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Language Interaction in Emergent Grammars: Morphology and Word Order in Bilingual Children's Code-Switching

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Abstract: This paper examines the morphological integration of nouns in bilingual children's code-switching to investigate whether children adhere to constraints posited for adult code-switching. The changing nature of grammars in development makes the Matrix Language Frame a moving target; permeability between languages in bilinguals undermines the concept of a monolingual grammatical frame. The data analysed consist of 630 diary entries with code-switching and structural transfer from two children (aged 2;10–7;2 and 6;6–11;0) bilingual in Estonian and English, languages which differ in morphological richness and the inflectional role of stem changes. The data reveal code-switching with late system morphemes, variability in stem selection and word order incongruence. Constituent order is analysed in utterances with and without code-switching, and the frame is shown to draw sometimes on both languages, raising questions about the MLF, which is meant to derive from the grammar of one language. If clauses without code-switched elements display non-standard morpheme order, then there is no reason to expect code-switching to follow a standard order, nor is it reasonable to assume a monolingual target grammar. Complex morphological integration of code-switches and interaction between the two languages are discussed.

Keywords: code-switching; bilingual acquisition; language interaction; MLF; System Morpheme Principle; Morpheme Order Principle

1. Introduction

The bilingual practice of code-switching has been shown, over several decades of research, to consist in systematic linguistic behavior, rather than arbitrary or incompetent language usage. Bilinguals make use of their linguistic resources according to socio-pragmatic motivation, following grammatical patterns, although there is disagreement as to how universal the code-switching patterns are, and how to describe the systematicity. Researchers have noted that code-switching, as an online speech phenomenon, can also "afford insight into the *psychological reality of boundaries* posited by linguists" (Backus 2003).

Less research has investigated children's code-switching, though differences in code-switching between children and adults may help shed light on the validity of proposed models of constraints on code-switching, linguistic development and the cognitive processes underlying speech production. The gradual abstraction of regularities by monolingual children acquiring a language is difficult to assess based on spontaneous production, but can be made evident in the innovative constructions readily found when lexical items from two languages are combined. This paper examines the morphosyntactic integration of nouns in a dataset of two bilingual children's language usage.

Myers-Scotton's Matrix Language Frame (MLF) and 4M models (Myers-Scotton 2005; Myers-Scotton and Jake 2000a, 2017) provide clear sets of predictions regarding code-switching.

Because the MLF and 4M models have amassed empirical support and are more systematically elaborated than other models of code-switching, these are chosen here as a framework to compare the child data to, but it should be noted that these were not proposed by the authors as descriptions of child language. The child data are placed against a background of expectations for adult code-switching, but child usage is likely to be less consistent in adherence to norms than adult language.

However, developments in usage-based language acquisition research and linguistics more broadly suggest that in general, we are in need of more dynamic, probabilistic models to account for variability in usage across individuals and over the life course; models of code-switching need to become more flexible and dynamic in order to account for numerous sources of variability, including typological differences in language pairs and variation in language profiles of bilinguals. The critique implicit in this study applies to any code-switching models which base their claims on assumptions of monolingual clausal representations.

1.1. Bilingual Children's Speech

Bilingual development provides a unique window onto processes in cognitive, social, and linguistic development. Much research has been devoted to the question of whether and to what degree the languages of bilingual children interact; the current consensus is that interaction occurs (Argyri and Sorace 2007; Hulk and Müller 2000; Müller and Hulk 2001), but that children are able to separate their languages fairly early (Hoff 2015; Paradis and Genesee 1996). This must also depend to some extent on the degree to which the languages are separated in the community and the input to the child.

Bilingual children's utterances can also shed light on linguistic development more generally. Usually, the knowledge underlying a child's output is hidden. It is often unclear whether the production of a particular form reflects knowledge of co-occurrences (use of unanalysed forms or phrases taken directly from the input) or generalised, abstract knowledge (analysis of grammatical forms and ability to recreate them in novel contexts). Innovative constructions can show us what abstractions children make and at what point they can be said to be operational. Code-switched utterances offer opportunities for us to investigate how children apply their emerging grammatical systems to novel items during online speech production.

However, it is also important to remember that code-switching is characterised by variability, even among adults: Differences are found between individuals, sociolinguistic communities, and language pairs. In children, quantitative and qualitative differences in bilingual language use have been shown to derive from language proficiency (Meisel 2004; Poplack 1980), age of acquisition (Backus 1996; Deuchar et al. 2014), age during observation (Deuchar and Vihman 2005; Meisel 2004; Vihman 1985) and individual differences (Paradis 2011; Vihman 1998). Meisel's (1994, p. 417) grammatical deficiency hypothesis predicts a U-shaped developmental pattern, with a high proportion of mixes in early language before grammatical maturation (when structural constraints are irrelevant), followed by a decrease when functional categories are learned and the languages are separated, and subsequent increase in code-switching that is more adult-like. Indeed, studies have shown developmental changes in code-switching behaviour, such as a decline in the proportion of "function words" (variously defined) after the earliest multiword utterances (Meisel 1994; Vihman 1985) and a decline in violations of grammatical constraints during the first few years of language use (Paradis et al. 2000); Deuchar and Vihman (2005) found more predicate than argument language mismatches in the first six months of word combinations. Bolonyai (2000), while investigating bilingual children with Hungarian and English, found that the use of both Hungarian and English-influenced structural frames occurred in utterances with and without code-switching, showing language interaction and attrition.

The languages included in the present study, English and Estonian, constitute the same pair as those in Vihman's (1985, 1998) study of code-switching by bilingual siblings. The younger child in that study is "relatively uninhibited in his use of CS from the beginning," (Vihman 1998, p. 52) and uses a higher proportion of verbs, as well as switched conjunctions and prepositions (cf. Vihman 2016).

The latter are especially interesting in that English uses prepositions, while Estonian has mostly postpositions. In those data, English prepositions are inserted in Estonian clauses postnominally, in line with the MLF model, yet this usage is not commonly encountered in adult code-switching, where adpositions are rarely switched. Vihman also describes switching across morpheme boundaries, including double marking. She appeals to both linguistic and pragmatic maturation to account for code-switching patterns and notes that MLF violations occur only infrequently. She finds significant differences in code-switching styles between the siblings. Differences are also found in the present study, which focusses on the morphosyntactic structure of code-switched utterances.

1.2. Constraints on Code-Switching

Although code-switching often occurs intersententially, intraclausal code-switching is the most revealing in terms of linguistic structure and psycholinguistic processing: "It is only in the bilingual clause that the grammars of both languages are in contact" (Myers-Scotton 2005, p. 329). In intraclausal code-switching, the grammars of the two languages confront each other: either the structures are compatible and thus amenable to code-switching, or they are not. If not, then code-switches may be avoided, or else some strategy must be summoned up to resolve incompatibilities. The study of constraints on code-switching addresses both questions: What is required for compatibility, and how is structural incompatibility resolved?

Various structural constraints have been proposed and refined to characterise how bilinguals use elements from two languages within a single clause (Matras and Sakel 2007; Myers-Scotton 1993, 2005; Myers-Scotton and Jake 2000a; Pfaff 1979; Poplack 1980; Sankoff and Poplack 1981). The most influential of these, the Matrix Language Frame (MLF) model, posits an asymmetry between the Matrix Language (ML) and the Embedded Language (EL) in structuring the bilingual clause (Myers-Scotton 1993, 2005; Myers-Scotton and Jake 2000a, 2017). According to this model, a single ML can be identified for every utterance, and this ML determines the morphosyntactic structure of the clause. When elements from another language are inserted, they must be integrated into the morphosyntactic ML Frame—the MLF.

