhalter and Braine (1985) both tested comprehension of actional and non-actional passives in children. They had similar findings for English in that children performed much better in comprehending actional verbs (3) than non-actional (psychological) verbs (2).

(2) She was remembered by her sister.
(3) She was held by her sister.

Therefore, not only do children have difficulty comprehending passives, but also they seem to have a far greater difficulty with psychological passives than with actional passives.

3.2.1 A-Chain Deficit Hypothesis and the Universal Phase Requirement

The A-Chain Deficit Hypothesis (ACDH), by Borer and Wexler (1987, 1992), suggests that children's difficulties with passives comes from their inability to form the A(rgument)-chain between the underlying object and subject position. The movement of the object into subject position is an example of A(rgument)-Movement, since the moved element moves into an argumental position (a position selected for by the verb, such as subject or object). Lacking A-chains, children are unable to syntactically allocate the accurate thematic role to the displaced object. This inability of representing A-chains is thought to be biologically determined, and will

be resolved sometime after the age of five. Nevertheless, children try to syntactically parse passives. Hence, in English, the only type of passive available to children is the adjectival passive which does not involve an A-chain. So basically, example (4) can be interpreted as either passive or adjectival, and children tend to interpret it as the latter (5).

(4) The door was broken (by the wind).
(5) The door was broken. (Description of the state of the door)

The ACDH does not make a distinction between comprehension difficulties between actional and psychological passives, the latter thought to be developed later than the former. Borer and Wexler do further develop their theory, claiming that the reason for psychological passives being more poorly understood is that actional verbs are more likely to be interpreted as adjectival (6), and psychological verbs do not have the adjectival interpretation (7).

(6) John was combed.
(7) *John was seen.

Assuming the adjectival interpretation of passives in pre-mature children, their difficulty with by-phrases may also be explained. Adjectival passives do not occur with by-phrases, therefore, when children are confronted with passives without by-phrases (short passives), they may interpret them as adjectival passives, but this is not so with long passives[2].

The debate over the influence of biological or environmental factors in determining the rate of acquisition of passives led to implementation of a twin method by Ganger et al. (2004). This study used identical and fraternal twins comprehension on actional and non-actional passives, and the timing of the development of the passive in English, based upon individual differences. The results suggested that actional passives were more exposed to environmental factors, showing little effect of heritability, and non-actional passives, on the other hand, showed the opposite. The Results of this study overall supports Borer and Wexler's mapping between actional passives and adjectival passives, and rejects Pinker's (1987) theory of non-actionals being highly dependent on environmental factors.

The Universal Phase Requirement (UPR) is a recasting of Borer and Wexler's (1987, 1992)

[2] It is important to note that ACDH does not only predict delay for passive sentences, but also any structure that involves A-movement such as unaccusatives, and raising verbs, which leads to the prediction of synchronous development across such patterns.

hypothesis, formulated in Wexler (2004), based on Chomsky's (2001) notion of phase in the minimalist framework. Chomsky states that, in passives, vP doesn't designate a strong phase, therefore raising the object to subject position is possible. UPR states that, what causes the premature children difficulty to comprehend passive structure is their immature knowledge of the phase properties of vP: Children happen to take all v's to be phases. For adults, while v*P defines a phase, v_{def} is deficient and therefore do not define a phase. Yet children generalize all v's as heading phases. This is an over generalization of phase building, and Non-defective v does not allow them to raise the object to surface subject position, because the promoted subject is not in a Spec relationship with the lower phase as so it is not visible, and available for movement. This also applies to similar constructions, such as unaccusatives, raising verbs, etc.

3.2.2 Theta Transmission

Horgan (1978) tested 234 participants (ages 2-13) with a picture description task, and reported that children rarely produced long passives, and they had a high tendency to produce short passives. Focusing on this observation and in the optionality of the agent by-phrase, the Theta-transmission hypothesis formulated by Fox and Grodzinsky (1998) places children's delay in passives on their problems with transmitting theta roles to the complement position of the by-phrase. This hypothesis explains children's difficulty with long non-actional passives because the theta-role transmitted to the by-phrase in these types of passives holds the experiencer role versus the agent role. Other predictions of Theta-transmission are early development of actional passives in comparison to non-actional passives, and no problems with short passives of actional/non-actional verbs, and long actional passives. Although these predictions were fulfilled in the small sample of children tested by Fox and Grodzinsky (1998), the results have not been replicated.

3.2.3 The Smuggling Approach, and Universal Freezing Hypothesis

Collin's (2005) analysis of passive, known as the "smuggling approach" is based on the idea that the external argument is merged in the passive in exactly the same way as it is in the active. The Universal Freezing hypothesis, advanced by Hyams and Snyder (2006), is based on Collin's analysis and suggests that the Freezing Principle in adults (necessary to Collin's analysis) has not matured in children, and so they fail to apply exceptions to the Freezing Principle. Since the passive construction is an exception to the Freezing Principle, children cannot recognize it as an exception, and therefore cannot extract a subpart of an already moved phrase, and the smuggling

approach is unavailable to children (Hyams & Synder, 2006: 13).

3.2.4 Argument Intervention Hypothesis

Argument Intervention (AIH) is a recent hypothesis proposed by Orfitelli (2012). Orfitelli conducted a series of seven experiments exploring the late acquisition of subject-to-subject raising. The AIH states that: "children are delayed in acquiring those structures which require A-movement across a structurally intervening argument" (Orfitelli, 2012: 126) Basically, it argues that children have difficulty raising any argument over another one due to a locality constraint (the object of the sentence moving to the subject position). This hypothesis makes the same predictions as UPR with respect to passives, but differs in its predictions with respect to e.g. unaccusatives.

3.3 Passive Structure in Persian

Persian is part of the Indo-Iranian branch of Indo-European family of languages (see Appendix 1). It is the first spoken language in Iran, Afghanistan, Uzbekistan, and Tajikistan. Persian has evolved over the years, to what is known today as modern Persian, or Farsi.

Generally, the use of passives is rare in Persian. Although passive constructions have always been part of this language, translations from other languages such as English, and French have caused an increase of passive sentences in written Persian (Nemati, 2013).

Naturally, passives have transitive verbs (TVs) at their root. In some languages, passives are formed by a strict morphological change in the verb. These types of passives are called morphological passives. In other languages, a morphological alternation of a TV comes along with an auxiliary, which is specific to make passive structures. Modern Persian does not have morphological passives. It only has the periphrastic passive, which has changed from Old Persian to a whole new format. In Modern Persian, the verb *šodan* 'to become', has shifted from its old meaning 'to go', and is used as a passive auxiliary, with the meaning of 'to become'. This verb not only can be used as an auxiliary to form passives, but it can also be used as a copula with an inchoative interpretation (as will be discussed further in this section). Syntactically, the verb *šodan* has a special characteristic, and that is its ability to take, as complements, different elements such as the past participle of a verb, a nominal, and an adjective. When *šodan* is combined with the past participle of a verb, a basic form of passive is constructed, as exemplified in (8).

(8) a. Ali Mina râ boosid.
Ali Mina OM kissed.3.SG
'Ali kissed Mina'

b. Mina tavasote Ali boosid-eh šod.
Mina by Ali kissed.PTCP become.3.SG
'Mina was kissed by Ali'

The defining characteristic of passives in Modern Persian is illustrated in (8b). The object of the active sentence (8a), which is marked by the object marker *râ*, is promoted to the subject position in (8b), and the subject is demoted, headed by the by-phrase, which is introduced by *tavasote*.

Overall, passive voice in Persian is a controversial grammatical construction. One well-known work in this area, which has attracted a lot of attention, is Moyne's (1974) claim that the passive construction in Modern Persian does not exist. What we form today with the verb *šodan*, so called passivized verbs, are in fact inchoative. Karimi (1997) also claims that Persian lacks raising constructions. This claim is based on four pieces of evidence: One is that the embedded subject does not need to move into the matrix clause. Second is that the embedded subject agrees with the embedded verb. Third is that there is no agreement between the matrix verb and the moved embedded subject. And forth is that any other phrasal element may move into the matrix clause in these constructions (Taleghani, 2008). The following example illustrates these four points:

(9) Be nazar mi-y-ad/*mi-y-an (ke) bacce-ha
view DUR-come .3.SG / *view DUR-come .3PL (that) child-PL
in film- râ did-eh ba-šan.
this movie OM see.PTCP be.3.PL
'It seems like the children have seen this movie.'

(10) In film- râ bacce-ha be nazar mi-y-ad/*mi-y-an
this movie- OM child-PL view DUR-come .3.SG / *view DUR-come .3PL
did-eh ba-šan
see-PTCP SUBJ-be.3.PL
'The children seem to have seen this movie'

In example (9), the embedded subject *bacce-ha* "child-PL" agrees with the embedded verb *dide ba-šan* "see.PTCP SUBJ-be.3PL", yet does not agree with the matrix verb *be nazar mi-y-ad* "view DUR-come .3SG", which is singular. In example (10), the object of the embedded clause moved into the matrix clause, and the subject remains in-situ. The sentence is still grammatical. From the same evidence, Taleghani (2008) concludes that Persian does not have raising construction, yet, for discourse reasons, embedded elements can move into the matrix clause.
Another view is that of Dabir-Moghaddam (1982) who argues that there are only "basic passives" in Persian, such as example (8b) with past participle of the verb + *šodan*, and the rest of the verbs that are combined with *šodan* are complex predicates, which could not be interpreted as passives. Here I will follow a recent study on the syntax-semantics of passives in Persian by Nemati (2013), who argues that passives in Persian involve movement and creation of an A-chain. The verb *šodan* 'to become', and the combinations possible with this verb in Persian are also discussed. Overall, any combination with *šodan* can be schematized as: X + šodan, given that Persian is a head-final language. There is also a different and rare type of passive in Persian, which is called impersonal passive (there seems to be no subject involved), which I discuss briefly.

