What Was Done to Whom?

Passive Voice Comprehension in High-Functioning Danish Autistics

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Abstract

This dissertation assesses passive voice comprehension in high functioning autism in Danish. Historically, research in autism spectrum disorders (ASD) has not focused on grammatical impairment in depth, however representing language maturation is essential to map cognitive and linguistic phenotypes within autism. Due to the wide heterogeneity in autism, correlations between symptoms and subgroups require extensive investigations across different language groups. Antecedent studies by Perovic, Modyanova, & Wexler (2007) in English and Terzi Marinis, Francis, & Kotsopoulou (2012) in Greek show contrasting results in autistic passive comprehension. However, we suggest that this is due to the different functioning level of the autism spectrum participants. The present study is the first to analyze passive comprehension in high functioning autistic Danish adolescents. The results show that adult-like competence in the passive construction is achieved within the high functioning subgroup of autism.

1. Introduction and general background

Autism spectrum disorders (ASD) have come to the forefront of research initiatives within cognitive and neurosciences due to both the growing prevalence and perplexity that the condition presents to the academic community. Since Leo Kanner's 1943 seminal case studies, the decision of what symptoms are essential to autism has been actively debated, resulting in progressive redefinitions of the pathology (Tager-Flusberg, 2004). Clinical markers outline diagnostic boundaries and guide theories that strive to account for the both the heterogeneity yet cognitive-style similarity within the autistic community. Although discussion within brain-based fields (e.g. psychology, linguistics and neurobiology) is often unconsolidated in regard to the underpinning of the condition, it is precisely this kind of theoretical collaboration that is gaining traction within dynamic disciplines like cognitive science.

The often expressed difficulty of autism research is due to both the wide scope and severity of symptoms and the historical shifts of diagnostic parameters. As definitions have changed over time, it is key to correctly identify what we mean by 'autism' and 'autistic subgroups'- especially when taking a longitudinal view of autism spectrum disorders research. Currently, according to clinical diagnostic guidelines such as the *American Psychological Association's Diagnostic Guidelines and Statistical Manual, 5th edition* (DSM-V), autism is a developmental syndrome with a triad of social impairments, communicative impairments, and repetitive and stereotypical behavior - all of which being recognizable in early childhood. Noticeably, the clinical term 'autism spectrum disorders' is plural, emphasizing the diversity among autistics, as illustrated in the contemporary proverb, 'once you have met *one person* with autism, you have met *one person* with autism.' Due to such renowned diversity, more research is needed to fully tease out all the linguistic and cognitive profiles within autism. Although language deficits have been documented throughout clinical histories, it is only relatively recently that language deficits take center stage in research initiatives.

Language pathology research is essential in a comprehensive study of our language faculty. Unlike acquired impairments that result from traumatic injury, developmental language impairments differ in the ontogenetic growth of language and therefore constitute a potentially distinct language phenotype. By contrasting language growth in diverging phenotypes and in typically developing peers, we may more greatly understand the basis of our human language faculty. Although there are no biomarkers yet confirmed in autism, current consensus points to a composite etiology of multiple gene-based irregularities (Happé & Ronald, 2008; Muhle, Trentacoste, & Rapin, 2004). However, although the search for the genetic cause in autism is clearly beneficial, cognitive theories are essential to represent, with explanatory power, the cognitive workings of these diverse individuals and eventually contribute to therapeutic applications.

Passives are one of the last acquired syntactic structures in typical language development. Although uncommon in spontaneous speech in many languages, the passive is acquired at the same developmental age regardless of the specific language acquired (Hirsch & Wexler, 2006; Armon-Lotem, Haman, & Jensen de López et al., *submitted,* although see Demuth, 1989 for counter position). This cross-linguistic similarity suggests a biologically determined developmental milestone for the ability to parse passive structures. Importantly, this does not imply genetic encoding of specific grammatical structures, but rather the progressive development of cognitive mechanisms that underwrite syntactic manipulations such as passives. However, it has been found that, depending on the language, some children do *appear* to comprehend certain types of passives earlier than in other languages, sourcing a great debate within hypotheses of the passive in child grammar. Importantly, this early comprehension has been found to be merely apparent due to surface-level homonymy rather than actual early maturation (Borer & Wexler, 1987). This point will be developed in depth in Section 4, along with the theoretical debate of universal passive delay. This last benchmark of typically developing syntactic development motivates the study of passives with children in atypical language and cognitive development. Furthermore, the discrepancy

between severe impairment in English data (Perovic, Modyanova, & Wexler, 2007) and typical performance in Greek data (Terzi, Marinis, Francis, & Kotsopoulou, *to appear*) suggests space for further evaluations of the heterogeneity and subgroups within the autism spectrum.

2. Theoretical Considerations of Autism Spectrum Disorders

2.1 A historical perspective of autism

Earliest accounts of autism date to Leo Kanner's 1943 pioneering work documenting case studies of the then rare and newly conceived pathology. Through a detailed clinical analysis of 11 children (including 8 boys and 3 girls), Kanner documented types of shared symptoms, which later became the clinical basis for diagnosis. All children were said to show 'severe autistic aloneness,' hence coining the term 'autism.' Behaviorally, the children showed deep interests in limited items (e.g. spinning objects, etc.), repetitive motions, need for sameness, and stereotyped exchanges with caregivers. All children were healthy with no abnormalities in their physical appearance, leading to the perception of unaffected intelligence. Kanner states that, of the 11 children, 3 remained mute while 8 developed fluency. Although sentence production was generally normal, Kanner documented pervasive pronoun reversals. Regarding one child, 'Paul,' he wrote, "*He never used the first [person] pronoun, nor did he refer to himself as Paul. All statements pertaining to himself were made in the second person, as literal repetitions of the things that had been said to him before*" (Kanner 1943, p.228). Furthermore, speech was interpreted very literally with abstract meanings misunderstood and frustrating to the child. In addition to impairments, the children with fluent language also displayed remarkable strengths in counting skills and/or memorization skills (e.g. advanced vocabulary, poetry and song recitation, and even identification of various symphonies). However, these skills were not necessarily met with conceptual comprehension of the content of their memorization. These early symptoms underscore current required symptoms for diagnosis: social impairment, communicative impairment, repetitive/stereotyped behavior, and non-required

symptoms: grammatical impairment, hyperlexia, and detail-orientation.

Following Kanner, there was a flurry of research on autism and also a remarkable rise in autism diagnosis. As of the 1960s autism was thought to affect between 3-4 children among 10,000 (Lotter, 1966), however this ratio drastically jumped to 1/300 in the late 1990s (Baird, Charman, & Baron-Cohen, 1999). Currently the estimated ratio is as high as 1/88 (US Center for Disease Control and Prevention, 2012). However, these studies are limited in scope to the USA and global occurrence rates are still unavailable.

During the 1960s, research initiatives focused on psycholinguistics - bringing particular interest to prosody, idiosyncratic word use, and pronoun reversals (Tager-Flusberg, 2004). However, these early studies were poorly defined and, although influential, did not isolate predictive correlations (Tager-Flusberg, 2004). Through the seventies, experiments more carefully controlled for IQ, matching both chronological and mental age. Interestingly, by the early 1980s, it was generally concluded that there was no difference between high functioning autistics and control groups in phonological, syntactic, morphological, and semantic abilities (e.g. Tager-Flusberg, 1981) thereby reducing subsequent research in this field. Throughout the 1980s, autism was dominantly explored as a pervasive pragmatic disorder (e.g. Baron-Cohen, Leslie, & Frith, 1985) considering grammatical errors such as pronoun reversals to be side affects of wider pragmatic deficits such as mind-blindness (e.g. Tager-Flusberg, 1993). Recently however, there has been a re-evaluation of grammatical abilities, specifically regarding a possible correlation to Specific Language Impairment (SLI) due to similarities in linguistic profiles (Roberts, Rice, & Tager-Flusberg, 2004).

2.2 Heterogeneity and co-morbidity

The autism spectrum may be simplistically divided into high and low functioning, high functioning being determined by having a non-verbal IQ within chronological norms. Within the autism spectrum there are high rates of co-morbidity with other diagnostic conditions such as Intellectual Disability (ID), Attention Deficit

Hyperactivity Disorder (ADHD), and anxiety disorders. As many as 75% of the autistic community have an intellectual disability, while the other 25% span across normal to highly intelligent ranges (Tager- Flusberg, 2004). However, in May 2013, the DSM-V (*Diagnostic and Statistical Manual, 5th edition*) redefined autism to include Asperger's syndrome, consequentially boosting the ratio of the high-functioning subgroup although new ratios have yet to be determined in the literature. Similarly, as many as 50-80% of autistics also meet the criteria for ADHD (Fraizier, Biederman, & Bellord, 2001; Gadow, Devincent, & Pomeroy, 2005). Recently, the theoretical debate about the etiology of such heterogeneity and co-morbidity has been productive. Certainly more research is needed, yet if autism is caused by multiple genetic irregularities (in concurrence with possible environmental factors), then we can expect that the symptoms will be found in isolation in other groups that are not diagnosed with autism (Happé & Ronald, 2008). Therefore, it is congruent that we find specific communicative disorders (pervasive Developmental Disorder - not otherwise specified), language disorders (SLI), attention disorders (ADHD), etc. Furthermore we would expect to find genetic correlations between these conditions and autism.

Recent studies (e.g. Roberts et al., 2004) have suggested correlations between autism and SLI due to both descriptive similarity of language impairment and family history. Errors shared by ASD and SLI include omission of obligatory morphemes such as the English past tense *-ed*, third person singular *-s* and present progressive *-ing* (Roberts et al., 2004). Additionally, autistic children also show difficulty with nonce word repetition, a clinical marker for SLI, in either spoken or signed modalities (Shields & Meier, 2012.) Families with occurrences of SLI are 10 times more likely to also have autism within the family than the general population (Roberts et al., 2004), therefore suggesting the need for genetic research to determine to what extent the similarity is correlated to a shared genetic cause or coincidental ontogenetic similarity of differing deficits. However, descriptive similarities are not necessarily indicative of similar processing. Riches, Lucas, & Baird (2010) argue that the error analysis differs between SLI and ASD, which

suggest that the correlation between SLI and ASD may be superficial. Therefore more research is needed to square both differential performance in shared areas of affected grammar and likely genetic correlation.