Importantly, the later-developed 4M model fine-tunes the MLF by distinguishing between four types of morpheme. Two are seen to be activated conceptually, by the speaker's intentions: Content morphemes and early system morphemes like noun number marking. The other two are said to be activated structurally, by the grammar of the ML: the late system morphemes (Myers-Scotton 2005; Myers-Scotton and Jake 2000a). Bridge morphemes connect two constituents (e.g., *of* in 'age of the child'). Late outsider morphemes depend on information external to their own constitutent to determine their form, with prime examples being verb agreement (governed by the subject), object case (governed by the verb) or noun case governed by certain adpositions. The 4M model predicts that late outsider system morphemes only come from the ML (for more detail and empirical evidence for the 4M model, see (Myers-Scotton and Jake 2000a, 2017)).

This paper applies to the dataset of bilingual child utterances two fundamental principles proposed in the MLF and 4M models: (1) the System Morpheme Principle (SMP), which predicts that only the ML will contribute late system morphemes indicating grammatical relations within mixed language constituents, and (2) the Morpheme Order Principle (MOP), which says that the linear order of morphemes will follow the ML. Both of these principles rely on the assumption that a ML can be identified, governing the morphosyntactic frame of an utterance. The validity of this assumption will also be addressed in the paper. Various studies have found data which diverge from these constraints (e.g., Backus 2014; de Bot 2004; Zabrodskaja and Verschik 2015), but the constraints have been found in other studies to describe code-switching behaviour well in various contexts (e.g., Deuchar 2006; Deuchar et al. 2007; Myers-Scotton 2005), including studies of children (Bolonyai 2000; Paradis et al. 2000; Vihman 1998).

Appealing to a morphosyntactic frame governed by a ML implies at least the following assumptions, which have been contested by critics of the model (Alvarez-Caccamo 1998; Auer and

Muhamedova 2005; Gardner-Chloros 2005; Gardner-Chloros and Edwards 2004; Zabrodskaja 2009): (1) that spoken language can be characterised by a set of grammatical rules, (2) that two languages interacting in code-switching are mentally represented as independent grammars, (3) that one of the languages can always be identified as the ML, (4) that code-switching adheres to abstract rules rather than surface-level structures emerging in the course of production, and (5) that morphosyntactic structure is paramount in determining code-switching behaviour. This paper questions these points, particularly (2) and (4), and returns to them in the discussion. Nevertheless, after decades of research into both grammatical and sociolinguistic aspects of code-switching, the MLF remains the most explicitly articulated model of grammaticality in code-switching. It proposes a clear set of constraints and predictions for evaluating a new dataset, and its falsifiability is also its strength.

The SMP and MOP are investigated here through a linguistic analysis of utterances in a dataset of bilingual children's mixed language usage. The application of the MOP, even more than the SMP, begs the question of what the ML grammar looks like. It has been noted elsewhere that it is not always possible to identify a ML (e.g., Auer and Muhamedova 2005; Gardner-Chloros and Edwards 2004), for various reasons, one being that the bilingual clause may draw its structure from two different languages. Myers-Scotton has allowed for a composite ML, for example, in cases of L1 attrition or matrix language change (turnover) in progress (Bolonyai 2000; Myers-Scotton and Jake 2000a, 2001).

More importantly, structural transfer can affect the grammar of the clause, including word order: "Cross-language interactions and competition occur at the level of the grammar as well as the lexicon" (Kroll and Bialystok 2013, p. 510); see also Schmid and Köpke (2017). Curiously, the literature on code-switching and convergence are mostly separate, although the two phenomena are likely to transpire in the same contexts, going hand in hand in bilingual speech, when the languages are both explicitly activated. A growing body of research shows parallel activation for bilinguals—even in monolingual contexts (Kroll et al. 2006; Marian and Spivey 2003; Thierry and Wu 2007). Johanson (2002) has shown that the same processes may underlie code-switching and structural transfer. Although convergence has been associated with attrition or imperfect acquisition, the approach here assumes that structural transfer and code-switching are part of the same process of bilingual language use. Parallel activation, convergence and transfer make the MLF a moving target. If clauses *without* code-switched elements display non-standard morpheme order, then the question of whether code-switched utterances follow the morpheme order of the ML becomes moot. Hence, in order to probe the MOP, we look at utterances with and without code-switched elements in the children's data.

Children's code-switching has been found to conform to Myers-Scotton's constraints in studies which explicitly examined this question (Bolonyai 2000; Paradis et al. 2000; Vihman 1998). Paradis et al. investigated a group of 15 French-English bilinguals aged 2;0–3;6, recorded separately in the context of each of their languages. Out of three constraints investigated in detail, the authors found few violations of the MOP and ML blocking constraint, but much weaker adherence to the SMP, with 18% of code-switched utterances violating it overall. They also found developmental changes, with higher proportions of SMP violations occurring in recordings when the children were aged 2;6–3;0, and fewer violations before and after this. The young French-English bilinguals in their study generally adhered to adult-like structural constraints, implying complex knowledge of how to combine languages during speech production as well as "language-specific syntactic knowledge even during an early period of development where the use of INFL-related morphosyntax is variable in their two languages" (Paradis et al. 2000, p. 259). Bolonyai (2000) examined predictions of the MLF with two more distant languages, spoken by children who are older and have acquired basic morphosyntax (tense, agreement and case morphology) in both languages, as in this study. Her findings upheld the distinctions of the 4M model, although the children used abstract structure drawing on both languages, affecting the MLF and leading to frequent omission of morphemes required in Hungarian. This study focusses on the validity of the SMP and MOP in children's bilingual usage.

1.3. The Languages

Estonian and English are genetically unrelated; English has become a primary contact language in Estonia only recently, through mobility and globalisation in many spheres of life. Contemporary Estonian shows effects of long-term contact with German, including a strong tendency toward V2 word order. English is analytic, whereas Estonian is fusional-agglutinative (Erelt 2009). A combination of postpositions, prepositions, and cases are used in Estonian to signal the adverbial meanings usually encoded by prepositions in English. English signals argument structure primarily through rigid word order, whereas Estonian uses a complex system of morphological case-marking to signal grammatical relations, with flexible, pragmatically sensitive word order, though SVO is most frequent. Adverbial order differs across the two languages.

The morphological richness of Estonian can be clearly seen in verb and noun paradigms. Vihman (2016) investigates code-switching with verbs, and provides an overview of core verb morphology. This study emphasises nouns, which provide a greater contrast with English. While only pronouns show any case-marking in English, Estonian nouns take fourteen cases, shown in Table 1, with a number of differing declensional paradigms, two of which are exemplified (see Blevins 2008). Kaalep (2012) distinguishes seven basic declension classes, with additional subclasses. The first three cases (NOM, GEN, PAR) are known as the grammatical cases; they are also the most frequent (Granlund et al. under review) and vary in form across lexical items: these three are in bold in Table 1. The nominative form is the default, citation form and uninflected stem; the genitive form is the inflectional stem used to form the other cases, from inessive onwards.

Genitive case always ends in a vowel and does not always take an affix. Hence, a vowel-final nominative needs no affix and may remain unchanged (as *emme*, in Table 1) or undergo stem change to form genitive case. Consonant-final nouns either add a vowel or delete a consonant, and may undergo stem change as well (e.g., *kiige*, in Table 1). Partitive case ends in either a vowel, '-t' or '-d', and may involve stem change. In some classes it is not an affix but *only* stem-changing morphology that signals case distinctions, as with *kiige* vs. *kiike*, 'swing.GEN' vs. 'swing.PAR' (Table 1), or 'room': *tuba* 'room.NOM', *toa* 'room.GEN'. It is also crucial that the genitive form of a noun is the stem for all other cases in singular (except partitive), as well as the nominative plural. This ensures attachment of consonant-initial affixes in accordance with phonological rules, without risk of illicit consonant clusters. Note that this also has implications for code-switched nouns.

English, too, employs stem changes in many irregular forms of noun plurals (as with past-tense verbs). In English, these irregulars contrast with highly regular affixal forms. In Estonian, the largest declension class, with 37% of noun lemmas in Child-Directed Speech, is a stem-changing noun class, which depends on syllable duration rather than affixes to convey morphological information (Granlund et al. under review). There is no single "default" class, and stem-changing morphology is productive and frequent. This poses a challenge in code-switching, both for speakers integrating non-sequential morphology and for the MLF model, which depends on embedded segments inserted into a ML frame.

