Making discourse-dependent decisions: The case of the copulas *ser* and *estar* in Spanish

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Abstract

We present the results of two experiments (an Elicitation Task and a Picture Matching Task) that test 4–5 year-old children's ability to distinguish between the Spanish copulas *ser* and *estar*, when copula choice depended on the properties of the context. Departing from an analysis that relies on two different types of stative predicates (stativity associated with lack of aspectual information and stativity associated with the subevent property STATE), we tested (i) children's ability to calculate the permanent/temporary implicatures commonly associated with *ser* and *estar* and (ii) their ability to restrict the temporal domain of evaluation. We argue that our results are compatible with the idea that children do distinguish between the two copulas in an almost adult-like manner, but have problems when required to restrict the domain of evaluation of each copula, providing further support for the hypothesis that children have difficulties with domain restrictions.
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1. Introduction

It is well known that the gross distribution of categories and word order are acquired very early (Wexler, 1998, among others). It is also well known that various rough semantic properties of both lexical and functional categories are also acquired very early (Golinkoff et al., 2001). However, from research on interpretive properties of various types of nominals, we know that not everything is acquired early. The fine-grained syntactic and semantic properties of particular functional elements seem to take a long time to be mastered, especially those properties whose

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interpretations depend on the interaction between the syntactic–semantic context in which they are embedded and the conditions in which one or another interpretation is felicitous (Krämer, 2000; Miller and Schmitt, 2003; Munn et al., 2005; Noveck, 2001; Papafragou and Musolino, 2003; Papafragou and Tantalou, 2005; Perez-Leroux et al., 2004; Unsworth, 2005). The bulk of this fine-grained acquisition research has been on interpretive properties of noun phrases, especially (in)definiteness, genericity and quantification. Much less has been done in the tense, aspect and mood domain and even less on copular verbs (Becker, 2001; Holtheuer, 2003; Sera, 1992).

To account for children's lingering non-adult behavior on various types of noun phrases, a number of explanations have been put forward. We find competence explanations (children have a different semantic representation of the definite from the adult, as in Wexler, 2003), pragmatic explanations (the semantic analysis is the same but children take a longer time learning how to restrict the domain in adult like ways, Krämer, 2005; Munn et al., 2005) and performance explanations (processing load, Grodzinsky and Reinhart, 1993).

In this paper, our goal is to broaden empirically the discussion of the acquisition of fine-grained interpretive properties of functional elements that depend on properties of the discourse, by examining the copulas *ser* and *estar* in Spanish, illustrated in (1).

(1)   a.   Manolo es   flaco.   *ser*
           Manolo *ser*-PRES.3SG thin
           'Manolo is thin (a thin person).'
      b.   Manolo está   flaco.   *estar*
           Manolo *estar*-PRES.3SG thin
           'Manolo is thin (looks thin)'

Although these copulas have triggered a fair amount of interest in linguists (Bello, 1951; Gili Gaya, 1955; Lema, 1995; Luján, 1981; Maienborn, 2000, 2003; Querido, 1976; Schmitt, 1992, 2005, among others) and second-language specialists (Geeslin and Guijarro-Fuentes, 2003, 2006; Ramirez-Gelpi, 1995; Ryan and Lafford, 1992; Woolsey, 2006) very little is known about first language acquisition of *ser* and *estar* (Holtheuer, 2003; Schmitt et al., 2004; Sera, 1992). The two verbs, however, present, an interesting challenge to the learner because, like many determiners, mastering the properties of these highly frequent elements involves a lot more than learning co-occurrence restrictions. Rather, the learner has to understand how the syntactic–semantic properties of each of the copulas interact with properties of the discourse.

We present the results of two experiments (an Elicitation Task and a Picture Matching Task) that tested children's ability to distinguish between the Spanish copulas *ser* and *estar*, when copula choice depended on the properties of the context. For example, in (1a) the use of the copula *ser* allows the reading that Manolo is a thin person, while the use of the copula *estar* in (1b) allows the reading that Manolo is thin right now. Of course, the appropriateness of (1a) or (1b) depends on knowing something about the physical characteristics of Manolo and also depends on what should count as 'now'. The empirical question is therefore under what conditions can children use the context to make the adult-like choice.

Our results aim at contributing a couple of data points on the acquisition of these copulas and providing support to the hypothesis that any linguistic property whose mastery requires setting up a domain of discourse and very specific ways of restricting this domain will be hard for children. We argue that our results are compatible with the idea that children *do* distinguish between the two copulas in an almost adult-like manner, but have problems when they are required to restrict the domain of evaluation of each copula. In this sense, we believe that children's behavior with

ser/estar provides further support for Kramer's (2000) hypothesis that children have difficulties with domain restrictions.

This paper is divided into four sections. Section 1 describes the basic properties of *ser* and *estar* and the analysis we will be adopting. Section 2 describes the previous work done on the acquisition of these copulas. Section 3 presents our hypothesis and predictions, while section 4 presents two experiments and a general discussion of issues raised by the acquisition of semantically impoverished functional elements.

2. Linguistic background

When we examine analyses for the copula in English we find two main trends. One trend assumes that the copula is devoid of semantic content (Becker, 2001; Schütze, 2001) and is just the spell-out of purely grammatical, un-interpretable features. The second trend assumes that the copula is multiply ambiguous (Carlson, 1977; Diesing, 1992; Partee, 1993): there is an identity copula, a stage-level copula that outputs stage-level predicates, a stage-level copula that outputs individual-level predicates, etc. In Spanish and Portuguese, since there is more than one copula, it is hard to argue that both copulas lack any semantic content. The issue becomes determining their semantic and pragmatic properties. In this section, we start by providing the basic data and properties. Then we present one potential analysis of the copulas and finally we describe the analysis we will be assuming.

The copulas *ser* and *estar* have overlapping, but not identical, distributions. From basic distribution we can learn that *ser* and *estar* can both appear with prepositional phrases and adjectival predicates. On the other hand, *ser* can be used in identity statements and take nominal predicates, but *estar* cannot. *Ser* is also the passive auxiliary, while *estar* is the progressive auxiliary. With respect to inflection, while *ser* is very irregular (various root alternations depending on the tense), *estar* is basically a regular verb with respect to inflectional morphology.

Historically, we find that in 12th Century Spanish, only *ser* was used in copulative constructions but in the 13th Century we start to see both copulas being used (Roca and Batllori, 2004).

In this paper, we concentrate on the properties of *ser* and *estar* with adjectival predicates that can appear with both copulas. As illustrated in (1) and (2), some adjectives can appear with both *ser* and *estar*, although others seem to select one or the other copula (3): *pregnant* and *dead* appear with *estar* (3a), while *transitory* with *ser* (3d). Others yet seem to appear preferably with *ser* but in marked contexts can appear with *estar* (3b, c).

(2)   a.   Los ojos de Manolo son   verdes.
           The eyes of Manolo *ser*-PRES.3SG green-PL
           'Manolo's eyes are green.'
    b.   Los ojos de Manolo están   rojos.
           The eyes of Manolo *estar*-PRES.3SG red-PL
           'Manolo's eyes are red (now, after crying a lot).'

