



Argument structure in the Spanish Determiner Phrase: Acquisition of hierarchies through possessivization



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Received 2 August 2021; revised 20 December 2021; accepted in revised form 14 January 2022; Available online 16 February 2022

Abstract

Four types of Determiner Phrases (DP) in Spanish have arguments in the form of Prepositional Phrases (PP) introduced by *de* ('of'). Picture (*foto* 'photo') and deverbal nouns (*descripción* 'description') project a more complex argument structure than relational (*primo* 'cousin') and deadjectival nouns (*belleza* 'beauty'). The possessivization test implies that the most prominent *de*-PP of each DP type can be possessivized depending on different thematic hierarchies. This study analyzes whether comparative complexity affects convergence on possessivization, with earlier convergence predicted for comparatively simpler relational and deadjectival DPs. To test this prediction, this study examines order of DP acquisition in 52 L1 Spanish-speaking children (6-year-olds ($N = 14$), 7-year-olds ($N = 21$), 8-year-olds ($N = 17$)). A Graded Grammaticality Judgment Task (GGJT) containing 32 items divided across four conditions (relational, deadjectival, picture, deverbal) with four contexts each was administered. Results reveal developmental improvement and partial support for the prediction in that relational DPs are converged upon first, while deverbal DPs are converged upon last. This study's import is the novel examination of argument structure across four DP types in Spanish-speaking children with the aim of observing and explaining the developmental path.

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Keywords: Argument structure; Determiner Phrase (DP); Possessivization; Child language acquisition; Spanish

1. INTRODUCTION

The argument structure of a predicate is compounded by the set of thematic roles it selects. For example, a verb like *eat* selects two arguments: an agent (someone who eats) and a patient (something that is eaten). Although arguments are commonly associated with verbal predicates, some nouns can also select arguments, giving rise to a Determiner Phrase (DP) with argument structure: this occurs with deverbal nouns (e.g. *description*), picture nouns (e.g. *photo*), deadjectival nouns (e.g. *intelligence*) and relational nouns (e.g. *mother*).

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In Spanish, these arguments can adopt the form of postnominal Prepositional Phrases (PP) that can be introduced by the preposition *de* ('of'), the prototypical argument-marking preposition: *la descripción del paisaje* ('the description of the landscape'), *la foto de Ana de su hijo* ('Ana's picture of her son'). The internal organization of these arguments around the nominal head follows a specific hierarchy according to which only the most prominent PP argument can be replaced by a prenominal possessive (typically *su*, the third person possessive), in a process known as possessivization:

(1)	a. la descripción	<i>del</i>	<i>paisaje</i>
	the description	of.the	landscape
	b. <i>su</i> descripción		
	its description		

Hence, argument structure within deverbal, picture, deadjectival and relational DPs in Spanish varies in terms of complexity depending on the number and type of arguments therein. The aim of this paper is to analyze the different types of argument structure within the DP in Spanish to determine if there is a developmental pattern and to test whether this varying structural complexity is also reflected in its acquisition. To do so, we conducted an experiment with 52 Spanish-speaking children between 6 and 8 years of age, and with a control group of 20 native Spanish-speaking adults. The experiment consisted of a Graded Grammaticality Judgement Task (GGJT), with age-appropriate versions adapted for children and adults, testing grammatical and ungrammatical possessivization of the four DP types (relational, deadjectival, picture and deverbal). The results provide nuanced insight on how the argument structure of DPs is acquired and developed according to the specific head noun that projects it. The study, the first of its kind to our knowledge, makes a novel contribution that goes beyond the well-examined cases of deverbal and picture nouns, opening a new line of inquiry.

2. THEORETICAL BACKGROUND AND PREVIOUS LITERATURE

2.1. Argument structure of the Spanish Determiner Phrase

The theory of argument structure (Grimshaw 1990) states that verbs have a network of thematic roles (θ -roles) (e.g. agent, theme, experiencer, beneficiary, etc.) that realize into syntactic arguments (e.g. subject, object, etc.) in a process known as linking. The theta-criterion (Chomsky 1981: 36) establishes a biunivocal correspondence between θ -roles and arguments: «Each argument bears one and only one θ -role, and each θ -role is assigned to one and only one argument».

These θ -roles are hierarchically organized according to abstract prominence such that the realization into syntactic arguments is based on the position of each θ -role in the hierarchy. Hence, the most prominent θ -role is assigned to the most relevant argument in the syntactic structure (i.e. the subject); the second most prominent θ -role is assigned to the second most relevant argument and so on. In example (2), the agent θ -role realizes as the most prominent argument, the subject, whereas the theme becomes the object:

(2)	[The baby] _{AGENT-SUBJECT} destroyed [the tower] _{THEME-OBJECT} .
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Many thematic hierarchies have been proposed (see, for example, Fillmore 1968, Jackendoff 1972, Baker 1989, Grimshaw 1990 or Gutiérrez-Bravo, 2007), yet there is no agreement on the specific ordering of the θ -roles or on which thematic hierarchy should be applied in each case. Herein, we adopt the thematic proto-roles approach (Dowty 1991), which suggests that all θ -roles can be reduced to two prototypes with several semantic entailments:

(3)	Proto-Agent
	a. volitional involvement in the event or state
	b. sentience (and/or perception)
	c. causing an event or change of state in another participant
	d. movement (relative to the position of another participant)
	(e. exists independently of the event named by the verb)

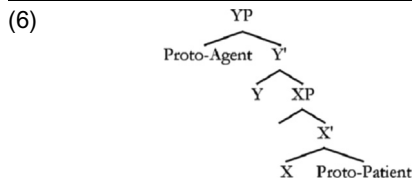
-
- (4) Proto-Patient
- a. undergoes change of state
 - b. incremental theme
 - c. causally affected by another participant
 - d. stationary relative to movement of another participant
 - e. does not exist independently of the event named by the verb¹
-

¹ As in (3e), the parenthesis is due to the possibility that in fact these properties are discursively associated with subject status, rather than with the very definition of proto-roles (Dowty 1991: 572).

Under this approach, the argument for which the predicate entails the greatest number of Proto-Agent properties will be lexicalized as the subject or external argument; the argument having the greatest number of Proto-Patient entailments will be lexicalized as the direct object. Hence, example (2) can be reformulated as:

-
- (5) [The baby]_{PROTO-AGENT-SUBJECT} destroyed [the tower]_{PROTO-PATIENT-OBJECT}.
-

The Uniformity of Theta-Assignment Hypothesis (Baker 1988: 46) states that identical thematic relationships between items are represented by identical structural relationships between those items. Therefore, thematic hierarchies must have a direct reflection in the syntactic representation: if a Proto-Agent is hierarchically more prominent than the Proto-Patient, the Proto-Agent must also be syntactically higher than the Proto-Patient:



Like verbs, some nouns can also develop an argument structure. The Thematic Correspondence Hypothesis (Giorgi & Longobardi 1991: 29), inherited from the lexicalist approach initiated by Chomsky (1970), suggests that verbs and corresponding nouns have a similar thematic network that selects the same argument as the external one. Consider (7), where the noun *destruction* has the same argument structure as the verb *destroy* (2): an agent and a patient.

