Pragmatic abilities of high-functioning Greek-speaking children with autism

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ABSTRACT

This paper reports on the findings of the pragmatic abilities of Greek-speaking children with autism spectrum disorders (ASD). Twenty high functioning children with ASD and their typically developing age and vocabulary controls were administered a pragmatics task. The task was based on the Diagnostic Evaluation of Language Variation (DELV) in the context of a larger study targeting the grammar of Greek-speaking children with autism, and assessed the children's abilities in communicative role taking, narrative, and question asking. The children with ASD showed an uneven profile in their pragmatic abilities. The two groups did not differ in communicative role taking and question asking. However, the children with ASD had difficulties on the narrative task, and more specifically, on the items assessing reference contrast and temporal links. Yet, they performed similarly on the mental state representations and the false beliefs items. Despite their good performance on mental states and false beliefs, the ASD children's lower performance on reference contrast can be interpreted via Theory of Mind deficits if we assume that the former involve an additional level of complexity; namely, quantifying the amount of information available to the listener. Lower performance on temporal links is in line with the ASD children's attested difficulties in organizing events into a coherent gist. Their overall profile, and, in particular, the dissociation between the different sections of the task, does not support single deficit accounts. It rather indicates that the deficits of individuals with ASD stem from distinct deficits in core cognitive processes (Happé & Frith, 2006).

Keywords: Autism, pragmatics, Greek, reference, Theory of Mind, Central Coherence.

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1. Introduction

Autism is a developmental disorder (World Health Organization, 1993). Among its diagnostic features are delays and deficits in language acquisition and primary impairments in pragmatic aspects of language in both expression and comprehension (Roberts et al., 2004; Tager-Flusberg, 2000). Particular aspects of pragmatics that are affected are: an inability to conform to conversational rules, violations of Grice's maxims, interpreting statements in a literal manner, failure to take into account the distinction between given and new information and difficulties in structuring narratives (Diehl et al., 2006; Tager-Flusberg, 2000).

Three main accounts have been put forward to explain the language deficits of individuals with ASD: 1) The weak central cohesion account, according to which individuals with ASD have a tendency to interpret utterances in isolation at the expense of the global picture (Frith, 1989; Happé & Frith, 2006). As a result they have difficulties in organizing pieces of information into a coherent gist. 2) The deficits in Theory of Mind (ToM) account, according to which pragmatic deficits result from a developmental impairment in ToM (e.g., Baron-Cohen, Leslie & Frith, 1985; Happé, 1993); 3) The executive function (EF) deficits account, according to which individuals with ASD have deficits in EFs that lead to global difficulties with planning and organization (e.g., Pennington & Ozonoff, 1996). Finally, it is possible that the pattern of performance in individuals with ASD is not reducible to a single deficit but results from a number of distinct abnormalities in core cognitive processes (global-local processing, social cognition, and executive functions) (Happé & Frith, 2006). The last account differs from the previous ones because it predicts that individuals with ASD may show deficits in only some but not all core cognitive processes and is important for studies that test a range of abilities, such as the present study.

To date, very few studies have investigated the language abilities in Greek-speaking children with ASD. Only two studies addressed the pragmatic abilities by interviewing children's parents (Vogindroukas, 2005), or by assessing the children themselves on a single aspect of pragmatics, the comprehension of idioms (Vogindroukas, 2010). Therefore, there is a gap in studies addressing a range of pragmatic abilities of Greek-speaking children with ASD, and moreover, within the same group of children. The present study fills this gap by using an adaptation of the Diagnostic Evaluation of Language Variation (DELV) (Seymour et al., 2005).

The study aims at documenting the strengths and weaknesses of a range of language abilities that fall within the remit of the pragmatics domain in Greek-speaking children with ASD, using the pragmatics subtest of the DELV. This subtest includes sections on communicative role-taking, question asking, and a narrative task assessing reference, temporal cohesion, mental state representations and false beliefs. Hence, it enables us to address accounts that have been proposed to explain the pragmatic difficulties in ASD. The accounts make different predictions for the children's performance in the various sections of the task. The weak central cohesion account predicts difficulties with the narrative task in terms of reference and temporal cohesion. However, it does not predict difficulties in communicative role-taking, asking questions, and false beliefs. The deficits in ToM account predicts deficits in communicative role-taking, asking questions, mental state representations and false beliefs. The EF deficits account predicts difficulties in all sections of the pragmatics task because all sections require planning and organization. Finally, the multiple deficits account predicts dissociations between the children's performance in the various sections of the pragmatics task.

In the present study, the children with ASD had non-verbal abilities within norms and were matched to a group of age-matched peers on their verbal abilities in order to be able to distinguish between deficits due to general low abilities and deficits due to ASD. Moreover, a narrow age-range was selected in order to control for the heterogeneity in the sample.

