

Developing psycholinguistic models of subject-verb agreement in speech production: New data from Shipibo-Konibo relative clauses

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Subject-verb agreement is assumed to be the marking of the verb in an utterance as determined by properties of the subject. Psycholinguistic models of agreement in speech production differ as to whether they treat this phenomenon as driven primarily by syntactic processes or semantic influences. But these models are based primarily on research in Indo-European languages. This paper suggests that a useful approach to investigating the psycholinguistic mechanisms behind agreement in speech production is to extend the research to more typologically variant languages and more complex structures. Relative clause data from a Panoan language, Shipibo-Konibo, based on the work of Valenzuela (2002) is presented here as an ideal case study for psycholinguistic research on syntactic and semantic influences on subject-verb agreement. Shipibo-Konibo has a flexible word order, and a variety of relative clause types and relativization strategies that display subjects and verbs in various positional relationships. The data is presented in the context of two psycholinguistic models of agreement production: the Marking and Morphing model (Eberhard, Cutting & Bock 2005) and the Maximal Input model (Vigliocco & Hartsuiker 2002).

1. Introduction

The study of sentence production investigates how speakers produce grammatically well-formed utterances that communicate an intended message. The successful production of an utterance entails that, during grammatical encoding, the speaker must match not only lexical and morphological items to conceptual information from the message she intends to convey, but also that each of these items are compatibly integrated in a conventional syntactic structure that can then be phonologically encoded. As with other areas of psycholinguistics, research into sentence production is informed by data provided first through observation of the linguistic phenomenon in question and then experimental investigation and modeling of the phenomena under examination. As it is assumed that the psychological mechanisms involved in speech production are the same for all normal speakers, theories of these mechanisms must account for data observed in a wide range of typologically variant languages. The purpose of this

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paper is to present a general overview of current psycholinguistic approaches to one particular linguistic phenomenon, agreement, while drawing attention to data in a language unlike those previously considered in psycholinguistic studies of agreement, Shipibo-Konibo. It will be argued that the data observed in Shipibo-Konibo, based on the work of Pilar Valenzuela (2002), are of interest not only because they exhibit features not seen in languages previously examined in agreement studies thus far, but also because they provide suitable stimuli that may be used in well-established experimental paradigms used to investigate agreement in speech production.

So what is “agreement”? In theoretical linguistics, agreement is typically understood as an asymmetric syntactic relationship in which the form of one element (the “target”) in a sentence corresponds to the form of another (the “controller”) (Corbett 2006). Typical examples include number marking on verbs to correspond with the number of the subject, as in the English examples (1-2).

(1) The cat (sg) plays (sg)

(2) The cats (pl) play (pl)

Other features often considered as reflecting agreement in subject-verb relations include person and gender (but see Corbett 2006:133-5 for discussion).

Within psycholinguistic studies of agreement production, one main question concerns the extent to which agreement morphology is influenced by information in the conceptual representation of the message rather than being strictly the result of syntactic procedures as defined by a language’s grammar. In other words, do targets (verbs) “look into” the conceptual message to access the notional values of agreement features, such as whether or not the referent is conceived of as singular or plural with regard to the number feature, or do they simply copy the grammatical values from the corresponding controlling elements (subjects) in the sentence, that is, whether or not the lexical item referring to the controlling element is specified as singular or plural¹? Thus, data of interest to studies of agreement production often include examples in which there is a mismatch between the *notional* value of the feature and the *grammatical* value of the feature. Example of such mismatch with regard to the number feature include

¹ In this example, ‘singular’ and ‘plural’ refer to values for the feature ‘number.’ However, the same distinction between ‘notional’ and ‘grammatical’ values is relevant for other agreement features, such as gender. In languages that mark gender, some referents (such as humans and other animate entities) may have notional gender values (e.g., female-feminine, male-masculine), while other referents may only have grammatical gender. This paper will focus on the number feature involved in subject-verb agreement, as that is the feature relevant to the Shipibo-Konibo data presented.

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the English noun *scissors*, in which the referent is notionally singular but grammatically plural, or *family*, which is grammatically singular but may, in some dialects, have a notionally plural value (being conceived of as a set of individual members). Cases in which agreement morphology reflect the grammatical number of the controlling referent (*the scissors ARE*) are taken to be evidence for agreement production being governed by syntactic processes. On the other hand, when agreement morphology reflects the notional value of the controlling referent (*the family ARE*, in some dialects), we have evidence that conceptual information is relevant to the agreement production process.

On one side of the debate are production models that describe agreement as being driven primarily by syntactic procedures. One such model is the Marking and Morphing model (Eberhard, Cutting & Bock 2005). The Marking and Morphing model assumes a grammatical encoding process that includes roughly two components: *functional assembly*, during which lexical entries are accessed and matched to grammatical functions as marked by the conceptual message, and *structural integration*, at which point agreement morphology is added to the lexical forms that have been accessed, and those forms are integrated into the appropriate constituent structure. Agreement processes operate under syntactic guidance with respect to hierarchical representations of sentence structure, where features are transmitted or copied from the controller to the target. During subject-verb agreement production the agreement target (verb) has no access to the conceptual representation of the controlling referent, but only to the grammatical value of the features as marked on the lexical form (the subject noun phrase, after it is encoded lexically).

