Impact of the Context of Home and Preschool in the Expressive Language of Children with Autism Spectrum Disorder

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Abstract

The present study investigates the influence of the context in early language development of preschool children with Autism Spectrum Disorder. Expressive language of children between 2 and 5 years of age with a diagnosis of Autism Spectrum Disorder was measured with the MacArthur-Bates Communicative Development Inventory, a caregiver-reported language assessment tool, which parents and preschool teachers filled out. Ten semantic categories comformed only by nouns were the focus of comparision between the two groups of reporters. Results show little to no difference between the words that these children are reported to say at home and at preschool, with all semantic categories following a similar curve. This study, being the first to explore this specific topic, contributes to the knowledge on the influence of the context in the early expressive language of children with Autism Spectrum Disorder and may help encourage further research within this particular topic.

As a research-based master's thesis, this work consists of two parts: the first part is an overview of the theoretical and methodological background of the issue here investigated, while a draft of the resulting article of the study carried out is attached in Appendix A.

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1. Introduction

The present study investigates the influence of different contexts in the development of early language in children with Autism Spectrum Disorders (ASD). In order to offer the reader a comprehensive view on this topic, the first chapters will review its theoretical background, offering pertinent information about ASD, language in both typical development and autism and the role of context and generalisation skills in language learning. The second part presented here, which constitutes the methodological background, will add on the sections included in the article draft, focusing on the particularities of the study carried out for this master's thesis.

2. Theoretical background

2.1. ASD

The description and criteria surrounding the term "autism" has immensely changed. Eugen Bleuer's coined the word "autistic" to describe a symptom in severe cases of sqizophrenia in 1911. Then Grunya Sukhareva, Leo Kanner and Hans Asperger enriched the term in the following decades (Evans, 2013; Manouilenko & Bejerot, 2015) and currently we have the definitions of ASD by the fifth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5, American Psychiatric Association, 2013) and by the draft of the eleventh edition of the International Statistical Classification of Diseases and Related Health Problems (ICD-11, World Health Organization, 2019). While the DMS-5 offers a list of criteria aimed for diagnosis, the ICD-11 is redacted in a more descriptive way that is meant to serve as a guide to identify ASD. Nevertheless, they both bring into the spotlight the persistent deficits in social communication and interaction and the restrictive, repetitive patterns of behaviour, activities and interest (i.e., also known as RRB) as the two core diagnostic domains of ASD. They both also leave out the language criterion that their corresponding predecessor editions mentioned, but they do highlight the ample range of language and intellectual abilities of the ASD.

Taking the DSM-5 as a reference, the deficits in social communication and interaction may include deficits in social-emotional reciprocity, deficits in nonverbal communication and deficits in creating, maintaining and understanding social

relationships. Regarding the RRB, they may be constituted by stereotyped or repetitive motor movements, use of objects or speech, inflexibility of routines, highly restricted and fixated interests with an abnormal focus or intensity, and hyper- or hyposensitivity or abnormal interests in sensory aspects of the environment.

These symptoms are to be manifested across several contexts and they must have been present in the early stages of development, although they might not have been manifested until the social demands exceed the person's competences or they might have been masked by learned compensatory strategies. They are not better explained by intellectual disability or global developmental disorder and they originate clinically significant impairment in several important areas of the current functioning of the person. Severity of symptoms shall be specified regarding both core diagnostic criteria (i.e., social communication and interaction impairments and restricted, repetitive patterns of behaviour). It shall also be specified whether there is any comorbid intellectual or language impairment, any medical or genetic condition or another neurodevelopmental, mental or behavioural disorder (APA, 2013).

2.1.1. Prevalence

Considered a rare disorder some decades ago, ASD is nowadays one of the most common developmental disorders, since it has a prevalence of 1% or more in Europe (Kawa et al., 2017) and in the United States (Lord & Bishop, 2010), reaching 1,57% or even 1,68% according to some studies (Baron-Cohen et al., 2009; Baio et al., 2018). In Norway, where the present study takes places, the prevalence of ASD in children between 6 and 12 years old is 0,6% (Surén et al., 2013).

After the DSM-5 established new criteria, a smaller prevalence has generally been reported (Bent, Barbaro, & Dissanayake, 2017; for an exception see Baio et al., 2018), maybe due to the more restrictive diagnostic criteria, which seemingly makes that many cases of ASD diagnosed with the DSM-IV are no longer meeting the criteria (Tsai, 2014).

Regarding gender differences in ASD prevalence, a recent meta-analysis shows that the male-to-female ratio in the ASD group (i.e., diagnosed with either the DSM-IV or the

ICD-10) compared with the non-ASD group in research studies were 3:1 (Loomes, Hull, & Mandy, 2017). It has been suggested that girls with ASD are missing out by some of the current diagnostic procedures (Ratto et al., 2018). This may be because, without any additional behavioural or intellectual impairment, girls seem less likely than their male peers to meet diagnostic criteria for ASD in spite of showing the same high levels of ASD-like traits (Dworzynski, Ronald, Bolton, & Happé, 2012).

2.1.2. Phenotype

These new diagnostic criteria find its basis in more than a decade of empirical research that depicts ASD as a spectrum along two domains: social communication and interaction and restrictive behaviours.

Already in the 80s, Mundy, Sigman, Ungerer, and Sherman (1986) observed that non-verbal communication behaviours such as initiation of eye contact or showing something to others were the best criteria to differentiate children with ASD from those with typical development and those with a cognitive delay. Abnormalities in non-verbal communication have continued to be soundly demonstrated as a core characteristic of the autism spectrum (Frith & Happé, 1994; Mundy, 1995; Charman et al., 2000; Warreyn, Roeyers, & de Groote, 2005; Chiat & Roy, 2013).

The second DSM-5 criterion (i.e., restricted, repetitive patterns of behaviour, interests, or activities, also known as RRB) has also been present as a defining trait of ASD almost from the beginning. A plethora of studies has thoroughly added knowledge to this aspect of the disorders, one of the most recent of them reporting the predictive ability of these repetitive behaviours in children as young as 12 months old that later in life received an ASD diagnosis (Wolff et al., 2014), and differentiating subcategories of RRB (Bishop et al., 2013).

2.2. Language in typical development and autism

The first reference of language impairments in autism was made by Leo Kanner more than seven decades ago (Kanner, 1943) and several decades of robust findings have proven the heterogeneity of language within autism. It is therefore that, as we have

previously introduced, in 2013 the latest edition of the DSM-5 (APA, 2013) left out the abnormalities in language and so they became a specification within the spectrum, highlighting this way the continual aspect of these disorders. Following the language domain in ASD in light of its counterpart in typical development is addressed.

Tager-Flusberg et al. (2009), acknowledging the lack of consensus of the definition of "functional speech", suggested using milestones in expressive language observed in typical development as a reference to interpret this domain in children within the spectrum. In addition, they recommended omitting echolalic language (i.e., meaningless and unsolicited repetition of another person's vocalisations) from any analysis of speech in autism, since its function in these disorders is still unclear (Stiegler, 2015) in spite of its high occurrence in both TD (Gerber, Wilks, & Erdie-Lalena, 2010) and ASD (Prizant & Duchan, 1981; Eigsti, de Marchena, Schuh, & Kelley, 2011)

According to their classification of expressive language benchmarks in ASD (Tager-Flusberg et al., 2009), preverbal communication in children with typical development starts with vocal and gestural communication at around 6-12 months of age. Then when they are between 12 and 18 months old the first words come, including spontaneous single words about objects and events (i.e., both present and not present in the immediate context) used symbolically and referentially (e.g., labels, requests, comments). Within the 18-30-month-old period they are able to make two- and three-word combinations, which include nouns, verbs and descriptors. From 30 to 48 months of age, typical development children can say sentences that have prepositions, plurals and verb endings with both familiar and unfamiliar people. The last benchmark in their classification is that of 48-month-olds and on, when they have reached a complex language skill that comprehends abstract ideas, complex grammatical sentences within different linguistic contexts.

These phases go along the different domains of language (i.e., prosody, phonology, morphology, syntax, semantics and pragmatics) and since many children with ASD show a mixed profile with different elements of these phases and domains (for a review see Eigsti, et al., 2011), a developmental approach such as this is therefore recommended to define the level of expressive language in these children.

In the following sections, we address the issue of how both children with typical development and children with ASD learn words, with a special mention to the often forgotten language domain in ASD: grammar.

2.2.1. Word learning

Current knowledge about language learning in ASD is much more hopeful than decades ago: in spite of early impairments in speech, 95% of the sample in Lord, Risi and Pickles (2004) had expressive language by late childhood.

If we seek for understanding of the process of word learning in autism, we can depart from the relevant role that social clues hold in the process of mapping a new word in typical development (i.e., the social-pragmatic approach to language acquisition described in Tomasello, 2001). This theory finds its foundations in the findings in Baldwin (1991; 1993; 1995), Baldwin and Moses (1996) and Baron-Cohen, Baldwin and Crowson (1997), who conducted a series of experiments that highlighted the role of emotion and attentional focus (i.e., joint reference) in the learning of new labels in both children with typical development and children with ASD. Particularly, Baron-Cohen and colleges' study (2007) contributed to the field with their coining of the so-called "Speaker Direction of Gaze" strategy (i.e., using the speaker gaze in order to map a new label), which they observed was not the preferred strategy to use by the young children with ASD in their study. The authors claimed that this strategy and its counterpart, the "Listener Direction of Gaze" strategy, are part of joint attention skills, which children with ASD have somehow altered. Also McDuffie, Yoder and Stone (2006) reinforced the evidence on this *fast-mapping* (i.e., the associative process by which a label and an object are associated) in children with autism by reporting a link between attention-following, fast-mapping and vocabulary acquisition in their sample with ASD.

In the following decades, many studies focused on demonstrating how these deficits in social communication skills (e.g., joint attention), which are present as early as the first year of life (Zwaigenbaum et al., 2005) in these children, are related to deficits in language learning and therefore can predict different aspects of language that are affected in autism (e.g., Mundy et al., 1990).

In Luyster and Lord (2009), both children with TD and children with ASD (matched on expressive vocabulary) showed equal ability to learn a new label when the experimenter followed the child's focus of attention. Even when the focus of attention was that of the experimenter, both groups tended to performed in the same terms. In their study, though, they used an "entry task" to select the participants with ASD (i.e., correctly identifying a known label among two other distracters when shown three objects, and with generally average nonverbal ability and rather good joint attention skills measured by the Autism Diagnostic Observation Schedule – Generic (i.e., the most used diagnostic assessment tool for ASD, Lord et al., 2000). These results thus should be interpreted with caution by restricting them to those children within the spectrum that are more skilled only. The authors also pointed out that, even though the children in their sample had reached the mental age observed to be necessary to consistently fast-mapping (i.e., 16-18 months of age, Baldwin, 1993), they did not do so, but only showed the ability of avoiding mapping errors. They attributed this to the fact that children with ASD have shown to achieve developmental milestones later than their TD peers (Happé, 1995). This delayed fast-mapping ability is yet another piece of evidence on the qualitative similar, though later-achiever, developmental pathway within the ASD. Tek, Jaffery, Fein, & Naigles (2008) obtained similar results on the fast-mapping ability of both children with TD and children with ASD with an average age of 33 months.

It is well proven that, in typical development, children understand more than they can say. In other words, comprehension or receptive language precedes production or expressive language (Fenson et al., 1994; Dale & Fenson, 1996). This lag seems to be present through the whole development and it impregnates/influence/affli all domains of language (i.e., semantics, syntax, and so on) (Gernsbacher, Morson, & Grace, 2016). Does the same happen in autism? A debate around this phenomenon in autism is still without a firm conclusion. In 2003, Charman, Drew, Baird, and Baird (2003) compared the language comprehension and production skills of their sample of children with ASD with those of Fenson's (1994), finding that they had greater limitations in comprehension over production, which made the comprehension-production gap smaller but yet present as in the normative sample. In addition, Hudry et al. (2010)

found divergent results depending on the age, ASD-criteria (i.e., measured with the ADOS, Lord et al., 2000), nonverbal age equivalents (NVAE, measured with the Mullen Scales of Early Learning (MSEL), Mullen, 1995) and adaptive skills of the children with ASD in their sample, making it possible to differentiate two groups. Those children who were older, had better adaptive skills and NVAE and fewer ASD-features, followed an "atypical" lag (i.e., better expressive than receptive language skills, but still both impaired compared to a normative sample). Those who were younger, with less adaptive skills and NVAE and more ASD-features, showed a typical development pattern with better language comprehension than production skills. Another study that sheds some light on this topic is that of Luyster, Kadlec, Carter, and Tager-Flusberg (2008), where it was found that different language assessment methods showed different directions of the lag. For example, when assessed with the MSEL (Mullen, 1995) and the MacArthur Communicative Inventories (CDI, a parent-based report of the child's language comprehension and production, Fenson et al., 1993), language production outscored language comprehension. But when assessed with the Vineland Adaptive Behavior Scales (VABS, a parent-based measure of functional communication skills, Sparrow, & Cicchetti, 1989), comprehension obtained higher scores than production of language. Taken these results together, it appears that the lag is quite relative, depending on both the child's characteristics and the assessment tools employed. This may explain the lack of any lag at all in Kjelgaard and Tager-Flusberg (2001): they did not find significant differences between language comprehension and production in their children with ASD assessed with direct tests (e.g., Autism Diagnostic Observation Schedule, ADOS, DiLavore, Lord & Rutter, 1995). Finally, other authors claim that the typical lag (i.e., predominance of production over comprehension) in ASD does exist, but that it is less salient than in TD (Gernsbacher, Morson, & Grace, 2016). Indeed, these authors have recently observed that language comprehension skills in their sample of children with ASD was even more impaired than in children with TD, which makes the gap between language comprehension and production less marked.

2.2. 2. Grammatical categories

As Eigsti, et al.'s (2011) review on the research literature on different aspects of language in autism (i.e., prosody, phonology, morphology, syntax, semantics and

pragmatics) made clear, there is a surprising lack of research on the use of grammatical categories (e.g., verbs, nouns, adjectives, etc.) by children in the autism spectrum, which is one of the main motivations for the present study.

Eigsti, Bennetto, and Dadlani, (2007) demonstrated that children with high-functioning autism (i.e., one of the inclusion criteria was, for example, to produce at least 2-word phrases at home) say as many grammatical categories as their peers (i.e., children with TD and children with developmental delay) in free play sessions. Charman, Drew, et al., (2003) compared the patterns within language production and comprehension (reflected in the 19 categories of words of the CDI, Fenson et al., 1993) of their sample with that of Fenson and Dale (1996), obtaining similar patterns between children with ASD and TD. Regarding language production, the children with ASD only were reported to say proportionally fewer words than children with TD in the categories of Sound Effects and Animal Toys, keeping a highly typical pattern of production of the 19 categories of the CDI. They also were observed to follow a typical pattern when it comes to grammatical and semantic categories: an increasing predominance of nouns over verbs until the children said 50 words or more, with the majority of them being within the categories of Sound Effects, Games and Routines, Names for people and Places to go (Charman, Drew, et al., (2003). Fein et al. (1996), Tager-Flusberg et al. (1990) and Swensen et al. (2007) corroborated that children within the spectrum, similarly to children with TD, have vocabularies with a majority of nouns (also known as "noun bias"), but Tek et al. (2008) found that in the first phases of word learning they did not categorise them into abstract conceptual units (i.e., semantic categorisation). This bias seems to happen also in language comprehension (Miller, Chapman, Branston & Reichle, 1980).

We do not know whether this "noun bias" in children's expressive language is a reflection of a "noun bias" in the speech of English-speaking adults talking to their English-speaking children since, interestingly enough, an opposite "verb bias" occurs in the speech of Korean-speaking (Au, Dapretto, & Song, 1994) and Mandarin-speaking adults (Tardif, Shatz, & Naigles, 1997), but still children of the three cultures show this predominance of nouns in their speech (mainly names of objects). In opposition to these

findings, Tager-Flusberg, et al. (1990) did not find that verbs were in disadvantage compared to other grammatical categories.

