

THE INFLUENCE OF FUNCTIONAL AND DISCURSIVE STRATEGIES ON THE USE OF COMPLEX AND COMPLETE SYNTAX AFTER THE AGE OF 3

A sequential analysis in a French intervention programme

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Abstract

Numerous studies have documented the features of child-directed speech, such as recasts and prompts, that contribute to the development of phonology, morphology, lexicon, and syntax in children before three. Upon entering the school system, significant disparities in language skills become apparent. This exploratory study aims to provide a deeper understanding of the processes that foster the development of complex syntactic skills in French-speaking children aged three to five with language vulnerabilities in an after-school intervention programme. Specifically, this research investigates which features of child-directed speech influence the syntactic structure of children's utterances in terms of complexity and completeness. A series of dyadic interactions between an adult and a child engaged in a joint narration within an intervention programme were analysed using sequential analysis. The findings indicate that the functional strategies (assertions and prompts) employed by adults as the discursive strategies (recasts and offers) significantly influence the syntactic structure of children's utterances. Assertions facilitate the production of complete and more complex utterances, whereas prompts are linked to the use of incomplete and simpler utterances. Additionally, recasts promote the use of complex and complete utterances, in contrast to offers. Furthermore, children appear to become increasingly aware of adults' expectations over time.

Keywords: Child syntax, child directed speech, interaction, sequential analysis, French after-school intervention program

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1. INTRODUCTION

Language is a fundamental component of social participation and academic achievement (Uccelli et al., 2019). Among the skills required for the successful completion of verbal and written tasks in school, the ability to produce complete and complex syntax is crucial (Arndt & Schuele, 2013; Berman, 2018; Lentin, 1998). A growing body of research indicates that children with underdeveloped syntactic skills struggle to produce decontextualised speech and access literacy (Canut & Vertalier, 2011; Conica et al., 2023), which in turn contributes to academic difficulties (Rodriguez & Tamis-LeMonda, 2011). Both empirical studies and teacher observations highlight significant disparities in language development among children, which can be attributed to social, educational, and developmental factors (Roseberry et al., 2014), as well as variations in the quality and quantity of linguistic input they receive (Hirsh-Pasek et al., 2015; Rowe, 2018).

Intervention programmes have been developed to address these disparities, drawing on research on parent-child interactions demonstrating the positive impact of specific supporting behaviours - such as prompts and recasts - on language development (Gallaway & Richards, 1994; Rowe & Snow, 2020). They have shown promising results (Buschmann et al., 2009; Justice et al., 2008; Roberts & Kaiser, 2011), with further evidence supporting their effectiveness (Markussen-Brown et al., 2017; Walker et al., 2020). However, the precise relationship between these supporting behaviours and the development of syntactic complexity - particularly after children begin using more advanced constructions, such as conjunctive, infinitive, relative, and temporal subordinate clauses - remains insufficiently explored (Canut, 2013; Huttenlocher et al., 2002).

Thus, the objective of this study is to investigate the interactional processes that support the development of complex and complete syntax in French-speaking children aged three to five with language or communication needs in an intervention programme. This research builds upon existing studies on language development, child-directed speech (CDS), and the supporting behaviours (e.g., imitation, repetition, and recasts) that facilitate this developmental trajectory.

2. THEORETICAL BACKGROUND

2.1 *Child-directed speech and child syntax*

Speaking to children, adults' language take particular forms and functions compared to language used with adults. They spontaneously make modifications, simplifications and modulations. This register is called "Child-Directed Speech" (CDS) (Newport et al., 1977; Soderstrom, 2007). It serves two purposes: initiating and maintaining interaction with children and supporting their processing and understanding of language (Garnica, 1977; Snow, 1995). Through CDS, adults adjust

their language use to match children's social, cognitive and linguistic abilities (Rowe & Snow, 2020).

The relationship between CDS and the development of syntax in children's spontaneous speech has been extensively examined, particularly up to the age of four, with a primary focus on English-speaking children (Newport et al., 1977). Research has explored the role of CDS, especially within the home environment, demonstrating its influence on various aspects of language acquisition over time, including increases in mean length of utterance, lexical diversity, morphological complexity, and syntactic structure (Canut, Jourdain, et al., 2023; Diessel, 2004; Huttenlocher et al., 2010). Input frequency plays a crucial role in shaping different facets of children's language development (Ambridge et al., 2015; Chevrot et al., 2009; Lieven, 2010; Morgenstern & Parris, 2012). However, *the rare event learning theory* (Nelson et al., 2001) suggests that children can acquire linguistic elements that appear infrequently in adult speech. The "catalyst effect" of these rare events depends on the context in which they occur and how children interpret them. Engaging children in interactive exchanges is at least as important as, if not more so than, the mere frequency of language exposure (Anderson et al., 2021).