On the other end of the spectrum are constraint-based models such as the Maximal Input model (also referred to as the Unification model; Vigliocco, Butterworth & Semenza 1995; Vigliocco, Butterworth & Garrett 1996; Vigliocco & Franck 2001; Vigliocco & Hartsuiker 2002). Such models claim that agreement features marked on targets are derived not solely from the syntactic controller, but also from information in the conceptual representation of the message. Targets have direct access to the notional value of the referent—for example, in the case of the number feature, whether or not the referent is conceived of as ‘singular’ or ‘plural.’ Controllers and targets are marked separately for features and are then unified during structural assembly. During this unification process, agreement features are checked for compatibility.²

² Based on her work with Franck (Franck, Vigliocco, Antón-Méndez, Collina & Frauenfelder 2008), one may assume that Vigliocco now rejects the Unification model. This rejection is based partially on the fact that the model has not fully accounted for morphophonological effects on agreement, but primarily on the claim that a conceptually-driven account of agreement “is

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Both models are based in part on observational data. The Marking and Morphing model accounts for the observation that subject noun phrases differing in notional number but having the same grammatical (e.g., *the label on the bottles* vs. *the road to the lakes*) both display grammatical agreement in English (Bock & Miller 1991). Observational data that motivate the Maximal Input/Unification model include agreement features marked on verbs in null-subject languages and conceptual effects on verb agreement features (Vigliocco, Butterworth & Semenza 1995:188-189; Vigliocco, Butterworth & Garrett 1996:264-266). Beyond observational data, each model has been supported by a variety of experimental data, almost all of which is based on eliciting a type of speech error referred to as *attraction* (Bock & Miller 1991). Attraction occurs when agreement features on a target erroneously match those on a referent other than the controller, as in *The cost of the improvements have not yet been estimated*, where *have* agrees with the plural *improvements* rather than the singular *cost*.

Yet the data investigated in studies underlying these models hardly cover all agreement phenomena. As Eberhard, Cutting and Bock (2005:553) themselves note in presenting the Marking and Morphing model, “[n]o other models have yet been developed to address in any detail the range of findings generated in the literature on grammatical agreement, so there is ample room for improvement”. Evidence for the models discussed are based primarily on results from empirical studies in English, although other languages have, to various degrees, been investigated (English: Bock, Eberhard & Cutting 2004, Bock, Butterfield, Cutler, Cutting, Eberhard & Humphreys 2006; Eberhard, Cutting & Bock 2005; French: Franck, Vigliocco, Antón-Méndez, Collina & Frauenfelder, 2008; German: Berg, 1998; Russian: Lorimor, Bock, Zalkind, Sheyman & Beard 2008; Hebrew: Deutsch & Dank 2008). Agreement morphology in languages that are more typologically variant has not yet been examined. Moreover, there is still much variation in the type of syntactic structures to be examined; while there is a well established literature on agreement in tag questions and subject-verb agreement in non-embedded clauses, (Bock, Nicol & Cutting 1999; Vigliocco, Butterworth & Semenza 1995; Vigliocco, Butterworth & Garrett 1996) psycholinguistic research in agreement production has just begun to consider a wider variety of structures (see Franck, Frauenfelder & Rizzi 2007).

incompatible with most modern linguistic accounts of agreement which, in order to account for a number of syntactic phenomena, assume a fundamental difference between the way features are specified on the noun and on the verb or adjective” (Franck et al. 2008:355). This critique ignores constraint-based accounts of syntax (Pollard & Sag 1994; Wechsler & Zlatic 2003). Because no psycholinguistic model of agreement has yet explained the full range of agreement phenomena observed across languages, and because there are indeed modern syntactic theories that are compatible with a unification-based model of agreement, I take the Maximal Input/Unification model to still be relevant.

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How to address these gaps in the current literature? Further development of psycholinguistic models to handle a wider range of agreement phenomena seen in language production can be based on two possibilities: one, considering languages that are more typologically variant, and two, following the current trend and continuing to examine structures that have not been previously examined with respect to agreement in the context of the model. This paper presents data that address both possibilities by considering the morphology of a particular linguistic structure, relative clauses, from data in a language previously uninvestigated in psycholinguistic studies—Shipibo-Konibo. It will be argued here that the examination of agreement morphology as well as other morphologically-marked relations of compatibility in relative clauses in Shipibo-Konibo, a Panoan language spoken in the Peruvian Amazon, challenges the architecture and underlying assumptions of current psycholinguistic models of agreement in speech production.

Shipibo-Konibo is a morphologically rich language with variable plural marking on verbs, adverbial transitivity agreement, and case-marked arguments, among many other morphological features. Within relative clauses, Shipibo-Konibo demonstrates multiple positional types (pre-nominal, post-nominal, internally-headed) as well as various relativization strategies (including gaps and anaphoric pronouns). Thus, the abundance of overt morphology and variation in Shipibo-Konibo relative clauses as compared to languages such as English offers an opportunity for empirical researchers to examine a broader range of notional and grammatical agreement morphology. Such variance would allow for researchers to investigate the psycholinguistic processes of agreement production while varying more parameters, including word order, clause boundaries, and optional expression of morphemes.

The remainder of this paper will be organized as follows: Section 2 will present a brief typological sketch of data in Shipibo-Konibo, based on the work of Pilar Valenzuela (2002), relevant to the discussion of the psycholinguistic mechanisms behind the production of agreement. Section 3 provides a basic overview of the two psycholinguistic models of agreement in sentence production compared here, as well as how they differ with respect to the role of conceptual (notional) and syntactic (grammatical) information in the production of subject-verb agreement. Section 4 will discuss Shipibo-Konibo relative clause features that show promise as data for further investigation in researching agreement in speech production, and Section 5 briefly concludes.