Early signs of autism are important in representing the language growth pattern in the autism spectrum. One of the earliest signs of autism is the lack of pointing by the child's first birthday. While pointing itself is not 'linguistic' *per se*, it has been argued to underwrite grammatical deictic reference (Hinzen & Martin, 2012). Transitioning from gestural deictic delay, we find subsequent difficulty with pronoun reference and temporal inflection in childhood, which has grounded an argument for grammatical deictic deficiency in autism (Bartolucci, Pierce, & Striener, 1980; Hobson, García-Perez, & Lee, 2010). Returning to Kanner (1943), autistics have often been described as havening difficulty following and assigning personal nominal pronouns in conversation, although with improvement over time. Therefore, this raises the question of how this maturation progresses, and whether it holds for the whole spectrum. Recently, Mizuno, Liu, & Williams et al. (2011) conducted an fMRI study that looked at the cortical activation during deictic processing in high-functioning autistics and found activation to be atypical with significantly less interregional connections than in control groups. Moreover, it was suggested that many high-functioning autistics may compensate for deictic difficulty in part through recruiting wider neurological resources in under-connected brain regions.

The debate of pronominal reference was also taken up by Perovic, Modyanova, & Wexler (2012), who contrastively found 3rd person pronominal reference to be within norms. Interestingly, though, this did not hold for reflexive pronoun comprehension, which was far below control groups, suggesting problems with binding principles. However, such findings were not replicated in Greek by Terzi, Marinis, Francis, & Kotsopoulou (2012). In the Greek study, the participants were specifically selected for high-functioning level and performed within typically developing norms for reflexive pronouns, although they performed substantially worse in clitic comprehension, possibly indicating difficulty with case marking

(Terzi et al., 2012). This discrepancy in difficulty with pronominal binding may be attributed to control for function level and/or possibly to the different underlying structures of Greek. Another construction, currently under debate in autism research is the passive which I will presently focus on.

3. The passive

The passive is an argument reducing operation in which the internal argument is promoted to the subject position. The external argument is therefore made null and optionally included in a by-phrase, as seen in examples (1a-c). Passives are classified as 'short' or 'long' depending on the exclusion or inclusion of the by-phrase, respectively. This movement forms an argumental chain (A-chain) that links the object position to the subject position, and has a reflex in verbal morphology that is expressed overtly as seen in (1b, c) by the *–ed* morpheme in the passive sentences.

(1) a. The cat chases the mouse. *Active*

b. The mouse$_i$ is chased t_i. *Short Passive*

c. The mouse$_i$ is chased t_i by the cat. *Long Passive*

Foundational theoretical considerations of passive structure were proposed in Baker, Johnson and Roberts (1989), nested within the Principles and Parameters paradigm. In this approach, there is no passive construction *per se,* but rather the properties of passive sentences are determined by a number of UG principles such as the case-filter, the theta criterion, and movement properties (Collins, 2005). A key element of passive sentences discussed by Baker et al. (1989) is that the 'implicit' arguments are syntactically active; therefore they show co-referential constraints equal to syntactically realized arguments in active sentences. Thus, we see that in short passives the overt subject may not be coreferential with the implicit by-phrase argument. This is illustrated in examples from Baker et al., 1989 (2) and (3). In short, we find that (2) cannot mean (3), and as such (4) is illformed.

(2) They were killed.

(3) They committed suicide.

(4) *They$_i$ were killed by them$_i$.

Due to the promotion of the internal argument and the demotion of the external argument, theta-roles in passives are in reverse-canonical order, as seen in (5). In English, an SVO language, the agent is generally realized in the pre-verbal subject and the patient/experiencer is realized in the post-verbal object. However this does not hold in passives.

(5) a. [$_{\text{AGENT}}$ The cat] chases [$_{\text{PATIENT}}$ the mouse] *Active*

b. [$_{\text{PATIENT}}$ The mouse] is chased [by [$_{\text{AGENT}}$ the cat]] *Passive*

Collins (2005) proposes that passives are an exception to the freezing principle of Müller (1998), and are able to 'smuggle' the object past an available DP landing site to the external argument of IP, while retaining the original thematic roles.

Although the structure undergoes drastic manipulations there is no change in truth-value of the proposition in long passives. However, the grammatical structure frames the perspective of the sentence by defocusing the agent and focusing the experiencer/patient. Although all passives show overt markings of passive relationships, there are diverse ways of representing these relationships cross-linguistically. This is seen in the distinctions of different types of verbal passives.

3.1 Types of passives

Periphrastic passives are formed compositionally by an auxiliary verb with an inflected verbal participle (6a). In English, the inflected participle, verb *–ed*, is homophonous with the simple past tense (6b) and adjectival passives (6c). However, we see that (6d) is unambiguous because although using the same *–ed* ending, *pushed* is not a well-formed adjective. This is further illustrated in (7).

(6) a. The man$_i$ is shav**ed** t$_i$ by the barber. *Passive*

the man is shave$_{+PASSIVE}$ by the barber

b. The barber shav**ed** the man. *Active (past tense)*

the barber shave$_{+PAST}$ the man

c. The man$_{(i)}$ is shav**ed** (t_i)**.** *Ambiguous: Adjectival passive or short verbal passive*

the man is shave$_{+ADJ\ /PASS}$

d. The girl$_i$ is push**ed** t_i. *Unambiguous: short verbal passive*

the girl is pushed

(7) a. The man is well shaved$_{+ADJ}$.

b. *The man is well pushed$_{+ADJ}$.

The morphological passive is formed by a passive morpheme conjoined to the verb. Like periphrastic passives, short morphological passive structure may also be ambiguous with other structures. Greek is an example of a language that expresses passives morphologically. As the passive morpheme *-e* is homophonous with the reflexive morpheme (Terzi et al. 2012; Alexiadou, Anagnostopoulou & Schäfer 2006), (8) is ambiguous. This example is extracted from Terzi et al. 2012.

(8) O Petros skepazet**e**.

the Petros cover. 3s.non-act

'Petros is covering himself' or 'Petros is being covered.'

Terzi & Wexler (2002) analyzed Greek morphological passives and established that, like English periphrastic passives, there is an argumental chain between the moved object and its underlying copy.

The adjectival passive differs from the verbal passive with regards to categorial and telic properties. While verbal passives may express an on-going event, adjectival

passives are resultative. Adjectival passives are composed of an auxiliary verb + adjective. In English, the adjectival passive is homophonous with the short verbal passive, due to selection of the same auxiliary verb, *to be*, and morpheme *-ed* for both the passive verb and adjective.

(9) a. Dad is shaved. *Adjectival Passive*

dad is shaved $_{ADJ}$

b. Dad is shaved. *Short Verbal Passive*

dad is $_{AUX}$ shaved

Importantly, adjectival passives do not derive from leftward movement of the internal argument and therefore do not involve A-chains like their verbal passive counterparts.

3.2 Danish Passives

Danish, like Swedish and Norwegian, has both the periphrastic and the morphological verbal passive (Engdhal, 1999). The periphrastic passive is formed by the auxiliary verb *bliver* and a verb with past participle morphology, akin to English, as in (10a). The morphological passive is marked by the passive morpheme *-s* as in (10b).

(10) a. Storesøster$_i$ bliver undersøgt t_i af lillesøster. *Periphrastic Passive*

big sister AUX examined by little sister

'Big sister is examined by little sister.'

b. Storesøster$_i$ undersøges t_i af lillesøster. *Morphological Passive*

big sister examine-PASS by little sister

'Big sister is examined by little sister.'

Structurally, both verbal passives show reverse canonical word orderings. While

Armon-Lotem, Haman, & Jensen de López et al. (submitted) expressly propose the periphrastic *bliver*-passive to contain argumental chains, there is no published derivational syntactic analysis to date which analyses the morphological passive in Danish. However in (10b), I suggest a likely analysis in which there is an argumental chain between the raised internal argument at the Spec of T and the underlying copy. This analysis is similar to other morphological passives, such as Greek, however further study in the structure of the morphological passive is needed.

In Danish, the adjectival passive is not s(yntactically)-homophonous with the periphrastic passive, as in English. The relevance of which in maturation will be discussed in depth in section 4. The auxiliary verb selected is different, although the morphological ending of the periphrastic passive and adjectival passive is the same. While the verbal passive selects the auxiliary *bliver* (literal translation: 'to become'), the adjectival passive selects the auxiliary verb *er* (literal translation: 'to be'). Such distinction is visible in examples (11a-b).

Danish:

(11) a. Far er bararet. *Adjectival Passive*

Dad is shaved$_{+\ ADJ}$

'Dad is shaved.'

b. Far bliver bararet. *Short Verbal Passive*

Dad is-$_{AUX.PASS}$ shaved

'Dad is shaved.'

Engdhal (1999) explores the factors affecting the choice between the periphrastic *bliver* passive and morphological *–s* passive. While often selection of either verbal passive type is wellformed, there are fine-grained semantic distinctions manifested between the two. A first fundamental difference hinges on the perspective telicity

of the action, as noted by early philological accounts of Danish passives by grammarian Kristian Mikkelsen (1911). The morphological passive is selected for unfinished actions and states and habitual actions. Conversely, the periphrastic passive is preferred for completed actions (Mikkelsen, 1911). This importantly gives the periphrastic passive a more stative quality. Therefore, in (12) we see use of the morphological passive for ongoing events and the periphrastic passive for competed actions.

(12) Vi kan snart komme til at spise; for mens maden

we can soon come to-INF eat; for while the.food

laves i køkkenet, **bliver** der dækket bord I lyshuset.

makes-S in the kitchen, AUX_{PASS} there set table in the.pavillion

'We can soon eat, for while the food **is being prepared** in the kitchen, the table **is laid** in the pavilion.'