When a word is fused with its grammatical morphology (e.g., 'swing' in Table 1, which undergoes stem-internal consonant gradation to differentiate the genitive *kii**g**e* and partitive *kii**k**e*), rather than concatenated (e.g., 'mommy', *emme*.**GEN**–*emme*-***t*.PAR**), it is not clear what the MLF model predicts: Should the uninflected default stem be selected for insertion, or would either stem be acceptable for insertion and available for ML marking? When code-switchers select a stem-changing lexeme, they inevitably have to decide which stem to select, and how to integrate the stem changes. Although code-switching may be blocked in certain instances, bilingual children often code-switch because of lexical retrieval issues. In cases where code-switching results from a lexical gap, the choice is not whether to insert an EL lexical item or stay with the ML for morphological integrity, but rather how to integrate the EL morphologically (e.g., apply similar stem changes to the EL, despite phonological differences, or make use of bare stems and affixes despite not suiting the phonological requirements for a particular declension class). This is discussed in Section 3.2.

Table 1. Noun case system in Estonian: overview of functions and forms.

CASE	FUNCTION	FORM	EXAMPLES	
NOMINATIVE	subject (default stem form)	Ø	***Kiik*** 'swing'	***Emme*** 'mommy'
GENITIVE	possession, affected direct object, PP complement	Vowel-final (±stem change)	***Kiige*** 'swing's'	***Emme*** 'mommy's'
PARTITIVE	direct object (imperfective, negative), numeral phrase complement	Vowel + stem change OR *-t/d*	***Kiike*** 'swing-OBJECT'	***emme-t*** 'mommy-OBJECT'
INESSIVE	In	*-s*	*kiige-s* 'in the swing'	*emme-s* 'in mommy'
ILLATIVE	Into	*-sse* OR short form	*kiige-sse/kiike* 'into the swing' (affixal/short form)	*emme-sse* 'into mommy'
ELATIVE	out of	*-st*	*kiige-st* 'from the swing'	*emme-st* 'from inside mommy'
ADESSIVE	on top of, experiencer	*-l*	*kiige-l* 'on the swing'	*emme-l* 'at mommy'
ALLATIVE	directional (exterior location), dative/beneficiary	*-le*	*kiige-le* 'onto the swing'	*emme-le* 'to mommy'
ABLATIVE	Source	*-lt*	*kiige-lt* 'off of the swing'	*emme-lt* 'from mommy'
COMITATIVE	Accompaniment	*-ga*	*kiige-ga* 'with the swing'	*emme-ga* 'with mommy'
ABESSIVE	Absence	*-ta*	*kiige-ta* 'without the swing'	*emme-ta* 'without mommy'
ESSIVE	State	*-na*	*kiige-na* 'as the swing'	*emme-na* 'as mommy'
TRANSLATIVE	change of state	*-ks*	*kiige-ks* 'turning into the swing'	*emme-ks* 'becoming mommy'
TERMINATIVE	goal, endpoint	*-ni*	*kiige-ni* 'as far as the swing'	*emme-ni* 'as far as mommy'

Typically developing, monolingual children acquiring Estonian have been found to acquire the complex noun case system quite early and to use it accurately (Argus 2009b, 2015; Hallap et al. 2014). For an overview of acquisition of Estonian, with reference to typological features, see Argus (2009a). Granlund and colleagues, in a cross-linguistic, experimental study of 3–5-year-old children's knowledge of nominal case, found that Estonian children made more errors with stem-changing forms than with invariant stems, but still found high overall accuracy, and improvement with age (Granlund et al.).

2. Data and Methodology

The present study follows from earlier studies on Estonian-English children's language usage (Vihman 1985, 1998), in that it consists of a new dual case study of siblings bilingual in Estonian and English. However, the sociolinguistic context and language skills of the children in this study are different from those cited. The children included in the earlier studies by M. Vihman spoke Estonian at home, in an English-dominant community, whereas the present study involves a bilingual home within an Estonian-speaking community, with each parent speaking a different language with the

children. For the majority of the data collection, the family resided in Estonia. A subset of the data is described and analysed in Vihman (2016), which focusses on code-switching of verbs.

The family thus follows a 'one-parent, one-language' model, with the mother (myself) speaking American English and the father speaking Estonian, but the policy is not strictly enforced. Estonian is the language the parents usually speak with each other, and the main social language outside the home; however, either parent might join a conversation in the other's language, often using that language. During the period of data collection, intrasentential code-switching appeared in the parents' language—especially in cases of culturally or situationally specific items, such as terms related to holidays, school, or local landmarks. Impressionistically, however, code-switching was not as frequent in the parents' speech as in the children's. Parental code-switching tended to follow the norms of inflectional morphology as predicted by the MLF: EL items usually inflected according to the Matrix Language, particularly with late system morphemes. Unfortunately, we lack objective data on the child-directed speech heard by the children in this study, and more generally, we lack comparable spoken data from adults bilingual in English and Estonian. Recent research has found some variability in the use of English and Estonian in computer-mediated communication (on Facebook, Igav 2013; in blogs, Kask 2016). Most of the studies to date, however, involve native Estonian speakers who make liberal use of L2 English in their writing. The insertion of Estonian words in an English context by adults has not been investigated.

For most of the period of data collection, the children were attending full-time day-care or school in Estonian. However, they showed a striking preference for English when speaking with each other. This may be due to the amount of time spent with their mother, or the abundance of English-language entertainment. The difference between speaking Estonian in the United States and speaking a prestigious, global language like English in Estonia is remarkable; the sociolinguistic context is not the subject of this study, but it very likely has an effect on the language of the children. The family moved to England for two years when the children were aged 4;3–6;3 and 7;11–9;11[1] (following the main data collection period; examples drawn from the UK period are marked as such). Language dominance was not formally tested, but appeared to be balanced throughout the main data collection, with vocabulary differing by contexts of use. According to both children's teachers' reports at the time, their linguistic development in Estonian showed no delay due to bilingualism, and language development was judged to be within norms for typically developing children.

The data derive from the author's diary of her children's speech, from a period when the two sisters, M and K, were aged 6;6–11;0 and 2;10–7;2, respectively, beginning with 17 months of more intensive diary records, at ages 6;6–7;11 and 2;10–4;3 (prior to moving to the UK). Intermittent recordings were made as well, but they involved an overwhelming majority of English-medium play with minimal code-switching and are not included. Note that diary records do not afford data on frequency or the nature of the input, but they allow us to investigate contexts out of reach of other methodology (Deuchar and Quay 2001; Tomasello 1992).

Bilingual utterances produced by the children were written down as soon as possible after they were heard. However, the children produced innumerable bilingual utterances, so the diary necessarily represents only a selection, with particular attention to unexpected usage as well as usage representative of the children's speech during a particular period. The author was not seeking confirmation or contradiction of hypotheses at the time of data collection, but was rather seeking to portray the children's bilingual usage, which seemed to be highly individual. The dataset includes 630 utterances and dialogue segments, of which 80% come from K, the younger child. Beyond differences in quantity, the data show differences in the children's code-switching styles. Examples of both code-switching and structural transfer were noted; 421 of K's 504 utterances, and 69 of M's 125 utterances involve code-switching (with or without transfer). Yet we cannot make claims about a

[1] This notation is used in developmental literature to indicate age: *x;y.z* = *x* years, *y* months, *z* days.

developmental trajectory based on this: individual differences are great in some areas, these data are somewhat sparse, and the sample is too small to draw conclusions about what drives these differences. The high proportion of examples with Estonian insertions into English utterances reflects the bias created by the observer's role (Labov 1972; Lanza 1997): The utterances most frequently heard and noted came from an English discourse context. The data were coded according to type of bilingual phenomenon, code-switched elements, and indications of structural transfer. For the present analysis, examples were coded for adherence to the SMP and MOP as well as morphological integration.