2. Relative clauses in Shipibo-Konibo

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This brief typological sketch of Shipibo-Konibo, a Panoan language with approximately 26,000-30,000 speakers inhabiting the Peruvian Amazon along the Ucayali River and its tributaries, is based on the work of Pilar Valenzuela (2002). I will follow Valenzuela's operational definition of relative clauses as "all expressions in which an optional clause containing a verb form adds information about a single head nominal, even if the latter remains unexpressed," (Valenzuela 2002:6). Three general characteristics of Shipibo-Konibo that will be relevant to the discussion of models of agreement production will be presented here: features of the morphological system, including the behavior of S and A arguments and number marking on verbs; flexible word order within both main clauses and relative clauses; and a range of relativization strategies.

2.1. Morphological features relevant to subject-verb agreement

Shipibo-Konibo has an ergative/absolutive phrasal-suffix case marking system. As there are no cross-referencing subject and object pronouns on verbs or auxiliaries in Shipibo-Konibo, and word order is relatively flexible, these case-marking suffixes are helpful in marking arguments of the verb. Case marking is realized on main-clause arguments, which may be modified by relative clauses, as well as arguments within the relative clause. In the case of modified main-clause arguments, the case marking appears at the end of the noun phrase, attached to the relative clause modifying the argument. Examples are shown in (3-6).³ In (3), *Ainbo* "woman" is shown in the absolutive form, being the S argument. In (4), the ergative marker *tonin* is attached at the end of the relative clause modifying the A argument, *Ainbo*, rather than at the end of *Ainbo*. Regarding case marking for arguments within the relative clause, (5-6) demonstrate the use of the ergative form *E-n-ra* "I" for the A argument in a single clause "I met a woman last year," in (5), and the same use of the ergative marker when that clause is then embedded as a relative clause modifying *Ainbo* "woman" in (6):

- (3) *Ainbo-ra* *Kako-nko-ni-a-x* *nokó-ke*
 woman:ABS-EV Kako-LOC-LIG-ABL-I meet:DTRNZ-CMPL
'The/a woman arrived from Kako.' (Valenzuela 2002:12)
- (4) *Ainbo* [*Kako-nko-ni-a-x* *nokot-a*]-*tonin-ra* *rao*
 woman Kako-LOC-LIG-ABL-I arrive-PP2-ERG-EV plant.medicine:ABS
kobin-ak-[a]i
boil-do.T-INC

³ A list of abbreviations and conventions (Valenzuela 2002) are provided in the appendix

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'The woman who arrived from Kako is boiling the plant medicine.'
(Valenzuela 2002:12)

- (5) E-**n**-ra ainbo onan-yantan-ke Makáyain-xon
1-ERG-EV woman:ABS know-PST3-CMPL Makaya:LOC-T
'I met the/a woman in Makaya last year.' (Valenzuela 2002:13)
- (6) Ainbo [Makáyain-xon e-**n** onan-yantaan-a]-ra ne-no nokó-ke
woman Makaya:loc-t 1-erg know-pst3-pp2:abs-ev prox-loc meet:dtznz-cmpl
'The woman I met in Makaya last year arrived here.' (Valenzuela 2002:13)

Although Shipibo-Konibo displays ergative/absolutive morphology, the language often treats subjects of intransitive verbs (S arguments) similarly to subjects of transitive verbs (A arguments). One example of such categorization is seen in plural agreement marking. Plurality is coded through a verbal suffix if it is not indicated on the S/A argument (Valenzuela 2002:1). The data presented here suggest that plural marking on the verb is not obligatory when the S/A argument is marked as in (7), as there is no plural marking on the verb *keyo-ai* "finish", while there is plural marking on the ergative (A) argument *joni-baon-ra* "people". It is required on the verb when the plural subject is omitted, as in the headless relative clause shown in (8); note the plural *-kan-* on *meni-kati-kan-ai* "give", and the absence of an ergative argument "they". It is also required when the S argument is unmarked, as in (9), where plural is unmarked on *bake* "child" but is shown on *be-kan-a* "come". The data also suggest that nothing prevents plural marking on the verb when it is marked on the subject nominal as well, as seen in (10), where both the A argument, *Shipi-baon-ra* "the Shipibo" and the verb *pi-[y]ama-kan-ai* "eat" display plural morphology.

- (7) [Jatik-xon-bi sepa-[a]i] joni-baon-ra jati-tian ishton
altogether-T-EM slash-PP1 person-PL:ERG-EV all-TEMP quickly
keyo-ai
finish-INC
'Men who slash a chacra altogether always finish quickly.' (Valenzuela 2002:13)
- (8) [Jawerato-n-ki yokat-ai] ja meni-kati-**kan**-ai.
which-ERG-INT ask-PP1:ABS 3:ABS give-PST4-PL-INC
'They gave her (her daughter) to whoever asked for (her).' (Valenzuela 2002:58)

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- (9) Jain-ribi-ronki be-**kan**-a iki... oa bake
 there-REP-HSY come.PL-PL-PP2 AUX DIST child
 [moa xontako-ai].
 already (become) young.woman-PP1:ABS
 ‘There also came...those girls (who were) already turning into young women.’
 (Valenzuela 2002:55)

- (10) Shipi-**baon**-ra kapé pi-[y]ama-**kan**-ai
 Shipibo-**PL:ERG**-EV alligator:ABS eat-NEG-**PL**-INC
 ‘The Shipibo don’t eat alligator.’ (Valenzuela 2002:9)

It is the case for relative clauses as well as main clauses that when the plural S/A argument is not overtly expressed, plural marking on the verb is obligatory, as seen in (11). Within the relative clause, the A argument “they” is not expressed. The verb, *ta-nini-nan-yama-bain-wan-kan-a* appropriately displays the plural morpheme *-kan-*.