Moreover, there is also a difference in perspective of the knowledge conveyed. Periphrastic passives are selected for general assumptions and subjective events (13a), while the morphological passive is used for actual events (13b). Both examples are extracted from Engdahl (1999).

(13) a. Det antages at serberne vil angribe.

it assumes-S that the.serbs will attack

'It is generally assumed that the Serbs will attack.'

b. Det blir antaget at serberne vil angribe.

it AUX_{PASS} assumed that the.Serbs will attack

'There are people who assume that (i.e. there are some actual events where people assumes that) the Serbs will attack.'

Mikkleson also notes the short morphological passive is homophonous with reflexive morphology, however the inclusion of the word *sammen* meaning 'together,' blocks the reciprocal reading allowing for an unambiguous passive reading. This is illustrated in Engdhal (1999) in the following examples (14a-c). In (14a) we see that the passive reading is unambiguous due to the specific passive marking by the passive auxiliary, *bliver*. (14b-c) the morpheme *–s* is ambiguous between reciprocal morphology and passive morphology. However, in (14b) *sammen* blocks a reciprocal reading, leaving only a passive reading available.

(14) a. De to unge **blev** aldrig set i selkaber. *Periphrastic passive*

the two young AUX_{PASS} never seen at parties

'The young couple were never seen at parties.'

b. De se**s** næsten aldrig **sammen.** *Morphological Passive*

they see-S almost never together

'They are almost never seen together.'

c. De to unge så**s** aldrig uden om söndagen. *Reciprocal*

the two young saw-S never except on Sunday

'The young couple only saw each other on Sundays.'

Therefore, the selection between the *bliver* periphrastic passive and the morphological *-s* passive is determined by both the stative quality of the verb and the perspective taken toward the proposition, whether it is objective information or subjective information that is being conveyed. While the *-s* passive may be homophonous with reciprocal interpretation, the *bliver* passive is unambiguously passive due to a unique passive auxiliary selection.

4. Maturation accounts of the passive in typical development

The acquisition of passive structure has been an active area of research within child

language over the past four decades (Deen, 2011). Much evidence has shown that until at least five years old, children, regardless of the language of acquisition, show substantial difficulty in comprehension and production of passives. Initial data stems from English-language research, namely Bever (1970) and subsequent replications studies have confirmed passive delay in English (Maratsos, Fox, & Becker et al., 1985; Fox and Grodzinsky, 1998; Stromwold et al., 2002; Hirsch & Wexler, 2004, 2006) and importantly many other languages across language families, including: Spanish (Pierce, 1992), Greek (Terzi & Wexler, 2002), German (Barke, 2004), Russian (Babyonyshev & Brun, 2003), Japanese (Sugisaki, 1998), and Dutch (Verrips, 1996). Although passives are quite uncommon in spontaneous production and child directed speech in most but not all languages, the age of acquisition is remarkably similar, which would be coincidental if frequency alone were at work. Therefore, the homogeneity in acquisition suggests that, around the age of five, the child develops cognitive mechanisms that underwrite the grammatical ability necessary to parse passives.

4.1 A-Chain Deficit Hypothesis

An early account that seeks to explain passive delay is Borer and Wexler's (1987) A-Chain Delay Hypothesis (ACDH). This theory proposed that, in child grammar, argument chains cannot be established. This theory therefore predicts that structures, such as verbal passives, that contain A-chains will be delayed while structures that crucially do not include A-chains, such as the adjectival passive, will be available early in acquisition. The ACDH importantly predicts that some movements are not delayed, such as Wh-movement (derived from A' movement), while passives are (derived from A-chains). This hypothesis squares with child data since children acquire adjectival passives earlier, as young as 4 years old (Hirsch & Wexler, 2007) while verbal passives may not mature until years later. Furthermore, this theory interestingly explains discrepancies found within comprehension of verbal passives based on whether they are short or long, and whether they are 'actional' or 'psychological.'

Verbal passives are classified as being either 'actional' or 'psychological,' depending on the semantic content of the verb. Actional verbs (like *kiss, hit, feed*) establish a thematic relationship of agent and patient or experiencer between the subject and object. Psychological verbs (*love, see*, etc.) express a change in mental state. Interestingly it has been found that English-speaking children perform well on short actional passives, but poorly on long actional passives (Borer & Wexler, 1987). Furthermore, the children do poorly on both long and short psychological passives (Maratsos et al., 1985).

According to Borer and Wexler (1987), the ability to parse short, actional verbal passives in spite of a wider A-Chain deficit is due to the child's ability to apply an adjectival strategy. Returning to example (9), children are therefore able to interpret the sentence *Dad is shaved* as an adjectival passive with *shaved* being a completed state. However, the inclusion of the *by* phrase blocks an adjectival reading, as *by* phrases are incompatible with adjectival passives. Short psychological passives, however, are generally illformed with an adjectival reading and therefore children do as poorly on short psychological passives as long psychological passives. Although all passives are problematic for children, the problem is not apparent in short actional passives due to coincidental homonymy with adjectival passives.

The adjectival strategy is possible when the adjectival passive is homophonous with the short, actional passive. However this does not hold across all languages. If children have difficulty with A-chains and are not able to rely on an adjectival interpretation, then it is predicted that they have equally poor performance with short passives as with long passives. In Greek, verbal passives are synthetic and expressed though morphological inflection which is homophonous in the short form with reflexive verbal morphology (15a, 15b). Adjectival passives in Greek however are periphrastic and are not s-homophonous with verbal passives (15c).

(15) a. O Petros skepazete. *Short Passive*

the Petros cover.3s.non-act

'Petros is being covered.'

b. O Petros skepazete. *Reflexive*

the Petros cover.3s.non-act

'Petros is covering himself.'

c. To vivlio ine diavasmeno. *Adjectival passive*

the book is.3.s read

'The book is read.'

Therefore, Greek children are not able to utilize an adjectival interpretation to comprehend verbal passives, and have been found by Driva & Terzi (2007) to perform as poorly on short actional passives as long actional passives.

Returning to Danish, the periphrastic verbal passive is not fully homophonous with the adjectival passive, due to selection of different auxiliary verbs. While short verbal passives select the unambiguously passive auxiliary *bliver*, the adjectical passive selects the auxiliary *er*. Interestingly, according to the recent cross-linguistic study of passive acquisition by Armon-Lotem, Haman, & Jensen de López et al. (*submitted*), Danish 5-year-old children did significantly better at comprehending short actional passives than Catalan children, who have an analogous, distinct auxiliary selection between adjectival and verbal passives. However, in the Danish study, the children did quite well on both long and short passives, as seen in the Table 1, below.

Table 1. *Danish Typically Developing Comprehension*

	Short Passive Experiment		Long Passive Experiment	
	Mean	Range	Mean	Range
Active	92.31	69-100	94.23	69.23-100
Passive	93.31	53.85-100	86.22	53.85-100

However as the ACDH is hypothesized to hold generally until the age of 5, it does not preclude individual variance in development. Therefore, it is possible that a larger percentage of those children were maturing out of the ACDH in Danish at the time of study than in Catalan. This Danish experiment serves as the base line for the present study and will receive further analysis in Section 7.

4.2 Retractions to the ACDH.

Fox & Grodzinsky (1998) raise counterarguments to the ACDH and propose an alternative analysis for passive delay: the theta-role transmission theory. If A-chains are the only operation at fault, they argue, Spanish post-verbal passives should not be delayed as they contain no overt A-chains. Importantly, this structure has been shown to pose as much difficulty to Spanish-speaking children as do standard verbal passives (Pierce, 1992). Secondly, Fox and Grodzinsky (F&G) assert that short psychological passives are indeed *not* affected. Given that psychological passives make unsatisfactory stative adjectival passives, coincidental homonymy cannot explain target responses of short psychological and actional passives. Therefore F&G propose that children are able to process passives *per se*, however they are unable to transmit theta-roles via a by-phrase. F&G propose that it is the by-phrase alone that blocks correct interpretation and that the argument in the adjunct by-phrase is expressly assigned the agent thematic role by the preposition *by*, leading to theta-role reversal in comprehension.

Importantly, however, their findings that children *do* comprehend short psychological passives have not been replicated. Therefore, attributing passive miscomprehension to by-phrases alone becomes a moot point. Secondly, in a subsequent study by Hirsch and Wexler (2006), they show that children do not have adult interpretation of *by* and rather interpret *by* as a semantically–contentful preposition, with the meaning of 'about'. Therefore, it is unlikely that children operate as suggested by F&G. Similarly, the Spanish post-verbal passive counterexample does not represent a problem for ADCH. Although it is true that

post-verbal passives do not contain (overt) A-chains, they do contain covert A-chains (Hirsch & Wexler, 2007).

Still, other objections do pose substantial pressure on the ACDH. Stromswold (1996) found that children are a not delayed in placing the subject correctly outside of the VP which does constitute an A-chain and hence motivated new hypotheses that are more in tune with current linguistic theory.

4.3 Universal Phase Requirement

The Universal Phase Requirement (Wexler, 2004) is nested in a minimalist approach to syntactic derivation. Rather than attributing passive delay to the deficiency of an isolated transformational structure, the UPR contextualizes A-chains delay within the cyclic transfer to the Phonetic-Articulatory and Conceptual-Intensional interfaces. Simply put, during derivation, movement and feature checking may occur during a semantically contained phase that, when completed, is transferred to the interfaces and is rendered unavailable in subsequent steps in the derivation. Importantly, although the complement is unavailable, the specifier and head remain 'visible' after the closure of the phase. This process is summarized as the Phase Impenetrability condition, or PIC (Chomsky, 2001).

(16) PIC: When working at a phase, only the edge (the head and the spec(s)) of the next lower phase are available for analysis, and nothing lower than the edge. In particular, the complement isn't available.

Chomsky (2001) initially cites two phases: CP (in the left periphery) and v*P which is the "functional head associated with full argument structure, transitive and experiencer construction". (Later theoretical analysis has identified subsequent phases, but I will ignore those developments here.)

