Intra-sentential Code Switching at the Syntax-prosody Interface[1]

Mandy Cartner
Tel Aviv University
mandycartner@mail.tau.ac.il
https://orcid.org/0009-0008-2743-6089

Julia Horvath
Tel Aviv University
horvath@tauex.tau.ac.il
https://orcid.org/0000-0002-5648-4847

Abstract

Grammatical patterns of intra-sentential code-switching (ICS) provide a testing ground for architectural questions in generative linguistics. ICS shows that bilinguals are able to derive sentences containing material in more than one language. We investigate the nature of a minimal unit for ICS, which must remain unilingual, and propose to derive it from already established properties of grammar, specifically the mapping from syntax to phonology. We report data from three acceptability studies on Hebrew-English bilinguals, investigating ICS patterns at the CP edge, the DP edge, and with pronominal subjects. Our results point to a prosodically-defined minimal unit for ICS, which does not adhere to the boundaries established by Phase theory, contra López et al. (2017)'s theory of "code-switching by Phase".

Keywords: Code Switching, phases, prosodic structure, bilingualism, English, Hebrew.

1. Introduction

Intra-sentential code switching (ICS) is the use of more than one language within the boundaries of a single sentence, exemplified in (1a). ICS is common among fluent bilinguals. Alongside the various social factors that influence the practice of ICS, studies find that ICS is grammatically constrained (e.g., Poplack, 1980; Di Sciullo, Muysken and Singh, 1986; Mahootian, 1993; Myers-Scotton, 1993; MacSwan, 1999, 2006; Muysken, 2000; González-Vilbazo, 2005; González-Vilbazo and López, 2011; López, Alexiadou and Veenstra, 2017;

[1] **Acknowledgments**: We thank Gilly Hoffman Even and Nathan Lewin for recording the materials used in our experiments, and the audiences at CGG 33, Tel Aviv University, and UMass Amherst for their feedback and discussion. This research was supported by a Collaborative Research Grant from the Cukier-Goldstein-Goren Center for Mind and Language (MILA), awarded to PIs Julia Horvath and Aya Meltzer-Asscher (2021–2023). The data and analysis files can be accessed in the following Open Science Foundation repository: https://osf.io/3xkwu/?view_only=776cd7293b2e4a74b6be012c84308a29

López, 2020). For example, while the sentence in (1a), with a switch between a Spanish auxiliary and an English progressive is considered acceptable; Spanish-English bilinguals are reported to reject (1b), with a switch between a Spanish auxiliary and an English perfective.

(1) a. Los ciudadanos están *supporting the program* Spanish/*English*
The citizens are
b. **Tú habías* told that story.
You had

López, Alexiadou & Veenstra (2017)

Deriving such grammaticality patterns is the focus of theoretical work on ICS. While early research on ICS patterns often made use of constraints specific to ICS, we pursue the null hypothesis that bilinguals' patterns of ICS derive from general properties of bilinguals' grammar (Mahootian, 1993; MacSwan, 1999). This approach, in turn, suggests that ICS patterns can provide valuable insight into the organization of bilingual grammar, and grammar in general.

MacSwan (1999) develops a model of ICS which is embedded in the Minimalist Program (MP) of generative grammar (Chomsky, 1965, 1981). MacSwan posits that bilinguals are equipped with two traditional lexicons to which parametric differences are attributed, while the syntactic component lacks language-specific rules and thus can be shared across a bilingual's two languages. Lexical items may be drawn from either lexicon and inserted into a single derivation, introducing features which must be checked for convergence, no different from the derivation of a unilingual sentence.

While MacSwan (1999) motivates a single syntactic component, he argues that bilinguals must represent distinct PFs, one for each language. He argues that the PF component cannot be unified because PF rules are ordered/ranked with respect to one another, and these orders are language-specific (Bromberger and Halle, 1989). In order for each ordering to be maintained, it must be encapsulated in a language-specific PF. Relatedly, research into the phonetics and phonology of bilinguals motivates the assumption that bilinguals have two phonological systems, as they successfully maintain two sets of phonetic targets and phonological processes, even in ICS (Caramazza *et al.*, 1973; Olson, 2019; Gosselin, 2022).

Under this architectural assumption, the derivation of an ICS sentence must be divided between two PF components. A crucial question to explore then is: Can any unit of derivation be divided as such? Or are there units that must be sent off to a single PF component? This would determine a minimal unit for CS, a unit that cannot involve CS internal to it but must be in a single language.

We pursue this question within the framework of Distributed Morphology (DM) (Halle and Marantz, 1993). Under DM, the information associated with lexical items of previous models is distributed across various components of grammar, such that the objects inserted into syntax are abstract and lack phonological exponence, making them potentially non-language-specific. Thus, the choice between one language or another in bilingual grammar may only affect the derivation at spell-out, where an abstract syntactic representation is assigned language-specific exponence. While ICS patterns are likely influenced by parametric differences across a bilingual's two languages, commonly represented as contrasting formal-feature specifications within the MP, this study focuses on whether and how properties of the syntax-phonology interface and the mapping of an abstract syntactic representation to language-specific PFs affect ICS patterns.

López (2020) develops a DM model for bilingual grammar to account for ICS patterns, but argues for a single shared PF. His argument is based on cases where the PF rules associated with one language apply to, or affect the processing of, material in a bilingual's other language. Examples include a Spanish impoverishment rule for clitic sequences that bilinguals may sometimes apply to Catalan; Welsh-English bilinguals exhibiting processing difficulty when a Welsh mutation rule is applied to an English word in the wrong environment (Vaughan-Evans *et al.*, 2014); light verbs imposing the prosodic structure and constituent order of their language on a complement in the other language (González-Vilbazo and López, 2012).

However, such cases could also be the result of grammatical transfer due to language contact, or of co-activation across separate grammatical systems. Thus, they do not necessarily motivate the stronger claim that bilinguals represent a single PF, which would face empirical challenges. Beyond the facts noted above supporting MacSwan (1999)'s model, a single PF component in bilingual grammar predicts competition between vocabulary items across languages. For example, due to the Elsewhere Principle, in Hebrew-English grammar, the Hebrew exponent of 'with' should always win against the English exponent when this preposition appears with a pronominal complement, since Hebrew specifies a contextually restricted form with pronouns, while the English form functions as the elsewhere exponent.

In the next section, we review previous work by MacSwan (1999) and López et al. (2017), each suggesting a PF-based restriction on ICS, and motivate our study. In section 1.2. we discuss some important methodological considerations. Section 2, 3 and 4 present the design and results of three studies we conducted. Section 5 discusses our conclusions.

1.1. Mapping ICS at PF

Based on his assumption that bilinguals' grammar represents two distinct PFs, MacSwan (1999) proposes that ICS within a single syntactic head is impossible, as each head must be interpreted by a language-specific PF component. In particular, he argues that since phonological rules are sensitive to inflectional affixes (Halle and Mohanan, 1985), a complex syntactic head must be sent to one language-specific PF, e.g., PF of L_x. If this head hosts material in L_y, this L_y material is unidentified by the L_x PF system, and cannot be parsed. Thus, a stem and an inflectional affix must be in the same language, and no ICS can occur between them. This accounts for Poplack (1980)'s observation that a switch between a root and bound morpheme is banned, as in (2).

(2) *Juan está *eat*-iendo Spanish/*English*
Juan be eat-DUR
'Juan is eating'

Moreover, MacSwan utilizes this proposal to explain several acceptability patterns in Spanish-Nahuatl ICS. For example, he reports that switching between an auxiliary and an inflected verb is unacceptable, and argues that this is the result of inflected verbs raising to T^0 for feature-checking, resulting in a complex syntactic head. Similarly, switching between a Spanish determiner and a Nahuatl noun is also unacceptable, which MacSwan argues is the result of Spanish determiners triggering noun raising for agreement purposes, resulting in a complex D^0. Within his model, these complex syntactic heads must be sent to a single language-specific PF component for interpretation. Since any material in the other language is uninterpretable at the other language's PF, code-switching is unacceptable.