- (11) Nokon koka r-iki [jawen ochíti
 POS1 maternal.uncle:ABS EV-COP POS3 dog:ABS
 ta-nini-nan-yama-bain-wan- **kan**-a] joni
 foot-pull-MAL-NEG-AND2-PST1-PL1-PP2 person
 ‘The man whose dog they did not pull by the foot to his detriment while
 passing earlier today is my maternal uncle.’ (Valenzuela 2002:10)

2.2. Word order

The basic constituent order of Shipibo-Konibo is AOV/SV, although word order within the main clause can be flexible to include non-verb-final orders. Word order within the relative clause, however, is strictly verb-final, although A and O arguments may be switched (Valenzuela 2002:15-17).

Within noun phrases, nouns and modifying elements including adjectives, quantifiers, numerals and relative clauses display flexibility in word order. (Valenzuela 2002:1). Shipibo-Konibo displays an interesting variety of positional types of relative clauses. Pre-nominal, post-nominal, and internally-headed relative clauses are found in the language, as well as relative clauses which separate a determiner and the head noun. Discontinuous relative clauses are also present, in which the head and the relative clause are separated by a modifying expression. Examples of pre-nominal, post-nominal and internally-headed relative clause types are presented in (12-14), where the head nominal *jono* “peccary” is shown following, preceding, and residing within the relative clause *papa-n rete-ibat-a* “(that) father killed”:

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- (12) [papa-n rete-ibat-a] **iono-ra** moa no-n keyo-ke
 father-ERG kill-PST2-PP2 peccary:ABS-EV already 1p-ERG finish-CMPL
'We already finished the collared-peccary father killed yesterday.'
 (Valenzuela 2002:18)
- (13) **iono** [papa-n rete-ibat-a]-ra moa no-n keyo-ke
 peccary:ABS father-ERG kill-PST2-PP2:ABS-EV already 1p-ERG finish-CMPL
'We already finished the collared-peccary father killed yesterday.'
 (Valenzuela 2002:19)
- (14) [papa-n **iono** rete-ibat-a]-ra moa no-n keyo-ke
 father-ERG peccary:ABS kill-PST2-PP2:ABS-EV already 1p-ERG finish-
 CMPL
'We already finished the collared-peccary father killed yesterday.'
 (Valenzuela 2002:19)

2.3. Relativization strategies

In addition to the variety of positional types of relative clauses, Shipibo-Konibo has several relativization strategies. These include a gap strategy, in which the relativized element corresponding to the head nominal is omitted from the relative clause, and an anaphoric pronoun strategy, where the relativized element corresponding to the head nominal is expressed in the relative clause by an anaphoric pronoun *ja*, a third-person singular pronoun unmarked for gender (Valenzuela 2002:51).

Overall, while relative clauses in Shipibo-Konibo show some nominalization behaviors (some constraints on word order with the relative clause, and other nominalization features that will not be relevant to the analysis presented here), it is important to note that they exhibit hallmarks of main declarative clauses. Like declarative clauses, relative clauses usually keep their full array of case-marked arguments and full adverbials with transitivity marking. Most important for this study is the fact that relative clauses, like main clauses, show some flexibility regarding word order as well as their position relative to the modified head noun. Thus, agreement morphology linking arguments and verbs is not dependent upon linear order or overt expression of arguments.

The next section continues with an examination of the psycholinguistic models that will may examined with respect to such agreement morphology.

3. Psycholinguistic models of agreement in sentence production

3.1. The Marking and Morphing model

In the Marking and Morphing model (Bock, Eberhard, Cutting, Meyer & Schriefers 2001; Eberhard, Cutting & Bock 2005) subject-verb agreement in speech production is composed of two distinct stages during grammatical encoding. The first stage, Marking, is a mapping of agreement features (such as person, number, and gender) from a conceptual representation to grammatical representations early in the grammatical encoding process. Early in the grammatical encoding process, marking assures that a subject noun phrase is specified for agreement features in accordance with the conceptual representation. In certain cases, the features marked on the subject NP may not be realized in the lexical specification. For example, in the sentence, “The sheep are grazing,” *sheep* has no morphological plural marker. Yet the subject NP *the sheep* is marked as notionally plural, as demonstrated by the verb morphology (i.e., *are*, rather than *is*). The realization of number (and, presumably, person and gender) on subject NPs is then a joint product of the notional number retrieved from the conceptual representation and the grammatical number specified by the lexical representations used to build the noun phrase. A computational version of the theoretical Marking and Morphing model explains how both notional number (from Marking) and grammatical number (from lexical specifications) contribute to the final value of number for subject noun phrases (Eberhard, Cutting & Bock 2005). While lexical specifications of local nouns inside the subject noun phrase (i.e., *books* in “*The editor of the history books*,”) are calculated into the final subject NP number value (and, in some cases, can override the head noun, leading to errors in agreement), notional number of local nouns is not a factor. Moreover, the lexical specification of nouns embedded in clausal modifiers inside the noun phrase (i.e., *books* in “*The editor who rejected the books*,”) are less likely to affect the number value of the subject NP than nouns in the same clause as the head noun of the subject NP (Bock & Cutting 1992).