-
- (7) [the baby's]_{PROTO-AGENT} destruction [of the tower]_{PROTO-PATIENT}
-

The idea that both clausal and nominal arguments are essentially regulated by the same rules means that the syntactic projection principles of lexical categories are unified in some way. Most studies on the argument structure of the Noun Phrase (Chomsky 1970, Cinque 1980, Demonte 1985, Abney 1987, Giorgi & Longobardi 1991) focus almost exclusively on deverbal nouns, which inherit their arguments from the verbs of origin, and so-called picture or representation nouns, like *photo* or *portrait*, because their argument structure seems to follow a pattern similar to that of verbs, as shown in (8).

-
- (8) [Picasso's]_{PROTO-AGENT} portrait [of himself]_{PROTO-PATIENT}
-

Nevertheless, deadjectival nouns (*intelligence*, *greatness*), which derive from adjectives, and relational nouns (*brother*, *friend*), which establish a relationship between two entities, also project an argument structure. Differently from deverbal and picture nouns, the Proto-Agent and the Proto-Patient do not seem to be assigned to the arguments of deadjectival nor relational DPs:

-
- (9) [Mary's]_{??} intelligence
 (10) [Paul's]_{??} Brother
-

Therefore, we need to adopt strictly nominal proto-roles, as suggested by Barker & Dowty (1993): the Proto-Part and the Proto-Whole, with a set of semantic entailments:

-
- (11) Proto-Part
 a. located at or defines a boundary of the other relatum
 b. is a property of the other relatum
-

- (12) Proto-Whole
 a. entirely contains the other relatum as a proper part
 b. is a concrete entity
-

Under this approach, *Mary* in (8) will be the Proto-Whole of *intelligence* (its corresponding Proto-Part), and *Paul* will be the Proto-Whole of *brother* (its corresponding Proto-Part). Hence, we follow Recio (2018) and accept that the relevant criterion for explaining the argument structure of the DP is not its inherited or inherent character, but rather its “verbal” or purely “nominal” nature: deverbal and picture nouns follow the verbal θ -roles of Proto-Agent and Proto-Patient, whereas deadjectival and relational nouns follow the nominal θ -roles of Proto-Whole and Proto-Part. The underlying idea to this principle is that argument structure in DPs cannot be explained only from parallelism with the VP, translating the organization patterns of verbal arguments to the nominal domain. There are, in fact, two classes of argument structure, verbal and nominal (Table 1):

Table 1
 Classes of argument structure.

Argument structure	Inherited	Inherent
Verbal <i>Proto-Agent / Proto-Patient</i>	Deverbal nouns	Picture nouns ²
Nominal <i>Proto-Whole / Proto-Part</i>	Deadjectival nouns	Relational nouns

² As an anonymous reviewer notes, there is a conceptual link between picture nouns and the nominal argument structure projected by deadjectival and relational nouns, since the container/content relationship that characterizes the semiotic entity expressed by picture nouns can be claimed to be similar to the inclusion relationship that we find in deadjectival and relational DPs with Proto-Whole/Proto-Part θ -roles.

Furthermore, one characteristic feature of the Spanish DP is that, unlike in other languages, all arguments of the DP can be introduced by the same genitive preposition *de* ‘of’,³ the prototypical argument-marking preposition. Examples (13), (14), (15) and (16) below demonstrate this point for deverbal, picture, deadjectival and relational DPs, respectively, with a corresponding PP assigned to one specific θ -role:

-
- (13) la destrucción [de la torre]_{PROTO-PATIENT}
 the destruction of the tower
 ‘the destruction of the tower’
-

- (14) la foto [del alumno]_{PROTO-AGENT/PROTO-PATIENT}
 the picture of. student
 the
 ‘the student’s picture’
-

³ We use the term “genitive” in this article in a non-literal broader sense, understood as the preposition *de* that introduces a nominal modifier.

(21)	*SU _{PROTO-WHOLE} her Lit. 'her beauty of the princess'	belleza beauty	[de la princesa] _{PROTO-WHOLE} of the princess
(22)	*SU _{PROTO-WHOLE} her Lit. 'her friend of mom'	amigo friend	[de mamá] _{PROTO-WHOLE} of mom

However, Spanish DPs with deverbal or picture nouns⁴ can have more than one PP argument headed by *de*, with θ -roles such a Proto-Agent and Proto-Patient, as in (23), or even in coexistence with a Possessor, a purely nominal argument, as in (24).⁵ In these cases, only one of them can be possessivized, thus the ungrammaticality of (23c) and (24c):

(23)	a.	la descripción the description 'Cervantes's description of the landscape'	[de Cervantes] _{PROTO-AGENT} of Cervantes	[del of.the	paisaje] _{PROTO-PATIENT} landscape
	b.	SU _{PROTO-AGENT} his 'his description of the landscape'	descripción description	[del of.the	paisaje] _{PROTO-PATIENT} landscape
	c.	*SU _{PROTO-PATIENT} its Lit. 'its description of Cervantes'	descripción description	[de Cervantes] _{PROTO-AGENT} of Cervantes	
(24)	a.	el libro the book 'the professor's book by Cervantes'	[de Cervantes] _{PROTO-AGENT} of Cervantes	[de la profesora] _{POSSESSOR} of the professor	
	b.	SU _{POSSESSOR} her 'her book by Cervantes'	libro book	[de Cervantes] _{PROTO-AGENT} of Cervantes	
	c.	*SU _{PROTO-AGENT} libro his Lit. 'his book of the professor'	[de la profesora] _{POSSESSOR} book	of the professor	

⁴ Deverbal DPs can have either an event or a result reading: for example, *descripción* 'description' can refer to the process of describing something or the result of this process. In a similar way, picture nouns *like* *foto* 'picture', due to their semantic properties, may lead to an agent ('someone takes a picture'), patient ('someone is taken a picture') or representational entity ('someone has a picture').

