Person and Number Asymmetries in the Acquisition of Spanish Agreement and Object Clitics

Hannah Forsythe

Spanish verb inflection carries number and person information and object clitics carry person, number, and gender information. Children acquiring Spanish must therefore learn to use this information to retrieve the antecedent.

	Spanish present-tense agreement		Spanish object clitics	
	singular	plural	singular	plural
1st person	-o	-mos	me	nos
2nd person	-s	--[1]	te	--
3rd person	Ø	-n	lo (masc)	los (masc)
			la (fem)	las (fem)

Children acquiring languages with rich verbal morphology generally produce highly accurate verbal inflection from very early on (Phillips 1995), and Spanish is no exception (Bel & Rosado 2009). However, evidence that children can interpret these person and number cues is mixed. The age at which children successfully use agreement in comprehension tasks varies by language, by task and also by form. For example, Dominican and Mexican Spanish-speaking children show greater sensitivity to 3rd person plural marker /-n/ than to the zero-marked 3rd person singular (Pérez-Leroux 2005, Legendre et al 2014), and Mexican and Chilean children show greater sensitivity to the 2nd person singular marker /-s/ than to either of the 3rd person forms (Miller & Schmitt 2014, experiment 3). These asymmetries are summarized below, where > indicates greater sensitivity:

(1) 2S /-s/ > 3P /-n/ > 3S ø

Michigan State University, forsyt40@msu.edu. Many thanks to the teachers, children, and administrators at SEDI, Mexico City, in particular Patricia de la Fuente and Beti López Juárez. Thanks to Antoinette Hawayek and Camila Alfonso for help with adults participants. Thanks to Cristina Schmitt, Alan Munn, Jessica Gamache, Ni La Le, and the rest of the MSU language acquisition lab for insightful feedback.

[1] Latin American varieties of Spanish, including Mexican Spanish, examined here, does not employ a separate inflection or object clitic for 2nd person plural. Instead, the 3rd person plural form is used. Additionally, the formal 2nd person singular agreement and clitics are syncretic with 3rd person singular forms. These forms are not tested here.

To our knowledge, no study has ever examined child comprehension of all five Spanish agreement forms together. The first goal, therefore, is to simply test children's comprehension all five agreement forms, as well as five of the clitic forms (masculine object clitics are not tested here), to see what asymmetries arise. Next, we ask whether these comprehension asymmetries are due to children's difficulty interpreting semantically underspecified forms.

1. The role of Implicated Presuppositions in comprehension asymmetries

Sauerland (2008a, 2008b) proposes that the 3rd person and the plural are semantically underspecified and are interpreted by contrast with their more specified counterparts. For example, since 1st and 2nd person explicitly presuppose the features [+speaker] and [+hearer] of their referent, and since adults generally assume that speakers presuppose as much as possible, use of a 3rd person form implies that the presuppositions of the 1st and 2nd person do not hold. This generates what is called an Implicated Presupposition, namely, the presupposition that the 3rd person picks out a [-speaker], [-hearer] referent. In a similar fashion, use of the underspecified plural contrasts with the singular—which presupposes a referent of cardinality 1—generating the Implicated Presupposition that the referent has cardinality >1.

Evidence from child acquisition of French subject clitics suggests that children aged 30 months have difficulty interpreting semantically underspecified person and number features (Legendre et al 2011). In the task, the child, her interlocutor, and a third person each pretended to fish for different animals. The child was then asked to identify which animal each person was fishing for, using subject clitics to identify each person; in a second round the same task was repeated with plural subject clitics. Children performed better in 1st and 2nd person relative to 3rd person conditions, and in singular relative to plural conditions. Most errors consisted of providing singular responses to plural prompts or 1st and 2nd person responses to 3rd person prompts. Legendre et al claim that these children struggled to calculate Implicated Presuppositions and therefore did not realize that 3rd person clitics did not refer to the speaker or hearer, or that plurals did not refer to singular referents. One reason to be cautious is that no adults were tested. Before making this claim it would be beneficial to confirm that adults reliably calculate the Implicated Presuppositions associated to the plural and 3rd person forms tested in this task.