In the second stage, Morphing, subject noun phrases control the agreement marking on the target verb by copying person-number-gender features, as determined by a combination of the notional marking process and lexical specification, onto the verb phrase. This occurs later in the grammatical encoding process, at the point when agreement-relevant features marked on grammatical representations (i.e., ‘subject’ marked as ‘plural’) are reconciled to those features specified in the lexicon (either a plural morpheme ‘-s’ or the appropriate lexical item, as in ‘sheep’). Those morphological forms are retrieved and integrated into the constituent structure in the subject noun phrase position.

The realization of agreement morphology on the verb, however, is constrained by syntactic processes. Verbs inherit person-number-gender features

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from the subject noun phrase; they cannot directly access notional number from the conceptual message. The verb ‘morphs’ to take on the correct form in accordance with the number value copied from the subject noun phrase. Thus, the Marking and Morphing model treats agreement as primarily driven by syntactic procedures in which agreement features are copied from the subject NP to the verb during grammatical encoding.

3.2. The Maximal Input/Unification model

A second model for the production of agreement, the Maximal Input model (Vigliocco, Butterworth & Semenza 1995; Vigliocco, Butterworth & Garrett 1996; Vigliocco & Hartsuiker 2002), claims that the production of agreement morphology is semantically driven. Unlike the Marking and Morphing model, in which only the grammatical representation of the subject NP receives person-number-gender information from the message’s conceptual representation, in the Maximal Input model, relevant conceptual features are retrieved by both the subject NP and the verb. In this approach, features are not copied from a controller to a target. Rather, each element (in this case, the subject and the verb) individually retrieves information from the conceptual representation. Agreement is thus a relation in which two elements supply partial information about a single linguistic form. Unlike the Marking and Morphing model, the Maximal Input model does not assume directionality (i.e., a controller-target relationship) in agreement, although if one element involved in the agreement relationship carries more information than another, as in English, agreement may appear directional.

Once features have been retrieved from the conceptual representation by the head of the subject NP and the verb, they are passed up to the highest projections in the syntactic structure (the subject NP node and the VP node) and the structures then undergo a unification process. This occurs during the grammatical encoding stage when constituents are combined in a structural representation but before word order is determined. Subject-verb agreement is the result of unification of the subject NP and the VP at the S node (Vigliocco, Butterworth & Garrett 1996). The final realization of agreement features is a combination of the information provided by both subject NP and verb, and unification may be considered to be a sort of “feature checking” procedure that ensures that the features of each element are compatible (Franck, Vigliocco & Nicol 2002:376).

4. Shipibo-Konibo relative clauses and psycholinguistic models of subject-verb agreement

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As presented in Section 2, above, the typological features of relative clauses in Shipibo-Konibo offer new potential for assessing psycholinguistic models of agreement in speech production. These features will be discussed here with respect to the models, looking at both observational data (attested utterances that it is assumed the models strive to account for), and data of experimental interest (potential stimuli that may be constructed in Shipibo-Konibo for the purposes of experimental investigation of the models.)

4.1. Observational data

Relative clauses in Shipibo-Konibo provide an opportunity to study subject-verb agreement production that languages previously investigated with respect to agreement do not provide. Unlike previously studied languages, Shipibo-Konibo displays a wide range of flexibility not only with regard to word order in both main and, to some extent, relative clauses, but also in the positional types of relative clauses allowed.

As discussed above, plural morphology may or may not appear on the verb when plural subject NPs (S/A arguments) are overtly expressed, but when the plural subject NP is not expressed, plural marking on the verb is obligatory. The first issue, then, concerns the case of non-overt subjects. While this particular issue is not unique to Shipibo-Konibo and has been discussed previously in both psycholinguistic and theoretical linguistic studies of agreement, the data presented here allow new ways to address the issue. The relative clause verb in (15) shows the plural suffix *-kan-* while the A argument “they” is not expressed overtly.

- (15) Jain iki pionis bepon [ja-n rao-n-kati-**kan**-ai]
 there COP pionis resina 3-INST plant.medicine-TRNZ-PST4-**PL**-PP1:ABS
‘There is the resina pionis with which they cured the girls.’ (Valenzuela 2002:23)

It has been suggested in previous literature that the phenomenon of agreement with null-subjects is problematic for hierarchically-based syntactic models of agreement, such as the Marking and Morphing model or the Feature Selection and Copy model (which will not be examined here) (Franck, Vigliocco, Antón-Méndez, Collina & Frauenfelder 2008), as no subject exists in the utterance from which to copy agreement features. A unification-based approach such as that of the Maximal Input model, however, is more easily able to account for the appearance of agreement morphology on the target (the verb) in absence of the controller (the subject) because agreement does not depend upon the surface expression of the controller; the target may receive feature information directly from the conceptual message.