2. Pragmatic abilities in individuals with ASD

The pragmatic abilities of children with ASD can be assessed by using a variety of tasks, including judgment, false belief, and narrative tasks. Surian et al. (1996) investigated the children's ability to conform to conversational rules and to detect violations of Grice's maxims using an acceptability judgment task. A false belief task was used along with the judgment task to investigate the relationship between the ability to detect violations of Grice's maxims and passing false belief tasks. Eight children with autism (mean age: 12;11 years), eight age-matched children with SLI (mean age: 11;10 years), and eight younger (mean age: 6;7 years) typically developing (TD) children took part in this study. The three groups were tested on their verbal abilities on the basis of the Test of the Reception of Grammar (TROG) (Bishop, 1983). The children with ASD had very low verbal age (5;7 years), which was similar to the children with SLI (5;9 years) and considerably lower than their chronological age peers (12;11 years). The judgment task consisted of a set of brief conversations, some of which violated Grice's maxims. Children had to identify which people 'said something silly'. They were also administered the Sally-Ann task in order to assess their false belief abilities. Both tasks require ToM because to complete the tasks successfully, participants have to be able to take into account someone else's perspective. This involves inhibiting their own perspective, and therefore, it requires good EF abilities. Failing these tasks could provide evidence for a ToM deficit or a deficit in EFs. The judgment task also involves social cognition. If children failed only one of the two tasks, this would provide evidence for the multiple deficits account because it would indicate that the two abilities can be impaired independently from each other. Three of the eight children with ASD, all children with SLI and all typically developing children performed above chance and passed the false belief task. However, the remaining five children with ASD were at chance level on the judgment task and did not pass the false belief task. These findings indicate that a large number of children with ASD have difficulties in detecting pragmatic violations and there is an association between this ability and passing a false belief task. This association supports the ToM and the EFs deficit accounts. Clearly there was no dissociation between the two abilities, but this does not necessarily provide evidence against the multiple deficits account because the sample size was very small. Children may also have had concurrent deficits in ToM and EFs. Moreover, there was considerable individual variation. As mentioned above, more than a third of the children with ASD did not have low performance on the judgment task and passed the false belief task. This questions as to whether or not all children with ASD have difficulties in the aspects of pragmatics tested (Grice's maxims, false beliefs). In addition, since the children with ASD had low verbal abilities, it is unclear whether the difficulties in the judgment and false belief tasks were related to their low verbal abilities.

Narrative tasks can assess a large range of language abilities, including morpho-syntax, semantics, and pragmatics. Since the present paper addresses pragmatics, we will focus mainly on aspects of narratives that reflect pragmatic abilities. Pragmatic abilities within a narrative can be measured, among others, by analysing the structure and the cohesion of the narrative, and the use of referential expressions, such as articles and pronouns, the choice of which requires taking into account the interlocutor's point of view and whether something is old or new information.

Studies on the narrative abilities of children with ASD have focused on story length, structure, cohesion, and the use of referential expressions (e.g. Colle, Baron-Cohen, Wheelwright, & van der Lely, 2008; Tager-Flusberg & Sullivan, 1995). Studies that matched children with ASD to TD controls on their language abilities showed few quantitative differences between the groups in measures that are assumed to tap into grammatical abilities, such as, narrative length, structure, and complexity (Colle, et al., 2008; Diehl et al., 2006; Tager-Flusberg & Sullivan, 1995). Some studies, however, have found a relationship between

narrative abilities and ToM in children with ASD (Tager-Flusberg & Sullivan, 1995) and qualitative differences in the structure of narratives, and the use of referring expressions. Narrating a story in a structured way requires the ability to see the global picture of the story and the ability to plan and organize the sentences in a coherent way. Difficulties in narrative structure would provide evidence for the weak cohesion or the EFs deficit account. Correct use of referring expressions requires being able to take the listener's perspective. This requires good ToM and EFs in relation to planning and organization. Difficulties in the use of referring expressions would provide evidence for the ToM and EFs deficit accounts. In terms of the structure of narratives, children with ASD had difficulties in retelling a story as a meaningful chain of events, creating thematically integrated narratives and using clear cohesive links in their expressions when retelling a personal narrative (Losh & Capps, 2003) or a story from a storybook (Diehl et al., 2006). Their narratives were often reminiscent of listings of events rather than structured narratives with causal connectedness (Diehl et al., 2006). In terms of the use of referring expressions, Nadig, Vivanti, & Ozonoff (2009) demonstrated that some children with ASD were using under-informative expressions (*the cup* instead of *the short cup*) when a modifier was required from the context and some were more likely to use an over-informative expression (*the short cup* instead of *the cup*) when the modifier was not required. Moreover, Colle, et al. (2008) found that adults with ASD often used full noun phrases (*the boy*) instead of pronouns (*he*) to maintain reference, and also used more ambiguous pronouns than TD adults. Nadig et al. (2009) and Colle et al. (2008) interpreted these results to show that individuals with ASD are less likely to take into account the perspective of the hearer. Along the same lines, Arnold, Bennetto, & Diehl (2009) investigated the use of referential expressions (names, descriptions, overt pronouns, zero pronouns) in the narratives of 9-to-17 year old high functioning individuals with ASD and a group of TD controls matched on age, gender, verbal, and non-verbal abilities. Although children with ASD showed

sensitivity to discourse context, the younger children with ASD (9-12 years old) were less likely to produce overt and zero pronouns in contexts that required them, especially when an entity was already introduced into the discourse but not in the previous clause, and used names and full noun phrases instead.

As the studies presented so far indicate, a large heterogeneity has been well documented in the language abilities of children with ASD, including their pragmatic abilities. Individual variability holds not only for the language abilities of children with ASD; there is also large individual variation in the symptoms of autism, which vary in severity and span along a continuum. To some extent, variation can be traced back to the inclusion and exclusion criteria of the studies. Several studies include small samples of individuals with ASD with a large age range, including children and adolescents. Age heterogeneity can introduce noise to the data related to developmental aspects of language and cognition. Other studies include high and low functioning individuals with ASD or high functioning individuals with ASD with high and low verbal abilities. By using such heterogeneous groups, it is very difficult to tease apart effects of low non-verbal abilities and effects of low language abilities from effects related to the clinical status of the children. And yet, heterogeneity in the profile of children with ASD has been demonstrated, even in studies that matched individuals with ASD to TD individuals on all three factors: chronological age, non-verbal, and verbal abilities (e.g., Diehl et al., 2006; Arnold et al., 2009). To control for heterogeneity as much as possible, the current study reported here included only children within a narrow age range and used very strict inclusion and exclusion criteria, allowing better discrimination between the accounts that could explain pragmatic difficulties in children with ASD.

