Syntactic priming in L1 and L2 Spanish

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ABSTRACT

"Syntactic priming" refers to the tendency people have to repeat the type of sentence construction used in an immediately preceding, unrelated sentence. This effect suggests the existence of abstract mental representations for particular syntactic constructions, independent of particular words and meanings. Priming also appears to facilitate the use of a particular construction when it is otherwise unlikely to be produced, due to processing limitations or preferences for an alternative form. The current study looked at syntactic priming of the passive construction in Spanish speech production. The passive is commonly found in spoken English but is not frequent in spoken Spanish. The study employed a dialogue game in which a naïve participant (either a native Spanish speaker or an L2 Spanish speaker) and a confederate of the experimenter (a native Spanish speaker) took turns to describe pictures to each other. Each picture could be described using either a passive or active construction. The confederate followed a script specifying which construction to use, and priming was looked for in the form of the immediately subsequent utterance of the naïve participant. Preliminary results showed a small priming effect of the passive construction in native speakers of Spanish, and a larger priming effect in the L2 speakers. The implications for syntactic represenation and processing in a second language are discussed.

1. INTRODUCTION:

A key issue in adult second language acquisition (SLA) research is the question of how the outcome of learning a language in adulthood differs from learning one in early childhood. In particular, how do the mental representations and linguistic processing in a second language (L2) speaker differ from that of a native?

Much research has focussed on whether or not the parametric options (functional features) contained in Universal Grammar (UG) are still available to the L2 learner after the critical period. Various cases have been argued including that L2 learners have full access to UG, no access to UG, or access to functional features without knowing their strengths. However, a different way to address L2 acquisition is to ask how the processing of particular functional features differs between native and non-native speakers.

Performance in spontaneous speech and grammaticality judgements may reflect knowledge about the second language, but the mechanisms underlying performance may still differ, even in advanced L2 speakers who may show native-like behaviour. In contrast, online techniques borrowed from psycholinguistic research provide opportunities for comparing the mechanism underlying language processing

in native and non-native speakers. Many experimental paradigms are known to give characteristic results in native speakers. Differences in the behaviour pattern of non-native speakers when compared with that of natives would indicate differences across the groups, either in how syntax is represented or in how this representation is retrieved and implemented.

One such online technique for looking at speech production is based on the phenomenon of syntactic priming. Priming is the tendency people have to repeat the type of sentence construction used in a immediately preceding, unrelated sentence. This technique addresses both what syntactic representations are available in a speaker, and under what circumstances they are produced.

Syntactic Priming:

It has been well established that in language production of a native language, people have a tendency to repeat the types of sentences that have already been used, either by themselves, or in something they have read or heard. This is seen in situations in which an underlying message can be expressed using more than one syntactic form, without much change in the overall meaning of the message, and a choice must be made as to which to use. An example in English is the option of using an active or a passive, as in the following sentences:

    a) The alarm clock awakens the boy
    b) The boy is awakened by the alarm clock

Where there are two such forms in a language, the processing of one candidate construction appears to facilitate future processing of the same construction, and it is more likely to be reused in a subsequent utterance. Although other processes may be involved, this effect is at least partly due to the activation of an isolated representation of that syntactic form, separate from particular lexical items or semantics. For this reason the phenomenon is referred to as syntactic priming (or syntactic persistence/structural priming).

Over the last couple of decades syntactic priming has been extensively explored. The general pattern of a priming experiment is that subjects are presented with a prime sentence (that uses a particular grammatical structure) and must then produce a target sentence, which is monitored for any effect of the prime structure. Importantly, the experiments are given under the guise of a different task, so subjects are less inclined to notice the variance of syntactic structures.

In the 1980s Bock and colleagues produced strong experimental evidence to support the persistence of syntactic form using a priming/recognition procedure. To distract attention from the manipulation of the experimental primes, subjects were lead to believe that they were performing a recognition test. The first study to use this was done by Bock in 1986. Subjects were asked to describe a set of pictures, each of which was preceded by a prime sentence. This sentence was spoken by the experimenter and then repeated by the subject; the primes and target sentences were neither related in meaning, nor did they form a connected discourse. The prime sentences were manipulated across conditions, so that some were in an active voice (e.g., *The alarm clock awakened the boy*), others in a passive voice. (e.g., *The boy was awakened by the alarm clock*). In other conditions Bock varied the positions of the direct and indirect objects of alternating dative verbs to produce either a prepositional object form (e.g., *A rock star sold some cocaine to an undercover agent*) or a double object form (e.g., *A rock star sold an undercover agent some cocaine*). The target pictures in both cases could be described using either form. The results showed a highly significant effect of the picture descriptions tending to be syntactically

congruent with the form of the prime sentences, so for example if the prime was a double-object sentence, the picture description tended to be a double-object sentence too.

