Syntactic satiation and the inversion effect in English and Spanish *wh*-questions

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Abstract: Both English and Spanish exhibit an inversion effect in *wh*-questions: a verbal element must appear to the left of the subject. Analyses differ, however, as to whether this effect is due to similar syntactic mechanisms in the two languages or not. The phenomenon of judgment satiation, in which certain unacceptable sentence types improve upon repeated exposure, is used here to provide new evidence addressing this issue. It is shown that unacceptable *wh*-questions in Spanish are susceptible to satiation, but their counterparts in English are not, thus suggesting that different mechanisms are responsible for the inversion effect in the two languages. In addition to providing new evidence regarding the nature of inversion in *wh*-questions, this study also constitutes a test case for using satiation in the service of comparative syntax.

Key words: inversion, satiation, *wh*-questions, English, Spanish

In a number of languages with canonically preverbal subjects, a verbal element must be to the left of the subject in *wh*-questions, among other environments. This phenomenon, known generally as inversion, is most famously exemplified by the case of Subject-Auxiliary Inversion in English:

(1) What **will** Mary say?

Inversion in *wh*-questions has also been extensively documented in several Romance languages ((2a-d) from Hulk and Pollock (2001)):

- (2)a. Che cosa **ha detto** Maria? [Italian]
 ‘What did Maria say?’
- b. Qu’**a dit** Jean? [French]
 ‘What did Jean say?’
- c. Onde **foi** a Maria? [European Portuguese]
 ‘Where did Maria go?’
- d. Què **farà** en Joan? [Catalan]
 ‘What will Joan do?’
- e. Adónde **fue** María? [Spanish]
 ‘Where did María go?’

As will be discussed below, there has been continuing disagreement in the literature as to whether the English and Romance cases of inversion are to be accounted for with the same basic grammatical mechanisms, or whether the similarities between them are more superficial.

In this paper, I examine English and one of these Romance languages, Spanish, and argue that the inversion phenomenon seen in the two languages must be due to different mechanisms. In doing this, I will make use of evidence that is not just new, but of a new type, in that it will be based on the phenomenon of syntactic satiation discussed in Snyder (2000), in which certain unacceptable sentence types become more acceptable upon repeated exposure. The evidence presented will thus be of use not only in resolving the question of the proper analysis of inversion in English and Romance, but also in demonstrating how the phenomenon of satiation can be put to use in the service of comparative syntax.

This paper is organized as follows. In section 1, I give an overview of why the analysis of inversion in *wh*-questions has important implications for syntactic theory, and I give a more detailed picture of the facts in both English and Romance. Section 2 presents background information on the phenomenon of satiation and how it has been approached experimentally. Inversion and satiation come together in section 3, where I present an experiment exploring the

possibility of satiation effects in English and Spanish *wh*-questions in which the inversion requirement is not observed. The implications of the experiment are discussed in detail in section 4, and concluding remarks are given in section 5.

1. Inversion in *wh*-questions and syntactic theory

The phenomenon traditionally known as Subject-Auxiliary Inversion in English is standardly taken to be the result of T-to-C movement (den Besten 1983), and I will adopt that analysis here (see, e.g., Radford (1997)). One question which then arises is why this particular variety of head movement is forced to cooccur with movement of a non-subject *wh*-phrase into the matrix SPEC of CP, though not with movement of a subject *wh*-phrase, as in (3), or with movement into an embedded SPEC of CP, as in (4).

(3) *Who does go to school? (* with non-emphatic *do*)

(4) *I wonder what will Mary say.

One influential response to this question is Rizzi (1996), who proposes that these facts are ultimately due to the *Wh*-Criterion, given in (5).

(5) The *Wh*-Criterion

A. A *wh*-operator must be in a SPEC-head configuration with $X^0_{[+wh]}$.

B. An $X^0_{[+wh]}$ must be in a SPEC-head configuration with a *wh*-operator.

(Rizzi 1996)

If we assume that in matrix questions, a $[+wh]$ feature is specified on T, then (5) requires that the *wh*-phrase and T be in a SPEC-head configuration. If the *wh*-phrase is a non-subject, then this requirement can only be satisfied if both the *wh*-phrase and T move into a higher projection. This then accounts for why *wh*-movement and T-to-C movement cooccur, but what about cases where they do not, as in (3) and (4)? In the case of *wh*-movement of the subject, as in (3), Rizzi proposes that T-to-C movement is prohibited by the ECP. (5) is nonetheless satisfied, however, because of coindexing of C and T. In the case of embedded *wh*-questions, as in (4), the matrix verb selects an embedded C marked $[+wh]$, and (5) is thus satisfied without T-to-C movement.

Another influential analysis has been Pesetsky and Torrego (2001), in which T-to-C movement is what makes it possible for a non-subject *wh*-phrase to move to SPEC of CP. In their analysis, matrix interrogative C has an uninterpretable $[T]$ feature and an uninterpretable $[wh]$ feature, both with the EPP property. If the $[wh]$ feature attracts a non-subject *wh*-phrase first, however, this will violate their Attract Closest X condition, shown in (6), since a non-subject *wh*-phrase will never be the constituent closest to the attracting head C.