⁵ Cases of three PP arguments (Possessor, Proto-Agent and Proto-Patient) with the preposition *de* are not uncommon with picture DPs:

- (i) el retrato [de Carlos IV]_{P-PATIENT} [de Goya]_{P-AGENT} [del duque]_{POSSESSOR}
the portrait of Charles IV of Goya of.the duke
'the duke's portrait of Charles IV by Goya'

To determine the most prominent PP argument and, hence, the one that accepts possessivization, we follow [Recio \(2015, 2018\)](#) and adopt the following principle, based on the previous classification:

-
- (25) POSSESSIVIZATION PRINCIPLE
 A possessive can replace:
 a. in deverbal or picture DPs, the genitive argument according to the thematic hierarchy {Possessor > Proto-Agent > Proto-Patient}.
 b. in deadjectival or relational DPs, the genitive argument having the greatest number of Proto-Whole entailments, that is, the PP argument.
-

Therefore, in (23), a deverbal DP, possessivization can be applied to the Proto-Agent (23a), but not to the Proto-Patient (23c) because the former is hierarchically more prominent than the latter, whereas in (24), a picture DP, possessivization can be applied to the Possessor (24b), but not to the Proto-Agent (24c) for the same reason. This principle also explains why (21) and (22) are ungrammatical: in deadjectival and relational DPs only the PP argument can be possessivized and this process cannot apply twice.

2.2. Acquisition of elements in the Spanish Determiner Phrase

As is well known, nouns are acquired before verbs. [Gentner \(1982\)](#) argues that this ‘noun advantage’ in child vocabulary from around one year of age is due to the Natural Partitions hypothesis: nouns are learned earlier because their referents are more accessible than those of predicates. This distinction is based on a preexisting perceptual-conceptual difference between concrete concepts (persons or things) and predicative concepts (activity, change of state or causal relations). Hence, the category of nouns is, at its core, conceptually more basic than the category of verbs. [Waxman et al. \(2013\)](#) add that since the meaning of a verb depends on the arguments (nouns) that it takes, children need to establish a repertoire of nouns before they can learn verbs. From the one-word stage of development, where only noun heads appear, different types of nominal elements start emerging ([Kamhi & Nelson 1988](#)): first adjectives and determiners, then modifiers like PPs. [Roeper \(2006\)](#) provides strong evidence that children from 3 to 6 years of age move from less specific to more specific in a path that mirrors the syntactic tree from N to the Noun Phrase to the Determiner Phrase.

Many studies have specifically analyzed how different aspects of the DP are acquired. [Kayser, Contreras and Finney \(2006\)](#), in their review of the literature concerning the development of several syntactic features in Spanish, show that Spanish speakers develop possessives from between ages 2.2 to 3.10 years. However, to our knowledge, the acquisition of argument structure within the Spanish DP, with its corresponding hierarchy shown by possessivization, has not yet been examined.

Of the four types of nouns that allow argument structure (deverbal, picture, deadjectival and relational), the Spanish corpus CHIEDE ([Garrote 2008](#)), which contains data from the spontaneous speech of children aged 3–5 years, shows that relational nouns —most of them kinship relations— are the first to appear and are the most used in terms of frequency: *mamá/papá* ‘mom/dad’, *niño* ‘kid’, *madre/padre* ‘father/mother’, *abuelo/a* ‘grandfather/grandmother’, *hermano/a* ‘brother/sister’, *primo* ‘cousin’, *tío* ‘uncle’, *amigo* ‘friend’, etc. This corpus contains only three picture nouns acquired between ages 3 and 5 (*dibujo* ‘drawing’, *libro* ‘book’ and *foto* ‘photo’). The lack of deverbal or deadjectival nouns might be due to both morphological and semantic reasons: they are derived from verbal and adjectival predicates, and therefore require the establishment of more abstract connections of morphological derivation and argument structure inheritance ([Recio 2015](#)), and they also denote intangible entities, which are harder for children to process and understand. Regarding other categories, [Garrote \(2008\)](#) shows that the genitive preposition *de* (‘of’), which is the main introducer of PP arguments in the DP, is the second to be acquired, only after a ‘to’, and is produced from age 3 years. The possessive *su* (‘his/her’) first appears at age 4 and increases at age 5, with a frequency lower than *mi* (‘my’) but higher than *tu* (‘your’).⁶

The previous studies and aforementioned data suggest that the acquisition and processing of complex DPs with argument structure only starts fully when children are at least 5 years of age. Therefore, we conducted an experiment to analyze the development of the PP arguments in the Spanish DP in children from 6 to 8 years of age.

⁶ For English several studies ([Haas & Owens 1985](#), [Huxley 1970](#), [Morehead & Ingram 1973](#), [Waterman & Schatz 1982](#), [Wells 1985](#)) show a similar time pattern: the first to develop are, as expected, *my* and *mine*, between 27 and 30 months, then *your* between 31–34 months, *his/her* between 35–40 months and finally *our/their* between 41–46 months.

3. METHODOLOGY

3.1. Research questions and predictions

As described above, the four types of Spanish DPs examined herein differ from one another in terms of the number and type of *de*-PP arguments they permit. Relational and deadjectival nouns allow only one argument while picture and deverbal nouns can select up to three arguments. Furthermore, the Possessivization Principle is only possible with one of the three potential arguments selected by picture and deverbal nouns according to a specific thematic hierarchy. Given the difference in argument selection as well as the possessivization restriction, we examine the following research question:

(26) Do Spanish-speaking children demonstrate knowledge of the underlying argument structure of relational and deadjectival nouns prior to picture and deverbal nouns?

Recall that the arguments of each of the four noun types can be introduced by the preposition *de*. When the *de*-PP is possessivized, as in examples (17)-(24) above, it is the most prominent argument that undergoes possessivization according to a specific thematic hierarchy (25). Of course, in noun types that permit only one argument (relational and deadjectival) the one and only argument is by default the most prominent and, therefore, necessarily becomes possessivized. Possessivization also occurs in noun types that permit more than one argument introduced by the preposition *de* (deverbal and picture), but here we see more clearly the effects of thematic hierarchy since only the most prominent of the (potentially) three arguments can be possessivized (see examples (23)-(24)), making this case of possessivization more structurally complex than the former. Therefore, the Spanish-speaking child participants described in the next section are predicted to demonstrate earlier convergence on possessivization of relational and deadjectival nouns as compared to picture and deverbal nouns due to the relative complexity of the latter.

3.2. Participants

Two groups of native Castilian Spanish speakers participated in the experiment described below: an adult control group ($n = 20$) and a child participant group ($n = 52$). The adult control group consisted of 20 first language speakers of Castilian Spanish whose ages range from 19 to 72 years (average 38.9; $n = 12$ female, $n = 8$ male). All adult participants reported having been born in Spain to Spanish-speaking families, the majority in Salamanca where the entirety of the experiment was carried out. Most reported knowledge of a second language, in most instances English or French; however, the adult participants are Spanish-dominant.