2.3. Influence of the context in language learning and generalisation skills

Building on an interactional approach to child development in autism, both the child's characteristics and the characteristics of their social contexts (i.e., family, kindergarten, school) should be taken into account when trying to explain their developmental trajectories and idiosyncratic differences (Sameroff & Fiese, 1990; Chapman, 2000), and this is the reason why the present study focuses on the differential influence of the context in word learning across different semantic categories.

As we have already mentioned, both children with TD and with ASD learn words via fast mapping and, at least those with TD, learn best when they hear a new label in the same context in the initial phases of the learning process. Horst (2013) explained this on the reduced load of new information to process within the familiar and repeated context versus the additional new objects of a different, unfamiliar context.

In TD children, Hoff-Ginsberg and Tardiff (1995) confirmed an association between language development and parent-child interaction style. More concretely, Hart and Risley (1992) found that a high percentage of the verbal IQ of children between their first and third year of life was explained by three parenting factors: the quantity of parent participation in the child's activity, parent's performance as a social partner and the quality of content of parents' utterances. A follow-up study (Hart & Risley, 1995) revealed that language diversity (i.e., how many different nouns and modifiers they hear per hour) and symbolic emphasis (i.e., total number of nouns, modifiers and past-tense verbs per hour divided by total utterances) were, among others, two variables highly correlated with their child's expressive language. Other studies have found that occupational status and maternal or caregiver education level influence the cognitive and language development in TD (Richman, Miller, & LeVine 1992) and in ASD (Anderson et al., 2007).

A semantically diverse parent speech has indeed shown to be positively associated with a more diverse vocabulary in early, typical development and faster growth in vocabulary (Huttenlocher, Haight, Bryk, Seltzer, & Lyons, 1991; Hoff & Naigles, 2002), but there is some specificity to it. Hills, Maouene, Maouene, Sheya, and Smith, (2009) demonstrated the positive influence of contextual diversity in semantic development and how it affects the order we learn different grammatical categories such as nouns, verbs, adjectives and function words, among others. Generally speaking, the more related words a word has (e.g., "shoe" is related to "foot", "sock", "shoe lace", "shoe bag", etc.), the earlier in development it will be acquired. This is called the "contextual diversity" of a word: the quantity of related words that are frequently said with a particular word in the learning environment, and may respond to the "preferential acquisition" principle suggested by Hills et al. (2009). This principle states that children learn nouns that are well-connected in the learning environment itself, rather than in the children's own internal network (i.e., "principle of preferential attachment").

Findings in typical development reveal that, for nouns, it is beneficial that the learning contexts vary, so hearing and using a noun in different contexts (e.g., at home and at the kindergarten) will enhance its learning. For verbs and adjectives, findings suggest the opposite, at least when it comes to the first learning stages of that word: early consistency of the learning context (i.e., hearing and using a verb or an adjective in the same context at first will increase its acquisition) (Hoff & Naigles, 2002; Sethuraman & Goodman, 2004; Sandhoffer & Smith, 2007; Sandhofer & Doumas, 2008). In the case of nouns, Hills et al. (2009) reported that they held the strongest contextual diversity effect in child-directed speech, but it decreased noticeably when frequency was controlled. In the case of verbs and adjectives, on the other hand, the effect of their contextual diversity increased when frequency was controlled. They also found strong correlations within grammatical categories: children learn frequent nouns earlier than less frequent nouns, with the exception of individual basic-level nouns, which are relatively infrequent, but they are learned rather early in development; articles and prepositions, on the contrary, are learned later in development even though they are quite frequent in adult speech.

As for ASD, many studies have evidenced the limited spontaneity and decreased capacity of generalisation of new skills (e.g., Koegel, 2000) beyond the intervention context. De Marchena, Eigsti, and Yerys's (2015) study found weakened generalisation of spontaneously acquired skills in children with ASD. In their sample, they did not find correlation between this skill and age, but they did so regarding language comprehension, in line with Hartley and Allen (2014) and Hani, González-Barrero and Nadig (2013), this study also linking language production to generalisation skills.

These diminished generalisation skills not only may hinder intervention outcomes but they also may entail measurements problems. Assessing language in an unfamiliar context for the child may produce an inaccurate picture of this child's real performance, since he or she may not be able to transfer mastered language skills to a new context as well as a peer with typical development may do. It is thus important to acquire more knowledge on the role of context in early language learning in ASD, with special focus on their language generalisation skills across different contexts. The influence of the context in language learning may hold the key to know more about the language generalisation skills of these children across different contexts, since there is little evidence about them in the scientific literature.

2.3.1. Semantic categories

Different contexts include different persons, objects, behaviours and feelings, and it is therefore reasonable to think that a context will differentially enhance the learning of the words most often used in it, at the same time that it will differentially diminish the learning of less frequent words associated to that context.

Mandler and McDonough (1998) reported that between 7 and 11 months of age, children with typical development are able to categorise animals, vehicles and furniture, something that can be interpreted as a result of a potential high frequency of such semantic domains in interactions between them and their caregivers. Huttenlocher, Waterfall, Vasilyeva, Vevea, and Hedges' study (2010) assessed both vocabulary and syntax produced by TD children and their caregivers, concluding that there were ample individual differences among the children's expressive language that was predicted by the speech of their early caregivers. In the case of vocabulary, but not for syntax, it also

predicted later caregiver's speech, which evidences a bidirectional influence of caregiver's and children's speech. This is in line with a previous study of Huttenlocher Levine and Vevea (1998), where both preschool teachers and parents used fewer words with their low socio-economic status (SES) children than with those of middle SES, although these differences were less marked in the parent's case.

It is undoubtable that the quantity of words that children are exposed to is important, but rather more determining to later expressive language skill is the quality of that input and how varied it is. This is what Jones and Rowland (2017) recently demonstrated: the semantical quality (i.e., using many different semantic categories such as toys, clothes, food, etc.) of the caregiver's speech deeply influences the semantic knowledge for both new and learned words.

Tamis-LeMonda, Custode, Kuchirko, Escobar, and Lo (2018) reported the activity-dependant specificity of the semantic content of child-directed speech. In this study, findings evidenced how different home routine activities determined the word categories of mother's utterances: during a certain activity, they used more words (i.e., nouns and verbs) related to that activity (i.e., the objects and actions involved in it) and highly associated among each other, and fewer words that were not related to the activity at hand. These results are in line with Hills et al.'s (2009) conclusions: semantic (and phonological) similarity of words, along with their frequency in the learning context, is what determines the potential of a word to be learned. Yet, the majority of the categorisation of words in Tamis-Lemonda et al., (2018) study was unspecific: between 60% and 70% of the words used across all activities correspond to other semantic categories. This, rather than a limitation of the categorisation process, was interpreted by the authors as an advantage to decontextualise words, something that has been demonstrated to help word learning from a certain mental age (e.g., Rowe, 2013). Moreover, they argued that this word consistency (i.e., the specificity of semantic categories depending on the context of the activity) within the bigger picture of word discrepancy (i.e., the high percent of non-specific words during a certain activity) created a contrast that facilitated the learning of routine activity-related words. This highlights how a specific semantic category may be bounded to a specific context, and

how variation of the context (i.e., decontextualisation) in which that word is used may influence learning that word.

But this decontextualisation of a word is not innate, but learned through interactions with the environment. In typical development, early memories, and therefore learning, are more context-dependent, meaning that young children tend to not be able to retrieve memories in a different context from that where the learning took place (e.g., Smith, 1982). In this sense, if category members (e.g., socks, sweater, trousers, etc., belong to the semantical category of "Clothes") are associated to a particular context (e.g., "Clothes" may be more often hear and use at home, while "Toys" category may be more linked to kindergarten since most of the time is dedicated to play), a different context might not be enough to "trigger" the production of words belonging to such semantic category (Vlach & Sandhofer, 2011). These authors also found developmental differences in performance of their children with TD regarding depending on whether the learning took place in varied contexts (i.e., context diversity) *or* in the same context (i.e., context consistency): when the children were 2.5 years old, they benefited from the same context only (suggesting that they word learning still is quite context-dependent), performing worse in the varied contexts condition; while 3- and 4-years-old children benefited from both the same and different contexts, maybe because encountering the same label in different contexts helps them to de-contextualise that word. But 2-years-olds seem to overcome this context-dependency when the learning happens in both similar *and* varied contexts and *only* if they attend to the context (Goldenberg & Sandhofer, 2013; Goldenberg & Johnson, 2015)

Bringing these results to autism, it may be suggested that children within the spectrum at a cognitive age (rather than chronological, since these children seem to match their typical developmental peers' benchmarks somehow later, e.g., Tager-Flusberg et al., 2009) of 3 years old or more might benefit from the diversity of contexts when learning words. They might not benefit from the combined strategy (i.e., learning in both the same and different contexts) since a condition for this type of context support is visually attending to the context's characteristics, something that children with ASD may not be as skilled at as their peers with TD that participated in these studies.

3. Methodological background

3.1. Design

This study is a quantitative, nonexperimental within-group design, where the dependant variable is the amount of nouns that the child says, as reported by parents and kindergarten staff, and the independent variable is the context, in which there are two discernible groups: home (i.e., parent-reported) and kindergarten (i.e., kindergarten staff-reported).

The reason to use a quantitative approach here was the interest on looking for differences and similarities in the amount of nouns reported, which obligatorily implies analysing numbers rather than opinions or attitudes. The main advantage of quantitative studies is their high objectivity, something that contributes to the external validity (i.e., the extent to which results can be extended from the sample to the population). The rigorous data collection and analyses and the use of only one instrument at only one time point helped avoiding threats to internal validity such as effects of maturation, instrumentation or confounding variables. The measurement used in this study has shown high internal consistency and high interrater and test-retest reliability, which ensures a robust internal validity.

A nonexperimental design is used in the present study because there was no intention of altering the independent variable. Moreover, we only aimed to look at the relations between the two groups, since this study has an exploratory, rather than explanatory, character. Yet again, this study was meant to be a first step in the exploration of early language development in preschool children with ASD, we did not seek to explain the why to any phenomenon.

With a within-group approach we could better explore the wide language phenotype that is characteristic of the ASD (Tager-Flusberg, 2004), in this case additionally comparing it in two different natural contexts.

3.2. Participants

The present study uses the participants from the study by Kaale, Smith, and Sponheim (2012). Families of 61 children agreed to participate. Inclusion criteria were (1) a chronological age of 24 to 60 months, (2) a confirmed age diagnosis of Childhood Autism assessed with ICD-10, and (3) attendance in kindergarten. Exclusion criteria were (1) having a central nervous system disorder, and (2) having non-Norwegian speaking parents. Child and Adolescent Mental Health Clinics in East and West Norway identified participants between October 2006 and August 2008. Data of 3 participants were excluded from the analysis in the current study as they were incomplete (i.e., either one or both parent's and preschool teacher's reports were missing). Therefore, the sample in the present study is n=58.

Regarding the characteristics of the children, the sample in this study is rather homogeneous in age, since the mean is 48,8 months of age and the standard deviation is only 8 months of age, with the youngest of the children being 30 months old and the oldest 60 months old. The mean mental age, as expected for children with ASD, is lower than the mean chronological age (i.e., 27,9 months old). The variability here is wider, since the standard deviation is 11,4 months of age and the range varies from 9 to 59 months old. This broader mental age range (i.e., more heterogeneity in terms of cognitive skills) is characteristic of the autism spectrum and it is indeed an advantage not only because it makes the sample in this study highly representative of the population, but also because, as authors such as Tager-Flusberg (2004) and Eigsti, et al., (2011) have stated, it provides an unique opportunity to identify more homogeneous subgroups within the population.

When it comes to language, these children seem to hint to the language comprehension dominance often observed in children with ASD (e.g., Charman, Drew, et al., (2003) (i.e., 23,2 months of age for language comprehension versus 21,1 months of age for language production). The language variability observed among the children is this study is typically seen in autism (i.e., in this study, the receptive language age ranges from 6 to 60 months old, and the language production (i.e., *expressive language* in the instrument used) age ranges from 3 to 60 months old). This intravariability of the sample reflects the enormous variability of skills that is seen within the autism

spectrum, giving the sample a robust external validity due to its representativeness. The male-to-female ratio of the participants in the present study is slightly higher than the usual for a population within the autism spectrum, since the male-to-female ratio in this study is 5 boys for every girl, while a recent metaanalysis concluded that the current tendency in research is 3:1 (Loomes, Hull, Mandy et al., 2017). The present study does not provide information about the ethnicity ratio of the participant children.

From the demographical information collected about the parents, we know that the majority of the parents have secondary education or a higher level in education (i.e, 86% for mothers and 89% for fathers), and that most of the children's homes (i.e., 91%) are Norwegian-speaking environments. It would be interesting for future studies with these data to look at that remaining 9% of children that only hear Norwegian at preschool: there might be differences in their level of expressive language due to this contextual factor, which could further strengthen the hypothesis of contextual influence in early language development in ASD. This subgroup is too small in this study to run statistical analysis though, but it may be feasible in a larger study.

3.3. Procedures and instrument

Measuring skills such as language is always complicate, especially when the subjects are children, and even more when they have a disorder that might affect not only language, but also other related skills such as attention, and that usually co-occurs with other disorders. Frequent methodological issues in research in young children with ASD are the heterogeneity in a wide range of abilities that characterises this population, cognitive delays that accompany the main ASD diagnosis, the difficulty of obtaining big samples that ensure a good external validity, and the inevitable developmental change that comes with the passing time (Tager-Flusberg et al., 2009). It is therefore that many authors expert in the area recommend adopting a developmental approach (Tager-Flusberg, 2004) and using triangulation of measurement tools (i.e., using for example both direct test, report-based instrument and natural language samples) when researching in and assessing language in children with ASD.

This study uses a caregiver-report measure to investigate early expressive language skill. Some advantages of parent report measures in comparison with direct tests are the broader range of participants that can be reached in a relatively short amount of time due to the easiness of its application, which do not require expert respondents, along with the avoidance of the potential issues of a wide variability of vocabulary skills (Dockrell, & Marshall, 2015; Barokova, & Tager-Flusberg, 2018) and the child's lack of attention or motivation (Tomasello & Mervis, 1994; Koegel, Koegel, & Smith, 1997; Nordahl-Hansen, Kaale & Ulvund, 2014; Miller, Perkins, Dai & Fein, 2017). These last two characteristics are specially important when assessing language in ASD, since these children usually have motivation challenges and shorter attention span than their peers with typical development, and show a wider range of language skills, which sometimes leads to either floor effects or ceiling effects (e.g., Charman, Drew, et al., (2003); Charman, Baron-Cohen, Swettenham, Baird, Drew & Cox, 2003).

In the present study expressive vocabulary is used as a measure of language production skill. The instrument that we used was the Communication Development Inventory (Fenson et al., 1993), which consists of two forms: the "Words & Gestures" form, designed for children between 8 and 16 months of age, and the "Words & Sentences" form, designed for children between 16 and 30 months of age. "Words & Gestures" is constituted by a 396-item vocabulary production and comprehension checklist with 19 semantic categories whereof 10 of them are composed only of nouns (the rest of the categories contain verbs, adjectives, pronouns, prepositions and quantifiers), and by several sections about actions and gestures.