The current study examines child and adult comprehension of Spanish subject-verb agreement and object clitics, which encode the same person and number features as French subject clitics, examining to what extent developmental asymmetries within these paradigms are due to children's difficulty with Implicated Presuppositions. We hypothesize that children initially struggle to calculate Implicated Presuppositions, leading to better comprehension of 1st and 2nd person agreement and clitics relative to 3rd person, as well as better comprehension of singulars relative to plurals.

2. Methods

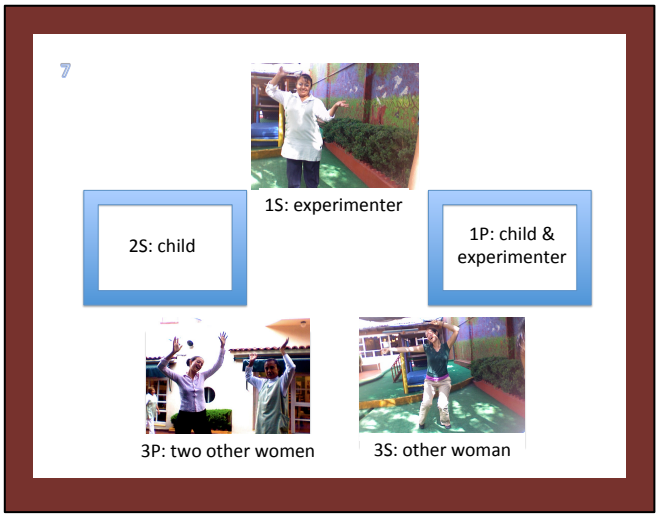
2.1. Participants

Participants were 46 children from a daycare in Mexico City, Mexico divided evenly into a younger group ages 2;3-4;3 6;7 (mean 3;4) and an older group ages 4;3-6;7 (mean 5;2.9), 9 adults (6 women) recruited from among the teachers and administrators at the daycare, and 14 adults (6 women) recruited from the Michigan State University community. All participants were born and raised in Mexico, with Spanish as their first language. Children received stickers and a piece of candy, adults in Mexico were not compensated, and adults in the U.S. received $15 for their participation.

2.2. Design and Materials

A picture-selection task consisting of 30 test items in two blocks (15 agreement, 15 clitic), with 14 fillers and 14 distractors was used. Participants selected one photo from an array of five in which actors performed some action, such as dancing, jumping or being kissed by a puppet (see figure 1). Each actor or group of actors corresponded to one of the five grammatical person/number combinations in Spanish (the participant, the experimenter, the participant and experimenter together, another woman, and two other women).

Figure 1: example array for a test item



For test items, illustrated in (1)-(2), all actors were depicted performing the same action, and therefore participants had to identify the target photo based on

the person and number features of the agreement affix or clitic. 3rd person clitics also carry gender features, but only the feminine forms were tested.

(1) Muéstrame la foto en donde salta**mos/o/s/n/Ø**
Show-me the photo in which jump-1P/1S/2S/3P/3S

(2) Muéstrame la foto en donde Nemo está besándo**nos/me/te/las/la**
Show-me the photo in which Nemo is kissing-1P/1S/2S/3P/3S

For filler items, illustrated in (3)-(4), each actor was depicted performing a different action and therefore subjects could identify the target photo based on the verb. An additional two fillers in each block required subjects to select the actor depicted *sentado* ('seated') or *acostado* ('lying down'), as in (5). For distractor items, subjects were asked to choose which of two cartoon characters had more of some object or substance.

(3) Muéstrame la foto en donde hay alguien saltando/bailando/etc…
Show-me the photo in which there-is someone jumping/dancing/etc…

(4) Muéstrame la foto en donde Nemo está besando/peinando/etc… a alguien
Show-me the photo in which Nemo is kissing/combing/etc… someone

(5) Muéstrame la foto en donde hay alguien parado/sentado.
Show-me the photo in which there-is someone standing/lying down.

Agreement and clitics were tested in separate blocks, with agreement always first. Each test item was followed by either a filler item or a distractor item, in alternating order. Filler items were re-ordered after every other subject to mitigate the possibility that any particular ordering of fillers would unfairly affect certain test items over others. The location of the target picture was randomized, and subjects were split between two different versions of the task, each with a different random ordering of test items and distractors.

2.3. Procedure

Photos of the participant and other actors were taken during a short, 15-minute session, and testing occurred in an approximately 15-minute session held no more than one week later. Before testing, the subject was asked to identify the puppet and each of the actors by name, and any errors were corrected.