3. Language Analysis and Results

Analysis of the data addresses three issues: (1) code-switching of late system morphemes; (2) incorporation of stem-changing morphology; and (3) morpheme order. The example in (1) conforms neatly to Myers-Scotton's notion of 'classic code-switching', in which one of the participating languages is the sole source of the morphosyntactic frame. Although the content words in the subordinate clause are Estonian, the ML can be identified as English: English provides all the grammatical morphemes, and the clause itself is embedded in an English-language main clause, during an English-medium conversation. The utterance refers to a semi-formal lesson at day-care; some switched nouns are technical terms, for which the translation equivalent may not be available to the child. Yet the word for 'fox', providing the case-bearing element in the compound noun, is a highly familiar noun for Estonian children (it is also used by K at 2;11 in ex. 20).

1. Mother: Why did you get a sticker?
   M: Because I knew why the (M, 6;8.7)

polaar-rebane	-'s	*kõht*	is	*valge*.
Arctic-fox.NOM(EST)	-GEN(ENG)[2]	stomach		white

One striking point about (1) is the form of the noun *rebane* 'fox.NOM', inflected with an English possessive affix. In the genitive, this noun undergoes a stem change to *rebase* rather than receiving an affix. The child learned the phrase *polaar-rebase kõht* 'Arctic fox's stomach' in Estonian (as attested when repeating the event in Estonian to her father). Yet the NP may not be stored as a multiword unit, and when retrieving the lexemes from Estonian, M reformulated the NP according to the morphosyntactic frame provided by English, removing the Estonian genitive marker to embed an uninflected, nominative noun stem. This demonstrates the power of the MLF model. The question of stem changes is revisited in Section 3.2. First, the next section turns to examples which do not conform as well as (1) to the MLF model's predictions.

3.1. The System Morpheme Principle

The child code-switching data under investigation here show much variability, both within one child's utterances and across individuals. In example (2), the ML, unarguably English, would leave the noun unmarked ('winter things' rather than 'winter's things'). If the noun is analysed as a compound, then the first noun in English may be analysed as a stem. Estonian uses genitive case for the first element, hence the genitive inserted form: this can be analysed as an EL island, meaning a phrase-level constituent bearing EL morphology, but placed in a position following ML structural conditions. Yet if the speaker were to seek a stem, then the nominative form *talv* seems just as amenable to insertion. Stem changes in the paradigm are likely to also affect the storage and retrieval of the forms, making ready-inflected forms more easily retrieved than stems in certain contexts. Particularly for children, with still developing, tenuous grammatical knowledge, switching cases may be more

[2] Abbreviations used in glosses: DIM: DIMINUTIVE, ENG: ENGLISH, EST: ESTONIAN, GEN: GENITIVE, IMP: IMPERATIVE, INF: INFINITIVE, LOC: LOCATIVE, NOM: NOMINATIVE, SG: SINGULAR, PAR: PARTITIVE, PL: PLURAL, PROG: PROGRESSIVE.

effortful, and inflected forms easier to code-switch. This example does not flout predictions, but demonstrates the interaction of languages even in a single embedded lexeme.

2. They need to put on their *talv-e* things when it's snowing. (K, 3;5.1)
winter-GEN.SG

Kask (2016, p. 94) describes examples from Estonian blogs of English affecting L1 Estonian usage even in monolingual clauses, where nominative forms are used with elements expected to be in genitive case in standard Estonian noun compounds. The genitive inflection on the embedded noun is a system morpheme, but it is a bridge late morpheme in the 4M model (Myers-Scotton and Jake 2000a), which may come from either language. Late outsider morphemes maintain the grammatical structure of the Matrix Language and cannot be switched. Our data, however, contain code-switching involving both kinds of late system morphemes.

Embedded objects exhibit patterns of marking from either language, with examples of various strategies: Objects following ML or EL structure, and utterances with EL verb and object together, which can sometimes be analysed as EL islands. Object NPs following the MLF may appear in nominative case in an English ML utterance, as in (3a–b), or case-marked with object case in an Estonian MLF (4), as predicted by the model:

3. a. Do you see the red *pilve-d* ? (K, 3;11.28)
clouds-NOM.PL

b. Do for me a big *hoog* , Mommy. (K, 3;4.18)
momentum.NOM.SG
'Give me a big push, Mommy' (context: on swing)

4. Oota Nana! Pane oma *seatbelt*-i peale. (M, 6;7.26)
wait Nana put.IMP own seatbelt-GEN on
'Wait, Nana! Put your seatbelt on'

The plural direct object in (3a), *pilved* 'clouds', bears an Estonian plural marker but is in nominative case, which would not be an option following the verb *nägema* 'see' in Estonian. The clause obeys English ML structural constraints. In (3b), the utterance looks like an English MLF by most criteria (number of English morphemes, verb inflection), but this structure is a direct translation of an idiomatic expression in Estonian for pushing someone on a swing, *tegema hoogu* 'to make/give momentum'. Although the direct object takes partitive case in Estonian, in this English frame it is in unmarked, nominative case. Hence, the object marking follows the ML, taking a singular indefinite article despite being a mass noun, yet the structure as a whole shows transfer. In addition to the translated Estonian idiom, the adverbial phrase 'for me' shows transfer as well, as this construction requires a dative pronoun (without the preposition) or reversed word order in English.

In (4), the English lexical noun insertion *seatbelt* is inflected according to one of the most common Estonian paradigms, with the vowel *-i* added, a pattern commonly used with borrowings, neologisms, and names. The lexical frame looks Estonian, yet it is more colloquial to use the phrasal verb *pane kinni* 'put closed' (in lieu of 'put on'). Hence, this example, too, shows structural transfer. An imperative verb takes a nominative, uninflected object noun instead of the case-marked noun, but this is a grammatical phenomenon in Estonian which tends to be acquired late, and so is not an unexpected error.

The utterances in (5) show EL object marking. It is unclear what the SMP would predict here, as English lexical objects do not show case-marking, yet objects do take accusative case, as shown by pronouns. Both (5a–b) employ idiomatic verb compounds from Estonian, with English 'do' translating the verb *tegema* 'make/do' and an Estonian direct object in partitive case. These both have lexical equivalents in English ('cheat', 'skip/cut class'), but the generic, or light verb frame is easily borrowed, as noted by Myers-Scotton and Jake (2017) and Toribio (2017).

5. a. how did you do *sohki* ? (M, 7;6.5)
cheating.PAR
'how did you cheat?'

b. some of the girls did *poppi* today from dance class. (M, 7;6.6)
cutting-class.PAR
'some of the girls cut dance class/didn't go to dance class today'

The code-switched objects in (3–5) are embedded in utterances clearly framed by one language or the other, as least in terms of overt morphemes. Yet the dataset also includes utterances in which the (non-finite) verb and object are both inserted. In (6a), there is no light verb, but the phrasal verb *tundma ära* 'recognise' [lit. 'know away'] is taken wholesale from Estonian, along with the pronominal direct object in partitive case. The code-switch splits the verb phrase: The lexical verb stem, along with direct object and particle, are in Estonian, while the English auxiliary marks tense and negation. In Estonian, negation is also expressed periphrastically, yet a past tense negated verb is in past participial, not stem form, as shown in (6b).

