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The Relationship between Vocabulary processing and Pragmatic skills in children with Autism Spectrum Disorder

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Abstract

There is a great deal of research on the development of vocabulary and pragmatic skills in people with ASD. However, there is little scientific evidence about the relationship between these two areas. In this research, the aim is to find out the relationship between comprehensive vocabulary and pragmatic skills in people with Autism Spectrum Disorder (ASD). For this purpose, 9 subjects with a diagnosis of ASD aged between 5 and 12 years old took part in the study, who were evaluated by means of the Peabody Test in order to find out the subjects' comprehensive vocabulary. In addition, spontaneous language was assessed by means of a recording in a clinical setting, and through an inter-judge evaluation, appropriate information was obtained on different levels of pragmatics: textual, enunciative and interactive. For this purpose, the Rapid Pragmatic Assessment Protocol-Revised (PREP-R) was used. The results indicate that, in most of the subjects, the age of comprehension vocabulary is higher than that which would correspond to chronological age. On the other hand, pragmatic skills correspond to the levels reached in comprehensive vocabulary. These results lead us to believe that the majority of participants could be compatible with a diagnosis of high-functioning ASD.

Keywords: Autism Spectrum Disorder, language, vocabulary, pragmatic

Introduction

The diagnostic and statistical manual of mental disorders DSM-5 (2013) defines Autism Spectrum Disorder (hereinafter ASD) as a neurodevelopmental disorder where symptoms must be present from the early stages of development, characterised by the presence of difficulties in communication and social interaction, as well as restrictive and repetitive patterns of behavior, interests or activities.

According to the World Health Organization (WHO, 2021), approximately one in every one hundred and sixty children is diagnosed with Autism Spectrum Disorder and it is this same organisation that states that the prevalence of ASD has increased considerably in recent years.

It is currently estimated that 1.4% of the population suffers from this disorder. This increase has aroused great interest and many authors attribute this increase to the continuous changes in diagnostic criteria [22].

People with ASD may have difficulties in certain areas of development such as social interaction, verbal and non-verbal communication, creative play, sensory processing, maintaining eye contact and adapting to noisy environments (Bowe 2004; Wilmshurst and Brue, 2010). Many authors agree that the difficulties in relating to others present in this disorder include limited interests, resistance to change and difficulty in following rules [20]. However, the social skills of people with ASD are also compromised by the language difficulties they exhibit(Durkin, et al. 2012). Many of these symptoms are evident between 12 and 18 months and persist throughout the lifetime of people with ASD [46].

Language acquisition is an extremely complex process and is threatened by any biological, social or psychological alteration of the conditions in which it develops. This is why language development is anomalous in Autism Spectrum Disorder [29].

Most users with ASD who acquire language suffer from a delay in their development and many have structural problems. Even so, not all people with this disorder experience difficulties in language acquisition. Kjelgaard and Tager-Flusberg (2001) have established that between 15% and 40% of users with ASD

exhibit a regression during language development, which usually occurs between 15 and 30 months.

Children with ASD who manage to develop language use it, but not in a communicative way. Therefore, in verbal communication, there is difficulty both in perceiving and expressing language [54]. In the language of people with ASD, it is common for there to be echoing, literalness, pronoun reversal and on many occasions, there may be a sense of deafness at some point in development. For this reason, the language of people with ASD is impaired or deficient (Garrido, 2020). Regarding morphosyntax, they exhibit problems in the use of personal pronouns and stereotyped expressions, as well as the absence of function words [4]. They also exhibit difficulties in semantics, since the development of vocabulary is slower than children with neurotypical development. Likewise, they experience difficulties in understanding the deeper meanings of words, and this hinders the metaphorical and functional use of language (Andreou and Peristeri, 2020).

People with ASD have serious difficulties in both communication and social interaction. These abnormalities are also reflected in conversational skills, that is, it is difficult for them to stay on the same topic and provide relevant and new information [55].

Family members of people with ASD report a lack of conversational skills and note that this is one of their main concerns [5,27]. Social communication skills are essential for successful conversational exchanges [10,40,41]. Successful communication requires the ability to go beyond the information provided linguistically, as many contextual and social factors continually influence interpretations of language [18].

Loukusa, Mäkinen, Kuusikko-Gauffin, Ebeling and Leinonen (2018) researched social-pragmatic inference skills in children with ASD. In this research, two groups were compared: one comprised of participants with ASD and another of children with typical development. The results revealed that children with ASD have social-pragmatic inference difficulties and these difficulties increase when the situation requires a greater degree of mind reading. These difficulties may be because inferences are not guided by rules. These difficulties negatively affect the quality of life of people with ASD since they impair social interaction.

Lexicon development in Autism Spectrum Disorder

When we talk about semantics, we refer to the ability to understand and know how to correctly use the meaning of words and sentences. It has been found that people with ASD suffer certain semantic deficits, especially in word recall, semantic information processing and spontaneous word production [23,24,56].

