Linguistic competences at schools. Comparison of students with attention deficit hyperactivity disorder, specific language impairment and typical development

Competencias lingüísticas en el contexto escolar. Comparación entre alumnado con trastorno por déficit de atención con hiperactividad, trastorno específico del lenguaje y desarrollo normotípico

Paola Gabriela PAREDES-CARTES, PhD. Lecturer. Universidad Internacional de la Rioja (*paola.paredescartes@unir.net*).
Inmaculada MORENO-GARCÍA, PhD. Associate Professor. Universidad de Sevilla (*imgarcia@us.es*).

Abstract:

Research shows a high comorbidity between attention deficit hyperactivity disorder (ADHD) and language problems, similar to those seen in subjects with specific language impairment (SLI) (Helland et al., 2014; Korrel et al., 2017).

Our goal was to assess the differences in semantic and pragmatic linguistic competences between students with ADHD versus SLI and children with typical development. A total of 142 students, ages 7-12 (M=9.27; SD=1.41), from public, subsidised and private schools participated in the study: 48 (33.80%) with ADHD, 47 (33.09%) with SLI, and 47 (33.09%) with normal development. Linguistic competences were evaluated using the Objective and Criterion-referenced Language Suite

Revision accepted: 2021-03-01.
This is the English version of an article originally printed in Spanish in issue 280 of the **revista española de pedagogía**. For this reason, the abbreviation EV has been added to the page numbers. Please, cite this article as follows: Paredes-Cartes, P. G., & Moreno-García, I. (2021). Competencias lingüísticas en el contexto escolar. Comparación entre alumnado con trastorno por déficit de atención con hiperactividad, trastorno específico del lenguaje y desarrollo normotípico | *Linguistic competences at schools. Comparison of students with attention deficit hyperactivity disorder, specific language impairment and typical development. Revista Española de Pedagogía, 79* (280), 497-513. https://doi.org/10.22550/REP79-3-2021-04
https://revistadepedagogia.org/ ISSN: 0034-9461 (Print), 2174-0909 (Online)

(Batería de Lenguaje Objetiva y Criterial, or BLOC, Puyuelo et al., 1997).

We found significant differences in semantic (F (2.148)=86.99, p<.001) and pragmatic language skills (F (2.428)=83.00, p<.001) between the three study groups: ADHD, SLI and typical development.

Students with ADHD present fewer deficits in aspects of semantic language than those with SLI. However, they face greater obstacles in certain uses of pragmatic language compared with the children with SLI and typically developed students. They face significant difficulties in the use of pragmatic language in different communication situations and social interaction, and in different functions and uses.

Keywords: ADHD, SLI, student, linguistic skills, pragmatics, semantics.

Resumen:

El trastorno por déficit de atención con hiperactividad (TDAH) frecuentemente se asocia a alteraciones en el lenguaje, similares a las manifestadas por las personas con trastorno específico del lenguaje (TEL) (Helland et al., 2014; Korrel et al., 2017). Nuestro objetivo es analizar las diferencias en las competencias lingüísticas semánticas y pragmáticas, entre alumnado con TDAH, TEL y niños con desarrollo normotípico.

Incluimos 142 alumnos, de 7-12 años (M=9.27; SD=1.41), procedentes de enseñanza pública, concertada y privada: 48 (33.80 %) con TDAH, 47 (33.09 %) con TEL y 47 (33.09 %) con desarrollo normotípico. Evaluamos las competencias lingüísticas mediante el instrumento denominado, *Batería de Lenguaje Objetiva y Criterial - BLOC* (Puyuelo et al., 1997).

Encontramos diferencias significativas en las competencias lingüísticas semántica (F (2.148) =86.99, p<.001) y pragmática del lenguaje (F (2.428) =83.00, p<.001), entre los tres grupos de estudio: TDAH, TEL y desarrollo normotípico.

Los alumnos con TDAH presentan menos déficit en aspectos del lenguaje semántico que los alumnos con TEL. Sin embargo, se enfrentan a mayores obstáculos en aspectos relacionados con el uso del lenguaje pragmático que los alumnos con TEL y que los niños con desarrollo normotípico. Sus dificultades son significativas para usar el lenguaje pragmático en distintas situaciones de comunicación y de interacción social, en diferentes funciones.

Descriptores: TDAH, TEL, alumno, competencias lingüísticas, pragmática, semántica.

1. Introduction

Attention deficit hyperactivity disorder (ADHD) is a neurodevelopmental disorder (American Psychiatric Association [APA], 2013) characterized by a persistent symptoms of inattention, hyperactivity and impulsivity. A lifelong condition, it is more common among men, occurring in 5.9% of youth and 2.5% of adults (Faraone et al., 2021).

ADHD is one of the most common neurodevelopmental and psychiatric disorders in children and adolescents, and is more prevalent in boys than girls, with a ratio of 2:1 in children and 1.6:1 in adults (APA, 2013).

Specific language impairment (SLI) is a neurodevelopmental disorder and more specifically, a communication disorder (APA, 2013). It is characterised by a delay in language acquisition and development and may affect some or all linguistic domains, including phonological, semantic, morphosyntactic and pragmatic areas (Acosta et al., 2016; Buiza et al., 2015; Mendoza, 2016; Ramirez et al., 2017; Szenkman et al., 2015).

Linguistic similarities have been noted in subjects with ADHD and SLI (Bellani et al., 2011; Hutchinson et al., 2012). However, the estimates of comorbidity between the two disorders vary widely, ranging in some cases between 8 and 90% (Brown, 2010), and in others, between 20 and 40% (Noger and Artiga, 2009), with a prevalence of between 12.4-19.5% (Ercan et al., 2021). Conversely, ADHD is reported in up to 30% of patients with language disorders (Mueller & Tomblin, 2012).

Although there are deviations, the high rate of comorbidity is mainly seen in terms of inattention (McGrath et al., 2011). Tromblin & Mueller (2012) argue that despite the fact similarities between the two cognitive systems, executive functions and procedural learning, the two disorders are phenotypically different. According to other authors, such as Mendoza (2016), these disparate results can be attributed to myriad considerations regarding the relationship between the two disorders.