(6) Attract Closest X

If a head K attracts X, no constituent Y is closer to K than X.

(Pesetsky and Torrego (2001))

The [T] feature on C may attract T, though, since as the head of the constituent TP, T is closer to C than anything else. In conjunction with the Principle of Minimal Compliance, given in (7), this movement of T to C then allows C to attract the less close non-subject *wh*-phrase.

(7) Principle of Minimal Compliance

Once an instance of movement to α has obeyed a constraint on the distance between source and target, other instances of movement to α need not obey this constraint.

(Pesetsky and Torrego (2001))

In this sense, non-subject *wh*-movement would not be able to occur without concomitant T-to-C movement.

As for movement of a subject *wh*-phrase to SPEC of CP, as in (3), nominative subjects have an uninterpretable [T] feature and this suffices to check the [T] feature on C. Given familiar economy considerations, T-to-C movement is then blocked from occurring, since C's features can be checked without it and movement of the subject to SPEC of CP is in accord with Attract Closest X without resorting to the Principle of Minimal Compliance. As for the lack of T-to-C movement in embedded questions, as in (4), Pesetsky and Torrego suggest that this is because the [T] feature on the embedded interrogative C in standard English does not have the EPP property, thus allowing it to be checked by the simpler operation of Agree, without movement. There is no deep reason for the absence of the EPP property in this case, but Pesetsky and Torrego argue that this is as it should be, since other dialects of English (in particular, Belfast English (Henry (1995))) seem to have the EPP property in this environment, with the result that T-to-C movement is required in embedded (as well as matrix) questions.

What Rizzi (1996) and Pesetsky and Torrego (2001) have in common is that they both offer an explanation for why *wh*-movement and inversion cooccur in many cases (e.g., (1)), but not in all (e.g., (3) and (4)), and their explanations rest mostly on fundamental principles of the grammar (e.g., (5)-(7)) that are unlikely to be language-particular. As we examine *wh*-movement in other languages and find similar inversion patterns, we should thus be understandably attracted to finding an analysis which is consonant with fundamental principles of this type. Initial appearances suggest that there is promise in pursuing such an approach. As we saw in (2), Romance languages also display an inversion phenomenon in *wh*-questions, and we would expect this inversion to be the result of T-to-C movement, to satisfy either the *Wh*-Criterion, as in Rizzi (1996), or Attract Closest X, as in Pesetsky and Torrego (2001). In fact, an account in terms of T-to-C movement looks plausible, since it has been argued for many Romance languages (see Suñer (1994) for Spanish) that main verbs raise to T, so T-to-C movement would result in the main verb appearing in C, just as appears to be the case in (2). The apparent contrast between English (1), with an auxiliary to the left of the subject, and Romance (2), with a main verb to the left of the subject, can thus be reduced to the well-known difference between English and Romance in terms of what is allowed in T (modals and auxiliaries in English, main verbs in Romance).

Even restricting ourselves to the most basic properties of *wh*-questions, however, unexpected differences do emerge between English and Romance. Most striking, perhaps, is the fact that the prohibition against inversion in embedded questions seen in (4) largely disappears in Romance, with Spanish (along with Catalan and Romanian) even requiring inversion in this environment:

- (8)a. *No sé [qué Juan compra]
 NEG know-1s what buy
 b. No sé [qué compra Juan]
 NEG know-1s what buy
 ‘I don’t know what Juan buys.’

Nonetheless, this difference does not appear to be fatal for the accounts we have been examining. Rizzi suggests the [wh] feature is on T in embedded questions in these languages (as opposed to English, where it is on C), thus necessitating T-to-C movement to satisfy the *Wh*-criterion. Within Pesetsky and Torrego’s analysis, this issue is already dealt with in their treatment of standard vs. Belfast English and it could presumably be easily extended to the Romance case (by saying that as in Belfast English, the [T] feature on the embedded C has the EPP property). Neither of these accounts offers an explanation for why English and Romance should contrast in just this manner, but there at least appears to be a way to account for the contrast while still maintaining their proposed universal principles.

At this point, then, we have seen that there is promise in developing a principled analysis of the inversion effect in *wh*-questions in English and Romance which would allow us to achieve some understanding of why inversion is observed in these environments while still allowing for some language-particular differences. Nonetheless, an analysis along these lines still faces some significant empirical hurdles, particularly in Spanish. Whereas there is broad consensus that inversion in English results from T-to-C movement, a number of arguments have been put forward that this is not the case in Spanish (see, e.g., Goodall (1993), Gutiérrez Bravo (2002), Olarrea (1996), Ordóñez (1997), Suñer (1994), and for recent dissenting views, Bok-Bennema (2006) and Gallego (2006)). Perhaps the strongest of these comes from the fact that in Spanish, adverbs that typically appear in the area between the preverbal subject and the verb in declarative sentences, such as *jamás* ‘never’, remain preverbal in *wh*-questions (Goodall 1993, Suñer 1994):

- (9) A quién jamás ofenderías tú con tus acciones? (Suñer 1994)
 whom never offend you with your actions
 ‘Who(m) would you never offend with your actions?’