More recently, López, Alexiadou and Veenstra (2017) proposed that ICS is only possible between *phasal spell-out domains* and prohibited within one. Phasal spell-out domains of the MP framework constitute cycles of derivation that are transferred to the interfaces before further structure is built (Chomsky, 2001). According to the prevalent view, phases are CP and vP (and sometimes DP), and their complements (TP and VP, respectively) undergo transfer. The transferred material, i.e., the phase's spell-out domain, becomes inaccessible to further syntactic probing, while the phase head and specifier (the phase *edge*) remain active in the next higher phase (Chomsky, 2001). Phasal and spell-out boundaries are illustrated for the sentence *Maria studied laws* in Figure 1.

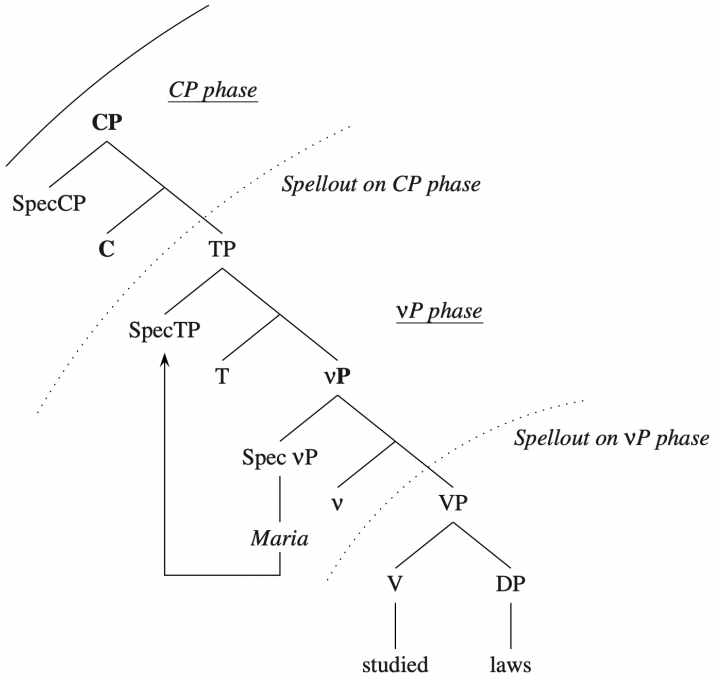

Figure 1. An illustration of phases and spell-out for the derivation of *Maria studied laws*. (Kratzer and Selkirk 2007, p. 104)

López et al. (2017) propose that since the whole spell-out domain undergoes transfer to the interfaces as one unit, it is sent off to a single, language-specific phonological system and hence must be realized all in one language. They predict that material within a spell-out domain must match in language, such that ICS is possible only across spell-out boundaries. Thus, they account for the contrast in (1), repeated in (3). In (3b), the auxiliary and the verb are spelled-out together, as part of the CP complement domain, and cannot involve code-switching. On the other hand, the authors suggest that the progressive in (3a) introduces a phase boundary between T and the *-ing* verb, based on the locative PP analysis for progressives (Bolinger, 1971), making code-switching between the auxiliary and progressive possible.

(3) a. Los ciudadanos están *supporting the program* Spanish/*English*
The citizens are
b. **Tú habías* told that story.
You had

López, Alexiadou & Veenstra (2017)

However, as noted by the authors, patterns of ICS at the CP phase challenge the proposal that ICS is constrained by spell-out domains. They report that switching between a *wh*-phrase and a TP is acceptable (4a), while switching between a complementizer and a TP is not (4b).

(4) a. *Ich weis nicht*, [$_{CP}$ *welches Buch* [$_{TP}$ Juan compró]] *German*/Spanish
I know not which book Juan bought.
'I don't know which book Juan bought'

(González-Vilbazo and López, 2013)

b. *Eduardo *denkt* [$_{CP}$ que [$_{TP}$ *Elena schreibt sich im sekretariat*]]
Eduardo thinks that Elena registers SELF in.DEF.DAT secretary's office
'Eduardo thinks that Elena registers at the secretary's office.'

(González-Vilbazo, 2005)

To account for the contrast in (4), they suggest that transfer is sensitive to the feature content of the elements at the phase edge (based on Ott, 2011). In the embedded interrogative (4a), C is marked with an interpretable [+Q] feature which must be checked at the higher Phase, ensuring that C stays behind and is spelled-out separately from its complement TP, allowing for ICS. However, in declarative clauses (4b), C allegedly bears no uninterpretable or clause-typing features that would require further checking, and thus it is transferred along with its complement, blocking ICS between the CP edge and complement.

Note however that their proposed distinction may be confounded: The *wh*-phrase in (4a) is lexically restricted, while the complementizer in (4b) is a bare function word. In the present study, we explore the possibility that the source of the contrast in (4) is prosodic, and specifically, that ICS between prosodically dependent elements is restricted. As predicted by theories of prosodic parsing (Selkirk, 1972, 1996; Nespor and Vogel, 1986), only a lexical element triggers the formation of an independent prosodic phrase, and thus functional elements are always parsed along with some lexical material. The complementizer in (4b), but not the *wh*-phrase in (4a), is thus expected to be prosodically dependent, which may restrict ICS. We propose the hypothesis in (5), to be tested in the present study:

(5) *ICS by prosodic phrase*

ICS cannot occur within a prosodic phrase; it is possible only at prosodic phrase boundaries.

We report data from 3 acceptability studies on Hebrew-English bilinguals, comparing the predictions of MacSwan (1999)'s theory, which we label *ICS by head*, our proposed theory *ICS by prosodic phrase*, and López et al. (2017)'s theory *ICS by Phase*. Experiments 1A-B target ICS at an embedded CP, manipulating the prosodic size and feature-content of the CP edge element (Section 2), experiments 2A-B target ICS at the DP edge (Section 3) and experiments 3A-B target ICS with pronominal subjects, manipulating the Phase status of the

surrounding clause. Before presenting the studies, Section 1.2 motivates the methodology used in our study.

1.2. Methodology

Early work on ICS patterns were based on informal acceptability judgements, which often resulted in empirical disagreements between researchers. For example, while some researchers claim that ICS between a complementizer and TP is unacceptable (Belazi, Rubin and Toribio, 1994; López, Alexiadou and Veenstra, 2017), others claim it is acceptable (Joshi, 1982; Di Sciullo, Muysken and Singh, 1986; MacSwan, 2000). While judgements on ICS vary based on external factors, such as speakers' language background, fluency, and presentation modality (González-Vilbazo *et al.*, 2013; Badiola and Sande, 2018; Koronkiewicz and Ebert, 2018), these factors are often not disclosed in non-experimental work on ICS, leaving discrepancies across studies unaccounted for. González-Vilbazo et al. (2013) provide an exploration of different methodologies for ICS research, stressing the importance of the experimental design, participant selection, and the explicit reporting of methodology. In accord with the conclusions of this work and others (e.g., Gullberg, Indefrey and Muysken, 2009), we investigate grammatical patterns of ICS experimentally.

This research utilizes acceptability judgment tasks using auditory, rather than written stimuli, which mirrors more closely speakers' experience given that ICS is primarily a phenomenon of informal spoken language use. Moreover, this mode of presentation avoids the orthographic problem arising in Hebrew-English ICS, as each language uses an opposite writing direction. Lastly, in order to understand participants' language background, all participants completed the Bilingual Language Profile (BLP) questionnaire (Birdsong, Gertken and Amengual, 2012) which consists of questions about one's language history, use, proficiency, and attitudes. Each participant's responses are scored for the calculation of their relative language dominance score, ranging from -218 for most Hebrew dominant, to +218 for most English dominant.

2. Experiments 1A-B: The CP edge

Experiments 1A and 1B are auditory judgment tasks, designed to test whether Hebrew-English bilinguals' ICS patterns at the CP edge are modulated by prosodic structure, and/or complement spell-out. The two experiments differ only in the direction of the switch: all items in Experiment 1A switched from Hebrew to English, and all items in Experiment 1B switched from English to Hebrew.