Halfway through each block, there was a short break in which the child was given a sticker. After the task was complete, child subjects received a piece of candy and adult subjects were debriefed and/or given compensation.

2.4. Coding of responses

Responses were recorded on a sheet of paper by the author and then transferred to a spreadsheet for coding. Any photo containing the target actor was considered a target response, regardless of whether it also included another actor as well. This means that in singular conditions, two target responses were possible.

3. Results

Adult and child responses in each block are reported in Figure 2. The first thing to note is that accuracy in 3rd person conditions is quite low, not just for children but also for adults. We will discuss this in more detail shortly. In 1st and 2nd person conditions, adult accuracy was basically at ceiling (91% and above) and child accuracy was also quite high (69% and above).

Figure 2a: response frequencies (target answers in shaded cells)

Adults	**agreement**					**clitics**				
	1S	**1P**	**2S**	**3S**	**3P**	**1S**	**1P**	**2S**	**3S**	**3P**
investigator	56	0	1	14	1	67	0	0	19	1
inv & self	7	66	3	5	26	1	68	6	0	14
self	2	0	64	17	0	1	0	63	5	0
other woman	4	0	0	30	3	0	0	0	44	0
two women	0	3	1	3	38	0	1	0	1	54
other	0	0	0	0	1	0	0	0	0	0
no answer	0	0	0	0	0	0	0	0	0	0
accuracy	0.91	0.96	0.97	0.48	0.55	0.99	0.99	1.00	0.65	0.78
(SD)	(0.22)	(0.15)	(0.13)	(0.37)	(0.27)	(0.06)	(0.06)	(0)	(0.35)	(0.31)

Children	**agreement**					**clitics**				
	1S	**1P**	**2S**	**3S**	**3P**	**1S**	**1P**	**2S**	**3S**	**3P**
investigator	57	9	2	15	12	88	11	5	29	6
inv & self	54	86	31	33	44	23	90	39	9	40
self	6	14	88	39	34	4	14	77	28	22
other woman	3	1	2	20	13	3	4	0	48	8
two women	5	15	3	17	21	8	6	5	11	49
other	1	0	0	0	2	0	0	0	1	1
no answer	0	1	0	2	0	0	1	0	0	0
accuracy	0.88	0.69	0.94	0.30	0.17	0.88	0.72	0.92	0.47	0.39
(SD)	(0.19)	(0.30)	(0.12)	(0.34)	(0.22)	(0.19)	(0.31)	(0.17)	(0.37)	(0.38)

3.1. Person asymmetries

Our hypothesis predicts that children learn to associate 1st and 2nd person forms with the speaker and the hearer earlier than they learn to associate 3rd person forms with referents other than the speaker or hearer. Adults of course should be equally adept at both. Chi-squared tests on child responses revealed that the proportion of 1st and 2nd person responses given in 1st and 2nd person conditions was significantly higher than the proportion of 3rd person responses given in 3rd person conditions, for both the younger half of children (n = 21, ages: 2;3-4;3; Agreement: $\chi^2(1)=163.38$, $p < 0.001$, Clitics: $\chi^2(1)=100.22$, $p < 0.001$) and the older half of children (n = 21, ages: 4;4-6;7; Agreement: $\chi^2(1)=108.18$, $p < 0.001$, Clitics: $\chi^2(1)=69.13$, $p < 0.001$). However, contrary to expectations, adults produced many 1st and 2nd person responses in 3rd person conditions. Chi-squared test on adult responses revealed the same asymmetry between 1st and 2nd relative to 3rd person forms (Agreement: $\chi^2(1) = 86.74$, $p < 0.001$, Clitics: $\chi^2(1)=59.65$, $p < 0.001$). This indicates that both adults and children allow photos of themselves or their interlocutor to be referred to in the 3rd person, but they do not as readily allow a photo of another person to be referred to in the 1st or 2nd person.

Since adults are presumably perfectly able to calculate Implicated Presuppositions, there must be some other reason that they apparently fail to do so in this experimental situation. We return to this in more detail in section 3.3. For the moment, regardless of the reason for this behavior, it is shared by both children *and* adults, and therefore we have no evidence that children experience any difficulty calculating the Implicated Presupposition associated with the 3rd person.