(3)   a.   Maria está/*es embarazada /muerta.
           Maria *ser*-PRES.3SG/**estar*-PRES.3.SG pregnant/dead
           'Maria is pregnant/dead.'
    b.   Maria es/?está muy joven.
           Maria *ser*-PRES.3SG/?*estar*-PRES.3SG very young.
           'Maria is very young.'

      c.   La casa es/?está nueva.
              The house *ser*-PRES.3SG/?*estar*-PRES.3SG new.
              'The house is new.'
      d.   El problema es/*está transitorio.
              The problem *ser*-PRES.3SG/**estar-PRES.3SG transitory
              'The problem is transitory.'

2.1. The stage-level/individual-level implementation

The generalization that commonly appears in grammar books is that *ser* is associated with predicates denoting inherent properties and *estar* is associated with predicates denoting temporary properties. The differences between the two copulas could be captured in terms of selection: *ser* selects permanent/inherent properties and *estar* selects transitory/temporary properties. To account for (1) and (2) all we would need to say is that most adjectives are ambiguous.

There are, however, many empirical problems with this generalization. The adjectival predicates *joven* 'young' and *nueva* 'new', qualify as non-permanent properties, but tend to appear with *ser*. *Muerto* 'dead' is a permanent state but must combine with *estar*. As for *transitorio* 'transitory' we would have to assume it is a permanent property because it combines with *ser*. It is important to note that this is not simply a matter of lexical idiosyncrasies because the division between temporary and permanent properties depends on what they apply to. While a leaf of a maple tree is not permanently green, leaves of an avocado tree are.

Furthermore, the idea that *estar* is always associated with a non-permanent property seems much more like an implicature than part of the meaning of *estar*. The botanist's example put forward by Querido (1976) and explored by Maienborn (2000, 2003) suggests that we are not asserting temporariness when we use *estar*. The example from Querido tells the story of a botanist who just discovered a new species of plant, whose leaves are yellow. Querido notes that the cautious way for the botanist to describe this new plant of which he knows nothing about is to say that its leaves are yellow with *estar*. It may turn out that they are always yellow or that they are only yellow at that time of the year. The point is that *estar* just asserts that at that moment the leaves are yellow. If he used *ser*, he would be assuming too much, namely that the leaves of that plant have the property of being yellow. Importantly, by using *estar* he is not asserting that the leaves are only sometimes yellow. Our botanist is just asserting that the property holds at that particular time. In other words, *estar* + predicate only has an implication that the situation described is transitory.

This observation leads us to conclude that the choice between *ser* and *estar* has a pragmatic component that needs to be accounted for (Maienborn, 2000, 2003; Schmitt, 2005). But before we do that, we need to consider a popular way of implementing the distinction between *ser* and *estar*, namely as a distinction between stage-level and individual-level predicates (Carlson, 1977).[1]

Stage-level predicates (SLPs) are predicates that hold of stages (temporal slices) of an individual, while individual-level predicates (ILPs) hold of individuals. While the latter are a-temporal, the former are temporally anchored. This division captures more or less the permanent/temporary intuition and has the advantage of being more precise, since various linguistic tests

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[1] We will illustrate the problems using Carlson's implementation. However, the same problems arise for the Kratzer (1995) and Diesing (1992) versions. See Schmitt (1992) for details.

have been developed to determine whether a predicate is stage-level or individual-level. This allows us to rely on something more than intuitions that primarily depend on our knowledge of the world.

There are at least two ways of implementing the stage-level versus individual-level distinction in *ser* and *estar* predications. First, we can assume that the adjectives are inherently individual-level or stage-level. In this case *ser* and *estar* only differ in their selection properties and have no meaning on their own. This is illustrated in (4):

(4)   a.   [*ser* [IL adjective]] = IL predicates
       b.   [*estar* [SL adjective]] = SL predicate

The second way is to assume that *ser* and *estar* are functions that take predicates of particular types and output ILPs or SLPs, respectively. In this sense they have a semantic value of their own.

Consider first the possibility that the copulas are transparent, and the adjectives are SL or IL predicates. One well-known property of stage-level predicates is that they can appear as secondary predicates. If that is the case, then adjectives that can appear in secondary predicates should be acceptable with *estar* but not *ser*, unless they are ambiguous. If we examine the data in (5), we find that the correlation seems to hold. The adjectives *embarazada* 'pregnant', and *muerta* 'dead', which are acceptable with *estar*, but not *ser*, as illustrated in (3a), can appear as secondary predicates (5a). The adjective *gordo* 'fat', which can appear with both *ser* and *estar* (1), is also a possible secondary predicate, as illustrated in (5b). (5c) illustrates the adjective *joven* 'young' as a secondary predicate. This adjective is marginally acceptable with *estar*, as illustrated in (3b).

(5)   a.   La niña llegó   embarazada/ muerta.
             The girl arrived pregnant/   dead
             'The girl arrived pregnant/dead'
       b.   El   niño se casó   gordo.
             The boy RFL married fat.
       c.   Ellos se casaron jóvenes.
             They RFL married young

Note, however, that the first implementation depends on the copulas being transparent and this is where problems arise. When we run tests for stage-level-hood (perception verb reports, for example), we find that *estar* + predicate cannot appear as the complement of a perception verb (6a). This is illustrated below:

(6)   a.   *Ví a Maria *estar*   embarazada
              I saw Maria *estar*-INF pregnant
              'I saw Maria be pregnant'
       b.   Ví a Maria *ser*   cruel (con los gatos)
              I saw Maria *ser*-INF cruel (to the cats)
              'I saw Maria be cruel (to the cats).

More surprisingly, perhaps, is the fact that *ser* is perfectly acceptable in this context, as shown in (6b). This forces us to discard the idea that both copulas are completely transparent. To account for the contrasts above, it is necessary to say first that *ser* can output ILPs or SLPs or that the output of *ser* + predicate can be coerced into a SLP. Second, we need to assume that *estar* outputs ILPs, otherwise we cannot explain why *estar* predicates are unacceptable in perceptual verb reports, a typical test for stage-level-hood.

Matters become even more complicated when we consider the behavior of *ser* and *estar* in absolute constructions, as in (7) and (8):

(7)   Siendo   muy jóven, no podía   viajar solo.
            Being:*ser* muy young, (he) could not travel alone
    a.   'Because he was very young, he could not travel alone.'
    b.   '*If he were very young, he could not travel alone.'

(8)   Estando   muy enfermo, no podía viajar solo.
            Being:*estar* muy sick, (he) NEG could.3.SG travel
    a.   'Because he was very sick, he could not travel alone.'
    b.   'If he were very sick, he could not travel alone.'