As for lexicon development, Marchena González (1992) points out that people with ASD have difficulties in acquiring concepts related to inanimate and static objects. The use of verbs is very limited, especially those that express moods, desires, feelings, etc. They also rarely use spatio-temporal terms. It has been demonstrated that people with ASD experience semantic anomalies, as well as problems in the use of the meaning of words for the interpretation of language. These difficulties occur more frequently in people with low-functioning autism [34]. In addition, Luyster,Kadlec, Carter and Tager-Flusberg(2005) observe a reduction in memory for lexical information, since it seems that people with Autism Spectrum Disorder tend to rely on syntactic information more than on lexicon to allow them to understand sentences. Following this same author, it is common for people with ASD to make mistakes with deictic terms, that is, words with meanings that depend on the context. In addition, on many occasions, children with ASD refer to themselves in the third person or by name.

Pragmatic skills in Autism Spectrum Disorder

Halliday (1973) found that the basic functions of communication are already present in the pre-verbal stage: When children begin to point with their fingers, they do so both to obtain objects (proto-imperatives) and to share attention with adults (proto-declaratives). In Autism Spectrum Disorder, these behaviors are impaired or even absent. Children with ASD show no interest in the objects or people around them, they do not ask people for things, they are not able to rely on other people and they do not exhibit joint attention [17].

Autism Spectrum Disorder is characterised, among many other symptoms, by difficulties in the pragmatics of language, an aspect that compromises the social and adaptive sphere of people with ASD [2].

It has been demonstrated that people with ASD have greater difficulties in pragmatics and speech since they are the areas of greatest linguistic deterioration [12,25]. Numerous studies indicate that people with this disorder have difficulties in turn-taking during conversational exchanges [8,30]. People with ASD experience difficulties both in establishing and maintaining eye contact [35], and it is also difficult for them to identify turn-taking, respond to turns and introduce and develop conversational topics [51]. In addition, scientific evidence has found that a common characteristic of this disorder is the literal interpretation of messages, which is why the understanding of irony and metaphors is compromised [11]. However, Villiers, Myers and Stainton(2013) found that, despite these obvious difficulties, people with ASD can identify errors in non-literal language. Some studies also show that these pragmatic difficulties are not present in some people with ASD.

Roberts, Martin, Moskowitz, Harris, Foreman and Nelson (2007) assessed the ability to maintain a topic of conversation. The results obtained were compared between children with various neurodevelopmental disorders (ASD, fragile X and Down syndrome) and children with typical development. These results demonstrate that children with ASD and fragileX exhibit a higher number of non-contingent topic maintenance responses than the other groups. This means

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that they intended to stay on topic but did not provide the expected information or failed semantically in some way. However, children with typical development provide much more elaborate statements than users with a neurodevelopmental disorder.

Furthermore, we can highlight two studies that researched the conversational balance in people with ASD, that is, whether the level of participation between the interlocutors is equivalent or not. Adams, Green, Gilchrist and Cox (2002) compared a group of high-functioning people with ASD with one with typical development and Nadig, Lee, Singh, Bosshart and Ozonoff (2010) compared three groups; one of people with ASD, another of people with speech and language disorders and the last group of children with typical development. Both studies demonstrate that no differences are found in the proportion of statements between the different groups evaluated.

It is common for people with ASD to experience difficulties in inferences, as well as in deriving implicatures. These difficulties affect the ability to infer the implication of an utterance, and also to make inferences from social scripts, metaphors and speech acts [**31**]. Loukusa et al. (2018) conducted research on the social-pragmatic inference skills of children with ASD. In this research, they compared two groups, one comprised of 16 participants with ASD and another of 16 participants with typical development. The results demonstrate that children with ASD have social-pragmatic inference difficulties and these difficulties increase when the situation requires more mind reading. These difficulties may be because inferences are not guided by rules. These difficulties negatively affect the quality of life of people with ASD since they impair social interaction.

According to Tirapu-Ustárroz, Sayes, Bilbao and Valero (2007), it is important to note that the Theory of Mind concept encompasses the understanding and prediction of other people's behavior, as well as their knowledge, intentions and beliefs. It is a concept that refers to a "heterometacognitive" ability. SixtoOlivar, Flores and De La Iglesia (2003) consider that a Theory of Mind deficit in users with Autism Spectrum Disorder means the inability to form mental representations about the beliefs, thoughts and intentions of others and to differentiate them from those that one has about oneself, which implies an inability to understand the mental states of others. There is an attempt to determine the contents of someone else's cognitive system using one's own—necessarily different—cognitive system. In children with Autism Spectrum Disorder, the understanding and expression of emotions do not develop, because 'mentalist terms' have not been learned [**50**]. According to Monfort, Sánchez and Juárez (2019), mentalist terms are those that refer to internal mental states, as well as emotions or processes such as thinking, knowing, believing, imagining, supposing, etc.

Baron-Cohen and Leslie (1987 and 1989) focused their research on Autism Spectrum Disorder and demonstrated that users suffering from ASD have serious problems theorizing about the minds of others [**50**].

This inability to read the minds of other people is common in all the clinical manifestations of this disorder, regardless of their intellectual development and the level of the formal dimensions of language [**17**].