6. a. Katie didn't *tunne* *mind* *äla (=ära).* (K, 4;0.3)
know.STEM 1SG.PAR PERFECTIVE.PARTICLE

b. *Katie* *ei* *tund-nud* *mind* *ära.* (Monolingual Estonian)
NEG know-PAST.PARTICIPLE 1SG.PAR PERFECTIVE.PARTICLE
'Katie didn't recognise me'

The finite verb provides the clue to the ML (e.g., Klavans 1985; Myers-Scotton and Jake 2017). The utterance in (6a), with the English-language auxiliary carrying person, tense and polarity and an Estonian lexical verb in stem form, would be analysed as containing an EL island (non-finite verb + object + particle), but for the fact that the form of the lexical verb follows the English-language uninflected stem form rather than the participle, as past-tense negation in Estonian would require. The examples shown in (7) are also problematic, with various mixtures of verb and object marking. In (7a), the verb is marked with an affix *-n*, which seems to make use of the Estonian first person singular ending, *-n,* to mark the English progressive *-ing* (see Vihman 2016, p. 191), for further discussion of this affix). The lexical verb and object look like an embedded-language unit, but they cannot form an EL island, if the ending is interpreted as English progressive *-ing*. The direct object noun is case-marked as expected in Estonian, but this marking is unexpected if the verb morphology is ML English. Further examples of verb and object morphology from different morphosyntactic systems are (7b), in which the verb and object noun are both English lexemes yet, notably, Estonian object case-marking is used. With an English ML, we would expect null object marking, as in "button *minu* [my] sweater".

In (7c), we do find an example of null object marking, yet here the opposite is expected: The second clause has an Estonian verb (with an Estonian voiceless/s/ending) and Estonian noun (with Estonian phonology—a clear/l/—but lacking Estonian morphology, as the object case is unmarked). With an Estonian finite verb, we would expect the object to show partitive case-marking. If Estonian is analysed as the ML (based on the verb inflection), we would expect the object to be case-marked as *pall-i* 'ball.PAR'. The examples in (7) seem to genuinely flout the model's predictions.

Utterances with verb morphology and object marking drawing from different languages are attested in two dozen examples in the data, and appeared regularly in K's speech between 3;5 and 4;1 (unfortunately, frequency is uninformative with this sort of diary data). The noun data also raise questions about integrating stem changing morphology, discussed in the next section.

7. a. we are *mängi-n* *peitus-t* with the *karu.* (K, 3;5.10)
play-*n* hide-and-seek-PAR bear.NOM
'We are playing hide-and-seek with the bear.'

b. *palun* button *minu* sweater-*i-t* (K, 3;5.7)
please my (1SG.GEN) sweater(ENG)-PAR(EST)
(Expected: '*palun* button *minu* sweater.')
'Please button my sweater.'

c. there was a big girl and she *veereta-s* a *pall* (K, 3;11.24)
roll-3SG.PST ball.NOM.SG
(Expected either 'she *veereta-s palli*' OR 'she *veereta*-ed a ball')
'There was a big girl and she rolled a ball'

3.2. Accommodating Stem Changes

Most irregular verbs and nouns in English make use of stem changes instead of affixes, and the Estonian noun inflectional paradigm centrally involves stem changing morphology (see Section 1.3). When words with stem changes are code-switched, decisions must be made regarding the choice of stem form: This can shed light on how lexical items are selected. Are the embedded words base forms, selected before any morphological information is encoded, or do they involve stem changes, implicating the EL inflectional paradigm? Stem-changing nouns might be judged incongruent and resistant to code-switching when morphology is sequential in one language but fused in the other, yet many examples of uninflected, embedded stem forms occur in the data. The utterance in (8a), repeated from Vihman (2016) uses an EL English verb with ML affix '*choose*-isin'; (8b) has an English noun with ML plural affix on an uninflected, base EL stem.

8. a. Issi kui me käisime arsti-s (K, 3;9.14)
Daddy when we went doctor-LOC

siis ma *choose*.i-si-n selle *sparkly* konna.
then I *choose*-PST-1SG this.GEN.SG *sparkly* frog.GEN

'Daddy, when we went to the doctor's then I chose this sparkly frog.'

b. We're going to grow up into *naine*-s. (K, 3;4.24)
woman-PL(ENG)
'We're going to grow up into women.'

In these examples, the uninflected base stem is used for the embedded word. In (8a), the context requires a past tense form, but the embedded lexeme is *choose* rather than the past tense *chose. Choose* is transformed into an appropriate, vowel-final stem with the vowel *-i-*, thus allowing the Estonian verb endings to mark past tense and first person singular. Likewise, in (8b), the singular nominative stem *naine* is used instead of the genitive, *naise-*, which would be used to form the plural in Estonian (*naise-d*). The MLF model allows that early system morphemes like plural markers may come from either language (or both, Myers-Scotton and Jake 2000b, p. 1066). However, which stem form to use is not always clear, sometimes involving variation, as can be seen in example (9). Two different plural forms, used successively in (9a) and (9b), show that use of the base EL form with an ML affix is not

always satisfactory, perhaps because it conflicts with the form more frequently occurring in the input, inevitably that in (9b). The use of an embedded noun here is prompted by a lexical gap: this word was learned in school, and M had not encountered the English word 'workshop'.

9. a. Basically, there are four different *töö-tuba*-s . (M, 10;1.23)
work-room-PL(ENG)

b. *Töö-toa-d* are these things where you go from room to room and you can do different activities.
work-room-PL(EST)

The self-repetition is informative. The first code-switched item operates similarly to the verb *choose* in (8a): The uninflected EL base form is selected and inflected with a ML plural affix. However, the word is inflected differently when immediately repeated in (9b), now with the EL stem change and EL affix.

When stem choice is not at stake, it is more straightforward to use a base form with a matrix language affix, as in (10). The Estonian nominative plural morpheme *-d* attaches to a vowel-final genitive form. Here, the child at 2;11 already employs stem adaptation by adding a vowel, *-i*, before the plural ending.

10. Mul on vaja lõigata *picture*-id (K, 2;11.13)
to-me is needed cut.INF picture-NOM.PL(EST)
'I need to cut pictures.'

Yet we find intra-speaker variability, even with sequential affixes and no stem change, demonstrating an open choice between EL islands and ML morphological integration. Like M in example (9), K also makes use of both EL islands and ML morphology affixed to a stem, as shown in (11–13):

11. At preschool the *õuna-puu*-**s** started *õitse*-ing
apple-tree-PL(ENG) bloom-PROG(ENG)
and the *kirsi-puu*-***d*** too.
cherry-tree-NOM.PL(EST)
'At preschool the apple trees started blooming and the cherry trees too.' (K, 4;0.08)

12. a. I found a pinecone under my seat. In English it's *käbi*. (K, 3;4.22)
pinecone.NOM.SG
I found a *käbi*. Squirrels like *käbi*-**s**.
pinecone.NOM.SG pinecone-PL(ENG)

b. Two *käbi*-***d***. Look, I have two *käbi*-***d.*** (K, 3;4.28)
pinecone-NOM.PL(EST) pinecone-NOM.PL(EST)

13. There are *sajajalgse-d* boy-**s** and these are *sajajalgse-d* girl-***d.***
centipede-PL(EST) boy-PL(ENG) centipede-PL(EST) girl-PL(EST)
'There are centipede boys, and these are centipede girls.' (K, 3;7.14)

Whether (11) involves self-correction or simply shows arbitrariness in the choice of ending, it is clear that plural marking has been acquired and activated in both languages. The plurals in examples (12a–b) derive from conversations on different days. The first line in (12a) provides a peek at the

metalinguistic awareness of the bilingual child, who initially produces the compound lexical item *pinecone* in English, then mis-labels the Estonian item as English (as she was wont to do), and continues using the Estonian EL item, perhaps due to its simpler phonology. The source language for plural marking varies, but the ML frame is English in both (a) and (b); in Estonian, plural numerals require partitive singular nouns rather than nominative plural (12b). Example (13) again shows variability within a clause: Here, the adjective *sajajalgsed* 'centipedes [=hundred-legged.PL]' is embedded twice with EL plural marking. The language choice for the plural morpheme on the ML head noun ('boy', 'girl') contrasts with the adjective in the first NP (centipede-PL(EST) boy-PL(ENG)), whereas the language of the two plural markers matches in the second. The 'intrusive' EL marker on the second ML noun, *girl-d* 'girl-PL(EST)', is attached to a consonant-final stem, although Estonian morphophonology would require a vowel-final stem.