Stump, 1985 noted that ILP and SLPs behave differently in absolute constructions. According to him, while ILPs only allow a 'because' reading of the absolute construction, SLPs allow also a conditional interpretation. (8), as the paraphrases (a) and (b) illustrate, allows both readings, but (7) only allows the 'because' reading. We have to assume that the output of (8b) is a SLP or that the copula, in this case, but not in perception-verb reports, is transparent. If we assume that the copula in absolute constructions is transparent, then we would have to explain why transparency of the copula only holds in absolute constructions. Furthermore, we need to answer what accounts for the fact that the adjective *joven* 'young', which can appear as a secondary predicate, does not allow the conditional reading (7b). If stage-level hood is what allows an adjective to appear as a secondary predicate and the copula is absolutely transparent, the absolute construction in (7) should have a conditional reading. However, we find only a 'because' reading.

Summarizing, it is impossible to treat the copulas as transparent in all cases, and it is also not easy to assume that *ser* always outputs an ILP and *estar* a SLP. Even if we postulate two verbs *ser* and two verbs *estar*, we cannot, without various ancillary assumptions, predict their behavior in the different constructions. This does not seem very promising and suggests that we should find an alternative account. Furthermore, there is another distinction between the two copulas that seems to require yet another explanation. That is the case of the so-called ACT BE readings, illustrated in (9). They are possible with *ser* + predicate but not with *estar* + predicate.

(9)   Los hombres fueron/*estuvieron crueles ayer.
     The men   *ser*-PRES.3PL/*estar*-PRES.3PL cruel yesterday
     'The men were cruel yesterday.'

We need, therefore, a distinction that avoids the need for the multiplication of lexical entries for *ser* and *estar*, avoids contradictions and can account for the fact that the temporary/permanent distinction is an implicature and not part of the semantics of the two copulas.

2.2. Two types of states

In this section, we follow Schmitt's (2005) analysis that relies on two different types of stative predicates. In this sense, we share with many others the idea that the distinction between *ser* and *estar* is ultimately an aspectual distinction (Fernández Leborans, 1999; Luján, 1981; Marin, 2004; Schmitt, 1992, 1996, among others). At the same time, with Clements (1988) and Maienborn (2000, 2003) we assume that there is a pragmatic dimension of the copulas that needs to be considered.

We depart from two main assumptions. First, although both *ser* and *estar* predications are associated with states, stativity may actually come from two different sources (Santos, 1993): a predicate may be stative because it is a-temporal (Bach, 1981) and a predicate may be stative because it denotes a STATE (Smith, 1991). We define STATES as having the subinterval property, as in (10).

(10)   Every open subinterval I' of an open interval I where a state is true is also an interval where the same state is true. (Adapted from Smith, 1991)

The second assumption is that copulas create verbal predicates in the syntax and can be devoid of any eventuality type. In other words, they are not necessarily specified as being STATES or EVENTS.

The analysis we are going to adopt assumes that the two copulas are semantically distinct, but do not encode permanence/temporariness directly. We assume that *ser* is devoid of any semantic content and does not impose restrictions on the complements it can appear with, being interpreted as a state by default, unless aspectual operators are added and allow temporal interpretations of the whole *ser* + adjective predicates. In this sense, the analysis we give for *ser* is closer to that of the copula as pure functional material.

estar, on the other hand, contributes to the VP with a subevent of the type STATE, defined as in (10). This is schematically illustrated in (11a,b), respectively.

(11)   a. VP = STATE   b.   AspP

                      V+STATE   AP   Asp   VP=ASPECTUALLY UNMARKED

                      estar   V   AP

                                                    ser

Adjectival phrases in Spanish cannot be tensed directly. Instead, a verbal head must mediate this operation. The verbalizing element can be just a carrier of tense/aspect morphology or can itself carry a subevent property. In (11a), we see a verbal head that has the subevent property of state and is spelled-out as *estar*. In (11b) the verbal head has no aspectual features associated with it and is then spelled out as *ser*. Of course, additional aspectual operators can be added so that an eventive interpretation can be achieved (as is the case of the ACT BE readings). Since *estar* has the STATE subevent property, its VP asserts that property x holds at all times *t*, and the predication is always temporally anchored. Given that the language allows an option of a copula that is not obligatorily anchored, then the choice of *estar* creates the implication that the property does not always hold.

On the other hand, since *ser* + predicate does not involve any reference to some specific interval, then the use of *ser* brings about the implication that the property holds independent of time. In order to assign an aspectual interpretation to the VP in (11b), it must be modified by an aspectual operator of some sort. In other words, the only way to temporally anchor *ser* + predicate is to add an overt/covert adverbial or aspectual marker.[2]

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[2] The role of aspectual operators and adverbials in making atemporal statives, such as *resemble*, temporally anchored can be illustrated for English as well. When modified by an adverb such as *suddenly* or *yesterday* we interpret a VP predicate with *resemble* as inchoative and temporary respectively as in (i):

(i)   Mary suddenly/yesterday resembled her mother.

This proposal makes three predictions: first, while *estar* predicates are always interpreted as STATES, *ser* is flexible in terms of its event type properties. In other words, it can easily be shifted into an inchoative reading or even a temporary reading by the addition of overt or covert adverbs. The data supports this prediction and explains why *ser* can be used in ACT BE readings, but *estar* cannot. *Ser* has no subevent property. Depending on the context, it can be interpreted as a permanent state, a temporary state or even an ACTIVITY (ACT BE readings). This is an important result because it allows *ser* + predicate to describe non-inherent/non-permanent properties. This means that in many contexts, both *ser* and *estar* may be used to describe the same situation truthfully. In fact, it is the lack of adverbs and aspectual modifiers that will trigger the implicature of permanent/inherent properties.

Second, the proposal predicts that because *estar* is a state as opposed to being aspectually unmarked, there is an implicature of temporariness associated with its use. If we wanted to describe a property as permanent, we would have used *ser*. Summarizing, while *ser* has no inherent aspectual properties, *estar* is a STATE. The temporary versus permanent distinction and/or the stage-level versus individual-level characteristics of these predicates are *not* part of the meaning of these two verbs but rather part of the implicatures associated with the copula choice.

Based on this proposal, it may not be necessary to say that adjectives that can appear with both copulas are ambiguous. Adjectives may have STATE-like properties but this state-like property is temporally linked only if it combines with an aspectual copula, i.e., a copula that has a subevent type, in this case, *estar*. When they combine with *estar*, the predication is interpreted as holding at a certain time. The task is then to find the relevant interval in which the property holds. This means that some permanent property can be described with *estar*, if we choose to describe it as holding at all times *t*. To use it like an adult, the child will need to refer to the same interval that is being used by the adult. Furthermore, the child will need to be aware of the implicatures associated with the copula choice. When adjectives that could be interpreted as holding of delimited intervals combine with *ser*, their stativity is not interpreted temporally because *ser* does not have temporal properties. To use *ser* in an adult-like manner, the child needs to know that the property is being treated as devoid of temporal characteristics and furthermore he/she needs to know under what circumstances *ser* can be made inchoative by hidden adverbials of the type *from now on*, which pick an evaluation interval.