These experiments are designed to examine López et al. (2017)'s claim that code-switching at the CP edge is modulated by the feature-content of C^0, such that *wh*-phrases may mismatch the language of the embedded clause, while declarative complementizers cannot, as a function of spell-out. This prediction is compared against an alternative hypothesis, *ICS by prosodic phrase*, which predicts ICS at the CP edge to be modulated by prosodic size: ICS with small, prosodically dependent function words is predicted to be constrained, while lexical phrases forming independent prosodic units may be switched freely. These hypotheses critically contrast in their predictions for bare *wh*-words: While *ICS by Phase* predicts bare *wh*-words to align with lexically restricted *wh*-phrases, due to their [+Q] feature, *ICS by prosodic phrase* predicts them to align with complementizers, due to their prosodic status as bare function words. Finally, MacSwan's (1999) *ICS by head* predicts all patterns of ICS tested in Experiments 1A-B to be acceptable, since material at the CP edge does not incorporate with any surrounding material into a single head.

2.1. *Methods*

Participants. Participants were recruited via social media. 101 participants completed the task, until data from 96 (48 in each task) suitable Hebrew-English bilinguals were collected. 5 participants were removed because they reported that they were also fluent speakers of Russian. On average, participants were more Hebrew dominant, with the large majority residing in Israel at the time of testing. The average age of participants was 26.5 (*Std. 5.6*). See Table 1 for a summary of data collected in the BLP questionnaire.

	Experiment 1A				**Experiment 1B**			
	Avg.	*Std.*	*Min.*	*Max.*	*Avg.*	*Std.*	*Min.*	*Max.*
Dominance	*-48.32*	*45.52*	*-140.01*	*82.12*	*-64.33*	*39.31*	*-133.12*	*25.94*
Hebrew AOA	*0.73*	*1.74*	*0*	*6*	*0.71*	*2.60*	*0*	*6*
English AOA	*3.54*	*3.01*	*0*	*10*	*4.63*	*3.53*	*0*	*12*

Table 1. BLP data for Experiments 1A-B. The Dominance scale ranges from -218 to 218.

Materials. The materials were pre-recorded by a bilingual speaker of Hebrew and English. All experimental items included a switch at the edge of an embedded clause. In each experiment, 24 sets included embedded *wh*-interrogatives, in which two factors were manipulated: whether a *wh*-phrase matched the language of its clause (*C+TP*: the language of the C edge and TP

match or *mismatch*) and what is its type (*wh*-type: *bare wh*-word or a *lexical wh*-phrase). In 12 other sets (in each experiment), the language of a declarative complementizer was manipulated (*C+TP*: *match* or *mismatch*). Example items can be seen in Table 2. Experimental items were accompanied by an additional 36 filler items, all involving ICS.

Embedded declaratives		
	C+TP mismatch	*ha-melcarit hodi'a še-* the restaurant is closing soon the-waitress announced that
	C+TP match	*ha-melcarit hodi'a* that the restaurant is closing soon the-waitress announced
Embedded interrogatives		
bare	**C+TP mismatch**	*ha-mazkira badka mi* is supposed to come in today the-secretary checked who
	C+TP match	*ha-mazkira badka* who is supposed to come in today the-secretary checked
lexical	**C+TP mismatch**	*ha-mazkira badka eize mitlamed* is supposed to come in today the-secretary checked which intern
	C+TP match	*ha-mazkira badka* which intern is supposed to come in today the-secretary checked

Table 2. Example sets for Experiment 1A, switching from Hebrew to English.

Procedure. The experiment was hosted on the online platform PCIbex farm (Zehr and Schwarz, 2018), and completed by each participant on their personal device. The instructions informed participants that they will hear sentences that mix Hebrew and English and will be requested to provide their impression of how natural each sentence sounds, on a 6pt scale. After completing the judgment task, participants filled out the BLP questionnaire.

2.2. *Analysis and Results*

Embedded declaratives. Participants' ratings for the embedded declaratives item sets were analysed using Bayesian logistic mixed-effects models (using the brms package in R, Bürkner, 2017), one for each experiment (experiments 1A and 1B). The models included *C+TP* as a predictor, and random intercepts and slopes for participants and items. Weakly informative priors were used throughout. The model was estimated with 6 chains, each running for 5000 iterations (1000 warmup). We consider parameters whose 95% credible interval (Crl) does not contain 0 to indicate reliable effects– that is, when the data provide evidence for a positive or negative effect rather than one that could plausibly be absent.

For both experiments (1A & 1B), the models provided evidence for negative *C+TP* effects, such that sentences in which the complementizer mismatched the embedded clause were rated poorly compared to sentences in which they matched. The effect seems to be more robust in Experiment 1A; in Experiment 1B, the upper bound of the 95% CrI was 0, indicating only marginal evidence for this effect. Mean ratings by condition are presented in Figure 2. Posterior values for the estimates and their errors, along with 95% Crl's, are provided in Table 3.

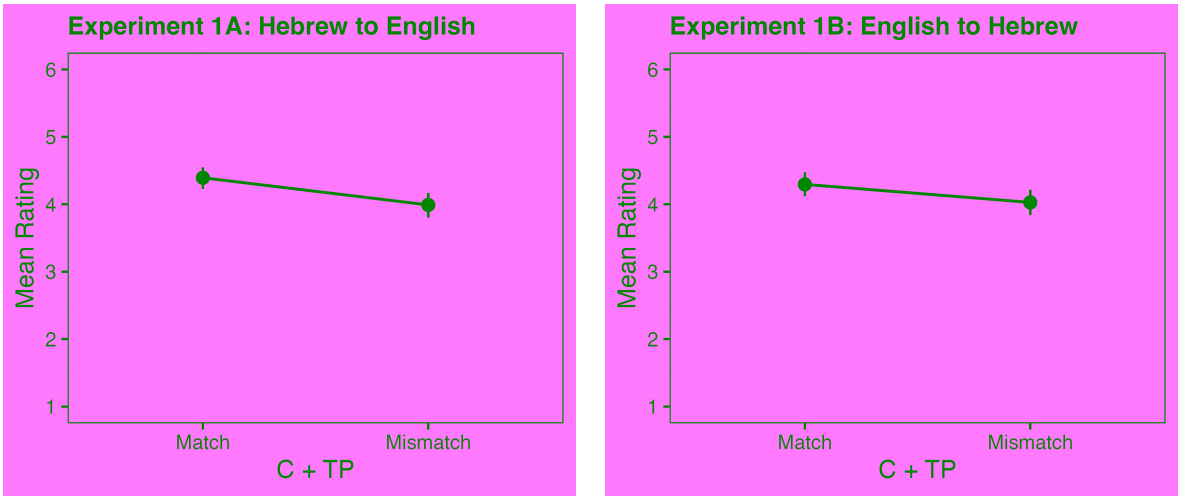

Figure 2. Mean acceptability ratings for *embedded declaratives* in Experiments 1A-B. Error bars show 95% bootstrapped confidence intervals for the mean rating.

	Estimate	Est. Error	95% Crl lower	95% Crl upper
Experiment 1A				
C+TP	-0.37	0.18	-0.72	-0.02
Experiment 1B				
C+TP	-0.22	0.11	-0.43	-0.00

Table 3. Bayesian logistic mixed-effects models fit to the *embedded declaratives* data from Experiments 1A-B.

Embedded interrogatives. Participants' ratings for the *embedded interrogative* item sets were analysed using Bayesian logistic mixed-effects models, one for each experiment. The models included *C+TP* and *Wh Type* as predictors. All other model details were identical to the models used for the *embedded declaratives* dataset.

For both experiments (1A & 1B), the models provided evidence for *C+TP* effects, such that participants preferred sentences in which the *wh*-element matched rather than mismatched the language of the embedded TP. Crucially, this effect interacted with *Wh Type*, such that the preference for the *wh*-element and the embedded TP to match was only present with bare *wh*-words, and not with lexically restricted *wh*-phrases. The models also provided evidence for a main effect of *Wh Type*, indicating higher acceptability ratings with lexically restricted *wh*-phrases compared to bare *wh*-words, which likely stems from the sharp decrease in acceptability for bare *wh*-words in the *C+TP mismatch* condition. This effect, as well as the interaction, seem to be more robust in Experiment 1A than 1B. Mean ratings by condition are presented in Figure 3. Posterior values for the estimates and their errors, along with 95% Crl's, are provided in Table 4.