3.3.1 Past participles + šodan

Canonical passives are typical types of passive formation with an overt agent as their defining characteristic. The verb involved in this type of passive is also generally the past participle of its active sentence counterpart, and this past participle precedes the conjugated *šodan*; 'to become', as in (11b). (11a) also shows that Persian objects are marked by an object marker – *râ* (11a), which the raised object does not have any more (11b) (Karimi, 1997; Cagri, 2007; Jayaseelan, 2008)

(11) a. Madar name râ nevesht.
mother Letter-OM wrote.3.SG
'Mother wrote a letter.'

b. Name (tavasote madar) nevešteh šod.
the letter (by mother) written.PTCP became.3.SG
'The letter was written.'

In the above example, the verb that appeared in the active form of the sentence is *nevešt* 'wrote'.

In the passive, there is an extra morpheme *–eh*, that is attached to the end of the verb. This morpheme turns the verb into its past participle (PTCP) form. The past participle of the verb followed by conjugated *šodan* forms the basic passive: nevešt-**eh** + šod. In the present tense, every indicative verb is accompanied by the prepositional particle *–mi* (Samvelian & Tseng, 2010). Table 4 illustrates the two verbs *neveštan* and *khordan* in Present, Past, and Passive forms (past participle + šodan). For passive in the present tense, the only thing that changes is the tense of the verb *šod*: khord-**eh** + mi-šavad; 'is eaten'.

Durative Prefix (DUR) Mi+Verb	Past Stem	Past Passive Past Participle + šodan	Present Passive Past Participle + mi + šodan
Mi-nevešt	nevešt	Nevešt-eh šod	Nevešt-eh mi-šod
Mi-khorad	khord	Khord-eh šod	Khord-eh mi-šod

Table 4. The two transitive verbs neveštan 'writing' and khordan 'eating'

However, there are intransitive verbs in Persian that can also precede *šodan*. These types of intransitive verbs do not appear with *šodan* to form passives, rather *šodan* is part of the verb itself. For instance, 'feeling relieved' is one of those intransitive verbs: *khiali asood-eh* (12). This is one of the cases where *šodan* does not form passive, but is a copula with an inchoative interpretation. Therefore, there is a syntactic similarity among some intransitive verbs, and some past participles of transitive verbs.

(12) Ba didan-e madar xiyal-aš asudeh šod.
with seeing-Ez mom imagination-his relieved became.3.SG
'With seeing mother, he felt relieved.'

These types of intransitive past participle verbs can take comparative suffix *-tar*, and express a state when proceeding nouns, therefore act like adjectives. The following example (13)-(14) illustrates the adjective form of intransitive verb *asud-eh šodan*; 'to be relieved':

(13) Khiali asood-eh
with imagination-indf relieved
'Feeling relieved'

(14) Khialaš asood-eh-tar šod.
imagination-his relieved-CMPR became.3.SG
'He felt more relieved.'

In the example (14), the past participle of intransitive verb *asood-eh* took the comparative suffix –*tar* 'more'. In contrast, the past participle of a transitive verb does not take adjectival suffixes, and cannot be interpreted as an adjective (e.g. 15) (Vahidian, 1992). On the other hand, if we insert a by-phrase to the past participle of the intransitive verbs, the outcome will be ungrammatical (16), and therefore by-phrases can be a test for real passive structures.

(15) *Xane saxte-tar šod
house built-CMPR became.3.SG
'The house became more built.'

(16) Golha (*tavasote mina) pazhmord-eh šodand
flowers (by Mina) withered-PTCP became.3.PL
'The flowers became withered.'

There is an additional way to distinguish the two forms: by adding the negative marker *-n* to the past participle of the verb. If it is in the passive form, it does not directly take the negative marker –*n* (18b), but rather *šodan* takes it (18a). If it is an adjectival past participle, then it directly takes the negative marker –*n* (17).

(17) **Na**-did-eh.
NEG-see-PCPT
'He has not seen.'

(18) a. Did-eh na- šod-eh.
see-PCPT NEG-became.3.SG
'Has not been seen.'

b. *Na-dide šod-eh
NEG-saw-PTCP became.3.SG
'Has not been seen.'

From the discussion above, we can conclude that, in Persian, past participle of a transitive verb +

šodan features a basic passive structure and forms a passive reading of verbs in simple predicates.

3.3.2 Nominals + šodan

In Modern Persian, a maximum of 115 lexical verbs are used. The rest are compounds, meaning that the verbs are complex phrases formed as a combination of light verbs with nominals, adverbs, and/or adjectives (Sadeghi, 1993). Due to an increase in tendency to use complex predicates, there has been a growing number of passive constructions, especially in written Persian, in which instead of having past participle preceding *šodan*, so called the basic Persian passives, there is a nominal replacing the past participle before *šodan*. The formation of such compound predicates is actually one of the supporting pieces of evidence used by scholars who believe that there are no real passive structures in Persian (Taleghani, 2008). In (19b), the agentive light verb *kardan* 'do/make' is replaced by the inchoative verb *šodan*. In (19c), when the light verb *kardan* is turned into past participle *kard-eh* to form passives, the sentence becomes ungrammatical. Therefore, there is no room for two non-verbal elements at the head of the complex predicate.

(19) a. Ali xuna-ro xarab kard.
Ali house-râ destroyed did.3.SG
'Ali destroyed the house.'

b. Xune xarab šod.
house destroyed became.3.SG
'The house was destroyed'

c. *Xune xarab kard-eh šod
*house destroyed made-PTCP became.3.SG

Let us briefly introduce Persian complex predicates. A complex predicate, which involves a nominal followed by a light verb, is passivized differently than the basic passives. In most cases, the light verb in the compound is a finite form of *kardan* 'to do'. But as mentioned in the beginning of this section, there are other light verbs involved in the making of complex predicates, such as *dadan* 'to give' (22), *šodan* 'to become', *gereftan* 'to take' etc. But the most common light verb used in complex predicates is *kardan* (20) & (21).

(20) taghaza kard
request did.3.sg
'requested'

(21) partab kard
throw did.3.sg
'threw'

Interestingly, when passivizing such complex predicates, *kardan* 'to do' is replaced with *šodan* 'to become' (22)-(23). Here, *šodan* no longer has a light verb effect, but a passivizing effect.

(22) Taghaza šod.
request became.3.SG
'It was requested'

(23) Partab šod.
throw became.3.SG
'It was thrown.'

This alternation of the light verbs only applies to the verb *kardan*, yet Persian has other complex predicates with other existing light verbs:

(24) Reza be man yary dad.
Reza to me help gave.

In (24), *yary dadan*; 'helping' is a complex predicate consisting of the noun *yary* followed by the light verb *dadan*. In such cases, when the light verb is a verb other than *kardan*, passivization is achieved without elision of the light verb. The passive form for the verb in (24) is presented in (25):

(25) Be man yary dad-eh šod.
to me help give.PTCP became.3.SG
'I was helped.'

If we want to go by the general rule of passive formation, the complex predicates, where the verb *kardan* is involved, should get the passivized suffix *–eh* to *kard* and followed by the verb *šodan*:

'kard-eh šod'. But this is not the case. In complex predicates with *kardan,* alternation happens : the verb *kard* is replaced by *šod*.

Nemati (2013) ran an experiment among native Farsi speakers to examine the awareness of passivization strategies. This experiment, which asked participants of their preference of verbs used in different passive situations on a questionnaire, showed that not one participant used the format *kard-eh šod.* Participants in this study used light verb alternation when faced with complex predicates made with *kardan* (substituting *kardan* with *šodan*), and overall preferred the use of basic passive information in general. There are also some cases of complex predicates with light verb *kardan* in the current study.

3.3.3 Adjectives + šodan

Just like there are nominals preceding *šodan*, there are adjectives that appear before *šodan*. However, these complex predicates are more complex in that they appear along with an apparently agentive by-phrase:

(26) Miz (tavasote mina) tamiz šod
table (by Mina) clean became.3.SG
'The table was cleaned (by Mina).'

(26) shows the ambiguity caused by the nature of *šodan*. As mentioned in the beginning of this paper, *šodan* can either act as a copula with an inchoative interpretation (light verb) or as an auxiliary in passive constructions. The adjectives that precede the verb *šodan*, only in the case of being caused externally by a proto-agent cause and showing causative alternation, can form passive constructions (27). Otherwise, if the change is internally caused, they will form inchoative constructions (28).

(27) Mina miz râ tamiz kard. (active: adjective + kardan)
Mina table OM clean did.3.SG
'Mina cleaned the table.'

(28) Miz tamiz šod (passive: adjective + šodan)
table clean became.3.SG
'Table became clean.'