Assuming that these adverbs cannot appear to the left of C, examples like (9) suggest that the verb has not raised higher than T. Note that in the English gloss, it is the modal which has moved to C and the adverb remains adjacent to the *in situ* verb, as would be expected.

If it turns out to be true that verbs in Spanish *wh*-questions remain in their canonical position and T-to-C movement does not occur, we would then be faced with two questions: (i) What forces the subject to remain in a postverbal position in *wh*-questions, and (ii) how can the lack of T-to-C

movement be reconciled with the two analyses that we have been examining here? I will put the first question aside for now (see the references cited above for some possible answers) and consider briefly the second. For Rizzi, one might propose that the [+wh] feature is already specified on C in Spanish for some reason, thus rendering T-to-C movement superfluous. For Pesetsky and Torrego, one could say that interrogative C in this language lacks the EPP feature, which would allow the [T] feature on C to be checked without movement. My intention is not to explore the details of these various avenues, but merely to note that there do appear to be ways one could make the apparent lack of T-to-C movement in Spanish *wh*-questions compatible with accounts such as Rizzi and Pesetsky and Torrego without dismantling the principles which they claim force T-to-C movement in *wh*-questions in English.

Nonetheless, if T-to-C movement does not occur in Spanish *wh*-questions, this is clearly at odds with the spirit of Rizzi and Pesetsky and Torrego. These accounts attempt to explain the partial co-occurrence of T-to-C movement and *wh*-movement observed in some languages, and it would seem strange from this perspective if a language like Spanish were to mimic the effect of T-to-C movement (by displaying an inversion effect in just those environments where T-to-C movement would produce it), without actually using that process.

The discomfort that one might feel with this state of affairs becomes more concrete from the viewpoint of acquisition. Children hear large numbers of questions of the form (2e) in the everyday environment, and under either account, their default assumption should be that this is T-to-C movement. In Rizzi's framework, (2e) is perfectly consistent with the *Wh*-Criterion, assuming that the verb is in C, and in Pesetsky and Torrego's framework, (2e) is perfectly consistent with Attract Closest X, assuming that the verb has raised out of T to C, thus satisfying the Principle of Minimal Compliance. For children not to adopt one of these analyses, they would require evidence, and it is not clear if they receive such evidence, given that examples such as (9) are very infrequent.

The question of whether Spanish *wh*-questions exhibit T-to-C movement is thus much more than a difficult descriptive question for Spanish syntax; there are issues of larger import at stake. If T-to-C movement occurs in this environment, it offers confirming evidence for analyses such as Rizzi (1996) and Pesetsky and Torrego (2001), which claim that T-to-C movement follows directly from certain fundamental principles of the grammar, and at a broader level, it supports the view that universal principles of this general type exist. If T-to-C movement does not occur, it at least casts doubt on this approach, since the principles forcing T-to-C movement in English might be expected to do the same in Spanish, and children in particular would apparently have no reason to think otherwise.

In what follows, I will not fully resolve the question of the proper analysis of inversion in Spanish *wh*-questions, but I will offer new evidence that T-to-C movement is unlikely to be involved, suggesting that the problems just discussed are thus real. Apart from being new, the evidence to be presented is also of a new type, relying on the phenomenon of syntactic satiation discussed in Snyder (2000), and thus constitutes a demonstration case of the use of satiation in comparative syntax. The section that follows is devoted to a brief overview of satiation.

2. Syntactic satiation

The phenomenon in which initially unacceptable sentences become increasingly acceptable upon repeated exposure has come to be called “syntactic satiation” or “judgment satiation.” Although this phenomenon is familiar to syntacticians anecdotally, it did not begin to be explored systematically until Snyder (2000), who made two important findings: (i) that syntactic satiation can be induced in subjects in an experimental setting, and (ii) that not all sentence types are susceptible to satiation.¹

Snyder reached these conclusions by performing an experiment in which 22 subjects were presented with 50 test items, where each item consisted of a context (e.g., “Maria believes the claim that Beth found a \$50 bill.”), a test sentence (e.g., “What does Maria believe the claim that Beth found?”), and a request for a yes/no judgment of the test sentence. These 50 items were composed of 5 blocks, where each block consisted of 3 fully acceptable sentence types and 7 unacceptable sentence types in random order. Forward/backward presentation of the 50-item list was balanced across subjects. The 7 unacceptable sentence types, together with example sentences, are given in (10).

(10) a. **Want-for**

Who does John want for Mary to meet ____?

b. **Whether-island**

Who does John wonder whether Mary likes ____?

c. **That-trace**

Who does Mary think that ____ likes John?

d. **Subject island**

What does John know that a bottle of ____ fell on the floor?

e. **Complex NP Constraint**

Who does Mary believe the claim that John likes ____?

f. **Adjunct island**

Who did John talk with Mary after seeing ____?

g. **Left branch**

How many did John buy ____ books?