After analysing the linguistic characteristics and pragmatic skills of people with Autism Spectrum Disorder, the main goal of the research is to compare the vocabulary processing skills and pragmatic skills of people with Autism Spectrum Disorder.

Methods

Participants

In this research, 9 people aged between 5 and 12 years participated, all with a current diagnosis of Autism Spectrum Disorder (one patient of 5 years, one of 7 years, four of 8 years, one of 10 years, one of 11 years and one of 12 years). There was only one girl among the participants, while the rest were boys. It is important to highlight that, to control the cognitive level, the children participating in the research did not have an intellectual disability. Along the same lines, all the children possessed a certified functional disability of 33%.

These users belonged to the ASD Talavera Association and it was within this same association that the assessment of the users was carried out in individual sessions of approximately 45 minutes.

To collect this sample, the inclusion criteria established were that all users had to have a diagnosis of ASD, have acquired oral language, be Spanish speakers, and their parents or legal guardians must have given us consent to carry out the research. The exclusion criteria established were having a certified mental disability, not having received an ASD diagnosis or not having developed oral language.

Instruments

The instruments required to carry out the assessment were: The Peabody Picture Vocabulary Test (Dunn and Dunn, 1997), adapted to the Spanish version by Arribadas, (2006) and the Revised Pragmatic Evaluation Rapid Protocol (PREP-R) (Gallardo, 2009), modified by Fernández, Díaz, Moreno,Lázaro, Simón, (2015).

The first test aimed to assess the level of receptive vocabulary and thus be able to carry out a rapid detection since it is an instrument with a maximum application time that does not usually exceed 15 minutes. Using this tool, we assessed the vocabulary level of the 9 participants with ASD. The goal was to obtain the equivalent vocabulary age with respect to the chronological age of the user, which may or may not coincide.

The second protocol allowed us to obtain a first impression of the deficit that is at the root of the subjects communication problems. This protocol is a tool that allows professionals to obtain a pragmatic analysis quickly. We can assess different pragmatic levels using the PREP-R:enunciative pragmatics, referring to the intelligibility of speech; textual pragmatics, referring to the coherence of discourse; and, finally, interactive

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pragmatics, which is related to the exchange of roles with the receiver. The PREP-R is comprised of 18 items:

- 6 items for enunciative pragmatics;
- 5 items for textual pragmatics; and
- 7 items for interactive pragmatics.

Lastly, we obtained three percentages as a final score: the first referred to general pragmatic skills; the second concerned specific pragmatic skills relating to cognitive and metacognitive abilities; and the last percentage referred to grammar-based pragmatic skills, as well as turn-taking and the morphosyntactic and semantic aspects of discourse.

Data analysis

Once the research data was collected, the videos were analysed following the protocol set out in the PREP-R to obtain the pragmatic skills scores. To avoid a possible assessment bias, each video was analysed using an inter-rater assessment between two assessors, where the scores of both assessors were compared and an average was found between the two scores. The results presented below show the descriptive analysis of the data obtained.

Results

Regarding vocabulary processing, the results demonstrate that there is a gap between chronological age and equivalent age. In some cases, the linguistic age is lower than the chronological age and, in most participants, the linguistic skills are superior, as can be seen in **Table 1** and **2**.

Table 1. Peabody test results.

Users	Chronological age	Equivalent acquired vocabulary age
User 1	5 years and 11 months	6 years
User 2	7 years and 3 months	9 years
User 3	8 years and 2 months	6 years and 1 month
User 4	8 years and 6 months	15 years
User 5	8 years and 8 months	11 years and 7 months
User 6	8 years and 10 months	10 years and 9 months
User 7	10 years and 1 month	11 years and 10 months
User 8	11 years and 8 months	8 years
User 9	12 years and 5 months	5 years and 10 months

Note: Compiled by the author

After analysing the data, it has been found that there is a correlation between the level of vocabulary processing ability and the development of pragmatic skills in this sample of participants.

To complete the data obtained, a qualitative analysis of the results found through the PREP-R has been carried out with some important observations to take into account.

With regard to the production of speech acts, all participants articulate correctly, find words and can correctly use grammar and adequately manage pauses and silences during conversational acts. The same occurs with the comprehension and/or production of direct and indirect speech acts.

Table 2. Results Revised Pragmatic Evaluation Rapid Protocol.

	PREP-R		
User	***General pragmatic skills***	***Specific pragmatic skills***	***Grammar-based pragmatic skills***
User 1	81.66%	77.85%	92.85%
User 2	82.53%	77.37%	92.85%
User 3	75%	65%	100%
User 4	90.45%	86.60%	100%
User 5	94.44%	95%	100%
User 6	85.38%	85%	86.6%
User 7	90.07%	84.7%	100%
User 8	83.49%	80.35%	92.85%
User 9	30.26%	31.25%	53.57%

Note: Compiled by the author

However, regarding compensatory behaviors, only 33.33% of users use compensatory verbal and/or para verbal acts (locutionary acts). Here are some examples:

[E.g. 1], user 7
S: Do you want to ask him any questions to get to know me?
M: Yes, how old are you?
S: Twenty-four.
M: **Oh.** When is your birthday?
S: The third of May.
M: **You don't say!** Mine is in three days.