People with ADHD frequently have language difficulties in tasks that require semantic organization and pragmatic skills (Uekermann et al., 2010; Ygual, 2011), revealing, in these cases, more language problems than typically developing people (Korrel et al., 2017).

In terms of semantic skills, studies show that children with ADHD have a developmental delay in the executive functions of verbal working memory, which affects semantic language competence. These children thus present working memory and language content difficulties (Moraleda et al., 2018) and develop verbal strategies at a slower pace (Sowerby et al., 2011) than healthy controls.

Children with SLI present difficulties in adding new words to their lexicons (Coady, 2013), as well as in naming (Acosta et al., 2014; McGregor et al., 2010) and definition tasks (Evans & Coady, 2010).

The deficit in verbal working memory has an effect on semantic skills, impacting one's ability to understand or explain the sequencing of concepts, which can have repercussions on memory and the learning of vocabulary words (Shaw et al., 2012).

Pragmatic deficits in children with ADHD (Ygual, 2011) sometimes present as short narratives that are poorly organised, confusing, lack coherence and a causal connection, and wherein the order of events

are changed (Lambalgen et al., 2008). This results in diminished verbal production and a delay in the detection of grammatical errors (Peets & Tannock, 2011).

Students with ADHD and SLI score lower in social narrative conversations than their typically developing peers. Children with ADHD are neither precise nor concise in selecting their answers (Staikova et al., 2013), their verbal output is excessive (Crespo-Eguílaz et al., 2016) and they provide fewer responses regarding characters and descriptive aspects such as location, time, actions, obstacles, goals, thoughts and desires (Flory et al., 2006).

According to Rodríguez-Meirinhos & Ciria-Barreiro (2018), pragmatic deficits may affect the way in which individuals with ADHD understand the structure of a dialogue or the language inferences. Subjects with SLI find it difficult to adapt the formulation of their responses to the role of a character, or to the scene or social context in which the character is involved (Buiza et al., 2015). They also omit crucial information about characters, plans, actions and the states of mind of the main characters (Andreu et al., 2011).

Students with ADHD and SLI score lower than typically developing children in pragmatic aspects of language (inappropriate initiation, stereotyped language, use of context and nonverbal communication), thus revealing the pragmatic difficulties of both groups (Helland et al., 2014). Among SLI students with ADHD, 80.7 % present limitations in their linguistic skills, mainly in terms of pragmatic competence (Helland et al., 2016).

The semantic and pragmatic impairments that students with ADHD experience could be related to a deficit in executive function. This has a negative impact on performance, attention, organisation, working memory, behavioural rigidity and impulsivity (González-Castro et al., 2013; Vaughn et al., 2011), thus generating obstacles in the conscious and temporary manipulation of information which is necessary to perform complex cognitive activities. Such activities include the comprehension and internalisation of language and the ability to analyse and synthesise verbal information (Barkley, 2011).

This study aims to investigate semantic and pragmatic linguistic competence among students with attention deficit hyperactivity disorder, students with language impairment and typically developing children. The specific objectives are:

a) To analyse linguistic competences differentiated according to diagnosis (ADHD and SLI, respectively), and to compare these competences against typically developing students.

b) To analyse and compare each of the specific areas that make up the semantic and pragmatic linguistic competence, in the three groups.

2. Method

2.1. Participants

The screening and selection of the participants was as follows.

The screening involved 170 students between the second year of primary education and the first year of secondary education

(Compulsory Secondary Education, ESO). The students were from public, subsidised and private schools in Seville and its province, and from the Seville Association of Parents and People Affected by Hyperkinetic Disorder (Asociación Sevillana de Padres y Afectados con trastorno Hipercinético, ASPATHI).

Guidance counsellors, the heads of the Educational Guidance Teams (EOE) of the different schools, and the clinical professionals of the Parents' Association provided referrals for potential research participants. The inclusion criteria at the screening stage were as follows: a) between ages 7 and 12; b) a diagnosis of ADHD, without a comorbid disorder, issued by the Child and Adolescent Mental Health Team (USM-IJ); c) a diagnosis of the communication disorder SLI, without a comorbid disorder, with a clinical diagnosis issued by a psychiatrist, paediatrician, or public or private psychologist; d) students without a diagnosis of any psychological disorder or alteration.

Finally, 67 students with ADHD were selected in the screening phase, 55 with SLI and 48 typically developing students. Among the students selected, 41 attended public schools, 89 subsidised schools and 13 private schools, with 27 from the Parents' Association.

At the selection stage, the inclusion criteria were as follows: a) a written informed consent signed by the parents/legal guardians; b) between the ages of 7 to 12; c) a diagnosis of ADHD and/or SLI without comorbid disorders; d) an intelligence quotient (IQ) > 80, according to the Kaufman Brief Intelligence Test (Kaufman & Kaufman, 2009) and e) verbal aptitude with an IQ of > 80, evaluated using the Peabody Picture Vocabulary Test (Dunn & Dunn, 2006). After these criteria were applied, 28 students were excluded.

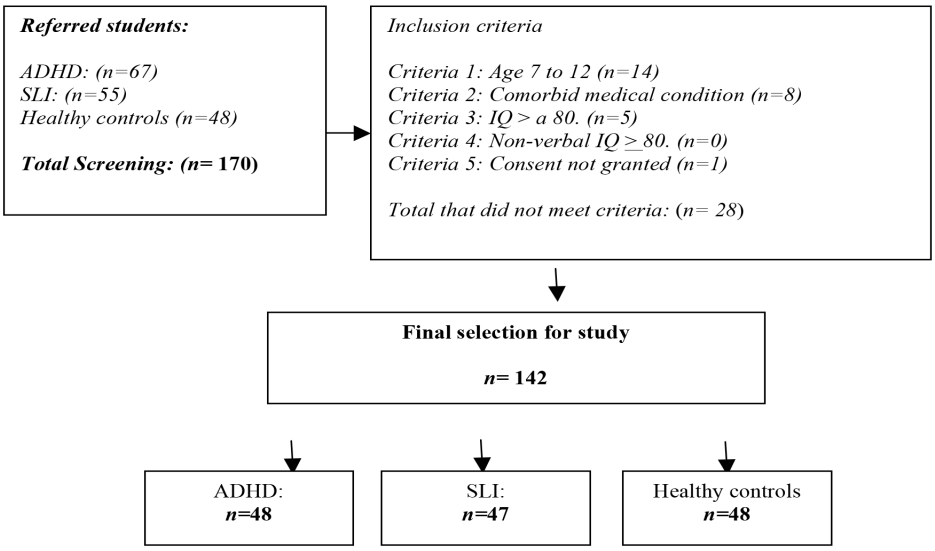
Ultimately, the sample consisted of 142 children between 7 and 12 years of age (M=9.27, SD=1.41), 64 boys (45.07%) and 78 girls (54.92%), distributed between three groups: a) students with ADHD, (n=48), b) students with SLI, (n=47) and c) typically developing students (n=48). Among the children with ADHD, 44 (91.6%) were taking medication (Table 1 and Graph 1).

