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Construction Coordination in First and Second Language Acquisition

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Abstract

Repetition of linguistic forms is a pervasive coordination mechanism in interactive language use. In this paper, we investigate patterns of cross-participant repetition in dialogues where participants have different levels of linguistic ability. Achieving a better understanding of these patterns can not only shed light on how humans coordinate in conversation, but may also contribute to developing more natural and effective dialogue agents in education contexts related to language learning. Our approach is novel in several respects: We focus on multi-word constructions at the lexical and morphosyntactic level, consider both first and second acquisition dialogue, and contrast these setups with adult native conversation. The results of our study show that language acquisition scenarios are characterised by richer inventories of shared constructions but lower usage rates than fluent adult dialogues, and that shared construction use evolves as the linguistic ability of the learners increases, arguably leading to a process of routinisation.

1 Introduction

Interacting through conversation, although arguably the most intuitive form of language use, requires complex interpersonal coordination. Part of such coordination is realised by the tendency of interlocutors to repeat each other's linguistic forms. Indeed, dialogue partners have been shown to align their behaviour at a range of different levels, from phonetic features, lexical choice and syntactic structures to body posture, eye-gaze or gestures (Brennan and Clark, 1996; Pardo, 2006; Reitter et al., 2011; Holler and Wilkin, 2011; Rasenberg et al., 2020). In this study, we investigate patterns of cross-participant repetition of lexical and structural constructions present in two language acquisition settings. We compare dialogues between young children and their caregivers (L1) with learners practicing English as a second language with a tutor (L2), contrasting these to adult native dialogue.

Language acquisition dialogues are particularly interesting scenarios to study alignment since the language choices made by both speakers are not solely for communicative or social purposes, but play a key role in the process of language learning. Therefore, a better understanding of alignment patterns in these scenarios can contribute to developing more natural and effective dialogue agents in education contexts (Litman and Silliman, 2004; Graesser et al., 2005; Steinhauser et al., 2011; Katz et al., 2011; Sinclair et al., 2019b). Beyond education, linguistic alignment has been shown to lead to increased naturalness and task success in dialogue systems (Lopes et al., 2015; Hu et al., 2016) and has been incorporated into chatbots and dialogue assistants (Hoegen et al., 2019; Gao et al., 2019).

In the present study, we adopt a usage-based perspective to language acquisition and investigate multi-word constructions in the sense of Construction Grammar (Goldberg, 2006; Tomasello, 2003; Bybee, 2010). According to this tradition, constructions are form-function units acquired through interaction, where a form is a particular configuration of structural and/or lexical elements. Constructions have been shown to play a role in both first and second language acquisition (Diessel, 2013; Ellis, 2013). In this paper, we focus on cross-participant alignment of constructions, i.e., multi-word expressions at the lexical and morphosyntactic level that are used by both participants within a given dialogue. We call such expressions *shared constructions*. Examples are shown in Table 2, Section 4.

Using data from four different dialogue corpora, we extract the inventory of shared lexical and morphosyntactic constructions within a dialogue and compute several usage measures for these constructions. Our results demonstrate that shared constructions are an important aspect of interaction and

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reveal interesting contrasts. We find that language acquisition scenarios, particularly regarding L2, are characterised by richer inventories of shared constructions but lower usage rates than fluent adult dialogues. However, over the course of learning, usage rates significantly increase, arguably due to a process of routinisation. With higher linguistic ability, shared constructions become more complex, are more frequently introduced by the learner, and their cross-speaker repetition is less affected by local mechanisms possibly related to priming.

2 Alignment in L1 and L2 Learning

First and second language acquisition have key differences, for example regarding the mental and social maturity of the learner and the absence vs. presence of self-awareness regarding the learning process (Cook, 1973). In addition, in adult L2 acquisition the learner already has full knowledge of their first language, which conditions how a second language will be learned (Cook, 2010). Yet L1 and L2 acquisition also share important features: They involve similar learning stages, with particular structures being acquired in a relatively fixed order (McDonough et al., 2013), and the use of formulaic speech is present in both learning processes (O'Donnell et al., 2013). These similarities and differences are likely to influence the patterns of cross-speaker construction repetition exhibited in these two scenarios. With this study, we aim to gain understanding of these patterns, contrasting them to those present in adult native dialogue.

Several previous studies have analysed alignment and repetition processes in first and second language acquisition dialogue, but to our knowledge these two settings have not been compared directly. In the context of L1 acquisition dialogue, it has been shown that there is cross-speaker coordination at lexical and syntactic levels and that this occurs at higher rates in adjacent turns (Dale and Spivey, 2005, 2006; Fernández and Grimm, 2014; Misiek et al., 2020). Clark and Bernicot (2008) argue that cross-participant lexical repetition in child-adult dialogue is typically used to draw attention to the partner's utterances and to add the repeated information to the common ground. While more recently, Denby and Yurovsky (2019) found that parental alignment at the level of syntax and function words is also present and is a strong predictor of vocabulary development in young children. In L2 acquisition dialogue, repetition patterns have also been shown to occur and to serve several functions, such as testing newly learned words, clarifying, or indicating understanding and misunderstanding (Allwood and Ahlsén, 1986; Broeder, 1992; Costa et al., 2008). Furthermore, alignment at the lexical level and coordination in terms of dialogue act usage between tutors and L2 learners has been shown to increase with language ability (Sinclair et al., 2018, 2019a).