Within this framework, numerous studies have examined the characteristics of adult-child interactions in a family context. Findings illustrate that contingent interactions sustain and enhance children's attention and comprehension of communicative intent, thereby facilitating language development (Masek et al., 2021). Prior research has underscored the significance of adult recasts of children's utterances in fostering language development before the age of four (Clark, 2020; de Weck, 2006). When recasts are slightly beyond a child's current linguistic level, they support the development of phonology, morphology, and lexical skills (Bruner, 1983; Clark & Bernicot, 2008). Similar results were found in classroom setting: when teachers extend on what children said, it supports their lexical development (Cabell et al., 2015; Farrow et al., 2020; Justice et al., 2013; Saulpic, 2025).

In family context, parent's use of prompts has been found to contribute to vocabulary expansion, increased utterance length, and enhanced verbal reasoning skills (Rowe et al., 2017). Furthermore, following parental instruction, children were more likely to respond to prompts than to general comments during shared book reading, indicating that prompts encourage greater engagement (Justice et al., 2002). Research on teacher language practices has examined the effects of various types of prompts, revealing results comparable to those observed in home environments (Cabell et al., 2015; de Rivera et al., 2005; Deshmukh et al., 2019). However, the relationship between prompts and the later stages of syntactic development - specifically the production of complex and complete utterances beyond the age of four - has received limited attention.

Qualitative studies on French-speaking children have sought to establish the positive influence of prompts and recasts on syntactic development by linking pragmatic patterns to the emergence of complex constructions. These studies have identified acquisition processes and emphasised the importance of analysing adult-

child interactions to determine how functional strategies and discursive strategies influence the development of complex and complete syntax (Canut, Espinosa, et al., 2013; Lentin, 1975). Using recasts of children's utterances can demonstrate them how to express their ideas using complex and complete syntactic structures. Children will pick up on the ones that are accessible to them in adult speech and test their effects in their own utterances (Canut, Bertin, et al., 2013). It has been shown that the acquisition of syntactic structures is the result of a long process between a child's first attempts and the independent use (without prior verbalisation by an adult) of these structures (Canut & Verticalier, 2005, 2014). However, many of these studies have relied on limited conversational samples, making it difficult to generalise findings regarding which supporting behaviours are most strongly associated with increased syntactic complexity in children's speech.

2.2 Language intervention programmes

Children may be at high risk of experiencing language and communication difficulties due to factors such as a family history of language impairments (Kumar et al., 2022) or an unsupportive environment, including cases of neglect (Sylvestre et al., 2023). These difficulties may manifest in various domains including phonology, language comprehension and production, or the social use of language (Pace et al., 2017). In response, intervention programmes have been developed to enrich the linguistic experiences of children with social, cognitive, and language vulnerabilities and to support adults in the use of strategies to engage children in meaningful interactions (Walker et al., 2020). However, the effectiveness of these interventions is not yet sufficiently well-documented to draw consistent conclusions (Law et al., 2017). A review by Markussen-Brown et al. (2017) of 25 intervention programmes in English-speaking countries yielded mixed results, suggesting that factors such as programme intensity, duration, delivery method, participant backgrounds, and the specific interactive and scaffolding strategies employed may influence their outcomes. About the scaffolding strategies, a systematic review of literature exploring the efficacy of recasts in language intervention, corroborated the importance of recasts in certain conditions (Cleave et al., 2015). To be efficient recasts has to target selected items during an intervention session and be limited to one recast per minute in order to manage the child frustration and not interfere with the ongoing activity.

Most of these programmes target three-year-olds who exhibit language delays or difficulties, often from low socioeconomic backgrounds. These programmes may focus on multiple linguistic domains, such as lexical development, syntactic complexity, and phonological awareness (Dickinson & Caswell, 2007), or they may prioritise the conversational aspects of adult–child interactions (Pianta et al., 2008). Given the diversity of these interventions, establishing a standardised model remains challenging. However, their overarching objective is to enhance children's linguistic development by increasing both the quantity and quality of linguistic input,

strengthening adult responsiveness, and promoting input diversity (Burchinal et al., 2008; Piasta et al., 2012).