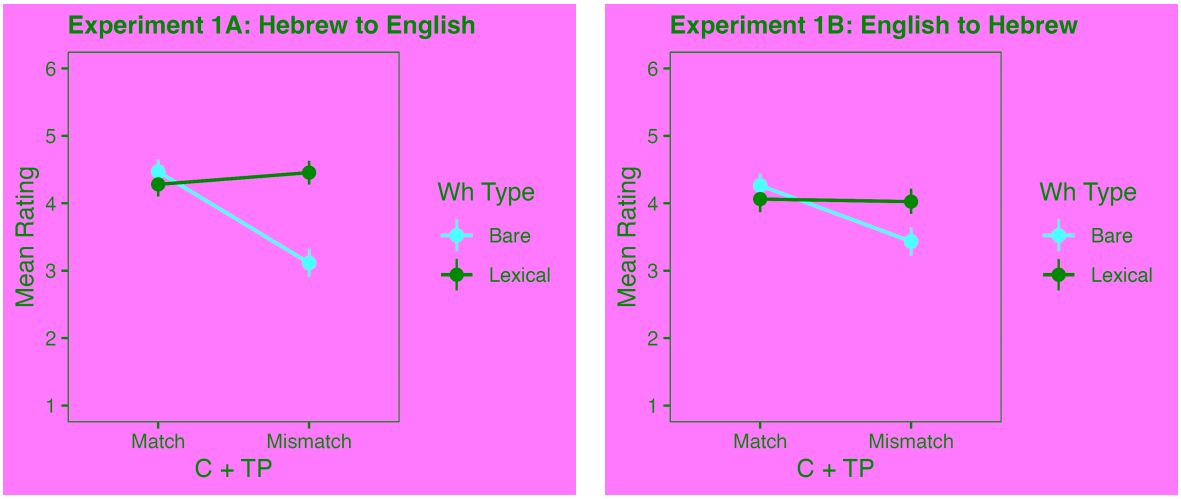

Figure 3. Mean acceptability ratings for *embedded interrogatives* in Experiments 1A-B. Error bars show 95% bootstrapped confidence intervals for the mean rating.

	Estimate	Est. Error	95% Crl lower	95% Crl upper
Experiment 1A: Hebrew to English				
Wh Type	0.23	0.05	0.14	0.32
C + TP	-0.24	0.05	-0.34	-0.13
Wh Type × C + TP	0.33	0.05	0.22	0.43
Experiment 1B: English to Hebrew				

Wh Type	0.08	0.05	-0.01	0.17
C + TP	-0.16	0.05	-0.26	-0.05
Wh Type × C + TP	0.16	0.05	0.06	0.26

Table 4. Bayesian logistic mixed-effects models fit to the *embedded interrogative* data from Experiments 1A-B.

2.3. *Discussion*

The results of Experiments 1A-B demonstrate that Hebrew-English bilinguals' preferences for ICS within an embedded CP vary by the prosodic size of the CP edge element: With complementizers and bare *wh*-words, we found a preference for the CP edge to match the language of the TP, rather than mismatch it. Contrarily, with lexically restricted *wh*-phrases, this preference was nullified and both ICS between the CP edge and complement, as well as ICS before the CP edge, were similarly acceptable.

This pattern of acceptability supports the proposed theory of ICS by prosodic phrase, as it is selective of size: Only bare functional material at the CP edge must match the language of the embedded material, its apparent host, while lexically restricted phrases are independent and free to switch. This pattern can be captured neither by the *ICS by head* (MacSwan, 1999) nor by the *ICS by Phase* (López et al., 2017) theories. First, MacSwan's proposal does not predict these ICS patterns to be constrained, because elements at the CP edge do not form a single head with any surrounding material. In fact, MacSwan casts doubt on early reports that ICS between a complementizer and TP is unacceptable (Belazi, Rubin and Toribio, 1994), and does not attempt to accommodate them within his theory.

López et al. (2017)'s theory *ICS by Phase* does not capture the reported pattern of acceptability, either. López et al. propose that the spell-out of complementizers and *wh*-phrases differs based on the feature-content of C^0, capturing the contrast they observe between complementizers and *wh*-phrases. Accordingly, *bare wh*-words would be expected to pattern with *lexically restricted wh*-phrases, since both specify a [+Q] feature, ensuring they are spelled-out with the next higher phase, and should thus match the language of the matrix verb, and may mismatch the embedded TP. However, we observe the opposite pattern: Bilinguals prefer bare *wh*-words to match the language of TP, similarly to declarative complementizers.

More broadly, the patterns of acceptability reported in Experiments 1A-B do not support the boundaries predicted by Phase theory. We observe that bare function words at the

CP edge must match the language of the embedded TP, despite the assumption that the CP edge and complement are spelled-out separately. This is also surprising under the *ICS by prosodic phrase* hypothesis: given the assumption that spell-out feeds prosodic structure, prosodification across a spell-out boundary would be blocked. This is discussed further in Section 5.

3. Experiments 2A-B: The DP edge

Experiments 2A-B are auditory judgment tasks, designed to test the acceptability of switching between a determiner and a NP. As in 1A-B, the two experiments differ only in the direction of the switch (2A: Hebrew→English; 2B: English→Hebrew).

Assuming that DP is a Phase (Chomsky, 2000; Bošković, 2005), *ICS by Phase* (López et al., 2017) predicts switching between a determiner and its complement NP to be acceptable, as they would be spelled-out separately. In fact, *ICS by Phase* predicts determiners to obligatorily match the language of the higher Phase with which they are spelled-out. On the other hand, within our *ICS by prosodic phrase* hypothesis, determiners should match the language of the NP with which they are prosodified, due to their status as prosodically dependent function words (Selkirk, 1972). Finally, MacSwan (1999)'s *ICS by head* does not predict determiners in Hebrew-English to be constrained. MacSwan argues that ICS between a determiner and NP is constrained insofar as the determiner agrees with the noun, which triggers noun raising resulting in a complex D^0. Since neither English nor Hebrew determiners agree with N, *ICS by head* predicts these to be freely switched.

3.1. *Methods*

Participants. Participants were recruited via social media. 96 Hebrew-English bilinguals (48 in each task) completed the task. On average, participants were more Hebrew dominant, with the large majority residing in Israel. The average age of participants was 27.52 (*Std. 5.08*). See Table 5 for a summary of data collected in the BLP questionnaire.

	Experiment 2A				**Experiment 2B**			
	Avg.	*Std.*	*Min.*	*Max.*	*Avg.*	*Std.*	*Min.*	*Max.*
Dominance	*-53.26*	*32.58*	*-119.51*	*36.59*	*-57.07*	*31.07*	*-124.7*	*25.15*
Hebrew AOA	*0.64*	*0.97*	*0*	*5*	*0.62*	*1.68*	*0*	*9*

English AOA	*2.28*	*2.66*	*0*	*7*	*3.66*	*2.87*	*0*	*9*

Table 5. BLP data for Experiments 2A-B. The Dominance scale ranges from -218 to 218.

Materials. The materials were pre-recorded by a bilingual speaker of Hebrew and English. In 24 sets, in each experiment, two factors were manipulated: whether a determiner matched the language of a following noun phrase (*D+NP match* or *mismatch*) and whether that noun phrase matched the language of the following verb (*NP+V match* or *mismatch*). The critical NPs were all multi-word (with PP modifiers), to avoid participants construing them as borrowing, and items began with a language-mismatched adjunct to prevent the determiner from being the sole mismatched element. 24 items from another task (Experiments 3A-B) were used as filler items for this experiment, in addition 12 other filler items, all involving ICS.

NP+V	***D+NP***	
match	**match**	In my opinion, *ha-nose šel ha-xibur dey šanui be-maxloket* the-topic of the-essay bit lies in-debate
	mismatch	In my opinion, the *nose šel ha-xibur dey šanui be-maxloket* topic of the-essay bit lies in-debate
mismatch	**match**	In my opinion, *ha-nose šel ha-xibur* is a little controversial the-topic of the-essay
	mismatch	In my opinion, the *nose šel ha-xibur* is a little controversial topic of the-essay

Table 6. Example sets for Experiment 2B, switching from English to Hebrew.