Ambiguity arises in those cases of complex predicates formed by adjectives; when both external and internal causes can be cited (29). When the change is internally caused, the result is an inchoative construction (29a). In cases where both externally and internally caused scenarios can be conceived of, the ambiguity between inchoative and passive interpretation arises (29b).

(29) a. Barg-e deraxtan zard šod.
leaf-Ez trees yellow became.3.SG
'The leaves of the trees turned yellow.'

b. Golha (tavasote mina/ xod-be-xod) xošk šod-and
flowers (by Mina/ on.its.own) dry became.3.PL
'Flowers were dried (by Mina)/ became dry (on their own).'

3.3.4 Impersonal Passives

Finally, there is empirical evidence for passive structures that seem not to have a subject. These rare cases are called impersonal passives (Nemati, 2013)

(30) a. Dowlat az an-ha hemayat mi-konad.
government from them-PL support DUR-do.3.SG
'The government supports them.'

b. Az anha (tavasote dowlat) hemayat mi-šavad.
from them (by government) support DUR-become.3.SG
'They are supported by the government.'

The syntactic structure in which they appear can be best categorized as the passives of intransitive *kardan* complex predicates, as the above pair of sentences (30a,b), respectively in active and passive voice, illustrate: *kardan* in the active (30a) alternates with *šodan* in the passive (30b). However, what makes these cases different from the intransitive *kardan* complex predicates is the lack of a surface subject. Nemati explains: "the recipient of the action is realized in syntax as a prepositional phrase and is not promoted to the subject position to take on a nominative case as is typically observed in canonical passivization. An overt pronoun in the subject position results in ungrammaticality" (Nemati, 2013:277). The following illustrates this ungrammaticality:

(31) * U az anha hemayat mi-šavad.
he from them support DUR-become.3.SG

The change in the verbal ending to 3rd person plural *mi-šavand* and positing a 3rd person plural pro renders the sentence ungrammatical as well:

(32) * Az anha hemayat mi-šavand
from them support DUR-become-3.pl
'They are supported by the government.'

These passives are rarely used in both written and spoke Persian (Nemati, 2013).

3.4 Summary of Literature Review

A vast amount of experimental data indicates that passive is a late acquisition. The main question here is: why do children normally begin to develop passives around the same age cross-linguistically? On one hand, there are studies which suggest that environmental factors, such as the frequency of the use of passives, are mostly responsible for the delay in passive acquisition. On the other hand, there are theories that put forward compelling evidence on different grammatical structures involved in representing passive constructions being maturationally delayed. For instance, the UPR, UFH and AIH are all based on the idea that syntactic locality constraints on A-movement is what is lacking in the pre-mature child's grammar: according to UPR, children have difficulties with constructions where movement through a phase boundary without going through the edge is necessary, and basically demanding for non-local A-movement; in the UFH and AIH, the difficulty lies in constructions in which an argument has a higher position than a more local one.

Persian passive structure, syntactically, includes basic passives, complex predicate passives with nominal, complex predicate passives with adjectives, and impersonal passives. There is a lexical semantic similarity among all these types of passives, since they all resort to the light verb *šodan*; 'to become', and have a complex event structure. Ambiguities that might arise from some of these forms are mostly due to the nature of *šodan*, which could be acting as a copula or auxiliary. Nemati (2013) shows how to solve some of the controversies over the Persian passive structure by suggesting that different interpretations of the verb *šodan* are due to the "interaction of the lexical semantics of *šodan* with the lexical semantic specification of other constituents in syntax

to calculate the meaning compositionality" (Nemati 2013: 279).

4. Direction of the current study and hypotheses

In the current study basic Persian actional passives (Past Participle of action verb + *šodan*) as well as the Nominal in X + *šodan* are investigated. They are more frequently used among Persian adult speakers; therefore, children are more exposed to these types of passives. To illustrate, the following four examples, in their active and passive form, are extracted from the experiment. Note that the verb *mi- šavad* in (34) and (36), which are the passive structures, is the present continuous form of the verb *šodan*.

(33) Dokhtare koochak madar ra miboosad. (active)
girl little mom OM kiss.3.sg
'The little girl kisses mom.'

(34) Madar (tavasote dokhtare koochak) boosid-eh mi-šavad. (passive)
mom (by little girl) kiss-PTCP DUR-become-3.sg
'Mom is kissed (by little girl)'

(35) Dokhtare koochak dokhtare bozorg ra navazesh mi-konad. (active)
girl little girl big OM stroke DUR-does-3.sg.
'The little girl strokes the big girl'

36). Dokhtare bozorg (tavasote dokhtare koochak) navazesh mi-šavad. (passive)
girl big (by girl little) stroke DUR-become-3.sg.
'Big girl is stroked (by the little girl)'

(34) is the basic Persian passive form: *mi-boosad*: 'kisses' becomes *boosid-eh* + *mi-šavad* 'is kissed'. The example (36) is Nominal + šodan passive form: in active form (35), *Navazesh mi-konad*: 'strokes' becomes passivized in (36): *navazesh mi-šavad* (substitution of *kardan* with *šodan*). There is no investigation on the acquisition of actives and passives in the acquisition of Persian, therefore, I undertake this task with 5-6 year-old children and compare the new results with those available in the literature.

Although many early studies on syntactic aspect of language in ASD observed relatively strong lexical and syntactic knowledge in the ASD population, none of these studies deny a significant delay in development of such knowledge in this population. Knowing that children with autism show significant delay in language acquisition involving many aspects of language, including

comprehension, the goal of this study is to test autistic children on the comprehension of passives. Based on the two studies of Terzi et al. (to appear) and Perovic et al. (2007), the purpose is to investigate the comprehension of Persian passives in children with autism and to investigate whether there is a difference in the comprehension of passives between low-functioning and high-functioning children with autism.

My goal is to test the following hypotheses:

(a) Typically developing children comprehend passives in an adult-like manner past the maturational stage, which ends at the age of 5-6.

(b) Non-verbal IQ level affects grammatical performance. The lower the IQ level, the lower the performance.

(c) Low-functioning children with ASD score lower than High-functioning children with ASD in comprehending passive sentences.

(b) and (c) could help disentangle the mixed results coming from the two studies on passives by Terzi et al. and Perovic et al., based on the heterogeneity of language abilities in the autism spectrum.

5. Methodology

5.1. Subjects

The research on autistic children took place at the Autism Children Charity, in Tehran, Iran. Initially, there were fourteen children to be tested but due to highly disruptive behavior, four were eliminated from the study. These four children were of ages 7;4, 8;5, 6;2, 6;9, all non-verbal (unable to produce sentences), in the very low functioning end of the autism spectrum, categorized by psychiatrics based on the DSM-IV(APA Diagnostic and Statistical Manual of Mental Disorders).

The present study includes the remaining ten 6 to 13 year-old children with autism (mean age: 8;8). Also ten 5-6 year old typically developing children were tested. Ten adults were tested as a control group.

For the purpose of this study, participants diagnosed with ASD were divided into two groups of high-functioning and low-functioning autism. They were all regularly attending applied behavior, physical, occupational, and speech-language therapies at the charity center for at least

1 year.

Language	Group	Mean Age	N of subjects
Persian	Low	8;6	5
Persian	High	9;1	5
Persian	TD	6;2	10
Persian	Adult	27;5	10

Table 5. Participants' general description

The autistic children were tested on their Non-Verbal IQ by means of the Ravens Progressive Matrices test. This test is used in Iran to test Non-verbal IQ level of 5-9 year old normal children, and includes 36 questions. Each question includes a picture, from which a small part has been cut out, and children have to choose which of the 6 possible answers is the missing part from the main picture. The 5 high-functioning autistic children scored a mean of 49% correct answers out of the total 36 questions, and the low-functioning autistic children scored a mean of 20% correct answers. The individual scores are represented in the following two tables. The average for normal children ages between 5-9 years old is 55%.

Participant	Gender	Age	Raw score	Percentage
1	Male	6	7/36	19.4%
2	Male	6	2/9	22.2%
3	Male	8	5/18	27%
4	Female	12	2/9	22.2%
5	Male	13	5/36	13.8%

Table 6. Low-Functioning Children with ASD Non-Verbal IQ Scores

Participant	Gender	Age	Raw score	Percentage
6	Male	6	5/12	41.6%
7	Male	10	1/2	50%
8	Male	12	3/4	75%
9	Male	6	13/36	36%
10	Male	8	4/9	44%

Table 7. High-Functioning Children with ASD Non-Verbal IQ Scores

5.2 Materials

The current experiment is a replicate of COST Action 33 passive experiment, an experiment designed for a large-scale cross-linguistic investigation of the acquisition of passives in TD 5-year-old children (Armon-Lotem, Haman, Jensen de López et al., submitted).

The experiment is a picture selection task testing (i) long passives, (ii) short passives, and (iii) actives. The original experiment divided the sections into female and male characters, which in many of the languages tested in COST A33 related to gender differences; since Persian has no grammatical gender, the fact that female and male characters (26 female pictures and 18 male pictures) are depicted does not have any bearing on the grammar.