In adult grammar, v*P defines a phase; however light verbs, v_{def}, are deficient and do not. Wexler (2004) proposes that children overgeneralize and interpret every vP to be a phasal head, v*P, whether deficient of not. Therefore, where in adult grammar v*P alone is a phasal head, in child grammar both v*P and v_{def}*P trigger spell-out to

the interfaces and beginning of the new cycle. Wexler formally defines the Universal Phase Requirement (UPR) below:

(17) UPR: (holds of pre-mature children, until around age 5)

v defines a phase, whether *v* is defective of not

By proposing overgeneralization of phase boundaries, this theory is congruent with a broader developmental approach to language growth, in which children achieve complex mechanisms through progressive differentiation (e.g. Lenneberg, 1957). Therefore, this maturation theory forms a logical progressive link between an abstract representation of child grammar and adult grammar. We can analyze the effect of diverging phase boundaries on active and passive structures within adult and child grammars, first in an active sentence (18).

(18) John$_i$ T [t_i v [V laughed]] *Active*

(18) does not pose a problem to child interpretation because *John* is in the SPEC of T, and is therefore visible across the phase boundary. However this is not the case in passive structure (19). In adult comprehension, the light verb (v_{def} *was*) is unable to head a new phase. Therefore, for adults AGREE and MOVE are available for the complement. Children, however, define a new phase at v^*_{def} and unlike in the active sentence (18), *John* is not within a visible SPEC position. Therefore, AGREE and MOVE are unable to take place and the verbal passive is consequentially non-convergent (Wexler, 2004) as seen in (19).

(19) John$_i$ T was v^*_{def} V pushed t_i *Short passive*

Within a UPR framework, the adjectival strategy proposed under the ACDH still holds. Adjectival passives do not have a $v_{def,}$ and therefore do not have a different phase head boundary from adults.

(20) Mary T[v is V adj fed] *Adjectival Passive*

5. Antecedents on passives and autism

The motivation for examining passives in autism stems from in the first place from Perovic et al.'s (2007) empirical conclusion that passives are severely impaired, a finding that is in line with earlier descriptive accounts that actional passives are poorly comprehended (e.g. Tager-Flusberg, 1981). Perovic et al.'s English-language study analyzed comprehension of actional and psychological passives in both long and short forms, as well as their active counterparts. The task consisted of a picture selection between two images, one that showed the target interpretation and one with thematic role reversal. For example, if the child heard 'Homer is pushed' the child would need to select the picture of Homer being pushed by Marge rather than Homer pushing Marge, and so forth. Sample items for each sentence condition are seen in (21).

(21)	a.	Marge kissed Lisa.	*Actional Active*
	b.	Lisa is kissed.	*Actional Short Passive*
	c.	Lisa is kissed by Marge.	*Actional Long Passive*
	d.	Homer loves Bart.	*Psychological Active*
	e.	Bart is loved.	*Psychological Short Passive*
	f.	Bart is loved by Homer.	*Psychological Long Passive*

This study divided the participants into 2 groups: autism spectrum and Asperger's syndrome. The participant details are shown in Table 2, below. The autistic participants were additionally tested for non-verbal IQ, and were found to have an average non-verbal IQ of 67 (below average).

Table 2 *American English Participants*

	Number of participants	Non-verbal IQ		Age	
		Mean	Range	Mean	Range
ASD	12	67	40-103	11,06	6-17
AS	8	_____	_____	13,01	6-18

Importantly, the autistic participants performed significantly worse on both short and long passives than both their controls matched for non-verbal mental age and verbal mental age. While typically developing peers can appear to parse short actional passives correctly, autistic children were unable to use the linguistic strategy of interpreting short actional passives as adjectival passives. Therefore, this suggests a very pervasive grammatical deficit, beyond typical difficulty with passives. However, in contrast to the participants on the autism spectrum, the Asperger's syndrome (AS) participants performed significantly better, with near ceiling performance in all structures. At the time of this experiment, Asperger's syndrome was not included within the autism spectrum; and although the difference between AS and ASD is often vague, hence leading to the recent inclusion of AS within ASD, there were diagnostic differences. Asperger's syndrome differs from autism in both expressly specifying normal IQ levels as well as no delay in the onset of language. Therefore, in light of these findings, Perovic et al. (2007) suggests that while AS is unaffected by grammatical impairment, the autism spectrum subjects are profoundly impacted.

Table 3 *Comprehension Results*

	Actional Active	Actional Short Passive	Actional Long Passive	Psychological Active	Psychological Short Passive	Psychological Long Passive
ASD	78%	36%	36%	67%	30%	26%
AS	100%	83%	83%	83%	100%	67%

Subsequently, Terzi et al. (*to appear*) studied passive comprehension in Greek high functioning autistics. In contrast to the findings of Perovic et al. (2007), this study importantly found that high functioning autistics did not statistically differ from their typically developing peers. Participant details are presented in Table 4.

Table 4 *Greek Participants*

	Number of Participants	Age		Non-verbal IQ	
		Mean	Range	Mean	Range
High functioning ASD	20	6,4	5,1- 8,11	103	80-135
Typically Developing	20	6,75	5,6-8	98	80-120

The passives tested were short verbal passives, which in Greek are not homophonous with adjectival passives. Therefore, there is no available strategy by which immature children can parse a verbal passive interpretation; sample questions are seen in (22). As such, both TD and ASD groups made a significant amount of errors, seen in Table 5. Difficulty with passive structure was further isolated in this study by testing their comprehension of reflexive verbs with passive interpretation, as the verbal morphology is the same as in passives. This structure crucially differs from passives in that reflexives arguably do not have a derived subject and hence do not create argumental chains.

(22) a. O papus taizete. *Passive*

the grandpa feed.3s.non-act

'Grandpa is being fed.'

b. O Giorgos skepazete. *Reflexive with passive interpretation*

the George cover.3s.non-act

'George is being covered.'

Table 5 *Comprehension Results*

	Passive		Reflexive verb (passive interpretation)	
	Mean	Range	Mean	Range
High Functioning ASD	66,6%	33%-100%	93.3%	33%-100%
Typically Developing	70%	33%-100%	94.9%	83%-100%

In the reflexive with passive interpretation condition, both TD and ASD groups performed near ceiling. Therefore, in short, this study isolates difficulty in passives to argumental chains as explainable by the UPR. Consequently, high functioning autistic children are on par with their TD peers, and are not atypically affected as argued by Perovic et al. (2007).

However, an important factor distinguishing these studies is the control for autistic functioning level. While the Perovic et al. (2007) study had a heterogeneous autistic group with an average IQ below norms, the Terzi et al. (*to appear*) study controlled for high functioning autism. Therefore, by comparing both studies, it appears that there are correlations between severity of grammatical impairment and autistic subgroups. While low functioning autistics may be more severely impaired, high functioning autistics appear to follow development like their TD-peers in passive structure.

6. Current Study

The objective of this study is to assess passive voice comprehension in Danish, high-functioning autistics. As previously discussed, earlier studies by Perovic et al. (2007) and Terzi et al. (*to appear*) have shown contrasting results regarding passive comprehension within the autistic community during language acquisition. By conducting an empirical study of Danish actional passive comprehension that is controlled for autistic functioning level, I hypothesize that both long and short passives will be within norms of typically developing peers in high-functioning

autism. This is the first study to assess autistic language development in Danish.

6.1 Participants

The participants were all Danish adolescents recruited from a specialized school for high functioning autism in the Aalborg region of Jutland, Denmark. The total number of participants was 7 individuals (6 male and 1 female) with ages ranging from 13yrs to 18yrs old with a mean age of 15.71 years old. Each was given an ID code for data analysis, numbered K1-K7. A standardized non-verbal intelligence test, which consisted of matrix completion, was performed to assure that the participants were in the 'high-functioning' classification. The test was divided by age; those 16 and younger took the WISC (Wechsler Intelligence Scale for Children), and those above 16 took the WAIS (Wechsler Adult Intelligence Scale) as appropriate for their age bracket.

Table 6 *Participants*

	Age	Other Diagnosis	IQ	
			WISC	WAIS
K1	13,08	_____	Above average	_____
K2	14,92	_____	Above average	_____
K3	15,42	_____	Above average	_____
K4	16,07	_____	Above average	_____
K5	17,33	ADHD	_____	Below average
K6	17,50	_____	_____	Above average
K7	18,17	_____	_____	Above average
	Mean: 15,71	Total: 1/7	Total: 6 above average, 1 below average	

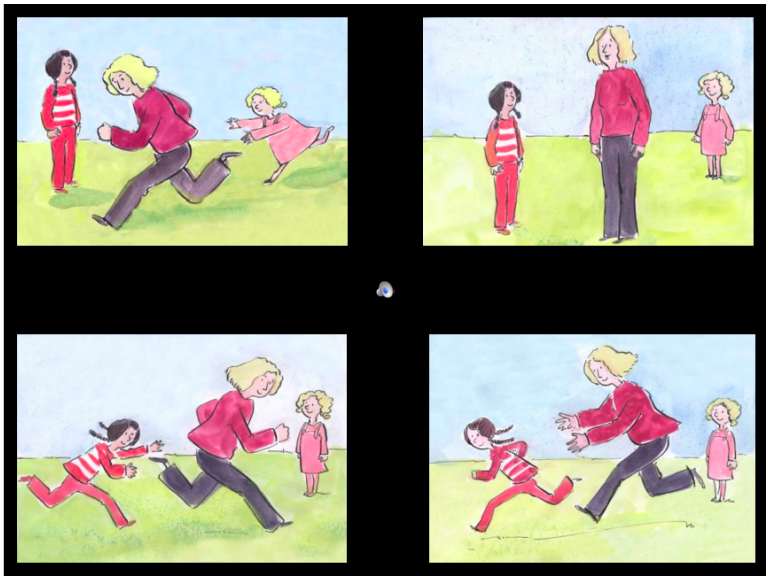
After scoring their tests, 6 were deemed to be high- functioning (all of them above their normalized mental age) while one was marked as below average intelligence. This individual was also diagnosed with ADHD and is the only participant to have a secondary diagnosis. Passive data was also collected on this participant (ID code

K5) and contrasted to the other participants. All participants were Danish monolinguals with some exposure to foreign languages such as English. All participants had parental permission to participate in the experiment and received a small gift in exchange for their participation.