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A somewhat different picture is painted by relative clause utterances in which the unexpressed subject corresponds to the modified head nominal, as in (16):

- (16) [Jatik-ax-bi teet-ai] joni-baon-ra jatí-tian ishton keyo-ai
 altogether-I-EM work-PP1 person-PL:ERG-EV all-TEMP quickly finish-INC
'People who work altogether always finish quickly.' (Valenzuela 2002:13)

Although the subject *joni-baon* “people” is not expressed in the relative clause, the verb *teet-ai* “work” does not display plural morphology. There are two possible explanations for this. First, it may be the case that Shipibo-Konibo only requires the plural-marked head nominal corresponding to the subject of the clause to be expressed in the main clause of the utterance in order to omit plural verbal morphology. Second, as the relative clause displays a “gap” strategy of relativization, one might hypothesize that the syntactic structure of the relative clause contains a trace—a null argument that carries all of the features of the subject, even though it is not overtly expressed.

The first hypothesis may very well be in line with some version of the constraint-based Maximal Input model but would be problematic for syntactically driven models. Without a subject carrying features to control the form of the verb, there is no way to predict whether the verb should or should not exhibit the plural morpheme. The constraint-based model shows more promise. The lack of plural morphology on the verb in the relative clause can presumably be explained in Maximal Input model because of two features: one, the unification procedure that occurs during constituent assembly is a checking procedure to make sure that features expressed on the head nominal coindexed with the relative clause subject and relative clause verb are compatible; and, two, it is assumed that all that is necessary for such compatibility is for the plural marking to be expressed by at least either the head nominal or the relative clause verb. In this way, the Maximal Input model can explain examples such as (16) as well as cases in which both subject and verb show plural marking, and those in which there is plural marking on the verb in the absence of marking on the subject. This would require, however, that the gap in the relative clause (the missing subject) be coindexed with the head nominal. While unification based theories of syntax posit such representations where a missing element can be coindexed with other elements in the utterance—without positing a “trace” (see Sag, Wasow & Bender 2003, chp. 14)—the Maximal Input model has not been fully developed to explain how such representations would be processed on-line during speech production.

The second hypothesis is more compatible with syntactically-driven models of speech production. If one assumes an underlying representation of the relative clause contains a subject argument coindexed with a trace containing its

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features, the form of the verb can be explained as a result of those features. Evidence for traces controlling target features has been demonstrated in prior experimental research (Franck, Frauenfelder & Rizzi 2007). The difference in Shipibo-Konibo, however, is that the plural features on the subject cause an omission of features being expressed on the verb rather than a copying of features on to it. This would not be terribly problematic—it would still be a “systematic covariance” of one element dependent upon another (Steele 1978:610, cited in Corbett 2006)—if it were not for the fact that Shipibo Konibo shows variability in the marking of subject-verb agreement. Example (17) provides an example of a relative clause in which the omitted subject corresponds to the marked-plural head nominal, but the verb also displays plural marking:

- (17) Jain ik-á iki oa [no-a shiro bewakan ninká-ma-ai-**bo**]
 there do.I-PP2 AUX DIST 1p-ABS *shiro* song:OBL hear-CAUS-PP1-**PL**
 ainbo-**bo**.
 woman-**PL:ABS**
‘There stood the women who provoked us with their shiro songs.’ (Valenzuela 2002:28)

Finally, Shipibo-Konibo relative clauses are of interest in assessing psycholinguistic models of agreement in speech production in that they present data for which the models cannot account. One such example concerns number marking of resumptive pronouns within relative clauses. As shown in (18), the resumptive pronoun *ja-n* (3-ERG) that corresponds to the head nominal *joni-bo* “men”, is singular, despite its reference to a plural antecedent.

- (18) [**Ja-n** jato bi-ai] **joni-bo** ik-á iki tampóra-ya.
3-erg 3p:abs get-pp1 **person-pl:abs** be-pp2 aux drum-prop
‘Those men who welcomed them had drums.’ (Valenzuela 2002:59)

This mismatch in number marking between pronoun and antecedent cannot be explained as a difference in notional and grammatical number of the target, nor can it be described as attraction. Previous research on pronoun-antecedent agreement has have treated the phenomenon as being more sensitive by conceptual information than by grammatical features; this is not the case here. Anaphoric pronouns in Shipibo-Konibo relative clauses are generally rejected by speakers (Valenzuela 2002:58). Both syntactically-driven and constraint-based models of agreement production have yet to explain how agreement features might be blocked from targets in certain clauses that would otherwise express those features. That such data have not yet been explained by the models is not in

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and of itself surprising; it is, however, interesting in that tokens such as these suggest directions for future work in modeling agreement in speech production.

4.2. Data of experimental interest

The variation of relative clause types and the flexible word order in Shipibo-Konibo allow for the creation of possible stimuli that can test and develop the agreement mechanisms proposed by psycholinguistic models using well-established experimental paradigms. For example, consider the verb and pronouns within the pre-nominal relative clause with respect to the head nominal in (19):

- (19) Tita-r keyot-ai, ja-tian no-a bane-ti ka-[a]i
 Mother;abs-ev finish-inc that-temp 1p-abs stay-inf go-inc
 [ja-n no-a axe-a-a] **jawéki-bo-ya.**
 [3-erg 1p-abs get.used.to-caus-pp2] thing-pl-prop
'Our mother dies and then we stay with the things she has taught us.'
(Valenzuela 2002:19)

The ergative pronoun *ja-n*, in agreement with its antecedent, *Tita-r* “mother”, has no plural marking. Likewise, the verb also lacks plural marking. The plural head nominal *jawéki-bo-ya* “things” follows the prenominal relative clause. But Shipibo-Konibo allows for not only pronominal but also post-nominal and internally-headed relative clauses. The inventory of relative clause types of Shipibo-Konibo presumably would allow the head nominal *jawéki-bo-ya* “things” to appear inside the relative clause, between the subject *ja-n* ‘she’ and the verb *axe-a-a* “taught.” Would it be possible to elicit attraction errors in Shipibo-Konibo internally-headed relative clauses by placing a head nominal between the subject and verb of a relative clause, resulting in a plural marking on the verb (in bold), as hypothesized in (20)?