To make the proposal more concrete, consider the following situation. Suppose we are looking at a family photo album. First we see a picture of two brothers, where one is a chubby boy and the other is quite skinny. Then we have another picture of the winter break they spent in their grandmother's house, known to be an amazing cook. In this picture we see the two boys eating a chocolate cake. In this picture it is obvious that both boys are pretty heavy now. Very clearly we can see from the skinny boy's clothes that he is not skinny anymore and you can tell that by the fact that he barely fits in his jacket. Then we see them again together in a hiking trip they took with their parents in the summer of the same year. Here they are back to their normal selves. The chubby one continues to be chubby but the skinny one is skinny again. When we go back to the chocolate cake picture, we can say that in that picture both boys *estar* fat because it is true that both boys are not skinny in the picture. Furthermore it is possible to say that the skinny boy is fat in that picture with *ser*. But the reading is different from the reading we would obtain by saying that the chubby boy *ser* fat. Rather than simply associating a property to an individual, using the predicate *ser* fat to the usually skinny boy involves the operation of a covert adverb or locative (here in this picture or now in this picture) that frames the situation and allows an inchoative reading of sorts.

There are then three partially independent requirements that need to be fulfilled in order to master the use of *ser* and *estar*: (i) determining that the two copulas are semantically distinct and

learning the selection restrictions associated with *estar*; (ii) using the pragmatic implicatures associated with the choice of each copula; (iii) determining the interval in which the property is being evaluated in the way an adult does for each of the two copulas. In the following section, we examine the few previous studies on *ser* and *estar* and we show that children by 4 seem to have learned (i) and partially (ii). Our experiments will corroborate the findings from Holtheuer (2003) and Schmitt et al. (2004) that (ii) and (iii) are not yet adult-like.

3. Previous acquisition studies

3.1. Previous studies on ser and estar

As we mentioned before, very little is known about the acquisition of *ser* and *estar* by children. With respect to spontaneous speech production, Sera (1992) shows that, in free speech, children as young as 3 pattern with adults in their production of *ser* and *estar*, producing the copulas correctly. Children only used *ser* with nominals, *estar* as the progressive auxiliary and with locatives, and both *ser* and *estar* with adjectives (but see Holtheuer, 2006). With adjectives, children produced *estar* 58% (*ser* 42%) and adults produced *estar* 55% (*ser* 45%) of the time; however, most adjectives produced by children and adults were used with one or the other of *ser* or *estar*, but not with both copulas. In elicited production tasks, 3-year-olds used *estar* 88% of the time while 9-year-olds used it 76% of the time. Adults used *estar* 63% of the time. Sera suggested that children initially overuse *estar*.

Sera et al. (1997) tested whether children could make distinctions between 'real' and 'apparent' properties (a white lamb versus a white lamb that appears red because it is under a red filter). She found that children's mistakes were consistently in one direction, namely children treated the apparent property as the real property. For example, when asked what the true color of the lamb was, children answered red. Interestingly, she found that the distinction between *ser* and *estar* helped Spanish speaking children, when compared to English-speaking children who received paraphrases of the *ser/estar* distinction, such as ''When you look at the lamb right now through this filter, what color is the lamb'' (*estar* paraphrase) and ''What color is the lamb really and truly'' (*ser* paraphrase). The scores were basically the same for both groups of children for familiar objects, but English speaking children scored much lower for less familiar objects than Spanish speaking children. It should be noted, however, that for familiar objects, Spanish speaking children (3–5 years old) matched *estar* with the apparent property 92.7% of the time but only matched *ser* with the real property 66.8% of the time. With less familiar objects, Spanish speaking children matched *estar* with the apparent property 81.9% of the time and matched *ser* with the real property 72.5% of the time. Sera attributes the discrepancy in the scores for *ser* and *estar* to an inherent bias towards treating apparent properties as real properties.

However, in none of Sera's studies was the pragmatic dimension of the copulas explored or examined, perhaps because Sera adopts the view that the two copulas are in complementary distribution: *ser* is associated with permanent properties and *estar* with temporary properties. As our chubby boy example shows, however, both *ser* and *estar* can be used truthfully to describe the same picture in some contexts, but the implicatures associated with the choice between *ser* and *estar* are quite different.

Schmitt et al. (2004) (based on Holtheuer, 2003) tested children's ability to comprehend the differences associated with *ser* and *estar* in Spanish in a context where, although both copulas were logically possible with both pictures, only one copula was felicitous with each picture, if the

implicatures were taken into account. In other words, if implicatures were taken into account, the copulas should appear as in complementary distribution. They hypothesized that children need to first master the meaning differences associated with the two verbs *be* before the pragmatics can adjudicate among the readings associated with a sentence (Gualmini and Crain, 2000; Gualmini et al., 2000; Noveck, 2001).

In one of the experiments, the task of the child was to choose between two pictures. One picture depicted a typical property of a character and the other depicted an atypical property. For example, a child was given two pictures one of a normal-sized giraffe and one of a short giraffe standing on top of a table or of a Dalmatian with normal black spots versus a Dalmatian with purple spots (painted by his parents so that he would not feel left out for being born spotless). After a short story that backgrounded the pictures, the child was asked to choose the picture that matched the experimental sentence.

The child heard (12) followed by (13a) or (13b):

(12)   Mira las jirafas. ¿Me puedes describir una jirafa? Altas las jirafas ¿no?
          Pero aquí hay una más alta que la otra. Esta solucionó su problema subiéndose
          a esta mesa.
          Look at the giraffes. Can you describe one of the giraffes? Tall the giraffes, eh?
          But here we have one taller than the other. This one solved her problem by
          climbing on top of this table.

(13)   a.   ¿Cuál jirafa es alta?
              'Which giraffe is *ser*-PRES tall?
          b.   Cuál jirafa está alta?
              Which giraffe is *estar*-PRES tall?

Children chose the picture illustrating permanent properties in the *ser* condition 83% (40/48) of the time but they only chose the picture illustrating temporary properties in the *estar* condition 29% (14/48) of the time. Child performance in the *ser* condition was significantly higher than chance, and child performance in the *estar* condition was significantly lower than chance. The results showed also that in this experiment adults chose the picture illustrating permanent properties in the *ser* condition 100% of the time and they chose the picture illustrating temporary qualities in the *estar* condition 100% of the time.

In other words, adults treated the copulas as in complementary distribution, although both pictures were compatible with *estar* (e.g., the botanist example discussed above), and both pictures may be marginally compatible with *ser* if an adverbial such as *from now on* or *in this picture* is added covertly to the temporary picture. The children, on the other hand, did not treat the copulas as in complementary distribution. Children overused *estar* for the picture with the canonical property (as our botanist would) (they chose the canonical picture in the *estar* condition 78%) and seemed to reject a statement with both *ser/estar* for the temporary property altogether (the temporary picture was chosen less than 30% of the time). This suggests that children were not distinguishing between *ser* and *estar*. A potential problem with this study is the fact that children did not seem to be happy assigning a temporary value to a characterizing property and this may have affected their behavior and obscured their knowledge of the two copulas.

In the experiments we present below, we further investigate their knowledge of the two copulas.