The parent(s) of the child participant group completed a language background questionnaire regarding the native language of both child and parent(s), language use at home, with their caretaker(s) and at school, as well as the language of the activities they participate in (e.g. reading, writing, TV/movies). The 52 child participants span three⁷ sub-groups separated according to age: 6-year-olds ($n = 14$),⁸ 7-year-olds ($n = 21$)⁹ and 8-year-olds ($n = 17$).¹⁰ Like the adult control group, all child participants were born in Spain to native Spanish-speaking parents. Parents and grandparents were noted as the primary caretakers of the children who participated. For all children, parents reported Spanish as the language of child rearing. Likewise, parents reported use of Spanish in the home with mother and father, siblings, grandparents and as well as with friends. As the children attend level-appropriate English classes at school, roughly half of the parents reported a mix of both Spanish and English use while at school. Furthermore, roughly 1/3 of parents reported that their children watch movies or television in both Spanish and English, yet nearly all parents report that their children

⁷ Five 5-year-old participants also completed the experiment; although some demonstrated task comprehension via the practice items, each 5-year-old participant rated each of the experimental tokens identically. Due to low participant number in this group and lack of variation among their responses, this group has been excluded. Furthermore, five 9-year-old participants took part in the experiment. While this group demonstrated adult-like responses, this group has also been excluded given the low participant number.

⁸ In total, two additional 6-year-old participants were excluded, one because their parents consider them bilingual and one due to issues with task completion.

⁹ In total, eight additional 7-year-old participants were excluded, three because their parents consider them bilinguals, three because one or both of their parents were born outside of Spain, two due to issues with task completion and one because they were not a native speaker of Castilian Spanish.

¹⁰ In total, nine additional 8-year-old participants were excluded, five because their parents consider them bilingual, three due to issues with task completion and one because one of their parents was born outside of Spain.

use Spanish to read and write. Thus, while parents reported some exposure to English, the child participants examined herein are Spanish-dominant children who have been raised in a monolingual Spanish setting.

3.3. Experimental procedure

Child participants took part in two tasks described below: a story-telling familiarization/warm-up task (Edmonton Narrative Norms Instrument; Schneider, Dubé & Hayward, 2005) and a Graded Grammaticality Judgment Task (GGJT). To complete the tasks, children met with the researchers individually for 15–30 minutes depending on the speech speed and talkativeness of the child. The experimental sessions took place in a quiet room in the child participant's elementary school. It is important to note that each researcher performed a fixed role in each testing session. Researcher 1, a native speaker of Castilian Spanish, collected each child participant from their classroom, brought them to the testing room and introduced the tasks to the child. Researcher 2, a non-native but fluent speaker of Spanish, controlled a stuffed bear hand puppet named Osito ('Little Bear') who was said to have come from the United States and to be learning Spanish. As such, child participants were asked to help give Osito feedback about his language.

3.3.1. Story-telling and familiarization task

The Edmonton Narrative Norms Instrument (ENNI) was employed herein as a pre-task or warm-up method to familiarize the child participants with both researchers and Osito, and to help them become comfortable speaking in the experiment. The ENNI is a language assessment tool appropriate for children 4–9 years old¹¹ consisting of 13 separate black and white drawings (no words) depicting an interaction between personified characters, namely a young giraffe, a young elephant and an older elephant. As per the ENNI instruction manual, Researcher 1 explained to each child that they would be shown a series of drawings two times. The first time, child participants were asked to simply look at each drawing, while in the second round, they were asked to describe what was happening in each drawing to Researcher 1 and Osito. Importantly, Researcher 1 was unable to see the drawings and, therefore, asked a series of clarifying questions linked to each one. At the conclusion of the ENNI, Researcher 1 sought to establish language as the topic of conversation by asking child participants general questions about language (e.g. *Which language do you speak? Do you know anyone who speaks another language?*). Both the storytelling and the subsequent questions were conducted in Spanish. From here, Researcher 1 reminded the child participant that Osito is learning Spanish and, to understand this process better, they would all play a game together.

3.3.2. Graded Grammaticality Judgment task

The purpose of the GGJT was to gauge participants' understanding of argument structure in the noun types examined herein. In total, the GGJT contained 32 items, half of which were grammatical and half of which were ungrammatical, based on the same 16 nominal heads, four for each type as in (27):

(27) Relational:	<i>primo, vecina, hermana, amigo</i>	('cousin, neighbor, sister, friend')
Deadjectival:	<i>belleza, tristeza, alegría, grandeza</i>	('beauty, sadness, happiness, greatness')
Picture:	<i>película, dibujo, foto, libro</i>	('movie, drawing, picture, book')
Deverbal:	<i>destrucción, construcción, descripción, traducción</i>	('destruction, construction, description, translation')

The grammatical and ungrammatical tokens were evenly dispersed across four conditions (deverbal, picture, deadjectival, relational; see examples (28)–(31) below). For each condition, four distinct contexts were created, in a specific linear order and with appropriate intonation to facilitate comprehension. During the GGJT, each context was presented once with a grammatical comment from Osito and once with an ungrammatical comment from Osito.

(28) Relational noun context:

Mira,	aquí	viene	una	persona	muy	amable.	Parece	que	es	un	familiar.
look	here	comes	a	person	very	nice	seems	that	is	a	relative
Es	el	primo	de	la	abuela.						
is	the	cousin	of	the	grandma						

¹¹ The adult control participants did not complete the ENNI.

'Look, here comes a very nice person. It seems like it is a relative. It is the cousin of grandma.'

Osito response:

a. Su primo es muy amable.	b. *Su primo de la abuela es muy amable.
Her cousin is very nice	Her cousin of the grandma is very nice
'Her cousin is very nice.'	'Her cousin of the grandma is very nice.'

(29) *Deadjectival noun context:*

Mira,	aquí	viene	una	persona	muy	guapa.	Parece	que	es	una	princesa.
look	here	comes	a	person	very	beautiful	seems	that	is	a	princess
La	belleza	de	la	princesa	es	increíble.					
the	beauty	of	the	princess	is	incredible					

'Look, here comes a very beautiful person. It seems like it is a princess. The beauty of the princess is incredible.'

Osito response:

a. Su belleza es increíble.	b. *Su belleza de la princesa es increíble.
Her beauty is incredible	Her beauty of the princess is incredible
'Her beauty is incredible.'	'Her beauty of the princess is incredible.'

(30) *Picture nouns context:*

Mira,	el	alumno	tiene	una	foto	del	colegio.	Ves,	aquí	la	tienes.
look	the	student	has	a	photo	of.the	school	see,	here	it	have-you
La	foto	del	colegio	del	alumno	es	muy	bonita.			
the	photo	of-the	school	of.the	student	is	very	pretty			

'Look, the student has a photo of the school. You see, here it is. The photo of the school of the student is very pretty.'

Osito response:

a. Su foto del colegio es muy bonita.	b. *Su foto del alumno es muy bonita.
His photo of-the school is very pretty.	His photo of-the student is very pretty.
'His photo of the school is pretty.'	'His photo of the student is pretty.'