Each slide included four pictures. The experiment was designed for the participant to choose the picture that matched the sentence. The four pictures on each slide include the target (correct answer), and three mismatched pictures. Each picture shows three of the four characters introduced within sections. Two of these characters are directly involved in the action and one is a neutral observer. Among the three mismatched pictures, one depicts a role reversal of the two characters involved in the action (reversed agent and patient action), one depicts the neutral character substituting the agent, and one depicts no action. (See Appendix I for a list of all experimental items.)

In the female part of the experiment, the characters are: mother, little girl, big girl, and grandmother. In the male part, the characters are: father, little boy, big boy, and grandfather. The following is an illustration of short passive sentence with the target and the three mismatched pictures:

(37) Madar boosid-eh mishavad.
mom kissed-PCPT became.3.SG
'Mom is kissed.'

a) The three characters are in a neutral state. (Neutral. i.e., just sitting at a table with lack of any action)
b) The little girl is kissing mom. (Target)
c) Mom is kissing the little girl. (Theta-role reversal)
d) Big girl is kissing little girl (Substitute of agent and patient)

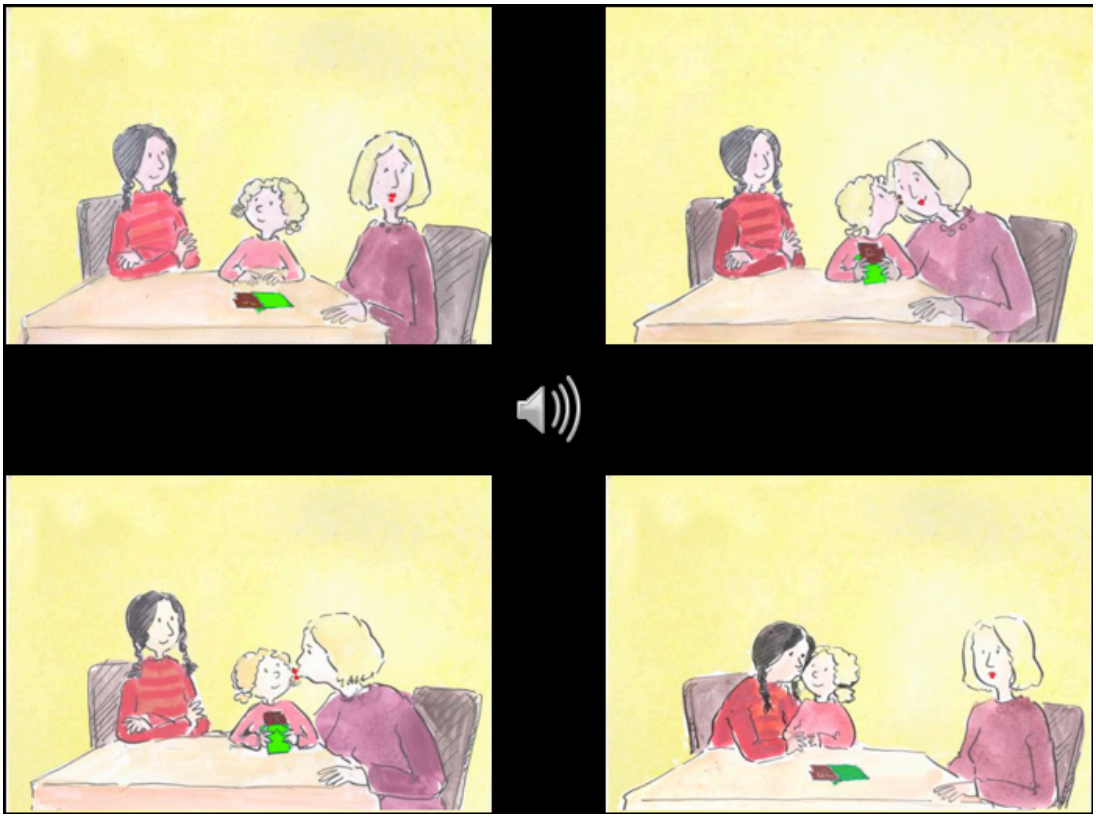


Figure 1. Target picture is on the top right

Figure 1 illustrates a slide with four pictures. Top left is "neutral". Top right is "target". Bottom left is "role-reversal". Bottom right is "other".

Many pictures from the original experiment were removed due to appropriateness to cultural sensitivities.[3] So our experiment included a total of 44 items, while the original COST A33 experiment included 88 items (44 active sentences, 22 short passives, and 22 long passives). The experiment was divided into four sections each including 11 active sentences, and 11 passive sentences. Therefore the total number of passives is 22. The actional verbs in our experiment were only a subset of those used in the original experiment: examine, chase, kiss, comb, draw, paint, push, hug, carry, stroke, cover, and shave (Appendix 3). The randomized items were presented in two orders: from 1 to 44 or the opposite, from 44 to 1.

5.3 Procedure

Each participant was tested individually in a quiet place, in the case of the subjects with autism mostly with the presence of their assigned speech pathologist, depending on the day they were tested. But there were also times that there wasn't anybody else but the experimenter (me) and

[3] Shia Islam is the official religion in the Islamic Republic of Iran. Some pictures in the experimental task included the family on the beach. I removed those pictures to avoid any conflicts with the official religion of the participants, and their families.

themselves. The experimental sessions were all administered on a Macintosh PowerBook computer using Microsoft Power Point to show each slide, on which a sentence had been prerecorded. The children were carefully given the instruction of the experiment. Before the main session started, children were presented with two trial items, not included in the experiment.

Before the actual test began, the participants were encouraged to ask questions. A given test item was presented as follows:

1. The slide including 4 pictures was displayed full screen mode.
2. A recorded voice, reading the sentence, which was assigned to the slide, was broadcasted. In some cases, I also read the sentences two or three times to them, to avoid miscomprehension of the recorded voice.
3. The participants were asked to point to the right picture.
4. Immediately after they answered a question, they were cheered and encouraged for motivation, and the next slide was presented to them.
5. After completing the test, they were provided with cookies, and an entertainment book for solving puzzles and coloring activities. The books were different, and were assigned to each child depending on his/her age.

6. Results

In this section I analyse the group differences among high-functioning autistic children, low-functioning autistic children, and TD children, on the comprehension of three types of sentences: Active, Short Passive and Long Passive. The variable of interest is the performance by each group (as Target, Reverse, Other, or Neutral).

The statistical analysis includes the descriptive statistics (Mean, Standard Deviation), and generalized Linear Model (Logistic regression) with repeated measures for the response variable. The analysis was performed with SAS software version 9.2 (SAS System, Cary, NC, USA, 2009) by the Servei d'Estadística Aplicada of the Universitat Autònoma de Barcelona.

There are two low-functioning participants who did not participate in answering all the items. Subject coded Low4, did not answer 4 items, from 32-35 (including 3 long-passives and 2 actives), and subject coded Low5 did not answer items 13-26 (including 7 actives and 7 short-passives). Therefore, the data points for the low-functioning ASD group, overall are 193 (44 items/subject times 5 subjects minus 27 missing values).

6.1 Descriptive analysis

6.1.1 Performance of all groups

In what follows I present the results of all groups, on all types of sentences. Note that the adult group scored at ceiling, with no errors, and so are no included. As we can see, TD children scored at ceiling on actives as well. Table 8 presents the results in percentages for the three subgroups of children, plus standard deviations.

Group	N of individuals	Response type	Mean	Std
Low	5	target	51%	14
		reverse	34%	5
		other	12%	8
		neutral	4%	3
High	5	target	90%	12
		reverse	8%	8
		other	1%	3
		neutral	0%	1
TD	10	target	97%	3
		reverse	3%	3
		other	0%	0
		neutral	0%	0

Table 8. Mean percentages and Standard deviation of participants' scores

This is graphically represented in Figure 2:

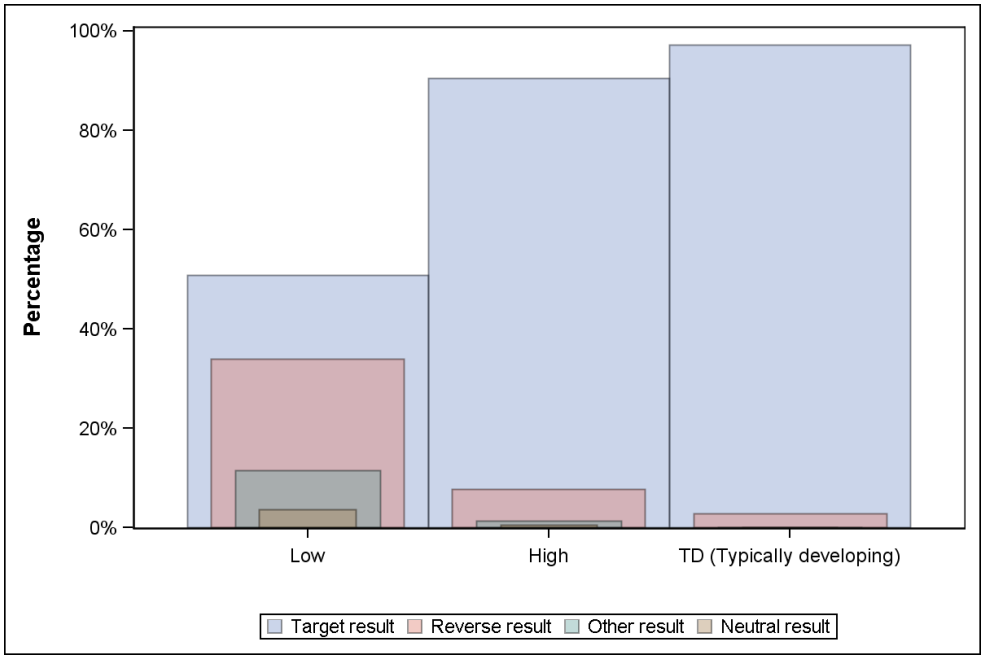


Figure 2. The results of all groups, on all types of sentences

The following Figure 3 shows the performance of all groups by sentence type. Note that the adult group was tested to check the accuracy of the translation of sentences, scored at ceiling, with no errors. As it's shown in Figure 3, TD children scored perfect on actives as well.