4. Hypothesis and predictions

There are two ways of thinking how children acquire the distinction between *ser* and *estar* in contexts where subcategorization selection is not enough. If we were to assume that *ser* and *estar* predications are the lexicalization of the stage-level and individual-level distinction, we could adopt a semantic bootstrapping approach (similar to Becker, 2001). Children first learn that some properties are inherent and some are not and then learn that they tend to appear with one or the other copula. This would predict that, if children know the value of each copula as the lexicalization of the stage-level or individual-level distinction, they should use the copulas for temporary and permanent properties respectively and not allow non-individual level readings of *ser* + predicate. Discourse properties and knowledge of the world should play a role in deciding whether a property is permanent or temporary.

We have, however, discarded the stage-level/individual-level distinction as a way to explain *ser* and *estar* on both theoretical and empirical grounds. We argued, instead, that we should capture the permanent/temporary effect as an implicature associated with the fact that *ser* is a-temporal and *estar* is temporal in that it asserts that a state holds at some time *t*. This amounts to saying that the two copulas can truthfully describe the same permanent situation and the same temporary situation (the latter will require modification by adverbials and aspectual operators). Interestingly, however, this approach does not treat the copulas as carrying the same amount of information. Rather it assumes that, while one copula has a constant interpretation, the other does not.

If Crain and Thornton's (1998) intuition that children make first the most falsifiable hypothesis, the overuse of *estar* reported by Sera (1992) and also by Schmitt et al. (2004) may be predicted. After all, a statement using *estar* asserts that a certain property holds at some time *t* and therefore is more falsifiable than a generic statement. Pushing this line a bit further it is reasonable to assume that it is easier to grasp the subevent type of a copula when its subevent property is constant than when the subevent type is the result of a default interpretation (stative) or the work of adverbials (inchoative, for example) and aspectual operators.

Under this approach, the difficulty is to learn the differences between the two copulas and the conditions under which each copula is to be preferred. This requires the child to establish the temporal slice that is relevant at a particular point in the discourse. To make this point clear, let us go back to the story above. There is a boy that is chubby throughout the story and a boy that is chubby in a subset of the run time of the story. If we ask in English which boy is fat without pointing to any particular picture, speakers will choose the permanently fat boy because the temporal domain is assumed to be the whole story. However, if I point to the picture depicting the tmp to the grandmother, the question is somewhat infelicitous because both boys are chubby in the picture and 'which boy' presupposes that there is only a single boy. With *ser* and *estar* in a similar question, the answer will also depend on whether children are taking the whole story into consideration or only a particular picture, which corresponds to a particular temporal slice of the story. If we only consider the temporal slice corresponding to the spell picture, we are restricting the domain of evaluation to a much smaller set. In this case one can safely say that in that picture both boys appear fat (and therefore *estar* is felicitous for both). Furthermore, we can also use *ser* for describing both boys. We say that one boy became fat (using *ser* plus a hidden adverb that forces an inchoative reading), while the other is permanently fat (*ser* fat).

Krämer (2000, 2005) based on a series of experiments involving definites and specific indefinites, argues that children have difficulty determining the domain of reference, which is a subset of what can be considered the common ground. There are many potential ways of

restricting the domain of reference. For example, in cases of anaphora, for the adult, the linguistic context usually overrides other non-linguistic contexts. Various experiments have supported Krämer's hypothesis, in that children seem to have an easier time determining the domain of reference when helped by both linguistic and extra-linguistic cues (Miller and Schmitt, 2003; Munn et al., 2005).

As the proposal we are adopting makes clear, *estar* forces the speaker to pick an interval at which a property holds. Choosing the appropriate interval requires the speaker to restrict the potential relevant intervals in the common ground. For the child to use *estar* in an adult-manner, he/she must choose the same interval as the adult as the relevant interval in which the property holds. That means tracking the discourse and its constant shifts in terms of what is the relevant time to evaluate the assertion.

Under this proposal, a reasonable trajectory for the acquisition of *ser* and *estar* is to first learn the rough distribution of the two copulas and assume they do not have the same semantics. Then the subtle differences between the two copulas can be mastered in roughly the following way: the semantic properties of *estar* will be mastered before *ser*, given the assumption that *estar* has a more constant meaning. Once the meaning of each copula is mastered, the implicatures for both can be calculated. It may be easier to calculate implicatures associated with *estar*, since it has a constant meaning. Knowing the implicatures associated with both copulas is still not enough to guarantee adult behavior. It is also necessary to learn how to restrict the temporal domain in the way adults do. And that may be the most difficult part of the whole process. If, however, the child can appeal to familiarity, i.e., their knowledge of which property holds indefinitely and contrast with some competing property, they may not need to track the discourse. In this case we predict a much better performance.

5. Experiments

As usual, with respect to experiments, the linguistic analysis is much more sophisticated than the acquisition investigative tools. The experiments we present in this paper are set up to determine whether children can choose between the two copulas in contexts where both are logically possible. The contexts explore the intuitive notion of permanent/temporary properties. In the first experiment, the child is familiar with one property as permanent and the other as temporary for that object. In the second experiment, the child has to take into consideration pictures and stories that have a more complex time line.

5.1. Experiment 1

Experiment 1 asks the same question as Schmitt et al. (2004) but avoids some of its problems. Its goal was to test child comprehension of *ser* and *estar* when both copulas are acceptable with the selected adjectives but the context/knowledge of the world does not allow both copulas to be associated to the same property. One such context is the context where different color terms can be used. Because physical attributes involving color (e.g. tongue color, skin color, eye color) are salient to children and generally stable over different stages of one's life (e.g. unlike hair length, body weight and height), we assumed that children would be familiar with such characteristics and treat them as inherent properties of the individual. On the other hand, we assumed that children would view any modifications in color as temporary, as holding only at the time of the story. We expect that in this case, children should be able to distinguish *ser* versus *estar*, basically as adults do.

5.1.1. Participants

Thirty-five 4;5–6;3 (mean age: 5;3) year old monolingual Spanish-speaking children participated in this experiment. All children were recruited from preschools in Mexico City and Punta Arenas, Chile. In addition, 24 monolingual Spanish-speaking undergraduate adults from the *Universidad de Magallanes*, in Punta Arenas, Chile were tested on the same task.

5.1.2. Method and materials

We tested children's comprehension of the copulas *ser* and *estar* through an elicitation task. Children were shown pictures of people with body parts that exhibited permanent and temporary colors (e.g. red tongue versus green tongue), as in Fig. 1, and were asked to complete sentences about the characters in the pictures, as in (14a) and (14b). Importantly, all pictures shown to children were in color and in all cases, children could see the permanent color (e.g. redness of tongue) under the temporary color (e.g. green coloring on the tongue).

(14)   Este es Manolo. Su lengua se puso verde por que estaba tomando este jugo de kiwi, pero el tiene la lengua roja.
        This is Manolo. His tongue turned green because he was drinking this kiwi juice but he has a red tongue (picture of a red tongue with green shading on the top of it).

      a.   La lengua de Manolo es _____.   *ser*
           "Manolo's tongue is _____."

      b.   La lengua de Manolo está _____.   *estar*
           "Manolo's tongue is _____."