33.33% of participants use verbal strategies that allow them to gain extra time for the construction of their utterances, which are known as 'draft acts'.

[E.g. 2], user 2
Me: What day is it today?
A: **eee/mm** seventh of March.
M: Very good. And the day of the week?
A: **mmm mmmm** Monday

Concerning item 3.3, which refers to the use of gestures that substitute, complement or regulate verbal production (compensatory gestures), only one participant makes use of them, while the rest of them do not use compensatory gestures or on the contrary, they could not be assessed.

[E.g. 3], user 3
M: What did you do at school today?
J: Eee the usual.
M: And what's the usual?
J: Gettingmy own back on Marcos. I allied with Tomás.
M: Who's Tomás?
J: A friend. And I convinced him to be / how should I put it? (LAUGHS) my ally to get back at Tomás **(while rubbing his hands together, complementing the verbal production)**

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Only 11.11% of the participants do not show awareness of their difficulties, and, therefore, do not correct their own statements when these are problematic. The remaining 88.88% of the sample do confirm to this item.

[E.g. 4], user 4
S: What are you going to do this weekend?
J: **At/we go to/at night, Friday night or Saturday night, we always** sleep special.

Regarding item 5, not all the participants comply with the principle of cooperation: generalised and particularised implicatures. If we analyse the sub-items individually, we can highlight the following:

Not all participants comply with the maxim of quality, that is, that the information they provide in the conversation is truthful. However, only 44.44% of the participants comply with the maxim of quantity, that is, that the information they provide is neither scarce nor excessive, bearing in mind the contextual requirements. In the same manner, only 44.44% of the participants comply with the maxim of manner, that is, that the information is provided in a clear, orderly and unambiguous manner. However,100% of users comply with the maxim of relation. This means that the contributions made by all users are related to the topic of conversation.

Lastly, let us consider sub-item 5.5, related to implicatures. That is, the ability to understand the contents implicitly communicated when one of the maxims is intentionally transgressed, and/or implicit content is communicated. Only 22.22% of participants did not conform to this item.

Below is a case where the maxim of quantity is not complied with since when asking for the user's favorite film, the information provided is very scarce.

[E.g. 5], user 1
S: What is your favorite film?
A: eeee // Bambi.
S: What happens in the film?
A: There are many pets and there is a skunk.
S: Do you have a skunk?
A: No, Bambi found it.
S: And what happened?
A: It's//
S: What happened to the skunk?
A: **A lot of things.**

In the following transcript, you can see a clear example of the maxim of manner not being complied with, since, when the participant is asked about his favorite film, he answers with information that is not related to the main topic of conversation. The maxim of quality is also not complied with, because the information is not true.

The next item refers to the conventional implicature and the correct understanding and use of lexicalised expressions or idioms, which could not be assessed in any participant.

Item 7 (textual superstructures) is divided into two subsections;

[E.g. 6], user 8.
S: What is your favorite film?
J: I don't know, none. Since I'm a 10-year-old boy, I don't go and watch films. Babies eat cereal. I don't eat breakfast or cereals I don't like. But I do like some cereal when there's chocolate inside.
S: And what do you have for breakfast?
J: Plain milk, no cereal. I eat cereal when I'm not sleeping because I like to eat cereal when I sleep.

narrative superstructure and argumentative superstructure. The first was scored positively—only 33.33% of participants—, while, in the second, four participants obtained a favorable score and in the remaining five users, it could not be assessed.

[E.g. 7], user 4
S: How did you tell me that a compass was made?
J: To make a compass, you have to take a magnet and a metal sewing needle, like the needles that old people use. You rub it for a long time and then take a piece of tape and wrap the needle until it is wrapped and then fill a cap with water / then you put the needle in and it indicates north, south and everything.
S: And you made one?
J: Yes, because we made a sundial at school // and it had to be in the right position so we made a compass to put it in the right position.

The next section concerns topic management. That is, if a person recognises when his or her interlocutor introduces a new topic and acts accordingly, developing it correctly. 100% of the participants recognise when a topic change occurs and act accordingly. However, it was not possible to assess the correct introduction of a new topic in 5 participants.

[E.g. 8] user 5
S: What did you play today on the playground?
D: Well, we didn't play anything because… because I didn't see anyone during the break but then…then…then I saw almost everyone in the class behind a bush except two people up on a bush.
S: And what were they doing there?
D: They lost their ball.
S: And did you climb the tree?
D: No, and someone climbed the bush and it was very tall.
S: **And what are you going to do on the weekend?**
D: **I'm going to play with my Nintendo Switch and paint something that Jimena's father gave me/he gave me a sculpture of a face on an olive branch and he made a D for Darío on the stick and I'm going to color it in.**

All users, except one, correctly use the different levels of cohesion. That is, they know how to correctly use the right words to explain what they want to convey; they have enough lexical repertoire to construct a discourse without simply relying on repetitions or empty words. Likewise, the construction of words is correct, appropriate morphology is used and the syntactic constructions are also those corresponding to their age.