(31) *Deverbal noun context:*

Mira,	el	bebé	está	destruyendo	la	torre.	Ves,	aquí	la	tienes.
look	the	baby	is	destroying	the	tower	see,	here	it	have-you
La	destrucción	del	bebé	de	la	torre	es	muy	mala ¹² .	
the	destruccion	of-the	baby	of	the	tower	is	very	bad	

¹² Although the predicate of this sentence might not sound natural for some adult speakers, it is justified as an approximation to child talk.

'Look, the baby is destroying the tower. Look, here you have it. The destruction by the baby of the tower is very bad.'

Osito response:

a. Su destrucción de la torre es muy mala. His destruction of the tower is very bad 'His destruction of the tower is bad.'	b. *Su destrucción del bebé es muy mala. His destruction of-the baby is very bad. 'His destruction of the baby is bad.'
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To engage child participants in the GGJT, Researcher 1 explained that they would play a game together to help Osito learn Spanish. Researcher 1 controlled a PowerPoint presentation depicting Osito in the woods during the first half of the task and on the beach during the second half of the task, as shown in Fig. 1. Child participants were told that as Osito responded in Spanish, he would move along a stone path shown in each scene until ultimately arriving at the other side.



Fig. 1. GGJT Game: Osito in the forest / Osito in the beach.

For each token, Researcher 1 read a brief context aloud (as in examples (28)-(31) above) while the corresponding visual aid was presented to both the child participant and Osito in Powerpoint (see Fig. 2 below). Then, Osito provided a summary of the context and visual aid that contained either a grammatical or ungrammatical DP (as in the corresponding a/b portions of the above examples). Finally, Researcher 1 asked the child participant to help Osito by pointing to a smiley face if he said it correctly, a frowny face if he said it incorrectly, or a neutral face if unsure (see Fig. 3 below). These three faces were employed to alleviate any shyness or negative feelings the child participants may have associated with directly telling Osito that he spoke incorrectly. Furthermore, regardless of the grammaticality of Osito's response, he always moved along the stone path and was eager to learn despite the errors he made. Slides were presented in alternating fashion: after each experimental slide with the visual aid came one slide with Osito moving along the stone path, demonstrating his progression in the game. To ensure that the child participants understood the task, 6 practice items were completed prior to the 32 experimental items.



Fig. 2. GGJT Game: Sample visual aid.



Fig. 3. GGJT Game: Response options.

Given that some components of the procedure described above and implemented with child participants are unnecessary and potentially infantilizing, the adult control participants completed a modified version of the GGJT. Adult participants completed the GGJT using the same PowerPoint as the child participants. However, instead of the hand puppet, adult participants judged a recording of Osito. In place of the three faces, they were asked to tell Researcher 1 if Osito's recording sounded 'good', 'bad', or 'regular/unsure'. Furthermore, the task was presented as a linguistic task to be used to measure child acquisition of Spanish; as such, the game component described above for the child version was removed.

4. RESULTS

4.1. Data analysis

For both the adult and child participant groups, data from the GGJT was coded in the following manner: Correct responses were coded as 1, while incorrect responses were coded as 0. This binary treatment of the three possible response types (good, bad, regular/unsure) is justified by the low percentage of regular/unsure answers (~9%) as well as the research question and property under investigation. For grammatical tokens, the correct response on the part of the children was the green smiley face, while for adults, 'good' was the correct response. Yellow neutral and red frowny face responses from children and the 'regular/unsure' and 'bad' responses were coded as incorrect responses to grammatical tokens. The opposite applied to the ungrammatical tokens in that the correct response to these tokens from the child participants was the red frowny face and 'bad' from the adults. Yellow neutral and green smiley face responses from children and the 'regular/unsure' and 'good' responses from adults were coded as incorrect responses to ungrammatical tokens. Thus, a child participant who responded with a green smiley face to all 4 grammatical deverbal noun tokens would produce an average score of 1 in this condition. Likewise, a child participant who responded with a red frowny face to all 4 ungrammatical deverbal noun tokens would produce an average score of 1.¹³

4.2. Group results

Fig. 4 below displays each group's mean correct response (from 0 to 1) for the grammatical tokens presented in each of the four conditions (relational, deadjectival, picture and deverbal nouns). Regarding the adult control group, the high correct response means seen in Fig. 4 across all four conditions demonstrate that this group is highly accurate and consistent in their assessment of these tokens. Of 320 total grammatical tokens, 301 (94.1%) were deemed "good" by the adult participants. Furthermore, the adult participants are seemingly equally correct regardless of condition. Regarding the child participant groups' mean correct response (from 0 to 1) for grammatical tokens, variable accuracy is seen across age groups as well as condition, with older child participants generally performing more accurately than their younger counterparts. Furthermore, children are more accurate on picture, deverbal and deadjectival nouns, respectively, than on relational nouns.

Regarding the ungrammatical tokens, Fig. 5 below shows a consistent, albeit lower, mean correct response for the adult control group, revealing that the adult participants treat each condition similarly. Of 320 total grammatical tokens, 252 (or 78.8%) were correctly rated as "bad". Differently from the grammatical tokens, the adult participants show slightly more accurately assessments of the picture and deverbal conditions as compared to the deadjectival and relational conditions. The child participant groups' correct response averages for the ungrammatical tokens are markedly lower than that of the adult control group. Differently from both the adult control group's average correct response to the ungrammatical tokens and the child participant groups' responses to the grammatical tokens, the child participant

¹³ The binary treatment of the three response types (good, bad, regular/unsure) resulted from the necessity of applying a binomial regression model to the data.

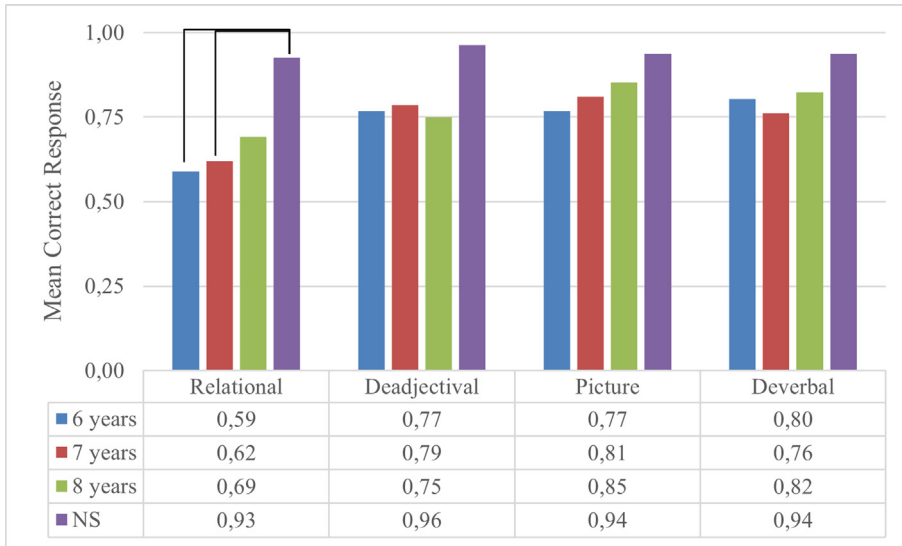


Fig. 4. **GGJT group results for grammatical tokens.** NS = adult native speakers; Relational = grammatical relational noun tokens; Deadjectival = grammatical deadjectival noun tokens; Picture = grammatical picture noun tokens; Deverbal = grammatical deverbal noun tokens.