In this paper we focus on multi-word lexical and morphosyntactic shared constructions. We consider both L1 and L2 acquisition dialogue, compare these two setups, and contrast them with adult native conversation.

3 Data

Child-adult dialogue (L1) We use a set of dialogues from the CHILDES Database (MacWhinney, 2000). In line with previous work (Chouinard and Clark, 2003; Dale and Spivey, 2005, 2006; Fernández and Grimm, 2014), we draw longitudinal data from the following three English child-adult corpora involving three different young children in relatively early stages of first-language acquisition: Abe (age range of the child 2;5–5;0) from the Kuczaj corpus, Sarah (age range 2;6–5;1) from the Brown corpus, and Naomi (age range 1;11–4;9) from the Sachs corpus. The dialogues are between a caregiver and a child who are interacting in free play. Since our focus is on multi-word constructions, we selected all dialogue transcripts from each of these three corpora where the child utterances have a minimum mean length of 2 words.

Student-tutor dialogue (L2) We use a set of dialogues from the Talkbank Database, specifically from the Barcelona English Language Corpus (BELC) (Muñoz, 2006). The BELC dialogues involve an English language tutor and a high school student (ranging in age from 11 to 18 years old) whose native language is Spanish or/and Catalan (students may be bilingual). The tutor conducts an interview in English about daily life aspects. The interviews are semi-guided, but learner-initiated topics are occasionally present since the goal is to favour natural interaction. The dialogues were gathered at four time points: after 200 hours, 416 hours, 726 hours, and 826 hours of English-language instruction (level 1, 2, 3, and 4, respectively).

Dialogue between adult native speakers As control group, we use two different corpora of adult

	L1		L2		MapTask		Switchboard	
total # dialogues	379		118		128		1155	
utterances / dialogue	388±220		132±48		162±83		192±80	
tokens / dialogue	1527±753		685±245		1182±639		1618±664	
	Adult	Child	Tutor	Student	Giver	Follower	A	B
utterance length	4.4±0.7	3.8±1.4	6.0±0.7	4.2±1.5	10.2±2.1	4.4±1.3	8.6±2.3	8.6±2.4
% utterances / dialogue	0.46±0.1	0.54±0.1	0.59±0.0	0.41±0.0	0.51±0.0	0.49±0.0	0.51±0.1	0.49±0.1
type-token ratio	0.4±0.1	0.3±0.08	0.3±0.1	0.4±0.1	0.4±0.1	0.2±0.1	0.3±0.1	0.3±0.1
vocabulary overlap	0.4±0.1	0.4±0.14	0.3±0.1	0.5±0.1	0.6±0.1	0.4±0.1	0.4±0.1	0.5±0.1

Table 1: Corpus statistics. Except *total number of dialogues*, we report mean and standard deviation per dialogue. For Switchboard, A is the participant who speaks first in each dialogue. Type-token ratio indicates the level of lexical diversity per dialogue. Vocabulary overlap refers to the percentage of word types used by a participant that are also used by the dialogue partner within a dialogue.

native dialogue: MapTask (Anderson et al., 1991), a corpus of task-oriented dialogue where the participants have different roles, and Switchboard (Jurafsky et al., 1997) where there is no role difference. The MapTask dialogues consist of one participant (the instruction giver) directing the other (instruction follower) to navigate to a point on a map. In the Switchboard dialogues both participants were asked to make conversation over the phone about one of a pre-specified range of daily life topics.

Table 1 summarises the corpora used in our analysis. All dialogue corpora are freely available, distributed tokenised and with part-of-speech tags.

T—144: is it a **big bedroom** or a small bedroom?
S—145: **big bedroom**.
T—146: a **big bedroom** okay .

(a) L2: BELC

A—550: it had lollipops **in it**
C—551: what's **in it**
A—552: it doesn't open it just a whosejigger
...
C—556: a lollipops is **in it**

(b) L1: CHILDES

Table 2: Example dialogue excerpts from BELC (T: tutor, S: student) and CHILDES (A: adult, C: child). Underlined expressions indicate shared morphosyntactic constructions for the patterns '`ADJ N`' in BELC and '`DET N`' and '`PREP PRO`' in CHILDES. Expressions in bold indicate shared **lexical** constructions.

4 Shared Constructions: Extraction and Key Properties

We focus on multi-word constructions used by both dialogue participants within a conversation. In our approach, constructions consist of at least two contiguous non-punctuation tokens at the utterance level. A construction becomes *shared* within a dialogue once both participants have used it, that is, once it has appeared in at least one utterance per dialogue participant. We consider lexical constructions (i.e., sequences of words, such as 'go to the' or 'how old are you') as well as morphosyntactic patterns (i.e., sequences of part-of-speech tags). Reusing a morphosyntactic pattern may or may not involve repeating some or all of its lexical realisation. For example, '`PREP N`' could be realised lexically as 'at home' or 'for friends', and '`CONJ PRO V`' as 'if you have' or 'if I have'. Table 2 contains examples of the types of shared constructions in the L1 and L2 corpora we examine in this study.

The automatic extraction of shared constructions per dialogue is an instance of the longest common subsequence problem (Hirschberg, 1977; Bergroth et al., 2000), which can be solved in linear time given the total number of tokens in a dialogue. For each dialogue in our corpora, we extract the inventories of shared lexical and morphosyntactic constructions using the method proposed by Duplessis et al. (2017a; 2017b).[1] A total of 29 (out of 1155) Switchboard dialogues do not contain shared constructions of at least length 2, thus are excluded.