In K's second utterance in (14), the embedded Estonian noun *onn* 'den.SG' (*onni-d* 'den.PL') takes a ML plural affix, yet this is not attached to the base form, although this would be phonologically acceptable in English (*onn*-s, akin to *lawn-s* or *bun-s*). Instead, the genitive form is used as an embedded base stem, as in Estonian, together with the ML English plural affix *-s*. The same strategy is illustrated in (15), with *sammu-s* 'step.GEN + PL(ENG)'.

14. K: I want to build a *onn* . (K, 4;4.13)
den.NOM.SG (UK period)
Mother: A what?
K: A *onn*. But when we build *onn.i*-**s** then you always say 'clean up it!'
den.NOM.SG den.GEN-PL(ENG)

15. when you all go to sleep, then I will wake up and go with very quiet *samm.u*-**s** to the bathroom.
step.GEN-PL(ENG)
'...then I will wake up and go, with very quiet steps, to the bathroom.' (K, 3;4.28)

While the ML is English, the plural stem is adapted according to Estonian morphophonology. Moreover, the word order in the reported speech 'clean up it!' is misrepresented, though the child will have heard the phrase 'clean it up' repeatedly in her mother's input.

It is important to note that embedded plural nouns are not invariably adapted in the same way. The examples in (16) involve an uninflected (consonant-final) stem with ML plural affix, unlike those in (14–15), in which the adapted, vowel-final EL stem is used before the same ML affix. All the code-switched nouns in (14–16) have consonant-final uninflected, nominative stems.

16. a. M: Mommy, Kribu's [=cat's name] hand was like this. [bends own hand backward]
Mother: Cats don't have hands.
M: Yeah. One of her *käpp*-s was like this. (M, 6;7.12)
paw-PL(ENG)

b. It's creepy. It's like those *metsa-vaim*-s (K, 6;5.3)
forest-spirit-PL(ENG).

c. I don't like Barbies that don't have *tukk*-s, I don't like how they look.
bang-PL(ENG) (K, 6;11.22)

From the discourse context in (16a), it is evident that the code-switch is due to lexical retrieval; the embedded noun in (16b) is from a film, *Princess Mononoke*, seen in Estonian. The noun in (16c) is plural in American English but singular in Estonian (like the British equivalent 'fringe'): it is given the ML plural affix.

Examples shown in (17) have embedded Estonian plural nouns, with EL stem and affix.

17. a. Then I have to make the *juure-d.* (M, 6;7.11)
root.NOM.PL(EST)

b. It's gonna be a cave with lots of *plahvatuse-d.* (M, 11;0.9)
explosion-NOM.PL(EST)

c. The book has all the *töö-lehe-d.* (K, 6;6.11)
work-sheet-NOM.PL(EST)

Although this variation may be entirely open to speaker choice, factors such as complexity of morphological formation may contribute to the selection of EL islands like those in (17). The plural in (c), for instance, involves a stem change, from the nominative stem *leht* to genitive *lehe.* The EL ending may be the most straightforward opt-out strategy in cases of morphological incongruence, complexity or uncertainty.

Moreover, in this language pair, plural nouns occurring with numerals and certain quantifiers involve a second level of potential incongruence. In Estonian, a numeral greater than one selects a *singular* noun in partitive case. Hence, when code-switched nouns appear in numeral phrases, case and number may be incongruent across the languages. In (9a) above, the switched noun is embedded in a numeral phrase, 'four different *töö-tuba*-s [work-room-pl(Eng)]'. The use of the English-language plural ending (not partitive singular, as in Estonian) may reflect avoidance of the complicating factor of numeral phrase syntax. In (18), the choice may also be affected by the distinctly un-English phonology of the stem-changing noun. The uncertainty and incongruence is clear in the pause and reformulation with an EL island (numeral and noun).

18. I only need to do two *tehe-* [pause] only *kaks* *tehet* [.] for homework.
operation two operation-PAR.SG(EST)
(M, 10;2.3)

A similar strategy may be at work in (17b, 'lots of *plahvatused*', 'explosion-NOM.PL'), which in Estonian requires a partitive plural *palju plahvatusi*. The bridge morpheme *of* expresses semantic partitivity, but this example is better analysed as following English ML structure with an EL island. In (19), the opposite choice is made: The embedded quantified noun is in partitive singular, imperfectly capturing Estonian morphosyntax: The same phrase in Estonian is expressed with a partitive plural (*palju punkt-e*).

19. Look, I have that much *punkt-i.* (M, 7;6.6)
point-PAR.SG(EST)

As the careful reader may notice, this clause is also imperfect in English, where the target would be 'I have that many points', rather than 'much points.' The equivalent Estonian quantifier does not differentiate count from mass nouns. Hence, both languages feed into the grammatical structure of the clause constituents.

There is also some evidence of K varying stem selection in code-switching. The example in (20) involves a plural noun in the first line, using a singular nominative EL stem + ML plural affix, and a hesitant use of genitive case in the third line, self-repaired to nominative. The requisite bridge morpheme in Estonian would be genitive (='fox's baby'). However, the Estonian nominative is closest to the non-case-marked English equivalent.

20. K: I'm a *rebane* . *Rebane*-s don't have a bottom.
fox.NOM.SG fox-PL(ENG)
M: Yes, they do!
K: But this is a *rebase* [.] *rebane* baby. (K, 2;11.12)
fox.GEN.SG fox.NOM.SG

The examples provided in this section, illustrative of noun embedding in the dataset, represent considerable variation when it comes to the question of stem selection and the morphological integration of nouns. They are not necessarily counter-examples to the model's predictions. They illustrate, however, how the grammatical systems of both languages are crucially involved in the production of an utterance, at all levels. This highlights the need for a model allowing for dynamic processes in speech production and processing. Both base stems and inflected stems are used, and morphology may come from the EL or ML in either case; the children show occasional uncertainty as to which form is better, along with sensitivity to morphological mismatches between an inflected EL stem and ML affixal morphology. We cannot directly compare these with data from adults, but further research would be welcome on stem selection in speech processing, and on the factors affecting morphological integration of embedded language lexemes in bilingual speech.

3.3. Double Marking

One solution to the stem selection quandary is double marking. Lexical retrieval sometimes accesses an inflected EL form, and adding ML marking serves to explicitly mark integration into the MLF and the intended semantic relations. In (21), *metsa* expresses *mets* 'forest' + a stem-changing illative case 'into'.

21. I want to go to metsa[3] ! (K, 2;11.9)
forest.illative('into').sg

The stem change alone may seem insufficient as a signal of directionality, and the English *to* is added for good measure (see also Poplack et al. (1989) for similar examples with Finnish-English). However, double marking is also used in contexts of no stem change, as in (22). Here, the ML preposition and EL suffix are positionally distinct, again allowing the use of double marking with no structural conflict. In (22a), case is transparent in the affix, yet double marking is employed with the English preposition 'to'. The form in (22b) involves a genitive stem and comitative suffix, as well as English 'with':

22. a. When I grow up and go to *töö-le* and daddy's school, then I can use your scissors.
work-ALLATIVE('to').SG (K, 3;5.1)

b. Where's that one with the *kausi-ga*? (K, 3;5.11)
bowl-COMITATIVE('with').SG

As has been noted previously (Myers-Scotton 2002; Myers-Scotton and Jake 2000a; Vihman 1998; Zabrodskaja 2009), double marking may also occur with the morphemes stacked in the same position, e.g., with loan words used in adult speech (e.g., *džin-**s-id***, < English plural 'jean-s'+ PL(EST)). Double marking in child speech is also noted with irregular stems by Vihman (1998, p. 67), e.g., with plural *feet* also receiving Estonian plural and case marking ("*FEETidele* 'to the FEET'", at age 4;3). In the dataset under consideration, this happens with genitives, as in (23), where Estonian genitive and English possessive are both noun-final.