Subsequent experiments have ruled out other explanations for the syntactic priming effect. The effect is not due to lexical priming of function words (e.g., prepositions *to* or *by*) as even when a full passive was used as a prime, the target description could be a truncated passive, not repeating the word *by* (e.g. *the church was struck*) e.g., Bock, 1989. The effect is not due to thematic event structure or metrical similarities between the prime and target descriptions Bock and Loebell (1990).

Finally, although syntactic priming can occur across a prime and target that use different verbs, the priming effect is enhanced when the verb is repeated (Pickering and Branigan, 1998). The same study found that this enhancement was of equivalent magnitude when the verb was the same or different with respect to tense (e.g., *shows* and *showed*), aspect (e.g., *showed* and *showing*) or number (e.g., *the racing drivers show* and *the patient shows*). In their discussion they argue for the existence of combinatorial nodes which are attached to particular verbs and are activated when a verb is used in a particular construction. This combinatorial information is shared between verbs and is represented with respect to a featurally unspecified form of the verb. The fact that same verb priming is stronger than different verb priming suggests that the link between a verb and a combinatorial node can also be primed.

Relevance of priming to studying L2 language production:

Syntactic priming offers an opportunity to address how syntax is represented using controlled, online methods. It has been studied extensively in native speakers of various languages (e.g., English, Dutch, German and Japanese) as well as in aphasics and children, but as yet studies have not looked at priming in L2 speakers. In addition to exploring priming in L2 speakers in general, this technique could be used to study situations in which L2 speakers use grammatically correct constructions but in situations in which a native would choose to use a different construction.

Because it is seen in a variety of conditions (e.g., different tasks, different languages, spoken and written production, comprehension; see Pickering & Branigan, 1999, for a review), priming is not thought to simply facilitate a particular process, but to tap into deeper linguistic knowledge (Branigan et al, 1995). It shows the existence of an abstract representation at some level for a particular aspect of syntax, separate from specific lexical items, morphology etc. These representations are activated when used and allow structures to persist to subsequent utterances.

An L2 learner faced with a new grammar may encounter syntactic constructions that do not exist in their L1 and for which new representations must be formed. If an L2 speaker has no knowledge of a particular L2 syntactic structure there should be no priming effect. If any priming is found this suggests that at some level there is a representation for this construction, which is being re-used in production. If a representation is present it is likely that priming may be stronger than in native speakers as the representation may be weaker and so more susceptible to influences promoting its use.

Priming also appears to facilitate the use of constructions which are unlikely to be produced in normal speech, either due to processing limitations (Hartsuiker and Kolk, 1998) or a strong preference for an alternative structure. If difficulties in using a new L2 construction in spontaneous speech are due to processing limitations, priming

may boost processing enough to overcome this. An L2 speaker may also show priming but the repetition is incorrect (e.g., mistakes are made in inflection of verbs or gender), even when the prime has provided the correct framework. This may reflect either that the underlying representation is defective in some way, or that it cannot be retrieved properly in production.

Finally, because priming occurs in cases where there are alternative ways of saying something in a language, it may be possible to prime L2 speakers to produced constructions which are inappropriate in a particular context but which the L2 speaker treats as optional. A native speaker should not show be primed to produce an inappropriate construction for their language. This would show differences in the way the structures are processed by the two speakers.

2. THE EXPERIMENT:

I described an experiment looking at syntactic priming in L2 speakers. The aim was to compare the magnitude of any priming in a native speaker group with that in groups of intermediate and advanced L2 learners of Spanish. The prediction was that priming would be found in both L2 and native speakers of Spanish, but that priming would be stronger in the L2 speakers for whom computational resources in Spanish might be limited and so strongly boosted by priming. A further comparison was between the strength of priming in an intermediate L2 group with that of an advanced L2 group.