TABLE 1. Demographics and origin of the final sample.

Educational Centres	**ADHD (%)**	**SLI (%)**	**Healthy controls (%)**
Public	7 (19.4 %)	15 (41.6 %)	14 (38.8 %)
Subsidised	15 (18.9 %)	31 (39.2 %)	33 (41.7 %)
Private	09 (90 %)	01 (10 %)	-
Parents' Association	17 (100 %)	-	-
Gender	**ADHD (%)**	**SLI (%)**	**Healthy controls (%)**
Female	39 (81.3 %)	20 (42.6 %)	19 (40.4 %)
Male	9 (18.8 %)	27 (57.4 %)	28 (59.6 %)

Key: ADHD: Attention deficit hyperactivity disorder; SLI: Specific language impairment.
Source: Own elaboration.

GRAPH 1. Participant selection procedure and configuration of the study groups.



ADHD: Attention deficit hyperactivity disorder; SLI: Specific language impairment.
Source: Own elaboration.

3. Assessment tools

The Objective and Criterion-referenced Language Suite (Batería de lenguaje objetiva y criterial, or BLOC, Puyuelo et al., 1997) comprehensively evaluates four basic language areas (morphology, syntax, semantics and pragmatics) in children between the ages of 5 to 14, through 580 items that simultaneously measure comprehension and expression. The test includes the following tasks to elicit a response: naming pictures, verbally completing incomplete sentences, formulating sentences and induced language.

The semantics model consists of eight blocks of ten items each, for a total of 80 items that measure agent-action, action-object, dative, instrumental, locative, modifiers: quantifiers and time and sequence modifiers. It focuses on content to assess knowledge of semantic relationships as well as spatial and temporal knowledge.

The pragmatics model consists of 13 blocks of ten items each, for a total of 130 items that measure saying hello and goodbye; getting people's attention; requesting/granting/refusing permission; demanding specific information; demanding confirmation or denial, who/what; where/when; from whom; why/how; making comments/showing approval/disapproval; directly requesting action be taken; indirectly requesting action be taken and complaining. The suite explores the use of an individual's locutionary, illocutionary and perlocutionary capacity as a speaker engaged in dialogue in different contexts, where he/she has to orally express states of mind, goals and attitudes of a set of characters appearing in different scenes.

Reliability is verified using the KR-20 coefficient; 0.90 in the semantics module and 0.97 in the pragmatics module.

The Peabody Picture Vocabulary Test (PPVT-III) (Dunn & Dunn, 2006) evaluates the level of verbal aptitude and receptive vocabulary. It is used as a screening test between the ages of 2 years 6 months and 90. It includes 192 test items (16 sets of 12 items, 8 different age groups). Reliability values range between 0.89 and 0.99, according to the author.

Brief Intelligence Test (K-BIT) (Kaufman & Kaufman, 2009) evaluates verbal and non-verbal intelligence (ages 4 to 90). It is composed of two scales: the Vocabulary subtest, which includes expressive vocabulary (45 items) and definitions (37 items), and the Matrices subtest, which is related to non-verbal and visual-spatial reasoning (48 elements). According to the authors, the reliability of the vocabulary scale ranges between 0.76 and 0.95; for the matrices, it is between 0.74 and 0.93; and the reliability of the composite IQ is between 0.90 and 0.98.

The Peabody and the K-BIT tests were also used to determine the equivalence of the IQ and verbal aptitude variables for the study groups.

4. Procedure

Information sessions were held with all of the parties involved in the study: the families, management teams, educational teams and guidance departments of the public, subsidised and private schools and of the Association of Parents with ADHD, in order to explain the research, objectives, procedure, etc.

All doubts that were raised at the sessions were discussed and families and school administrators were asked to provide consent to carry out the study.

After parents provided written informed consent, each student was evaluated individually in two 60-minute sessions (two hours total), in a quiet classroom. At the first session, the Peabody Picture Vocabulary Test (PPVT-III) (Dunn et al., 2006) and the Brief Intelligence Test (K-BIT) (Kaufman & Kaufman, 2009) were applied. The semantics and pragmatics linguistic modules were evaluated during the second session using BLOC (Puyuelo et al., 1997). Once the process was completed, each student received a personal report on his/her results.

5. Statistical Analysis

We performed a one-way ANOVA with a significance level α =.05. Where the homoscedasticity assumption was met, ANOVA was used. When the required model was not met, we performed Welch's t-test. In order to estimate the significant differences between groups, we carried out post-hoc pairwise comparisons using Tukey's method for multiple comparisons under the assumption of homoscedasticity, and the Games-Howell multiple comparisons procedure under the assumption of heteroscedasticity. The results were thus generated by comparing and contrasting the three groups (ADHD, SLI and the control group) × two domains of language skills (semantic and pragmatic), at the global level and according to the specific areas.

6. Results

We applied the aforementioned tests to determine the equivalence of the groups for the age variable and the variables related to IQ. The results showed no significant differences between the study groups (ADHD, SLI and healthy controls) for the age, IQ and verbal aptitude variables (Table 2).

TABLE 2. Demographic and clinical characteristics of the sample consisting of 48 students with attention deficit hyperactivity disorder (ADHD), 47 with specific language impairment (SLI) and 48 healthy control subjects Ages 7 to 12 (M=9.27, SD=1.41).