1.2 Language abilities in Greek-speaking children with ASD

Very few studies so far have addressed the language abilities of Greek-speaking individuals with autism. Vogindroukas (2005) investigated

communication skills of Greek children with ASD by interviewing the children's parents. This was accomplished via the Pragmatics Profile of Early Communication Skills tool (Dewart & Summers, 1988), which assesses four domains of communication: Communicative Functions, Responses to Communication, Interaction and Conversation, and Contextual Variation. This study compared 12 low-verbal children with ASD (mean age: 84 months) to 12 children with Down syndrome (mean age: 96 months) who had similar verbal and non-verbal abilities. The study found that the children with ASD differed from otherwise similar children with Down syndrome on only 14 of the 39 skills that the tool examines. This is in line with findings from English, according to which children with ASD were found to fall behind on 17 of the 39 skills of the tool. The main finding of this study is that the children with ASD wish to communicate and interact with others, but fall behind on the means via which they invite communication and interaction.

In a more recent study, the pragmatic abilities of Greek children with ASD were examined directly (Vogindroukas, 2010). Eleven children with Asperger (mean age: 11.44 years) were compared with 11 children with SLI of similar non-verbal abilities (mean age: 10.85 years), 10 typically developing children (mean age: 12.62 years), and 11 adults on the comprehension of Greek idioms. The study demonstrated that children with SLI performed much better than children with Asperger, while typically developed children performed almost at ceiling and did not differ significantly from adults. This pretty much exhausts the pragmatics related studies that have been conducted on Greek-speaking populations.

There is one more large scale study of Greek-speaking children with ASD, which, however, investigated grammatical abilities, i.e., morpho-syntax (see Terzi et al., 2012; 2014). This study focused on 20 high functioning children with autism (mean age: 80 months) and compared them with typically developing children matched on age, verbal, and non-verbal abilities. The areas of grammar investigated were reference of reflexive and personal pronouns (both, strong pronouns and clitics), and the comprehension of non-active morphology. The results showed that the two groups only showed a difference on the compre-hension of clitic pronouns, an area that develops early in TD children. Clitic pronouns have also been found to be a problem in young children with SLI (Smith, 2008; Stavrakaki & van der Lely, 2010; Tsimpli, 2001; Tsimpli & Stavrakaki, 1999; cf. Manika, Varlokosta, & Wexler, 2011). The above study conducted a number of language baseline tasks, including a pragmatics task based on the Diagnostic Evaluation of Language Variation (DELV) (Seymour et al., 2005) and the Diagnostic Verbal IQ Test (DVIQ) (Stavrakaki & Tsimpli, 2000) that taps into morphosyntax. The two groups did not differ on their morphosyntactic abilities but they differed significantly in their scores on the pragmatics task.

The present study is the first systematic study addressing a wide range of pragmatic abilities in high functioning Greek-speaking children with ASD. It focuses on the pragmatics task used in Terzi et al. (2012, 2014)[1] and presents in detail which subtests of the DELV showed differences between the two groups and were affected in the children with ASD.

2. Methodology

2.1. Participants

Twenty-three 5- to 8-year-old children with autism (mean: 79.8 months; SD: 10.4; range: 61-107; girls = 1) and twenty-three age-matched (mean: 81.1 months; SD: 8.7; range: 66-96; girls = 8) typically developing children (F (1, 39) = 0.184, p = 0.67; η^2 = 0.005) were recruited to take part in this study. The two groups had a mixed socio-

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1. In Terzi et al. (2012, 2014) the pragmatics task was used as a baseline task; only the total scores of the task were reported as part of the background information of the children.

economic status. Strict inclusion and exclusion criteria were used as follows. Inclusion criterion for the children with ASD was an age range between 5 and 8 years and a clinical diagnosis using DSM-IV-TR criteria (APA, 1994), corroborated with the use of Autism Diagnostic Observation Schedule - ADOS-2 (Lord et al., 2000). The specific age range was selected in order to capture the language abilities of the children around the first years of primary school, which is at the age of 6 in Greece.[2] The children with ASD had a mean ADOS-2 score of 17.5 (SD: 4.55). Exclusion criterion for all children was a score below 80 on the Raven's Coloured Progressive matrices (Raven, 1998). Three children with ASD had a score below 80 and were excluded from this study along with their three matched TD children.[3] Exclusion criterion for the TD children was a history of speech and/or language impairment or an ASD diagnosis. None of the TD children had a history of speech and/or language impairment or an ASD diagnosis. The ASD and the TD children were individually matched (+/-5 points) on the raw score of a vocabulary test (maximum score 204, see procedures). The children with ASD were recruited from intervention centres specialized for children with ASD, primarily in Athens. The TD children were recruited from mainstream schools in Patras.

2.2. Procedures

Baseline tasks

The Raven's Coloured Progressive matrices (Raven, 1998) measured the children's non verbal abilities. A receptive vocabulary task in a format based on the PPVT (Dunn & Dunn, 1997) was used to match the children's receptive vocabulary. The production of morphosyntax subtest of the Diagnostic Test of Verbal Intelligence (DVIQ, Stavrakaki & Tsimpli, 2000) was used to measure the children's morphosyntactic abilities. A picture-pointing comprehension task was used to measure the children's comprehension of pronouns and non-active morphology (Terzi et al., 2014).