- (20) Tita-r keyot-ai, ja-tian no-a bane-ti ka-[a]i
 Mother;abs-ev finish-inc that-temp 1p-abs stay-inf go-inc
 [ja-n no-a **jawéki-bo-ya** axe-a-a **(-kan-?)**]
 [3-erg 1p-abs thing-pl-prop get.used.to-caus-pp2 **(-pl-?)**]
'Our mother dies and then we stay with the things she has taught us.'
(Adaptation my own)

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By allowing variations in form for the same semantic content as seen in (20), Shipibo-Konibo provides a rare opportunity to tease apart syntactic and semantic factors in the production of agreement.⁴ There should be no difference between the semantics of (19) and (20) above; therefore, any attraction effects seen would have to be the result of syntactic processes and not conceptual features.

The possibility of constructing experimental stimuli to elicit attraction effects is further suggested by the existence of discontinuous relative clauses such as (21), in which the head nominal is separated by a clause with an attributive function:

- (21) Ja-káti-ai [yotokoni pi-á] kikin xeta wiso-bi-ribi
 Exist-PST4-INC yokotoni:ABS eat-PP2 extremely tooth black-EM-also
 ik-í joni-bo
 do.I-SSSI person-PL:ABS
'There were people who ate yotokoni and whose teeth were extremely (shiny) black.' (Valenzuela 2002:30)

In (21), the A argument corresponding to the head nominal *joni-bo* 'people' is not expressed within the relative clause. However, the relative clause verb *pi-á* 'eat' has no plural marking despite the separation of relative clause from head nominal. Just as (18) above, (21) demonstrates that it is not the case that such marking is required on a relative clause verb when a subject argument is missing in the relative clause, as long as that missing subject corresponds to the head nominal expressed in the main clause. What is worth noting here is that the variety of elements that are allowed to appear between relative clause and head nominal provide an opportunity for designing stimuli that would be useful in examining attraction phenomena in the production of agreement.

Experiments examining attraction in English number agreement have found that attractors specified for number are more likely to affect agreement than attractors that have a default number. In English, singular nouns, which are unmarked, are less likely to cause an attraction effect than nouns marked for plurality (Bock et al. 2001). Number in Shipibo-Konibo appears to be similarly marked in that the plural is specified while the singular form is the default. The agreement pattern, however, defies the canonical definition of agreement (Corbett 2006). It is not the presence of the number feature on the noun that requires a number marking on the verb; rather it is the *absence* of the feature that triggers number agreement. The presence of the plural marker on the noun actually seems

⁴ Whether or not variations in the form of relative clauses in Shipibo-Konibo are due to discourse factors has not yet been investigated (Valenzuela 2002:51).

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to make plural marking on the verb optional. How, then, might it be possible to test attraction effects in this language?

One possibility would be to create a variation of stimuli based on those used in previous experiments, in which singular subject noun phrases contain plural attractors, but to have the plurality unmarked on the attractor such that it might trigger the obligatory plural marking on the verb at a higher rate than singular attractors. Consider (22), an assumed adaptation of (21) above, in which the head nominal “people” would be placed before the relative clause, and *xeta* (assumed to be notionally plural “teeth” in this context) were to also remain unmarked for plurality⁵:

- (22) Ja-káti-ai joni-bo kikin **xeta** wiso-bi-ribi...
 Exist-PST4-INC person-PL:ABS extremely **tooth** black-EM-also ...
 ‘There were people whose teeth were extremely (shiny) black and who...’
 (Adaptation my own)

Now consider a token in which *xeta* “teeth” were to be replaced with a notionally singular item, perhaps the word for “canoe,” *nonti*:

- (23) Ja-káti-ai joni-bo kikin **nonti** wiso-bi-ribi...
 Exist-PST4-INC person-PL:ABS extremely **canoe** black-EM-also ...
 ‘There were people whose canoe was extremely (shiny) black and who...’
 (Adaptation my own)

As with previous experiments investigating attraction in subject-verb agreement, the point of interest is whether or not speakers prompted with sentence fragments given above finish the sentence with a plural form of the verb. Because the subject *joni-bo* “people” is marked as plural, a verb either marked or unmarked for plurality would be acceptable. Because unmarked plural subject nouns require verbs marked for plurality, however, if there is a higher rate of verbs produced with plural marking in the presence of a notionally plural attractor (*xeta* “teeth”) than singular attractors (*nonti* “canoe”), we may conclude that Shipibo-Konibo provides evidence in support of a constraint-based psycholinguistic model of agreement production.

A second possibility for experimental investigation lies in the variation of positional types of relative clauses in Shipibo-Konibo. As discussed in Section 2, Shipibo-Konibo displays pre-nominal, post-nominal and internally-headed

⁵ The examples adapted from Valenzuela (2002) are intended for illustration purposes and may not be grammatically felicitous. Naturally, any stimuli created for experimental investigation would require the review of a native speaker consultant.