Adults in these interventions receive training in communication-facilitating strategies (e.g., encouraging children to engage in conversation) and language-development strategies (e.g., expansions, recasts, and labelling) (Girolametto & Weitzman, 2002). Communication-facilitating strategies can be seen as functional strategies as their use can impact the course of the interaction and create different types of opportunity for children to engage in the interaction (Piasta et al., 2012). For example, when it comes to participate to the exchange and producing some types of language, prompts are more restrictive than assertions. Language-development strategies can also be called discursive strategies because they provide linguistic models for children. They are based, to varying degrees, on what has already been said during the interaction. In this sense, they involve adopting a particular stance in response to what the interlocutor has said (Bertin & Masson, 2020). When adults respond to children's recasting their utterances, they use what the children have said to suggest a more conventional or complex form. Additionally, many interventions incorporate shared book reading, which has been widely recognised as a beneficial practice for language development (Noble et al., 2019). Books can help adults to employ these different strategies (Vertalier, 1992; Wasik et al., 2006) and increase their frequency of use (Noble et al., 2018).

Nonetheless, the majority of studies evaluating the intervention programme have been of a correlational nature (Markussen-Brown et al., 2017; Walker et al., 2020). These studies have not investigated the interactive characteristics of child-adult interactions that are most likely to facilitate syntactic development in children. Little is known about the sequential structure and the contingent effects of communication-facilitating and language-development strategies on children's use of complex and complete utterances.

3. THE PRESENT STUDY

To address gaps in previous research about the contingent effect(s) of CDS features on the use of complex and complete syntax, the present study focuses on the processes that foster syntactic structuration of three- to five-year-old children utterances. These children are participating in an after-school language intervention programme provided by teachers¹. It is structured around shared book reading activities and includes both initial and ongoing training for educators. Teachers are introduced to two functional strategies (prompts and assertions) and two discursive strategies (recasts and offers). In order to examine the processes that foster syntactic structuration of three- to five-year-old children's utterances, this study therefore aims to identify the strategies that effectively support children's use of complex and

¹ Adults who participated in the programme were teachers, even though it took place outside the classroom.

complete syntax. More specifically, we seek to determine whether (a) functional strategies or (b) discursive strategies participate to processes influencing the syntactic structure of children's utterances in teacher–child interactions.

To address gaps in previous research, we employ sequential analyses to determine which functional and discursive strategies are most frequently associated with the production of complex and complete utterances. We hypothesise that CDS features known to support language acquisition, such as prompts and recasts, will facilitate the production of complex and complete syntactic constructions.

3.1 Methodology

3.1.1 Participants

Data for this study were collected by the organisation implementing the “Je lis, on raconte”² intervention programme. The study involved 14 teachers and 28 children aged 3-5 from eleven different preschools in five French cities. All schools were located in disadvantaged areas and benefited from additional educational resources. Teachers selected children from their classrooms based on language difficulties they observed. The selection criteria included challenges in one or more of the following areas: organising explicit language, engaging in conversation, structuring lexicon and syntax, or comprehending language. The inclusion criteria applied regardless of the child's first language(s)³. For some children, bilingual or not, what appears as a vulnerability could be the result of assessing them in the language used at school, which is specific in various ways and can differ from the familial practices and uses of language (da Silva-Genest et al., 2024; Faruk et al., 2020).

Participation in the programme was voluntary. Prior to data collection, all parents and teachers received detailed information regarding the programme, their rights as participants, and the research objectives. Consent forms were provided to ensure ethical compliance with the use of recorded data for research purposes.

Each teacher participated in the study during the first year of programme implementation and was recorded interacting with two different children. Each child was recorded twice: during the first session and the final session.

3.1.2 The language intervention programme

The language intervention programme was designed to support children's syntactic development through joint narration in dyadic interactions using storybooks (Canut, Husianycia, et al., 2023).

² The programme was named “Coup de Pouce Langage” until 2025. It was implemented by the Association de formation et de recherche sur le langage (www.asforel.fr)

³ It is possible that some children speak another language at home, but this information has not been collected by the association.

Prior to implementing the sessions, teachers participated in six hours of training focused on syntactic development, functional and discursive strategies, and contingent responses. Additionally, they received detailed instructions on how to conduct the sessions.