As Luyster, Qiu, Lopez, and Lord (2007) stated, the CDI may be a good instrument to assess language in young children with ASD or at risk of it because it provides both specific and general competence (e.g., production and comprehension of language, vocabulary and grammar, early and late gestures, etc.). This instrument has demonstrated high predictive ability regarding later language skills in children with typical development (Fenson et al., 1994) and children with ASD (Luyster, Qiu, Lopez, & Lord, 2007; Luyster, et al., 2008), as well as it has been used to study the associations between language and other developmental domains such as motor imitation, initiations of joint attention and object play skills (Stone & Yoder, 2001). Although the best

feature of the CDI, at least as it concerns this study, is the possibility to analyse individual items and thus semantic categories within the child's expressive vocabulary. By contrast, there have been uncertainties about the biased report that such an untrained eye as a parent's may give, especially in the sense of a potential overestimation of their child' skills. But the main advantage of the CDI, at least as this study concerns, is the fact that it allows to explore natural, contextualised language skill. While direct, standardised language assessments usually take place in an unfamiliar environment to the child with unfamiliar people, *cumulative CDIs* (i.e., the best score for any item on the CDI as reported by any rater, preferably from different contexts in which the child takes part) collect a broad picture of the daily vocabulary of the child in his/her natural, familiar context (Marchman & Martinez-Sussmann 2002; De Houwer, Bornstein, & Leach, 2005). The present study did not use this strategy to analyse the data, but a "match" variable computed with the amount of words said by the children in both contexts. This can be argued as a limitation, since we only looked at the amount of words and not which concrete words the children said in each and both contexts. Future research can therefore benefit from analysing the items within each semantic category for each reporter, and from further analysing in which items there was agreement between the two contexts and in which items they did not agree at all. Another suggestion for future use of the CDI in research is the comparison of comprehension (i.e., words the child understands) and production (i.e., words the child understands *and* says) in each semantic category, as previous research is still inconclusive regarding the quality, the direction and even the existence of the expressive-receptive language gap in ASD (Kjelgaard & Tager-Flusberg, 2001; Charman, Drew, Baird, & Baird, 2003; Luyster et al., 2008; Hudry et al., 2010).

In spite of the strengths of the present study due to the instrument used, a frequent problem to overcome in the research in productive language is the issue of echolalia. That a child repeats a word, either right after he/she hears it or a period of time later (i.e., delayed echolalia, Dyer & Hadden, 1981) does not presume understanding of it, which is what language assessments aim to test after all. The CDI is not impervious to this challenge, as one can see by the dichotomy of the answers in its vocabulary checklist: either the child "Understands" or "Understands and Says". This instrument, then, does not discern between functional language or simple echolalia (for an example

see Stone & Yoder, 2001); it just assumes the understanding of a word by its production. As Hudry et al. (2010) pointed out, the parent' expert *reading* of their child's communicative behaviour minimises the risk of reporting understanding when there is just echolalia.

3.3.1. Validity and reliability of the instrument

Fenson et al. (1994) reported the validation of the CDI to assess the early language skills of children with typical development. Both forms of the instrument obtained high internal consistency (i.e., measured with Cronbach's coefficient alpha) and great concurrent validity with other assessment methods such as direct observation and standardised tests (although the "Words & Gestures" form seems to address a broader vocabulary scope).

Regarding reliability, test-retests for the "Words & Gestures" form showed a correlation of .87 for comprehension, .95 for production, and .86 for gestures (all at $p < .01$), with a mean of 1.35 months in between measurements. Correlations for comprehension and gestures were similar when differentiating between above-the-mean or below-the-mean subjects, but the latter obtained significantly lower correlations on production. Comprehension showed high, uniform stability except from the case of those children who were assessed at 12 months of age, something that the authors attributed to a typical cognitive reorganisation that takes places around that age. Production, on the other hand, obtained initially low stability that started increasing up to mid .80 correlations when the children were older than 10 months of age. Test-retest correlations for the "Words & Sentences" were high (i.e., .95, $p < .01$) for production, with a mean test-retest time lapse of 1.38 months, and similar correlations for subjects above and below the mean (Fenson et al., 1994).

Regarding its use with children with ASD, the CDI has in recent studies obtained high concurrent validity with the *Reynell Developmental Language Scales* (RDLS, Reynell & Gruber, 1997) and *Mullen Scales* of Early Learning (MSEL, Mullen, 1995) on both expressive and receptive language using parents and preschool teachers as CDI-raters, demonstrating that this report-based instrument is as reliable as direct, standardised assessments (Luyster, Kadlec, Carter, & Tager-Flusberg, 2008; Nordahl-Hansen, Kaale,

& Ulvund, 2014) and, as some authors point out, any difference between direct assessments and parent reports in autism may be explained on the weaken language generalisation skills that these children usually have (Luyster et al., 2008). The CDI has also obtained moderate to high interrater reliability in research in autism (De Houwer, Bornstein, & Leach, 2005). More concretely, Nordahl-Hansen, Kaale, and Ulvund (2013) found that, although both excellent, interrater reliability for word comprehension was somehow lower than that for word production which these authors interpret as a consequence of the difficulty to assess children's expressive language over receptive language. Nevertheless, this trend was not observed when using the Vineland Adaptive Behavior Scales, a semi-structured parent interview (Luyster, et al., 2008; Miller, et al., 2017). It is true, though, that inter- and intrafamily reports on language comprehension with the CDI tend to be more reliable when the child has relatively weak comprehension skills (i.e., understands only few words) and little overall communicative competence (De Houwer, Bornstein, & Leach, 2005). Also, in Nordahl-Hansen, Kaale, and Ulvund (2013)'s research, parent's ratings on both word production and word comprehension were higher than those of kindergarten staff, something that may be argued as an overestimation by the parents (Tomasello & Mervis, 2004), an underestimation by the preschool staff or simply because of contextual differences in the frequency of spoken words. Some authors also mention the socioeconomic status of the reporter or the maternal education (i.e., which assumes that the mother is the one filling out the CDI form) may interfere with the rating of the CDI (Roberts, Burchinal, & Durham, 1999; Dollaghan et al., 1999), while other studies did not find such an effect (Luyster, Qiu, Lopez, & Lord, 2007). All these issues might be avoided or at least better controlled for by using both direct assessments and report-based ratings from different caregivers (i.e., father, mother, preschool teachers).

3.4. Statistical analyses

The statistical analyses conducted to answer the first hypothesis were descriptive statistical analyses (i.e., mean, standard deviation and range) and paired sample t-test (i.e., statistical analysis to test a hypothesis by comparing mean differences of two observations of the same group of participants) comparing both parent's and kindergarten staff's ratings across each semantic category of the CDI's "Words &

Gestures" that only contained nouns (i.e., from category 2 to category 11) separately and all these 10 categories taken together. We chose this paired sample t-test because (1) we had only one group of participants which was observed by two different raters (i.e., parents and preschool teachers) at the same point of time, thus making the two groups of data dependant (i.e., "paired"), and (2) we need to compare the mean differences of these two raters in order to see whether there was any difference between them. As a statistical analysis to test hypotheses, the t-test offered a *p*value with which we could see whether there were significant differences in the means of each context in each semantic category. But the use of this statistical way of determining the significance of mean differences carries an interesting debate (see Nordahl-Hansen, Øien, Volkmar, Shic, & Cicchetti, 2018): is "statistical significance" mandatorily equal to "clinical significance"? Taking the results of the present study as an example, the fact that only 1 word differentiated the expressive language performance of the children at home from their performance in the kindergarten in the two semantic categories that obtained statistically significant p-values raises interpretational questions: is a difference of 1 word enough to say that these children's expressive language skill is enhanced by the context of home?

For the second hypothesis we run descriptive analyses on the variable "Match", which compiled the amount of nouns from each category said by the children in the two contexts, in order to see the means and standard deviations in each semantic category and in all 10 categories taken together. We also calculated the percentages of the means obtained in these descriptive analyses to create a figure where the differences between the two contexts and between them and the match variable were easy to see.

3.5. Privacy and ethics

This investigation has followed the guidelines for data management in research that the University of Oslo published in January th 7th, 2019, and that are under European Union's General Data Protection Regulation ("2018 reform of EU data protection rules," n.d.). Following we review the 7 stages that constitute these guidelines and the level of security within each of them in which the present study is placed.

Stage 1. Identification of type of data/information.
This stage regulates how the information is collected and stored.

The data in the present study is placed in levels red and black, which are the two highest levels of security due to the sensitive nature of the information collected (i.e., information about health, ethnicity, sexuality, or opinions on political, philosophical or religion matters). In this study concretely, the data were related to children with a diagnosed disorder, placing the study in the highest level of security.

Stage 2. Information and consent forms.
This stage regulates the information about the project given to the participants and their written consent to participate in it.

The present study, using data from a previous study, did not need to send any information and consent form to new potential participants. The original project distributed a consent form, along with an informative invitation, to all the families that agreed to participate. This consent form entailed the agreement to use the data in future studies related to the original project, such as the present study. The information letter briefly explained the project, how the participants' anonymity will be ensured both during and after the project was over, the willingness of participation and dropping-out at any time without any repercussion and how the data were going to be stored and eventually erased. Both the information letter and the consent form are attached in Appendix B.

Stage 3. Plan for data management.
This stage regulates the signing of the plan for data management provided by the Norwegian Centre for Research Data ("NSD - Norwegian Centre for Research Data," n.d.).

The present study did not have a data management plan.

Stage 4. Registration of the project in the Research Ethics Committee (REC, "REK – Regionale komiteer for medisinsk og helsefaglig forskningsetikk," n.d.).

This stage regulates the registration for projects with security level yellow and above in the Research Ethics Committee. This entails filling out a form and sending it to the NDS in order for them to approve the carrying-out of the project. The evaluation and approval of a project usually takes a minimum of 30 days.

The responsible person for the present study applied for registration of the project in the REC and attached an information letter, where the aims, procedures and purpose of the project were explained. An approval letter was received only a few days later of having sent the application for registration, as it constituted an extension of the approved usage of data that the original study obtained by the REC. This approval letter can be found in Appendix C.

Stage 5. Preparation work for data collection.
This stage regulates the collection of the participants' consent either before the project takes place or before the researcher starts collecting data from the informants (e.g., before starting an interview). In this stage it is also regulated the way to store the consent forms (e.g., if they are paper forms, they can be stored in a safe-deposit box at the faculty) and the data collection instruments (i.e., the CDI forms in the present study).

The responsible person for this study and one of her supervisors (i.e., the leading researcher in the original project) agreed where and how the answered CDI forms would be used (i.e., only at the University of Oslo's Faculty of Special Needs Education) and stored (i.e., in a locked box in the supervisor's office at University of Oslo's Faculty of Special Needs Education) and how the usage of the instrument would be registered (i.e., a paper document stored in along the answered CDI forms, where the responsible of this study must register the material borrowed, the date and time of the loan and the date and time of return).

Stage 6. Data collection.
This stage regulates the collection of data. This study, being placed at levels red and black in the security scale, required the collection and analysis of data via University of

Oslo' Service for Sensitive Data ("Tjenester for Sensitive Data (TSD) – Universitetet i Oslo" n.d.).

The data collected with the CDI forms were entered and stored only in a computer at the University of Oslo's Faculty of Special Needs Education via the previously mentioned TSD. This service uses a two-factor login, which consists in a first identification using Google Authenticator installed in the personal mobile phone of the user, and a second identification using a user name and a high security level password.

Stage 7. Data storage.
This stage regulates the storage of data. As in stage 6, the red and black security level data used in this study required to be stored and analysed in the TSD.

The responsible person for this study only analysed the data via the TSD, being this the only virtual place in which the data was stored at all time. The paper versions of the answered CDI forms remained stored in a locked box, as explained in Stage 5.

Stage 8. Anonymity and eventual deleting of the data.
This stage regulates the insurance of the anonymity of the data before it is sent to lower security levels.

Anonymity in this study was ensured from the very beginning by erasing any personal information from the CDI forms that could be used to identify the children, the parents or the preschool teachers. Eventual deleting of the data has not been discussed as it is part of a larger project with a valid consent of data usage for future studies.

Stage 9. Clarification of the status of the data after the termination of the project.
This last stage regulates the status of the data after the project is over. The data can be either permanently deleted or stored for further research. In the latter case, the data must be stored in the Service for Sensitive Data of the University of Oslo. The decision about the status of the data must be in concordance with that stipulated in the consent form.

The status of the data used by this study at the present time is that of current validity for further research within the scope of the consent obtained by the original project.

Ethical issues were also very present in this study, since the participants were children with a developmental disorder. The biopsychosocial nature of the ASD makes research complex in the sense that several aspects of the life of these children and their families can be affected by the procedures and results of research, and this is of high importance when investigating such a vulnerable group of population. Ensuring the anonymity of the children and their families, and analysing the data with the maximum respect and professionalism were fundamental deontological mandates for the responsible researchers of this study. As mentioned before, the data used here was originally collected for and used by a study from 2012 (Kaale, Smith, & Sponheim, 2012), which obtained approval from the previously mentioned REC. A new request form was therefore submitted for the present study to the briefly explaining the contents, aims and motives for this new use of the data. The approval letter can be found in Appendix C. There was no need to collect additional consent for parents or kindergarten staff, since this study used the same data and was therefore within the legal compromise of the original study.

As the results of this study pose high relevance -not only for research, but also for educational interventions-, and since the ultimate goal of research in education is to provide knowledge that improves the quality of education and, ultimately, the quality of life of learners, the responsible way of action is to disseminate the results here obtained and their implications for practice.

4. Purpose of the present study

The theoretical and methodological background here reviewed is meant to serve not only as a base of knowledge on the state of the issue, but also as a justification of the aims of the present study. We have accounted for the important role of language as a specification of the autism spectrum, how children learn words and how influencing the context can be in terms of the kind (i.e., grammatically and semantically speaking) of

words that the children learn. But still there are some unanswered questions arisen from the research literature itself: how does context affect the learning of new words in children with ASD? Are there any differences in the words that children with ASD learn based on the context they use/hear them? If so, in which direction go these differences? Does a specific context enhance or reduce the learning of a specific semantic category of words? If so, why does this happen and how is this important for research and intervention?

The present study aims to answer some of these questions and add preliminary knowledge to this general issue in order to encourage future further research on the topic.

References

2018 reform of EU data protection rules [Text]. (n.d.). Retrieved May 13, 2019, from European Commission - European Commission website: https://ec.europa.eu/commission/priorities/justice-and-fundamental-rights/data-protection/2018-reform-eu-data-protection-rules_en

American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders (DSM-5®)*. American Psychiatric Pub.

Anderson, D. K., Lord, C., Risi, S., DiLavore, P. S., Shulman, C., Thurm, A., … Pickles, A. (2007). Patterns of growth in verbal abilities among children with autism spectrum disorder. *Journal of Consulting and Clinical Psychology*, *75*(4), 594.

Au, T. K.-F., Dapretto, M., & Song, Y.-K. (1994). Input vs constraints: Early word acquisition in Korean and English. *Journal of Memory and Language*, *33*(5), 567–582.

Baio, J., Wiggins, L., Christensen, D. L., Maenner, M. J., Daniels, J., Warren, Z., … Dowling, N. F. (2018). Prevalence of Autism Spectrum Disorder Among Children Aged 8 Years - Autism and Developmental Disabilities Monitoring Network, 11 Sites, United States, 2014. *Morbidity and Mortality Weekly Report. Surveillance Summaries (Washington, D.C.: 2002)*, *67*(6), 1–23. https://doi.org/10.15585/mmwr.ss6706a1

Baldwin, D. A. (1991). Infants' contribution to the achievement of joint reference. *Child Development*, *62*(5), 874–890.

Baldwin, D. A. (1993). Infants' ability to consult the speaker for clues to word reference. *Journal of Child Language*, *20*(2), 395–418.

Baldwin, D. A. (1995). Understanding the link between joint attention and language. *Joint Attention: Its Origins and Role in Development*, 131–158.

Baldwin, D. A., & Moses, L. J. (1996). The ontogeny of social information gathering. *Child Development*, *67*(5), 1915–1939.

Barokova, M., & Tager-Flusberg, H. (2018). Commentary: Measuring Language Change Through Natural Language Samples. *Journal of Autism and Developmental Disorders*, 1–20.

Baron-Cohen, S., Baldwin, D. A., & Crowson, M. (1997). Do children with autism use the speaker's direction of gaze strategy to crack the code of language? *Child Development*, *68*(1), 48–57.

Baron-Cohen, S., Scott, F. J., Allison, C., Williams, J., Bolton, P., Matthews, F. E., & Brayne, C. (2009). Prevalence of autism-spectrum conditions: UK school-based population study. *The British Journal of Psychiatry*, *194*(6), 500–509.