The experiment looked at use of actives and passives in Spanish. This was chosen because strong passive/active priming effects have been previously found in English, and in a crosslinguistic Spanish-prime-to-English-target study. Both passives (3) and actives (4) can be seen in English (3(a), 4(a)) and Spanish (3(b), 4(b)):

3 (a) John built the house
   (b) Juan construyó la casa
4 (a) The house was built by John
   (b) La casa fue construida por Juan

However, although the passive is grammatical in Spanish it is uncommon in spoken Spanish. This would make the passive construction generally less preferred by native Spanish speakers than by native English speakers. Therefore, in addition to any priming effect, the L2 speakers may be more willing in general to produce the passive than native speakers.

I used a dialogue game (Branigan, Pickering and Cleland, 2000) to set up the priming study. This game is played by a naïve participant and a second participant who, unbeknown to the first participant, was a confederate of the experimenter. The confederate read a script to provide the primes. The dialogue task was chosen because it appears to produce substantially greater magnitudes of priming compared to other single-speaker experiments. In this task the confederate says a sentence to the subject which is in either the active or passive voice (e.g., "the nurse kissing the clown" or "the clown being kissed by the nurse"). Immediately afterwards the subject must produce an unrelated sentence which involves different characters. The variable of interest is whether the naïve subject uses an active voice if they have just heard an active construction from the confederate, and a passive if they have heard a passive. In this study, the priming aspect was disguised by telling subjects it was a picture description/matching task, distracting attention away from the form of the descriptions. Participants took it in turns to describe pictures depicting actions, each of which could be described using either an active or passive sentence. The

confederate always spoke first and followed a script which specifies which syntactic structure to use for each of their descriptions. During the experiment the confederate and subject sit opposite each other with a screen between them so they cannot see each other (See picture below for experimental set-up).
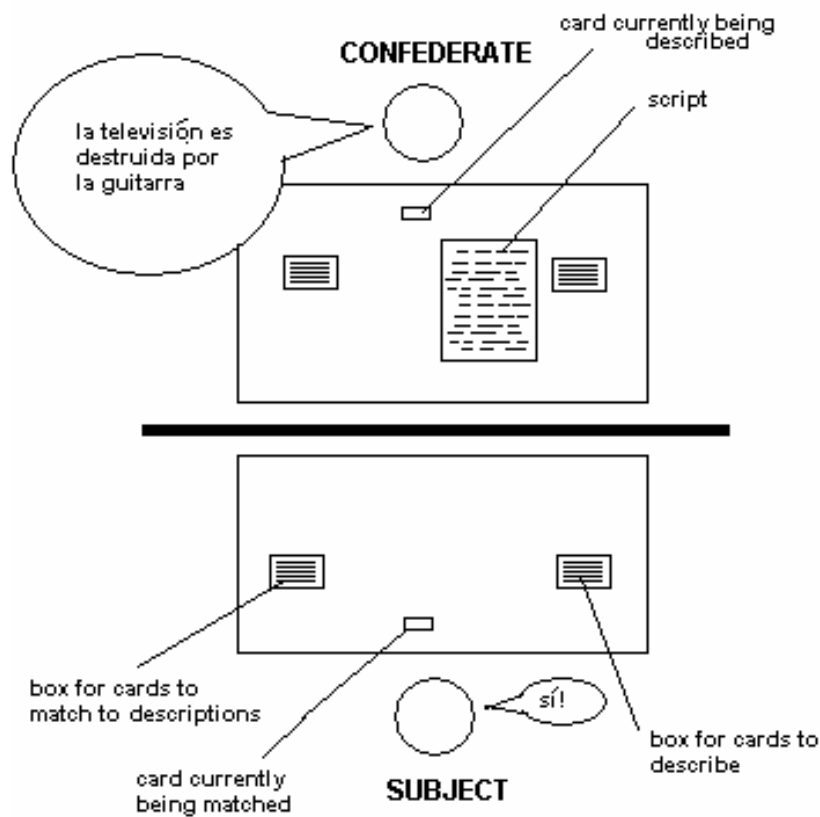
- **Experimental set-up for dialogue task**

Participants:

      36 participants took part in the study – 12 Native, 12 Intermediate and 12 Advanced. The Native group were all native speakers of Spanish from Spain with very little English (most had been in Britain for only a few weeks). The other two groups, Intermediate and Advanced, were all native English speakers who spoke Spanish as a second language. The level of these L2 speakers was assessed using a Cloze test (e.g., Montrul & Slabakova, 2003), the results of which were used to place the learners in either the Intermediate or Advanced group. The Intermediate group scored an average of 29/50 on this test (range 19-35). The Advanced group scored an average of 43/50 on this test (range 37-48). In addition to the experimental participants, there were three confederates. These were female native speakers of Spanish from Madrid, Asturias and Majorca. Each confederate performed the task with twelve participants, four from each group.