Each intervention session lasted between 10 and 20 minutes per child and was conducted twice a week for 28 weeks. At the beginning of each session, the child selected a book from a curated collection chosen by the teacher. The teacher then read the book aloud and encouraged the child to retell the story in their own words. During this phase, the teacher provided scaffolding to support the child's verbalization. The teacher aimed to produce utterances at or slightly above the child's current syntactic level to facilitate the expansion of their syntactic repertoire.

Throughout the academic year, teachers participated in individual and group-based continuous training sessions. These sessions were informed by recorded interactions, transcribed and analysed by researcher-trainers. The transcriptions enabled preliminary analyses of children's language development and facilitated observations of the features of teachers' speech.

3.2 Measures

3.2.1 Coding

The recordings were transcribed using standard orthographic conventions and subsequently verified by the first, second, and third authors. Instances of hesitation and repetition were documented, and interrogative intonation was identified with question marks. The transcriptions were then analysed to code both the functional and discursive strategies contained in teachers' utterances and the syntactic features of children's utterances. In total, 3,987 speaking turns were coded.

Functional and discursive strategies. Teachers' utterances were coded according to functional and discursive strategies employed. Within each category, the codes were mutually exclusive. The different categories are summarised in Tables 1 and 2.

Table 1. Functional strategies

<i>Functional strategies</i>	<i>Explanation</i>	<i>Example</i>
<i>Prompt</i>	When a speaker solicits information from the other (e.g. open or closed question, carrier sentence or repeat query).	<i>qu'est-ce qu'il a fait tonton?</i> <i>What did Uncle do?</i>
<i>Assertion</i>	When a speaker provides information to the other, with no constraint of response.	<i>il est bleu</i> <i>he's blue</i>
<i>Mixed</i>	At least one assertion and one prompt in the same speaking turn.	<i>elle fait son dentifrice qu'est-ce qu'elle fait?</i> <i>she's putting her toothpaste on, what's she doing?</i>
<i>Other</i>	Encouragement, approval, onomatopoeia, hesitation alone, or a combination of these.	<i>bien</i> <i>well</i>

Table 2. Discursive strategies

<i>Discursive strategies</i>	<i>Explanation</i>	<i>Example</i>
<i>Recast</i>	Repeats, extensions or recasts all or part of a child's speaking turn, which takes place at most two rounds before.	<i>CHI: elle met l'eau dans sa bouche</i> <i>ADU: elle met l'eau dans sa bouche pour se rincer</i> <i>CHI: she puts water in her mouth</i> <i>ADU: she puts water in her mouth to rinse off</i>
<i>Offer</i>	Proposals of new linguistic elements independently of the child's previous productions.	<i>CHI: elle prend le beurre dans le frigo</i> <i>ADU: Pamela sait trouver le miel</i> <i>CHI: she takes the butter from the fridge</i> <i>ADU: Pamela knows where to find honey</i>
<i>Mixed</i>	Combining an offer and a recast in the same speaking turn.	<i>CHI: et après elle trouvé son truc chapeau et elle arrête le vent</i> <i>ADU: voilà le vent a arrêté de souffler il ne siffle plus</i> <i>CHI: and then she found her trick hat and she stops the wind</i> <i>ADU: the wind stopped blowing it no longer whistles</i>
<i>Other</i>	Encouragement, approval, onomatopoeia, hesitation alone, or a combination of these.	<i>bien</i> <i>well</i>

Syntactic properties. Table 3 presents the classification used to analyse the syntactic structures of children's speaking turns.

Table 3. Categories used for syntactical analysis

<i>Syntactical composition</i>	<i>Explanation</i>	<i>Examples</i>
<i>Simple construction</i>	Speaking turn with a maximum of one inflected verb.	<i>il pleure</i> <i>he cries</i>
<i>Conjoined simple construction</i>	Speaking turn with several simple propositions juxtaposed or coordinated.	<i>il tombe et il pleure</i> <i>he falls and he cries</i>
<i>Complex construction</i>	A speaking turn containing at least one syntactic complexity that introduces a syntactic dependency relationship between two propositions (e.g. conjunctive, infinitive, relative, temporal).	<i>quand il tombe il pleure</i> <i>when he falls he cries</i>
<i>Other</i>	Encouragement, approval, onomatopoeia, hesitation alone, or a combination of these.	<i>euh</i> <i>uh</i>

For each speaking turn, we coded the maximal complexity level: if a turn contained an element from the "other" category and a complex syntactic construction, it was classified as "complex."