Procedure. The details of the procedure were identical to Experiments 1A-B.

3.2. *Analysis and Results*

Participants' ratings were analysed using Bayesian logistic mixed-effects models, one for each experiment. The models included *D+NP* and *NP+V* as predictors. All other model details were identical to the models used in Experiments 1A-B.

In both experiments (2A & 2B), the models did not detect reliable effects of *NP+V*, indicating similar acceptability ratings when the NP (subject) and verb match in language and when they mismatch. Crucially, the models provided evidence for *D+NP* effects, such that participants preferred sentences in which the determiner matched rather than mismatched the language of the complement NP. In both experiments, this effect interacted with *NP+V*, such that the preference for the determiner and the NP to match was stronger when the NP also matched the following verb, compared to when they mismatched. This interaction was more

robust in Experiment 2A; In Experiment 2B, the lower bound of the 95% CrI was 0, indicating only marginal evidence for this effect. The *D+NP* effect was also smaller overall in Experiment 2B. Mean ratings by condition are presented in Figure 4. Posterior values for the estimates and their errors, along with 95% Crl's, are provided in Table 7.

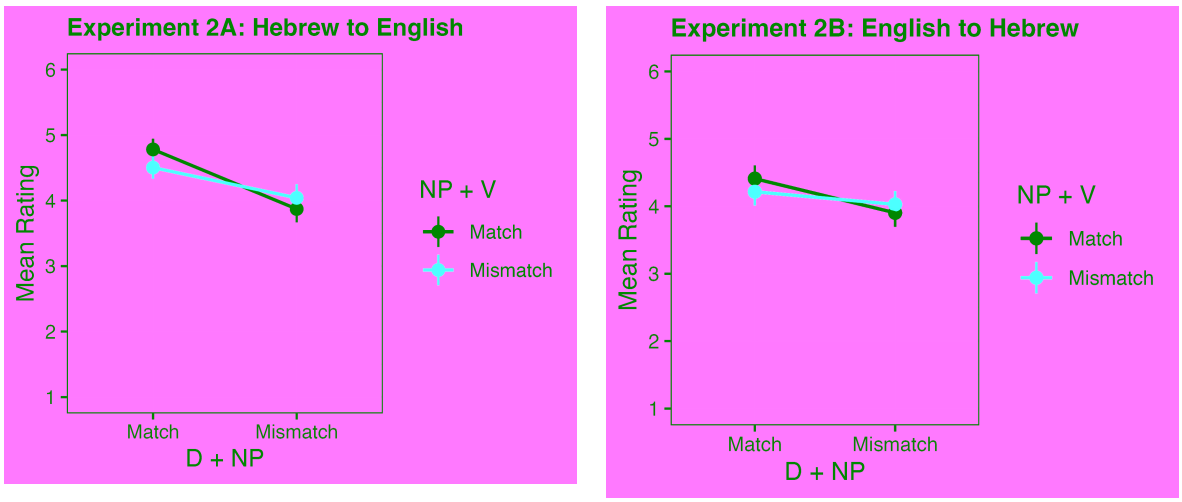

Figure 4. Mean acceptability ratings in Experiments 2A-B. Error bars show 95% bootstrapped confidence intervals for the mean rating.

	Estimate	Est. Error	95% Crl lower	95% Crl upper
Experiment 2A: Hebrew to English				
NP + V	-0.04	0.05	-0.14	0.07
D + NP	-0.28	0.07	-0.41	-0.14
NP + V × D + NP	0.11	0.04	0.04	0.18
Experiment 2B: English to Hebrew				
NP + V	-0.03	0.05	-0.13	0.08
D + NP	-0.13	0.05	-0.23	-0.03
NP + V × D + NP	0.07	0.04	0.00	0.15

Table 7. Bayesian logistic mixed-effects models fit to the data from Experiments 2A-B.

3.3. *Discussion*

The results of Experiments 2A-B demonstrate that Hebrew-English bilinguals prefer a determiner to match, rather than mismatch, the language of its complement NP. This pattern is consistent with the *ICS by prosodic phrase* hypothesis: Much like complementizers and bare *wh*-words, determiners must match the language of the material with which they form a prosodic phrase, the NP. On the other hand, this pattern is unpredicted by *ICS by Phase*: Since the determiner and embedded NP would be spelled-out separately, ICS between them should be acceptable. Moreover, *ICS by head* does not account for this pattern, as the determiner constitutes a separate head, which should be freely switched.

In addition, we find some evidence suggesting that the preference for a determiner to match the language of its complement NP is stronger when this NP matches rather than mismatches the language of the TP. This interaction could potentially reflect an additional preference for D and TP to match, which would be consistent with *ICS by Phase*, assuming that D is spelled-out with TP. However, since participants display a robust preference for D to match NP, implementing this interaction within Phase theory would require D to be spelled-out both with its complement and with the higher TP. Because of this, and since the interaction term was rather weak, it likely reflects a general decrease in sensitivity in sentences that include multiple points of code-switching, which occurs in the *N+V mismatch* conditions but not the *N+V match* conditions.

Moreover, the preference for a determiner to match the language of the NP seems stronger in Experiment 2A (Hebrew→English) compared to 2B (English→Hebrew). If this difference is reliable, it might reflect a contrast between English and Hebrew determiners: While both are small function words, Hebrew determiners are often analyzed as clitics (Danon, 1996; Wintner, 1998), potentially strengthening the preference for them to match the host NP.[2]

Lastly, it is important to note that previous work claims that ICS between a determiner and a noun is acceptable (Di Sciullo, Muysken and Singh, 1986; Parafita Couto and Gullberg, 2019). While this might reflect variation between different language-pairs, studies usually report ICS patterns for single-word NPs. Our design intentionally targeted ICS between a

[2] Alternatively, given that effect sizes are also larger in Experiment 1A than 1B, this could reflect a general trend of increased sensitivity of our participants in ICS from Hebrew to English, compared to the opposite direction.

determiner and a multi-word NP, to avoid ICS being interpreted as borrowing. This should be explored in an experiment that directly compares single and multi-word ICS within the DP.

4. Experiments 3A-B: Pronominal subjects

In order to investigate further the relationship between cyclic spell-out and a prosodic restriction on ICS, we ran Experiments 3A-B–auditory judgement tasks–focused on ICS patterns with pronominal subjects. ICS between a pronominal subject and a verb is generally considered degraded (Timm, 1975; Gumperz, 1977; van Gelderen and MacSwan, 2008). In particular, Koronkiewicz (2014) ran acceptability judgement tasks on Spanish-English bilinguals, comparing code-switching after weak or strong subject pronouns, the latter being modified, coordinated, stressed, or in a cleft/hanging topic construction. He reports that the ban on switching between a pronominal subject and a verb is more robust when the pronoun is weak compared to when it is strong. This is consistent with *ICS by prosodic phrase*, suggesting that this constraint may reflect the pronoun's status as a bare function word, prosodically dependent on the verb.

In Experiments 3A-B we further investigate the ban on ICS between a pronominal subject and verb, by comparing code-switching patterns in embedded clauses that are either finite or non-finite, such that only the former constitutes an independent Phase. This allows us to test whether the pattern of *ICS by prosodic phrase* emerging in the current study is consistent with Phase theory, despite our previous findings that are incompatible with phasal complement spell-out. In finite clauses (CP Phases), Phase theory predicts a spell-out boundary between the matrix verb and the embedded subject. If prosodification respects spell-out boundaries, that subject should be divorced from the main clause and must prosodify along with the embedded verb, which will block ICS between them. On the other hand, in the non-finite clauses we test, there is no spell-out boundary between the matrix verb and the embedded subject, which should allow prosodification of a pronominal subject to the matrix verb, and thus enable code-switching between that pronominal and the embedded verb. In other words, a contrast between the two types of clauses in ICS options is predicted if we assume that cyclic spell-out feeds prosodification, such that prosodic phrases cannot cross spell-out domains.