Pragmatics task

To measure the children's pragmatic abilities, we adapted the pragmatics subtest of the DELV (Seymour, Roeper, de Villiers, & de Villiers, 2005) into Greek (see de Villiers, 2004, for a discussion of the pragmatics subtest). The pictures and contexts used in the pragmatics section of the DELV do not have any culturally specific features that would make them not suitable for the Greek context; therefore, there was no need to change any of the pictures or stories. The stories were translated into Greek using vocabulary appropriate for the age range of the children. The task consists of three sections: 1) Communicative Role-Taking, 2) Short Narrative, 3) Question Asking, and thus, addresses a range of pragmatic abilities, as described below.

The Communicative Role-Taking section tests the ability to take the perspective of another speaker and use an appropriate speech act in a particular communication situation. It consists of four items: item 1 involves reporting an event, items 2 and 3 requesting something, and item 4 prohibiting something.

The Short Narrative section assesses linguistic cohesion and the ability to refer to the mental states of the characters in the story. The child looks at six pictures that are not visible to the experimenter and has to tell a story without the experimenter being able to see the pictures. After the child has told the story, both the adult and the child can see the pictures and the adult asks two questions about the story. This section consists of four items that assess the children's ability to refer to characters contrastively (Item 5), to provide temporal expressions to link events in time (Item 6), and to

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2. It should be noted that although narrative abilities develop until 9 years of age, this does not pose a problem for the present study because we compare the performance of children with ASD to age- and language-controls and not to adults.

3. The mean ADOS-2 score of the remaining twenty children was 11.22 (SD: 4.24).

refer to mental states of characters when telling a story (Items 7 and 8). Items 5 and 6 are assessed based on the story telling. The pictures show two characters of the same gender who need to be referred to contrastively throughout the story (e.g. using adjectives *young brother, old brother*) in order for the listener to understand which character is involved (Item 5). The story has important temporal relationships between the events in the pictures that have to be expressed in a cohesive way (e.g. using coordination (*and) then* or subordination *after, because*) (Item 6). Items 7 and 8 are based on the answers provided by the children after the story. Item 7 tests whether the child refers to the character's actions (e.g., *the boy is looking under the bed*), whether the child refers to his intentions/desires (e.g., *he wants to play with his toy*), or to the cognitive state of the character (e.g., *he is thinking about the toy*). Item 8 is a standard ToM question that assesses whether or not the child will be able to explain the behaviour of a character in a story in accordance to a false belief.

The Question Asking section addresses the ability to ask questions in order to obtain specific information. It consists of nine items testing argument and adjunct questions. The argument questions comprise a *pjos*-who-subject-animate question, a *pjon*-who-object-animate question, a *ti*-what-object-inanimate question, and a *pjos/ti*-who/what double-wh-question (see below some key cross-linguistic differences between Greek and English). The adjunct questions comprise two *pu*-where questions, two-*jiati*-why questions, and one *pos*-how question. In this section, children are not penalised for morphosyntactic errors. The double-wh-question assesses the children's understanding of the distributive set properties of multiple *wh*-questions. This structure is acquired late and even nine year old children are often unable to produce this item correctly in English (de Villiers, 2004).

There are two cross-linguistic differences between English and Greek in this section. In Greek, the *who* animate subject and object *wh*-words are marked for case, i.e., there is a different form for the subject and the object *wh*-word, namely, *pjos*=nominative and *pjon*=accusative.

Thus, case marking provides a cue for the syntactic function of the *wh*-word (subject, object). There is no case marking in *what* inanimate *wh*-words which have the same form for subjects and objects (*ti*=nominative and accusative). The other difference is that in English, the *wh*-words *where* and *how* share one part of their morphological make up with the quantifiers *some**where*** and *some**how*** which are used by the experimenter to elicit the questions, but this does not hold for *who* and *what* (*someone, something*). In Greek all four wh-words share one part: *pjos*-nom/*pjon*-acc (who*)*, ***kapjos***-nom/***kapjon***-acc (someone); *ti* (what), ***kati*** (something)*, pu* (where), ***kapu*** (somewhere); *pos* (how), ***kapos*** (somehow) (Giannakidou, 2012).

3. Results

Table 1 shows the children's performance on the baseline tasks. The two groups did not differ from each other in their non-verbal abilities (*F* (1, 39) = 2.062, *p* = 0.159; η^2 = 0.051*)* and in their vocabulary (*F* (1, 39) = 0.002, *p* = 0.961; η^2 < 0.001). The children with ASD had a slightly lower performance in the production of morphosyntax, but this difference did not reach significance (*F* (1, 39) = 3.274, *p* = 0.078; η^2 = 0.079*)*.

Overall accuracy on the pragmatics task
Figure 1 shows the participants' accuracy in the three sections of the pragmatics task: communicative role-taking, narrative, and questions. The percentages represent the children's accuracy out of the items correct and not the proportion of children who provided a correct response.

To investigate differences between the two groups and the three parts of the task, we conducted an Analysis of Variance (ANOVA) with Group as the between subjects factor (ASD, TD), and Section (Communicative Role-Taking, Narrative, Questions) as the within subjects factor. This showed a significant difference between the groups (*F* (1, 38) = 7.219, *p* = 0.011, η^2 = 0.16), a significant difference between the sections of the task (*F* (2, 76) = 20.427, *p* < 0.001, η^2 = 0.35), and

Table 1
Comparison between the ASD and TD children on the baseline tasks

Group	Non-verbal IQ*	Vocabulary†	DVIQ†
ASD children			
Mean	103.5	102.3	19.9
SD	13.1	22.7	2.9
Range	80-135	57-143	12-24
TD children			
Mean	98	102.7	21.3
SD	11.1	22.8	1.6
Range	80-120	62-141	19-24