Materials:

      The materials were cards depicting actions occurring between two inanimate objects. Although the passive is more natural when used with an *animate* object, this introduces other biases because the tendency for subjects to put this in first position in

a sentence is so strong. Entities depicted were chosen to be both easily recognisable and to have a name that early-intermediate learners would know in Spanish.

24 Target cards were to be described by each experimental subject. The cards used one of six monotransitive verbs, each appearing on four cards (*romper* 'break', *destruir* 'destroy', *empujar* 'push', *tocar* 'touch', *quemar* 'burn', *ocultar* 'hide'). The appropriate verb was printed in Spanish in the infinitive form beneath each picture. Participants were instructed to describe these cards as simply as possible using the verb given. Each target card would be preceded by a prime spoken by the confederate. There were 24 Prime cards using twelve monotransitive verbs, each appearing on two cards. Six of these were the same as the verbs on the Target cards, the other six were new verbs (*partir* 'part in two', *golpear* 'hit', *llevar* 'carry, raise', *perseguir* 'chase', *mojar* 'wet', *cortar* 'cut'). Each Target card was matched up with two Prime cards, one using the same verb, one using a different verb.

From the Prime pictures, scripts were prepared for the confederate to follow, which wrote out a sentence describing each prime. Each prime would appear in four different conditions – once in passive form before a target with the same verb, once in passive form before a target with a different verb, once in active form before a target with the same verb and once in active form before a target with a different verb. Any one subject would only see each prime and target once, but the conditions were varied across subjects.

In addition there were 48 filler pictures for both the participant and confederate. These consisted of a picture of a single object with an adjective written in the masculine form beneath the object. Participants were required to describe this object using the adjective given.

Procedure:

Subjects were unaware that the other person in the experiment was a confederate of the experimenter and believed that she was another naïve participant. The subject's description cards were arranged in a red box on the desk in front of them, with the order of the cards randomised for each subject. At least one filler card intervened between each target card. In addition, the subject had a blue box in front of them containing the card corresponding to the confederate's description list. Their task was to match descriptions from the partner to the card shown and to say whether or not the two corresponded. Therefore, for half of the cards one of the objects in the picture was different to the object given in the confederate's description.

The confederate's description list was printed out as a script, indicating the order in which to say the experimental primes and fillers and the form (passive or active). The confederate's desk could not be seen by the subject, but was also set up with a red and blue box, and the confederate had been instructed to take a card on each go, to make similar sounds to those made by the subject.

The confederate and subject took it in turns to describe one picture, and the other had to match this description to pictures they were looking at. The confederate always spoke first. For each prime-target pair the verb was either the same (see 5 below), or different (see 6 below). It was ensured that across all the subjects each target sentences would be preceded an equal times by an active and passive prime and by a same and different verb prime.

(5) Same verb in prime and target:

Participant hears "La guitarra destruye la televisión" or "La televisión es destruida por la guitarra" then they must describe the picture on the right

(6) Different verb in prime and target:
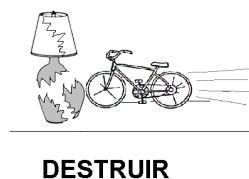
Participant hears "El autobús persigue el tren" or "El tren es perseguido por el autobús" then they must describe the picture on the right

3. RESULTS:
Scoring:

The dialogues were recorded and transcribed. Each description of a target picture was then scored as being either an active, passive or other. In order to be counted as an active, a transitive picture description needed to contain a subject-noun, a transitive verb and an object noun. In order to be counted as a correct passive a transitive picture description needed to contain a subject-noun, the auxiliary "estar" (to be), a passive participle, and a *por*-phrase incorporating an object noun. However, a second, more lenient scoring system was also applied to allow for L2 learners trying to produce a passive form but making mistakes at some level in the sentence (e.g., incorrect inflection, wrong auxiliary). Both scoring systems were analysed and produced the same pattern of significant results.