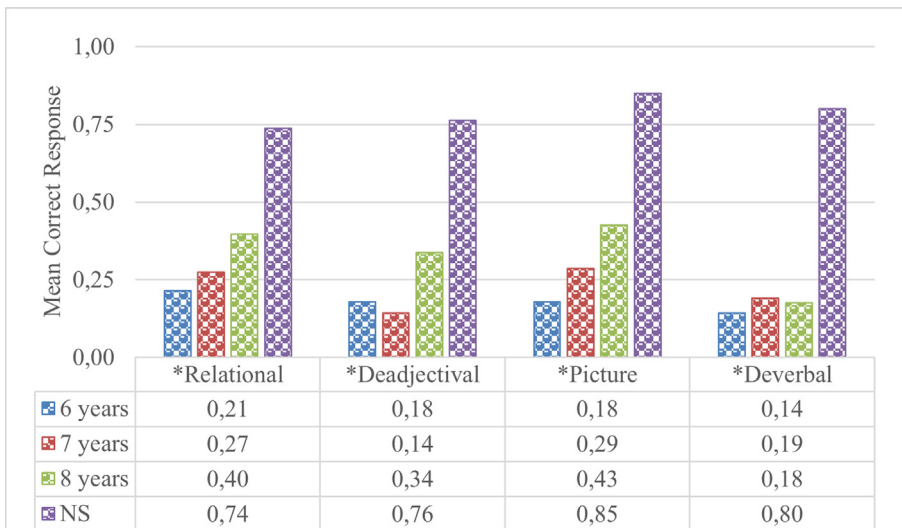


Fig. 5. **GGJT group results for ungrammatical tokens.** NS = adult native speakers; *Relational = ungrammatical relational noun tokens; *Deadjectival = ungrammatical deadjectival noun tokens; *Picture = ungrammatical picture noun tokens; *Deverbal = ungrammatical deverbal noun tokens.

groups are appreciably less accurate on the ungrammatical tokens with accuracy means ranging from 0.14 to 0.43. Here, the child participants more accurately identify as ungrammatical the picture and relational conditions, as compared to the deadjectival and deverbal conditions.

To determine statistical significance, the data from Figs. 4 and 5 above were submitted to a binary logistic regression with planned pairwise contrasts and Sidak corrections applied when necessary. Included in the final analysis are the random variable School, the fixed effects Group (6-, 7- and 8-years, adult), Condition (relational, deadjectival, picture and deverbal), and Grammaticality (grammatical and ungrammatical), the two-way interactions Group*Condition, Group*Grammaticality, Condition*Grammaticality, and the three-way interaction of Group*Condition*Grammaticality.

Main effects were found for Group ($F(3,2272) 19.683, p < 0.000$) and Grammaticality ($F(1,2272) 139.204, p < 0.000$), while no main effect obtained for Condition ($F(3,2272) 1.276, p = 0.281$). No two-way interactions were found between Group*Condition ($F(9,2272) 0.799, p = 0.617$), Group*Grammaticality ($F(3,2272) 2.342, p = 0.071$), nor between Condition*Grammaticality ($F(3,2722) 1.504, p = 0.212$). Similarly, the three-way interaction between Group*Condition*Grammaticality was not significant ($F(9,2722) 0.998, p = 0.439$).

Planned comparisons revealed statistically significant differences between each of the three child participant groups and the adult control group regarding their accuracy on the four conditions examined herein. In the overall relational condition, the adult control group was statistically significantly more accurate than the 6-year-old group ($p < .001$), the 7-year-old group ($p < .001$), and the 8-year-old group ($p = .033$). The same result obtained for the deadjectival and deverbal conditions, in that the adult control group was statistically significantly more accurate than each child participant group ($p < .001$ for all comparisons). Finally, for the picture condition, the adult control group was statistically significantly more accurate than the 6-year-old group ($p < .001$) and 7-year-old group ($p = .001$); however, no statistically significant difference obtained between the adult control group and the 8-year-old group ($p = .075$) for the overall condition of picture nouns. No statistically significant differences obtained between the child groups in any of the four overall conditions. Regarding each group's overall accuracy between the four conditions (e.g. adult control group accuracy on the relational condition compared to accuracy on the deadjectival condition), no statistically significant differences were found. In terms of grammaticality, each group was statistically significantly more accurate on the grammatical tokens than on the ungrammatical tokens (adult control group, $p = .017$; 6-year-old group, $p < .001$; 7-year-old group, $p < .001$; 8-year-old group, $p < .001$).

As pertains to the Group*Condition*Grammaticality interaction with group as the factor of interest, the only statistically significant difference between the adult control group and the younger two child participant groups for the grammatical tokens obtained in the relational condition only (6-year-old group, $p = .011$; 7-year-old group, $p = .008$). No other statistically significant differences obtained between the adult control group and any of the child participant groups for grammatical tokens in the other three conditions. Similarly, no statistically significant differences obtained between the child groups for any of the grammatical conditions. Nonetheless, statistically significant differences obtained between the groups for the ungrammatical tokens across the four conditions. Specifically, statistically significant differences obtained between the adult control group and the youngest child participant group only for the ungrammatical relational condition (6-year-old group, $p = .023$). Furthermore, statistically significant differences obtained between the adult control group and all three child participant groups for the ungrammatical deadjectival condition ($p < .001$ for each group), the ungrammatical picture condition (6-year-old group, $p < .001$; 7-year-old group, $p < .001$; 8-year-old group, $p = .004$), and the ungrammatical deverbal condition ($p < .001$ for each group). Finally, the 6-year-old group performed statistically significantly differently from the 8-year-old group ($p < .041$) on the ungrammatical picture nouns.

Considering now if the four participant groups treated each of the four conditions differently according to grammaticality, only one statistically significant difference obtained. The 8-year-old group was statistically significantly more accurate on the ungrammatical picture condition as compared to the ungrammatical deverbal condition. Finally, each group's treatment of the grammatical versus ungrammatical tokens within each of the four conditions is considered. The adult control group was statistically equally accurate on grammatical and ungrammatical tokens in each of the four conditions. Nonetheless, each of the three child participant groups were statistically significantly more accurate on the grammatical tokens than the ungrammatical tokens in each of the four conditions ($p < .001$ for all comparisons¹⁴).