	ADHD n=48		**SLI** n=47		**Healthy controls** n=48		F	p	**Total Sample** n=142	
Age (M + SD)	9.44	1.42	9.21	1.50	9.14	1.32	.575	564	9.27	1.41
IQ -K-BIT (M+SD) Cognitive IQ	97.31	11.50	96.23	8.21	98.61	8.75	.919	402	97.38	9.59
Peabody (M+SD) Verbal aptitude	103.75	13.95	97.98	9.60	98.23	15.18	3.04	051	99.95	13.33

Key: ADHD: Attention deficit hyperactivity disorder; SLI: Specific language impairment; IQ: Intelligence quotient; *p≤0.05; **p≤0.01; ***p≤0.001.
Source: Own elaboration.

We found significant differences between the study groups (ADHD, SLI and the healthy controls) in the semantic (F (2.148) =86.99; p<0.001) and pragmatic (F (2.428) =83.00; p<0.001) linguistic competences evaluated.

Following the post hoc comparisons, we found statistically significant differences between students with ADHD and SLI (p<0.001), on the one hand, and between the children with ADHD and the healthy controls (p<0.001), on the other.

According to the data, students with ADHD (M=58.0; SD=5.97) had fewer problems in semantic competence than students with SLI (M=51.2; SD=7.05). The competences measured included identifying meaning through a linguistic code and the knowledge of the way certain elements of a sentence serve to construct meaning, such as agent, patient or dative, subject or object, instrumental or locative, and spatial-temporal, qualitative and quantitative notions. However, they had more difficulties than the healthy controls (M=69.7; SD=3.91).

In terms of pragmatic skills, students with ADHD (M=64.6; SD=11.61) were less competent in using language in different communication situations and social interactions for different functions or uses (asking for information, saying hello, complaining, organizing, etc.). They also presented more problems than students with SLI (M=82.1; SD=13.20) and the healthy controls (M=116.7; SD=6.26) with respect to being able to put themselves in the communication situation of the character assigned to them and saying what that character would say in that particular situation.

In relation to the second objective, results showed significant differences between the groups investigated (ADHD, SLI and the healthy controls) in all of the specific areas related to semantic and pragmatic language skills (Table 3).

TABLE 3. Semantic and pragmatic language skills analysed in a comparison between the sample groups of the study: 48 students with attention deficit hyperactivity disorder (ADHD), 47 with specific language impairment (SLI) and 48 healthy control subjects ages 7 to 12 (M=9.27, SD=1.41).

Semantic area	***F***	***gl1***	***gl2***	***p***
AS1	12.15	2	80.15	0.001**
AS2	21.70	2	84.61	0.001**
AS3	84.22	2	79.94	0.001**
AS4	55.54	2	84.89	0.001**
AS5	102.68	2	81.81	0.001**
AS6	62.34	2	79.70	0.001**
AS7	54.14	2	82.67	0.001**
AS8	122.81	2	88.03	0.001**
Pragmatic area				
AP1	46.60	2	75.59	0.001**
AP2	240.07	2	79.23	0.001**
AP3	165.55	2	82.43	0.001**
AP4	321.44	2	85.43	0.001**
AP5	150.86	2	75.01	0.001**
AP6	109.98	2	89.47	0.001**
AP7	78.18	2	87.72	0.001**
AP8	55.80	2	77.48	0.001**
AP9	85.60	2	77.41	0.001**
AP10	150.61	2	69.66	0.001**
AP11	129.55	2	71.85	0.001**
AP12	236.75	2	87.51	0.001**
AP13	242.97	2	85.99	0.001**

Key: AS: semantic area; AS1: agent-action; AS2: action-object; AS3: dative; AS4: instrumental; AS5: locative; AS6: modifiers; AS7: quantifiers and AS8: time and sequence modifiers; AP: Pragmatic area; AP1: saying hello and goodbye; AP2: getting people's attention; AP3: requesting/granting/refusing permission; AP4: demanding specific information; AP5: demanding confirmation or denial; AP6:who/what; A7: where/when; AP8: from whom; AP9: why/how; AP10: making comments, showing approval and disapproval; AP11: directly requesting action be taken; AP12: indirectly requesting action be taken; and AP13: complaining. *$p\leq0.05$; **$p\leq0.01$; ***$p\leq0.001$.
Source: Own elaboration.

The specific analysis, according to linguistic competence levels, revealed the following results. At the semantic level, there were significant differences between students with ADHD and SLI for the following variables: AS2 (action-object), ($p<0.035$) in the use of action and the object of the exercise; AS3 (dative), ($p<0.029$) in the use of indirect complements, the person to whom the action is directed or received; and AS6 (modifiers), ($p<0.001$) in the use of qualities that express features of the noun.

On the other hand, there were also differences for these same variables between the students with ADHD and the healthy controls (Table 4). For all variables, the children with ADHD outperformed the subjects with SLI, though they had greater difficulties than the typically developing students in using an action-object and naming an attribute through adjectives that modify or distinguish an element or object (Table 3).

We also found significant differences between the groups with ADHD and with SLI in the use of the AS4 (instrumental) variable ($p<0.001$) and in the naming of objects or instruments with which the subject or agent performs the action. Here the students with ADHD presented fewer difficulties ($M=9.04$; $SD=0.82$) than those with SLI ($M=6.06$; $SD=1.98$).

We also found significant differences between the children with ADHD and the typically developing group (Table 4). The students with ADHD scored lower than the healthy controls on AS1 (agent-action), when asked to identify the action taking place in a picture and the agent or person who performed it; AS5 (locative), when using prepositional phrases to indicate the location of an action (in, on, etc.); AS7 (quantifiers), when using adverbs of quantification (many/few) that establish quantity, number or degree; and AS8 (time and sequence modifiers), when employing knowledge of temporality and spatiality with pronouns, all, none (Table 4).

TABLE 4. Specific analysis of semantic and pragmatic areas of language in a comparison between the sample groups of the Study: 48 students with attention deficit hyperactivity disorder (ADHD), 47 with specific language impairment (SLI) and 48 healthy control subjects ages 7 to 12 ($M=9.27$, $SD=1.41$).