For each of the two dialogue-specific inventories of shared constructions (lexical and morphosyntactic), we compute the following measures:

- *Relative inventory size:* The number of shared construction types normalised by the length of the dialogue in tokens. This measure indicates how large the set of shared constructions

[1]The original code by Duplessis et al. (2017b) is available at `https://github.com/GuillaumeDD/dialig`. We adapt it to extract sequences of POS tags besides surface text and to constrain the minimum sequence length to two tokens.

is taking into account dialogue length. We take this to capture the relative importance of the use of these shared constructions as a conversational mechanism.

- *Construction length:* Average length in tokens of the shared constructions in a dialogue.
- *Usage rate:* Proportion of utterances in the dialogue which contain a shared construction.

The plots in Figure 1 summarise the properties of the shared construction inventories found in the corpora under investigation. Regarding relative inventory size (left), we find that the learner dialogues have richer inventories of shared constructions than the fluent adult dialogues, i.e., they have more shared construction types per number of tokens in a conversation. This suggests that reuse of constructions across speakers is an important feature of this type of interaction. In particular, L2 dialogues have the richest construction inventories, both at the lexical, and morphosyntactic level. All differences between corpora are statistically significant (Welch's independent t-test, $p < 0.01$).[2]

As for shared construction length (middle), we observe that lexical shared constructions in L1 dialogues are significantly shorter (2.18 words on average), while their length is very similar across the other three corpora (around 2.5 words on average). More pronounced differences can be observed with respect to morphosyntactic shared constructions, which are significantly longer in the fluent adult dialogues (above 3 tokens on average; for example '`PRO V ADV V`'), reflecting the higher linguistic proficiency level of the speakers in these dialogues.

Finally, regarding usage rate (right), overall there is a higher proportion of utterances containing shared constructions in the adult fluent corpora than in the learner dialogues. Thus, while there are fewer shared construction types in the fluent dialogues these constructions arguably correspond to very common collocations in English and are therefore present in a higher proportion of utterances. Focusing on the learner dialogues, we see a clear contrast: The proportion of utterances per dialogue that contain shared constructions is significantly higher in L1 than in L2, in particular regarding morphosyntactic constructions (0.31 vs. 0.58, $p < 0.001$). We attribute the high usage rate in L1 to the high degree of repetition present in this type of dialogue (Bannard and Lieven, 2009).

Overall, these results suggest that in L2 dialogues, establishing shared constructions is a prominent conversational mechanism but does not necessarily involve frequent use of such constructions. For L1, repetition is the norm. In the following section we analyse in more detail how these patterns may relate to the language learning activity inherent to both L1 and L2 acquisition dialogue.

5 The Dynamics of Shared Constructions in Learner Dialogues

We now investigate in more detail how shared constructions are established and exploited in L1 and L2 acquisition setups. We address two aspects: differences in role (adult vs. child and tutor vs. student), and changes over the course of learning.

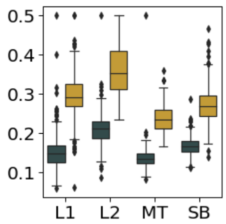
5.1 Differences across types of dialogue participant

We compute two additional measures for each of the dialogue-specific inventories of constructions:

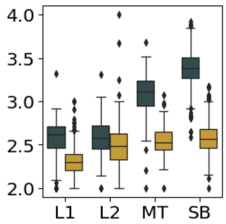
- *Construction initiator:* Percentage of shared constructions introduced by each dialogue participant. Concretely, we use *initiator* to designate the dialogue participant who first uses a construction that will become shared, and *re-user* for their dialogue partner. Naturally, after the first two usages of a construction, establishing it as shared, both participants may repeat the construction further.
- *Usage rate per participant:* Proportion of an individual speaker's utterances which contain a usage of a shared construction.

We firstly compare the differences in which speaker acts as *initiator* or *re-user* of shared constructions in a dialogue. While initiating a construction takes work (as the speaker needs to draw from their own linguistic knowledge without the scaffolding provided by the partner's usage), shared constructions are only established when repeated by the dialogue partner. Our hypothesis is that the significance of reusing a construction initiated by the partner varies depending on the relative roles of the initiator and re-user. In the language acquisition dialogues, a reuse by the learner serves to uptake and practice constructions introduced by the adult or tutor, while a reuse by the more proficient speaker serves to acknowledge and ratify a construction initiated by

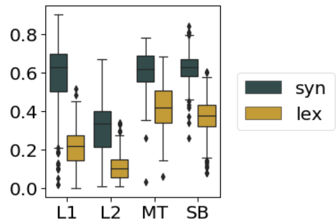
[2] Unless stated otherwise, all significance values reported in Sections 4 and 5 use Welch's independent t-test computed with the Python package SCIPY, TTEST_IND, version 1.3.3.



(a) Relative inventory size



(b) Construction length



(c) Usage rate

Figure 1: Key properties of shared lexical (lex) and morphosyntactic (syn) constructions per corpora: CHILDES (L1), BELC (L2), MapTask (MT), and Switchboard (SB).

the learner, occasionally to both ratify and correct (Clark and Bernicot, 2008; Chouinard and Clark, 2003). Thus both directions have potential to facilitate language learning.