Incorrect passives in L2 priming:

The L2 speakers, especially at the Intermediate level, made several mistakes when producing what were interpreted as passives. There was often only a minor error in the sentence, but this can support that priming is not due simply to repetition of lexical elements of the prime. Some examples are given below:

PRIME	TARGET – produced by L2 speaker
La bota es **ocultada** por la tarta (*The boot is hidden by the cake*)	**(a)** La casa es **oculta** por el arbol (*The house is hidden by the tree*)
La cocina **es rota** por la naranja (*The cooker is broken by the orange*)	**(b)** El cigarro **rompido** por el balón (*The cigarette is broken by the ball*)
La radio **es** golpeada por el sombrero (*The radio is hit by the hat*)	**(c)** La pelota **está** quemado por la fuego (*The ball is burnt by the fire*)

In target (a) the past participle produced by the subject lacks the correct morphological ending -*ada*, despite the confederate having provided it in the preceding prime. In target (b) the past participle of the verb *romper* requires an irregular form, which would be *roto/a*, as given in the prime, but the subject has over-regularised the participle to a different form. The subject has also omitted the auxiliary verb *ser* "to be" (which makes a correct but reduced form in Spanish) despite having heard the form *es* in the prime. Finally, in target (c) the subject has used a different auxiliary verb than that heard in the prime. Spanish has two auxiliary verbs, *ser* and *estar,* which would both translate into "to be" in English. The *ser* form is required for this construction, but the subject has incorrectly chosen the *estar* form. In all the above cases the implication is that subjects are not merely repeating the surface form of the prime, but are processing a more abstract representation of the passive and that this is being repeated.

Effects found:
A significant priming effect was found across all groups. A target description was much more likely to be a passive when it followed a passive prime description than an active prime (see graph below for proportion of passives produced by each group in each condition). When the verb was the same across the prime and target, all groups were slightly less than two-times as likely to produce a passive target after a passive prime than when the verb was different (significant effect of Verb type, $F1(1,27) = 43.743$, $P<0.001$; $F2(1,69) = 29.617$, $P<0.001$). There were significant overall effects of Prime-type and Verb-type. The magnitude of the priming effect was significantly different across the different groups (significant interaction between Group and Prime type, $F1(2,27) = 14.181$, $P<0.001$; $F2(2,69) = 25.524$, $P<0.001$), with the strongest priming effect being in the advanced L2 speakers, the second strongest in the intermediate L2 speakers, and the weakest in the natives. However, there was no significant interaction of verb type and group, so the effect of the verb type on priming was similar in all the groups.

In the **same** verb condition, the Native speakers produced 28% passives following a passive prime compared with 3% following an active prime. The Advanced speakers produced 73% passives following a passive prime compared with 1% following an active prime. The Intermediate speakers produced 58% passives compared with 4% following an active prime.

In the **different** verb condition, the effects were still significant, but approximately half the magnitude of the same verb condition. The Native speakers produced 7% passives following a passive prime compared with 4% following an

active prime. The Advanced speakers produced 42% passives following a passive prime compared with 6% following an active prime. The Intermediate speakers produced 33% passives compared with 7% following an active prime.