	ADHD		SLI		Healthy controls		ADHD SLI	ADHD Healthy controls
Semantic area	***M***	***SD***	***M***	***SD***	***M***	***SD***	***p***	***p***
AS1	9.33	0.85	8.95	1.14	9.74	0.44	0.172	0.012*
AS2	8.58	1.23	7.93	1.25	9.2	0.67	0.035*	0.004**
AS3	7.43	1.78	6.57	1.44	9.38	0.70	0.029*	0.001**
AS4	9.04	0.82	6.06	1.98	9.29	0.68	0.001**	0.232
AS5	5.66	1.73	5.87	1.31	8.44	0.71	0.791	0.001**
AS6	7.35	1.49	5.65	1.60	8.4	0.68	0.001**	0.001**

AS7	6.35	1.63	5.80	1.34	7.93	0.73	0.182	0.001**
AS8	4.27	1.36	4.42	1.29	7.23	0.83	0.838	0.001**
Pragmatic area (AP)								
AP1	7.43	1.69	8.23	1.46	9.59	5.7	0.042*	0.001**
AP2	4.16	1.54	7.04	1.48	9.29	0.65	0.001**	0.001**
AP3	4.66	1.71	6.68	1.36	9.14	0.75	0.001**	0.001**
AP4	3.18	1.36	6.21	1.71	9.01	0.85	0.001**	0.001**
AP5	5.4	1.72	6.4	1.17	8.8	0.49	0.003**	0.001**
AP6	4.95	1.97	6.17	1.38	9.17	1.14	0.002**	0.001**
AP7	5.22	1.97	6.1	1.41	8.5	1.03	0.028*	0.001**
AP8	6.95	1.96	6.21	1.41	8.4	0.65	0.091	0.001**
AP9	5.95	1.95	6.06	1.42	8.5	0.65	0.951	0.001**
AP10	5.33	2.36	5.95	1.53	9.2	0.47	0.282	0.001**
AP11	4.9	2.28	6.06	1.78	9.17	0.60	0.021*	0.001**
AP12	2.16	1.83	5.55	2.23	9.10	1.25	0.001**	0.001**
AP13	3.66	1.49	5.27	1.44	8.65	0.84	0.001**	0.001**

Key: ADHD: attention deficit hyperactivity disorder; SLI: specific language impairment; AS: semantic area; AS1: agent-action; AS2: action-object; AS3: dative; AS4: instrumental; AS5: locative; AS6: modifiers; AS7: quantifiers and AS8: time and sequence modifiers. AP: Pragmatic area; AP1: saying hello and goodbye; AP2: getting people's attention; AP3: requesting/granting/refusing permission; AP4: demanding specific information; AP5: demanding confirmation or denial; AP6: who/what; A7: where/when; AP8: from whom; AP9: why/how; AP10: making comments, showing approval and disapproval; AP11: directly requesting action be taken; AP12: indirectly requesting action be taken; and AP13: complaining. *$p \leq 0.05$; **$p \leq 0.01$; ***$p \leq 0.001$.
Source: Own elaboration.

The results for the pragmatic language competence variables showed significant differences between students with ADHD and SLI in terms of being able to use the following variables within a narrative discourse: AP1 (saying hello and goodbye) ($p<0.042$) in expressions of courtesy; AP2 (getting people's attention) ($p<0.001$), with the sender asking the receiver for information; AP3 (requesting/granting/refusing permission) ($p<0.001$) in asking for a favor or refusing a demand; AP4 (demanding specific information) ($p<0.001$) in expanding on or repeating information; AP5 (demanding confirmation or denial) ($p<0.003$), in the use of "yes" or "no"; AP6 (who/what) ($p<0.002$), in the use of interrogative pronouns "who" and "what"; AP7 (where/when) ($p<0.028$) in the use of the interrogative adverb "where" and establishing a time "when"; AP11 (direct requests for action) ($p<0.021$) in formulating an explicit demand or order; AP12 (indirectly requesting action be taken) ($p<0.001$) in which the sender offers a suggestion to the receiver; and AP13 (complaining) ($p<0.001$), expressing dissatisfaction with a situation.

These same variables were also significant between the students with ADHD

and those with normal development (Table 4). For all variables, the children with ADHD scored lower than students with SLI and the healthy controls in the use of language in different communication and social interaction situations, as well as in terms of the different functions or uses of pragmatic language (Table 4).

Likewise, significant differences were observed between students with ADHD and the healthy controls in the variables AP8 (from whom), where the communication interactions "from whom" and "for whom" are employed; AP9 (why/how), when using the expressions "why" or "how"; and AP10 (making comments, showing approval and disapproval), where the students with ADHD had greater difficulties using interrogatives in a context of communication and social interaction when a visual stimulus was presented (Table 4).

7. Discussion

According to our results, the students with ADHD present fewer problems in semantic-linguistic skills than the children with SLI, though the students with ADHD had greater semantic difficulties than the typically developing group when identifying and defining meaning through a linguistic code.

These results are consistent with those of Idiazábal, Guerrero & Sánchez (2006), who found that semantic errors were more common in the answers of children with ADHD than typically developing students. They are also concomitant with the findings of Sowerby et al. (2011), who observed that participants developed verbal responses at a slower pace. Furthermore, they coincide with the results obtained by Ygual (2011), who showed that children with ADHD did not perform as well in vocabulary comprehension or definition.

It is likely that the deficits found in the students with SLI and the children with ADHD are due to limitations in their capacity to process information simultaneously, their inhibitory control ability and their verbal working memory, a finding that coincides with those of Schreiber et al. (2014) and Hutchinson et al. (2012).

Consequently, a working memory deficit appears to significantly influence semantic-linguistic ability, thus affecting the ability to understand or explain the sequencing of concepts. This, in turn, has an impact on word learning (vocabulary), both in children with SLI and in students with attention deficit hyperactivity disorder.

The findings corresponding to the group of students with ADHD and those with typical development show that the children with ADHD have difficulties with pragmatic skills. This is in line with the results obtained by Staikova et al. (2013) on the use of verbal expressions among these children, and with the results of Crespo-Eguílaz et al. (2016), with respect to the production of their verbal responses.