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[E.g. 9], user 9
M: What did you do at school?
F: ↑ On the blackboard.
M: On the blackboard? And what did you do on the blackboard?
F: Songs.
M: And do you remember what songs they were?
F: // Yes.
M: What song?
F: Hello, ho, hello, hello, hello, how are you?

Regarding agility and fluidity in turn-taking, only 22.22% of the sample had a negative score. Below, I attach an example, where the user is not agile in turn-taking, since he uses long pauses when it is his turn to intervene.

[E.g. 10], user 9
M: Let's see. Tell us, what did you do at school?
F:// Played
M: And what did you play?
F: // With the clay.
M: With the clay (aa), and with anything else?
F: No.

Regarding the level of verbal participation in the conversation, 4.5% of participants obtained a positive score, while the remaining 4.5% of participants obtained a negative score, since the interactions of the two interlocutors when having a conversation are not balanced. That is, these participants made excessively short interventions compared with those of the other interlocutor.

Concerning the use of predictive and reactive turns, only one participant showed difficulties in this regard. In 44.44% of users, this characteristic from interactive pragmatics could not be evaluated and the remaining 44.44% of the sample acquired this item.

[E.g. 11], user 7
S: What are you going to do for your birthday?
M: Well, celebrate it at my grandmother's house.
S: And are you going to invite your friends?
M: You can't because of COVID (because infection rates are very high at the moment).
S: And who is going to your birthday?
M: My uncles and my grandparents.
S: Well that's cool, and are you going to have something nice for dinner?
M: Yes, I would really like to order at a restaurant that we have around here in Cebolla (that's where I live).
S: Oh, do you live in Cebolla?
M: **Yes, do you know where it is?**
S: No, I've never been there.

Moreover, of 100% of the participants in this study, the results demonstrate that only 22.22% of participants experienced difficulties in the use of gestures, facial expressions and non-verbal communication (natural gestures), 55.55% of users obtained a positive score and only 11.11% of the sample could not be assessed.

Lastly, regarding the communicative use of the gaze, only 11.11% of the participants show difficulties, while 88.88% of them used it adequately.

Discussion

After analysing the results of this research, we observe that there are discrepancies between chronological age and vocabulary age in people with ASD. These differences, in most cases, show a superiority of the linguistic level, although not in all cases. In general, pragmatic skills in people with ASD are good, although there are specific difficulties, such as maintaining the topic and following the conversation.

The results found do not follow the line of other research since, according to authors such as Garrido, Carballo, Franco and García Retamero (2015), most users with ASD understand language to a lesser degree than their peers without an ASD diagnosis, showing a greater delay in receptive vocabulary. In addition, these same authors suggest that the level of listening and grammatical comprehension in children with ASD is below what is expected for their chronological age.

Following this same line, Dioses, Susanibar, Brito, Velásquez, Chávez and Cuzcano (2017) carried out research to characterise the oral language comprehension of 20 children with ASD compared to 20 children with neurotypical development aged between 6 and 11 years, finding that between 90% and 95% of children with ASD are below the expected level for their chronological age in oral language processing and their scores are lower in all variables of oral language comprehension assessed in comparison with children with neurotypical development. This is what we find in the results of three participants in this research, user 3, user 8 and user 9, who have a chronological age higher than their age of acquired vocabulary processing.

These results are contrary to those obtained in the remaining participants of this study, a circumstance that could be explained by the fact that the participants do not have a mental disability and also have high-functioning traits.

Along the same lines, this study could be compared with others that research pragmatic skills in children with Asperger's Syndrome, currently known as level 1 ASD [**19**]. Camargo and Cortés (2020) conducted research to determine pragmatic deficits in children with level 1 ASD and confirm if an individual with this diagnosis can acquire the necessary skills for successful communication. This study was carried out through a survey of 110 families of children diagnosed with Asperger syndrome or level 1 ASD with functional language. The pragmatic skills evaluated were: communicative intention, conversational dynamics, non-verbal communication and understanding of figurative language. The results demonstrate that all the participants exhibit numerous difficulties in achieving successful communication. This is because they have difficulties in respecting turn-taking—both maintaining their turn and giving the rest of the interlocutors theirs—, they

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tend to centre on repetitive conversation topics focused on their own interests without taking into account the knowledge and interest of the other interlocutor, and we must also mention their difficulties in understanding figurative meaning and non-verbal cues.

This study has shown that certain pragmatic skills can be acquired at a later stage in development, such as answering questions, maintaining eye contact and interpersonal distance, and using age-appropriate vocabulary, since this can often be limited. However, there are certain aspects of social communication that most participants have not developed, all of them concerning the communicative intention and the ability to perceive the intention and needs of the interlocutor in a manner that ensures communication can be successful and bidirectional. This research concludes that part of the learning of these pragmatic skills is rote, and includes gestures and set phrases, which means that communication may be compromised in new contexts.