6.2 Methodology

Each participant was presented with a picture-selection task. The experimental design originated from the COST action 33 study by Armon-Lotem, Haman, & Jensen de López et al. (*submitted*). Figure 1 is a sample of one of the slides used. The participants heard an orally provided sentence and pointed to the corresponding picture on a power point slide. Each slide was divided into four quadrants with 4 picture options that showed contrasting or neutral thematic relations between characters. Each picture option was classified as target, role-reversal, other (correct action but other agents), and neutral in which all characters were present but no action was displayed. Therefore, when the child heard *big sister is chased by mom,* they would select the picture that reflected what they had understood, the target response being the bottom-right quadrant.

Figure 1. *Big Sister is chased by Mom*



Top left: Other; Top Right: neutral; Bottom Left: Role Reversal; Bottom Right: Target

There were a total of 88 sentences: 44 active sentences, 22 short passives, and 22 long passives. The test was divided into two sections, the first section alternated randomly between active and short passives while the second section alternated randomly between long passives and actives. Each half was also divided into male and female subsections as well, although there is no morphological distinction in the sentences for male or female. Four of the participants were given test A and three were given test B, which differed in order of male or female characters.

Test Version A:

1. Female Characters: Short passive/ Active form
2. Male Characters: Short passive/ Active form
3. Female Characters: Long Passive/ Active form
4. Male Characters: Long Passive / Active form

Test Version B:

1. Male characters: short passive/ Active form
2. Female characters: short passive/Active form
3. Male characters: Long Passive/Active form
4. Female characters: Long Passive/ Active form

A total of 22 verbs were included in the test. The list of verbs is presented in Table 7 below. The test was introduced and run by a native Danish speaker, a local student from the University of Aalborg. During testing, two other tests were run, testing clitic production and relative clause production. The results lie beyond the scope of this study and the analysis is currently in progress.

Table 7. *List of Verbs*

	Danish Verb	*English Translation*
1	skubber	to push
2	undersøger	to examine
3	kisser	to kiss

4	mader	to feed
5	vasker	to wash
6	jager	to chase
7	kradset	to chase
8	friserer	to comb
9	tegner	to draw
10	svinet	to dirty
11	aer	to pat
12	Krammer	to hug
13	tørrer	to dry
14	puttet	to cover
15	bærer	to carry
16	trukket	to pull
17	barberer	to shave
18	fotograferet	to photograph
19	mallet	to paint
20	kilder	to tickle
21	slået	to hit
22	bider	to bite

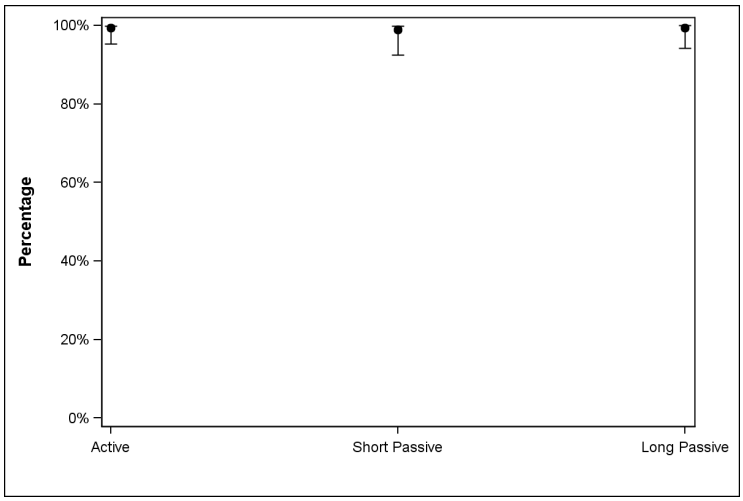
6.3 Results

The results show that for the 6 high functioning the mean score for all sentence types was 99%. The active sentence accuracy range spans between a minimum 95% to maximum 100%. The short and long passive sentence accuracy range both varied between a minimum score of 91% to 100% accuracy. These figures are represented in Table 8 and graphically in Figure 1.

Table 8. *High Functioning Performance According to Sentence Type*

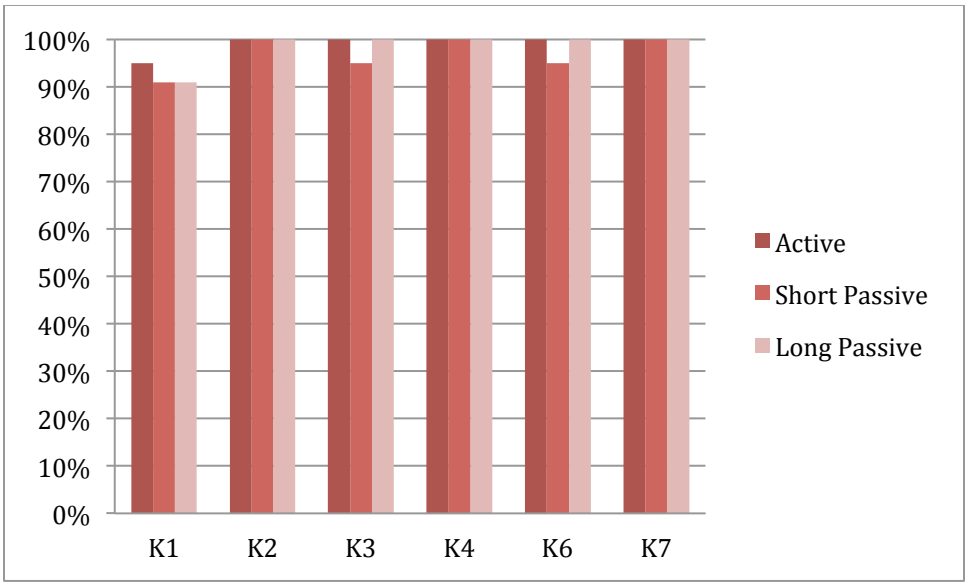
Type of sentence	Mean	Standard Error of Mean
Active	99%	.006813
Short Passive	99%	.01079
Long Passive	99%	.007665

Figure 2. *High Functioning Performance According to Sentence Type*



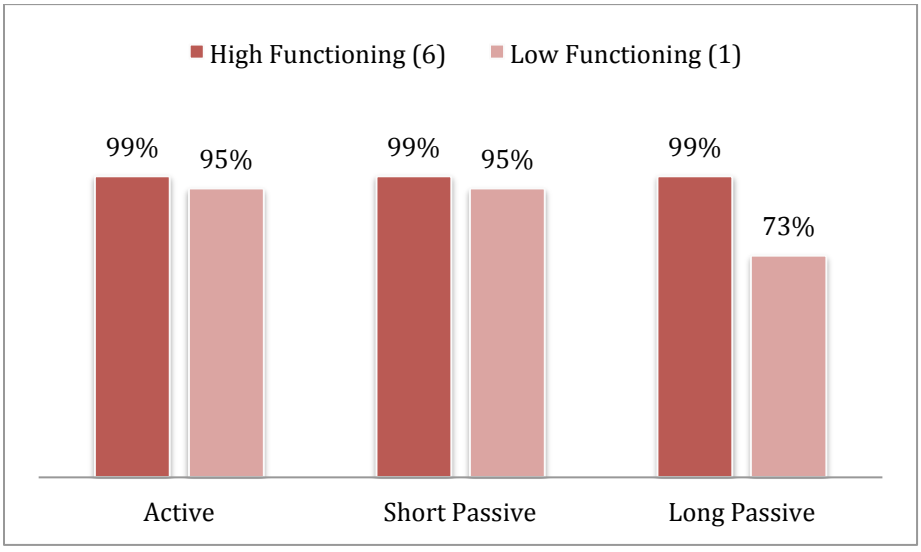
These results are expanded in the individual analysis below. Three of the six high functioning participants had perfect scores while the remaining three showed minimal errors across all sentence types. Note again that participant K5 has been removed from the high functioning group in this analysis. His results will be compared in Figures 4 and 5.

Figure 3. *High Functioning Individual Analysis*



The single Low functioning participant, K5, had a net lower performance on long passives, with 73% accuracy. Due to such a small sample size these results cannot be statistically compared. The net performance difference is illustrated in figure 4.

Figure 4. *High and Low Functioning Target Results*



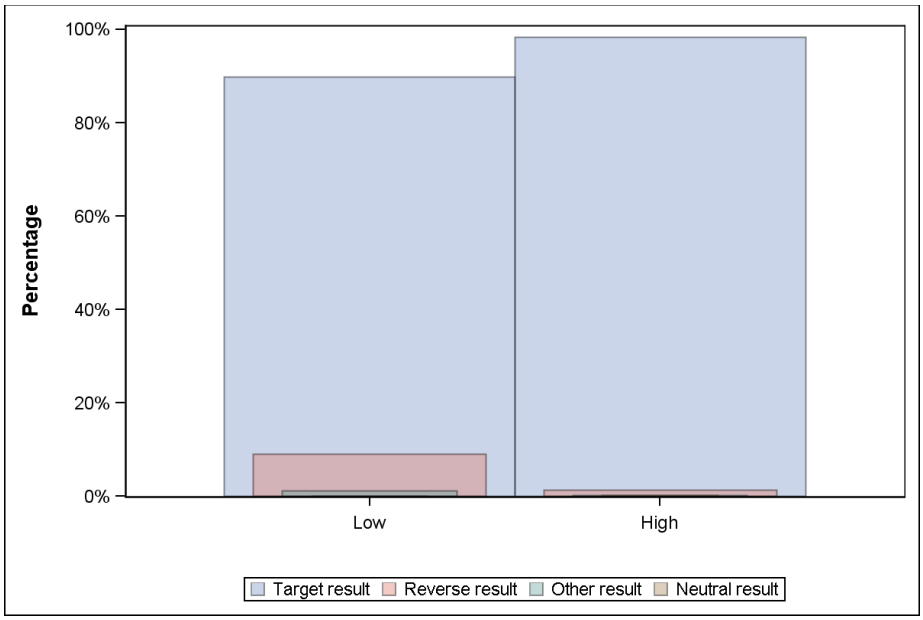
Taking all sentence types together, among the high functioning cohort, the error rate was 1%; the type of errors made were thematic role reversals. The low functioning participant had an overall average error rate of 10%; 9% of responses were

thematic role reversals and 1% of 'other' responses, as seen in Table 9 and graphically in Figure 5.