4.3. Average differential results

To more precisely respond to the RQ of this experiment, additional consideration of the child participant groups' data is necessary. Specifically, we start with the assumption that target-like knowledge of the four conditions examined herein consists of both acceptance of the grammatical tokens (i.e. green smiley face) and rejection of the ungrammatical tokens (i.e. red frowny face) as evidenced by the adult participant group. Thus, while a child participant group may correctly accept grammatical tokens, if they do not simultaneously reject the ungrammatical tokens within the same condition, they do not demonstrate robust evidence of knowledge of the properties of the particular type of DP. To gauge whether the participant groups treat the grammatical and ungrammatical tokens differently, the average differential acceptance for each token in each condition for all four groups was calculated. To calculate this figure, the average acceptance rate for ungrammatical tokens was subtracted from the average acceptance rate for the grammatical tokens for the same token within the same condition and for each participant. Since grammatical tokens are expected to be accurately accepted more frequently than ungrammatical tokens, the average differential should be positive, with differ-

¹⁴ One exception obtained: the significance level for the grammatical relational tokens versus the ungrammatical relational tokens in the 8-year-old group was $p = .001$.

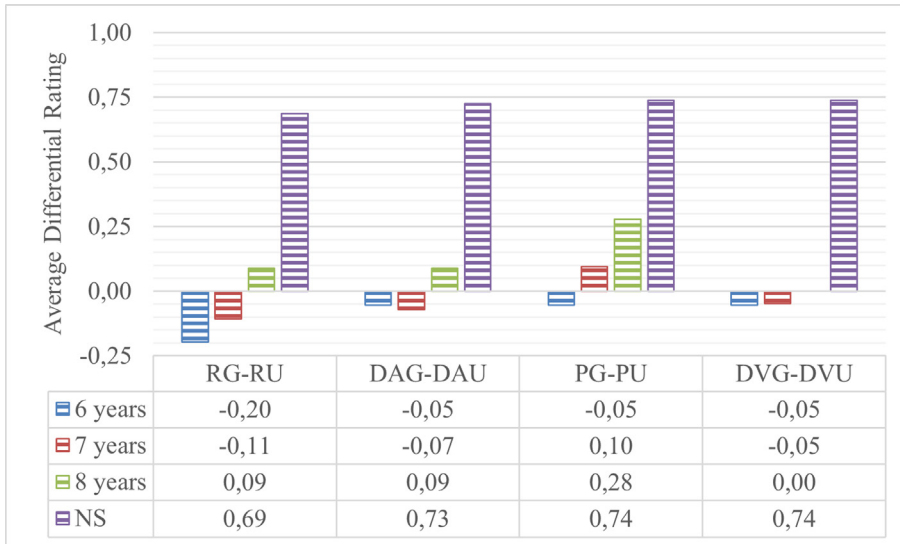


Fig. 6. **GGJT Group average differential ratings.** NS = adult native speakers; RG-RU = grammatical relational noun minus ungrammatical relational noun; DAG-DAU = grammatical deadjectival noun minus ungrammatical deadjectival noun; PG-PU = grammatical picture noun minus ungrammatical picture noun; DVG-DVU = grammatical deverbal noun minus ungrammatical deverbal noun.

entials nearing 1 (the maximum value) indicating a more target-like distinction between the grammatical and ungrammatical tokens. Negative average differentials are the product of a higher acceptance of the ungrammatical tokens as compared to the grammatical tokens, and indicate non-target-like performance.

The group average differential between the grammatical and ungrammatical tokens for each condition is depicted in Fig. 6 below. As is clear for the adult control group, all values are positive, indicating accurate group acceptance of grammatical tokens combined with accurate group rejection of the ungrammatical tokens. While each average differential is relatively high, a slightly lower average differential is seen in the relational noun context compared to the other three conditions. Differently, the child participant groups produced both positive and negative average differentials. In the case of the 6-year-old participants, a negative average differential was produced for all four conditions. Likewise, the 7-year-old participants produced negative average differential ratings for three of the four conditions (relational, deadjectival and deverbal conditions), yet produced a positive average differential for the picture condition. Finally, while the 8-year-old group's average differentials are much lower than that of the adult control group, the oldest child participant group performed most in line with the adult control group since they produced positive average differentials for relational, deadjectival and picture condition and a 0 rating for deverbal condition. Thus, we see a positive correlation between the child participant group's average differentials, which is a proxy for target-like knowledge, and age.

5. DISCUSSION

The current study sought to determine if experimental evidence supports the claim that picture and deverbal DPs are more structurally complex than relational and deadjectival DPs due to the former noun types' allowance of up to three PPs, and the latter noun types' restriction to one PP. Specifically, the research question asked appears in (26):

- (26) Do Spanish-speaking children demonstrate knowledge of the underlying argument structure of relational and deadjectival nouns prior to picture and deverbal nouns?

To answer this question, the Possessivization Principle was assumed and employed in the methodological design, with the hypothesis being that possessivization is less structurally complex in relational and deadjectival DPs that contain one PP argument as compared to picture and deverbal DPs that can have up to three PP arguments. Therefore, the participants were predicted to perform more target-like in the relational and deadjectival conditions. The results reveal some support for this prediction, especially when comparing relational and deadjectival DPs to deverbal DPs. Still, the overall picture is more nuanced, especially as it pertains to picture nouns, a point to which we return below.

One point of partial support for the aforementioned prediction is found in the fact that, taking Group as the factor of interest, the Group*Condition*Grammaticality interaction revealed a statistically significant difference between groups for the grammatical tokens: both the 6-year-old and 7-year-old groups were statistically significantly less accurate than the adult control group in the relational condition, potentially pointing to better performance on the grammatical deadjectival, picture and deverbal DPs regardless of age. Nonetheless, considering that convergence on a property entails both accurate acceptance of grammatical tokens and accurate rejection of ungrammatical tokens, and that participants may have a propensity for acceptance as opposed to rejection of a token, we take the accurate rejection of the ungrammatical tokens to be particularly revelatory in terms of the child participants' developing grammars. Here, the examination of the ungrammatical tokens revealed no statistically significant differences between the adult control group and the 7-year-old and 8-year-old groups on the ungrammatical relational DPs. Each age group differed in a statistically significant manner from the adult control group for each of the other ungrammatical conditions (deadjectival, picture and deverbal). Taken together, the only condition for which the child participants, specifically the 8-year-old group, accurately accepted the grammatical tokens while simultaneously accurately rejecting the ungrammatical tokens is the relational DPs.