Children's utterances were also categorised based on their completeness as:

- Complete: The utterance contains all the syntactic components expected within the construction of maximum complexity (e.g., "*When he falls he cries.*").
- Non-complete: The utterance lacks one or more syntactic elements expected within the construction of maximum complexity (e.g., "*He cries, uh, because, uh...*"). Trials and partially inaudible speech were counted as non-complete utterances. If a speaking turn contained multiple conjoined simple constructions and at least one was incomplete, the turn was coded as non-complete.
- Other: This category encompassed utterances consisting of approvals, negations, encouragements, onomatopoeic expressions, hesitations, or combinations of these elements.

Reliability of coded categories. The reliability of the coded categories was assessed using Fleiss' kappa on 10% of the corpus, which was selected at random. The calculations were performed using R Statistical Software (v.4.3.2, R Core Team, 2023) with the Kappa GUI package (v.2.0.2, Santos, 2018). Table 5 presents the agreement levels obtained for each category. Given the moderate inter-rater agreement for discursive strategies (0.53, medium), we identified and discussed areas of disagreement before conducting a second round of inter-rater reliability testing for this category. Across all analysed levels, the agreement levels were sufficient to confirm the validity of the coding scheme.

Table 4. Final results of the inter-judge agreement

	<i>% agreement</i>	<i>Fleiss' kappas</i>	<i>Level of agreement</i>
<i>Functional strategies</i>	87.80	0.79	sufficient
<i>Discursive strategies</i>	65.37	0.91	excellent
<i>Complexity</i>	94.55	0.93	excellent
<i>Completeness</i>	93.56	0.91	excellent

Data analysis. To address our research question, we conducted sequential analysis to examine potential dependencies between behaviours occurring in a sequential order (Bakeman & Gottman, 1997). This method assesses whether associations between given and target behaviours differ from what would be expected under conditions of independence.

Data were analysed using the Generalised Sequential Querier (GSEQ, v.5.1.23, Bakeman & Quera, 2011). A lag-1 sequential analysis was applied to determine whether the presence of a given code increased the probability of a target code occurring immediately afterwards.

To investigate whether specific functional and discursive strategies used by teachers influenced the syntactic composition of children's speech, we first conducted likelihood ratio chi-squared tests for contingency tables. Next, we analysed the transitional probabilities of pooled child data using two sequential analysis statistics: adjusted residuals and Yule's Q (Bakeman & Gottman, 1997).

Adjusted residuals (z) are standardised residuals that indicate differences between observed and expected joint frequencies. The expected frequency was calculated as the probability of a target behaviour multiplied by the frequency of a given behaviour, representing the occurrence probability under the assumption of no association. A positive residual indicates that the target behaviour follows the given behaviour more frequently than expected, while a negative residual suggests the opposite. The associated p-value determines whether the observed difference is statistically significant, assuming independence and normality.

Since sequential behaviours in interactions are inherently dependent, Yule's Q was used to measure effect size. This statistic ranges from -1 to +1, where 0 indicates no effect. The effect size classifications were as follows: values between 0 and ± 0.29 indicate a small effect, values between ± 0.30 and ± 0.49 indicate a moderate effect, values between ± 0.50 and ± 0.69 indicate a substantial effect, and values of ± 0.70 or higher indicate a very strong effect (Bernard, 2013).

These analyses enabled us to determine whether certain functional and discursive strategies used by teachers were more likely to be followed by specific syntactic constructions in children's speech.