Table 9. *High and Low Functioning Error Analysis*

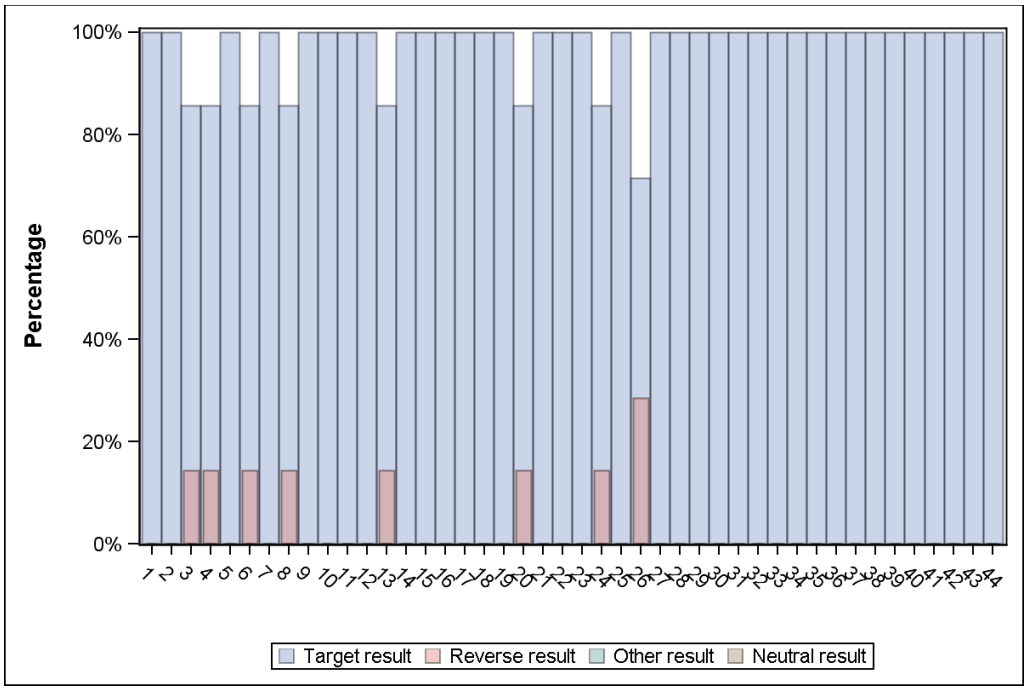
		N	Mean	Med.	Std	Min	Max
Low	Target Result	1	90%	90%	.	90%	90%
	Reverse Result	1	9%	9%	.	9%	9%
	Other Result	1	1%	1%	.	1%	1%
	Neutral Result	1	0%	0%	.	0%	0%
High	Target Result	6	99%	99%	0.03	93%	100%
	Reverse Result	6	1%	1%	0.02	6%	0%
	Other Result	6	0%	0%	0.00	1%	0%
	Neutral Result	6	0%	0%	0.00	1%	0%

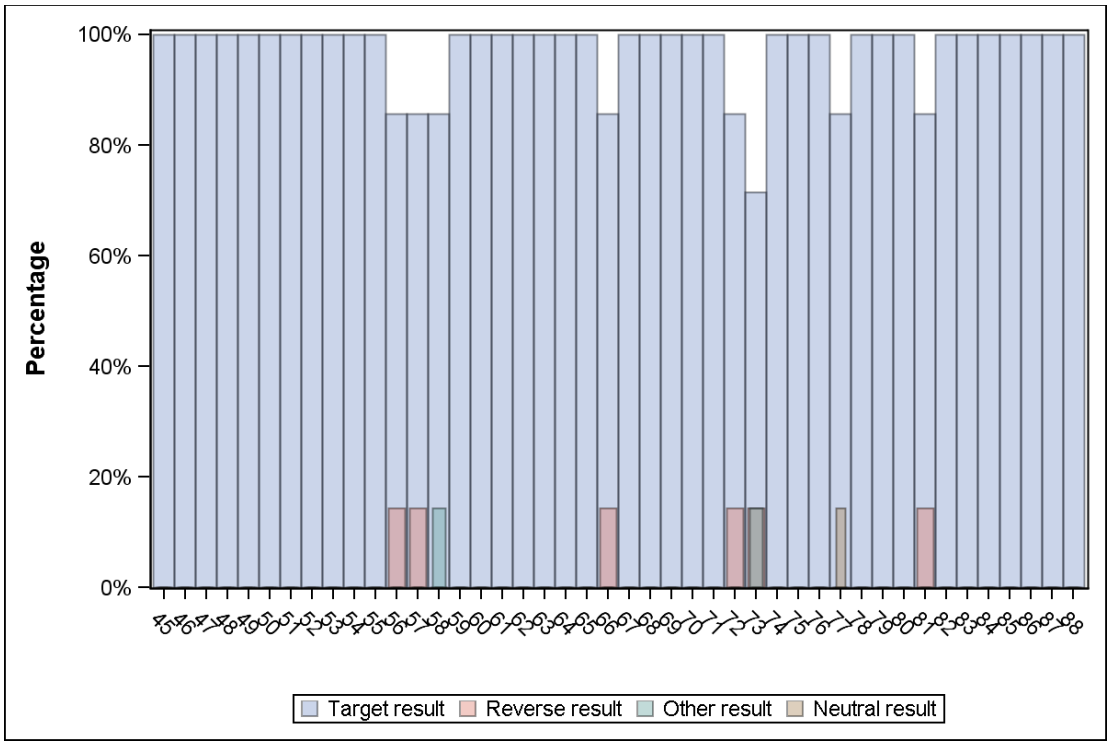
Figure 5. *High and Low Functioning Error analysis*



Furthermore, we analyzed the responses per question item. Two sentences had a lower success rate from the rest with 70% accuracy overall. These sentences included the long passive *The little girl is fed by Grandma* and the active sentence *Grandma is combing Mom*. At this time, we do not know why these two sentences showed worse performance. However there was no tendency in error occurrence, therefore suggesting that there was no order effect (e.g. as a result of tiredness) for either high or low functioning levels.

Figure 6: *Error Analysis by Item Number*





7. Discussion

The results from this experiment fit neatly within the antecedent works by Terzi et al. (*to appear*) and Perovic et al. (2007). Additionally, this study gains perspective in comparison with a sister study on passive comprehension in high and low functioning Persian-speaking autistics conducted by Yalda Heshmati (*in preparation)*. As hypothesized, high functioning Danish autistics have no difficulty comprehending passives, showing ceiling performance in all sentence types. Indeed while considering net scores, the autistic group actually outperformed the typically developing group in long passive comprehension.

Table 10. *Danish typically developing and autistic groups*

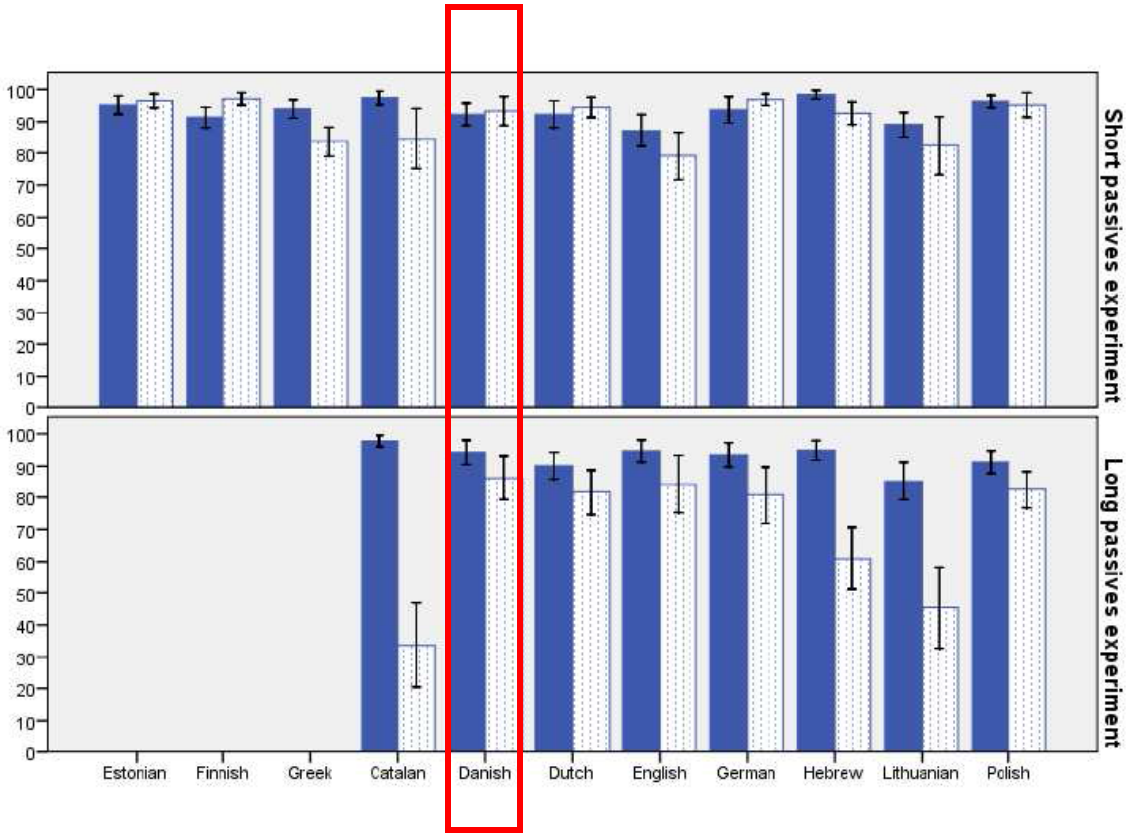
	Number of participants	Active		Short passive		Long Passive	
Danish Low functioning autism	1	95%		95%		73%	
Danish High Functioning autism	6	Mean	Range	Mean	Range	Mean	Range
		99%	95%-100%	99%	95%-100%	99%	95%-100%
Danish Typically Developing	20	93%	69%-100%	93%	53%-100%	86%	53%-100%

However before comparing the differential performance between the ASD group and the TD control, it is key that the variables are salient. Importantly, the typically developing group was significantly younger than the autistic group, with a mean age of 5.5 rather than 15.7. Although having a high level of comprehension overall, the typically developing children still showed statistically a significant greater difficulty comprehending long passives than short passives. This lower net performance of

the typically developing (TD) children is certainly due to age, as the 5 year old TD control were reaching ceiling level performance yet still immature.