All target sentences contained either the copula *ser* or *estar*. We were interested in whether children would choose one color over the other (e.g. green or red) depending on the copula they heard. Given the picture and context in Fig. 1, the expected adult response for (14a) was "*rojo*" ('red') and for (14b) was "*verde*" ('green').

All children were tested individually in a quiet classroom. A between subjects design was used so that half of the Mexican and Chilean children and adults were tested on sentences as in (14a) and the other half on sentences as in (14b).[3] In addition, both groups of children were tested on four controls (two with *ser* and two with *estar*). All experimental sentences are shown in Table 1 in the order they were presented. It is important to note that, although this is an elicitation task, children must interpret the implicatures associated to the *ser/estar* distinction in order to perform perfectly because the completion of the sentence did not involve children having to use any of the copulas. They had to interpret the copula in order to provide the answer. While target sentences involved choosing between a temporary and permanent color (e.g. red tongue or green tongue), for the control sentences there was only one available property in the story from which to choose and hence we expected that children should behave like adults in the control condition.

5.1.3. Results

As predicted, adults and children performed the same on controls, providing the correct response in both the *ser* and *estar* control conditions 100% of the time. In addition, as predicted, adults almost always chose the permanent color (e.g. red) in the *ser* condition (94% of the time)

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[3] A between subjects design was used because we wanted to avoid using both copulas in the same experiment so that one would not influence the other.

Fig. 1. Experiment 1: sample target picture and story.

and the temporary color (e.g. green) in the *estar* condition (100% of the time). This pattern was also found for children. Children chose the permanent color in the *ser* condition 82% of the time and the temporary color in the *estar* condition 84% of the time. Independent samples *t*-tests did not reveal a significant difference between children and adults in the *ser* condition ($t(1,28) = -1.318$, $p = .198$) but did reveal a significant difference between children and adults in the *estar* condition ($t(1,27) = -3.176$, $p < .01$). Given that in the experimental task there were two possible colors to choose from, scores were compared to chance behavior (50% equals chance). Although children did not reach adult levels in the *estar* condition, a one sample *t*-test revealed that both adults and children chose the predicted color in the *ser* (adults: ($t(1,11) = 9.753$, $p < .001$); children: ($t(1,17) = 4.808$, $p < .001$)) and *estar* (adults: ($p < .001$; children: ($t(1,16) = 7.948$, $p < .001$)) conditions significantly more often than chance.

5.1.4. Discussion

The findings of Experiment 1 indicate that by 4;5 years of age, Spanish-speaking children treat the copulas *ser* versus *estar* differently. Importantly, in this task it seems that children are calculating the implicatures associated with the distinction. If they were not able to do that, we should find either a strong bias towards the permanent property (assuming Sera et al.'s (1997) analysis of her results is correct) or chance behavior at least for the *estar* condition, since in the picture, the tongue can be described as red and green at time *t*. The fact that we do not find a bias towards the permanent property nor do we find chance behavior is compatible with the idea that the children are calculating the implicatures associated with the two copulas. One important fact about this particular task is that the children do not necessarily need to rely on choosing the right interval within the story to perform well because knowledge of the world will suffice to determine which is the a-temporal and which is the temporally anchored property. We assume that by 4;5 years of age (and actually much earlier), children understand that body parts (at least those used in this task) have an inherent color and that any modification to that color would be temporary. For this reason, the children in this task only need to rely on the semantic information associated with the copula in order to choose the appropriate color. If they know that *ser* does not provide temporal information, they will associate it to the permanent property. If they know that *estar*

Table 1
Experiment 1 experimental sentences

Practice 1	El gato esta cansado[a] The cat is:estar tired 'The cat is tired.'
Practice 2	El vestido de la niña es … azul The dress of the girl is:ser blue ''The girl's dress is blue.'
Target 1	La cara de Pedro es *cafe*/ La cara de Pedro está *roja* The face of Pedro is:ser brown/ The face of Pedro is:estar red 'Pedro's face is brown/ red.'
Control 1	Maria está triste Maria is:estar sad 'Maria is sad.'
Target 2	Los dientes de Pamela son *blancos*/están *verdes* The teeth of Pamela are:ser white/ are:estar green 'Pamela's teeth are white/green.'
Control 2	Sofía es alta Sofia is:ser tall 'Sofia is tall.'
Target 3	Los ojos de Jorge son *azules*/ están *rojos* The eyes of Jorge are:ser blue/ are:estar red 'Jorge's eyes are blue/ red.'
Control 3	Carolina está felíz Carolina is:estar happy 'Carolina is happy.'
Target 4	La lengua de Manolo es *rojo*/ está *verde* The tongue of Manolo is:ser red/ is:estar green 'Manolo's tongue is red/ green.'
Control 4	Javiera es baja Javiera is:ser short 'Javier is short.'

[a] Words in italics are expected adult responses.

needs to be temporally anchored the temporary property is the best choice. Interestingly, with respect to *estar*, they are significantly different from the adults, which means that they are allowing *estar* with the permanent property more than the adults. Perhaps this is to be explained by children's refusal to treat green as a property of teeth (as Sera's results suggest). Note that, while a stage-level versus individual-level analysis of the copulas may assume that children are allowing false statements or have a different analysis of *ser* and *estar* than the adults, it may be that children are just not calculating the implicatures as efficiently as the adults, which would explain the error rate. Overall, however, children do treat *ser* and *estar* differently and the results approach adult levels.

5.2. Experiment 2

Experiment 1 showed that children seem to know what to do when they have to make a choice based on *ser* and *estar*, at least when the contrast is between inherent and temporary colors of

body parts. Our results were compatible with the idea that they can calculate the implicatures associated with them at least most of the time. The goal of Experiment 2 was to test children's ability to make use of discourse information in their interpretation of *ser* versus *estar*.

One way to test whether children can use discourse information in their interpretation of the two copulas is by using a context where a particular property does not remain stable over the course of the discourse, for example, a context where a character undergoes some physical transformation (e.g. grows taller, becomes fatter) for a brief period of time. In this context, children must make an assumption about the inherent properties of the character as well as associate the temporary property with the relevant time slice in the discourse. Based on Krämer (2000), we predict that integrating discourse in order to interpret *ser* versus *estar* will be more difficult for children.

5.2.1. Participants

Twenty-four 4;7–6;0 (mean age: 5;5) year old Spanish-speaking children participated in this experiment. All children were recruited from preschools in Punta Arenas, Chile. In addition, 20 monolingual Spanish-speaking undergraduate adults from the *Universidad de Magallanes*, in Punta Arenas, Chile were tested on the same task.