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relative clauses. Consider possible variations of example (19), repeated here as (24), as containing a post-nominal (25) and internally-headed relative clause (26) with the head nominal as unmarked for plurality and the verb omitted.

- (24) Tita-r keyot-ai, ja-tian no-a bane-ti ka-[a]i
 Mother;ABS-EV finish-INC that-TEMP 1p-ABS stay-INF go-INC
 [ja-n no-a axe-a-a] jawéki-bo-ya.
 [3-ERG 1p-ABS get.used.to-CAUS-PP2] thing-PL-PROP
'Our mother dies and then we stay with the things she has taught us.'
(Valenzuela 2002:19)

- (25) Tita-r keyot-ai, ja-tian no-a bane-ti ka-[a]i
 Mother;ABS-EV finish-INC that-TEMP p-ABS stay-INF go-INC
 [ja-n no-a jawéki-ya ...
 [3-ERG 1p-ABS thing-PROP ...
'Our mother dies and then we stay with the things she ____ us.' (Adaptation
my own)

- (26) Tita-r keyot-ai, ja-tian no-a bane-ti ka-[a]i
 Mother;ABS-EV finish-INC that-TEMP 1p-ABS stay-INF go-INC
 jawéki-ya [ja-n no-a ...
 thing-PROP [3-ERG 1p-ABS ...
'Our mother dies and then we stay with the things she ____ us.' (Adaptation
my own)

Both the post-nominal and internally-headed relative clauses allow the head nominal to appear before the verb, making it possible to examine any attraction effects it might have on the production of the verb. Similar to the previous example, the influences of syntax and semantics in the production of agreement in speech might be examined by replacing the notionally plural head nominal attractor with a notionally singular attractor and examining the rates of production of plural marking on the elicited verb.

These are just a couple of examples of the range of possible experimental stimuli that might be designed in Shipibo-Konibo to examine psycholinguistic processes of subject-verb agreement production. Additional possibilities include examining attraction effects with respect to variations in linear and structural distance, examining the role of clause boundaries in attraction effects, and attraction effects on main verbs.

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5. Conclusion

Even the cursory examination of typological features of relative clauses in Shipibo-Konibo presented here clearly demonstrates that this language is unique among those considered for psycholinguistic investigation. This reason alone should prove enough to prompt researchers to add it to the lists of languages under psycholinguistic investigation up to now. But even beyond the need to consider a wider range of language types in psycholinguistic research, the variation seen in Shipibo-Konibo with respect to word order, relative clause positional types and relativization strategies are absolutely compelling. These features provide a wealth of possibilities for investigating both syntactic and semantic influences on agreement in speech production. Moreover, experimental paradigms such as elicitation techniques used in numerous previous studies promise to be suitable for investigating Shipibo-Konibo.

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Appendix: Abbreviations and Conventions (Valenzuela 2002)

1	first person singular		transitive matrix
2	second person		clause
	singular	FUT	future
3	third person singular	GEN	genitive
1p	first person plural	HAB	habitual
2p	second person plural	HSY	hearsay
3p	third person plural	HSY2	shorter hearsay
A	transitive subject	I	intransitive (subject
	function		orientation)
ABL	ablative	IMP	imperative
ABS	absolutive	INC	incompletive aspect
ADVZ	adverbializer	INF	infinitive
AGTZ	agentivizer	INFR	inferential
ALL	allative	INST	instrumental
ASSOC	associative	INT	interrogative
ATT	attenuative	INTENS	intensifier
AUG	augmentative	INTRST	complement of
AUX	auxiliary		interest
BEN	benefactive	LIG	ligature
CAUS	causative	LIM	limitative
CHEZ	chezative	LOC	locative
CMPL	completive aspect	MAL	malefactive
COM	comitative	MNS	means
CONI	conjunction	NEG	negative
COP	copula	NMLZ	nominalizer
DES	desiderative	NOM	nominative
DIM	diminutive	O	object function
DIST	distal	OBL	oblique
DISTR	distributive	ONOM	onomatopoeia
DTRNZ	detransitivizer	PDS	previous event,
DUB	dubitative		different subject
EM	emphatic	PEI	pejorative
ERG	ergative	P/J	prospective/jussive
EY	direct evidential	PL	plural
FDS	following event,	PO>S/A	previous event,
	different subject		dependent object is
FSSI	following event,		coreferential with
	same-subject,		matrix subject
	intransitive matrix	POS1	possessive first person
	clause		singular
FSST	following event,	POS3	possessive third
	same-subject,		person singular

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PPI	incompletive participle	S	intransitive subject function
PP2	completive participle	SDS	simultaneous event, different subject
PREV	preventive	SIML	similitive
PRIV	privative	SPECL	speculative
PROG	progressive	SSSI	simultaneous event, same-subject, intransitive matrix clause
PROP	propriative		
PSSI	previous event, same- subject, intransitive matrix clause	SSST	simultaneous event, same-subject, transitive matrix clause
PSST	previous event, same- subject, transitive matrix clause	T	transitive (subject orientation)
PST1	earlier today past	TEMP	temporal
PST2	yesterday past	TRNZ	transitivizer
PST3	several months/a few years ago past	VOC	vocative
PST4	several years ago past		
REC	reciprocal		
REM	remote past		