Bent, C. A., Barbaro, J., & Dissanayake, C. (2017). Change in Autism Diagnoses Prior to and Following the Introduction of DSM-5. *Journal of Autism and Developmental Disorders*, *47*(1), 163–171. https://doi.org/10.1007/s10803-016-2942-y

Bishop, S. L., Hus, V., Duncan, A., Huerta, M., Gotham, K., Pickles, A., … Lord, C. (2013). Subcategories of restricted and repetitive behaviors in children with autism spectrum disorders. *Journal of Autism and Developmental Disorders*, *43*(6), 1287–1297.

Chapman, R. S. (2000). Children's language learning: An interactionist perspective. *The Journal of Child Psychology and Psychiatry and Allied Disciplines*, *41*(1), 33–54.

Charman, T., Baron-Cohen, S., Swettenham, J., Baird, G., Cox, A., & Drew, A. (2000). Testing joint attention, imitation, and play as infancy precursors to language and theory of mind. *Cognitive Development*, *15*(4), 481–498.

Charman, T., Baron-Cohen, S., Swettenham, J., Baird, G., Drew, A., & Cox, A. (2003). Predicting language outcome in infants with autism and pervasive developmental

disorder. *International Journal of Language & Communication Disorders*, *38*(3), 265–285.

Charman, T., Drew, A., Baird, C., & Baird, G. (2003). Measuring early language development in preschool children with autism spectrum disorder using the MacArthur Communicative Development Inventory (Infant Form). *Journal of Child Language*, *30*(1), 213–236.

Chiat, S., & Roy, P. (2013). Early predictors of language and social communication impairments at ages 9–11 years: A follow-up study of early-referred children. *Journal of Speech, Language, and Hearing Research*, *56*(6), 1824–1836.

Dale, P. S., & Fenson, L. (1996). Lexical development norms for young children. *Behavior Research Methods, Instruments, & Computers*, *28*(1), 125–127.

De Houwer, A., Bornstein, M. H., & Leach, D. B. (2005). Assessing early communicative ability: A cross-reporter cumulative score for the MacArthur CDI. *Journal of Child Language*, *32*(4), 735–758.

De Marchena, A. B., Eigsti, I.-M., & Yerys, B. E. (2015). Brief report: generalization weaknesses in verbally fluent children and adolescents with autism spectrum disorder. *Journal of Autism and Developmental Disorders*, *45*(10), 3370–3376.

DiLavore, P. C., Lord, C., & Rutter, M. (1995). The pre-linguistic autism diagnostic observation schedule. *Journal of Autism and Developmental Disorders*, *25*(4), 355–379.

Dockrell, J. E., & Marshall, C. R. (2015). Measurement issues: Assessing language skills in young children. *Child and Adolescent Mental Health*, *20*(2), 116–125.

Dollaghan Christine A., Campbell Thomas F., Paradise Jack L., Feldman Heidi M., Janosky Janine E., Pitcairn Dayna N., & Kurs-Lasky Marcia. (1999). Maternal Education and Measures of Early Speech and Language. *Journal of Speech, Language, and Hearing Research*, *42*(6), 1432–1443. https://doi.org/10.1044/jslhr.4206.1432

Dworzynski, K., Ronald, A., Bolton, P., & Happé, F. (2012). How Different Are Girls and Boys Above and Below the Diagnostic Threshold for Autism Spectrum Disorders? *Journal of the American Academy of Child & Adolescent Psychiatry*, *51*(8), 788–797. https://doi.org/10.1016/j.jaac.2012.05.018

Dyer, C., & Hadden, A. J. (1981). Delayed echolalia in autism: some observations on differences within the term. *Child: Care, Health and Development*, *7*(6), 331–345.

Eigsti, I.-M., Bennetto, L., & Dadlani, M. B. (2007). Beyond pragmatics: Morphosyntactic development in autism. *Journal of Autism and Developmental Disorders*, *37*(6), 1007–1023.

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

Evans, B. (2013). How autism became autism. *History of the Human Sciences*, *26*(3), 3–31. https://doi.org/10.1177/0952695113484320

Fein, D., Barton, M., Eigsti, I.-M., Kelley, E., Naigles, L., Schultz, R. T., … Rosenthal, M. (2013). Optimal outcome in individuals with a history of autism. *Journal of Child Psychology and Psychiatry*, *54*(2), 195–205.

Fenson, L., Dale, P. S., Reznick, J. S., Bates, E., Thal, D. J., Pethick, S. J., … Stiles, J. (1994). Variability in early communicative development. *Monographs of the Society for Research in Child Development*, i–185.

Fenson, L., Dale, P., Reznick, J. S., Thal, D., Bates, E., Hartung, J., … Reilly, J. (1993). MacArthur Communicative Inventories: User's guide and technical manual. *San Diego*.

Frith, U., & Happé, F. (1994). Autism: Beyond "theory of mind." *Cognition*, *50*(1), 115–132.

Gerber, R. J., Wilks, T., & Erdie-Lalena, C. (2010). Developmental milestones: motor development. *Pediatrics in Review*, *31*(7), 267–277.

Gernsbacher, M. A., Morson, E. M., & Grace, E. J. (2016). *Language and speech in autism*.

Goldenberg, E. R., & Johnson, S. P. (2015). Category generalization in a new context: the role of visual attention. *Infant Behavior and Development*, *38*, 49–56.

Goldenberg, E. R., & Sandhofer, C. M. (2013). Same, varied, or both? Contextual support aids young children in generalizing category labels. *Journal of Experimental Child Psychology*, *115*(1), 150–162.

Hani, H. B., Gonzalez-Barrero, A. M., & Nadig, A. S. (2013). Children's referential understanding of novel words and parent labeling behaviors: similarities across children with and without autism spectrum disorders. *Journal of Child Language*, *40*(05), 971–1002. https://doi.org/10.1017/S0305000912000426

Happé, F. G. (1996). Studying weak central coherence at low levels: children with autism do not succumb to visual illusions. A research note. *Journal of Child Psychology and Psychiatry*, *37*(7), 873–877.

Hart, B., & Risley, T. R. (1992). American parenting of language-learning children: Persisting differences in family-child interactions observed in natural home environments. *Developmental Psychology*, *28*(6), 1096.

Hart, B., & Risley, T. R. (1995). *Meaningful differences in the everyday experience of young American children.* Paul H Brookes Publishing.

Hartley, C., & Allen, M. L. (2014). Brief report: Generalisation of word–picture relations in children with autism and typically developing children. *Journal of Autism and Developmental Disorders*, *44*(8), 2064–2071.

Hills, T. T., Maouene, M., Maouene, J., Sheya, A., & Smith, L. (2009). Longitudinal analysis of early semantic networks: Preferential attachment or preferential acquisition? *Psychological Science*, *20*(6), 729–739.

Hoff, E., & Naigles, L. (2002). How children use input to acquire a lexicon. *Child Development*, *73*(2), 418–433.

Hoff-Ginsberg, E., & Tardif, T. (1995). *Socioeconomic status and parenting.*

Horst, J. S. (2013). Context and repetition in word learning. *Frontiers in Psychology*, *4*, 149.

Hudry, K., Leadbitter, K., Temple, K., Slonims, V., McConachie, H., Aldred, C., … Charman, T. (2010). Preschoolers with autism show greater impairment in receptive compared with expressive language abilities. *International Journal of Language & Communication Disorders*, *45*(6), 681–690. https://doi.org/10.3109/13682820903461493

Huttenlocher, J., Haight, W., Bryk, A., Seltzer, M., & Lyons, T. (1991). Early vocabulary growth: relation to language input and gender. *Developmental Psychology*, *27*(2), 236.

Huttenlocher, J., Levine, S., & Vevea, J. (1998). Environmental Input and Cognitive Growth: A Study Using Time-Period Comparisons. *Child Development*, *69*(4), 1012–1029. https://doi.org/10.1111/j.1467-8624.1998.tb06158.x

Huttenlocher, J., Waterfall, H., Vasilyeva, M., Vevea, J., & Hedges, L. V. (2010). Sources of variability in children's language growth. *Cognitive Psychology*, *61*(4), 343–365.

Jones, G., & Rowland, C. F. (2017). Diversity not quantity in caregiver speech: Using computational modeling to isolate the effects of the quantity and the diversity of the input on vocabulary growth. *Cognitive Psychology*, *98*, 1–21. https://doi.org/10.1016/j.cogpsych.2017.07.002

Kaale, A., Smith, L., & Sponheim, E. (2012). A randomized controlled trial of preschool-based joint attention intervention for children with autism. *Journal of Child Psychology and Psychiatry*, *53*(1), 97–105.

Kanner, L. (1943). Autistic disturbances of affective contact. *Nervous Child*, *2*(3), 217–250.

Kjelgaard, M. M., & Tager-Flusberg, H. (2001). An investigation of language impairment in autism: Implications for genetic subgroups. *Language and Cognitive Processes*, *16*(2–3), 287–308.

Koegel, L. K. (2000). Interventions to facilitate communication in autism. *Journal of Autism and Developmental Disorders*, *30*(5), 383–391.

Koegel, L. K., Koegel, R. L., & Smith, A. (1997). Variables related to differences in standardized test outcomes for children with autism. *Journal of Autism and Developmental Disorders*, *27*(3), 233–243.

Loomes, R., Hull, L., & Mandy, W. P. L. (2017). What Is the Male-to-Female Ratio in Autism Spectrum Disorder? A Systematic Review and Meta-Analysis. *Journal of the American Academy of Child & Adolescent Psychiatry*, *56*(6), 466–474. https://doi.org/10.1016/j.jaac.2017.03.013

Lord, C., & Bishop, S. L. (2010). Autism Spectrum Disorders: Diagnosis, Prevalence, and Services for Children and Families. Social Policy Report. Volume 24, Number 2. *Society for Research in Child Development*.

Lord, C., Risi, S., & Pickles, A. (2004). Trajectory of Language Development in Autistic Spectrum Disorders. https://doi.org/10.4324/9781410610881-7

Lord, C., Risi, S., Lambrecht, L., Jr, E. H. C., Leventhal, B. L., DiLavore, P. C., … Rutter, M. (2000). The Autism Diagnostic Observation Schedule—Generic: A Standard Measure of Social and Communication Deficits Associated with the Spectrum of

Autism. *Journal of Autism and Developmental Disorders*, *30*(3), 205–223. https://doi.org/10.1023/A:1005592401947

Luyster, R. J., Kadlec, M. B., Carter, A., & Tager-Flusberg, H. (2008). Language Assessment and Development in Toddlers with Autism Spectrum Disorders. *Journal of Autism and Developmental Disorders*, *38*(8), 1426–1438. https://doi.org/10.1007/s10803-007-0510-1

Luyster, R., & Lord, C. (2009). Word learning in children with autism spectrum disorders. *Developmental Psychology*, *45*(6), 1774–1786. https://doi.org/10.1037/a0016223

Luyster, R., Qiu, S., Lopez, K., & Lord, C. (2007). Predicting Outcomes of Children Referred for Autism Using the MacArthur–Bates Communicative Development Inventory. *Journal of Speech Language and Hearing Research*, *50*(3), 667. https://doi.org/10.1044/1092-4388(2007/047)

Mandler, J. M., & McDonough, L. (1998). On developing a knowledge base in infancy. *Developmental Psychology*, *34*(6), 1274.

Manouilenko, I., & Bejerot, S. (2015). Sukhareva--Prior to Asperger and Kanner. *Nordic Journal of Psychiatry*, *69*(6), 479–482. https://doi.org/10.3109/08039488.2015.1005022

Marchman, V. A., & Martínez-Sussmann, C. (2002). Concurrent validity of caregiver/parent report measures of language for children who are learning both English and Spanish. *Journal of Speech, Language, and Hearing Research*.

McDuffie, A., Yoder, P., & Stone, W. (2006). Fast-mapping in young children with autism spectrum disorders. *First Language*, *26*(4), 421–438.

Miller, J. F., Chapman, R. S., Branston, M. B., & Reichle, J. (1980). Language comprehension in sensorimotor stages V and VI. *Journal of Speech, Language, and Hearing Research*, *23*(2), 284–311.

Miller, L. E., Perkins, K. A., Dai, Y. G., & Fein, D. A. (2017). Comparison of parent report and direct assessment of child skills in toddlers. *Research in Autism Spectrum Disorders*, *41*, 57–65.

Mullen, E. M. (1995). *Mullen scales of early learning*. AGS Circle Pines, MN.

Mundy, P. (1995). Joint attention and social-emotional approach behavior in children with autism. *Development and Psychopathology*, *7*(01), 63–82. https://doi.org/10.1017/S0954579400006349

Mundy, P., Sigman, M., & Kasari, C. (1990). A longitudinal study of joint attention and language development in autistic children. *Journal of Autism and Developmental Disorders*, *20*(1), 115–128. https://doi.org/10.1007/BF02206861

Mundy, P., Sigman, M., Ungerer, J., & Sherman, T. (1986). Defining the Social Deficits of Autism: The Contribution of Non-Verbal Communication Measures. *Journal of Child Psychology and Psychiatry*, *27*(5), 657–669. https://doi.org/10.1111/j.1469-7610.1986.tb00190.x

Nordahl-Hansen, A., Kaale, A., & Ulvund, S. E. (2014). Language assessment in children with autism spectrum disorder: Concurrent validity between report-based assessments and direct tests. *Research in Autism Spectrum Disorders*, *8*(9), 1100–1106. https://doi.org/10.1016/j.rasd.2014.05.017

Nordahl-Hansen, A., Kaale, A., & Ulvund, S. E. (2014). Language assessment in children with autism spectrum disorder: Concurrent validity between report-based assessments and direct tests. *Research in Autism Spectrum Disorders*, *8*(9), 1100–1106.

Nordahl-Hansen, A., Øien, R. A., Volkmar, F., Shic, F., & Cicchetti, D. V. (2018). Enhancing the understanding of clinically meaningful results: A clinical research perspective. *Psychiatry Research*, *270*, 801–806.

NSD – Norwegian Centre for Research Data. (n.d.). Retrieved May 13, 2019, from https://nsd.no/nsd/english/index.html

Prizant, B. M., & Duchan, J. F. (1981). The functions of immediate echolalia in autistic children. *Journal of Speech and Hearing Disorders*, *46*(3), 241–249.

Ratto, A. B., Kenworthy, L., Yerys, B. E., Bascom, J., Wieckowski, A. T., White, S. W., … Ollendick, T. H. (2018). What about the girls? Sex-based differences in autistic traits and adaptive skills. *Journal of Autism and Developmental Disorders*, *48*(5), 1698–1711.

REK – Regionale komiteer for medisinsk og helsefaglig forskningsetikk. (n.d.). Retrieved May 13, 2019, from https://helseforskning.etikkom.no/?_ikbLanguageCode=us

Reynell, J. K., & Gruber, C. P. (1997). *Reynell developmental language scales*. Western Psychological Services.

Richman, A. L., Miller, P. M., & LeVine, R. A. (1992). Cultural and educational variations in maternal responsiveness. *Developmental Psychology*, *28*(4), 614.

Roberts, J. E., Burchinal, M., & Durham, M. (1999). Parents' report of vocabulary and grammatical development of African American preschoolers: Child and environmental associations. *Child Development*, *70*(1), 92–106.

Rowe, M. L. (2013). Decontextualized Language Input and Preschoolers' Vocabulary Development. *Seminars in Speech and Language*, *34*(4), 260–266. https://doi.org/10.1055/s-0033-1353444

Sameroff, A. J., & Fiese, B. H. (2000). Transactional regulation: The developmental ecology of early intervention. *Handbook of Early Childhood Intervention*, *2*, 135–159.

Sandhofer, C. M., & Doumas, L. A. (2008). Order of presentation effects in learning color categories. *Journal of Cognition and Development*, *9*(2), 194–221.

Sandhofer, C., & Smith, L. B. (2007). Learning adjectives in the real world: How learning nouns impedes learning adjectives. *Language Learning and Development, 3*(3), 233–267.

Sethuraman, N., & Goodman, J. C. (2004). Learning to generalize verbs to new syntactic environments. *Proceedings of the 2004 Stanford Child Language Research Forum: Constructions and Acquisition. CSLI Publications*, 78–87.

Smith, S. M. (1982). Enhancement of recall using multiple environmental contexts during learning. *Memory & Cognition*, *10*(5), 405–412.