The test sentences varied from block to block, but the sentence types remained the same. Moreover, the *whether-island* violations always used the verb *wonder*, and the Complex NP Constraint violations always used *believe the claim*.

Snyder found that subjects exhibited satiation effects with the *whether-island* and Complex NP Constraint violations, but no such effects were found with the *want-for*, *that-trace*, adjunct island or left branch violations. Subject island violations showed a marginally significant satiation effect. These results confirm anecdotal reports that violations of *whether-islands* and the

¹ For further discussion of the phenomenon of judgment satiation, see Braze (2002), Hiramatsu (2000) and Sprouse (2007). For discussion of possibly related phenomena, see Kaschak (2006), Kaschak and Glenberg (2004), Kaschak, Loney, and Borreggine (2006), Luka and Barsalou (2005), and Tabor, Galantucci, and Richardson (2004).

Complex NP Constraint are particularly susceptible to satiation. Importantly, Snyder also found that susceptibility to satiation does not appear to correlate in any straightforward way with degree of initial acceptability, given that *whether*-island and Complex NP Constraint violations differ significantly in this regard. Both anecdotally and in a separate test reported by Snyder, *whether*-island violations are perceptibly more acceptable than CNPC violations, and neither is either the most or least acceptable among the sentence types in (10).

As Snyder points out, if one unacceptable sentence type is satiation-inducing and another is not, it is unlikely that their unacceptability is attributable to the same underlying principle. This suggests, for instance, that violations of *whether*-islands, which are susceptible to satiation, and *that*-trace violations, which are not, must be due to different underlying principles, in accord with the general consensus in the literature about these two phenomena. This same line of thinking can be applied to the inversion phenomena in English and Spanish being explored here. If failing to do inversion violates the same principles in both languages (e.g., the *Wh*-Criterion for Rizzi or Attract Closest X for Pesetsky and Torrego), we would then expect such unacceptable sentences to have the same status with regard to satiation, either both being susceptible or not.

The experiment to be described in the following section exploits this fact by testing for satiation in English and Spanish in a variety of sentence types, but crucially including *wh*-questions without inversion, as in (11) and (12).

(11) *What Mary will say?

(12) *Qué María dijo?
 what said
 ‘What María said?’

If this sentence type behaves similarly with regard to satiation in the two languages, this would not be informative for our present purposes, since it would be compatible either with an analysis in which (11) and (12) both violate the same principle or with one in which they violate different principles that happen to have the same status regarding satiation. If, on the other hand, this sentence type shows differing satiation effects in the two languages, this would be difficult to reconcile with an analysis attributing their unacceptability to a single common principle.

3. An experiment

3.1 Method

45 native speakers of English and 59 native speakers of Spanish (all undergraduate students at the University of Texas at El Paso) participated in this study. None of the native speakers of Spanish were natively bilingual and none had lived in an English-speaking environment before adulthood. All subjects were presented with a set of 4 practice items and 50 experimental items, each consisting of a context (the “situation”), a test sentence, and a request for a yes/no judgment on the test sentence. A sample is given in (13).

- (13) Situation:
Alice will write the letter at home.

Test sentence:
What will Alice write at home?

Does this sound good?
YES NO (Circle one)

The 50 experimental items consisted of 5 blocks, each containing 4 fully acceptable sentences and 6 unacceptable sentences, based on standard judgments in the literature. The order of the sentence types within blocks was randomized, and forward/backward presentation was balanced across subjects. The items were presented on paper, with one item per page. Subjects were instructed to give their initial reaction to each test sentence, not to try to analyze the sentence, to judge each sentence on its own without trying to remember previous judgments and to refrain from turning back to look at their previous responses.

The 6 unacceptable sentence types presented to English-speakers are shown in (14), with an example of each.

- (14)a. **No inversion**
*What John will buy at the store?
- b. **Subject island**
*What does Jane know that a bottle of fell from the table?
- c. **Complex NP Constraint**
*What does Brenda accept the idea that Tom should sell?
- d. **Adjunct island**
*Who did Alice speak with Tim after seeing?
- e. **Left branch**
*How many did Jill buy books?
- f. ***that*-trace**
*Who does Jake think that is at work?

Two examples each of the following two acceptable sentence types completed the block of 10:

- (15)a. **Matrix object extraction**
What will Jeff see in the park?
- b. **Embedded object extraction**
What does Mike think that Cindy will read?

The 6 unacceptable sentence types presented to Spanish-speakers are largely similar to those of English and are shown in (16), with an example of each.

(16)a. **No inversion**

*Qué Juan compró en la tienda?
 what bought in the store
 ‘What did Juan buy in the store?’

b. **Subject island**

*De qué sabe María que una botella se cayó de la mesa?
 of what know that a bottle REFL fell from the table
 ‘Of what does María know that a bottle fell from the table?’

c. **Complex NP Constraint**

*Qué acepta Carmen la idea de que Héctor venda?
 what accept the idea of that sell
 ‘What does Carmen accept the idea that Héctor sells?’

d. **Adjunct island**

*A quién habló José con Irma después de ver?
 whom spoke with after of see
 ‘Whom did José speak with Irma after seeing?’

e. **Left branch**

*Cuántos compró Mario libros?
 how-many bought books
 ‘How many did Mario buy books?’

f. **Double psych-fronting**

*A nadie la música le gustó.
 to nobody the music 3s-IO pleased
 ‘The music pleased nobody.’ (= ‘Nobody liked the music.’)