3.2. Number asymmetries

Our hypothesis predicts that children learn to associate singular forms with singular referents earlier than they learn to associate plural forms with non-singular referents. Nevertheless, a plural response in a singular condition was considered correct in our coding protocol because a plural photo contains two singular referents. Thus, the level of number accuracy was higher for singular than for conditions. Instead of comparing level of accuracy across conditions, we compared level of sensitivity, following Johnson et al (2005)[2]. This measure was designed to detect child sensitivity to inflectional markers in situations where there might be an overall bias towards one type of response over another (ex. towards choosing plural photos).

Sensitivity was compared to chance (0.6 for singular conditions, 0.4 for plural conditions) using two-tailed t-tests. For adults and for older children,

[2] Sensitivity is equal to the number of singular (or plural) responses given in singular (or plural) conditions, divided by the total number of singular (or plural) responses given in *all* conditions.

sensitivity was above chance in all conditions. For younger children, sensitivity was above chance in singular and plural clitic conditions, as well as in the plural agreement condition, but it was only marginally above chance in the singular agreement condition ($t(20) = 1.73$, $p = 0.09$). Thus, we have no evidence that children develop sensitivity to singulars sooner than to plurals; if anything, we have some slight evidence for the reverse.

However, participants' unexpected behavior in the 3rd person may have obscured the presence or direction of a number asymmetry within the 1st and 2nd persons. We therefore recalculated sensitivity to number marking separately for 1st and 2nd person conditions (see table 1) and for 3rd person conditions (see table 2). Interestingly, children showed asymmetries in both cases, but in the *opposite* direction. In 1st and 2nd person conditions, younger children showed above-chance sensitivity to singular (t(20)=3.14, $p < 0.01$) but not plural (t(20)=1.03, $p = 0.31$) number agreement, supporting our predictions. Sensitivity in all other 1st and 2nd person conditions was above chance (all $p < 0.05$). In contrast, in 3rd person conditions, older children showed sensitivity to plural (t(20)=3.38, $p = 0.003$) but not singular (t(20)=-0.28, $p = 0.78$) number agreement. Sensitivity was not above chance for younger children in either singular or plural 3rd person agreement conditions (both $p > 0.12$), but sensitivity was above chance for all 3rd person clitic conditions for both age groups (all $p < 0.05$.) Thus, it appears that within 1st and 2nd person, children develop sensitivity to singular number agreement before plural number agreement, in accordance with our hypothesis. This asymmetry runs in the opposite direction within the 3rd person, but this is more difficult to interpret given adults' unexpected behavior in the 3rd person condition.

Table 1: Sensitivity to number (out of 1) in 1st and 2nd person conditions

		agreement		clitics	
age group		**singulars**	**plurals**	**singulars**	**plurals**
	chance:	0.6	0.4	0.6	0.4
younger children (2;3-4;3)	mean	0.79**	0.44	0.82***	0.51*
	SD	0.16	0.14	0.14	0.24
older children (4;3-6;7)	mean	0.94***	0.62***	0.89***	0.61***
	SD	0.12	0.25	0.14	0.22

*Significantly different from chance at the $p < 0.05$ level.
**Significantly different from chance at the $p < 0.01$ level.
***Significantly different from chance at the $p < 0.001$ level.

Table 2: Sensitivity to number (out of 1) in 3rd person conditions

age group		agreement singulars	agreement plurals	clitics singulars	clitics plurals
	chance:	0.6	0.4	0.6	0.4
younger children (2;3-4;3)	mean	0.52	0.53	0.66*	0.75***
	SD	0.24	0.30	0.20	0.28
older children (4;3-6;7)	mean	0.59	0.60**	0.85***	0.87***
	SD	0.33	0.30	0.19	0.18

*Significantly different from chance at the $p < 0.05$ level.
**Significantly different from chance at the $p < 0.01$ level.
***Significantly different from chance at the $p < 0.001$ level.

3.3. Analysis of responses in the 3rd person

As noted above, adults frequently permit photos of the speaker and hearer to be referred to in the 3rd person, and therefore children's tendency to do the same cannot rightly be attributed to a non-adult-like difficulty with Implicated Presuppositions. Instead, there must be some other mechanism that explains this behavior, and we can ask whether children rely on the same mechanism.