Sparrow, S. S., & Cicchetti, D. V. (1989). *The Vineland Adaptive Behavior Scales.*

Stiegler, L. N. (2015). Examining the echolalia literature: where do speech-language pathologists stand? *American Journal of Speech-Language Pathology*, *24*(4), 750–762.

Stone, W. L., & Yoder, P. J. (2001). Predicting spoken language level in children with autism spectrum disorders. *Autism*, *5*(4), 341–361.

Surén, P., Bakken, I. J., Lie, K. K., Schjølberg, S., Aase, H., Reichborn-Kjennerud, T., … Stoltenberg, C. (2013). Differences across counties in the registered prevalence of autism, ADHD, epilepsy and cerebral palsy in Norway. *Tidsskrift for Den Norske Laegeforening: Tidsskrift for Praktisk Medicin, Ny Raekke*, *133*(18), 1929–1934. https://doi.org/10.4045/tidsskr.13.0050

Swensen, L. D., Kelley, E., Fein, D., & Naigles, L. R. (2007). Processes of language acquisition in children with autism: Evidence from preferential looking. *Child Development*, *78*(2), 542–557.

Tager-Flusberg, H. (2004). Strategies for conducting research on language in autism. *Journal of Autism and Developmental Disorders*, *34*(1), 75–80.

Tager-Flusberg, H. (2004). Strategies for conducting research on language in autism. *Journal of Autism and Developmental Disorders*, *34*(1), 75–80.

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

Tager-Flusberg, H., Rogers, S., Cooper, J., Landa, R., Lord, C., Paul, R., … Yoder, P. (2009). Defining spoken language benchmarks and selecting measures of expressive language development for young children with autism spectrum disorders. *Journal of Speech, Language, and Hearing Research*, *52*(3), 643–652.

Tager-Flusberg, H., Rogers, S., Cooper, J., Landa, R., Lord, C., Paul, R., … Yoder, P. (2009). Defining spoken language benchmarks and selecting measures of expressive language development for young children with autism spectrum disorders. *Journal of Speech, Language, and Hearing Research*, *52*(3), 643–652.

Tardif, T., Shatz, M., & Naigles, L. (1997). Caregiver speech and children's use of nouns versus verbs: a comparison of English, Italian, and Mandarin. *Journal of Child Language*, *24*(3), 535–565.

Tek, S., Jaffery, G., Fein, D., & Naigles, L. R. (2008). Do children with autism spectrum disorders show a shape bias in word learning? *Autism Research*, *1*(4), 208–222.

Tjenester for Sensitive Data (TSD) – Universitetet i Oslo (n.d.). Retrieved May 13, 2019, from https://www.uio.no/tjenester/it/forskning/sensitiv/index.html

Tomasello, M. (2001). Perceiving intentions and learning words in the second year of life. *Language Acquisition and Conceptual Development*, (3), 132–158.

Tomasello, M., & Mervis, C. B. (1994). The instrument is great, but measuring comprehension is still a problem. *Monographs of the Society for Research in Child Development*, *59*(5), 174–179.

Tsai, L. Y. (2014). Impact of DSM-5 on epidemiology of Autism Spectrum Disorder. *Research in Autism Spectrum Disorders*, *8*(11), 1454–1470. https://doi.org/10.1016/j.rasd.2014.07.016

Vlach, H. A., & Sandhofer, C. M. (2011). Developmental differences in children's context-dependent word learning. *Journal of Experimental Child Psychology*, *108*(2), 394–401.

Warreyn, P., Roeyers, H., & de Groote, I. (2005). Early social communicative behaviours of preschoolers with autism spectrum disorder during interaction with their mothers. *Autism*, *9*(4), 342–361. https://doi.org/10.1177/1362361305056076

Wolff, J. J., Botteron, K. N., Dager, S. R., Elison, J. T., Estes, A. M., Gu, H., … Piven, J. (2014). Longitudinal patterns of repetitive behavior in toddlers with autism. *Journal of Child Psychology and Psychiatry*, *55*(8), 945–953. https://doi.org/10.1111/jcpp.12207

Worldwide Health Organization. (2019, April). ICD-11 - Mortality and Morbidity Statistics. (n.d.). Retrieved May 25, 2019, from https://icd.who.int/browse11/l-m/en

Zwaigenbaum, L., Bauman, M. L., Choueiri, R., Fein, D., Kasari, C., Pierce, K., … Hansen, R. L. (2015). Early identification and interventions for autism spectrum disorder: executive summary. *Pediatrics*, *136*(Supplement 1), S1–S9.

Appendix A

Article draft

Impact of the Context of Home and Preschool in the Expressive Language of Children with Autism Spectrum Disorder

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Abstract

In this study I explore the impact of context on expressive language of children with autism spectrum disorder between 2 and 5 years old. Parents and preschool teachers reported words that the children say using the MacArthur-Bates Communicative Development Inventory and I look into different semantic categories of common nouns and the performance of these children at home and in preschool. Results show that there is little difference in the amount of nouns that the children say at home and in preschool, as well as lower percentages for the match on the amount of nouns said in both contexts than for each context taken separately. All the variables (i.e., home, preschool and both taken together, "match") follow a similar tendency through the different semantic categories, with a slightly superior amount of nouns reported by parents, followed by that reported by preschool teachers and lastly the match between both contexts. In spite of the few semantic categories that did reach statistical significance, these results are surprising due to the unexpectedly low differential influence of these contexts in the children's expressive language. I discuss further these results, their educational implications and the limitations and future directions of this study. This study offers a describing picture of the semantic expressive language of preschool children with ASD.

Key words: autism, expressive language, semantic categories, context, home, preschool

Article draft

1. Background

It is well known that factors such as caregiver's early child-directed speech have a strong influence in children's language development (Huttenlocher, Levine & Vevea, 1998; Huttenlocher, Vasilyeva, Waterfall, Vevea, & Hedges, 2007). In addition, although expressive language in autism spectrum disorders (ASD) has showed to follow a delayed, yet qualitative similar pathway to that of typical development (TD; McDuffie, Yoder & Stone, 2006; Tek, Jaffery, Fein, & Naigles, 2008; Luyster & Lord, 2009; Arunachalam, & Luyster, 2018), there is still little knowledge on the factors influencing in the development of the spoken language skills of these children. In addition, the main focus of previous studies has been grammatical categories such as verbs and nouns, while little attention has been paid to the semantic aspect that characterises their expressive language. One of the few studies that contributed to this field is that of Charman, Drew, Baird, and Baird (2003). They took advantage of the semantic categorisation of words in the Children Development Inventory (CDI, Fenson et al., 1994), a parent-reported measure of early expressive language, in order to compare the performance of children with TD and children with ASD. They observed that, although delayed in the use of words in some categories (i.e., Sound Effects, Animals and Toys), the expressive language of children with ASD was highly similar to that of the normative sample in Dale and Fenson (1996). Some years later, the same conclusions were reached by other researchers (Luyster, Qiu, Lopez, and Lord, 2007) and Weismer, Lord and Esler (2010). To the extent of my knowledge, the only study that has looked into within-category (i.e., words that belong to a particular semantic category) expressive language in children with ASD using the CDI is that of Weismer et al. (2011). They compared the performance of 20 toddlers with ASD in several semantic categories with that of 20 late taking toddlers, and concluded that both groups were rather similar. Both groups of children said a comparable amount of words within each category of the CDI and they used them in similar proportions (i.e., words said within a category divided by the total amount of words of that category).

However, none of these studies looked at the potential influence of different contexts in the early acquisition of spoken words in children with ASD, something of major interest since these children have systematically shown diminished generalisation skills (e.g., Koegel, 2000) and that can provide knowledge of language development in children with ASD.

Even fewer studies have focused on how contextual variables influence the development of semantic language skills concretely. For example, Jones and Rowland (2017) evidenced that the semantic quality of the caregiver's child-directed speech (i.e., defined by the use of many different semantic categories such as animals, furniture, toys, etc.) strongly influenced the semantic knowledge of both new and learned words by typical development children. These results were in line with past findings on a positive association between the semantic diversity of parent speech and both the amount and diversity of their children's early expressive language (Huttenlocher, Haight, Bryk, Seltzer, & Lyons, 1991; Hoff & Naigles, 2002). In spite of their contribution to the field, these two studies did not compare different contexts of the child, dismissing the opportunity to look at potential differential factors that influence early language development. Tamis-LeMonda, Custode, Kuchirko, Escobar, and Lo's (2018) study offers a more specific view of the contextual influence of different home routine activities in the mother's child-directed speech, which was observed to be determined by the actions and objects bounded to the child's activity. This specificity of the semantic language given by the context was reflected in the increased use of particular words during particular activities, the decreased use of these words in other activities, and the concurrence of semantically related word categories. This supports Hill, Maouene, Maouene, Sheya, and Smith's (2009) suggestion of "preferential acquisition" as the working principle behind expressive language growth: words that are better interconnected in the learning context, rather than in the child's internal semantic network, are learned earlier in development.

The generalisation skills of children with TD allow word learning to be enhanced when it takes place in both the same *and* different contexts (Goldenberg & Johnson, 2015), although this advantage seems to fade out when the learning happens in either just one context *or* just in different contexts. In addition, there is some specificity to this contextual influence: the type of words to learn and the developmental age of the learner. For example, Hill, Maouene, Riordan, and Smith (2010) observed that, while contextual diversity (i.e., learning a word in different contexts) benefits noun learning, contextual consistency (i.e., learning a word in the same context) increases the learning of verbs and adjectives, but has less effect on noun learning. Moreover, Vlach and Sandhofer (2011) reported that 3- and 4-years-olds with typical development benefited from learning a word in different contexts, but the performance of their 2,5-year-old peers was hindered by this same contextual diversity. This detrimental

aspect of contextual diversity only for the younger group can be explained by the fact that early learning is context-dependant and, hence, contextual diversity may not help learning words from a particular semantic category (e.g., bedroom, bed, living room, sofa, etc., belonging to the "Rooms and Furniture" category) that is more associated with a particular context than other (e.g., there are different rooms and different pieces of furniture at home than at preschool) when the child has a mental age under 3 years old. On the other hand, interacting in different contexts with the referent of a word from a semantic category that is more bounded to a particular context than to any other (e.g., again, toys may be more bounded to preschool than to home), seems to be beneficial when the child has a mental age above 3 years old. Then, when looking at expressive language generalisation in ASD, it should be taken into account that mental age, the type of words to learn and the variety of learning contexts are factors that will determine the outcomes.

Grounded in the evident lack of research on the impact of different contexts on the development of the expressive language skills of children with ASD, the aim of this study is to explore whether the child's expressive language is influenced by the context in terms of both amount of words used and semantic content. The research questions of this study therefore are (1) does context (i.e., home, preschool) influence the production of common nouns (i.e., generic name for a person, place, or thing in a class or group) in preschool children with ASD?, and (2) what is the agreement between parents and preschool teachers (i.e., as representative for home and preschool contexts) regarding the production of common nouns in preschool children with ASD? Since there is little evidence to hypothesise, the aims of this study are rather innovative. This study will thus be more exploratory than explanatory, hopefully opening the door to further investigation on this line of research.

2. Method

2.1. Study design

This study applies a quantitative, nonexperimental design that uses data from a previously published study (Kaale, Smith, & Sponheim, 2012). This current study has obtained the approval from The Norwegian National Committee for Research Ethics.

2.2. Participants

Fifty-eight children with (1) a chronological age of 24 to 60 months, (2) a confirmed diagnosis of Childhood Autism based on with ICD-10, (3) attendance in preschool, and (4) complete informant-reported forms from both home and preschool.

[Insert Table 1 here]

2.3. Procedures

This study uses a subset of the data collected as part of the assessment in a previous study (Kaale, Smith, & Sponheim, 2012). Demographic information about the children (e.g., age), their parents (e.g., level of education) and their preschool (e.g., type of preschool) was collected with questionnaires distributed among the participant parents and preschools.

2.4. Measures

Children's cognitive and language skill level were assessed with the Mullen Scales of Early Learning (MSEL, Mullen, 1995) and the Norwegian translation of Reynell Developmental Language Scales (RDLS, Hagtvet & Lillestøen, 1985) respectively. Expressive language was measured with the MacArthur-Bates Communicative Development Inventory (CDI, Fenson et al., 1994). A reliable unofficial Norwegian translation of the CDI (i.e., deemed to be highly similar to the original English version) was sent to parents and preschool teachers responsible for the participant children, along with instructions on how to fill it out. The CDI is an informant-reported checklist that includes two forms: the "Words & Gestures" form, targeted at 8-to-16-months-old children, and the "Words & Sentences" form, targeted at 16-to-30-months-old children. In this study only the "Words & Gestures" form was used. This form includes a 396-item vocabulary checklist (referring to both comprehension and production) with 19 semantic categories containing nouns, verbs, adjectives, pronouns, prepositions and quantifiers, and several sections addressing actions and gestures. Parents and preschool teachers were asked to cross off the words that the child either understands or understands and says.

In previous studies, this instrument has shown high inter-rater reliability (Nordahl-Hansen, Kaale, & Ulvund, 2013) and high concurrent validity with direct assessments (Nordahl-Hansen, Kaale, & Ulvund, 2014) in ASD. In this study, only the ten categories of the CDI's "Words & Gestures" form that only contain substantives (i.e., Animals (Real or Toy), Vehicles (Real or Toy), Toys, Food and Drink, Clothing, Body Parts, Furniture and Rooms, Small things in the household, Outside things and Places to Go, and People. Each of these categories includes nouns from a semantic family. For example, Furniture and Rooms include nouns such as *bedroom*, *kitchen* or *sofa*, while Clothing includes nouns such as *boots*, *jeans* or *zipper*. The choice of only using these ten categories was based on the interest in adding knowledge on the noun performance of children with ASD.

2.5. Statistical Analyses

Descriptive statistics and paired sample t-tests were conducted to compare the mean differences of both reporting groups (i.e., parents and preschool teachers) regarding the total amount of nouns in the ten categories of the CDI's Words & Gestures that only contain substantives jointly and of each of these categories separately.

A "matching" variable was computed with the amount of nouns that *both* parents and preschool teachers reported as "Understand and Say". This variable was computed in order to be analysed in regards of the second research question. Descriptive analyses were run on this variable to obtain the mean of both total amount of nouns in the abovementioned categories and the amount of nouns in each category separately. Furthermore, the percentages corresponding to each category are calculated by dividing the number of nouns reported in each category by the total possible amount of nouns in that category and multiplying it by 100; while the percentage corresponding to all noun categories taken together is calculated dividing the total amount of nouns reported in all these 10 categories by the total amount of nouns in the CDI (i.e., 228) and multiplying it by 100.

The software used to analyse the data were IBM Statistical Package for the Social Sciences version 25, and Microsoft Excel 2016.

3. Results

Analyses performed show similar means between the amount of nouns reported by parents and preschool teachers, regarding both all noun categories taken together and each category separately. This similarity of means consequently implies that there was no statistically significant difference in the overall amount of nouns said at home and at the preschool (see Table 2), although it was nearly statistically significant (p=0,07). In contrast to this, there are rather high standard deviations (i.e., some of them even exceeding mean values), which results in a high variability within the ranges of nouns said across all categories. There were two semantic categories where the parents and preschool teachers diverged in their report of the children's expressive language: Furniture and rooms (p<0.00) and People (p=0.04). In these two categories we can find nouns such as *bed*, *couch* and *living room*, and *aunt*, *uncle* and *grandma*, respectively. Another semantic category worth mentioning is Body parts, since its mean difference between the two contexts was especially close to reach statistical significance (i.e., p=0.06). Overall, there is predominance of the amount of nouns reported at home, followed close by those reported by the preschool teacher

[Insert Table 2 here]

Table 3 shows the match (i.e., the extent to which both home and preschool coincide in their reported amount of nouns) between the two contexts. As in the case of both contexts taken separately, their match shows high variability in terms of the amount of nouns said by the children (i.e., both contexts agree on the amount of nouns said by the child in a range that goes between none and almost all the nouns in each and every semantic category), which is reflected in high standard deviations. The percentages of this match in each semantic category and the match for all the noun categories taken together are also presented in this table.