To more clearly understand the child participant groups' convergence on these structures, one final analysis, the average differentials, was performed. Recall that this analysis combines the overall knowledge of each participant where knowledge is defined by acceptance of grammatical tokens and rejection of ungrammatical tokens, thus producing a positive average differential as in the adult control group. The 6-year-old group, however, produced a negative average differential rating for each of the four conditions, revealing an overall lack of target-like performance. The 7-year-old group produced a small, but positive, average differential in the picture condition only, revealing developmental improvement in this noun type. However, the 7-year-old group's average differential is negative in the three remaining conditions. Finally, the 8-year-old group produced positive average differentials in the relational, deadjectival and picture conditions, and a net zero rating in the deverbal condition, again demonstrating developmental improvement. Taken together, the average differential results reveal a positive correlation between the child participant group's average differential, which is a proxy for target-like knowledge, and age, with child participant groups becoming more target-like with increased age. This development is most clearly seen between 7 and 8 years of age.

Taking together the results of the three-way interaction and the average differential, partial support is found for the prediction tested herein, specifically as it relates to the 8-year-old group in the relational condition: only the 8-year-old group showed adult-like convergence on the grammatical and ungrammatical relational condition and a positive average differential. While a positive average differential was found for the 8-year-old group in the deadjectival condition, and for the 7-year-old and 8-year-old group for the picture condition, these groups differed statistically significantly from the adult control group regarding the accurate rejection of ungrammatical deadjectival and picture tokens, respectively. Furthermore, results for the deverbal condition revealed the least adult-like performance by the child participant groups. Thus, in two instances, the prediction is largely borne out: children seem to converge on adult-like knowledge of relational DPs first, and deverbal DPs last.

Nonetheless, a few items remain to be explained. First, given their comparatively simpler argument structure, it is not immediately clear why children would converge on relational DPs before deadjectival DPs. Second and similarly, it is not clear why children would show earlier development with picture DPs as compared to deverbal DPs, nor why the 7-year-old and 8-year-old child participant groups show higher average differentials for picture DPs than for any other condition.

To respond to the first item above, while both relational and deadjectival DPs are less structurally complex as compared to picture and deverbal nouns, there are three important differences between them. First, relational nouns, especially kinship nouns, are acquired first, and are most frequent in child corpora (see section 2.2 above). Thus, they appear earlier and are more frequent than deadjectival nouns in child speech. Second, relational nouns are strictly nominal (Barker & Dowty 1993), whereas deadjectival nouns retain some adjectival properties. Nouns, as a class, are acquired before adjectives; thus, we would expect that nouns with more nominal features are converged upon prior to nouns with fewer nominal properties. Lastly, relational and deadjectival nouns alike link two arguments (a Proto-Part and a Proto-Whole). However, only relational nouns imply an inherent possessive connection and they are simpler morphologically. All of these characteristics combined offer a likely explanation as to why the child participant groups show earlier convergence on relational nouns as compared to deadjectival nouns.

Finally, the seemingly earlier trend towards convergence on possessivization of picture DPs, as compared to deverbal DPs, can be explained by the particular nature of picture nouns themselves. Although they project a more complex argument structure similar to that of deverbal nouns (Recio 2018), there are important differences between the structures of these two complex DPs. Specifically, according to the order of acquisition and frequency in child corpora, picture nouns are acquired before deadjectival and deverbal nouns (see section 2.2), likely due to the fact that they express tangible and concrete objects rather than abstract entities as deadjectival and deverbal nouns do. Second, considering the presence of nominal properties within the noun, picture nouns are the only noun type that accepts both verbal argu-

ments (Proto-Agent and Proto-Patient) and nominal arguments (the possessor, a purely nominal argument; see (24) above). Finally, picture nouns are morphologically less complex than deverbal nouns in that they are not the result of derivation processes and in that their connection to verbs is inherently semantic rather than syntactic (*foto* ‘picture’ is linked to *hacer una foto* ‘take a picture’). Deverbal nouns are derived from verbs and inherit their argument structure from them, and therefore, bear verbal theta-roles (see Giorgi & Longobardi 1991), with a Proto-Agent and a Proto-Patient, thus having an underlying syntactic structure which is more sentence-like. In contrast, picture nouns are not derived from verbs and hence lack this property.

6. CONCLUSIONS

To our knowledge, this is the first study conducted to examine the acquisition of argument structure of noun types in Spanish. It analyzed the acquisition of argument structure within the Spanish DP in 52 L1 Spanish-speaking children between 6 and 8 years of age via the possessivization principle following the thematic proto-role approach (Dowty 1991, Barker & Dowty 1993) applied to DPs. Considering age, results show a distinction between the adult control group and the child participant group in terms of accuracy. Thus, while adults demonstrate knowledge of all types of DPs, the experimental results revealed a developmental pattern in the acquisition of the argument structure of the DP across time. These results suggest that, as expected, children progressively acquire the argument structure of the Spanish DP between 6 and 8 years of age converging first on relational DPs, then picture and deadjectival DPs and, finally, deverbal DPs.

Our findings only partially support the hypothesis that less structurally complex nouns/DPs are converged upon earlier than their comparatively more structurally complex counterparts. Still, our findings also suggest that the verbal or nominal nature of the noun—see Table 1 above—is perhaps a relevant criterion that should be considered as well as the inheritance/inherence of the argument structure, at least in terms of acquisition and development. In fact, focusing on deadjectival and relational heads and showing that argument structure within the DP goes beyond the prototypical and well-examined cases of deverbal and picture nouns constitutes a novel contribution to the field, revealing a line of future research for the acquisition of the argument structure within the DP.

Nonetheless, no study is free of limitations. Notably herein, for some DPs, the resulting possessivized sequence was ungrammatical under one thematic reading given its context, but grammatical under others. Thus, from *la destrucción del bebé de la torre* (‘the baby’s destruction of the tower’) the possessivized DP *su destrucción del bebé* (‘its destruction of the baby’) is ungrammatical if the baby is the Proto-Agent as is depicted in the experimental photo, but grammatical if is interpreted as the Proto-Patient. Despite efforts to clarify context, some judgements may have been affected by this possible interpretation. Other limitations include the sample size (52 children and 20 adults), the age selected (ideally, older children would also be tested), their restricted origin (they all speak the same dialect and have a very similar background) and the inherent complications of experiments with children. To expand the purview of the results, future studies with more and older children, and speakers of diverse varieties, will need to be implemented.

ACKNOWLEDGEMENTS

We wish to thank the two schools in Salamanca, Spain where the experiment took place: Colegio Marista Champagnat and Colegio Filiberto Villalobos. We are especially grateful to their principals, Dolores Santos and Manuel Holgado, for their collaboration, support and flexibility. It was a pleasure to work with the parents, students and staff.

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