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[3] Because this lexeme involves a change in phonological quantity, not represented orthographically, the gloss does not mark morpheme boundaries. The nominative form is *mets*; *metsa* is genitive, and the partitive and (short) illative are *mets-a*, with a lengthened duration.

23. Look, *Sandel-i-*'s *õde* has a telephone in her bag too.
Sander-GEN(EST)-GEN(ENG) sister.NOM.SG (K, 3;5.0)

When the nominative ends in a vowel, many nouns, including names, are syncretic in nominative and genitive case. K attempts to use an EL island (24a), with EL (ø) genitive marking on her sister's (vowel-final) name with a code-switched noun; her older sister corrects her—not with an injunction against code-switching, but rather on the morphological marking (24b).

24. a. K: When is *M..* *näidend* gonna be, for preschool?
M... ø = GEN.SG(EST) play.NOM.SG (K, 6;6.26)

b. M: Not *M...* *näidend,* but **my** *näidend.*
M-ø = GEN.SG(EST) play.NOM.SG play.NOM
M...-'s *näidend.*
M...-GEN(ENG) play.NOM (M, 10;2.16)

The use of 'my' in the initial correction indicates that she is targeting a perceived lack of genitive marking, assuming a MLF imposing the morphosyntactic structure on the utterance, which her younger sister fails to observe. Differing choice of morphological forms (e.g., stem changes vs. affixes, as in Section 3.2; prepositions vs. case endings, as in ex. 21–22; zero vs. overt marking, as in 24), indicate different code-switching strategies. It is likely that this reflects their differing status with respect to mental representations and processing.

4. The Morpheme Order Principle: What ML Grammar?

Various factors may underlie the divergences from predicted code-switching patterns discussed in Section 3. First and foremost, the dataset analysed here derives from children's speech. It is important to consider why the examples diverge from predictions: Whether they reflect different constraints or emerging, not yet fully acquired, grammars. Secondly, Auer and Muhamedova (2005) criticise the MLF model for the monolingual bias behind the assumption that every clause draws on a structural frame which can be described with reference to a single language; they claim that "a neat separation between matrix and embedded language is impossible" (Auer and Muhamedova (2005, p. 52); see also Gardner-Chloros 2005; Gardner-Chloros and Edwards 2004). Both of these issues are particularly problematic when applied to children's speech.

Some of the literature on bilingual children's language use contrasts adults' code-switching, which may serve pragmatic functions like highlighting informative meanings (e.g., Myslín and Levy 2015), with 'code-mixing' of children, said to derive rather from pragmatic incompetence resulting from incomplete differentiation between the two language systems before functional categories have been acquired (Meisel 1989, 1994). The children studied here have acquired functional categories, and it is clear that they are aware of using two languages and have expectations and opinions about how to combine them in code-switching. In (25), M again reacts to her sister's use of stacked double marking:

25. K: Will you put these in *Rahel-i-*'s box?[...] (K, 6;6.10)
Rahel-GEN(EST)-GEN(ENG)
M: It's not *Rahel-i-*'s. It's Rahel's. (M, 10;2.0)
Rahel-GEN(EST)-GEN(ENG)

The strength of M's sense of grammaticality is also demonstrated in (26), where she corrects her mother's use of morphology in code-switching. M's corrections demonstrate emerging awareness of regularities and recognition of deviations from them, as well as rigid adherence to (unarticulated) norms. This example indicates a preference by M for ML morphological integration over EL islands.

26. Mother: Ok, if you girls want to eat, um, *besee-d*, then we need to go eat them now.
meringue-NOM.PL(EST)
M: "*Besee*-s". (M, 9;0.0)
meringue-PL(ENG) (UK period)

Judging appropriate use of code-switching depends on having models of the grammars of the two languages, as well as having an idea of "correct" code-switching behaviour. Yet, despite evidence that the children have knowledge of and access to both systems, the structures underlying speech production may themselves be nonstandard, because of (a) developmentally immature grammars, (b) the mutual influence of the two languages, leading to structures divergent from the assumed monolingual model, or (c) effects of language interaction in the input the children hear, since both parents are fluently bilingual. It is also reasonable to assume that all three of these factors play a part, and we cannot tease them apart based on the data presented here. Yet it is important to recognise that this fluidity between systems affects not only children's bilingual language use, but also adults'. Assuming a monolingual frame for code-switched utterances, though it may often be descriptively adequate, is likely to misrepresent the bilingual speech production process, which may draw on either system or both.

Convergence

While code-switching and convergence are often examined separately, it is of critical theoretical importance to look at the two phenomena together. First, the presence of convergence makes it especially clear that languages interact and compete on a deeper level than the lexicon; more importantly, an effect of convergence is to make the grammatical frame in question less static—this inherently problematises the MOP. Moreover, it underscores the importance of treating language as an inherently dynamic phenomenon, open to creative online construction – especially in bilingual speech, and especially as used by young children.

In addition to the transfer evidenced above, e.g., in (3b) and (5), the dataset includes examples of lexical convergence and structural transfer in utterances without overt code-switching, too. These can be illustrated with choice of prepositions (27a–b), adverbial order (28a–c), and part-of-speech flexibility (29).

27. a. Palun *vaada-ke* minu loomade *pärast* (M, 6;6.1)
please look-IMP.PL my animal.PL.GEN after
<Eng: 'Please *look after* my animals'
(standard Est: '*hoolitsege minu loomade eest':* 'take care (on behalf) of my animals')

b. They're so yummy... and they're *with* sugar! (M, 7;11.3)
(intended: 'they have sugar on them')
< Est: *nad on suhkruga (koos)* 'they are (together) with sugar'

28. a. I'll take this *downstairs along*. (M, 6;7.28)
(standard: 'I'll take this along downstairs')

b. I have to open it *always* because it goes *so much times* broken. (M, 7;2.9)
(standard: 'I always have to open it because it gets broken so often.')

c. What do you *else* like? (M, 8;1.28)
(standard: 'What else do you like?') (UK period)

29. Oh my gosh, I've got two *perfects*. (=perfect waffles with no holes) (M, 10;3.29)

The MOP posits that morpheme order within the bilingual clause comes from *only one language*, identified as the ML. Because code-switching research focusses on bilingual utterances, it does not always compare code-switched utterances with single-language (monolingual) utterances to test whether this assumption is valid—in fact, monolingual utterances may be difficult to find in some contexts. For bilingual children, we cannot assume that their utterances are framed according to a grammar equivalent to that of either target language. In the dataset, we find code-switching with word order which does not follow the ML, such as (30). This is related to what Myers-Scotton has called a composite frame, resulting from low proficiency or attrition: "when speakers do not have full access to the grammatical frame of the intended ML, part of the abstract structure comes from one variety and part from another" (Myers-Scotton and Jake 2000b, p. 2). Yet the languages may affect each other, and speakers may produce blended or composite frames, even if they have access to both grammars.

30. Mommy, vihmaussi-kese-d eat birds! (K, 2;11.21)
earthworms-DIM-NOM.PL[4]
Intended: 'Birds eat earthworms.'

The English ML utterance in (30) is awkward from the point of view of the MLF and the MOP. However, this constituent order is no more expected if we look to EL word order. Estonian word order is flexible, but corpus analyses have shown that OVS order with two overt nominals, while acceptable, is rare (Lindström 2004). Moreover, OVS is more likely to occur with a light, pronominal object than a marked, focussed, multisyllabic one. However, when we look at the language used by K in (31), we find that she has a liberal approach to constituent order. Whereas M's examples in (28) show non-standard adverb order, the utterances in (31) concern the core arguments of the clause.