[Insert Table 3 here]

Figure 1 illustrates the percentages of nouns from each semantic category that parents and preschool teachers reported that the children said and the percentage of their match. The mean percentage of all noun categories taken together is 34% for home and 31% for preschool. The mean percentage of their match is 25%. Also here the tendency is a predominance of the percentage of nouns reported at home over both those reported at preschool and the match between them, with the only two exceptions of "Animals (real or toys)", which obtains the

same percentage in both contexts, and "Toys", which scores slightly higher at the preschool than at home. The three variables follow a similar curve, with home and preschool coinciding at "Animals (real or toys)" for home and preschool (i.e., both 32%) and differing in a maximum of 9 points at "Small things in the household". The match variable scores always at lower percentages, with a minimum distance of 2 points and a maximum distance of 8 points to the closest curve (i.e., preschool at "Small things in the household" and at "Animals (real or toys)", respectively). The highest percentage across the three variables is that of "Vehicles" (i.e., 49% for home, 46% for preschool, and 41% for their match), while the lowest percentage is "Outside things and places to go" and "People" for home (i.e., both obtain 30%), "Furniture and rooms" and "Small things in the household" for preschool (i.e., both with 23%) and "Furniture an rooms" for their match (i.e., which is also the lowest percentage across all variables and semantic categories, 19%).

[Insert Figure 1 here]

4. Discussion

In this study we used a caregiver-reported instrument to investigate the influence of home and preschool as contexts in the expressive language of children with ASD. We intended to (1) answer whether the quantity and content of the children's expressive, semantic language showed any difference from one context to the other (i.e., home and preschool), as well as to (2) examine which noun categories reflected in the CDI's "Words & Gestures" form were influenced similarly by these two contexts.

The results obtained here evince little difference between the expressive language reported by parents and preschool teachers. In terms of overall, expressive, semantic language, both parents and preschool teachers report roughly the same amount of nouns. In this sample, only two semantic categories seem to show a higher influence of one of the contexts (i.e., home) over the other: *Furniture and rooms* and *People*. This seems logical if we think that there are more rooms to be named at home than at the preschool, and probably more furniture too; and it is also reasonable to claim that children hear more people's denominations (i.e., grandpa, grandma, uncle, aunt) from their parents than while they are at the preschool, hence the differential learning of these two semantic categories of nouns. This interpretation finds

support in the results obtained by Tamis-Lemonda et al. (2018), where the mother's child-directed speech was highly determined by the actions and objects associated with the child's activity, and in Hill et al.'s (2009) language learning principle of "preferential acquisition", which refers to the enhanced learnability of those words that are strongly interconnected in the learning context.

The present results show also a lower mean percentage of match between the two contexts (i.e., 25%, illustrated by the yellow line in Figure 1) in all the noun categories taken together than its counterparts reported by parents and preschool teachers separately (i.e., 34% and 31 %, respectively). In spite of this relatively large difference between the mean percentages of home and preschool taken together and independently, the general tendency of the mean match-percentages of nouns from each semantic category follows a similar curve to that of them taken separately. Another three mean percentages worth mentioning are those of *Toys*, which is the only case where the mean percentage of nouns reported by preschool teachers (i.e., 41%) is slightly above the mean percentage of nouns reported by parents (i.e., 40%), and *Small thing in the household* and *Furniture and rooms*, which obtains the two largest differences of mean percentages between contexts, with the parents reporting that their children say 32% and 31% of the nouns of such categories, respectively, and preschool teachers reporting only the 23% of them in both categories. This difference of 9 and 8 points respectively is surprisingly high if we take into account that parents and preschool teachers only diverge a maximum of 3 points in all the other semantic categories. These results can be interpreted in concurrence with those of Vlach and Sandhofer (2011) in the sense that contextual diversity in word learning (i.e., operationalised in this study as the agreement between home and preschool in the amount of words in a particular semantic category) does not seem to help children with typical development younger than 3 years old. This interpretation is made in light of the recommendation to use mental age (instead of chronological age) to interpret spoken language benchmarks in this population (Tager-Flusberg et al., 2009), as in this study, even though the mean chronological age is 48,84 months old, the mean mental age is 27,86, which places these children under the 3 years old of mental age. Also, a potential moderator factor could be the language spoken at home, which for three fourths of this sample is Norwegian, the language that we use for this translation of the CDI, while 9% of the children use Norwegian only in preschool and 19% have a bilingual home. The children in this sample that only hear and speak Norwegian at

preschool would not be exposed to it as much as those children who also have a Norwegian-speaking home, which could lead to those children scoring lower in the CDI and therefore this factor may be influencing the results.

Comparing the statistically significant difference between home and preschool in Furniture and rooms and in People with the significantly different mean percentages between home and preschool in Small things in the household and in Furniture and rooms, it can be noted that the difference of the mean percentage of both contexts in People is not particularly big, whereas that of Small things in the household, which does not show statistical significance in the t-test, does show a relevant difference in terms of mean differences between the two contexts. These discrepancies when combining results from different analyses, along with the fact that both contexts, even statistically significant, only differ in one noun in People (i.e., mean difference of 1,03 nouns in favour of home) and almost two nouns in Furniture and rooms (i.e., mean difference of 1,93 nouns in favour of home), it can be argued that statistical significance does not equal clinical significance. The importance that statistical significance holds in interpreting empirical results has been discussed before (see for example Nordahl-Hansen, Øien, Volkmar, Shic, & Cicchetti, 2018), and therefore the findings in this study should be interpreted with caution.

In respect of the research questions of the present study, we can conclude that (1) the contexts of home and preschool do not seem to differentially exert much influence in the amount of nouns that a child with ASD says both in general terms and regarding specific semantic categories of nouns, and (2) there is lower agreement between these two contexts in the production of nouns in the different semantic categories compared with the reported children's performance in each context separately. We can consequently conclude that these two contexts did not differently affect in a high degree the kind of nouns that these children said in each context.

5. Limitations

One limitation of this study to consider is the lack of a comparison group with children with typical development. Charman et al. (2003) did have a control group to compare their ASD group, but they did not specifically analyse expressive noun performance with the CDI, and

Weismer et al. (2011), even though exploring within-category expressive noun performance with the CDI, decided to use a comparison group of late-talkers, which is technically not a typical development group. A potential future direction is thus introducing a comparison group with typical development in order to see how similar it is to the performance of children with ASD, although it would be highly difficult to find a corresponding child (i.e., same mental age, same preschool, same home, with the only difference being the typical development) for each one within the sample with ASD.

Another limitation, already introduced in previous sections of this work, is the impossibility to completely rule out echolalic speech: a form of expressive language that does not mandatorily imply word learning. Even though the instrument used in this study has shown high validity and reliability, it is nearly impossible to claim that the expressive language reported with the CDI is completely functional (Fenson et al., 1994). In this sense, it should be made clear that the aim of this study was not to explore the functionality of expressive language in children with ASD, so any potential echocalic use of the nouns in the CDI here reported is not taken into account.

On a similar note, the CDI only explores the language domain of semantics or vocabulary, which is just one of the several pieces of the early language development's puzzle. Moreover, the CDI does not record how many times a child says a certain word, and this may be seen as a lost opportunity to further explore the expressive, semantic language of children with ASD, since a majority of them seem to have particular interests that surely may influence the contains of their language outcome. Moreover, as already Weismer et al. (2011) pointed out, the CDI's predetermined semantic categorisation limits the exploration of the full semantic knowledge and use of the child, which may leave out atypical (and interesting) patterns of expressive language.

Using different measurement methods has been recommended when it comes to language assessment (Tager-Flusberg, 2004), and the present study only uses one (i.e., CDI), which could be argued as a limitation. Since the aims of the present study revolved concretely around the exploration of the semantics of the expressive language, it did not seem necessary to triangulate the CDI reports with any other instrument of language measurement.

6. Educational implications

Knowing how context influence noun learning in ASD helps developing more precise and better-tailored language programmes for children within the autism spectrum in preschool. The results presented here add knowledge on the influence of linguistic contexts in the early language development of children with ASD, and highlight how the CDI can be used both in research, such as the case of this study, and in the assessment of the early language of children with ASD and the consequent planning of language interventions in early stages of development. The influence of the contexts of home and preschool in the early expressive language of these children should call for a comprehensive, well-coordinated intervention that takes into account these two microsystems of the child, promoting the diversity of the linguistic context, which ultimately enhance the between-contexts generalisation of the words learned.

7. Future directions

This study offers preliminary evidence of the concurrence of nouns from a particular semantic category, it does not tell us which concrete nouns the children say in both contexts and hence it is unknown whether this kind of contextual diversity (i.e., home and preschool) plays a role in the early expressive, semantic language of children with ASD between 2 and 5 years old. This reason also prevents us from knowing whether there is generalisation of a particular word from one context to the other. We do not know either the reason for the contextual differences found here; are these differences between home and preschool due to context-specific factors (e.g., there are more furniture at home than at the preschool, there is the same furniture at home than at the preschool but parents say more furniture-related words and therefore the children learn them more easily, etc.)? Or are they just random differences? To answer why we obtained these results and whether, for example, a word was reported in both contexts in spite of not having been learned in one of them (i.e., generalisation), would require a more detailed study of the specific physical conditions of both linguistic contexts. Another suggestion for future research would be to explore the impact of the language spoken at home on the development of the "majority language" (i.e., Norwegian in this case), since in the present study it is only reported and no correlations were analysed for this sample.

8. Acknowledgements

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References

Charman, T., Drew, A., Baird, C., & Baird, G. (2003). Measuring early language development in preschool children with autism spectrum disorder using the MacArthur Communicative Development Inventory (Infant Form). *Journal of Child Language*, *30*(1), 213–236.

Dale, P. S., & Fenson, L. (1996). Lexical development norms for young children. *Behavior Research Methods, Instruments, & Computers*, *28*(1), 125–127.

Fenson, L., Dale, P. S., Reznick, J. S., Bates, E., Thal, D. J., Pethick, S. J., … Stiles, J. (1994). Variability in early communicative development. *Monographs of the Society for Research in Child Development*, i–185.

Goldenberg, E. R., & Johnson, S. P. (2015). Category generalization in a new context: the role of visual attention. *Infant Behavior and Development, 38,* 49–56.

Hagtvet, B., & Lillestøen, R. (1985). Reynell språktest. Oslo: Universitetsforlaget.

Hart, B., & Risley, T. R. (1992). American parenting of language-learning children: Persisting differences in family-child interactions observed in natural home environments. *Developmental Psychology*, *28*(6), 1096.

Hills, T. T., Maouene, M., Maouene, J., Sheya, A., & Smith, L. (2009). Longitudinal analysis of early semantic networks: Preferential attachment or preferential acquisition? *Psychological Science*, *20*(6), 729–739.

Hills, T. T., Maouene, J., Riordan, B., & Smith, L. B. (2010). The associative structure of language: Contextual diversity in early word learning. *Journal of Memory and Language*, *63*(3), 259–273.

Hoff, E., & Naigles, L. (2002). How children use input to acquire a lexicon. *Child Development*, *73*(2), 418–433.

Hoff-Ginsberg, E., & Tardif, T. (1995). *Socioeconomic status and parenting.*

Huttenlocher, J., Haight, W., Bryk, A., Seltzer, M., & Lyons, T. (1991). Early vocabulary growth: relation to language input and gender. *Developmental psychology*, *27*(2), 236.

Huttenlocher, J., Levine, S., & Vevea, J. (1998). Environmental Input and Cognitive Growth: A Study Using Time-Period Comparisons. *Child Development*, *69*(4), 1012–1029. https://doi.org/10.1111/j.1467-8624.1998.tb06158.x

Huttenlocher, J., Vasilyeva, M., Waterfall, H. R., Vevea, J. L., & Hedges, L. V. (2007). The varieties of speech to young children. *Developmental Psychology*, *43*(5), 1062–1083. https://doi.org/10.1037/0012-1649.43.5.1062

Jones, G., & Rowland, C. F. (2017). Diversity not quantity in caregiver speech: Using computational modeling to isolate the effects of the quantity and the diversity of the input on vocabulary growth. *Cognitive Psychology*, *98*, 1–21. https://doi.org/10.1016/j.cogpsych.2017.07.002

Kaale, A., Smith, L., & Sponheim, E. (2012). A randomized controlled trial of preschool-based joint attention intervention for children with autism. *Journal of Child Psychology and Psychiatry*, *53*(1), 97–105.

Koegel, L. K. (2000). Interventions to facilitate communication in autism. *Journal of Autism and Developmental Disorders*, *30*(5), 383–391.

Luyster, R. J., & Arunachalam, S. (2018). Brief Report: Learning Language Through Overhearing in Children with ASD. *Journal of Autism and Developmental Disorders*, 1–9.

Luyster, R., & Lord, C. (2009). Word learning in children with autism spectrum disorders. *Developmental Psychology*, *45*(6), 1774.

Luyster, R., Qiu, S., Lopez, K., & Lord, C. (2007). Predicting Outcomes of Children Referred for Autism Using the MacArthur–Bates Communicative Development Inventory. *Journal of*

Speech Language and Hearing Research, *50*(3), 667. https://doi.org/10.1044/1092-4388(2007/047)

McDuffie, A., Yoder, P., & Stone, W. (2006). Fast-mapping in young children with autism spectrum disorders. *First Language*, *26*(4), 421–438.

Mullen, E. M. (1995). *Mullen scales of early learning*. AGS Circle Pines, MN.

Nordahl-Hansen, A., Kaale, A., & Ulvund, S. E. (2013). Inter-rater reliability of parent and preschool teacher ratings of language in children with autism. *Research in Autism Spectrum Disorders*, *7*(11), 1391–1396. https://doi.org/10.1016/j.rasd.2013.08.006

Nordahl-Hansen, A., Kaale, A., & Ulvund, S. E. (2014). Language assessment in children with autism spectrum disorder: Concurrent validity between report-based assessments and direct tests. *Research in Autism Spectrum Disorders*, *8*(9), 1100–1106. https://doi.org/10.1016/j.rasd.2014.05.017

Nordahl-Hansen, A., Øien, R. A., Volkmar, F., Shic, F., & Cicchetti, D. V. (2018). Enhancing the understanding of clinically meaningful results: A clinical research perspective. *Psychiatry Research*, *270*, 801–806. https://doi.org/10.1016/j.psychres.2018.10.069

Reynell, J. K., & Gruber, C. P. (1997). *Reynell developmental language scales*. Western Psychological Services.

Tager-Flusberg, H. (2004). Strategies for conducting research on language in autism. *Journal of Autism and Developmental Disorders*, *34*(1), 75–80.

Tager-Flusberg, H., Rogers, S., Cooper, J., Landa, R., Lord, C., Paul, R., … Yoder, P. (2009). Defining spoken language benchmarks and selecting measures of expressive language development for young children with autism spectrum disorders. *Journal of Speech, Language, and Hearing Research*, *52*(3), 643–652.

Tamis-LeMonda, C. S., Custode, S., Kuchirko, Y., Escobar, K., & Lo, T. (2018). Routine language: Speech directed to infants during home activities. *Child Development*.

Tek, S., Jaffery, G., Fein, D., & Naigles, L. R. (2008). Do children with autism spectrum disorders show a shape bias in word learning? *Autism Research*, *1*(4), 208–222.

Vlach, H. A., & Sandhofer, C. M. (2011). Developmental differences in children's context-dependent word learning. *Journal of Experimental Child Psychology*, *108*(2), 394–401.

Weismer, S. E., Gernsbacher, M. A., Stronach, S., Karasinski, C., Eernisse, E. R., Venker, C. E., & Sindberg, H. (2011). Lexical and grammatical skills in toddlers on the autism spectrum compared to late talking toddlers. *Journal of Autism and Developmental Disorders*, *41*(8), 1065–1075.

Weismer, S. E., Lord, C., & Esler, A. (2010). Early language patterns of toddlers on the autism spectrum compared to toddlers with developmental delay. *Journal of Autism and Developmental Disorders*, *40*(10), 1259–1273.