The two sets of sentence types in (14) and (16) are mostly the same, but in place of the *that*-trace violation in (14f), the equivalent of which is fully acceptable in Spanish, (16f) is substituted. The 4 acceptable sentence types for Spanish are shown in (17), together with examples.

(17)a. **Matrix object extraction**

¿Qué vendió Héctor en la escuela?
 what sold in the school
 ‘What did Héctor sell at school?’

b. **Embedded subject extraction**

¿Quién cree Silvia que está en el trabajo?
 who believe that is in the work
 ‘Who does Silvia believe is at work?’

c. **Embedded object extraction**

¿Qué quiere Jesús que Laura venda?
 what want that sell
 ‘What does Jesús want Laura to sell?’

d. **Single psych-fronting**

A nadie le dio miedo la película.
 to nobody 3s-IO gave fear the movie
 ‘The movie frightened nobody.’ (= ‘Nobody was scared by the movie.’)

3.2 Results

Two methods were used to determine whether a given unacceptable sentence type induced satiation among subjects. In the first, the number of subjects showing a pattern of judgments indicating satiation was compared to the number who showed a reverse pattern. Satiation patterns were taken to be those where a subject initially gives a *no* response, switches to a *yes* response at some point, and then consistently responds *yes* thereafter. These patterns are shown in (18) (where Y and N indicate *yes* and *no* responses across the five presentations of the given sentence type), and the reverse patterns are given in (19).

- (18)a. NYYYY
 b. NNYYY
 c. NNNYY
 d. NNNNY

- (19)a. YYYYN
 b. YYYN
 c. YYNNN
 d. YNNNN

If the number of subjects with a response pattern as in (18) is significantly greater by sign test than the number with a pattern as in (19), this suggests that that sentence type is susceptible to satiation. Since the test items were balanced for forward/backward presentation across subjects, such an effect cannot be due to differences in the acceptability of individual sentences.

The results using this method for the English-speaking subjects are given in Table 1.

	Satiation pattern (18)	Reverse pattern (19)	$p =$
No inversion	4	4	.635
Subject island	2	2	.690
Complex NP Constraint	10	3	.046
Adjunct island	1	1	.750
Left branch	0	2	.250
<i>that</i> -trace	5	6	.500

Table 1: Number of English-speakers with satiation pattern and reverse pattern (N=45)

As in Snyder (2000), there is a significant satiation effect for the Complex NP Constraint, but not for the other violations. Unlike Snyder, there is not even a marginally significant effect for Subject island violations. Of particular interest is the fact that there is no satiation effect for the No Inversion sentence type.

Using this same method for the Spanish-speaking subjects yields the results in Table 2.

	Satiation pattern (18)	Reverse pattern (19)	$p =$
No inversion	12	1	.002
Subject island	6	2	.145
Complex NP Constraint	9	4	.134
Adjunct island	1	1	.750
Left branch	0	1	.500
Double psych-fronting	8	3	.114

Table 2: Number of Spanish-speakers with satiation pattern and reverse pattern (N=59)

Here there is a significant satiation effect for the No Inversion sentence type. There is a trend in the direction of satiation for the Subject Island, Complex NP Constraint, and Double Psych-fronting sentence types, but none approaches significance.²

²Snyder used a more lenient definition of what constitutes a satiation pattern, allowing any pattern in which the number of *yes* responses in the final two presentations exceeds the number in the first two presentations to count as satiation. Patterns YNNYY, NYNYY, NNNYN, YNYYY, NNYYN, and NNYYN thus count as satiation, in addition to the patterns in (18). Likewise, patterns NYNNN, YNNNN, YYNNY, NYNNN, and YYNNY count as the reverse, in addition to (19). Reanalyzing the data using this definition, the results for English remain essentially the same: Only the Complex NP Constraint violation shows a significant effect (18 subjects show satiation, 5 the

The results so far indicate that satiation obtains in the case of the Complex NP Constraint for English speakers and in the case of No Inversion for Spanish speakers. The method used to obtain these results has the advantage of looking only at individual subjects and counting only those cases that appear to be clear satiation, but one might object that only a small number of subjects exhibit either the satiation pattern or the reverse, and that many subject responses thus go uncounted. A way to address these concerns is to compare the overall number of *yes* responses on the first two presentations of a given sentence type to those on the final two presentations by paired *t*-test. Given the balanced forward/backward presentation of test items, subjects see one of two possible sentences on the first presentation, and on the fifth presentation they see the other of these same two sentences. Likewise, the two sentences that are possible for the second presentation are also those possible on the fourth. By comparing the first two presentations to the final two, we are thus comparing judgments on the same four sentences, differing only in early vs. late presentation. The third presentation is the same sentence for all subjects and is omitted from the comparison.