Figure 2a shows our results regarding construction initiator. The first aspect worth highlighting is that while there are differences across participant types in the L1 and L2 acquisition dialogues, these are not extreme – thus confirming that the two directions mentioned above are both at play. The differences across participants in the learner dialogues are in fact less pronounced than in MapTask, where the asymmetric task-related roles of the participants lead to more striking differences regarding construction initiation: In this case, the instruction giver has a strong tendency to initiate and the instruction follower to reuse for both lexical and morphosyntactic constructions.

In contrast, the learner dialogues exhibit more nuanced patterns. We find that in L1 the child is more likely to introduce constructions that will be repeated verbatim at the lexical level by the adult (53% vs. 45% average initiation by the adult and the child, respectively, $p < 0.001$), while the adult is more likely to introduce constructions that will be taken up at the morphosyntactic level by the child (52% adult vs. 47% child average initiation, $p < 0.001$). L2 acquisition dialogues show the same tendency regarding morphosyntactic constructions, with the tutor being more likely to introduce constructions that will be reused by the learner at the morphosyntactic level (58% vs. 42% average initiation by the tutor and the student, respectively, $p < 0.001$). In L2 there is however no difference regarding percentage of initiator and re-user roles for lexical shared constructions.

We interpret these results as an indication that in L1 acquisition reuse of lexical constructions is slightly more likely to constitute a ratification by the adult than an uptake by the child. While in both L1 and L2 acquisition, the reuse of morphosyntactic constructions is more likely to be the result of uptake by the less proficient speaker than a confirmation strategy by the adult or the tutor.

Finally, no significant differences are observed between speakers in the Switchboard corpus (not shown in Figure 2), where participants exhibit neither the asymmetry of task-related role (MapTask) nor language ability (CHILDES & BELC). Thus, patterns of initiation and reuse of constructions appear to be tightly connected to the presence of asymmetries between dialogue participants.[3]

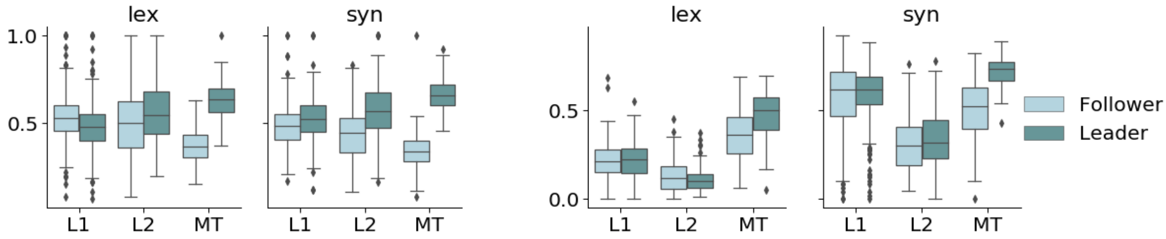
Turning our attention to usage rate per participant (Figure 2b), differences across participant types are minor in the learner dialogues: only L2 speakers show significant differences at the lexical level, with students showing a higher proportion of utterances containing shared lexical constructions than their tutors (0.12 vs. 0.10, $p < 0.05$). Again we observe clear contrasts in MapTask, with no significant differences in Switchboard.

5.2 Changes over the course of learning

Next, we investigate the dynamics of shared construction use over the language learning process regarding size of construction inventories, construction length, usage rate, and initiation. For space reasons, Figure 3 displays some key results only for the L2 acquisition dialogues.

Regarding the relative size of the inventories of shared constructions, a weak positive correlation with child age shows that there is a mild increase in L1 acquisition at both lexical and morphosyntactic levels (Spearman's $r = 0.2, p < 0.001$). We do not observe any significant changes over the ability lev-

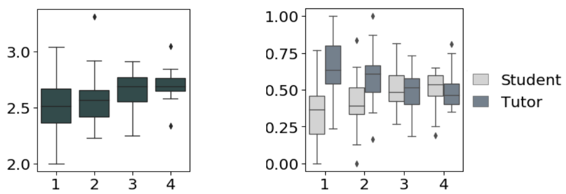
[3]Other kinds of asymmetry may also have an impact. E.g., alignment patterns (at levels other than constructions) have been shown to be influenced by social power (Danescu-Niculescu-Mizil et al., 2012; Noble and Fernández, 2015).



(a) Construction initiator (b) Usage rate

Figure 2: Trends per participant type across the three asymmetric corpora. *Follower* indicates child, student or instruction follower; *Leader* indicates adult, tutor or instruction giver in the L1, L2 and MT corpora, respectively.

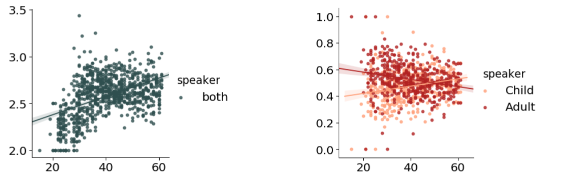
els in L2 acquisition dialogues. As for shared construction length (Figure 3a), we find a significant increase in the length of shared morphosyntactic constructions in both types of setups ($r = 0.46$ in L1 and $r = 0.31$ in L2, $p < 0.001$), while the length of lexical constructions does not significantly change over time. Regarding usage rate,there is a clear increase for both lexical ($r = 0.34$ in L1 and $r = 0.48$ in L2, $p < 0.001$) and morphosyntactic shared constructions ($r = 0.41$ in L1 and $r = 0.62$ in L2, $p < 0.001$). Finally, concerning shared construction initiation (Figure 3b), while there are no significant differences across level regarding the initiation of shared lexical constructions, we find that both L1 and L2 learners are able to introduce a higher proportion of morphosyntactic constructions with increased ability level ($r = 0.26$ in L1 and $r = 0.31$ in L2, $p < 0.001$). In BELC in particular, by level 4, speakers show equal likelihood of introducing shared morphosyntactic constructions.