The typically developing study was conducted by Kristine Jensen de López as part of Armon-Lotem, Haman, & Jensen de López et al. (*submitted*) cross-linguistic study on passive acquisition. The results from all 11 languages participating in this study, including Danish, are shown in Figure 7. Cross linguistically, long passives pose significantly more difficulty to immature children than short passives. However, as we see in the figure below, overall performance of passives is very high in most languages by the age of 5. This is particularly illustrated in Danish as the 5-year-old children comprehended passives well above chance although they were statistically worse in long passives.

Figure 7 *Typically developing passive comprehension* (emphasis ours)



An important conclusion that we may draw from the present study, therefore, is that high-functioning autistics do achieve a typically developing adult competence in

passive structure comprehension. However, this study in isolation does not point to whether this maturation trajectory is fully typical or possibly delayed in high functioning autistics.

To address this question and to best represent autistic grammatical growth, we must compare developmental checkpoints of passive maturation: first, when TD peers are within the UPR stage, secondly, when TD peers are maturing out of UPR in late childhood, and finally, when the ASD group is reaching adulthood. This assessment is possible through comparison of the present data with findings from Terzi et al. (*to appear*) and Heshmati (*in preparation*). For the first checkpoint, Terzi et al. (*to appear*) showed that young high-functioning autistic children have difficulty with passives like typically developing children, due to the Universal Phase Requirement stage that renders derived subjects ungrammatical.

Subsequently, the Persian study is able to point to the middle checkpoint of maturation, in which the TD peers were maturing out of the UPR stage. By the age of six, the Iranian typically developing control group showed 100% accuracy on active, 98% on short passives and 93% on long passives, with a statistical difference between long and short passives. Therefore, we see that by six Persian-speaking children are reaching ceiling performance in all passive types although still under the influence of the UPR. Similar to English, in Persian the short adjectival passive can be homophonous to the adjectival passive, therefore allowing a felicitous reading for even immature children (Heshmati, *in preparation*). In the high functioning autistic cohort, 5 Iranian children were tested. These children had a mean age of 8,6-years-old with an age range of six-years-old to eleven-years-old. Participant details are seen in Table 11.

Table 11

	Number of Participants	Age	
		Mean	Range
High functioning Autism	5	6	5-6
Typically developing	10	8,6	6-13

While, strictly speaking, we would hypothesize that by eight and a half these children would be maturing out of the UPR if they are on par with typical development, the heterogeneity of age within the group and relatively small sample size prohibits a strong assertion on this point. The results (presented in Table 12), however, show that their performance matches the 6-year-old typically developing children for all sentence types. The discrepancy between net scores was largest in long passives with the autistic group having an 82% target result and TD having a 93% target result. Therefore, it appears that at the age of 8,6, some of the Persian high functioning children appear to still be under the effect of the UPR.

Table 12. *Persian typically developing and high functioning autism comprehension*

	Number of participants	Active	Short passive	Long Passive
High Functioning Autism	5	97%	91%	82%
Typically developing	10	100%	98%	93%

These results from the Persian study are also contrasted statistically to the present study of Danish high functioning autistics. Importantly, autism diagnosis in both Denmark and Iran use the same guidelines (*APA Diagnostic Guidelines and Statistical*

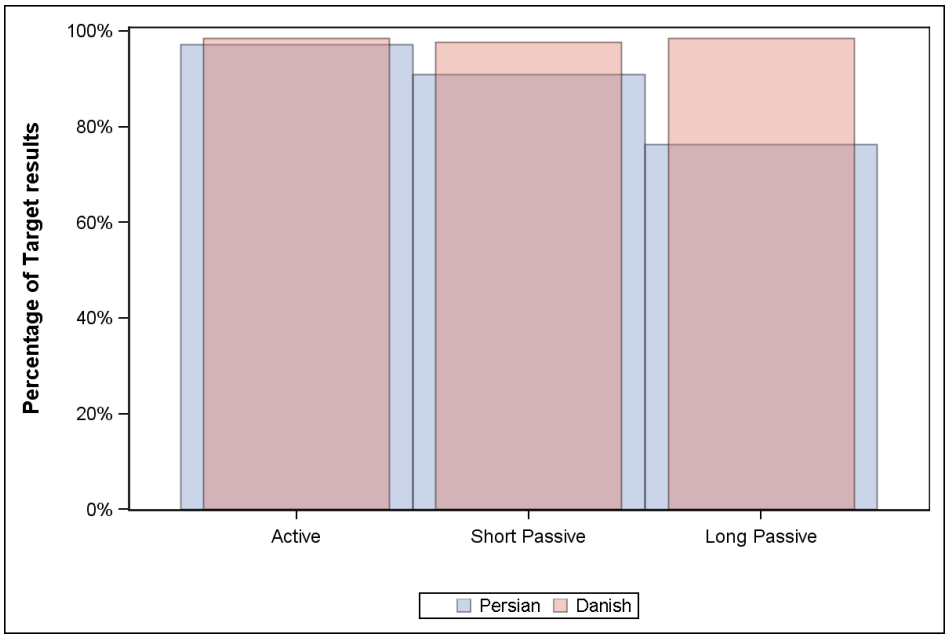
Manual, 4th edition) at the time of diagnosis (Memari, Shayestehfar, & Mirfazeli, 2013; European Commission of Public Health and Consumer Protection, 2005). The comparison of the Danish and Persian groups showed that while Persian high functioning autistics performed statistically worse on long passives, and Danish high functioning autistics performed at ceiling, there was no statistical difference between long passive comprehension in Persian and Danish (see Table 13 and Figure 8 for comparison). Therefore, we can see relative homogeneity in high-functioning autistics as well as probable influence of time in maturation that will account for the descriptive net performance difference in long passives.

Table 13. *Persian and Danish high functioning autism comprehension*[1]

		N	Mean	Median	Std	Min	Max
Active	Persian	5	97%	100%	0.04	91%	100%
	Danish	6	98%	100%	0.02	95%	100%
Short Passive	Persian	5	91%	100%	.20	55%	100%
	Danish	6	98%	100%	0.04	91%	100%
Long Passive	Persian	5	76%	82%	.22	45%	100%
	Danish	6	98%	100%	0.04	91%	100%

[1] During the statistical comparison of the Danish and Persian high functioning groups, the mean scores were not normalized for confidence index. Therefore in Table 12, we see a raw mean score of 98% rather than 99%, as previously seen in Table 9.

Figure 8. *High Functioning Danish and Persian Autistics*



As there was no statistical difference between Persian high-functioning autistics and TD peers, it may not be posited at this time that the UPR is prolonged in high functioning autism. However the 11% net difference between the younger Persian TD group (mean age of 6) and the High functioning Persian (mean age of 8.6), could point to a mild extension of immaturity. This possibility would be best explored in subsequent research, designed specifically to address mid-point maturation with less open variables as in the present study. Nonetheless, we may conclude with certainty is that there is a full maturation from the UPR by late adolescence in high functioning autism, showing that there is no 'freezing effect' in maturation by which the subjects remain under the effect of UPR.

Low functioning autism, however, does appear to be more greatly affected in grammatical maturation. K5, the low functioning Danish participant with co-diagnosis of ADHD, did have a much higher occurrence of role reversals, especially

in long passives. However, K5's performance was at near ceiling for short and actional passives as well as above chance level for long passives (73%). This individual performance falls in line, in part, with findings by Perovic et al., 2007, which suggests greater impairment due to low functioning level. However K5's high performance differs greatly from the mean performance in the Perovic et al. study in active (95% verses 78% target performance) and short passives (95% verses 36% target performance). Although stronger assertions cannot be drawn from this individual case study, we can suggest that within 'low functioning' there may be great heterogeneity in performance level due to a wide range of severity. It is clear that although intelligence strata is a marker for grammatical impairment within ASD groups, it cannot be inferred that the underlying grammatical deficit in low functioning autism is due to intelligence *per se*. Rather, in autism, we find the clustering of more pronounced syntactic deficit and low general intelligence. This contrasts with other groups that have low average intelligence with well-defined etiology such as Down syndrome. While there are importantly some similarities in language profiles, such as difficulty in pronominal reference (Perovic, 2004, Perovic et al., 2006), it has not been documented that there is difficulty in passives (Miolo, Chapman, & Sindberg, 2005).

Therefore, in relation to sentence comprehension in autism, it appears that high-functioning autistics also pass through the UPR stage in which they overgeneralize phase boundary rules. This explains poor behaviour in children as seen in Terzi et al. *to appear* yet target performance in late adolescence. Furthermore statistical similarity found between Persian data and Danish data suggest both a relative homogeneity among high functioning autistics, as well as how age may factor in progressive net improvement. These findings contribute to a consensus of differential performance between high and low functioning autistics, and the imperative for differential analysis in subsequent research.

Furthermore, by analyzing passive construction through phase building, we may show to what extent autistic data fits with derivational accounts of universal stages in typical development. The UPR suggests that if we find target performance of

passives we would also predict that raising constructions should be understood equally well. However, these theories in of themselves do not extend to other points of difficulty in autism such as clitics as proposed by Terzi et al. (2012) and possibly reflexive pronouns as suggested by Perovic et al. (2007, 2012). Through the emergence of homogeneous subgroups with correlated symptoms both on and off the spectrum, we may best move forward to create and assess cognitive models that account for impairment clusters. As such, the work remains open to elaborate representations of grammatical structure within autistic phenotypes that can account for clustering of impairments within the heterogeneity.