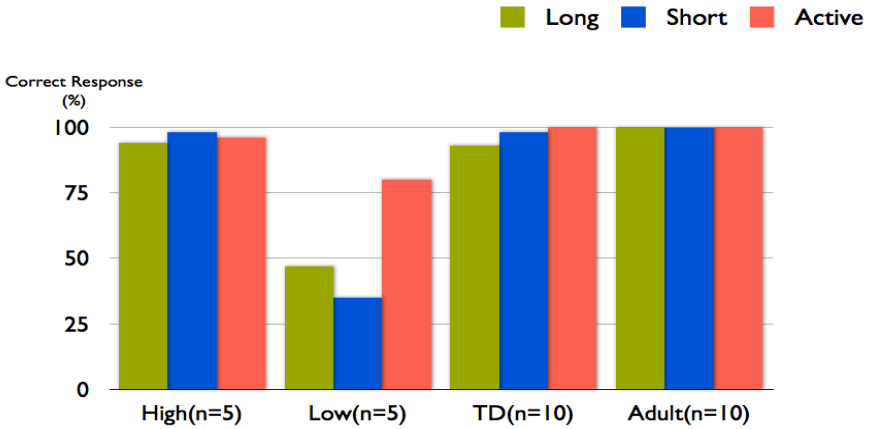


Figure 3. Performance of high and low functioning autistics, TD and adult groups on long/and short passives and active sentences

6.1.2 Order effect

To exclude the possibility that errors occurred as a consequence of the subjects' fatigue during the study, we considered the answer types taking into account order of presentation. In the Figure 4, we present the mean of Target, Reverse, Other, Neutral result in 1st, 2nd,…, 44th segment for all the subjects. The pseudo-random order of starting the experiment, either starting with male or female characters in the picture, has been taken into account. All subjects are represented in the graph, starting with autistic children, followed by TD children, and the adults. Figure 4 presents the order affect.

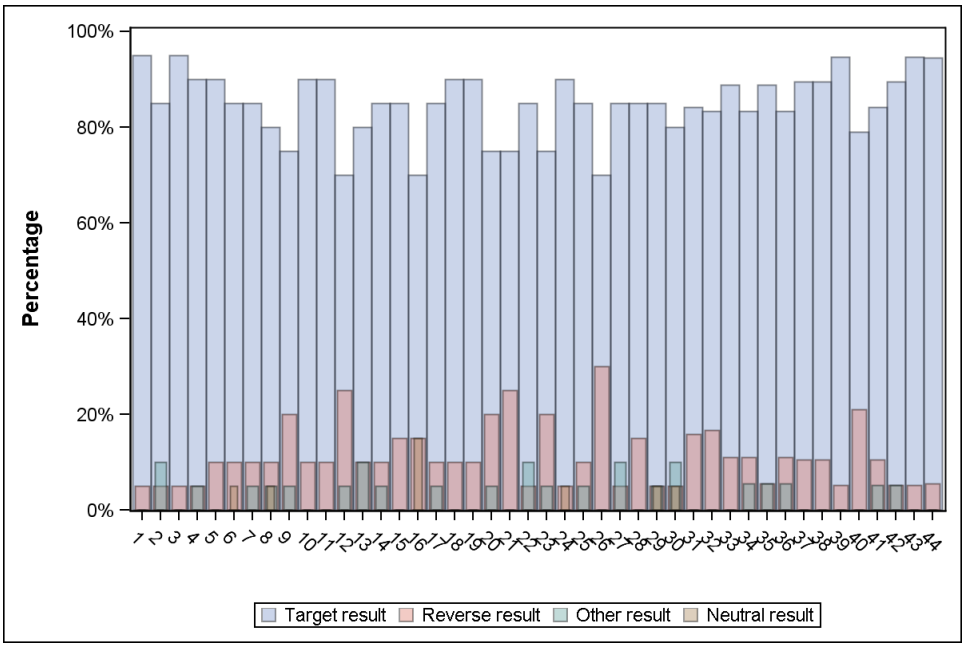


Figure 4. Order effect

Sentences 12, 16 and 26 have a 70% of individuals with Target result. These sentences show the worst performance, but we don't appreciate any tendency, so there isn't any order effect. In the following Figure 1 the percentages of Target, Reverse, Other and Neutral result for each individual are presented. The first five people are low functioning, from 6th to 10th are high functioning, and the rest are TD:

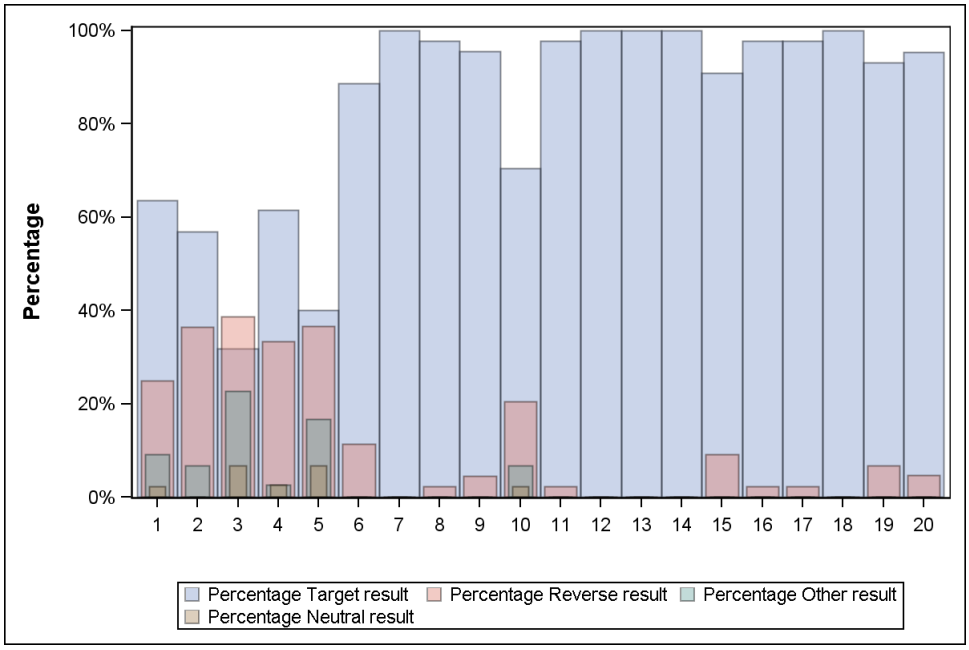


Figure 5. Percentage of Target, Reverse, Other and Neutral result for low, high, and TD groups, respectively

6.3 Statistical analysis

In this section, a Logistic Regression has been modelled for the binary response variable 'Target result' with covariates autism, type of sentence and the interaction among them. The goal is to estimate the differences among individuals with different conditions (low-functioning, high-functioning, TD), and the effect of type of sentence ('Active', 'Short Passive', 'Long Passive'). Primarily, there are the results comparing the effect of autism for each of type of sentences.

6.3.1 ASD vs. TD children

I first consider all the autistic subjects together and compare them to the TD, and then consider the high functioning separately from the low functioning.

- For active sentences, the Odds Ratio between autism and TD can't be estimated because the TD subjects have a perfect score of 100% in active sentences (there isn't any variability).
- For short passive sentences, the Odds Ratio between autism and TD is 0.035, $CI_{95\%}(OR)=(0.002, 0.599)$, and it is statistically significant (t=-3.37; p_value=0.0101). Thus, autism has 0.035 times the odds of the TD. This implies that the TD individual has much more likely to produce a target result than the autistic individual.