Comparing the characteristics of the users with level 1 ASD and the results obtained in both the Peabody and the PREP-R, we can conclude that there is a possibility that a large part of the participants have high-functioning ASD since they have numerous traits in common. This is because the linguistic level is not what is expected for this diagnostic profile. In the same manner, pragmatic skills are good despite there being difficulties in maintaining the topic and eye contact, an imbalance in the turn-taking necessary for communication to be equitable between the interlocutors, low turn-taking agility and non-compliance with the maxims of quantity and manner. However, as has been seen in research by Camargo and Cortés (2020), some of these skills may be acquired over time.

Furthermore, Rodríguez and Muñoz (2020) carried out a study to question the unilateral nature of communication in subjects with Asperger Syndrome (AS). To do this, they obtained a sample of a total of 40 participants: 20 with a diagnosis of AS aged 6 to 15 years and 20 with typical development aged 12 to 13 years. The results obtained show that there are no major differences between the two groups since the turns per minute and the percentage of turns are distributed similarly, both among the participants involved and between the two groups that are compared. These results are similar to those obtained in this research since a large part of the participants achieved positive scores in interactive pragmatics, which includes turn agility, turn-taking fluency and the level of verbal participation.

Conclusions

The data demonstrate that in ASD there is great variability concerning linguistic characteristics. The subjects of this research show significant pragmatic abilities and a large discrepancy has been revealed between chronological age and acquired vocabulary processing skills when it comes to vocabulary processing. However, both the level of vocabulary processing skills and pragmatic skills are correlated with each other even though lower results were expected from the participants. This is because6 of the participants show characteristics compatible with high-functioning ASD since there is a significant gap between their chronological age and their receptive vocabulary age, the latter being notably greater. In addition, the pragmatic skills of these same subjects are very good despite having difficulties in eye contact or maintaining the topic.

The remaining three participants in this research also show an imbalance between the two ages, with the acquired vocabulary age being lower than the chronological age. However, their pragmatic skills match their receptive vocabulary age.

These data lead us to underscore the need for linguistic interventions in both areas to improve communication in people with ASD and the findings focus on the importance of pragmatic skills throughout their lives since these difficulties negatively impact the social and adaptive environment of people with ASD.

Therefore, we can say that the hypothesis posed at the beginning of this research paper has been verified since there is a relationship between vocabulary processing and pragmatic skills in people with Autism Spectrum Disorder.

Lastly, the following suggestions are made for future lines of research in this same field:

- The spontaneous language samples should be collected in the family setting rather than in a clinical setting, ensuring that the conversational exchange will be much more variable.
- It is recommended that the collection of spontaneous language samples be carried out by the subjects' relatives since these are the people who know them best and can most easily have a conversation with them on a specific topic. When the sample is obtained by the assessor, the language may be more directed than spontaneous.

Competing interests

The authors declare that they have no competing interests.

Authors' contributions

Authors' contributions	DEMS	SPB
Research concept and design	√	--
Collection and/or assembly of data	--	√
Data analysis and interpretation	√	√
Writing the article	√	√
Critical revision of the article	√	--
Final approval of article	√	√
Statistical analysis	√	--