Using this second method yielded results that largely corroborate those obtained by the first method. The results for English speakers are in Table 3.

	Presentations 1 and 2	Presentations 4 and 5	<i>p</i> =
No inversion	32.20	34.45	.688
Subject island	11.10	14.45	.473
Complex NP Constraint	23.35	41.1	.008
Adjunct island	7.80	8.90	.710
Left branch	7.80	5.55	.486
<i>that</i> -trace	24.45	24.45	1.00

Table 3: English speakers' percentage of *yes* responses in early and late presentations (N=45)

There is a significant increase in acceptability with the Complex NP Constraint, but not with the other violations, suggesting that this is the only constraint among those considered here that is susceptible to satiation. This is the same conclusion reached by using the first method (Table 1).

The results for Spanish speakers are shown in Table 4.

reverse, $p = .005$). For Spanish, there are some differences: The effect with No Inversion becomes only marginally significant (14 show satiation, 7 the reverse, $p = .095$), and the effect with Double psych-fronting becomes marginally significant (12 show satiation, 5 the reverse, $p = .072$). Snyder's definition is intuitively less appealing than the more restrictive definition adopted here, in that it allows unclear patterns such as NNYYN to count as satiation. Still, it is roughly in line with the results obtained using the other two methods discussed here.

	Presentations 1 and 2	Presentations 4 and 5	$p =$
No inversion	40.50	49.50	.067
Subject island	12.05	18.10	.180
Complex NP Constraint	25.00	31.05	.209
Adjunct island	0.86	0.86	1.00
Left branch	1.72	0	.322
Double psych-fronting	11.20	21.55	.033

Table 4: Spanish speakers' percentage of *yes* responses in early and late presentations (N=59)

There is a significant increase in *yes* responses for the Double-Psych Fronting case, and a marginally significant increase in the case of No Inversion. This is similar, but not identical, to the results obtained with the first method (Table 2). In that method, Double-Psych Fronting showed a strong trend in the direction of satiation, but it did not reach significance, whereas No Inversion did show a fully significant satiation effect.

Combining the results of both methods, we see that there is strong evidence that the Complex NP Constraint induces satiation in English, just as in Snyder (2000). Spanish differs from English in not showing such an effect for the Complex NP Constraint, but some evidence for satiation does obtain with No Inversion (and with Double Psych-fronting, a constraint that is not relevant to English). Spanish and English coincided in not showing a significant satiation effect for any of the other sentence types.

4. Discussion

4.1 Implications for inversion

As discussed in section 2 above, the satiation phenomenon is potentially of use for analyzing inversion in English and Spanish, since if *wh*-questions without inversion are susceptible to satiation in one language but not the other, that would provide evidence against an analysis for the two languages in which the lack of inversion violates the same principle in both.

Interestingly, this is largely the result that obtains. In English, *wh*-questions without the required inversion had exactly the same number of subjects showing a satiation pattern of responses as the reverse, as seen in Table 1, and there was only a slight increase in acceptance in the final two presentations compared to the first two, as seen in Table 3. In short, there is little reason to think that No Inversion sentences in English are susceptible to satiation. In Spanish, on the other hand, there are indications that this sentence type is susceptible to satiation. A significantly higher number of subjects exhibited the satiation pattern than the reverse, as seen in Table 2, and there was a marginally significant increase in *yes* responses, as seen in Table 4.

This result is difficult to reconcile with the idea that inversion in *wh*-questions is forced by the same principle (e.g., the *Wh*-Criterion or Attract Closest X) in the two languages, since if this

were the case, we would expect that principle to be either susceptible to a satiation effect or not, but not to produce the effect in one language and not in the other. The result is consistent, on the other hand, with the idea that inversion follows from different principles in English and Spanish.

I will not attempt a detailed analysis of inversion in either language here, but it is worth noting that satiation may provide a hint of what such an analysis should look like. Snyder (2000) and Braze (2002) note that one possible explanation for why only certain sentence types are susceptible to satiation is that perhaps those sentence types violate limitations of processing, whereas those unacceptable sentence types that are not susceptible to satiation violate properties of the grammar itself.³ If correct, this suggests that inversion in English is forced by purely grammatical constraints, while inversion in Spanish is forced by processing considerations. Such an approach shows promise (see, e.g., Goodall (2004)), but I will not pursue it further here.

One might speculate that the satiation difference between English and Spanish that has been observed here somehow follows from the fact that No Inversion sentences have a higher level of acceptability in the first two presentations in Spanish than in English, as may be seen by comparing Tables 3 and 4. Recall, however, that Snyder shows that there seems to be no correlation between initial level of acceptability and susceptibility to satiation. This conclusion is corroborated by the results obtained here. Table 3 shows that the Complex NP Constraint and *that*-trace violations are almost identical in their acceptability in the first two presentations (23.35 and 24.45, respectively), yet only the Complex NP Constraint violation shows evidence of satiation in the final two presentations. Moreover, if we look just at the first presentation, as in Table 5, we see that the acceptability of the No Inversion sentences is virtually identical in English and Spanish.