*Non-verbal IQ: standard score
†DVIQ, Vocabulary: raw score

a significant interaction between group and sections (F (2, 76) = 3.116, p = 0.05, η^2 = 0.076). This demonstrates that the groups performed differently in only some of the sections of the pragmatics task. Comparison between the two groups in each one of the sections using Bonferroni correction (significance level p = 0.006) showed significantly lower scores in the children with ASD compared to the TD children only in the narrative section (F (1, 39) = 14.267, p = 0.001, η^2 = 0.273). Within-group comparisons showed that children with ASD were less accurate in the narrative than in the communicative role-taking section and the questions (communicative role-taking vs. narrative: p < 0.001; questions vs. narrative: p = 0.001), but there was no significant difference between communicative role-taking and questions. In the TD children, there was no significant difference between the three subcomponents of the task. In sum, the children with ASD did not show lower performance across the board in the pragmatics task; the only difference between the groups was attested in the narrative task.

In the next sections we present the results for each section separately in order to address between and within group differences in more detail.

Communicative Role-Taking section
Figure 2 shows the performance of the two groups on the items that make up the communicative role-taking section: Telling, Asking, Prohibiting.

To investigate difference between telling, asking and prohibiting within and between the groups, we conducted an ANOVA with Group as the between subjects factor (ASD, TD), and Communicative Role-Taking Type (Telling, Asking, Prohibiting) as the within subjects factor. This showed a significant difference between the three types (F (2, 76) = 3.739, p = 0.028, η^2 = 0.09) with Asking showing marginally significantly lower accuracy than Prohibiting (p = 0.056). There was no significant difference between the groups and no interaction between group and types.

Narrative section
Figure 3 shows the performance of the two groups in the items of the narrative section that comprises of Reference Contrast, Temporal Links, Mental State Representations, and False Belief items.
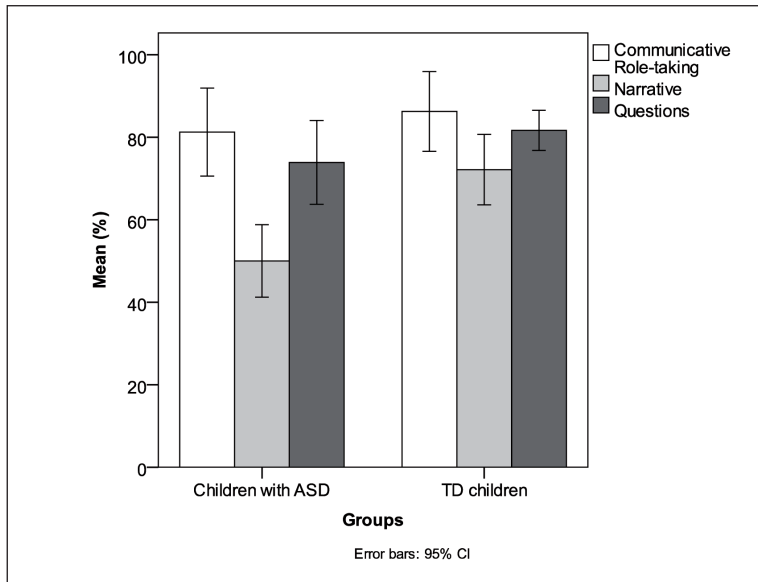
Figure 1
Participants' performance on communicative role-taking, narrative, and questions (% correct)
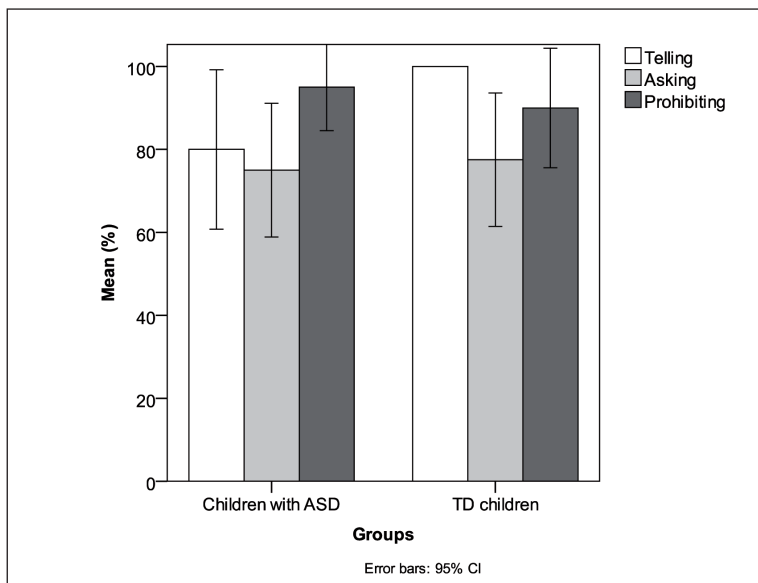

Figure 2
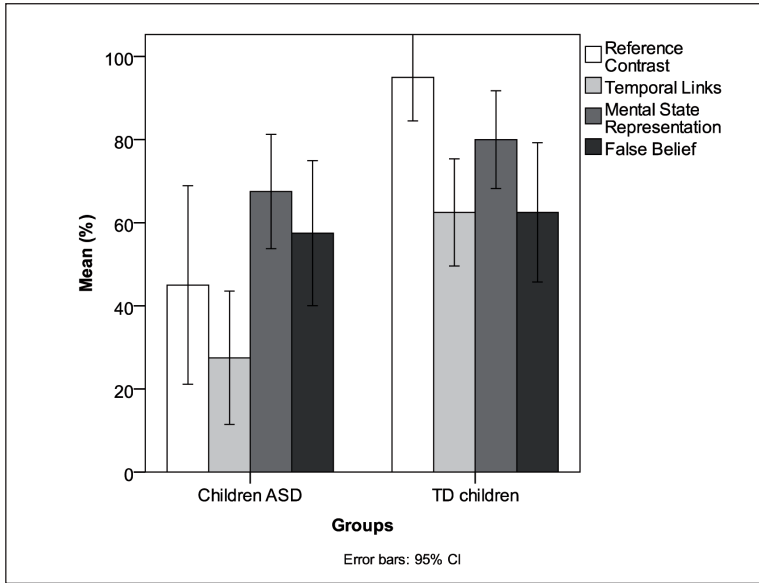**Participants' performance on Telling, Asking, and Prohibiting (% correct)**