5.2.2. Method and materials

Children were tested on their comprehension of *ser* versus *estar* in a picture matching task. They were presented with short stories about characters who had eaten magic beans and subsequently changed size or height for a short period of time, as in Fig. 2. Stories were presented on three picture cards. After the story, the child was asked a question involving
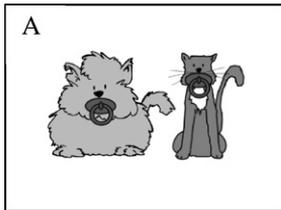
A Mira. Este gato nació gordo y este gato nació flaco.
'Look. This cat was born fat and this cat was born skinny'.
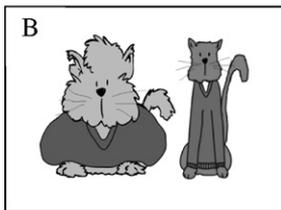
B Y ahora de grande y todavía gordo y flaco. Pero mira que pasa cuando comen estos porotos mágicos.
'Now they are older and still fat and skinny. But, look what happens when they eat these magic beans'.

C Este se pone verde y este se pone gordo. Pero, solo por unos minutos y después se vuelven a quedar como antes.
'This one turns green and this one gets fat. Only for couple of seconds and then they go back to the way they were before.'

Fig. 2. Experiment 2: sample target pictures and story.

either *ser* or *estar*, as in (15a) and (15b). All pictures were shown in color and, although the character could not portray both the original property and the new temporary property at the same time (e.g. the character could not be both thin and fat at the same time in the picture), characters who had undergone some physical transformation were always portrayed wearing clothing that no longer fit properly (e.g. a fat cat wearing a stretched out and torn sweater) so that subjects would be reminded of the original property of the character. In addition, while children were asked to point to the appropriate character in picture card C, both picture card B and C (but not A) were available to the children as they listened to the experimental question.

(15) a.   ¿Cuál gato está   gordo?   *estar* CONDITION
            Which cat *estar*-PRES.3SG*estarestar* fat
            'Which cat is fat?'
      b.   ¿Cuál gato es   gordo?   *ser* CONDITION
            Which cat *ser*-PRES.3SGSER fat
            'Which cat is fat?'

Given the picture and context in Fig. 2, the expected adult response for the *estar* condition (15a) was the cat on the right (i.e. the cat that had grown fat after eating the beans) and for the *ser* condition (15b), the cat on the left (i.e. the cat that was originally fat).

However, it is important to note that, unlike Experiment 1, the expected adult responses in Experiment 2 will only demonstrate preference as both cats in Picture Card C are logically possible answers to (15a) and with coercion both cats in Picture Card C can be answers for (15b). For questions involving *estar* in (15a), although we expect adults to prefer the cat on the right, it is possible to choose the cat on the left given that if a cat is inherently fat, he is also fat in picture C at the time the question in (15a) was presented. For the question involving *ser* in (15b), although we expect adults to prefer the cat on the left, it is also possible to choose the cat on the right, if one interprets the questions as having a hidden temporal adverb such as 'now', which will force an inchoative reading.

All children were tested individually in a quiet classroom. A between-subjects design was used. One half of the children and adults were tested on four target sentences with *estar* like those in (15a) while the other half were tested on four target sentences with *ser* like those in (15b). In addition, there were eight fillers. All target experimental sentences are shown in Table 2. Again the idea was to not have the two copulas presented to the same subject at the same time.

5.2.3. Results

There were three possible responses that children and adults could provide given the target questions: they could choose (1) the cat on the left (e.g. PERM CAT: cat who was originally fat), (2) the cat on the right (e.g. TEMP CAT: cat who had grown fat after eating the magic beans), or (3) both cats. Only the children responded by choosing both cats and they only did so in the *ser* condition, not in the *estar* condition.

In the *ser* condition, adults chose the PERM CAT 95% of the time, as expected; however, in the *estar* condition they only chose the TEMP CAT 50% of the time. Adults chose the PERM CAT in the *estar* condition 50% of the time. However, this pattern was not found for children. In the *ser* condition children chose the PERM CAT only 42% of the time. Instead, they chose the TEMP CAT 35% of the time and both cats 23% of the time. In the *estar* condition, children chose the TEMP CAT 77% of the time and the PERM CAT 23% of the time. The results are shown in Fig. 3.

Table 2
Experiment 2 experimental sentences

Target 1	¿Cuál gato está/ es gordo?
	Which cat is:estar/ is:ser fat
	"Which cat is fat?"
Target 2	¿Cuál perro está/ es flaco?
	Which dog is:estar/ is:ser thin
	"Which dog is thin?"
Target 3	¿Cuál hombre está/ es alto?
	Which man is:estar/ is:ser tall
	"Which man is tall?"
Target 4	¿Cuál mujer está/ es baja?
	Which woman is:estar/ is:ser short
	"Which woman is short?"

Independent samples t-tests did not reveal a significant difference between children and adults in the *estar* condition ($t(1,20) = 1.814$, $p = .085$) but did reveal a significant difference between children and adults in the *ser* condition ($t(1,20) = -5.213$, $p < .001$). Given that there were three possible responses, scores were compared to chance behavior (33% equals chance). Although children did not differ significantly from adults in the *estar* condition, a one sample t-test revealed that adults ($t(1,9) = 1.416$, $p = .190$) did not behave significantly different from chance in the *estar* condition, while children did ($t(1,11) = 4.982$, $p < .001$). In the *ser* condition we find the exact opposite pattern. A one sample t-test revealed that adults ($t(1,9) = 18.750$, $p < .001$) behaved significantly different from chance, while children did not ($t(1,9) = 1.032$, $p = .324$). If chance level is to be considered 50% under the reasoning that there are only two cats in the picture, the results are still the same for the *estar* condition: adults ($t(1,9) = 00$, $p = 1.0$); children: ($t(1,11) = 3.206$, $p < .05$) and the *ser* condition: adults ($t(1,9) = 13.500$, $p < .001$); children: ($t(1,11) = -.938$, $p = .368$).
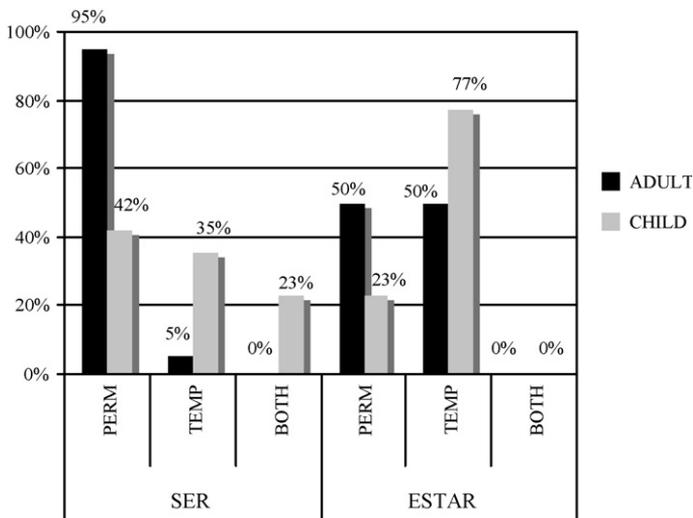

Fig. 3. Experiment 2: % of response types for *ser* and *estar* conditions.