In addition, the students with ADHD had trouble describing what was happening in visuals where different characters appear in different situations and differ-

ent communicative contexts. The results we obtained are consistent with those of Gallardo-Paúls et al. (2010). In this study, it was evident that the students with ADHD made arguments that did not contribute to the dialogue; on the contrary, they hindered dialogue and did not take into account the point of view of the characters or the possibility of the interviewer disagreeing. The students with SLI in this study presented similar issues, as also found in previous studies by Buiza et al. (2015), when asked to say what the character would have said and putting themselves in the character's shoes.

The deficits detected more predominantly in the students with ADHD than the children with SLI may well be explained as shortcomings in theory of mind, i.e., difficulties providing information on emotional responses, goals, or the thoughts and desires of characters in a story (Zegarra-Valdivial & Chino, 2017), or simply as a deficit in pragmatic social communication (APA, 2013).

On the other hand, the pragmatic difficulties affecting the students with ADHD could be due to the executive deficits evidenced in this study, which could in turn have an adverse effect on students asked to determine the communicative context of images and respond to questions posed by the interviewer. In addition, students with ADHD have difficulties in verbal working memory and in focused and sustained attention, aspects which are quite apparent in school contexts. In this sense, our findings coincide with those of Barkley (2011), who found that approximately 30% of children with ADHD present deficits in pragmatic skills. The findings are also concomitant with the diagnostic criteria of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5) (APA, 2013), which indicates that children with inattention show difficulties in pragmatic language competence. Thus, it seems safe to state that the attentional deficits characteristic of students with ADHD directly influence the results obtained in this study, specifically in the pragmatic area.

In conclusion, according to these findings students with ADHD present fewer difficulties than children with SLI but face greater difficulties than the healthy controls in semantic competences (identifying meaning through a linguistic code). In addition, their performance is poorer than that of students with SLI and the healthy controls in pragmatic skills (communicative use and interaction).

This study had certain limitations. On the one hand, the sample size is small, which thus limits the extrapolation of the results. On the other hand, only semantic and pragmatic language skills were examined.

Future research should expand the sample size; extend the research to include morphological, syntactic and phonetic/phonological linguistic competences; and analyse the effect of medication on students with ADHD when performing standardised language tests. Despite these limitations, the results obtained in this study open new lines of research related to language in children with SLI and ADHD.

References

Acosta, R., Ramírez-Santana, G., & Hernández, E. (2016). Las funciones ejecutivas y el lenguaje en niños con diferentes subtipos de trastorno específico del lenguaje [Executive functions and language in children with different subtypes of specific language disorder]. *Neurología, 16,* 213-4853. https://doi.org/10.1016/j.nrl.2015.12.018

Acosta, V., Axpe, A., & Moreno, A. (2014). Rendimiento lingüístico y procesos lectores en alumnado con Trastorno Específico del Lenguaje [Linguistic performance and reading processes in pupils with Specific Language Impairment]. **revista española de pedagogía**, *72* (259), 477-490.

American Psychiatric Association (2013). *Manual diagnóstico y estadístico de los trastornos mentales* (DSM-5*) [Diagnostic and Statistical Manual of Mental Disorders (DSM-5)].* Editorial Médica Panamericana.

Andreu, L., Sanz-Torrent, M., Guàrdia-Olmos, J., & MacWhinney, B. (2011). Narrative comprehension and production in children with SLI: an eye movement study. *Clinical Linguistics and Phonetics, 25* (9), 767-783. https://doi.org/10.3109/02699206.2011.565542

Barkley, R. A. (2011). *Niños hiperactivos. Cómo comprender y entender sus necesidades especiales. Guía completa del trastorno por déficit de atención con hiperactividad TDAH [Hyperactive children. Understanding and understanding their special needs. A complete guide to attention deficit hyperactivity disorder ADHD].* Paidos.

Bellani, M., Moretti, A., Perlini, C., & Brambilla, P. (2011). Language disturbances in ADHD. *Epidemiology and Psychiatric Sciences*, *20* (4), 311-315. https://doi.org/10.1017/S2045796011000527

Brown, T. E. (2010). *Comorbilidades del TDAH. Manual de las complicaciones del trastorno con déficit de atención con hiperactividad en niños y adultos.* Editorial Elsevier Masson.

Buiza, J., Rodríguez-Parra, M., & Adrián, J. (2015). Trastorno Específico del Lenguaje: marcadores psicolingüísticos en semántica y pragmática en niños españoles [Specific Language Impairment: Markers into semantic and pragmatic areas in Spanish-speaking children]. *Anales de Psicología, 3* (1), 879-889. https://doi.org/10.6018/analesps.31.3.180091

Coady, A. (2013). Rapid naming by children with and without specific language impairment. *Journal of Speech, Language, Hearing Research, 56*, 604-617. https://doi.org/10.1044/1092-4388(2012/10-0144)

Conti-Ramsden, G., Bishop, M., Clark, B., Norbury, F., & Snowling, J. (2013). Toma de conciencia sobre los trastornos específicos del lenguaje: la campaña RALLI en Internet [Raising awareness of specific language impairment: The RALLI Internet campaign]. *Revista de Logopedia, Foniatría y Audiología*, *33* (2), 51-54. https://doi.org/10.1016/j.rlfa.2013.04.004

Crespo-Eguílaz, N., Magallón, S., Sánchez-Carpintero, R., & Narbona, J. (2016). La adaptación al castellano de la Children's Communication Checklist permite detectar las dificultades en el uso pragmático del lenguaje y diferenciar subtipos clínicos [The Spanish adapted version of the Children's Communication Checklist identifies disorders of pragmatic use of language and differentiates between clinical subtypes]. *Revista Neurología, 1*, 49-57. https://doi.org/10.33588/rn.62S01.2015526

Dunn, L. M., & Dunn, L. M. (2006). *Test de vocabulario en imágenes [Peabody Picture Vocabulary Test, PPVT-III*]. Editorial TEA Ediciones.