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References

1. Adams, C., Green, J., Gilchrist, A., & Cox, A. (2002). Conversational behavior of children with Asperger syndrome and conduct disorder. *Journal of Child Psychology and Psychiatry*, 43, 679–690.
2. Baixauli, I., Berenguer, C., Roselló, B., & Colomer, C. (2018). Análisis de habilidades pragmáticas de niños con TEA y niños con TEA y TDAH. *European Journal of Child Development Education and Psychopathology,* 6(1), 33.
3. Baron-Cohen S, Leslie AM, Frith U. Does the autistic child have a 'theory of mind'? Cognition 1985; 21: 37-46.
4. Bishop, D. (2010). Overlaps between autism and language impairment: phenomimicry or shared etiology? *Behavior Genetics,* 40(5).
5. Bishop, D., & Baird, G. (2001). Parent and teacher report of pragmatic aspects of communication: Use of the Children's Communication Checklist in a clinical setting. *Developmental Medicine and Child Neurology*, 43, 809–818.
6. Bauminger-Zviely, N., Karin, E., Kimhi, Y., & Agam-Ben-Artzi, G. (2014). Spontaneous peer conversation in preschoolers with high-functioning autism spectrum disorder versus typical development. *Journal of Child Psychology and Psychiatry, and Allied Disciplines,* 55(4), 363–373.
7. Bowe, F. (2005). Making Inclusion Work. Pearson.
8. Chiang, C., Soong, W., Lin, T., & Rogers, S. J. (2008). Nonverbal communication skills in young children with autism. *Journal of Autism and Developmental Disorders*, 38, 1898–1906.
9. Camargo, L. y Cortés, R. (2020). Desarrollo y mejora de la competencia pragmática en niños y adolescentes con trastorno del espectro autista y lenguaje funcional. *Normas,* 10(1).
10. Church, C., Alisanski, S., & Amanullah, S. (2000). The social, behavioral, and academic experiences of children with Asperger syndrome. *Focus on Autism and Other Developmental Disabilities,* 15(1), 12–20.
11. Deliens, G., Papastamou, P., Ruytenbeek, N., Geelhand, P., & Kissine, M. (2018). Selective pragmatic impairment in autism spectrum disorder: Indirect requests versus irony. *Journal of Autism and Developmental Disorders*, 48, 2938–2952.
12. Dennis, M., Lazenby, A. L., & Lockyer, L. (2001). Inferential language in high-functioning children with autism. *Journal of Autism and Developmental Disorders*, 31, 47–54.
13. Dioses, A., Susanibar, F., Brito, J., Velásquez, C., Chávez, J y Cuzcano, A., (2017). Lenguaje comprensivo oral de niños de 6 a 11 años con Trastorno del Espectro Autista (TEA) incluidos en instituciones educativas de básica regular de Lima Metropolitana y el Callao. *Revista Digital EOS Perú. Vol 5 (1),* 17–33.
14. Durkin, M., Maenner M., Baio, J., Christensen, D., Daniels, J., Fitzgerald, R., Imm, P., Lee, L., Schieve, L., Braun, K., Wingate, M y Yeargin-Alsopp.M. Autism spectrum disorder among US children (2002–2010): socioeconomic, racial, and ethnic disparities. *Am J Public Health* 2017;107:1818–26.
15. García-de-la-Torre, M. P. (2002). Trastorno de la comunicación en el autismo. Revista galego-portuguesa de psicoloxía e educación: *Revista de estudios e investigación en psicología y educación.,* 8(2002), 409–517.
16. Garrido, D., Carballo, G., Franco, V. y García-Retamero, R. (2015) Dificultades de comprensión del lenguaje en niños no verbales con trastornos del espectro autista y sus implicaciones en la calidad de vida familiar. *Revista de Neurología,* 60 (5), 207-214.
17. Gerardo Aguado, Carmen Gándara (2013). Evaluación de la comunicación y el lenguaje en el Trastorno del Espectro Autista. Ediciones Libro Amigo.
18. Gibbs, R. W., & Colston, H. I. (2012). *Interpreting figurative meaning*. Cambridge University Press.
19. Guía de consulta de los criterios diagnósticos del DSM-5 (2013).
20. Habib, K., Montreuil, T., & Bertone, A., (2018). Social learning through exercise for students with autism spectrum disorders. *Review Journal of Autism and Developmental Disorders,* 5, 285-293
21. Halliday M, (1973): Explorations in the fuctions of languages. Londres. Arnold. (versión en castellano: Exploraciones sobre las funciones del lenguaje. Barcelona. Médica y Técnica 1982).
22. Hansen, S. N., Schendel, D. E., & Parner, E. T. (2015). Explaining the increase in the prevalence of autism spectrum disorders: The proportion attributable to changes in reporting practices. *JAMA Pediatrics,* 169(1), 56–62.
23. Kamio, Y., Robbins, D., Kelley, E., Swainson, B., & Fein, D. (2007). Atypical lexical/semantic processing in high-functioning autism spectrum disorders without early language delay. *Journal of Autism and Developmental Disorders*, 37, 1116–1122.
24. Kazak, S., Collins, G. M., & Lewis, V. (1997). Can young people with autism refer to knowledge states? Evidence from their understanding of "Know" and "Guess". *Journal of Child Psychology and Psychiatry*, 38, 1001–1009.
25. Kelley, E., Paul, J. J., Fein, D., & Naigles, L. R. (2006). Residual language deficits in optimal outcome children with a history of autism. *Journal of Autism and Developmental Disorders,* 36, 807–828.
26. Kjelgaard M.M. y Tager-Flusberg, H. (2001) An investigation of language impairment in autism: Implications for genetic subgroups. *Journal of Language and Cognitive Processes,* 16 (2/3), 287–30.
27. Knott, F., Dunlop, A., & Mackay, T. (2006). Living with ASD: How do children and their parents assess their difficulties with social interaction and understanding? *Autism,* 10, 609–617.
28. Levinson, S, Eisenhower, A, Bush, H, Carter, A, Blacher, J (2020). Brief report: Predicting social skills from semantic, syntactic, and pragmatic language among young children with autism spectrum disorder. *Journal of Autism and Developmental Disorders*, 50(11), 4165-4175.
29. López-Ornat, S. (2011). La adquisición del lenguaje, un resumen en 2011. *Revista de investigación en Logopedia,* 1–11.
30. Loucas, T., Charman, T., Pickles, A., Simonoff, E., Chandler, S., Meldrum, D y Baird, G. (2008). Autism symptomology and language ability in autism spectrum disorder and Specific language impairment. *Journal of Child Psychology and Psychiatry*, 49, 1184–1192.
31. Loukusa, S., Mäkinen, L., Kuusikko-Gauffin, S., Ebeling, H., & Leinonen, E. (2018). Assessing social-pragmatic inferencing skills in children with autism spectrum disorder. *Journal of Communication Disorders*, 73, 91–105.
32. Luyster, R. J., Kadlec, M. B., Carter, A. y Tager-Flusberg, H. (2008) Language assessment and development in toddlers with autism spectrum disorders. *Journal of autism and developmental disorders,* 38(8), 1426-1438.
33. Monfort, M., Sánchez A y Juárez, I. (2019). Niños con Trastornos Pragmáticos del Lenguaje y de la Comunicación. Descripción e intervención. Entha.
34. McCleery, J.P., Ceponiene, R., Burner, K.M., Townsend, J., Kinnear, M. y Schreibman, L. (2010) Neural correlates of verbal and nonverbal semantic integration in children with autism spectrum disorders. *Journal of Child Psychology and Psychiatry*, 51(3), 277-86.
35. McConnell, S. R. (2002). Interventions to facilitate social interaction for young children with autism: review of available research and recommendations for educational intervention and future research. *Journal of Autism and Developmental Disorders*, 32(5), 351–372.
36. Marchena González, C. (1992). El trastorno autista. Contextualización e intervención logopédica. Sevilla: Ediciones Alfar.
37. Nadig, A., Lee, I., Singh, L., Bosshart, K., & Ozonoff, S. (2010). How does the topic of conversation affect verbal exchange and eye gaze? A comparison between typical development and high-functioning autism. *Neuropsychologia,* 48(9), 2730–2739.
38. Organización Mundial de la Salud (OMS, 2021)
39. Pablo, M. N. (2003). Adquisición del lenguaje. El principio de la comunicación. CAUCE, *Revista de Filología y su Didáctica,* 26(2003),