4.1. *Methods*

Participants. Participants were recruited via social media. 96 Hebrew-English bilinguals (48 in each task) completed the study. The participants are the same as the ones in Experiments 2A-B. See section 3.1, and in particular Table 5, for information about the participants.

Materials. The materials were pre-recorded by the same bilingual speaker of Hebrew and English as Experiments 2A-B, in the same session. The experimental items all included an embedded clause with a pronominal subject. In 24 sets, in each experiment, two factors were manipulated: (a) whether the embedded clause is finite or a non-finite small clause with an accusative marked subject (*Tense*: *finite* or *nonfinite*) and; (b) whether the pronominal subject matched the rest of the embedded clause in language (*pron+V*: *match* or *mismatch*).

Tense	***pron+V***	
finite	**mismatch**	The teacher saw [that they *meramim ba-bxina*] cheat in.the-exam
	match	The teacher saw [*še-hem meramim ba-bxina*] that-they cheat in.the-exam
nonfinite	**mismatch**	The teacher saw them *meramim ba-bxina* cheat in.the-exam
	match	The teacher saw *otam meramim ba-bxina* them cheat in.the-exam

Table 8. Example set for Experiment 3B, switching from English to Hebrew. Brackets represent phase boundaries.

The critical pronoun was always plural, to avoid homonymy across languages which might create confusion regarding the switch location (Hebrew 3sg.M sounds like ‘who’ and Hebrew 3sg.F sounds like ‘he’). The verb in the finite clause was always in present tense to keep it morphologically identical to the non-finite verb. Material was constructed to be natural with both tenses, but there is still an unavoidable semantic contrast that accompanies the tense manipulation. 24 items from another task (Experiments 2A-B) were used as filler items for this experiment, in addition to 12 other filler items, all involving ICS.

Procedure. The details of the procedure were identical to Experiments 1A-B.

4.2. *Analysis and Results*

Participants' ratings were analysed using Bayesian logistic mixed-effects models, one for each experiment. The models included *pron+VP* and *Tense* as predictors. All other model details were identical to the models used in Experiments 1A-B.

In both experiments (3A & 3B), the models revealed robust interaction terms between *pron+VP* and *Tense*, reflecting a crossing pattern. In finite clauses, participants preferred the embedded pronominal subject to match the *embedded* verb in language, rather than mismatch it and match the matrix verb. In the non-finite clauses, the opposite pattern is observed: participants prefer the embedded pronominal subject to match the *matrix* verb, and mismatch the embedded verb in language. In Experiment 3A, no reliable main effects were detected for either *Tense* or *pron+V*, reflecting the crossing interaction. In Experiment 3B, the model detected a reliable effect of *Tense*, such that the *non-finite* condition received higher ratings on average than the *finite* condition. However, this effect was qualified by the interaction, indicating that it does not generalize across the levels of the *pron+V* condition.

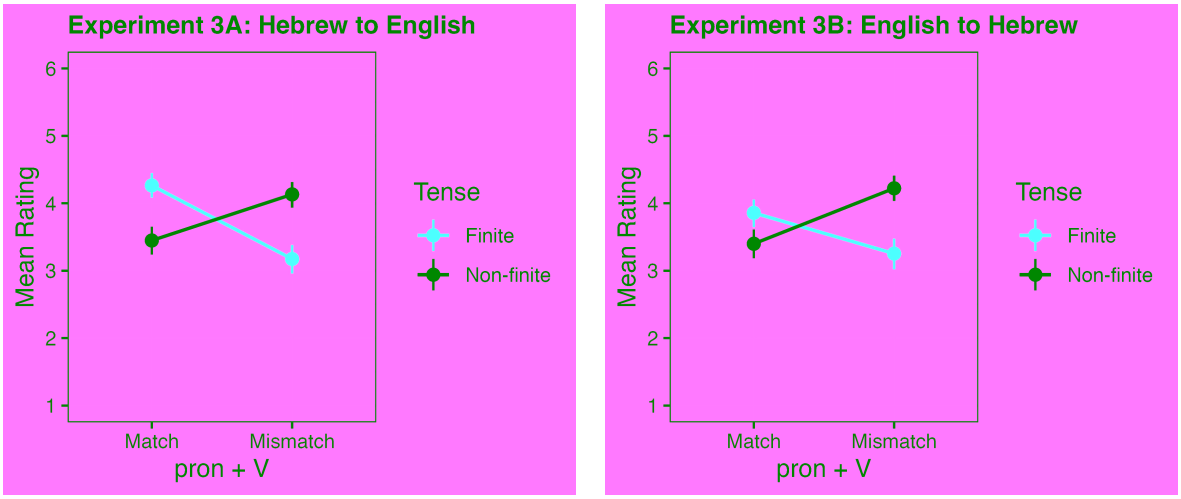

Figure 5. Mean acceptability ratings in Experiments 3A-B. Error bars show 95% bootstrapped confidence intervals for the mean rating.

	Estimate	Est. Error	95% CrI lower	95% CrI upper
Experiment 3A: Hebrew to English				
Tense	0.04	0.06	-0.08	0.16
pron + V	-0.08	0.05	-0.19	0.02
Tense ×	0.36	0.06	0.24	0.48

pron + V				
Experiment 3B: English to Hebrew				
Tense	0.10	0.04	0.03	0.19
pron + V	0.04	0.05	-0.06	0.13
Tense × pron + V	0.28	0.05	0.17	0.38

Table 9. Bayesian logistic mixed-effects models fit to the data from Experiments 3A-B.

4.3. *Discussion*

The results of Experiments 3A-B demonstrate that Hebrew-English bilinguals' preferences for ICS with a pronominal subject are modulated by the Phase status of the surrounding clause: In finite embedded clauses, participants prefer a pronominal subject to match the language of the embedded verb, rather than mismatch it and appear in the language of the matrix clause. On the other hand, the opposite pattern is observed in the non-finite, small clauses, where participants preferred a pronominal subject to match the matrix rather than the embedded clause-mate verb.

These results further support our hypothesis that ICS is prosodically restricted, such that prosodically dependent functional material must match the language of its host. The contrasting pattern across clause types is consistent with the idea that cyclic spell-out feeds prosodification, such that a functional element cannot depend on material across a phasal spell-out boundary.

A remaining question is why the subject-pronouns of the non-finite clauses must match the language of the matrix, rather than the embedded verb. The lack of a CP boundary above the pronoun should not influence its ability to prosodify alongside the embedded material, predicting optionality between the two ICS patterns. It is possible that this preference reflects a particular syntactic input underlying prosodic structure, forcing the pronoun to be prosodified to the left, as the small clause subject might need to raise to the matrix VP for exceptional accusative Case. This predicts ICS of small-clause subjects to pattern with matrix direct objects, which we are currently testing.

5. General discussion

We report Hebrew-English bilinguals' acceptability judgments for ICS sentences, collected across 3 auditory judgement studies testing possible ICS junctures, each comprising two experiments: One targeting ICS from Hebrew to English, and the other ICS from English to Hebrew. We argue that spell-out domains inadequately predict the set of possible ICS junctures, contrary to the proposal in López et al. (2017). Moreover, our results cannot be accounted for under MacSwan (1999)'s proposal that ICS is impossible within a syntactic head. Instead, we have shown that ICS at the CP edge, DP edge, and with pronominal subjects is preferred when it takes place between separate prosodic phrases, while prosodically dependent functional material should match the language of its host.

In addition, we suggest that the patterns reported in MacSwan (1999) and López et al. (2017) could be accommodated under *ICS by prosodic phrase*. First, since a head is always contained with a prosodic phrase, MacSwan (1999)'s proposal predicts a proper subset of the patterns our *ICS by prosodic phrase* predicts. Moreover, the ICS patterns which motivate López et al. (2017)'s *ICS by Phase* all involve bare function words, such as auxiliaries or bound morphemes. The finding that these elements are constrained to match the language of material within their spell-out domain, we suggest, could be accounted for under the assumption that prosodification applies at each cycle of spell-out.