Figure 3
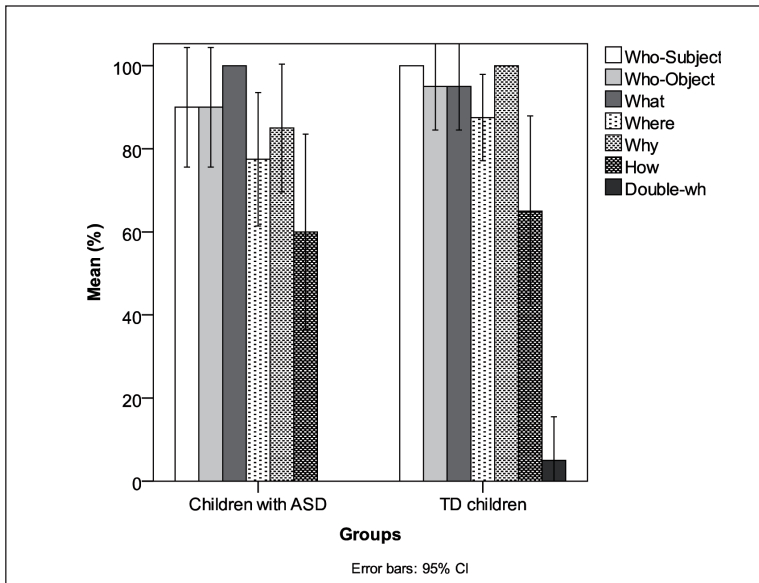**Participants' performance on the narrative items (% correct)**

Figure 4
Participants' performance on different questions types (% correct)

To investigate difference between the four categories in the narrative section within and between the groups, we conducted an ANOVA with Group as the between subjects factor (ASD, TD), and Type (Reference Contrast, Temporal Links, Mental State Representation, False Belief) as the within subjects factor. This showed a significant difference between the two groups (F (1, 38) = 17.181, p < 0.001, η^2 = 0.311), a significant difference between the four types (F (3, 114) = 6.442, p < 0.001, η^2 = 0.145) and a significant interaction between group and types (F (3, 114) = 4.164, p = 0.008, η^2 = 0.099). Between group analyses with Bonferroni correction (significance level p = 0.003) showed that children with ASD were significantly less accurate than TD children in Reference Contrast (F (1, 39) = 16.102, p < 0.001, η^2 = 0.298) and Temporal Links (F (1, 39) = 12.667, p = 0.001, η^2 = 0.25), but they did not differ in Mental State Representations and False Beliefs. Within-group comparisons showed that children with ASD performed less well in Temporal Links (27.5%) than in Mental State Representations (67.5%) (p = 0.002). TD children performed better in Reference Contrast (95%) than in Temporal Links (62.5%) (p < 0.001) and False Beliefs (62.5%) (p < 0.012).

Questions section
Figure 4 shows the children's performance on each question type.

To investigate differences between the seven question types within and between the groups, we conducted an ANOVA with Group as the between subjects factor (ASD, TD), and Question (Who-subject, Who-object, What, Where, Why, How, double-wh) as the within subjects factor. This showed a significant difference between the question types (F (6, 228) = 74.199, p < 0.001, η^2 = 0.661), no difference between the two groups and no significant interaction between group and question types. Pairwise comparisons with Bonferroni correction (significance level p = 0.001) showed that the children were less accurate in double wh-questions than in all other question types (p < 0.001) and also were less accurate in

how questions than in *what* questions (p = 0.001). There was no significant difference between the other question types.

It should be noted that none of the ASD children and only one of the 20 TD children used a double wh-question. The majority of the children from both groups used a single *ti-what* wh-question (e.g., *ti trone* = what eat 'what do they eat'; *ti trone i anthropi* = what eat the people 'what do the people eat') and some children used the quantifiers *o kathenas* = *everyone* (e.g., *ti troi o kathenas* = what eat the everyone 'what does everyone eat') and *oli* = *all* (e.g., *ti trone oli* = what eat all 'what do they all eat').

Correlations between the subparts of the pragmatics task
To investigate if there is a relationship between the subparts of the pragmatics task we conducted Pearson's correlations between the items tapping communicative role-taking, the items in the narrative section, and the items in the section with questions for each group separately. The analyses showed a strong correlation between communicative role-taking and questions (r (38) = 0.741, p < 0.001) and a moderate correlation between narratives and questions (r (38) = 0.603, p = 0.005) for the TD children, but no correlations for the children with ASD.