doi: 10.7243/2054-992X-10-1

321–347.

40. Paul, R., Orlovski, S. M., Marcinko, H. C., & Volkmar, F. (2009). Conversational behaviors in youth with high-functioning ASD and Asperger syndrome. *Journal of Autism and Developmental Disorders,* 39(1)
41. Rapin, I., & Dunn, M. (2003). Update on the language disorders of individuals on the autistic spectrum. *Brain & Development,* 25(3), 166–172.
42. Roberts, J., Martin, G. E., Moskowitz, L., Harris, A. A., Foreman, J., & Nelson, L. (2007). Discourse skills of boys with fragile X syndrome in comparison to boys with Down syndrome. *Journal of Speech, Language, and Hearing Research*: JSLHR, 50(2), 475–492.
43. Rodríguez, J. J. (2010). Adquisición y desarrollo del lenguaje. En Pirámide (Ed.), Psicología del desarrollo en la etapa de educación infantil (pp. 101–120). Pirámide.
44. Rodríguez, F. J y Muñoz, I. (2020). La comunicación unilateral en el Síndrome de Asperger: la agilidad de turno y el índice de participación en los intercambios pragmáticos en niños con y sin déficit pragmático. *Acta Scientiarum Lenguage and Culture*, 42.
45. Saban-Bezalel, R., Dolfin, D., Laor, N., & Mashal, N. (2019). Irony comprehension and mentalizing ability in children with and without autism spectrum disorder. *Research in Autism Spectrum Disorders*, 58, 30–38.
46. Salgado-Cacho, J. M., Moreno-Jiménez, M. D. P., & de Diego-Otero, Y. (2021). Detection of early warning signs in autism spectrum disorders: A systematic review. Children (Basel, Switzerland), 8(2).
47. Santos, F. R. (2016). Guía de intervención logopédica en los Trastornos del Espectro del Autismo. Editorial síntesis.
48. Sixto Olivar, J., Valle Flores, M., De La Iglesia, M., (2004). Relación entre Teoría de la Mente y comunicación referencial. Una explicación de los déficits pragmáticos en personas con autismo y síndrome de Down. *Acción Psicológica*., 3, 31–42.
49. Tager-Flusberg, H., Paul, R. y Lord, C. (2005) Language and communication in autism. *Handbook of autism and pervasive developmental disorders*, 1, 335-364.
50. Tirapu Ustárroz, J., Pérez Sayes, G., Erekatxo Bilbao, M., & Pelegrín Valero, C. (2007). ¿Qué es la teoría de la mente? *Revista de neurologia,* 44(08), 479.
51. Thornbury, S., & Slade, D. (2006). *Conversation: From description to pedagogy.* Cambridge University Press.
52. Vargas, M. G. (2020). Propuesta de Intervención para mejorar las habilidades lingüísticas en un caso diagnosticado con Trastorno del Espectro Autista.
53. Villiers, J., Myers, B., & Stainton, R. J. (2013). Revisiting pragmatic abilities in autism spectrum disorders: *A follow-up study with controls. Pragmatics & Cognition*, 21, 253–269.
54. Wing, L. (2002). International statistical classification of diseases and related health problems. 1.
55. Ying Sng, C., Carter, M., & Stephenson, J. (2018). A systematic review of the comparative pragmatic differences in conversational skills of individuals with autism. Autism & *Developmental Language Impairments*, 3.
56. Ziatas, K., Durkin, K., & Pratt, C. (1998). Belief term development in children with autism, Asperger syndrome, specific language impairment, and normal development: Links to theory of mind development. *Journal of Child Psychology and Psychiatry*, 39, 755–763.