	Presentation 1
English	33
Spanish	34

Table 5: Percentage of *yes* responses for No Inversion in first presentation

It thus appears that speakers' initial judgment on *wh*-questions without inversion is remarkably similar in the two languages, but that only Spanish shows the notable increase in acceptability upon subsequent presentations.

One difference between English and Spanish with regard to *wh*-questions that is potentially relevant is that in Spanish, some dialects do allow *wh*-questions without inversion, whereas this

³ Another possibility, following a suggestion by Braze (2002), is that satiation-inducing sentence types violate temporally bounded processing constraints which the processor can learn to overcome with experience by allocating additional resources to the critical region of the sentence. Sentence types that do not induce satiation, however, either violate a grammatical constraint or violate a processing constraint from which the processor is not able to recover even with additional resources.

is not possible, to my knowledge, of any dialect of English. One might then wonder whether the satiation effect observed in Spanish is due to speakers being familiar with the non-inversion variety and thus more readily “switching” to it after some relevant exposure. Although this possibility cannot be discarded completely, it nonetheless seems unlikely. The Spanish-speaking subjects in this experiment were all speakers of northern Mexican Spanish, a region that does not allow the non-inversion pattern itself. In a separate experiment reported in Goodall (2004), subjects from this same dialect area were asked to give judgments on sentences on a scale from 1 (“very bad”) to 5 (“perfect”). For (20), without inversion, and (21), with inversion, the mean ratings are shown in Table 6.

- (20) Qué Juan leyó en la biblioteca?
 what read in the library
 ‘What did Juan read in the library’
- (21) Qué leyó Juan en la biblioteca?
 what read in the library
 ‘What did Juan read in the library’

	Mean rating
(20)	2.130
(21)	4.739

Table 6: Mean rating on scale of 1 (“very bad”) to 5 (“perfect”) on sentences (20) and (21) (N=23)

Speakers from this area thus appear to find *wh*-questions without inversion strongly unacceptable. In addition, this region is very distant from any region that allows the non-inversion pattern (primarily the Caribbean; see Ordóñez and Olarrea (2001), Suñer (1994), Toribio (2000)). There is also no significant immigrant population of non-inversion speakers in this area, nor is there much evidence of non-inversion dialects in the mass media. It thus seems unlikely that the subjects in this study would even be aware of such dialects, and it is even less likely that they would have had any significant amount of exposure to them.

Moreover, although native speakers of English do not allow *wh*-questions without inversion themselves, they nonetheless often hear them, since they are a common error among non-native speakers. Such errors are even reproduced in print sometimes, as seen in (22) (which appeared without comment in a non-fiction article):

- (22) “‘Why it is fifty-five?’ he finally asked, in a tone of exaggerated surprise.”
 The New Yorker, Aug. 19 & 26, 2002, p. 85.

It would thus be difficult to argue that the Spanish-speaking subjects were more familiar with No Inversion sentences than the English-speaking subjects and that this could account in itself for

the satiation effect in Spanish.

4.2 Other constructions

In addition to the results directly relevant to inversion, there are two other areas of note in the results displayed in Tables 1-4. The first concerns the differing behavior of Complex NP Constraint violations in English and Spanish. In English, this sentence type induced a clear satiation effect, whether measured by the number of individual subjects showing a satiation pattern of responses (Table 1) or by the overall increase in acceptability among the subjects as a group (Table 3). In Spanish, on the other hand, we find a trend in the same direction using both methods (see Tables 2 and 4), but it does not attain significance in either case. Why would there be a difference like this between English and Spanish? There are a number of possibilities, but the most likely is that it is due to a small, but potentially important structural difference between complex NPs in the two languages. In Spanish, the head noun takes a PP complement, which in turn contains a clausal complement, as illustrated in (23) (cf. (16c)).

- (23) [DP la idea [PP de [CP que Héctor venda __]]]
 the idea of that sells
 ‘the idea that Héctor sells’

In English, the head noun takes its clausal complement directly, without the mediation of the PP, as in (24) (cf. (14c)).

- (24) [DP the idea [CP that Tom should sell __]]]

Given the additional structure present in Spanish, and in particular given the fact that extraction out of PPs is strongly disallowed in Spanish, it is perhaps not surprising that Complex NP Constraint violations appear to behave differently in the two languages. Despite the common label, the two cases may not be directly comparable.

The other area of interest concerns Double Psych-fronting in Spanish, an unacceptable sentence type that we saw in (16f), repeated here as (25).

- (25) *A nadie la música le gustó.
 to nobody the music 3s-IO pleased
 ‘The music pleased nobody.’ (= ‘Nobody liked the music.’)

This sentence type presented some evidence of being susceptible to satiation. More subjects showed a satiation pattern of responses than showed the reverse (see Table 2), though this difference did not reach significance, and subjects overall showed an increase in acceptability between the first two presentations and the final two that did reach significance (see Table 4). There is no correlate to this sentence type in English, so this was not part of the stimulus set for English-speaking subjects.