(a) Length (b) Initiator

Figure 3: Trends on morphosyntactic shared construction use across student ability levels in BELC.

In summary, over the course of learning, morphosyntactic shared constructions become more complex and learners are progressively more able to introduce them. Moreover, both lexical and morphosyntactic shared constructions are used more frequently (higher proportion of utterances) in the dialogues as language learning advances. We interpret this as indication of increased ability leading



(a) Length (b) Initiator

Figure 4: Trends on morphosyntactic shared construction use across age in months in Childes.

to greater likelihood of routinisation. We discuss this further in the next section, where we explore local patterns of construction repetition.

6 Effect of Locality on Cross-Speaker Construction Repetition

We now analyse the extent to which cross-speaker construction repetition is local, i.e. influenced by distance in utterances between usages. Concretely, we test whether the likelihood of speaker B repeating an expression used by their dialogue partner A decreases as the number of utterances from A's use of the expression increases. A similar kind of analysis has been carried out on fluent adult dialogue for single words and syntactic rules (Reitter et al., 2006; Howes et al., 2010; Reitter et al., 2011; Healey et al., 2014). Here our aim is to shed light on the importance of local dynamics on multi-word lexical and morphosyntactic construction reuse patterns in language acquisition dialogue.

A negative effect of distance (i.e., a higher proportion of construction repetition at short distance) may have two main causes: (1) it may be due to priming effects, since priming is assumed to be strongest immediately after a representation has been activated and then decay with distance from the prime (Reitter et al., 2006, 2011); (2) it may be due to other functions of repetition, such as acknowledging, elaborating or clarifying, which take place locally in dialogue structure (Clark, 1996). In contrast, routinisation mechanisms, whereby formulaic constructions are established as part of the repertoire of expressions of a speaker, are expected to be less affected by proximity than priming and grounding moves (Du Bois, 2014; Pickering and Garrod, 2005). All these mechanisms have been shown to influence, and play a role in language learning (Broeder, 1992; Wood, 2002; Chouinard and Clark, 2003; Huttenlocher et al., 2004; Clark and Bernicot, 2008; Costa et al., 2008; Gerard et al., 2010)

We expect that in the fluent adult dialogues the kind of multi-word constructions we focus on in this study will be more indicative of routinisation (in the sense of frequent collocations) than priming or grounding moves. While in the learner dialogues we hypothesise priming and grounding will be more prominent, particularly at lower levels of linguistic ability, while routinisation will develop further as learning progresses and constructions become more established in the learners' own repertoires. Therefore, we expect that repetition of constructions at shorter distance will be stronger in the language acquisition scenarios than in fluent adult dialogues, and that the negative effect of distance will become weaker over the course of learning.

6.1 Methods

We model distance in terms of utterances, considering a window of 25 utterances after the use of a construction in the shared inventory. Given that a participant has used construction e in utterance u_t, for each utterance $u_{t'}$ by the other participant (where $t < t' \leq 25$) we record whether e is used and the distance $d = t' - t$ from u_t. We extract this information for each construction in the inventory of shared constructions per dialogue. This allows us to compute a *cross-speaker construction repetition proportion* (xCRP) value for each distance $d \leq 25$, defined as the number of times a construction is repeated by the other participant over the total number of opportunities available for cross-speaker repetition, at a given distance.

Distance effects are obviously dependent on the temporal order of utterances in the dialogue. To control for chance effects, we create a scrambled version of each dialogue, maintaining the turn-taking relationship but shuffling utterance order.

6.2 Results

Figure 5 shows xCRP per distance value up to a distance of 25 utterances between repetitions (x axis shows log-transformation of this value) for the original dialogues and the shuffled control dialogues. As can be observed in the plots, there is a significant locality effect of xCRP in the original dialogues that is not present in the control dialogues. We fit General Linear Models (GLM) to the original dialogues per corpus in order to investigate the effect of distance on shared construction use and its interaction with participant type and ability level.[4]

We fit a GLM with (log-transformed) distance as predictor and xCRP as dependent variable. In the learner corpora and MapTask, the effect of distance is significant for both shared construction types: The probability of repeating a construction is highest in adjacent turns (distance 0) and then decreases progressively as distance from the use of the expression increases. The effect is stronger in the L1 and L2 corpora. In Switchboard, there is no distance effect regarding shared lexical constructions and a significant effect in the opposite direction regarding morphosyntactic constructions, i.e., the probability of repeating a morphosyntactic expression by the dialogue partner is lowest in adjacent turns. This confirms similar results regarding structural divergence in adjacent turns in non-task oriented fluent adult dialogue (Healey et al., 2014).

The plots in Figure 5 also show the distance effect broken down per participant type. To check whether there are significant differences between participants, we fit a second set of GLMs with distance and participant type as predictors. We find a significant interaction between distance and participant type in the learner corpora for shared lexical constructions, with adult and tutor showing stronger effect size than children and students. This difference between speakers is more pronounced in L2 than L1. As for MapTask, while there is a significant effect of participant type on xCRP at the morphosyntactic level, there is no significant interaction between distance and participant type. No differences are observed in Switchboard.