Based on the present data, we confirm Terzi et al.'s (*to appear*) position that controlling for functioning level is predictive in grammatical processing. Adolescent high-functioning autistics are adult-like in both long and short passives, therefore showing that there is full maturation of this structure in high functioning autism. Although intelligence level is predictive in descriptive language profiles within autism, it is not a causal relationship, in of itself, as we may find no particular difficulty in passives within intellectually disabled groups (e.g. Down Syndrome). Nonetheless, this finding contributes to the development of linguistic profiles in autistic subgroups and stresses the importance of separating high and low functioning groups for statistical analysis. This will furthermore remain important, as individuals previously diagnosed with Asperger's syndrome will be joining the ranks of high functioning autism. Furthermore, these findings are the first to assess passive comprehension in Danish autistics, contributing to a much needed accumulation of grammatical representations in autistic phenotypes.

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APPENDIX *Experimental Items*

1. Female Characters: Short Passive/Active Form

Item Number	Verb	Sentence Type	Sentence Item
1	skubber *to push*	Active	Lillesøster skubber storesøste *Little sister pushes big sister*
2	undersøger *to examine*	Active	Lillesøster undersøger storesøster *Little sister examines big sister*
3	kysser *to kiss*	Short Passive	Mor bliver kysset *Mother is kissed*
4	mader *to feed*	Short Passive	Bedstemor bliver madet *Grandmother is fed*
5	vasker *to wash*	Active	Storesøster vasker mor *Big sister washes mother*
6	jager *to chase*	Short Passive	Storesøster bliver jaget *Big sister is chased*
7	kradset *to scratch*	Short Passive	Lillesøster bliver kradset *Little sister is scratched*
8	friserer *to comb*	Active	Bedstemor friserer mor *Grandmother combs mother*
9	tegner to draw	Active	Storesøster tegner mor *Big sister draws mother*
10	svinet to dirty	Short Passive	lillesøster bliver svinet *little sister is dirtied*
11	aer to pat	Active	Bedstemor aer lillesøster *Grandmother pats little sister*
12	skubbet *to push*	Short Passive	Lillesøster bliver skubbet *Little sister is pushed*
13	undersøgt *to examine*	Short Passive	Lillesøster bliver undersøgt *little sister is examined*

14	kisser *to kiss*	Active	Mor kysser lillesøster *Mother kisses little sister*
15	mader *to feed*	Active	Bedstemor mader lillesøster *Grandmother feeds little sister*
16	vasket *to wash*	Short Passive	Storesøster bliver vasket *Big sister is washed*
17	jager *to chase*	Active	Storesøster jager mor *Big sister chases mother*
18	kradser *to scratch*	Active	Lillesøster kradser storesøster *Little sister scratches big sister*
19	friserer *to comb*	Short Passive	Bedstemor bliver friseret *Grandmother is combed*
20	tegner *to draw*	Short Passive	Storesøster bliver tegnet *Big sister is drawn*
21	sviner *to dirty*	Active	Lillesøster sviner storesøster *Little sister dirties big sister*
22	aer to pat	Short Passive	Bedstemor bliver aet *Grandmother is pat*

2. Male Characters: Short Passive/Active

Item Number	Verb	Sentence Type	Sentence Item
23	krammer *to hug*	Active	Bedstefar krammer lillebror *Grandad hugs little brother*
24	tørrer *To dry*	Active	Far tørrer storebror *Dad dries big brother*
25	puttet *to cover*	Short Passive	Far bliver puttet *Dad is covered*
26	bærer *to carry*	Active	Lillebror bærer storebror *Little brother carries big brother*

27	trukket to pull	Short Passive	Storebror bliver trukket *Big brother is pulled*
28	barberer *to shave*	Active	Far barberer bedstefar *Dad shaves grandad*
29	fotograferet *to photograph*	Short Passive	Storebror bliver fotograferet *Big brother is photographed*
30	mallet *to paint*	Short Passive	Far bliver mallet *Dad is face-painted*
31	Kilder *to tickle*	Active	Storebror kilder lillebror *Big brother tickles little brother*
32	slået *to hit*	Short Passive	Lillebror bliver slået *Little brother is hit*
33	bider *to bite*	Active	Lillebror bider storebror *little brother bites big brother*
34	krammet to hug	Short Passive	Bedstefar bliver krammet *Grandad is hugged*
35	tørret to dry	Short Passive	Far bliver tørret *Dad is dried*
36	putter to cover	Active	Far putter lillebror *Dad covers little brother*
37	båret to carry	Short Passive	Lillebror bliver båret *Little brother is carried*
38	trækker to pull	Active	Storebror trækker far *Big brother pulls dad*
39	barberet to shave	Short Passive	far bliver barberet *dad is shaved*
40	fotographer to photograph	Active	Storebror fotograferer bedstefar *Big brother photographs grandad*
41	maler to paint	Active	Far maler lillebror *Dad face-paints little brother*

42	kildet to tickle	Short Passive	Storebror bliver kildet *Big brother is tickled*
43	slår to hit	Active	Lillebror slår storebror *Little brother hits big brother*
44	bidt to bite	Short Passive	Lillebror bliver bidt *Little brother is bit*

3. Female Characters: Long Passive/Active

Item Number	Verb	Sentence Type	Sentence Item
45	skubber *to push*	Active	Storesøster skubber lillesøster *Big sister pushes little sister*
46	undersøger *to examine*	Active	Storesøster undersøger lillesøster *Big sister examines little sister*
47	kysser *to kiss*	Long Passive	Lillesøster bliver kysset af mor *Little sister is kissed by mother*
48	mader *to feed*	Long Passive	Lillesøster bliver madet af bedstemor *Little sister is fed by grandmother*
49	vasker *to wash*	Active	Mor vasker storesøster *Mother washes big sister*
50	jager *to chase*	Long Passive	Mor bliver jaget af storesøster *Mother is chased by big sister*
51	kradset *to scratch*	Long Passive	Storesøster bliver kradset af lillesøster *Big sister is scratched by little sister*
52	friserer *to comb*	Active	Mor friserer bedstemor *Mother combs grandmother*
53	tegner to draw	Active	Mor tegner storesøster *Mother draws big sister*
54	sviner *to dirty*	Long Passive	Storesøster bliver svinet af lillesøster *Big sister is dirtied by little sister*

55	aer to pat	Active	Lillesøster aer bedstemor *Little sister pats grandmother*
56	skubbet *to push*	Long Passive	Storesøster bliver skubbet af lillesøster *Big sister is pushed by little sister*
57	undersøgt *to examine*	Long Passive	Storesøster bliver undersøgt af lillesøster *Big sister is examined by little sister*
58	kisser *to kiss*	Active	Lillesøster kysser mor *Little sister kisses mother*
59	mader *to feed*	Active	Lillesøster mader bedstemor *Little sister feeds grandmother*
60	vasket *to wash*	Long Passive	Mor bliver vasket af storesøster *Mother is washed by big sister*
61	jager *to chase*	Active	Mor jager storesøster *Mother chases big sister*
62	kradser *to scratch*	Active	Storesøster kradser lillesøster *Big sister scratches little sister*
63	friserer *to comb*	Long Passive	Mor bliver friseret af bedstemor *Mother is combed by grandmother*
64	tegner *to draw*	Long Passive	Mor bliver tegnet af storesøster *Mother is drawn by big sister*
65	sviner *to dirty*	Active	Storesøster sviner lillesøster *Big sister dirties little sister*
66	aer to pat	Long Passive	Lillesøster bliver aet af bedstemor *Little Sister is pat by grandmother*

4. Male Characters: Long Passive/ Active Form

Item Number	Verb	Sentence Type	Sentence Item
67	krammer *to hug*	Active	Lillebror krammer bedstefar *Little brother hugs grandad*
68	tørrer *To dry*	Active	Storebror tørrer far *Big brother dries dad*
69	puttet *to cover*	Long Passive	Lillebror bliver puttet af far *Little brother is covered by dad*
70	bærer *to carry*	Active	Storebror bærer lillebror *Big brother carries little brother*
71	trukket to pull	Long Passive	Far bliver trukket af storebror *Dad is pulled by big brother*
72	barberer *to shave*	Active	Bedstefar barberer far *Grandad shaves dad*
73	fotograferet *to photograph*	Long Passive	Bedstefar bliver fotograferet af storebror *Grandad is photographed by big brother*
74	mallet *to paint*	Long Passive	Lillebror bliver malet af far *Little brother is face-painted by dad*
75	Kilder *to tickle*	Active	Lillebror kilder storebror *Little brother tickles big brother*
76	slået *to hit*	Long Passive	Storebror bliver slået af lillebror *Big brother is hit by little brother*
77	bider *to bite*	Active	Storebror bider lillebror *Big brother bites little brother*
78	krammet to hug	Long Passive	Lillebror bliver krammet af bedstefar *Little brother is hugged by grandad*
79	tørret to dry	Long Passive	Storebror bliver tørret af far *Big brother is dried by dad*

80	putter to cover	Active	Lillebror putter far *Little brother covers dad*
81	båret to carry	Long Passive	Storebror bliver båret af lillebror *Big brother is carried by little brother*
82	trækker to pull	Active	Far trækker storebror *Dad pulls big brother*
83	barberet to shave	Long Passive	Bedstefar bliver barberet af far *Grandad is shaved by dad*
84	fotographer to photograph	Active	Bedstefar fotograferer storebror *Grandad photographs big brother*
85	maler to paint	Active	Lillebror maler far *Little brother face-paints dad*
86	kildet to tickle	Long Passive	Lillebror bliver kildet af storebror *Little brother is tickled by big brother*
87	slår to hit	Active	Storebror slår lillebror *Big brother hits little brother*
88	bidt to bite	Long Passive	Storebror bliver bidt af lillebror *Big brother is bit by little brother*