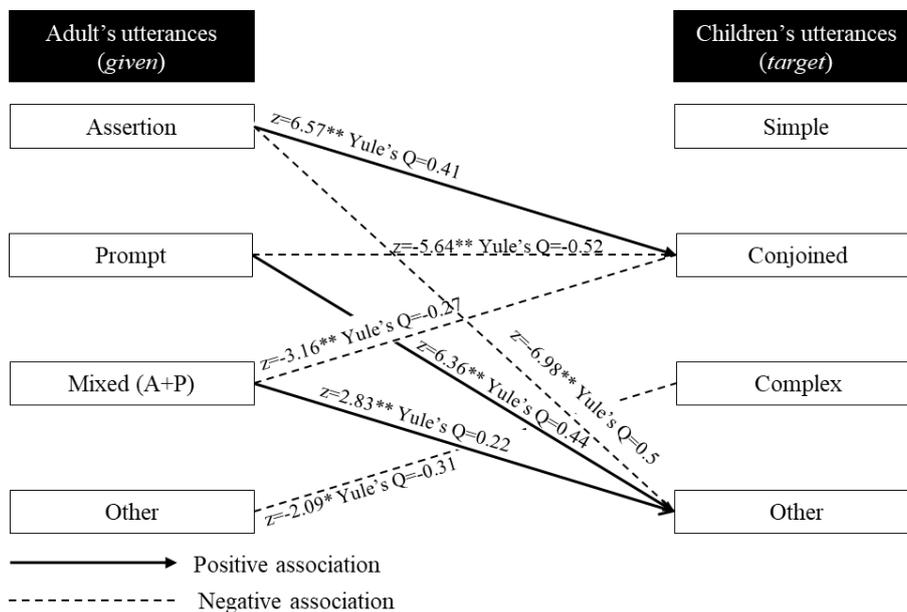
4. RESULTS

Our research question seeks to establish the relationship between the characteristics of teachers' speech and the syntactic configuration of children's utterances. The aim is to determine whether either of these factors influences children's production, irrespective of the recording period. For the contingency tables A1, A2, A3, and A4 presented in this section (see Appendix A), the overall distribution deviated significantly from chance ($p \leq 0.01$). The adjusted residuals indicated associations between different characteristics of teachers' speech and both the syntactic composition and completeness of children's utterances, though the effect sizes varied depending on the analysed variables.

4.1 The potential effect of functional strategies

Figure 1 illustrates the associations revealed by the sequential analysis examining the relationship between teachers' functional strategies and the syntactic structure of children's utterances (see table A1 for detailed results).

Figure 1. Associations between functional strategies and syntactic structure of children's utterances

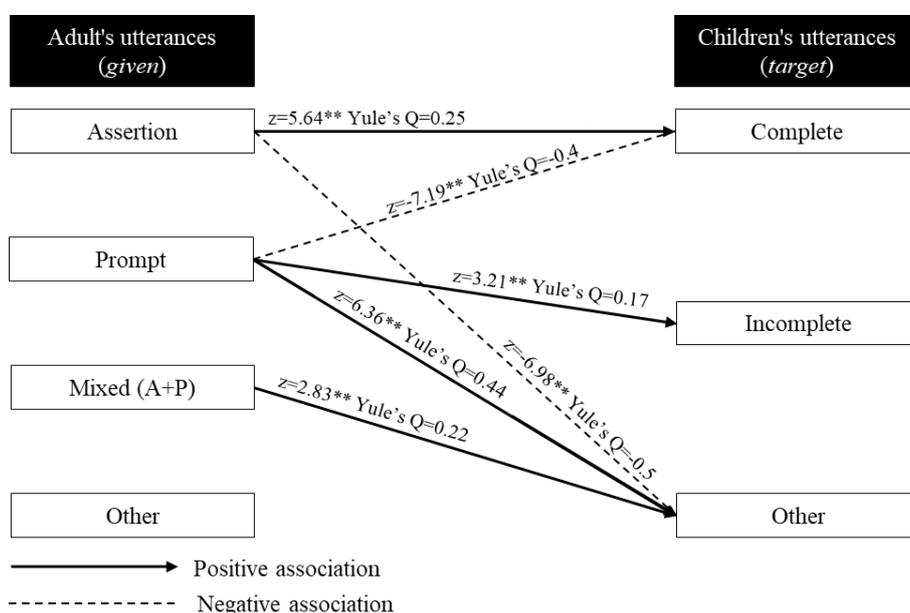


Compared to the distribution expected by chance, assertions were significantly more likely to be followed by conjoined utterances and less likely to be followed by "other" utterances. Prompts were followed significantly less often by conjoined utterances

and more frequently by “other” utterances. Mixed speaking turns were significantly less likely to be followed by conjoined utterances and more likely to be followed by “other” utterances. Speaking turns categorised as “other” in teachers’ speech were followed significantly less often by complex utterances.

Figure 2 illustrated the associations revealed by the sequential analysis examining teachers’ functional strategies and the completeness of children’s utterances (see table A2 for detailed results).

Figure 2. Associations between functional strategies and syntactic completeness of children’s utterance



Compared to the distribution expected by chance, assertions were significantly more likely to be followed by complete utterances and less likely to be followed by “other” utterances. Prompts were followed significantly less often by complete utterances and significantly more often by incomplete utterances as well as “other” utterances. Mixed speaking turns were significantly more likely to be followed by “other” utterances.