We derive the constraint our study motivated, *ICS by prosodic phrase*, from the assumption that bilingual grammar represents separate PF components. Due to the fact that the boundaries of prosodic phrases affect language-specific phonological and morphological rules, we hypothesize that the material within each prosodic phrase must be drawn from a single, language-specific, Vocabulary component. "Vocabulary" refers to the inventory of phonological exponence assigned to abstract syntactic terminals at the output of the syntactic derivation, within the architecture of DM.

A crucial question is how this constraint, *ICS by prosodic phrase*, can be enforced within the general architecture of DM applied to bilingual grammar, without relying on ICS-specific stipulations. This depends on independent assumptions regarding the order of operations at PF, which are under debate (Pak, 2008; Embick, 2010; Arregi and Nevins, 2012; Schuhmann and Putnam, 2021). In particular, if we assume that Vocabulary Insertion (VI) takes place before prosodification, the ban on ICS within a prosodic phrase may be

implemented as a filter: A code-switched string prosodified into a single phrase will not be able to be parsed by the phonology at later PF stages, resulting in a crash, much like MacSwan (1999) proposed for syntactic heads.

On the other hand, under the assumption that prosodification precedes VI, *ICS by prosodic phrase* may reflect a restriction on Vocabulary access: Once a structure is prosodified, only one language-specific Vocabulary component may be accessed at each prosodic phrase; this would block the possibility of inserting exponents from different Vocabularies in a single phrase, blocking ICS. Prosodic structure may precede VI within a theory of prosodification that depends only on syntactic bracketing, and not on exponence, such as Selkirk (1995). The broader debate about the relative ordering of PF operations remains unsettled, but bilingual data on ICS offer a unique testing ground, as they may shed light on the kinds of information PF operations are sensitive to, and in what respects they are language-specific.

Notably, the prosodic restriction on ICS does not align with the boundaries defined by *complement spell-out*, a prevalent assumption of Phase theory, since we found a preference for prosodically dependent function words to match the language of material *across* a complement spell-out boundary, both for CPs and DPs. This is surprising under the assumption that prosodification applies to spell-out domains, blocking the possibility of a prosodic phrase across a spell-out boundary. Instead, these ICS patterns are compatible with *full Phase spell-out*, wherein the assignment of prosodic structure is sensitive to the boundaries of full Phases, rather than phasal complements, allowing material at the Phase edge to be prosodified along with the Phase complement.

These findings favouring full Phase spell-out join evidence from monolingual grammar showing that prosodic, phonological and morphological phenomena often cross the boundaries defined by complement spell-out (Kratzer and Selkirk, 2007; Cheng and Downing, 2012; D'Alessandro and Scheer, 2015; Bošković, 2016). For example, Shlonsky (1994) reports that complementizers in Palestinian Arabic display morphological allomorphy dependent on the identity of the embedded subject, which Bošković (2016) argues is incompatible with TP spell-out. These types of phenomena challenge the basic conception of Phases as derivational units that determine locality domains across modules of grammar, including PF. Accordingly, they gave rise to proposed modifications to Phase theory, which allow for phonological cycles to match the boundaries of full Phases, while capturing syntactic locality restrictions (D'Alessandro and Scheer, 2015; Bošković, 2016).

6. Conclusions

This study investigates the idea that intra-sentential code-switching (ICS) is subject to constraints at the syntax-phonology interface, where the output of the syntactic derivation must be split between two language-specific phonological systems. Data from 3 studies on Hebrew-English ICS are reported, showing that bilinguals prefer to switch between separate prosodic phrases, rather than within one. In embedded clauses, bilinguals prefer a complementizer or a bare *wh*-word to match the language of the TP, but have no preference for the language of a prosodically independent *wh*-phrase; in subject DPs, bilinguals prefer the determiner to match rather than mismatch the language of the NP; and finally, bilinguals prefer a pronominal subject to match the language of the verb it is prosodified with, which varies by the Phase status of the surrounding clause. We argue that these data are incompatible with López, Alexiadou and Veenstra,(2017)'s proposal that ICS can only take place between spell-out domains determined by Phase theory, nor can they be accounted for under MacSwan (1999)'s proposal that ICS cannot take place within a syntactic head. We discuss implications for Phase theory, suggesting that our data are compatible with a theory of full Phase spell-out, and consider potential implementations of our *ICS by prosodic phrase* constraint within the architecture of Distributed Morphology.

References

Arregi, K. and Nevins, A. (2012) *Morphotactics: Basque Auxiliaries and the Structure of Spellout*. Berlin: Springer.

Badiola, L. and Sande, A. (2018) "A study of simultaneous bilinguals: Gender assignment in Basque/Spanish mixed determiner phrases," in L. López (ed.) *Code-switching – Experimental Answers to Theoretical Questions: in honor of Kay González-Vilbazo*. John Benjamins Publishing Company (Issues in Hispanic and Lusophone Linguistics), pp. 15–38. Available at: https://doi.org/10.1075/ihll.19.02bad.

Belazi, H.M., Rubin, E.J. and Toribio, A.J. (1994) "Code Switching and X-Bar Theory: The Functional Head Constraint," *Linguistic Inquiry*, 25(2), pp. 221–237.

Birdsong, D., Gertken, L.M. and Amengual, M. (2012) "Bilingual language profile: An easy-to-use instrument to assess bilingualism." COERLL, University of Texas at Austin. Available at: https://blp.coerll.utexas.edu.

Bolinger, D. (1971) "The Nominal in the Progressive," *Linguistic Inquiry*, 2(2), pp. 246–250.

Bošković, Ž. (2005) "On the locality of left branch extraction and the structure of NP," *Studia Linguistica*, 59(1), pp. 1–45. Available at: https://doi.org/10.1111/j.1467-9582.2005.00118.x.

Bošković, Ž. (2016) "What is sent to spell-out is phases, not phasal complements," *Linguistica*, 56(1), pp. 25–66. Available at: https://doi.org/10.4312/linguistica.56.1.25-66.

Bromberger, S. and Halle, M. (1989) "Why Phonology Is Different," *Linguistic Inquiry*, 20(1), pp. 51–70.

Bürkner, P.-C. (2017) "brms: An R Package for Bayesian Multilevel Models Using Stan.," *Journal of Statistical Software*, 80(1), pp. 1–28. Available at: https://doi.org/10.18637/jss.v080.i01.

Caramazza, A. *et al.* (1973) "The acquisition of a new phonological contrast: The case of stop consonants in French-English bilinguals," *The Journal of the Acoustical Society of America*, 54(2), pp. 421–428. Available at: https://doi.org/10.1121/1.1913594.

Cheng, L.L. and Downing, L.J. (2012) "Prosodic domains do not match spell-out domains," *McGill Working Papers in Linguistics*, 22.

Chomsky, N. (1965) *Aspects of the Theory of Syntax*. Cambridge, MA: MIT Press.

Chomsky, N. (1981) *Lectures on government and binding*. Dordrecht: Foris.

Chomsky, N. (2000) "Minimalist Inquiries: The Framework," in *Martin, R., Michaels, D. and Uriagereka, J. (eds.) Step by step: Essays on minimalist syntax in honor of Howard Lasnik*. Cambridge, MA: MIT Press, pp. 89–155.

Chomsky, N. (2001) "Derivation by Phase," in *Kenstowicz, M. (ed.) Ken Hale: A Life in Language*. MIT Press, pp. 1–52. Available at: https://doi.org/10.7551/mitpress/4056.001.0001.

D'Alessandro, R. and Scheer, T. (2015) "Modular PIC," *Linguistic Inquiry*, 46(4), pp. 593–624.

Danon, G. (1996) *The syntax of determiners in Hebrew*. Ph.D. dissertation, Tel-Aviv University.

Di Sciullo, A.-M., Muysken, P. and Singh, R. (1986) "Government and code-mixing," *Journal of Linguistics*, 22(1), pp. 1–24. Available at: https://doi.org/10.1017/S0022226700010537.

Embick, D. (2010) *Localism versus Globalism in Morphology and Phonology*. Cambridge, MA: MIT Press. Available at: https://doi.org/10.7551/mitpress/9780262014229.001.0001.

van Gelderen, E. and MacSwan, J. (2008) "Interface conditions and code-switching: Pronouns, lexical DPs, and checking theory," *Lingua*, 118(6), pp. 765–776. Available at: https://doi.org/10.1016/j.lingua.2007.05.003.