- For long passive sentences, the Odds Ratio between autism and TD is 0.122, but there is no statistically significant difference between the autistic group and TD in long passive sentences from this model. Percentages of target results for all the factor variables are shown in Figure 6. For each type of groups (autism, TD) and Type of sentences, the estimated percentage of target result with confidence intervals (CI) at 95% is presented:

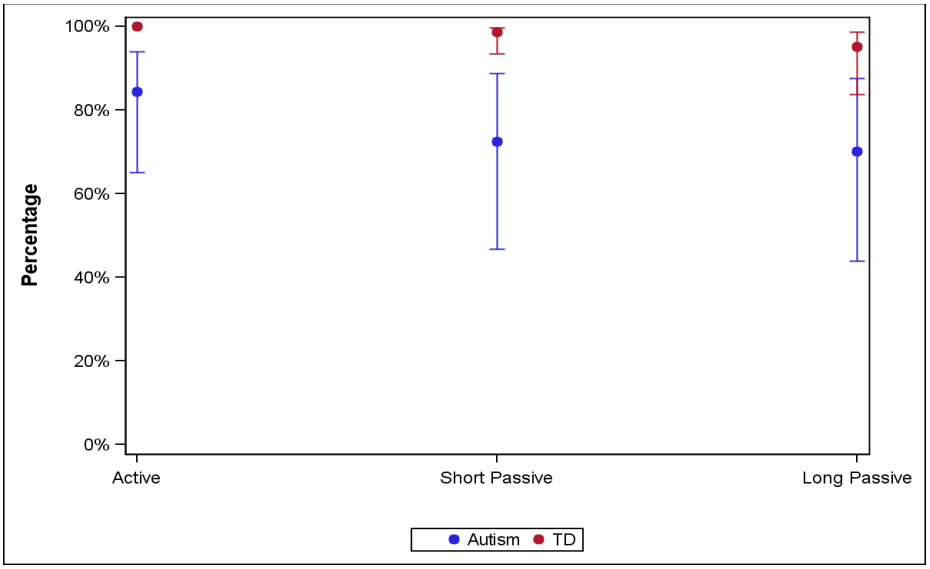


Figure 6. Percentages of target results for all the factor variabl

6.3.2 Low vs. High

In this section, I take into account only the individuals with ASD.

For each category of autism (Low, High) and type of sentence, the estimated percentage of target result with the confidence intervals (CI) at 95%, is presented in Figure 7. For Low-functioning individuals with autism, the Estimated Mean of 'target result' percentages are: for active sentences 52% with a $CI_{95\%}$ (30%, 73%); for short passive sentences 35% with a $CI_{95\%}$ (17%, 59%); and for long passive sentences 47% with a $CI_{95\%}$ (25%, 70%). For High-functioning individuals, the Estimated Mean of 'target result' percentages are: for active sentences 99% with a $CI_{95\%}$ (93%, 100%); for short passive sentences 94% with a $CI_{95\%}$ (81%, 99%); and for long passive sentences 81% with a $CI_{95\%}$ (59%, 93%).

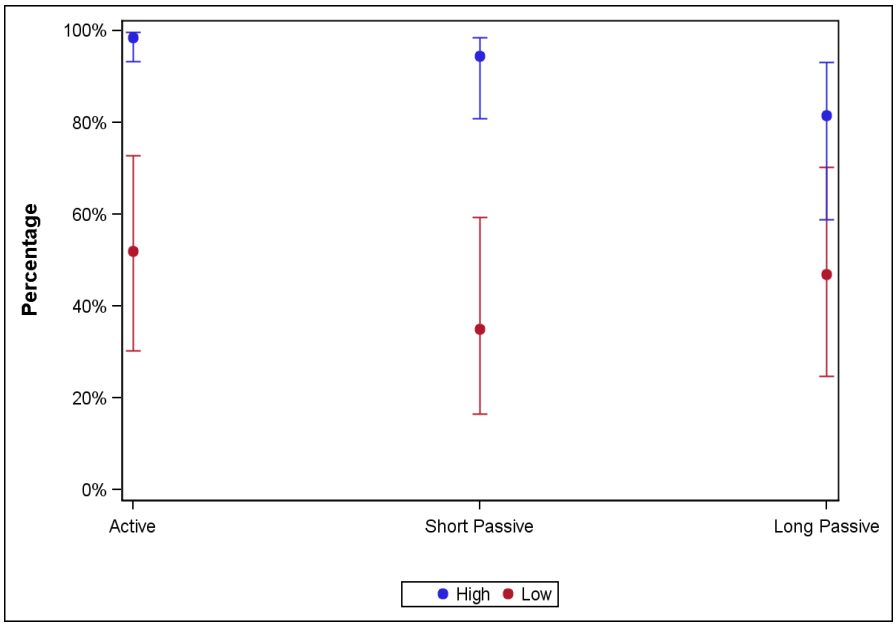


Figure 7. The estimated percentage of target result with the confidence intervals (CI) at 95% for each high-functioning

- For active sentences, the Odds Ratio between High and Low is 61.402, $CI_{95\%}(OR)=(4.5, 846.3)$, and therefore the difference is statistically significant (t=4.49; p_value=0.0001). Thus, in active sentences, the high-functioning group has 61 times the odds of low-functioning in choosing the target answer. That is, the high-functioning group is much more likely to produce a target result that the low-functioning group in actives.
- For short passive sentences, the Odds Ratio between High and Low is 31.209, $CI_{95\%}(OR)=(2.6, 374.1)$, and it is again statistically significant (t=3.97; p_value=0.0012). Thus, the high-functioning group has 31 times the odds of the low-functioning group in choosing the target answer, which implies that the high-functioning group is much more likely to choose Target answer than low-functioning group.
- For long passive sentences, the Odds Ratio between High and Low is 4.975, and there is no statistically significant difference between High and Low in long passive sentences.
- For individuals with low functioning autism, there isn't any statistically significant difference between the two types of passives (short and long)

- For high-functioning individuals, the Odds Ratio between active and long passive sentences is 15.074, $CI_{95\%}$(OR)=(1.9, 116.9), and the difference is statistically significant (t=3.79; p_value=0.0023).

6.3.2 High vs. TD

- For Short Passive Sentences, the Odds Ratio between High and TD is 0.325, therefore there are NOT statistically significant differences between High and TD in Short Passive Sentences.
- For Long Passive Sentences, the Odds Ratio between High and TD is 0.319, therefore there are NOT statistically significant differences between High and TD in Short Passive Sentences.

6.3.3 Low vs. TD

- For Short Passive Sentences, the Odds Ratio between Low and TD is 0.011, $CI_{95\%}$(OR)=(0, 0.2), and it's statistically significant (t=-5.33; p_value<0.0001). Thus, Low has 0.011 times the odds of the TD subjects. That is, TD is 1/0.011≈90.9 times the odds of the Low. This implies that the TD individuals are much more likely to have Target result than the low-functioning individuals with ASD.
- For Long Passive Sentences, the Odds Ratio between High and Low is 4.936, which implies that there are no significant differences in this type of passives between Low and TD.

6.4 Error Analysis

The following tables 9 to 11 provide analysis of the children's responses, based on the choices they made when their responses were inaccurate. Recall that the error choices are: "theta-role reversal", "other", and "neutral".

Actives	Low-F	High-F	TD
Theta-role Reversal	16/21	1/3	0
Other	4/21	1/3	0
Neutral	1/21	1/3	0

Table 9. Error Analysis of Active sentences this tables have to made the same as those before (or the ones before be made like this)

Long Passives	Low-F	High-F	TD
Theta-role Reversal	7/13	5/6	1
Other	5/13	1/6	0
Neutral	1/13	0	0

Table 10. Error analysis of long passive sentences

Short Passives	Low-F	High-F	TD
Theta-role Reversal	3/20	1	1
Other	7/10	0	0
Neutral	3/20	0	0

Table 11. Error analysis of short passive sentences

The error analysis of the two types of passives, short and long, among the three groups, clearly shows that while high-functioning children with ASD and TD children have fewer errors compared to the low-functioning children with ASD, they also had more errors in "theta-role reversal". Overall, with respect to actives, low-functioning children with ASD had more errors in "theta-role reversal", while high-functioning children with ASD had one error of each three types of errors, and TD children had no errors.
With respect to long passives, the low-functioning children with ASD had more errors in "theta-role reversal", and also made errors in "other" and "neutral", while high-functioning children with ASD only had one error in "other", no errors in "neutral, and most errors in "theta-role reversal". TD children only had one error in long passives in "theta-role reversal".
With respect to short passives, the low-functioning children with ASD had more error in "other", and equal errors in "theta-role reversal" and "neutral".

7. Discussion

The main goal of this study was to further investigate the grammatical abilities of children with autism, with specific emphasis on identifying the differences among subgroups within the population. The reason for such emphasis was to compare previous findings on comprehension of passives in children with ASD, especially with results from Perovic et al. (2007) and Terzi et al. (to appear). Overall the study was designed to answer the following questions:

1. In the domain of syntax, with respect to the comprehension of passives, do children with ASD display any deficiency or they experience the normal delay in developing this aspect of grammar?
2. Does the level of Non-Verbal IQ affect performance in the domain of grammar?
3. Which theory/theories of delay in comprehension of passives are most applicable to the results?

Based on the results presented in the previous section, in this section I discuss the findings of the current study, and try to provide possible answers to the questions above.

Considering the reasons behind the contrasting findings from the results of Greek-speaking autistic children and English speaking children with autism, Terzi et al. pointed out two factors. One was that the English grammar domain tested in Perovic's study did not have an exact counterpart in Greek. The other factor was that studies, which revealed grammatical deficit in children with autism, tested participants with autism who had lower than average non verbal IQ level. Hence, this factor was the underlying reason for testing both high and low-functioning children with ASD in my study. The results for Persian revealed that, overall, low-functioning autistic children performed significantly lower than high-functioning autistic children and the TD control group, while high-functioning children with ASD performed very much like TD group, but still not at ceiling.

7.1 Comparing Groups

7.1.1 Adult group

Since all participants in the adult group scored 100% on all items, the translation of the experiment from English to Persian is considered to be accurate, and comprehensible.