In order to test our hypothesis that the distance effect will change with ability level, we fit a third set of GLMs with distance and ability level as pre-

[4] We use a Binomial link function, to capture, of the opportunities for repetition, the repetition proportion (xCRP), a value in the interval of $[0, 1]$. Python's SCIPY GLM package version 1.3.3. is used. Full output of the models can be found in the appendix.

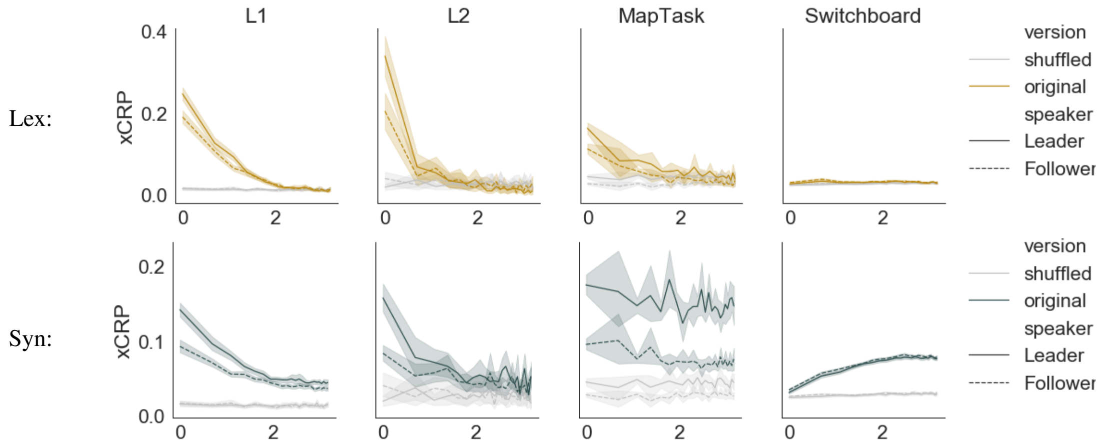


Figure 5: Distance effects on cross-speaker construction repetition proportion (xCRP) by speaker role. Log-scaled distance in utterances in the x axis. The plots distinguish between speaker roles: Leader (solid lines) quantifies situations where the adult, tutor, instruction giver, or first speaker repeats a construction used by the child, learner, instruction follower, or second speaker, respectively per corpora. And vice versa for Follower (dotted lines).

dictors.[5] We find a significant effect of level and a significant interaction of level and distance for both shared lexical and morphosyntactic constructions in L1 and for lexical constructions in L2. In particular, both xCRP and the effect of distance on xCRP decrease as child and student ability increases, with a substantially stronger effect size in L2. However, there is no effect of level nor interaction between level and distance regarding use of shared morphosyntactic constructions in L2.

In sum, our results provide evidence of a strong local effect on shared construction repetition in learner dialogues, with smaller effects in task-oriented and no or opposite effects in conversational fluent adult dialogue. The locality effect becomes weaker with ability level. This is in line with our hypothesis that priming and grounding moves may be more prominent in terms of shared construction use in L1 and L2 acquisition dialogue, while routinisation (which should be less affected by locality effects) develops as learning progresses. Surprisingly, however, we do not find a weakening of the distance effect with increased ability level regarding shared morphosyntactic constructions in L2. Thus, while the use of this type of shared construction certainly changes over time, we do not see a significant decrease in the importance of locality.

[5] As in Section 5, in CHILDES level corresponds to the age of the child in months, while in BELC it is captured by the instruction level; in both cases the level predictor is numerical.

7 Conclusion

We have investigated cross-speaker repetition of multi-word constructions at the lexical and morphosyntactic level in both L1 and L2 acquisition setups, contrasting them with adult native dialogue. Our results demonstrate that shared constructions form an important aspect of dialogue, both learner and fluent. We show that language acquisition scenarios are characterised by richer inventories of shared constructions, and that their use evolves as learner linguistic ability increases. In language learning setups, particularly in L2 learning, such constructions are used at lower rates overall, but with higher local repetition than in fluent adult dialogues. This trend decreases with learner ability. We interpret this change as an increase in construction routinisation, which we take to be present in fluent adult dialogue: Constructions become more established as part of the learner's own repertoire, thus requiring less reliance on the interlocutor's language use and less local confirmation by the dialogue partner.

Besides contributing to a better understanding of alignment patterns in language learning scenarios, our empirical results are relevant for the development of more natural and effective tutoring dialogue agents. For example, monitoring the level of learner ability in terms of degree of routinisation could help make decisions on the need to increase or decrease the amount of support provided by the tutoring agent.

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A Effect of locality on cross-speaker construction repetition

In this section we provide the full outputs from the models described in the main paper. The variables mentioned are the following:

- *xCRP*: the dependent variable for all models, namely the *cross-speaker construction repetition proportion.*

V *version*: indicates whether the dialogues are the original version, or a scrambled baseline where the order of the utterances are randomly reindexed, maintaining the turn taking order of the speakers. The variables are either ORIG or BASE, for original or shuffled baseline.

D *ln_dist*: log-transformed distance in utterances.

S *speaker*: indicates which interlocutor utters the shared construction, S1 represents the Lead speaker i.e. the Adult, Tutor or instruction follower, and S1 represents the Follower speaker: Child, Student or instruction follower. In Switchboard where the speakers have equal roles, S1 is whichever speaker speaks first in the dialogue.