Tables and figures

Table 1

Demographic Information About the Children, Their Parents and Their Preschool

	Mean / No. (%)	SD	Range
Children			
Chronological age	48,8	8	30-60
Mental age[1][3]	27,9	11,4	9-59
Receptive language age[2]	23,2	11,1	6-60
Expressive language age[2]	21,1	11,9	3-60
Gender			
Female	11 (19%)		
Male	47 (81%)		
Hours in prreschool per week[4]	37,3	5,1	20-45
Parents			
Mother's educational level[5]			
Primary education	8 (14%)		
Secondary education	22 (40%)		
University/College	26 (46%)		
Father's educational level[6]			
Primary education	5 (9%)		
Secondary education	24 (45%)		
University/College	23 (44%)		
Language spoken at home[7]			
Norwegian only	41 (72%)		
Norwegian *and* another	11 (19%)		
Other than Norwegian	5 (9%)		

[1] *Mullen Scale of Early Learning (MSLE)*

[2] *Reynell Developmental Language Scale (RDLS);* for scores <4 stanine for 1.5 years language age was based on MSLE.

[3] Missing data from 1 child

[4] Missing data from 2 children

[5] Missing data from 2 mothers

[6] Missing data from 6 fathers

[7] Missing data from 4 fathers and 1 couple of parents (i.e., both mother and father), n=57.

Table 2

Differences Between Home and Preschool in All Noun Categories and in Each Semantic Category Independently

Category	**Home**		**Preschool**			
	Mean (SD)	**Min-Max**	**Mean (SD)**	**Min-Max**	**Mean difference (SD)**	**t (df), p**
All noun categories (228)[1]	78,1 *(*78,4*)*	0-226	70,5 (75,9)	0-227	7,6 (31,5)	1,8 (57), p=0,07
Animals (real or toy) (36)[2]	11,6 (12,3)	0-36	11,5 (12,3)	0-36	0,1 (6,4)	0,3 (57), p=0,87
Vehicles (real or toy) (9)	4,4(3,6)	0-9	4,1 (3,8)	0-9	0,3 (1,6)	1,5 (57), p=0,15
Toys (8)	3,2 (3,2)	0-8	3,3 (3,2)	0-8	-0,1 (1,4)	-0,5 (57), p=0,65
Food and drinks (30)	12,2 (11,4)	0-30	11,1 (10,8)	0-30	1,1 (4,6)	1,8 (57), p=0,09
Clothes (19)	6,3 (6,9)	0-19	6,0 (6,8)	0-19	0,3 (3,5)	0,6 (57), p=0,53
Body parts (20)	7,7 (8)	0-20	7,2 (8,1)	0-20	0,4 (3,9)	0,9 (57), p=0,40
Furniture and rooms (24)	7,4 (8,8)	0-24	5,4 (7,4)	0-24	2,0 (4,7)	3,2 (57), **p=0,00**
Small things in the household (36)	11,4 (12,7)	0-35	9,7 (12)	0-36	1,6 (6,3)	2,0 (57), p=0,06
Outside things and places to go (26)	8,1 (9)	0-26	7,2 (8,7)	0-26	0,9 (4,4)	1,5 (57), p=0,15
People (20)	6,0 (5,5)	0-19	5,0 (5,8)	0-20	1,0 (3,8)	2,1 (57), **p=0,04**

[1] Data from CDI semantic categories that only contain common nouns (i.e., categories from 2 to 11).

[2] Total amount of words in that semantic category.

Table 3

Match Between Home and Preschool in Across All Noun Categories and in Each Semantic Category Independently

Category	**Mean**	**SD**	**Min-Max**	**Percentage**[3]
All noun categories (228)[1]	57,4	66,6	0-196	25%
Animals (real or toy) (36)[2]	8,6	10,2	0-31	24%
Vehicles (real or toy) (9)	3,7	3,6	0-9	41%
Toys (8)	2,7	3,0	0-8	33%
Food and drinks (30)	9,4	10,0	0-30	31%
Clothes (19)	4,9	6,1	0-19	26%
Body parts (20)	6,0	7,4	0-20	30%
Furniture and rooms (24)	4,6	6,7	0-19	19%
Small things in the household (36)	7,6	10,3	0-32	21%
Outside things and places to go (26)	5,9	7,6	0-24	23%
People (20)	4,0	4,7	0-14	20%

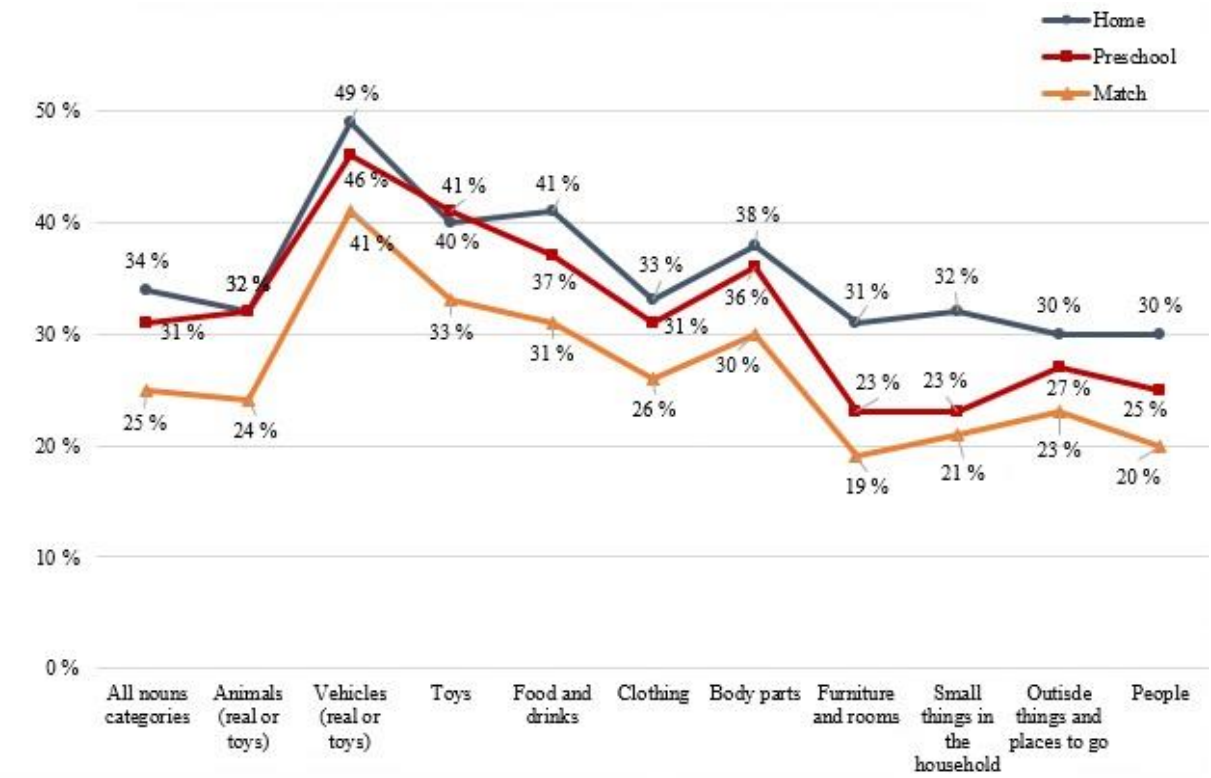
[1] Data from CDI semantic categories that only contain common nouns (i.e., categories from 2 to 11).

[2] Total amount of words in that semantic category.

[3] Percentages of the each semantic category are calculated on the mean of each semantic category divided by the total amount of nouns in that category and multiplied by 100. The percentage of *All noun categories* is calculated on the mean of the percentages of each semantic category.

Figure 1

Percentages of Nouns Reported in Each Category by Parents and by Preschool Teachers and Their Match"



Appendix B

Informative invitation and consent form for the original project

ULLEVÅL
universitetssykehus
Klinikk for psykisk helse – Barn og Ungdom
Forskningsenheten

Regionsenter for barn og unges psykiske helse
Helseregion Øst og Sør

Til foreldre

Invitasjon til deltakelse i forskningsprosjekt;

Effekt av å jobbe med utvikling av felles oppmerksomhet hos småbarn med autisme

Barn med autisme har store vansker med å dele oppmerksomhet om et objekt eller en hendelse med andre mennesker. Disse vanskene er sentrale i utviklingen av deres kommunikasjons- og samspillsproblemer. I forskningsprosjektet vil vi undersøke effekten av en behandlingsmetode som fokuserer på utvikling av barnas felles oppmerksomhet. I løpet av 2006, 2007 og 2008 vil vi rekruttere 60 to-fire år gamle barn med autisme fra Øst- og Vestlandet til undersøkelsen. Vi inviterer dere til å delta i studien.

Hva innebærer det å være med i forskningsprosjektet
Har behandlingen av felles oppmerksomhet effekt? For å kunne få vite det, er det nødvendig å sammenligne to grupper av barn med autisme; en som får og en som ikke får behandling. Fordelingen til behandlingsgruppen eller kontrollgruppen vil trekkes tilfeldig av en computer. Alle barna, både de som kommer i kontrollgruppen og de som kommer i intervensjonsgruppen, skal fortsette med sitt ordinære barnehagetilbud gjennom hele studieperioden. Barna som trekkes til behandlingsgruppen får felles oppmerksomhetsbehandling i barnehagen i tillegg til sitt vanlige tilbud. Deltakelse i undersøkelsen forutsetter at også barnehagen er positiv til å være med. Vi tar kontakt med barnehagen når vi vet om dere ønsker å være med. Fordelingen til gruppene gjøres først etter at både foreldrene og barnehagen har sakt ja til å delta.

Alle barna som blir med i prosjektet, uansett gruppe de kommer i, skal testes grundig i forhold til språkfunksjon, sosial kommunikasjon og generell fungering. Vi vil gjennomføre fire testrunder; den første med en gang barnet blir med i studien, den andre etter ca. 10 uker, den tredje etter ½ år og den fjerde etter 1 år. Testene vil utføres av erfarne fagpersoner tilknyttet forskningsprosjektet, i lokaler i deres hjemfylke. Etter at vi har testet barnet første og siste gang vil vi skrive en rapport som oversendes foreldrene, med kopi til hjelpeapparatet dersom foreldrene ønsker det. Før hver testrunde vil vi sende barnehagen et spørreskjema som omhandler barnets sosial kommunikasjon og språk.

Første testrunde er den mest omfattende og vil strekke seg over en dag. De resterende testrundene forventes å ta fra 2-4 timer. Det vil ta om lag en time å fylle ut spørreskjemaene. Det er fint om både foreldrene og en fra barnehagen kan følge barnet til testing. Vi ønsker også å ta et kort videoopptak av mor og barnet og barnehagepersonalet og barnet i vanlig lek.

Hvis barnet deres kommer i behandlingsgruppen vil en ansatt i barnehagen med spesielt ansvar for deres barn, få opplæring i metoden. Deretter starter felles oppmerksomhetsbehandlingen. Behandlingen er basert på lystbetont lek og samspill mellom voksen og barn, og vil gjøres i barnehagen i to økter á 20 minutter pr dag over en periode på 8 uker med ukentlig veiledning fra spesialisthelsetjenesten. For å følge prosessen vil behandlingen filmes en gang pr uke.

Prosjekt:
Effekt av å trene felles oppmerksomhet hos småbarn med autisme – en randomisert og kontrollert behandlingsstudie

Prosjektleder:
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23 49 21 00
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23 49 23 02

Besøksadresse / Postadresse:
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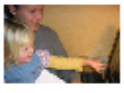
0319 Oslo



Om vi finner at behandlingen har en positiv effekt skal alle barna som kommer i kontroll-gruppen gis det samme eller et tilsvarende behandlingstilbud etter at studien er avsluttet.

Informasjon om diagnostisk utredning
I forbindelse med analyser og publisering av resultater av undersøkelsen trenger vi informasjon om deltakerbarnas diagnose. Vi ber derfor om samtykke til å innhente resultater fra vurderinger knytte til avklaring av barnets autismediagnose.

Frivillighet
Det er selvsagt helt frivillig å delta i prosjektet. Om dere samtykker til å være med kan dere på hvilket som helst tidspunkt trekke dere fra undersøkelsen og kreve at alle opplysninger, inkludert videoopptak, slettes, uten å måtte begrunne dette nærmere. Hvorvidt dere velger å delta i forskningsprosjektet eller ikke får ingen betydning for deres videre kontakt med hjelpeapparatet eller for barnets barnehagetilbud.

Taushetsplikt
Prosjektgruppen består av stipendiat Anett Kaale, dr. med Eili Sponheim og professor Lars Smith. Det er ingen andre enn oss som får tilgang på de personidentifiserbare opplysningene. Vi er alle underlagt taushetsplikt og opplysningene vil bli behandlet strengt konfidensielt. I en hver sammenheng der resultatene diskuteres med andre enn barnets foreldre eller barnehage-personalet, vil data anonymiseres slik at det ikke er mulig å gjenkjenne det enkelte barn.

Mot slutten av prosjektperioden (november 2009) vil vi spørre om deres samtykke til at vi fortsetter å lagre informasjon og videofilmer av barnet med tanke på en senere oppfølging. Om dere ikke ønsker videre lagring, vil testmateriellet bli anonymisert og videoopptak slettet ved prosjektslutt (31.12.2009). Undersøkelsen er tilrådd av personvernombudet ved Ullevål Universitetssykehus og Regional komité for medisinsk forskningsetikk.

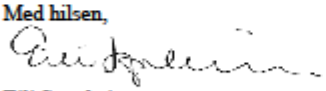
Deres rettigheter
Hvis dere sier ja til å delta i studien, har dere rett til å få innsyn i hvilke opplysninger som er registrert om barnet. Dere har også rett til å få rettet eventuelle feil i opplysningene vi har registrert.

Ansvarlig for undersøkelsen
Undersøkelsen drives av dr. med Eili Sponheim, forskningskoordinator ved Senter for psykisk helse – barn og Ungdom, Ullevål Universitetssykehus, professor Lars Smith ved Psykologisk institutt, UIO, professor Berit Grøholt ved Institutt for psykiatri, UiO og stipendiat cand. ed Anett Kaale ved Ullevål Universitetssykehus og Regionsenter for barn og unges psykiske helse.

Skriftlig samtykkeerklæring
Dersom dere ønsker å delta i undersøkelsen må dere signere og fylle ut samtykkeerklæringen og sende den til oss i vedlagt frankert svarkonvolutt så snart som mulig.

Spørsmål kan rettes til Anett Kaale, tlf. 23492100/98472132 eller e-post: anett.kaale@r-bup.no.

Med hilsen,



Eili Sponheim
Forskningskoordinator dr. med
Klinikk for psykisk helse - barn og ungdom, UUS

Anett Kaale
Cand. ed/stipendiat
Klinikk for psykisk helse - barn og ungdom, UUS
og
Regionsenter for barn og unges psykiske helse

Samtykkeerklæring

Samtykke til deltakelse:
Jeg/vi har mottatt skriftlig informasjon om undersøkelsen "Effekt av å trene felles oppmerksomhetsferdigheter hos småbarn med autisme – en randomisert og kontrollert behandlingsstudie" og vil med dette meddele at vi samtykker i å delta i undersøkelsen.

Dato: .....Signatur: .....

Barnets navn: ..... **Fødselsdato**:.....

Mors navn: **Far navn**:
....

Adresse: ..... Adresse: .....
....

Tlf: .... Tlf: ....

Mobli: ..... Mobli: .....
E-post: ..... E-post: .....

Samtykke til å innhente og benytte informasjon:
Jeg/vi samtykker i at Anett Kaale, Eili Sponheim og Lars Smith som driver udersøkelsen "Effekt av å trene felles oppmerksomhetsferdigheter hos småbarn med autisme – en randomisert og kontrollert behandlingsstudie" får tillatelse til å benytte informasjon om vårt barn innhentet ved diagnostisk utredning ved:

.....
(skiv inn navn på tjenesten som har utredet og diagnostisert barnet)

Dato: .....Signatur: .....

Barnehage
Går barnet i barnehagen (sett kryss) Ja ..... Nei ..... Begynner (dato) .....