7.1.2 TD Group

As mentioned previously, this is the first study testing typically developing children on the comprehension of passives between ages 5-6 year old. Therefore, it is important to compare the results found in this group to studies in other languages which used the same experimental design (COST ACTION 33, Armon-Lotem et al., submitted). Knowing that the present study used basic passive formation in Persian (past-participle of the verb + *šodan*), this type of passive in Persian is known to be very similar to passive formation in English (Paul, 2003).

The results from testing 10 different languages (Danish, Dutch, Estonian, Finnish, German, Hebrew, Polish, Catalan, Cypriot Greek, Lithuanian) using the same experiment shows that overall the performance on short-passives is high, and comprehension of full-passives is more difficult than the short-passive. In the comprehension of short-passives, some languages had higher scores than others. The children's mean score on short passive sentences was 90.08, and on long passive sentences are 93.42. While Danish, Dutch, Estonian, Finnish, German, Hebrew, and Polish speaking children performed higher than Catalan, Cypriot Greek, Lithuanian and English speaking children, they all had above chance results. It is important to note that English and Greek were two languages in which children had significantly lower performance than the other 9 languages. Interestingly, these are the two languages from which children with ASD were tested on the comprehension of passives. My results from testing Persian-speaking children (mean age 6.1 month) reveals at ceiling performance on short-passives.

In the current study, the TD children only had a 6% error rate in passives. In the

comprehension of short passives, they had a 98% of correct answers, whereas in the comprehension of long passives they performed 91% correct.

The error analysis for the TD children indicates that in long passives where most errors were made, two items ('kiss' and 'examine') seem to have been more difficult. *Kiss* is an item that was also mentioned as the source of many reversal errors in the Cost Action 33 experiments. This was justified as *kiss* is a more reciprocal verb in nature. We can probably conclude the same for my results.

Also interesting to note is that all errors made by TD children in passives are the reverse interpretation. Similarly, from the COST ACTION A 33 results, the majority of children in 7 languages (Danish, Dutch, English, German, Polish, Catalan, and Greek) also made reversal errors. Based on this analysis, we can conclude that children tend to misinterpret passives as actives. They assigned the agent role to the subject in the passive sentence.

The typically developing children scored almost perfect in short passives, except for one participant who picked the role-reversal answer for one of the short-passives, with the verb 'carry'. In fact, I believe the reason for this was that the verb is rarely used for children. So, it is possible that this mistake was due to misunderstanding of the verb 'carry'.

7.1.3 High-Functioning Autism

The results show that high-functioning participants with ASD performed very well on short passives, close to the TD children's performance, and much better than on long-passives. Also, it is observed that all mistakes made in short-passives by the high-functioning ASD children were role-reversal choices, similar to the TD results. These two factors are in line with both Wexler's Universal Phase Requirement (2004). Just to recall this theory, the UPR states that for immature children, because of the phases establishment of restricted domains to movement, the movement of the internal argument is impossible (blocked). Therefore, pre-mature children develop passives later than actives, and in a language like English assign an adjectival interpretation to short passives. They make more mistakes with long-passives, because the existence of the by-

phrase does not allow them to assign an adjectival interpretation.

With respect to children's tendency to pick the theta-role reversal, the UPR can also explain such behavior, taking the raised object as the agent of the sentence because of their inability to move the object with the patient thematic role to the subject position.

Overall, participants in the group of high-functioning ASD didn't have significant difference in their performance on all types of passives from the TD group. They not only made most of their errors with role reversal, but also showed the most difficulty in long-passives. A sister study by Schroeder (in preparation) on Danish-speaking high-functioning children with ASD, ages of 13-18 (mean age of 15.7 months) reveals at ceiling (99%) performance of adolescent high-functioning autistics on all passives. Based on these results, we can confidently conclude that comprehension of passives in high-functioning children with autism is mature. High-functioning children with ASD do not fall behind TD children, and in fact there are no statistically significant differences between TD children and High-functioning autistics in short passive nor in long passive comprehension.

7.1.4 Low-Functioning Autism

The results of low-functioning children with autism show significantly lower performance on both passives and actives compared to the other two groups. Contrary to what was found on the other two groups, the Low-functioning children performed worse on short-passives (35%) than in long-passives (47%), and the choices were not mostly limited to reversal theta-roles.

Recall from the literature review the study of Perovic et al. (2007), which investigated comprehension of passives in AS and ASD, which suggested that grammar in autism is severely impaired, and such poor performance was thought to be derived from the inability of establish A-chains. The same analysis can be proposed for the current study. Although participants of this group showed complete understanding of the task, they had a very hard time matching the sentences to the pictures. It took a much longer time to test each of the participants of this group than the other two groups.

Since May 2013, AS is considered to be part of ASD, in the high-functioning category

(American Psychiatric Association, 2013). The results of my study suggest impairment in the passive domain of grammar in low-functioning autistic children. Results form both groups of low and high-functioning children with ASD are in line with the two studies of Terzi et al. on high-functioning autism, and Perovic et al. on AS and low-functioning autism. Further, the results of Persian-speaking TD group on the comprehension of passives are in line with previous cross-linguistic studies on this domain of grammar and indicate that the mechanisms underlying passives mature by the age of 6.

8. Conclusion

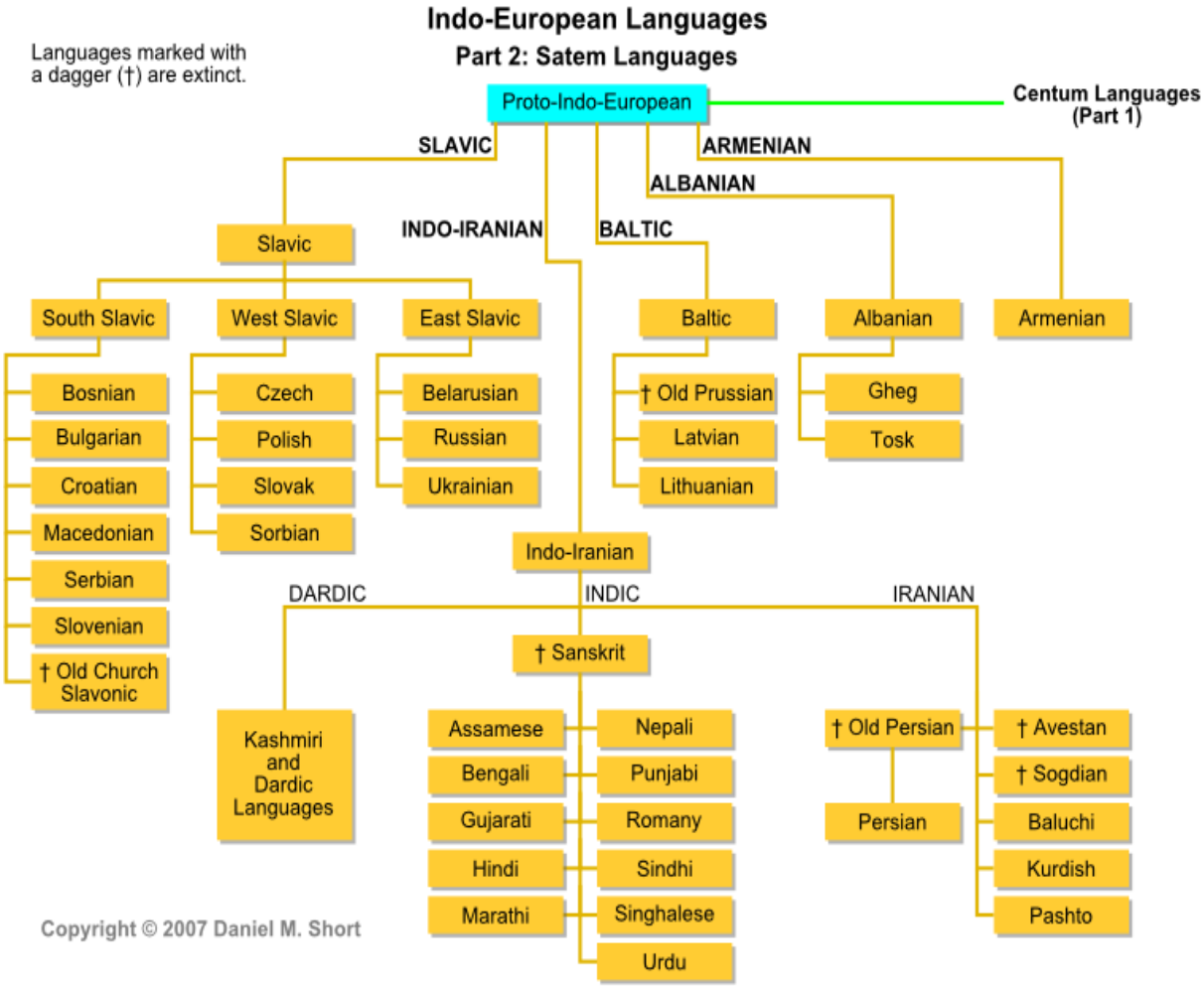
To summarize, in the current research, I investigated the comprehension of short and long passives in Persian-speaking low-functioning and high-functioning children with ASD. The results show that while high-functioning children with ASD performed like the TD group, low-functioning children with ASD showed significantly lower performance. The findings suggest grammatical impairment in the area of passives in low-functioning children with ASD. The two studies of comprehension of passives by Terzi et al. (to appear) on Greek-speaking, high-functioning children with ASD, and Perovic et al. (2007) on lower than average non verbal IQ level children with ASD are both in line with the results of the current study.