L *level*: indicates the Child and Students' relative competence which is measured by either the child's age in months, or one of 4 ability level brackets for the L2 student.

A.1 Baseline *(V)*

For the baseline *V* indicates whether the dialogue is the scrambled baseline or in the original order.

Lexical - $xCRP \sim D * V$

BELC	coef	stderr	z	P>|z|	[0.025	0.975]
Intercept	-3.5383	0.263	-13.446	0.000	-4.054	-3.023
V[T.orig]	2.2902	0.326	7.029	0.000	1.652	2.929
D	-0.0299	0.110	-0.273	0.785	-0.245	0.185
D:V[T.orig]	-1.0875	0.157	-6.923	0.000	-1.395	-0.780

Childes	coef	stderr	z	P>|z|	[0.025	0.975]
Intercept	-4.2741	0.185	-23.154	0.000	-4.636	-3.912
V[T.orig]	2.9675	0.209	14.176	0.000	2.557	3.378
D	-0.0103	0.076	-0.134	0.893	-0.160	0.140
D:V[T.orig]	-1.0880	0.095	-11.397	0.000	-1.275	-0.901

MapTask	coef	stderr	z	P>|z|	[0.025	0.975]
Intercept	-3.4445	0.236	-14.624	0.000	-3.906	-2.983
V[T.orig]	1.3673	0.319	4.283	0.000	0.742	1.993
D	0.0293	0.097	0.302	0.762	-0.161	0.219
D:V[T.orig]	-0.4681	0.138	-3.385	0.001	-0.739	-0.197

Switchboard	coef	stderr	z	P>|z|	[0.025	0.975]
Intercept	-3.6511	0.081	-45.146	0.000	-3.810	-3.493
V[T.orig]	0.2225	0.134	1.661	0.097	-0.040	0.485
D	0.0510	0.033	1.543	0.123	-0.014	0.116
D:V[T.orig]	-0.0532	0.055	-0.964	0.335	-0.161	0.055

Morphosyntactic - $xCRP \sim D * V$

BELC	coef	stderr	z	P>|z|	[0.025	0.975]
Intercept	-3.5383	0.263	-13.446	0.000	-4.054	-3.023
V[T.orig]	1.2272	0.354	3.465	0.001	0.533	1.921
D	-0.0299	0.110	-0.273	0.785	-0.245	0.185
D:V[T.orig]	-0.2669	0.151	-1.762	0.078	-0.564	0.030

Childes	coef	stderr	z	P>|z|	[0.025	0.975]
Intercept	-4.2741	0.185	-23.154	0.000	-4.636	-3.912
V[T.orig]	2.0452	0.219	9.359	0.000	1.617	2.474
D	-0.0103	0.076	-0.134	0.893	-0.160	0.140
D:V[T.orig]	-0.3417	0.093	-3.691	0.000	-0.523	-0.160

MapTask	coef	stderr	z	P>|z|	[0.025	0.975]
Intercept	-3.4445	0.236	-14.624	0.000	-3.906	-2.983
V[T.orig]	1.4421	0.302	4.778	0.000	0.851	2.034
D	0.0293	0.097	0.302	0.762	-0.161	0.219
D:V[T.orig]	-0.1352	0.125	-1.078	0.281	-0.381	0.111

Switchboard	coef	stderr	z	P>|z|	[0.025	0.975]
Intercept	-3.6511	0.081	-45.146	0.000	-3.810	-3.493
V[T.orig]	0.6338	0.115	5.531	0.000	0.409	0.858
D	0.0510	0.033	1.543	0.123	-0.014	0.116
D:V[T.orig]	0.1432	0.046	3.089	0.002	0.052	0.234

A.2 Distance *(D)*

Models are only fitted on the original version of the data.

Lexical - $xCRP \sim D$

BELC	coef	stderr	z	P>|z|	[0.025	0.975]
Intercept	-1.2481	0.192	-6.495	0.000	-1.625	-0.871
D	-1.1174	0.113	-9.925	0.000	-1.338	-0.897

Childes	coef	stderr	z	P>|z|	[0.025	0.975]
Intercept	-1.3066	0.099	-13.237	0.000	-1.500	-1.113
D	-1.0982	0.057	-19.202	0.000	-1.210	-0.986

MapTask	coef	stderr	z	P>|z|	[0.025	0.975]
Intercept	-2.0772	0.215	-9.641	0.000	-2.499	-1.655
D	-0.4388	0.099	-4.448	0.000	-0.632	-0.245

Switchboard	coef	stderr	z	P>|z|	[0.025	0.975]
Intercept	-3.4286	0.107	-32.085	0.000	-3.638	-3.219
D	-0.0021	0.044	-0.049	0.961	-0.089	0.084

Morphosyntactic - $xCRP \sim D$

BELC	coef	stderr	z	P>|z|	[0.025	0.975]
Intercept	-2.3112	0.237	-9.752	0.000	-2.776	-1.847
D	-0.2968	0.105	-2.838	0.005	-0.502	-0.092

Childes	coef	stderr	z	P>|z|	[0.025	0.975]
Intercept	-2.2289	0.117	-19.054	0.000	-2.458	-2.000
D	-0.3520	0.052	-6.738	0.000	-0.454	-0.250

MapTask	coef	stderr	z	P>|z|	[0.025	0.975]
Intercept	-2.0024	0.189	-10.613	0.000	-2.372	-1.633
D	-0.1059	0.080	-1.331	0.183	-0.262	0.050

Switchboard	coef	stderr	z	P>|z|	[0.025	0.975]
Intercept	-3.0174	0.081	-37.165	0.000	-3.176	-2.858
D	0.1943	0.033	5.976	0.000	0.131	0.258

A.3 Speaker Role *(S)*

Models are only fitted on the original version of the data.