Ercan, E., Unsel-BolaT, G., Tufab, A., Demirkaya, S., Bilac, O., Celik, G., Kilic, B., Ardic, U., Sapmaz, S., Aksu, H., Tahiroglu, A., Karacetin, G., Turak, U., Aktepe, E., Arman, A., Basgul, S., Coskum, M., Dursun, O., Durukan, I., Fis, N., … Gormez, V. (2021). Effect of Impairment on the Prevalence and Comorbidities of Attention Deficit Hyperactivity Disorder in a national survey: Nation-wide prevalence and comorbidities of ADHD. *Journal of Attention Disorders*. https://doi.org/10.1177/10870547211017985

Evans, J. L., & Coady, J. A. (2010). Explaining Lexical-semantic deficits in specific language impairment: The role of phonological similarity, phonological working memory, and lexical competition. *Journal of Speech, Language, and Hearing Research, 53* (6), 1742-1756. https://doi.org/10.1044/1092-4388(2010/08-0198)

Faraone, V. E., Banaschewski, T., Coghill, D., Zheng, Y., Biederman, J., Bellgrove, M., J, Newcorn., M, Gignac., M., Saud, N, N., Manor, I., Rohde, A., Yang, L., Cortese, S., Almagor, D., Stein, M., Albatti, T., Aljoudi, H., Alqahtani., M., Asherson, P., Atwoli, L., … Bolte, S. (2021). The World Federation of ADHD international consensus statement: 208 evidence-based conclusions about the disorder. *Neuroscience Biobehavioral Reviews*, *2* (4). https://doi.org/10.1016/j.neubiorev.2021.01.022

Flory, K., Milich, R., Lorch, E. P., Hayden, A. N., Strange, C., & Welsh, R. (2006). Online story comprehension among children with ADHD: Which core deficits are involved? *Journal of Abnormal Child Psychology*, *34*, 853-865. https://doi.org/10.1007/s10802-006-9070-7

Gallardo-Paúls, B., Gimeno-Martínez, M., & Moreno-Campos, V. (2010). Pragmática textual en adolescentes con trastorno por déficit de atención/ hiperactividad: argumentación [Textual pragmatics in adolescents with Attention Deficit/Hyperactivity Disorder: Argumentation]. *Revista Neurología*, *50*, 113-7.

González-Castro, P., Rodríguez, C., Cueli, M., Cabeza, L., & Álvarez, L. (2013). Competencias matemáticas y control ejecutivo en estudiantes con trastorno por déficit de atención con hiperactividad y dificultades de aprendizaje de las matemáticas [Mathematical competence and executive control in students with Attention Deficit Hyperactivity Disorder and mathematical learning disabilities]. *Revista de Psicodidáctica, 19* (1), 125-143.

Helland, W. A., Helland, T., & Heimann, M. (2014). Language profiles and mental health problems in children with specific language impairment and children with ADHD. *Journal of Attention Disorders, 15* (3), 26-35. https://doi.org/10.1177/1087054712441705

Helland, W. A., Posserud, M. B., Helland, T., Heimann, M., & Lundervold, A. J. (2016). Language impairments in children with ADHD and in children with reading disorder. *Journal of Attention Disorders*, *20* (7), 581-9. https://doi.org/10.1177/1087054712461530

Hutchinson, E., Bavin, E., Efron, D., & Sciberras, E. (2012). A comparison of working memory profiles in school-aged children with Specific language impairment, attention deficit/hyperactivity disorder, comorbid SLI and ADHD and their typically developing peers. *Child Neuropsychol*, *18* (2), 190-207. https://doi.org/10.1080/09297049.2011.601288

Idiazábal, M., Guerrero, D., & Sánchez, M. (2006). Procesamiento del lenguaje en el trastorno por déficit de atención con hiperactividad [Language processing in attention deficit hyperactivity disorder]. *Revista de Neurología, 42* (2), 29-36. https://doi.org/10.33588/rn.42S02.2005783

Kaufman, A., & Kaufman, N. (2009). *Test breve de inteligencia K-BIT [K-BIT brief intelligence test]*. Editorial TEA Ediciones.

Korrel, H., Mueller, K. L., Seda, T., Anderson, V., & Sciberras, E. (2017). Research review: Language problems in children with attention-deficit hyperactivity disorder – a systematic meta-analytic review. *The Journal of Child Psychology and Psychiatry*, *10*. https://doi.org/10.1111/jcpp.12688

Lambalgen, M., Kruistum, C., & Parigger, E. (2008). Procesamiento del discurso en el trastorno de déficit de atención e hiperactividad TDAH [Discourse processing in attention-deficit hyperactivity disorder (ADHD)]. *Diario de la Lógica, Lenguaje e Información, 17* (4), 467-487. https://doi.org/10.1007/s10849-008-9066-5

McGrath, L., Pennington, B., Shanahan, M., Santerre-Lemmon, L., Barnard, H., Willcutt E., Defries, J., & Olson, R. (2011). A multiple deficit model of reading disability and attention deficit/hyperactivity disorder: the search for shared cognitive deficits. *The Journal of Child Psychology and Psychiatry*, *52* (5), 547-57. https://doi.org/10.1111/j.1469-7610.2010.02346.x

McGregor, K., Rost, C., Guo, L., & Sheng, L. (2010). What compounds mean to children with SLI. *Applied Psycholinguistics*, *31* (3), 463-487. https://doi.org/10.1017/S014271641000007X

Mendoza, E. (2016). *Trastorno específico del lenguaje (TEL). Avances en el estudio de un trastorno invisible [Specific language impairment (SLI). Advances in the study of an invisible disorder]*. Ediciones Pirámide.

Moraleda, E., Fernández, L., Sánchez, J., & López P. (2018). Perfil lingüístico en niños y adolescentes con trastorno por déficit de atención e hiperactividad-TDAH [Linguistic profile in children and

adolescents with attention deficit hyperactivity disorder]. *International Journal Developmental Educational Psycholy*, *2*, 151-158

Mueller, L., & Tomblin, B. (2012). Examining the comorbidity of language disorders and ADHD. *Topics in Language Disorders*, *32* (3), 228-46.

Noger, S., & Artiga, J. (2009). Trastorno de déficit de atención hiperactividad [Attention deficit hyperactivity disorder (ADHD)]. In J. Artigas (Ed.), *El niño incomprendido* (pp. 35-55). Amat, S.L.