González-Vilbazo, K. (2005) "Die Syntax des Code-Switching. Esplugisch: Sprachwechsel an der Deutschen Schule Barcelona," *PhD dissertation, Universität zu Köln* [Preprint]. Available at: https://www.academia.edu/741071/Die_Syntax_des_Code_Switching_Esplugisch_Sprachwechsel_an_der_Deutschen_Schule_Barcelona.

González-Vilbazo, K. *et al.* (2013) "Methodological Considerations in Code-Switching Research," *Studies in Hispanic and Lusophone Linguistics*, 6(1), pp. 119–138. Available at: https://doi.org/10.1515/shll-2013-1143.

González-Vilbazo, K. and López, L. (2011) "Some properties of light verbs in code-switching," *Lingua*, 121(5), pp. 832–850. Available at: https://doi.org/10.1016/j.lingua.2010.11.011.

González-Vilbazo, K. and López, L. (2012) "Little v and parametric variation," *Natural Language & Linguistic Theory*, 30(1), pp. 33–77. Available at: https://doi.org/10.1007/s11049-011-9141-5.

González-Vilbazo, K. and López, L. (2013) "Phase switching," *Paper presented at Workshop: Code-switching in the bilingual child: Within and across the clause*, 18. Available at: https://www.academia.edu/7990026/Phase_switching.

Gosselin, L. (2022) "Bilinguals have a single computational system but two compartmentalized phonological grammars: Evidence from code-switching," *Glossa: a journal of general linguistics*, 6(1). Available at: https://doi.org/10.16995/glossa.5800.

Gullberg, M., Indefrey, P. and Muysken, P. (2009) "Research techniques for the study of code-switching," in *Bullock, B.E. and Toribio, A.J. (eds.) The Cambridge handbook of linguistic code-switching*. Cambridge: Cambridge University Press (Cambridge Handbooks in Language and Linguistics), pp. 21–39. Available at: https://doi.org/10.1017/CBO9780511576331.003.

Gumperz, J.J. (1977) "The Sociolinguistic Significance of Conversational Code-Switching," *RELC Journal*, 8(2), pp. 1–34. Available at: https://doi.org/10.1177/003368827700800201.

Halle, M. and Marantz, A. (1993) "Distributed morphology and the pieces of inflection," in K. Hale and S.J. Keyser (eds.) *The view from building 20*. Cambridge, MA: The MIT Press, pp. 111–176.

Halle, M. and Mohanan, K.P. (1985) "Segmental phonology of modern english," *Linguistic Inquiry*, 16(1), pp. 57–116.

Joshi, A.K. (1982) "Processing of Sentences With Intra-Sentential Code-Switching," in *Proceedings of Coling 1982: Ninth International Conference on Computational Linguistics*. *COLING 1982*. Available at: https://aclanthology.org/C82-1023/.

Koronkiewicz, B. (2014) *Pronoun Categorization: Evidence From Spanish/English Code-switching*. PhD dissertation, University of Illinois Chicago. Available at: https://indigo.uic.edu/articles/thesis/Pronoun_Categorization_Evidence_From_Spanish_English_Code-switching/10786253/1.

Koronkiewicz, B. and Ebert, S. (2018) "Modality in experimental code-switching research: Aural versus written stimuli," in L. López (ed.) *Code-switching – Experimental Answers to Theoretical Questions: In honor of Kay González-Vilbazo*. John Benjamins Publishing Company, pp. 147–176. Available at: https://doi.org/10.1075/ihll.19.06kor.

Kratzer, A. and Selkirk, E. (2007) "Phase theory and prosodic spellout: The case of verbs," *The Linguistic Review*, 24(2–3), pp. 93–135. Available at: https://doi.org/10.1515/TLR.2007.005.

López, L. (2020) *Bilingual Grammar: Toward an Integrated Model*. Cambridge: Cambridge University Press. Available at: https://doi.org/10.1017/9781108756181.

López, L., Alexiadou, A. and Veenstra, T. (2017) "Code-Switching by phase," *Languages*, 2(3), p. 9. Available at: https://doi.org/10.3390/languages2030009.

MacSwan, J. (1999) *A Minimalist Approach to Intrasentential Code Switching*. Taylor & Francis.

MacSwan, J. (2000) "The architecture of the bilingual language faculty: evidence from intrasentential code switching," *Bilingualism: Language and Cognition*, 3(1), pp. 37–54. Available at: https://doi.org/10.1017/S1366728900000122.

MacSwan, J. (2006) "Code Switching and Grammatical Theory," in *The Handbook of Bilingualism*. John Wiley & Sons, Ltd, pp. 282–311. Available at: https://doi.org/10.1002/9780470756997.ch11.

Mahootian, S. (1993) *A null theory of codeswitching*. PhD dissertation, Northwestern University. Available at: https://www.proquest.com/docview/304089810/abstract/2CF00B1213854DBCPQ/1.

Muysken, P. (2000) *Bilingual Speech: A Typology of Code-Mixing*. Cambridge University Press.

Myers-Scotton, C. (1993) *Duelling Languages: Grammatical Structure in Codeswitching*. Oxford: Clarendon Press.

Nespor, M. and Vogel, I. (1986) *Prosodic phonology*. Dordrecht: Foris.

Olson, D.J. (2019) "Phonological processes across word and language boundaries: Evidence from code-switching," *Journal of Phonetics*, 77, p. 100937. Available at: https://doi.org/10.1016/j.wocn.2019.100937.

Ott, D. (2011) "A Note on Free Relative Clauses in the Theory of Phases," *Linguistic Inquiry*, 42(1), pp. 183–192.

Pak, M. (2008) *The postsyntactic derivation and its phonological reflexes*. PhD dissertation, University of Pennsylvania. Available at: https://www.researchgate.net/publication/247949599_The_postsyntactic_derivation_and_its_phonological_reflexes.

Parafita Couto, M.C. and Gullberg, M. (2019) "Code-switching within the noun phrase: Evidence from three corpora," *International Journal of Bilingualism*, 23(2), pp. 695–714. Available at: https://doi.org/10.1177/1367006917729543.

Poplack, S. (1980) "Sometimes I'll start a sentence in Spanish Y TERMINO EN ESPAÑOL: toward a typology of code-switching 1," *Linguistics*, 18, pp. 581–618. Available at: https://doi.org/10.1515/ling.1980.18.7-8.581.

Schuhmann, K.S. and Putnam, M.T. (2021) "Relativized Prosodic Domains: A Late-Insertion Account of German Plurals," *Languages*, 6(3), p. 142. Available at: https://doi.org/10.3390/languages6030142.

Selkirk, E. (1972) *The Phrasal Phonology of English and French*. Ph.D. dissertation, MIT.

Selkirk, E. (1996) "The prosodic structure of function words," in *Morgan, J.L. and Demuth, K. (eds.) Signal to syntax: Bootstrapping from speech to grammar in early acquisition*. Hillsdale, NJ, US: Lawrence Erlbaum Associates, pp. 187–213.

Shlonsky, U. (1994) "Semitic clitics," *Geneva Generative Papers*, 2, pp. 1–11.

Timm, L.A. (1975) "Spanish-English Code-Switching: El Porqué y How-Not-To," *Romance Philology*, 28(4), pp. 473–482.

Vaughan-Evans, A. *et al.* (2014) "Anomalous Transfer of Syntax between Languages," *Journal of Neuroscience*, 34(24), pp. 8333–8335. Available at: https://doi.org/10.1523/JNEUROSCI.0665-14.2014.

Wintner, S. (1998) "The affixal nature of the definite article in Hebrew," in *Computational Linguistics in the Netherlands 1997. Selected Papers from the Eighth CLIN Meeting, number 25 in Language and Computers: Studies in Practical Linguistics*. Editions Rodopi B.V., pp. 145–167.

Zehr, J. and Schwarz, F. (2018) "PennController for Internet Based Experiments (IBEX)." Open Science Foundation. Available at: https://doi.org/10.17605/OSF.IO/MD832.