- Graph showing proportion of passive targets produced in response to different primes (lenient scoring)
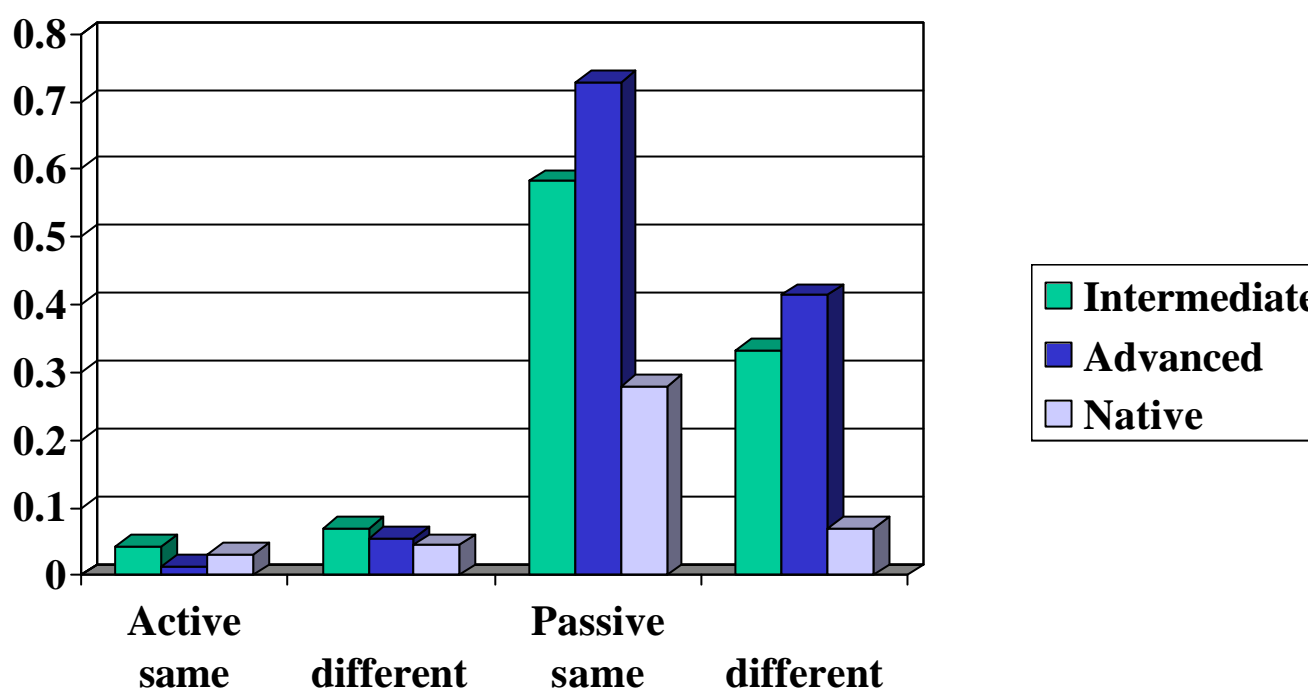
4. DISCUSSION:

This initial study showed that it is possible to produce syntactic priming in L2 speakers. The results also imply that shared representations for syntactic forms underlie comprehension and production, even for these L2 speakers, as priming occurs from something being heard to something being said. At some level there is some abstract representation for the passive or active structure, and spontaneous dialogues causes this to be activated. If there were no representation for a particular structure, e.g., if L2 speakers had no knowledge of the passive existing in Spanish or how it is formed, then no priming would be expected.

The priming effect is stronger in the L2 speakers than in the native speakers, and stronger in the advanced L2 speakers than in the intermediate speakers. L2 speakers of a language will have less experience with the language and so any representations for the language are likely to be of a weaker strength than those in a native speaker. This may be one reason why the priming effect is stronger in non-native speakers, because syntactic representations in these speakers are weaker than in natives and so more susceptible to a boost from priming. The intermediate learners may not have had much experience with the passive and syntactic representations in these speakers may still be forming, as shown by the incorrect reproductions of passive by these speakers. Therefore, even if priming has a stronger effect on

representations than in native speakers, the boost is not as strong as in the advanced speakers because the representation is still forming. However, the effect of same vs different verb was the same in all three groups, showing that the way syntactic representations are connected to representations of verbs is likely to be the same in natives and non-natives.

There is clearly priming involved, and not simply conscious repetition of structures, as the effect is always stronger for same than different verbs. If the effect were purely from repetition this difference across conditions would not be seen. However, in addition to priming there is likely to be a social factor contributing to the repetition effects observed. The natives are assumed to have more knowledge about the language, so the non-natives may treat them as an 'expert' and be more willing to follow their lead in production, even if this is subconscious. Although most of the participants were not aware that they were copying the structure given to them by the confederate, a couple of participants said they felt themselves copying these structures, because they assumed that the native speakers knew best how to describe the (unrelated) pictures. These participants often said they were not sure why they were repeating structures, that it was not a conscious decision. Priming is assumed to reflect an automatic, often unconscious mechanism in language production, but in addition to the automatic processing there may be a more conscious desire to copy the native or produce more complex structures to demonstrate advanced knowledge.