Peetsa, K., & Tannock, R. (2011). Los errores y autocorrecciones en la narración distinguen el TDAH del TDAH con trastornos del lenguaje [Errors and self-correction in narrative distinguish ADHD from ADHD with language impairments]. *Revista de Logopedia, Foniatría y Audiología, 31* (4), 228-236. https://doi.org/10.1016/S0214-4603(11)70191-7

Puyuelo, M., Wiig, E. H., Renom, J., & Solanas, A. (1997). *Batería del lenguaje objetiva y criterial [Objective and criterial language battery]*. Editorial Masson.

Ramírez-Santana, G. M., Acosta-Rodríguez, V. M., Moreno-Santana, A. M., del Valle-Hernández, N., & Axpe-Caballero, Á. (2017). El uso combinado de narraciones orales y actividades morfosintácticas para mejorar habilidades gramaticales de alumnado con trastorno específico del lenguaje (TEL) [Use of oral narrative and morphosyntactic activities to improve grammar skills in pupils with specific language impairment (SLI)]. *Revista de Psicodidáctica, 23* (1), 48-55. https://doi.org/10.1016/j.psicod.2017.07.002

Rodríguez-Meirinhos, A., & Ciria-Barreiro, E. (2018). Revisión de intervenciones para mejorar las habilidades pragmáticas en niños y niñas con problemas de conducta y atención | *Review of interventions to improve pragmatic language skills in children with behaviour and attention problems*. **revista española de pedagogía**, *76* (270), 295-312. https://doi.org/10.22550/REP76-2-2018-05

Schreiber, J., Possin, K., Girard, J., & Rey-Casserly, C. (2014). Executive function in children with attention deficit hyperactivity: NIH EXAMINER battery. *Journal of the International Society of Neuropsychology*, *20* (1), 41-51. https://doi.org/10.1017/S1355617713001100

Shaw, P., Malek, M., Watson, B., Sharp, W., Evans, A., & Greenstein, D. (2012). Development of cortical surface area and gyrification in attention-deficit/hyperactivity disorder. *Biological Psychiatry, 72* (3), 191-197. https://doi.org/10.1016/j.biopsych.2012.01.031

Sowerby, P., Seal, S., & Tripp, G. (2011). Working memory deficits in ADHD: The contribution of age, learning/language difficulties, and task parameters. *Journal of Attention Disorders, 15,* 461-472. https://doi.org/10.1177/1087054710370674

Staikova, E., Gomes, H., Tartter, V., McCabe, A., & Halperin, J. M. (2013). Deficits pragmáticos y el deterioro social en los niños con TDAH [Pragmatic deficits and social impairment in children with ADHD]. *Journal Child Psychol Psychiatry, 12*, 1275-1283.

Szenkman, D., Fumagalli, J., & Martínez-Cuitiño, M. (2015). *Adaptación de una herramienta para evaluar la morfosintaxis temprana. El Rice-Wexler test of early grammatical impairment TEGI [Adaptation of a tool for assessing early morphosyntax. The Rice-Wexler test of early grammatical impairment TEGI] [Poster presentation].* VII Congreso Internacional de Investigación y Práctica Profesional en Psicología XXII. Jornadas de Investigación Décimo Encuentro de Investigadores en Psicología del MERCOSUR. Facultad de Psicología, Universidad de Buenos Aires, Buenos Aires. http://dx.doi.org/10.13140/RG.2.1.4753.8802

Tomblin, J. B., & Mueller L. K. (2012). How can comorbidity with attention-deficit/hyperactivity disorder aid understanding of language and speech disorders? *Topics in Language Disorders*, *32* (3), 198-206. http://dx.doi.org/10.1097/TLD.0b013e318261c264

Uekermann, J., Kraemer, M., Abdel-Hamid, M., Schimmelmann, B. G., Hebebrand, J., Daum, I., Wiltfang, J., & Kis, B. (2010). Social cognition in attention-deficit hyperactivity disorder (ADHD). *Neuroscience and Biobehavioral Reviews*, *34* (5), 734-743. https://doi.org/10.1016/j.neubiorev.2009.10.009

Vaughn, A., Epstein, J., Rausch, J., Altaye, J., Newcorn, J., Hinshaw, S., & Wigal, T. (2011).

Relation between outcomes on a continuous performance test and ADHD symptoms over time. *Journal of Abnormal Child Psychology, 39,* 853-864. https://doi.org/10.1007/s10802-011-9501-y

Ygual, A. (2011). Los trastornos del lenguaje en el trastorno por déficit de atención con hiperactividad (TDAH) [Language disorders in the attention deficit-hyperactivity disorder (ADHD)]. *Revista de Logopedia, Foniatría y Audiología*, *31* (4), 181-182. https://doi.org/10.1016/S0214-4603(11)70186-3

Zegarra-Valdivia1, J., & Chino, B. (2017). Mentalization and the theory of mind. *Journal of Neuro-Psychiatry*, *80* (3), 189-199. http://dx.doi.org/10.20453/rnp.v80i3.3156

Authors' biographies

Paola Gabriela Paredes-Cartes. PhD in Psychology from the Universidad de Sevilla, Degree in Pedagogy and Specialist Teacher in Hearing and Language from the Universidad de Concepción (UC), Chile. Currently member of the Department of Guidance in Public Education of the Ministry of Education, Regional Government of Andalusia, Lecturer at Universidad Internacional de La Rioja (UNIR) and Researcher in the Universidad de Sevilla (US). With publications in scientific journals and participation in conferences, her work focuses on neurodevelopmental disorders, ADHD, SLI and language skills.

https://orcid.org/0000-0002-2223-2246

Inmaculada Moreno-García. PhD in Psychology from Universidad de Sevilla and Associate Professor at the same university. Her main line of research is attention deficit disorder. She is the author of six books on ADHD and numerous scientific articles on the disorder. She has presented more than 160 studies at scientific conferences, including papers and lectures, mostly on ADHD. She has been lead investigator for several National Plan RDI projects, and is currently working on project PSI2017-82550-R on ADHD.

https://orcid.org/0000-0002-6335-9200