Lexical - $xCRP \sim D * S$

BELC	coef	stderr	z	P>|z|	[0.025	0.975]
Intercept	-1.7343	0.206	-8.428	0.000	-2.138	-1.331
S[T.S2]	0.6978	0.271	2.574	0.010	0.167	1.229
D	-0.8325	0.108	-7.733	0.000	-1.044	-0.622
D:S[T.S2]	-0.5032	0.157	-3.215	0.001	-0.810	-0.196

Childes	coef	stderr	z	P>|z|	[0.025	0.975]
Intercept	-1.5105	0.098	-15.347	0.000	-1.703	-1.318
S[T.S2]	0.3424	0.134	2.554	0.011	0.080	0.605
D	-0.9767	0.054	-18.026	0.000	-1.083	-0.870
D:S[T.S2]	-0.1742	0.076	-2.289	0.022	-0.323	-0.025

MapTask	coef	stderr	z	P>|z|	[0.025	0.975]
Intercept	-2.2595	0.222	-10.186	0.000	-2.694	-1.825
S[T.S2]	0.3952	0.293	1.350	0.177	-0.179	0.969
D	-0.4413	0.101	-4.372	0.000	-0.639	-0.243
D:S[T.S2]	0.0148	0.132	0.112	0.911	-0.245	0.274

Switchboard	coef	stderr	z	P>|z|	[0.025	0.975]
Intercept	-3.3461	0.101	-33.120	0.000	-3.544	-3.148
S[T.S2]	-0.0862	0.145	-0.593	0.553	-0.371	0.199
D	-0.0232	0.042	-0.553	0.580	-0.105	0.059
D:S[T.S2]	0.0177	0.060	0.294	0.769	-0.100	0.136

Morphosyntactic - $xCRP \sim D * S$

BELC	coef	stderr	z	P>|z|	[0.025	0.975]
Intercept	-2.5268	0.235	-10.775	0.000	-2.986	-2.067
S[T.S2]	0.4649	0.309	1.505	0.132	-0.140	1.070
D	-0.2386	0.102	-2.347	0.019	-0.438	-0.039
D:S[T.S2]	-0.1212	0.135	-0.894	0.371	-0.387	0.144

Childes	coef	stderr	z	P>|z|	[0.025	0.975]
Intercept	-2.4103	0.118	-20.504	0.000	-2.641	-2.180
S[T.S2]	0.4160	0.155	2.676	0.007	0.111	0.721
D	-0.3010	0.052	-5.818	0.000	-0.402	-0.200
D:S[T.S2]	-0.0891	0.069	-1.292	0.197	-0.224	0.046

MapTask	coef	stderr	z	P>|z|	[0.025	0.975]
Intercept	-2.3478	0.201	-11.666	0.000	-2.742	-1.953
S[T.S2]	0.7373	0.253	2.910	0.004	0.241	1.234
D	-0.0864	0.084	-1.023	0.306	-0.252	0.079
D:S[T.S2]	0.0217	0.106	0.205	0.838	-0.186	0.229

Switchboard	coef	stderr	z	P>|z|	[0.025	0.975]
Intercept	-2.9305	0.077	-38.228	0.000	-3.081	-2.780
S[T.S2]	-0.0784	0.110	-0.714	0.475	-0.294	0.137
D	0.1758	0.031	5.716	0.000	0.116	0.236
D:S[T.S2]	0.0190	0.044	0.432	0.666	-0.067	0.105

A.4 Level *(L)*

Models are only fitted on the original version of the data.

Lexical - $xCRP \sim D * L$

BELC	coef	stderr	z	P>|z|	[0.025	0.975]
Intercept	-0.3086	0.324	-0.953	0.341	-0.943	0.326
D	-1.6166	0.194	-8.331	0.000	-1.997	-1.236
L	-0.4839	0.151	-3.194	0.001	-0.781	-0.187
D:L	0.2457	0.083	2.961	0.003	0.083	0.408

Childes	coef	stderr	z	P>|z|	[0.025	0.975]
Intercept	0.5368	0.265	2.025	0.043	0.017	1.056
D	-1.7210	0.153	-11.263	0.000	-2.020	-1.421
L	-0.0478	0.007	-6.968	0.000	-0.061	-0.034
D:L	0.0166	0.004	4.342	0.000	0.009	0.024

Morphosyntactic - $xCRP \sim D * L$

BELC	coef	stderr	z	P>|z|	[0.025	0.975]
Intercept	-1.8653	0.382	-4.886	0.000	-2.614	-1.117
D	-0.5268	0.171	-3.082	0.002	-0.862	-0.192
L	-0.1771	0.167	-1.059	0.290	-0.505	0.151
D:L	0.0994	0.073	1.360	0.174	-0.044	0.243

Childes	coef	stderr	z	P>|z|	[0.025	0.975]
Intercept	-0.9576	0.301	-3.182	0.001	-1.547	-0.368
D	-0.7814	0.136	-5.763	0.000	-1.047	-0.516
L	-0.0312	0.008	-4.080	0.000	-0.046	-0.016
D:L	0.0109	0.003	3.202	0.001	0.004	0.018