The L2 speakers have an additional source of influence on which constructions they choose – preferences for those constructions in the L1, English. Both Spanish and English allow the verbs being studied to appear in both passive and active forms. However, Spanish also uses other syntactic constructions to convey a passive voice, or bring the patient of the verb into focus. The passive form employed in this study is grammatically correct, but is relatively uncommon in spoken Spanish (it is more common in formal written Spanish). Some figures comparing Spanish and English use of active and passives are found in work by Prat-Sala (1997). She asked subjects from both languages to describe pictures showing an action occurring between two animate objects (e.g., a swing hitting a bicycle). Her results showed that while around 35% of descriptions by English speakers were passives, only 11% of descriptions by Spanish speakers were passives, and 6% dislocations (OVS). If the construction is a relatively more frequent structure in the L1 (as the passive is in English) there is likely to be a higher preference for the subject to use this structure in the L2. The increased priming of passives found in the L2 speakers may be partly due to a preference for passives in the L1 and no understanding that passives are less appropriate in Spanish. Further studies would be required to clarify what proportion is due to each factor. For example, any influence of the L1 could be removed by priming a structure not found only in the L2, such the OVS (or even VOS or VSO forms) which are found in Spanish but not English.

Future research - Priming dispreferred structures:

I am currently running an extension of this study in which participants perform the same task but with a computer providing the pictures and prime sentences instead of a native-speaker confederate. The hope is that this removes some of the social aspect of the task, so there is not the same pressure of dialogue with a native. In this way I hope to show a priming effect that is independent of the social aspect of talking to a native "expert" in a language leading people to coordinate their speech to fit the native.

On the assumption that these preliminary studies have shown that syntactic priming is possible in L2 speakers, my future research will concentrate on developing new L2 priming studies. In particular, I would like to explore the areas of Spanish syntax which are purported to cause persistent problems for even advanced L2 speakers. These are areas that involve the syntax-semantics interface, such as knowing when it is appropriate to choose an overt vs null pronominal or a pre- vs postverbal subject. To produce and understand the language as a native would it is not enough to be familiar with what structures exist in the language. Knowledge is also needed about when it is appropriate to use a particular structure.

Native speakers find the passive slightly odd when used in spoken contexts. This is taken to be one reason why the priming effect is lower in these speakers. However, the L2 speakers of Spanish do not have these intuitions about the passive being inappropriate and are more willing to produce them in a priming context. Similarly, the appropriateness of overt/null pronominals and pre/postverbal subjects in Spanish depends on understand what is appropriate in a given context. I would like to design priming studies looking at word order and use of pronominals.

A strongly dispreferred or ungrammatical structure would be very difficult to prime in a native speaker. However, if an L2 speaker treats structures as being optional in a way that a native does not, they should be more susceptible to being primed into using the structure, even if the context disfavours it.

References:

Bock, J.K. (1986). Syntactic persistence in language production. *Cognitive Psychology*, 18: 355–387.

Bock, J.K. (1989). Closed-class immanence in sentence production. *Cognitive Psychology*, 18: 355-387.

Bock, J.K., & Loebell, H. (1990). Framing sentences. *Cognition*, 35: 1–39.

Branigan, H.P., Pickering, M.J., & Cleland, A.A. (2000). Syntactic coordination in dialogue. *Cognition*, 75: B13-B24.

Branigan, H.P., Pickering, M.J., Liversedge, S.P., Stewart, A.J., & Urbach, T.P. (1995). Syntactic priming: Investigating the mental representation of language. *Journal of Psycholinguistic Research*, 24: 489-506.

Hartsuiker, R.J., & Kolk, H.H.J, (1998a). Syntactic facilitation in agrammatic sentence production. *Brain and Language*, 62: 221–254.

Montrul, S. & Slabakova, R. (2003). Competence similarities between native and near-native speakers: an investigation of the preterite/imperfect contrast in Spanish. *Studies in Second Language Acquisition*, 25: 3.

Pickering, M.J., & Branigan, H.P. (1998). The representation of verbs: Evidence from syntactic priming in language production. *Journal of Memory and Language*, 39: 633–651.

Pickering, M.J., & Branigan, H.P. (1999). Syntactic priming in language production. *Trends in Cognitive Sciences*, 3, 136-141.

Prat-Sala, M. (1997). The production of difference word orders: A psycholinguistic and developmental approach. *Unpublished PhD thesis.*