An important difference between 3rd person on the one hand, and 1st and 2nd person on the other, is the way in which reference is achieved. While 1st and 2nd person refer directly to the speaker and hearer, 3rd person can refer either to a referent in the immediate physical context (deictic reference) or via an antecedent selected from the discourse (anaphoric reference). If the 3rd person form encodes grammatical features such as number and gender features, then the antecedent must be compatible with those features, and it must also be sufficiently prominent in context, where prominence may be defined in terms of cognitive availability (Gundel et al 1993) or discourse structure (Ariel 2001).

We hypothesize that adults' unexpected behavior in 3rd person conditions may be due to the fact that they allow a photo of themselves or the speaker to serve as the antecedent to a 3rd person null subject or object clitic. We expect this to happen most often for discourse-prominent photos, which in the context of our experiment is the photo that was selected in response to the immediately preceding filler question[3]. If this hypothesis is correct, and if children behave

[3] The prediction is less clear for items immediately preceded by a distractor, which depicts two cartoon characters, because neither of the cartoon characters was ever an available response choice. In this situation, participants could do one of three things: 1)

like adults, then we would expect all participants to choose the photo selected in the immediately preceding filler as the antecedent of a 3rd person form, so long as it has the right number and gender features.

Figure 3 shows the proportion of adult and child responses in 3rd person conditions that match the response given in the preceding filler question, depending on whether or not that response was compatible in number and/or gender with the particular 3rd person form being tested. For the agreement block, only number was relevant because agreement markers do not carry gender; however, for the clitic block both number and gender were relevant. For example, if the preceding filler response was the photo of the experimenter and the participant together, and if the form being tested was the 3rd plural feminine clitic *las*, then the photo would be compatible in number with the tested form, but it would only be compatible in gender for female participants. (Recall that all experimenters were female, so only the gender of the participant him/herself could influence gender compatibility.)

Figure 3 also shows the proportion of responses in 1st and 2nd person conditions that match the preceding filler response. Because 1st and 2nd person forms do not select an antecedent from the preceding discourse, matching of the preceding filler response in these conditions should be due to sheer coincidence. Indeed, the proportion of responses matching the preceding filler response in 1st and 2nd person conditions was not different from chance (20%) in either block for any age group (all $p > 0.12$). Therefore we use participants' proportion of matching responses in 1st and 2nd person conditions as a baseline against which to compare their proportion of matching responses in 3rd person conditions. All comparisons reported below are one-tailed t-tests.

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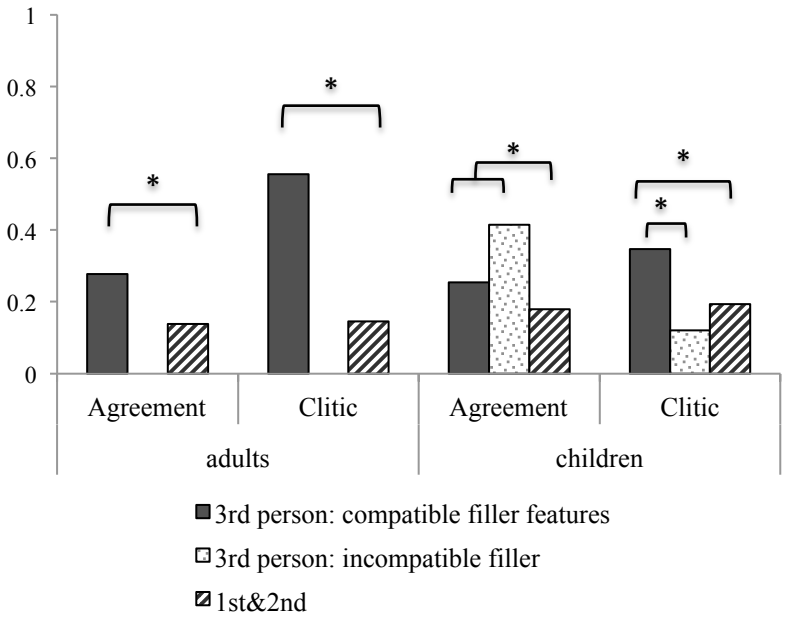
they could search even farther back in the discourse for an appropriate antecedent, selecting the photo from the preceding test item, provided it had compatible number and/or gender features; 2) they could allow the 3rd person null subject or clitic to refer deictically to one of the photos in the array, or 3) they could use metalinguistic reasoning to infer which photo the experimenter intended.