The fact that Double Psych-fronting displays at least a mild satiation effect is perhaps not

completely unrelated to the case of inversion in *wh*-questions, the more central concern of this paper. The term “double psych-fronting” is used here to describe cases where both arguments of a psych-verb appear to the left of the verb, but not through clitic left-dislocation. In (25), for instance, both the experiencer *a nadie* ‘to nobody’ and the theme *la música* ‘the music’ are to the left of the verb. This is what is ruled out, even though either of these arguments may be fronted alone, as in (26).⁴

- (26)a. A nadie le gustó la música .
 to nobody 3s-IO pleased the music
 ‘The music pleased nobody.’ (= ‘Nobody liked the music.’)
- b. La música no le gustó a nadie.
 the music NEG 3s-IO pleased to nobody
 ‘The music pleased nobody.’ (= ‘Nobody liked the music.’)

Bare quantifiers such as *nadie* ‘nobody’ are well-known to resist clitic left-dislocation, but they are easily fronted as focused phrases, which is apparently the case in (25). When an experiencer is used that accepts a clitic left-dislocation interpretation, the counterpart of (25) is fully acceptable:

- (27) A Juan, la música le gustó.
 to the music 3s-IO pleased
 ‘The music pleased Juan.’ (= ‘Juan liked the music.’)

If (25) is in fact the result of focusing the experiencer *a nadie* ‘to nobody’, the question then becomes why the theme *la música* ‘the music’ cannot be fronted at the same time. A full answer to this question would take us beyond the scope of this paper, but it is worth noting that there are significant similarities between this double psych-fronting constraint and the phenomenon of required inversion in *wh*-questions that we have been examining in this paper. In both cases, what is disallowed is a quantified expression (i.e., the bare quantifier or the *wh*-phrase) followed by a DP and the verb. If their unacceptability has a common explanation, as their superficial resemblance might suggest, the fact that they both show some similarity with regard to satiation would not be surprising (see Hernanz and Brucart (1997) and Zagana (2002) for more comprehensive reviews of the similarities between focus movement and *wh*-movement in Spanish).

4.3 Implications for the study of satiation

With regard to the experimental investigation of satiation more generally, the results reported above confirm the basic findings of Snyder (2000) in a number of ways. They show that satiation can indeed be induced experimentally, that not all sentence types are susceptible, and more specifically, that the Complex NP Constraint is one of the types that is susceptible (at least

⁴(26b) exhibits the well-known phenomenon of negative concord in Spanish. See Zagana (2002) for an overview.

for English speakers).⁵ The only possible conflict concerns subject island violations, where Snyder found marginally significant satiation effects, a result that was not replicated here.

One important difference between Snyder's study and the present one concerns the repetition of particular lexical items. In the two sentence types that clearly induced satiation in Snyder's study, *whether*-islands and the Complex NP Constraint, the former always had the string *wonder whether* and the latter always had *believe the claim that*. It is at least imaginable that the increasing acceptability of these sentence types was due to the presumed increasing familiarity with these collocations. Snyder addressed this point by including a post-test at the end of the 50-item questionnaire in which subjects were presented with an additional *whether*-island violation, but with *ask* instead of *wonder*, and an additional CNPC violation, but with *accept the idea* instead of *believe the claim*. Results from this post-test suggest that there was a significant carryover effect for satiation across lexical items. Nonetheless, the question remains whether satiation can be induced entirely on structural grounds, i.e. when the lexical items are varied from the very beginning. In the present study, then, the five test sentences for the Complex NP Constraint involved a variety of verbs and head nouns (*accept the fact*, *reject the idea*, *make the suggestion*, *propose the hypothesis*, *accept the idea*), but there was nonetheless a clear and significant satiation effect that was just as robust as that obtained in Snyder (2000), where *believe the claim* was used in all five initial presentations of this sentence type. This suggests that the satiation effect that we are observing is indeed due to subjects' perceiving structural similarities across presentations, not just lexical repetition.

5. Conclusion

As we have seen, initially unacceptable *wh*-questions without inversion appear to differ in English and Spanish with respect to the stability of judgments upon repeated exposure, with evidence for increasing acceptability only in Spanish. This argues against attributing the unacceptability to the same constraint (or cluster of constraints) in the two languages, since that would leave this difference in susceptibility to satiation unexplained. This supports the view that inversion in English, but not Spanish, is the result of T-to-C movement as forced by a principle such as the *Wh*-Criterion or Attract Closest X, but it makes it appear unlikely that these are principles of UG, since if they were, we would expect children to adopt a T-to-C movement analysis of inversion in Spanish, apparently contrary to fact.

At a more general level, the present study suggests that satiation can be a useful new source of evidence in comparative syntax. In addition to comparing the overall acceptability of a sentence type in two or more languages, it seems that syntacticians should also attend to the extent to which the acceptability judgment changes upon repeated exposure.

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⁵ Compare this result, however, with Hiramatsu (2000) and Sprouse (2007), who did not find a satiation effect for English with the Complex NP Constraint.

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