In my future work, I would like to test as many as 20 children with ASD for each group of low-functioning and high-functioning within the autism spectrum. I hope to change the design of the experiment to a culturally more adapted pictures and verbs.

There are as many different brains as there are people. Perhaps trying to narrow all "autistic" brains down to one problem is impossible. Hopefully, a breakthrough is forth coming in understanding autism.

Appendix 1. Indo-European family of languages

Persian is under the Indo-Iranian branch. Source: <http://www.danshort.com/ie/**>**



Appendix 2: Experimental items

1AF. Dokhtar-e bozorg dokhtar-e koochak ra hol mi-dahad.
girl big-Ez girl-Ez little OM push DUR-give.3.SG
'The big girl is pushing little girl.'

2AF. Dokhtar-e bozorg dokhtar-e koochak ra moayene mi-konad.
girl -Ez big girl -Ez little OM examine DUR-do.3.SG
'The big girl is examining the little girl.'

3LF. Dokhtar-e koochak tavasote madar boosid-eh mi-šavad.
girl -Ez little by mom kiss.PCTC DUR-become.3.SG
'The little girl is kissed by mom.'

4LF. Madar tavasote dokhtar-e bozorg donbal mi-šavad.
mom by girl -Ez big chase DUR-become.3.SG
'Mom is chased by the big girl.'

5AF. Madar mooha-e madarbozorg ra shane mi-konad.
mom hair -Ez grandma OM comb DUR-do.3.SG
'Mom is combing grandma.'

6AF. Dokhtar-e koochak madarbozorg ra navazesh mi-konad
girl -Ez little grandma OM stroke DUR-do.3.SG
The little girl is stroking grandma.'

7AF. Dokhtar-e bozorg tavasote dokhtare koochak hol dad-eh mi-šavad.
girl -Ez big by girl little push does.PTCP DUR-become.3.SG
'The big girl is pushed by the little girl.'

8LF. Dokhtar-e bozorg tavasote dokhtare koochak moayene mi-šavad.
girl -Ez big by girl little examine DUR-become.3.SG
'The big girl is examined by the little girl.'

9AF. Dokhtar-e koochak madar ra mi-boosad.
girl -Ez little mom OM DUR-kiss.3.SG
'The little girl is kissing mom.'

10AF. Madar dokhtar-e bozorg ra donbal mi-konad
mom girl-Ez big OM chase DUR-do.3.SG
'Mom is chasing the big girl.'

11LF. Mooha-e madar tavasote madarbozorg shane mi-šavad.
hair - Ez mom by grandma comb DUR-become.3.SG
'Mom is combed by grandma.'

12LF. Madar tavasote dokhtar-e bozorg naghashi mi-šavad
mom by girl -Ez big paint DUR-become.3.SG
'Mom is drawn by the big girl.'

13AF. Dokhtar-e koochak dokhtar-Ez bozorg ra hol mi-dahad.
girl -Ez little girl-Ez big OM push DUR-give.3.SG
'The little girl is pushing the big girl.'

14AF. Dokhtar-e koochak dokhtar-e bozorg ra moayene mi-konad.
girl -Ez little girl -Ez big OM examine DUR-do.3.SG
'The little girl is examining the big girl.'

15SF. Madar boosid-eh mi-šavad.
mom kiss.PTCP DUR-become.3.SG
'Mom is kissed.'

16SF. Dokhtare bozorg donbal mi-šavad.
girl -Ez big chase DUR-become.3.SG
'The big girl is chased.'

17AF. Madarbozorg mooha-e madar ra shane mi-konad.
grandma hair-Ez mom OM comb DUR-do.3.SG
'Grandma is combing mom.'

18AF. Dokhtar-e bozorg madar ra naghashi mi-konad.
girl-Ez big mom OM paint DUR-do.3.SG
'The big girl is drawing mom'

19AF. Madarbozorg dokhtar-e koochak ra navazesh mi-konad.
grandma girl -Ez little OM stroke DUR-do.3.SG
'Grandma is stroking the little girl.'

20SF. Dokhtar-e koochak hol dad-eh mi-šavad.
girl -Ez little push give.PTCP DUR-become.3.SG
'The little girl is pushed.'

21SF. Dokhtar-e koochak moayen-eh mi-šavad
girl -Ez little examine.PTCP DUR-become.3.SG
'The little girl is examined.'

22AF. Madar dokhtar-e koochak ra mi-boosad.
mom girl-Ez little OM DUR-kiss.3.SG
'Mom is kissing the little girl.'

23AF. Dokthar-e bozorg madar ra donbal mi-konad.
girl -Ez big mom OM chase DUR-do.3.SG
'The big girl is chasing mom.'

24SF. Mooha-e madarbozorg shane mi-šavad.
hair -Ez grandma comb DUR-become.3.SG
'Grandma is combed.'

25SF. Dokhtar-e bozorg naghashi mi-šavad.
girl-Ez big paint DUR-become.3.SG
'The big girl is drawn.'

26SF. Madarbozorg navazesh mi-šavad.
grandma stroke DUR-become.3.SG
'Grandma is stroked.'

27AM. Pesar-e koochak pedarbozorg ra baghal mi-konad.
Boy-Ez little grandpa OM hug DUR-do.3.SG
'The little boy is hugging grandpa'.

28LM. Pesare koochak tavasote pedar pooshand-eh mi-šavad
boy-Ez little by dad cover-PTCP DUR-become.3.SG
'The little boy is covered by dad.'

29AM. Pesar-e bozorg pesar-e koochak ra haml mi-konad.
Boy-Ez big boy-Ez little OM carry DUR-do.3.SG
'The big boy is carrying the little boy.'

30AM. Pedarbozorg rish-e pedar ra eslah mi-konad.
grandpa beard-Ez dad OM shave DUR-do.3.SG
'Grandpa is shaving dad.'

31AM. Pesar-e koochak soorat-e pedar ra naghashi mi-konad
boy-Ez little face-Ez dad OM paint DUR-do.3.SG
'The little boy is face-painted by dad.'

32LM. Pesar-e koochak tavasote pedarbozorg baghal mi-šavad
boy -Ez little by grandpa hug DUR-become.3.SG
'The little boy is hugged by grandpa.'

33AM. Pesar-e koochak pedar ra mi-poošanad.
boy -Ez little dad OM DUR-cover.3.SG
'The little boy is covering dad.'

34LM. Pesar-e bozorg tavasote pesar-e koochak haml mi-šavad
boy-Ez big by boy-Ez little carry DUR-become.3.SG
'The big boy is carried by the little boy.'

35LM. Riš-e pedarbozorg tavasote pedar eslah mi-šavad
beard-Ez grandpa by dad shave DUR-become
'Grandpa is shaved by dad.'

36AM. Soorat-e pesare koochak naghashi mi-šavad.
face-Ez boy little paint DUR-become.3.SG
'The little boy is face-painting dad.'

37SM. Pedar pooshandeh mi-šavad
dad cover.PTCP DUR-become.3.SG
'Dad is covered.'

38AM. Pesare koochak pesare bozorg ra haml mi-konad.
boy little boy big OM carry DUR-do.3.SG
'The little boy is carrying the big boy.'

39AM. Pedar rish-e pedarbozorg ra eslah mi-konad.
dad beard-Ez grandpa OM shave DUR-do.3.SG
'Dad is shaving grandpa.'

40SM. Soorat-eh pedar naghashi mi-šavad
face-Ez dad paint DUR-become.3.SG
'Dad is face-painted.'

41AM. Pedar pesar-e koochak ra mi-poošanad.
dad boy -Ez little OM DUR-cover.3.SG
'Dad is covering the little boy.'

42SM. Pesar-e koochak haml mi-šavad.
boy -Ez little carry DUR-become.3.SG
'The little boy is carried.'

43SM. Riš-eh pedar esah mi-šavad
beard-Ez dad shave DUR-become.3.SG
'Dad is shaved.'

44AM. Pedar soorat-e pesare koochak ra naghashi mi-konad.
dad face-Ez little boy OM paint DUR-do.3.SG
'Dad is face-painting the little boy.'

Appendix 3: Verbs

Verbs used in the short and long passive experiments of Cost Action 33 across languages. + shows that the verb was used in the current study (Persian language).

Verbs of Cost A33	**Gender**	**Experiment in Persian**
Chase	Female	+ donbal kardan
Check-up	Female	+ moayene kardan
Comb	Female	+ shane kardan
Dirty	Female	
Draw	Female	+ naghashi kardan
Feed	Female	
Kiss	Female	+ boosidan
Push	Female	+ hol dadan
Scratch	Female	
Stroke	Female	+ navazesh kardan
Wash	Female	
Bite	Male	
Carry	Male	+ haml kardan
Cover	Male	+ pooshandan
Hit	Male	
Hug	Male	+ baghal kardan
Make-up	Male	+ naghashi kardan
Photograph	Male	
Pull	Male	
Shake	Male	
Tickle	Male	
Wipe/dry	Male	

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