4. Discussion

This study aimed at documenting the strengths and weaknesses of a range of pragmatic abilities in Greek-speaking children with ASD and by so doing to also address accounts that have been proposed to explain the pragmatic difficulties in ASD. The main findings of this study can be summarised as follows. The performance of the children with ASD differed among the sections of the task. The children with ASD did not differ from the TD children in the Communicative Role-Taking (reporting, requesting, prohibiting) and in Question Asking (arguments, adjuncts, double-wh questions), but they were less accurate than the TD children in the Short Narrative. Within the Short

Narrative section, the items that showed differences between the two groups were the ones assessing reference contrast and temporal links, while there was no difference between the two groups on the items tapping mental state representations and false beliefs. In terms of the relationship between the sections of the task, there was a correlation between the TD children's scores on the Short Narrative, Communicative Role-Taking, and Questions, but no correlations between the sections was attested in the children with ASD. We consider this an important finding of our study. In the remaining section we will first comment briefly on the adaptation of the pragmatics section of the DELV in Greek as a tool to assess children's pragmatic abilities, and, subsequently, we will discuss our findings in relation to previous studies on the pragmatic abilities of children with ASD and the predictions that follow from the accounts that have been proposed to explain the difficulties of children with ASD in this domain of grammar. The section will end with limitations of the present study and suggestions for future research.

4.1. Adapting the pragmatics section of the DELV as a tool measuring pragmatic abilities in Greek-speaking children

The pictures and stories of the DELV pragmatics section did not require any changes of the original material, as they were appropriate in the Greek context. Both groups of children had no difficulties to understand what they had to do in each of the three sections of the task and none of the items, apart from the item eliciting a double *wh*-question,[4] created particular difficulties.

A general comment regards the number of items and points distributed among the three subsections of the task. A similar number of points is allocated to each of the three sections (Communicative Role-Taking: 9; Short Narrative: 7;

Question Asking: 9), but there are fewer items in the Communicative Role-Taking (N = 4) and in the Short Narrative (N = 4) than in the Question Asking section (N = 9). The number of items addressing the children's attribution of mental states (N = 2) is underrepresented compared to the number of items addressing the children's ability to ask questions in order to obtain specific information (N = 9), an area that heavily involves syntax, and hence, it does not test only pragmatics. Therefore, the results on the children's attribution of mental states may be less reliable than the results addressing questions and should be treated with caution.

4.2. Pragmatic abilities of Greek children with ASD

Previous research on the pragmatic abilities of high functioning children with ASD has highlighted deficits in a variety of tasks, ranging from inability to conform to conversational rules, violating Grice's maxims, difficulties in interpreting non-literal meaning and metaphoric expressions, difficulties in taking into account the distinction between old and new information, difficulties in structuring narratives and failing false belief tasks (e.g., Diehl et al., 2006; Tager-Flusberg, 2000). The weak central cohesion account, deficits in ToM, and deficits in executive functions have been proposed to account for these difficulties. A more recent view is that the various deficits encountered by individuals with ASD are not reduced to a single aetiology, but are caused by multiple deficits affecting core cognitive processes (global-local processing, social cognition, and executive functions) (Happé & Frith, 2006).

The findings of the present study showed a dissociation between the sections of the pragmatics task. The children's performance in the sections and items that require the ability to take the perspective of another speaker and use ToM did not differ from that of the TD children: they were able to make an appropriate speech act, to report

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5. This item showed a floor effect, but this is in line with data on English showing that double wh-questions are acquired late (de Villiers, 2004).

an event, request something, prohibit something, and ask questions in order to obtain specific information. This indicates that they did not show deficits in social cognition. They were also able to refer to the mental state of the characters in the narrative task and they did not fail the false belief question. This is in contrast to the study by Surian et al. (1996) who found that five out of the eight children in their study were at chance level in an acceptability judgment task and did not pass a false belief task. The difference between the results by Surian et al. and our study are very likely to relate to differences in the verbal abilities of the children in the two studies. Although the study by Surian et al. included high functioning children with ASD, the children's verbal abilities (mean verbal age = 5;7 years) were around six years below their chronological age (12;11 years) and their verbal abilities were matched to the verbal abilities of children with SLI. This indicates that although high functioning, the children in that study had language delay/impairment. In contrast, in the present study there was no discrepancy between the verbal and non-verbal abilities of the children with ASD, who had similar vocabulary and morphosyntactic abilities to their TD chronological controls. This difference could indicate that the deficits attested in Surian et al. are not caused by a deficit in ToM per se, but by a combination of deficits in ToM and language delay/impairment that both impact on the acceptability judgment and the false belief tasks. Moreover, our findings are in line with previous research in the language abilities of high functioning children with ASD showing that not all children have difficulties with tasks involving ToM (e.g., Tager-Flusberg & Sullivan, 1994) and that some children with ASD pass false belief tasks, especially those with high verbal abilities (Fisher, Happé, & Dunn, 2005; Happé, 1995).

The children with ASD in our study were less accurate than the TD children in the items of the narrative task that require the ability to make reference to the characters of the story contrastively in order to enable the listener of the story identify the characters. In those items, the children in our study used under-informative

expressions, e.g., *the boy, he*, instead of *the big boy, the older brother*. As a result, the listener could not identify who the child was referring to. Similar types of errors have been documented in several studies using narrative tasks for storytelling and for personal narratives. In the study by Nadig, et al. (2009), children with ASD were shown to have difficulties in using the right amount of information to indicate to the listener which object they were referring to. In some cases, they used under-informative expressions, that is, they failed to make reference to objects contrastively, for example using adjectives (*the short cup*). In a similar vein, Colle et al. (2008) found that adults with ASD sometimes used ambiguous pronouns in the narratives that did not enable the listener to ascertain who they were referring to.