Figure 3: Proportion of responses matching the preceding filler response



For adult responses in the 3rd person condition, the proportion of responses matching the preceding filler response differed depending on whether or not the preceding response was compatible in number and/or gender with the form being tested. Only when the preceding filler response was compatible was the proportion of matching responses significantly higher than the rate of matching responses in 1st and 2nd person conditions (agreement: *M1* = 0.27, *M2* = 0.14, $t(78.46) = 1.79$, $p = 0.04$, clitics: *M1* = 0.55, *M2* = 0.15, $t(73.11) = 4.63$, $p < 0.001$). When the preceding filler response was incompatible in number and/or gender with the form being tested, adults never once chose this response. This indicates that adults use discourse salience in locating the antecedent of 3rd person null subjects and object clitics, provided this respects its grammatical features.

For child responses in the 3rd person condition, the proportion of responses matching the preceding filler response differed both by grammatical feature compatibility *and* block. In the clitic block, children showed the same pattern as adults: the proportion of responses matching the preceding filler response was higher in the 3rd person relative to 1st and 2nd person conditions, only when the preceding filler response was compatible in number and gender with the form being tested (*M1* = 0.36, *M2* = 0.19, $t(60.69) = 2.12$, $p = 0.02$). When the preceding filler response was incompatible with the form being tested, children did occasionally select this response, but they did so significantly less often than when the preceding filler response was compatible (*M1:compatible* = 0.36,

M2:incompatible = 0.13, $t(72.87) = 2.78$, $p = 0.003$). In the clitic block, therefore, we have evidence that children, like adults, are sensitive to both grammatical features and discourse salience when locating the antecedent of a 3rd person object clitic.

In the agreement block, the effect of feature compatibility disappeared. Here, children were no more likely to repeat the preceding filler response when it was compatible in number with the form being tested, relative to when it was incompatible (*M1* = 0.25, *M2* = 0.42, $t(104.01) = -1.91$, $p = 0.971$). However, when collapsing across both compatible and incompatible filler responses, children were more likely *overall* to repeat the preceding filler response in the 3rd person condition relative to 1st and 2nd person conditions (*M1* = 0.32, *M2* = 0.18, $t(229.85) = -2.74$, $p = 0.007$). Thus, in the agreement block we have evidence for child sensitivity to discourse salience but not to number marking.

4. Discussion

In summary, this study provides some evidence for the claim that children initially struggle to calculate the Implicated Presuppositions associated to plurals but does not provide any evidence of child difficulty with the 3rd person; on the contrary, we have evidence that children display an adult-like use of discourse context to interpret 3rd person null subjects and object clitics.

Regarding the first finding, younger children show sensitivity to singular 1st and 2nd person agreement forms but not to plural ones (in contrast to adults and older children, who show sensitivity to both). This provides support for the claim that children initially struggle to properly interpret plural forms. They seem not to realize that use of the plural pragmatically excludes singular referents.

As for the second finding, both children and adults allow 3rd person null subjects and clitics to refer to the speaker and hearer. This does not indicate that children are not necessarily struggling to calculate Implicated Presuppositions (as this would imply that adults are also struggling!) but instead that they are behaving like adults. Further examination reveals that what adults and children are doing is allowing discourse-prominent photos to serve as antecedents for 3rd person null subjects and object clitics. Participants tend to select the photo from the immediately preceding filler question in 3rd person conditions, where interpretation depends on selecting a discourse-prominent antecedent, more often than in 1st and 2nd person conditions, where interpretation depends only on identifying the speaker and hearer.

The only difference between children and adults is that children allow 3rd person null subjects to refer to the previously mentioned photo, even if it is incompatible with the null subject's number features. This is consistent with the claim by Ariel (2001) that null subjects require a more prominent antecedent than clitics. If children are sensitive to this difference, then the need for a prominent antecedent may override the need for an antecedent with the right cardinality, just in the case of null subjects.

This study was the first to simultaneously examine child comprehension of all five Spanish present-tense agreement forms. The results strongly highlight the importance of context in the interpretation of 3rd person subjects and objects and show that by about 5 years of age children are largely adult-like in their use of discourse prominence to resolve pronouns.

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