Table 3
Results by item in Experiment 2

ESTAR	% TEMP interpretation (cat on the right)		SER	% PERM interpretation (cat on the left)	
	Children	Adults		Children	Adults
GORDO 'fat'	83 (10/12)	50 (5/10)	GORDO	25 (3/12)	90 (9/10)
FLACO 'thin'	83 (10/12)	30 (3/10)	FLACO	67 (8/12)	90 (9/10)
ALTO 'tall'	75 (9/12)	50 (5/10)	ALTO	25 (3/12)	100 (10/10)
BAJO 'short'	67 (8/12)	70 (7/10)	BAJO	50 (6/12)	100 (10/10)

The results broken down by items are presented in Table 3.

The percentages above should be interpreted with caution given that the N for each item is quite low. An item-analysis of the *estar* experiment for children showed that internal consistency was acceptable (Cronbach α = .68) with all four items contributing reliably to this measure (α if item deleted range = .53–.69). For adults the item analysis in the *estar* experiment also revealed that consistency was acceptable (Cronbach α = .78). For children in the *ser* experiment, internal consistency was low (Cronbach α = .52), *ser* (α if item deleted range: .17 (*ser gordo*), .36 (*ser flaco*), .58 (*ser alto*), .58 (*ser bajo*). Adults were at ceiling in the *ser* experiment.[4] These alpha values should be interpreted with caution given that there were only four trials per experiment.

5.2.4. Discussion

The results of Experiment 2 showed that adults and children patterned completely differently in their interpretation of the two copulas. While adults were consistent in their interpretation of *ser*, preferring the PERM cat, children were not consistent. On the other hand, while children were fairly consistent in their interpretation of *estar*, preferring the TEMP cat, the adults were not consistent. These findings are very interesting and somewhat unexpected given the results from Experiment 1. In the *ser* conditions, adults seem to consider the whole story and choose the cat that maintained the property throughout the story. In the *estar* conditions, on the other hand, they seem to interpret the question as about the situation in the temporal slice associated to the magic beans spell. Children, on the other hand, in the *estar* conditions seem to consider the whole story and are calculating the implicatures associated to the *estar* predications. In fact, they are consistently above chance. As for the *ser* conditions, here children seem to behave at chance. They seem to allow more readings than the adults. In other words, children seem to understand the temporal nature of *estar* and are very restrictive in its use; (2) children understand that *ser* is unspecified and are not restrictive in its use, regardless of context and (3) adults behave more consistently in the *ser* conditions and treat the *estar* questions as questions about a particular picture.

It is hard to argue that children do not understand at all the implicatures associated to *ser* and *estar* given their behavior in the *estar* conditions. If they could not calculate the implicatures or were treating the question as not about the whole story but just a particular temporal slice, they should have behaved as the adults did.

However, when we think of the results in terms of domain restriction, we can understand them as related to the different choices in terms of the temporal domain.

Probably the most interesting finding of Experiment 2 is that children are fairly restrictive in their use of *estar* while adults are not. Instead, adults allowed *estar* to describe both cats in the

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[4] We thank the reviewers for suggesting an item analysis.

picture. More specifically, of the 10 adults tested on *estar*, 3 always chose the PERM cat, 2 always chose the TEMP cat, and 5 chose the PERM cat and the TEMP cat both about half the time. While the adults use *estar* sometimes as picking different relevant time intervals in which a cat with property P appears in the picture, children seem to prefer to use *estar* for the cat that underwent a transformation acquiring the property in question, which is consistent with the idea that they are taking into consideration the whole story, again suggesting that children understand the aspectual information associated with this copula. When asked about which cat *ser* P, the child had to examine a character that did not undergo the change in question and it had to evaluate what was known about it. In this case, the child could go back to the story and examine the other cat or keep thinking of the changed cat (in terms of the fat/thin parameter etc.) and interpret *ser* + predicate as inchoative (became P). The adults, on the other hand, can perhaps more easily switch to the other cat, make use of the implicatures associated with the choice, and prefer the permanent cat.

5.3. Final remarks

In acquiring the fine-grained interpretive properties of the copulas *ser* and *estar*, children not only need to master their basic distribution and assume that they are semantically distinct, but they also need to learn how to choose the appropriate copula in contexts where they can be used to describe the same situation truthfully. As discussed in section 1, this means learning the pragmatic implicatures associated to each copula and determining the interval in which the property is being evaluated. These are clearly not easy tasks.

The experiments presented in this paper are not easily comparable. While Experiment 1 is an elicitation task, Experiment 2 is a question–answer, which perhaps would be better treated as a comprehension experiment. One could argue that the different results are associated with the well-known production–comprehension asymmetries and perhaps could be better analyzed in an OT framework, as in Hendriks and Spenader (2005/2006) and de Villiers et al. (2006). However, we do not believe that there really is a production–comprehension asymmetry in our experiments. Both involve interpreting the copulas and none of the experiments actually elicits the copulas. For this reason, we reject the idea that the explanation for the differences in the behavior in the experiments is to be treated as a difference between production and comprehension. Rather we would like to claim that the difference in the results comes from a difference in their complexity. While Experiment 1 may allow the subjects to rely purely on their world knowledge and knowledge of the copulas and their implicatures, Experiment 2 requires subjects to track two characters, and a changing and a non-changing property. Although the experiments are not easily comparable, they allow us to make two claims: first, if the child can rely on their world knowledge instead of having to choose a relevant time interval, they can behave almost in an adult-like manner and seem to be able to calculate the implicatures associated with the copula choice at least 80% of the time. If they could not calculate the implicatures at all, we do not believe we would find the results we did. Second, as the context becomes more complex children seem to demonstrate the knowledge that, while *ser* is a copula that can be used in any context with the help of adverbials, *estar* does seem to require a temporal interpretation and a particular time slice. Unlike adults however, who oscillate between using *estar* to describe a picture and/or to describe the temporary state of one of the cats, children mainly choose *estar* for the temporary state of one of the cats, which is compatible with their paying attention to the changed cat. These facts together with the previous findings of overuse of *estar*, suggest that children do not take the same path while acquiring the two copulas. The results are consistent with *estar* as being a more stable copula in terms of meaning when compared with *ser*.

Needless to say, many more experiments must be done before we can actually trace the developmental path in the acquisition of *ser* and *estar*.

In this paper, we hope to have made clear that the issue is worth investigating from the first language acquisition perspective because it touches two important larger issues: first, the issue of how children integrate the discourse/restrict the domain of reference. The second issue is how children acquire the appropriate usage of elements that are almost devoid of semantic content. In the case of the copulas, when there is only one copula, this does not seem so problematic, but when there are more than one (a common feature of many languages), it is not clear how children exactly acquire the knowledge that the copulas can overlap but that pragmatics forces adults in some contexts to treat the two as in complementary distribution (Experiment 1) but not in others (Experiment 2).

Disclosure

Furthermore, we hope to have shown that an analysis that does not appeal to the temporary/permanent distinction directly and does not make use of the state-level versus individual-level distinction as part of the semantics of these copulas is to be preferred.

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