Using the appropriate referring expressions to indicate to the listener which character one refers to involves ToM. This raises the question of why the children were able to use ToM to make an appropriate speech act, to refer to mental states, and to pass false belief questions, but they were using under-informative expressions to refer to the characters of the story. Although all these items involved ToM, we believe that being able to use appropriate referential expressions is more demanding than being able to take someone else's perspective to use the right speech act, or referring to mental states and passing false belief tasks. We believe this is so because using the right referential expressions involves not only taking into account the listener's perspective, but also quantifying the amount of information available to the listener in order to convey the message. This latter process, involves also global-local processing and adds one more level of complexity, requiring higher level of planning and organization.

The second area in which the children with ASD scored lower than the TD children regards providing temporal expressions to link the events of the narrative in a coherent way. Children with ASD did not link events using subordination (*after, because*), but used coordination instead (*and then*) or did not link the events at all. This is in line with studies showing that children with ASD have

difficulties in telling a story as a meaningful chain of events (Diehl et al., 2006; Losh & Capps, 2003) and their narratives resemble listings of events, indicating that they may have difficulties in organizing events into a coherent gist, and instead, they describe them in isolation.

Turning to the predictions of the accounts formulated to explain the language deficits in children with ASD, the data from the present study do not support the deficits in Theory of Mind account because the children with ASD did not show difficulties in the Communicative Role-Taking section, the Questions Asking section, and the Mental State Representation and False Belief items of the Narrative task. The Executive Function deficits account was also not supported because the children with ASD did not show difficulties across all sections of the task, although all sections require planning and organization. The uneven profile of the children with ASD and the dissociation of the children's performance in the different sections of the pragmatics task strongly support the multiple deficits account, according to which the deficits of individuals with ASD stem from a number of distinct deficits in core cognitive processes. The data are also compatible with the weak central cohesion account because the deficits attested in the children with ASD that we tested related to reference and temporal cohesion, domains that require global-local processing.

4.3. Limitations and future research

This is the first systematic study addressing a wide range of pragmatic abilities in high functioning Greek-speaking children with ASD. The study has important strengths in terms of the participant selection: a narrow age-range of the participants, strict inclusion and exclusion criteria enabling the inclusion of only high functioning children with ASD with high verbal abilities, and one-to-one matching of children with ASD to TD children in their verbal abilities. Another important strength is that the pragmatics task included items addressing a wide range of pragmatic abilities. However, the pragmatics task has also limitations: it included a small number of items for each one of the domains tested and an imbalance in the number of items per domain. Another limitation of the present study is that we did not include any EF tasks. Therefore, it was not possible to address possible correlations between the children's performance on EF tasks and their scores in the pragmatics task sections.

Future research could include a set of EF tasks to address the relationship between EFs and pragmatic abilities. It should also include a larger number of items in each pragmatic domain in order to investigate the children's strengths and weakness in more depth. Inclusion of an additional group of low functioning children with ASD could address the independent contribution of verbal and non-verbal abilities in the children's performance of pragmatics. Finally, a longitudinal or a cross-sectional design could address developmental aspects of pragmatic abilities. This is especially relevant for narrative tasks because narrative abilities are not thought to be fully developed until nine years of age.

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Πραγματολογικές ικανότητες παιδιών με αυτισμό υψηλής λειτουργικότητας και μητρική γλώσσα την Ελληνική

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ABSTRACT   Το άρθρο παρουσιάζει τα ευρήματα μελέτης των πραγματολογικών ικανοτήτων παιδιών με αυτισμό και μητρική γλώσσα την Ελληνική που διεξήχθη στο πλαίσιο μιας ευρύτερης έρευνας επί των γραμματικών ικανοτήτων των παιδιών με αυτισμό. Παρουσιάζεται ανάλυση των πραγματολογικών ικανοτήτων 20 παιδιών με αυτισμό υψηλής λειτουργικότητας και της ομάδας ελέγχου ίδιας ηλικίας, με τυπική ανάπτυξη, σε δοκιμασία βασισμένη στο πρωτόκολλο DELV (Diagnostic Evaluation of Language Variation). Η δοκιμασία αξιολογεί τους τομείς των επικοινωνιακών ρόλων, της αφήγησης και της παραγωγής ερωτήσεων.

Οι δύο ομάδες διέφεραν μόνο στον τομέα της αφήγησης, ειδικότερα, ως προς την αναφορά και τη χρονική σύνδεση, αλλά είχαν παρόμοια απόδοση στην κατανόηση νοητικών καταστάσεων και στη δοκιμασία εσφαλμένης πεποίθησης. Η χαμηλότερη απόδοση των παιδιών με αυτισμό ως προς την αναφορά μπορεί να εξηγηθεί από ελλείμματα στη Θεωρία του Νου, παρά την καλή απόδοσή τους στην κατανόηση νοητικών καταστάσεων και στη δοκιμασία εσφαλμένης πεποίθησης, αν υποθέσουμε ότι η αναφορά εμπλέκει έναν επιπλέον βαθμό δυσκολίας, αυτόν της ποσοτικοποίησης των πληροφοριών που είναι διαθέσιμες στον ακροατή. Η χαμηλότερη απόδοση των παιδιών με αυτισμό στη χρονική σύνδεση συμφωνεί με προβλήματα που έχουν διαπιστωθεί ως προς την οργάνωση επεισοδίων σε ενότητες με συνοχή. Το προφίλ που προκύπτει από την παραπάνω δοκιμασία, και ειδικότερα η έλλειψη συσχέτισης ανάμεσα στα διάφορα μέρη της, δείχνει ότι τα ελλείμματα των ατόμων με αυτισμό ενδεχομένως να προέρχονται από διαφορετικά ελλείμματα σε κεντρικές γνωστικές διαδικασίες.

Λέξεις-κλειδιά: Αυτισμός, πραγματολογία, Ελληνικά, αναφορά, Θεωρία του Νου, Θεωρία Κεντρικής Συνοχής.

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