Fulltid.....
Deltid.....

Navn på barnehagen: .....

Adresse til barnehagen: .....
.....

Samtykkeerklæringen sendes til
Anett Kaale, Klinikk for psykisk helse – barn og ungdom, Postboks 26 Vinderen, 0319 Oslo

Appendix C

Approval letter for the present study from the Research Ethics Committee (REC)

REK
REGIONALE KOMITEER FOR MEDISINSK OG HELSEFAGLIG FORSKNINGSETIKK

Region:	Saksbehandler:	Telefon:	Vår dato:	Vår referanse:
REK sør-øst	Hege Cathrine Finholt, PhD	22857547	17.12.2018	2015/1268/REK sør-øst D
			Deres dato:	Deres referanse:
			07.12.2018	

Vår referanse må oppgis ved alle henvendelser

Anett Kaale
Oslo universitetssykehus

2015/1268 Utvikling og tiltak for barn med autismespekterforstyrrelse: 3-13 år

Forskningsansvarlig: Oslo Universitetssykehus
Prosjektleder: Anett Kaale

Vi viser til søknad om prosjektendring datert 07.12.2018 for ovennevnte forskningsprosjekt. Søknaden er behandlet av leder for REK sør-øst D på fullmakt, med hjemmel i helseforskningsloven § 11.

Endringene innebærer:

Nye prosjektmedarbeidere: Joakim Rudebjer, Ada Sørensen, Patricia Sanchez..
Nye analyser av innsamlete prosjektdata: De nye prosjektmedarbeiderne er masterstudenter og skal bruke de innsamlete prosjektdataene i sine respektive masteroppgaver. Prosjektbeskrivelse til hver masteroppgave er vedlagt søknaden. Masteroppgavene faller innenfor prosjektets opprinnelige formål.

Vurdering
REK har vurdert søknaden og har ingen forskningsetiske innvendinger til endringen av prosjektet.

Vedtak
REK har gjort en forskningsetisk vurdering av endringene i prosjektet, og godkjenner prosjektet slik det nå foreligger, jf. helseforskningsloven § 11.

Vi gjør samtidig oppmerksom på at etter ny personopplysningslov må det også foreligge et behandlingsgrunnlag etter personvernforordningen. Det må forankres i egen institusjon.

Klageadgang
REKs vedtak kan påklages, jf. forvaltningslovens § 28 flg. Eventuell klage sendes til REK sør-øst D. Klagefristen er tre uker fra du mottar dette brevet. Dersom vedtaket opprettholdes av REK sør-øst D, sendes klagen videre til Den nasjonale forskningsetiske komité for medisin og helsefag for endelig vurdering.

Vi ber om at alle henvendelser sendes inn på korrekt skjema via vår saksportal: http://helseforskning.etikkom.no. Dersom det ikke finnes passende skjema kan henvendelsen rettes på e-post til: post@helseforskning.etikkom.no.

Vennligst oppgi vårt referansenummer i korrespondansen.

Besøksadresse: Gullhaugveien 1-3, 0484 Oslo
Telefon: 22845511
E-post: post@helseforskning.etikkom.no
Web: http://helseforskning.etikkom.no/

Appendix D

Sage *Autism*'s author guidelines

This Journal is a member of the Committee on Publication Ethics.

Please read the guidelines below then visit the Journal's submission site http://mc.manuscriptcentral.com/autism to upload your manuscript.

Please note that manuscripts not conforming to these guidelines may be returned.

Only manuscripts of sufficient quality that meet the aims and scope of Autism will be reviewed. There are no fees payable to submit or publish in this journal.

As part of the submission process you will be required to warrant that you are submitting your original work, that you have the rights in the work, that you are submitting the work for first publication in the Journal and that it is not being considered for publication elsewhere and has not already been published elsewhere, and that you have obtained and can supply all necessary permissions for the reproduction of any copyright works not owned by you.

1. What do we publish?
   - 1.1 Aims & Scope
   - 1.2 Article types
   - 1.3 Writing your paper
2. Editorial policies
   - 2.1 Peer review policy
   - 2.2 Authorship
   - 2.3 Acknowledgements
   - 2.4 Funding
   - 2.5 Declaration of conflicting interests
   - 2.6 Research ethics and patient consent
   - 2.7 Clinical trials
   - 2.8 Reporting guidelines
   - 2.9 Data
3. Publishing policies
   - 3.1 Publication ethics

1. What do we publish?

1.1 Aims & Scope

Before submitting your manuscript to Autism, please ensure you have read the Aims & Scope.

1.2 Article Types

The Journal considers the following kinds of article for publication:

1. Research Reports. Full papers describing new empirical findings;
2. Review Articles

   (a) general reviews that provide a synthesis of an area of autism research;

   (b) critiques - focused and provocative reviews that may be followed by a number of invited commentaries, with a concluding reply from the main author.

Both full Research Reports and Review Articles are generally restricted to a maximum of 6,000 words, including all elements (title page, abstract, notes, tables, text), but excluding references. Editors may ask authors to make certain cuts before sending the article out for review.

3. Short Reports. Brief papers restricted to a maximum of 2,000 words with no more than two tables and 15 references. Short reports could include other approaches like discussions, new or controversial ideas, comments, perspectives, critiques, or preliminary findings. The title should begin with 'Short Report'.
4. Letters to the Editors. Readers' letters should address issues raised by published articles. The decision to publish is made by the Editors, in order to ensure a timely appearance in print. Letters should be no more than 800 words, with no tables and a maximum of 5 references.

1.3 Writing your paper

The SAGE Author Gateway has some general advice and on how to get published, plus links to further resources.

1.3.1 Make your article discoverable

When writing up your paper, think about how you can make it discoverable. The title, keywords and abstract are key to ensuring readers find your article through search engines such as Google. For information and guidance on how best to title your article, write your abstract and select your keywords, have a look at this page on the Gateway: How to Help Readers Find Your Article Online.

2. Editorial policies

2.1 Peer review policy

Autism operates a strictly anonymous peer review process in which the reviewer's name is withheld from the author and, the author's name from the reviewer. The reviewer may at their own discretion opt to reveal their name to the author in their review but our standard policy practice is for both identities to remain concealed. Each new submission is carefully read by one of the Editors to decide whether it has a reasonable chance of getting published. If the Editor thinks it does not have this chance, at least one other Editor will be consulted before finally deciding whether or not to send the manuscript out for review. *Autism* strives to do this

within two weeks after submission, so that authors do not have to wait long for a rejection. Feedback is also provided on how to improve the manuscript, or what other journal would be more suitable. Each manuscript is reviewed by at least two referees. All manuscripts are reviewed as rapidly as possible, and an editorial decision is generally reached within (e.g.) 6-8 weeks of submission.

As part of the submission process, you will be asked to provide the names of 2 peers who could be called upon to review your manuscript. Recommended reviewers should be experts in their fields and should be able to provide an objective assessment of the manuscript. Please be aware of any conflicts of interest when recommending reviewers. Examples of conflicts of interest include (but are not limited to) the below:

- The reviewer should have no prior knowledge of your submission
- The reviewer should not have recently collaborated with any of the authors
- Reviewer nominees from the same institution as any of the authors are not permitted

Please note that the Editors are not obliged to invite/reject any recommended/opposed reviewers to assess your manuscript.

2.2 Authorship

All parties who have made a substantive contribution to the article should be listed as authors. Principal authorship, authorship order, and other publication credits should be based on the relative scientific or professional contributions of the individuals involved, regardless of their status. A student is usually listed as principal author on any multiple-authored publication that substantially derives from the student's dissertation or thesis.

2.3 Acknowledgements

All contributors who do not meet the criteria for authorship should be listed in an Acknowledgements section. Examples of those who might be acknowledged include a person who provided purely technical help, or a department chair who provided only general support. Please supply any personal acknowledgements separately to the main text to facilitate anonymous peer review.

2.4 Funding

Autism requires all authors to acknowledge their funding in a consistent fashion under a separate heading. Please visit the Funding Acknowledgements page on the SAGE Journal

Author Gateway to confirm the format of the acknowledgment text in the event of funding, or state that: This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

Important note: If you have any concerns that the provision of this information may compromise your anonymity, you should withhold this information until you submit your final accepted manuscript.

2.4.1 National Institutes of Health (NIH) funded articles

If you have received NIH funding for your research, please state this in your submission and if your paper is accepted by *Autism* an electronic version of the paper will automatically be sent to be indexed with the National Library of Medicine's PubMed Central as stipulated in the NIH policy.

2.5 Declaration of conflicting interests

Autism encourages authors to include a declaration of any conflicting interests and recommends you review the good practice guidelines on the SAGE Journal Author Gateway.

2.6 Research ethics and patient consent

Medical research involving human subjects must be conducted according to the World Medical Association Declaration of Helsinki. Submitted manuscripts should conform to the ICMJE Recommendations for the Conduct, Reporting, Editing, and Publication of Scholarly Work in Medical Journals, and all papers reporting animal and/or human studies must state in the methods section that the relevant Ethics Committee or Institutional Review Board provided (or waived) approval. Please ensure that you have provided the full name and institution of the review committee, in addition to the approval number.

For research articles, authors are also required to state in the methods section whether participants provided informed consent and whether the consent was written or verbal. Information on informed consent to report individual cases or case series should be included in the manuscript text. A statement is required regarding whether written informed consent for patient information and images to be published was provided by the patient(s) or a legally authorized representative.

Please also refer to the ICMJE Recommendations for the Protection of Research Participants.

2.7 Clinical trials

Autism conforms to the ICMJE requirement that clinical trials are registered in a WHO-approved public trials registry at or before the time of first patient enrolment as a condition of consideration for publication. The trial registry name and URL, and registration number must be included at the end of the abstract.

2.8 Reporting guidelines

The relevant EQUATOR Network reporting guidelines should be followed depending on the type of study. For example, all randomized controlled trials submitted for publication should include a completed CONSORT flow chart as a cited figure and the completed CONSORT checklist should be uploaded with your submission as a supplementary file. Systematic reviews and meta-analyses should include the completed PRISMA flow chart as a cited figure and the completed PRISMA checklist should be uploaded with your submission as a supplementary file. The EQUATOR wizard can help you identify the appropriate guideline. The What Works Clearinghouse (WWC) guidelines should be followed when submitting in single-case design (SCD) and meet the standards outlined for internal validity of the SCD. Other resources can be found at NLM's Research Reporting Guidelines and Initiatives.

3. Publishing Policies

3.1 Publication ethics

SAGE is committed to upholding the integrity of the academic record. We encourage authors to refer to the Committee on Publication Ethics' International Standards for Authors and view the Publication Ethics page on the SAGE Author Gateway.

3.1.1 Plagiarism

Autism and SAGE take issues of copyright infringement, plagiarism or other breaches of best practice in publication very seriously. We seek to protect the rights of our authors and we always investigate claims of plagiarism or misuse of published articles. Equally, we seek to protect the reputation of the journal against malpractice. Submitted articles may be checked with duplication-checking software. Where an article, for example, is found to have plagiarised other work or included third-party copyright material without permission or with insufficient acknowledgement, or where the authorship of the article is contested, we reserve

the right to take action including, but not limited to: publishing an erratum or corrigendum (correction); retracting the article; taking up the matter with the head of department or dean of the author's institution and/or relevant academic bodies or societies; or taking appropriate legal action.

3.1.2 Prior publication

If material has been previously published it is not generally acceptable for publication in a SAGE journal. However, there are certain circumstances where previously published material can be considered for publication. Please refer to the guidance on the SAGE Author Gateway or if in doubt, contact the Editor at the address given below.

3.2 Contributor's publishing agreement

Before publication, SAGE requires the author as the rights holder to sign a Journal Contributor's Publishing Agreement. SAGE's Journal Contributor's Publishing Agreement is an exclusive licence agreement which means that the author retains copyright in the work but grants SAGE the sole and exclusive right and licence to publish for the full legal term of copyright. Exceptions may exist where an assignment of copyright is required or preferred by a proprietor other than SAGE. In this case copyright in the work will be assigned from the author to the society. For more information please visit the SAGE Author Gateway.

3.3 Open access and author archiving

Autism offers optional open access publishing via the SAGE Choice programme. For more information please visit the SAGE Choice website. For information on funding body compliance, and depositing your article in repositories, please visit SAGE Publishing Policies on our Journal Author Gateway.

4. Preparing your manuscript for submission

4.1 Formatting

Autism asks that authors use the APA style for formatting. The APA Guide for New Authors can be found on the APA website, as can more general advice for authors.

4.2 Artwork, figures and other graphics

For guidance on the preparation of illustrations, pictures and graphs in electronic format, please visit SAGE's Manuscript Submission Guidelines. Figures supplied in colour will appear in colour online regardless of whether or not these illustrations are reproduced in colour in the printed version. For specifically requested colour reproduction in print, you will receive information regarding the costs from SAGE after receipt of your accepted article.

4.3 Supplementary material

This journal is able to host additional materials online (e.g. datasets, podcasts, videos, images etc) alongside the full-text of the article. For more information please refer to our guidelines on submitting supplementary files.

4.4 Terminology

Autism has researched and compiled their own Terminology Guidelines, which all authors should follow.

4.5 Reference style

Autism adheres to the APA reference style. View the APA guidelines to ensure your manuscript conforms to this reference style.

4.6 English language editing services

Authors seeking assistance with English language editing, translation, or figure and manuscript formatting to fit the journal's specifications should consider using SAGE Language Services. Visit SAGE Language Services on our Journal Author Gateway for further information.

5. Submitting your manuscript

Autism is hosted on SAGE Track, a web based online submission and peer review system powered by ScholarOne™ Manuscripts. Visit http://mc.manuscriptcentral.com/autism to login and submit your article online. IMPORTANT: Please check whether you already have an account in the system before trying to create a new one. If you have reviewed or authored for the journal in the past year it is likely that you will have had an account created. For further guidance on submitting your manuscript online please visit ScholarOne Online Help.

5.1 ORCID

As part of our commitment to ensuring an ethical, transparent and fair peer review process SAGE is a supporting member of ORCID, the Open Researcher and Contributor ID. ORCID provides a persistent digital identifier that distinguishes researchers from every other researcher and, through integration in key research workflows such as manuscript and grant submission, supports automated linkages between researchers and their professional activities ensuring that their work is recognised.

We encourage all authors to add their ORCIDs to their SAGE Track accounts and include their ORCIDs as part of the submission process. If you don't already have one you can create one here.

5.2 Information required for completing your submission

You will be asked to provide contact details and academic affiliations for all co-authors via the submission system and identify who is to be the corresponding author. These details must match what appears on your manuscript. At this stage please ensure you have included all the required statements and declarations and uploaded any additional supplementary files (including reporting guidelines where relevant).

5.3 Permissions

Please also ensure that you have obtained any necessary permission from copyright holders for reproducing any illustrations, tables, figures or lengthy quotations previously published elsewhere. For further information including guidance on fair dealing for criticism and review, please see the Copyright and Permissions page on the SAGE Author Gateway

6. On acceptance and publication

6.1 Lay Abstracts

Upon acceptance of your article you will be required to submit a lay abstract of your article to the Social Media Editor, Laura Crane (journalautism@gmail.com). Lay abstracts are brief (max 250 words) descriptions of the paper that are easily understandable. These abstracts will be made available to researchers and clinicians, as well as the general public (including individuals with autism spectrum disorders and their families). These abstracts should avoid both technical terminology and the reporting of statistics. Examples of lay abstracts are provided in recent issues of the journal.

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Your SAGE Production Editor will keep you informed as to your article's progress throughout the production process. Proofs will be sent by PDF to the corresponding author and should be returned promptly. Authors are reminded to check their proofs carefully to confirm that all author information, including names, affiliations, sequence and contact details are correct, and that Funding and Conflict of Interest statements, if any, are accurate. Please note that if there are any changes to the author list at this stage all authors will be required to complete and sign a form authorising the change.

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Online First allows final articles (completed and approved articles awaiting assignment to a future issue) to be published online prior to their inclusion in a journal issue, which significantly reduces the lead time between submission and publication. Visit the SAGE Journals help page for more details, including how to cite Online First articles.

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