31. a. [*Context:* looking at picture cards and labelling them.]
Banana is it! Drum is it! (K, 3;0.2)
(standard: 'This is a banana. This is a drum')

b. I do want a cake to make. (K, 3;0.8)
(standard: 'I do want to make a cake')

c. Mr. Hoppy is eating his flies now because frogs like flies to catch. (K, 4;4.20)
(standard: '...frogs like to catch flies') (UK period)

d. My turn is! (K, 3;0.5)
(standard: 'It's my turn.')

e. Very beautiful is that table now! (K, 3;4.4)
(standard: 'That table is very beautiful now.')

Hence, utterances using lexemes from a single language, with non-standard word order, can be found in both children's speech. An example from M with non-standard order of core arguments is given in (32):

[4] Plural objects in Estonian perfective clauses take nominative case; hence, the lack of object-marking in this example does not disentangle the intended argument structure of this utterance.

32. [*Context:* Dividing chocolates among four family members, but father is not present.]
Can we choose one more? Let's pretend that *this one chose Daddy*.
(standard: 'Let's pretend that Daddy chose this one.' (M, 7;8.24)

All of these can be analysed as examples of structural transfer, as the translation equivalents are grammatical in Estonian. Examples of untargetlike word order in "monolingual" utterances (with lexemes from one language) puts the code-switched utterances, as in (33), in a new light:

33. a. *pääsuke* like this is done. (M, 7;5.4)
swallow.NOM.SG
'This is how you do the swallow (=gymnastics pose).'

b. I made with a *harilik* *pliiats* the *joone-d*, but then I colored outside the lines.
regular pencil.NOM.SG line.NOM.PL
'I drew the lines with a pencil, but then I colored outside the lines.' (M, 7;0.5)

If the clauses in (33) are analysed with reference to a standard view of monolingual English grammar, they are counterexamples to the Morpheme Order Principle. But compared to (28) and (32), the constituent order is similar in the utterances with and without code-switching. If the speaker uses nonstandard order in "monolingual" utterances, then there is no reason to expect her to draw on a standard MLF in code-switched utterances. This does not mean that the MOP is followed here, but rather that the MOP is not meaningful in a context in which the two languages so thoroughly interact as to make it difficult to identify a single language as the source of the grammatical frame. This would logically apply to the MLF itself as well.

More generally, the MLF model assumes a system of rules which organise speakers' language use, with one of the languages imposing its rules on any given utterance. Yet research has shown great permeability between the two languages in a bilingual's mind, with constant coactivation and mutual influence. If "every bilingual is an attriter" (Schmid and Köpke 2017), then children with two (incompletely acquired) first languages will inevitably show effects of bilingualism, most likely in both languages.

5. Discussion and Conclusions

Child speech provides an important testing ground for theories of linguistic structure and language processing, but it also comes with complications for analysis. It is difficult to judge whether nonstandard children's utterances are innovations or speech errors, as reflections of their level of language competence. Bilingual children's metalinguistic awareness may involve knowledge of grammar and code-switching. The grammatical knowledge is dynamic in development, permeable between a bilingual's languages, and difficult to capture. Speech production demonstrates the knowledge in operation, but also demonstrates its fluidity.

The children analysed in this dataset produce a variety of code-switching styles: Some examples show sensitivity to a MLF, others clearly flout the System Morpheme and Morpheme Order Principles. Even where the MLF model allows for variability, the extent of variability in these data, within and across individuals, and within utterances, is striking. The children's languages affect one another in more fundamental ways than lexical insertion, with examples of structural transfer across various domains. This indicates that the ML structures assumed to underlie the utterances may not always be the relevant ones. Analysts must be especially careful to avoid imputing grammatical knowledge to (even balanced bilingual) children who do not yet have it, or assuming as targets monolingual structures which are not well founded. The SMP violations may be developmental, and more prominent in early code-switching, as suggested by Paradis et al. (2000). The MOP is repeatedly violated in this dataset, whereas Paradis et al. report low levels of MOP violations in their French-English data. This may be due to greater permissible variability in constituent order in Estonian than in

either French or English, leading to weaker structural adherence to word order in general, i.e., in the bilingual children's English as well. There is a clear gap in existing research on children's use of code-switching. In order to untangle individual differences, developmental effects and the effects of language typology and sociolinguistic context, more detailed research is needed of the kind represented in Paradis et al. (2000). In order to more systematically investigate these variables, we need larger, controlled samples of spontaneous speech. Ideally, various language pairs with diverse, grammatically meaningful differences (of the kind discussed under stem changes and constituent order) need to be compared.

The MLF framework is useful as a tool for analysis, but it has its limitations. The assumption that targeted structures derive from a monolingual, identifiable and independent ML is problematic, especially for children's speech, but also for adults. Critics have pointed to a "misplaced faith in the role of the Matrix Language" and the unfounded assumption that bilingual speakers draw on clearly identifiable and distinct languages (Gardner-Chloros 2005, p. 91). As noted by Alvarez-Caccamo (1998), "research should first convincingly prove that (a) speakers who code-switch possess two (or more) identifiable linguistic systems or languages, each with its identifiable grammatical rules and lexicon; and (b) 'code-switched' speech results from the predictable interaction between lexical elements and grammatical rules from these languages" (Alvarez-Caccamo 1998, p. 36). Moreover, as noted by Gardner-Chloros (2005), "a prescriptive element can creep in: The outcome of specifying a 'grammar' of CS is that there appears to be a right and wrong way to code-switch, or at least a 'possible' and an 'impossible' way" (Gardner-Chloros 2005, p. 91).

Differences between children's and adults' code-switching derive from many factors. The two children in this case study show differences in metalinguistic awareness and approaches to bilingual language usage, as well as change over development. Both, however, are sensitive to linguistic structure and typological differences between their languages. Individual differences may affect children's code-switching more than adults', due to their less developed knowledge of the morphosyntactic systems; see also Paradis (2011), who found that child-internal factors trumped external factors in language outcomes in a larger-scale study of second language acquisition. Children have not learned the complete adult grammars, and do not fully conform to the constraints posited by the MLF model. However, adults may never have as clear a set of rules guiding their language usage as the model assumes either.

Research in bilingualism and language attrition has shown that languages are in constant interaction in bilinguals, and that parallel activation and crosslinguistic competition affect both the first and second language (Kroll and Bialystok 2013; Schmid and Köpke 2017). This casts doubt on the enterprise of comparing bilinguals' language use to any static, monolingual model of grammar. We expect to find cross-linguistic transfer among bilingual children, whose linguistic knowledge is dynamic, developing and dependent on context. The examples of convergence and structural transfer in the present study show that the MOP may not be relevant, and hence may not be violated; yet this raises the question of when it is relevant to compare bilingual production to a monolingual model of clausal grammar.

The assumptions of the MLF listed in Section 1.2 are all problematic: (1) A set of formal, grammatical rules cannot characterise spoken language, as a creative endeavour, performed online, even if those rules underlie abstract linguistic competence. (2) The data and discussion of convergence, along with a growing body of research, casts doubt on the notion that a bilingual's two languages are mentally represented as independent grammars, and makes it clear that (3) a single ML is not always possible to identify. (4) While code-switching may adhere to abstract rules, surface-level structures also emerge in the course of production, and (5) code-switching behaviour can be influenced by various factors beyond morphosyntactic structure. These points apply equally to adult spoken language. When analysing child language, however, it is critical to bear in mind the dynamic nature of linguistic knowledge and production. This is not to say the children are not aware of speaking two languages

with differentiated lexicons and grammatical systems, but that the use of the two can be much more fluid than what the models capture.

A more universal model may have to (a) replace constraints with tendencies in bilingual usage, (b) allow for more typologically sensitive nuance, (c) allow for construction-level analysis and effects of crosslinguistic influence and (d) assume that the languages interacting in bilingual usage are interdependent, dynamic, and negotiable outcomes of language use, rather than sets of rules imposed on usage. This would mean losing the principled structure of the MLF or other constraint-based models, but would mean gains in descriptive adequacy. The extent to which code-switching is subject to rules may itself be variable across contexts, considering the typological range of human languages, and the flexibility of language in use.

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