To illustrate the sequential analyses, observations from the corpora revealed recurring patterns. In the first extract, each assertion produced by the teacher was followed by a syntactically complete statement from the child, which contained either a single or a conjoined complete construction. In the second and third extracts, prompts were followed either by short and incomplete utterances (Example 2) or a yes/no response (Example 3). According to the sequential analyses,

these patterns occurred more frequently than would be expected under conditions of no association.

Example 1. Firdows, T1

ADU5	il bâille plusieurs fois	ADU5	he yawns several times
CHI6	i(l) prend son nounours i(l) s'est très fatigué	CHI6	he takes his teddy bear he's very tired
ADU6	nounours est également très fatigué	ADU6	Teddy is also very tired
CHI7	i(l) se pose contre son genou	CHI7	he's landing against his knee

Example 2. Adrian, T1

ADU8	où est le nounours ?	ADU8	where's the teddy bear?
CHI8	dans ses genoux	CHI8	in her lap

Example 3. Messie, T1

ADU8	oui alors est-ce que la casquette de papy est à la bonne taille ?	ADU8	yes + so is grandpa's cap the right size?
CHI8	oui	CHI8	yes

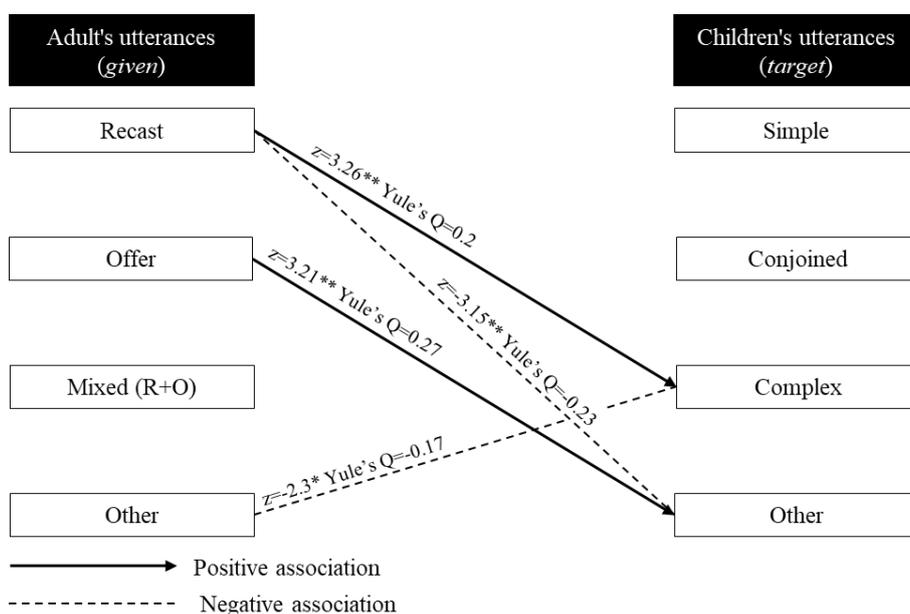
The findings suggest that assertions support the production of complete or longer utterances more effectively than prompts, which appear to function as a form of 'counter-scaffolding' in relation to syntactic complexity and completeness.

Further examination of the corpora identified additional sequences exhibiting similarities to these patterns, as well as similarities between interactions recorded at the beginning (T1) and end (T2) of the year. This observation led to the hypothesis that the effects of prompts and assertions would be comparable at T1 and T2. This hypothesis was partially confirmed by the sequential analysis (see Appendix B). Tables B1 to B4 summarise the adjusted residuals and Yule's Q values from the sequential analysis examining the relationship between functional strategies and syntactic structure at T1 and T2. In all cases, the overall distribution deviated significantly from chance ($p \leq 0.01$). At T1, the associations between given and target behaviours were similar to those described in Tables A1 and A2. However, at T2, one notable difference emerged. Compared to the distribution expected by chance, assertions were significantly more likely to be followed by complex utterances, although the effect size remained small ($z=2.93^{**}$, Yule's $Q=0.22$).

4.2 The potential effect of discursive strategies

Figure 3 illustrates the associations revealed by the sequential analysis examining the relationship between teachers' discursive strategies and the syntactic structure of children's utterances (see table A3 for detailed results).

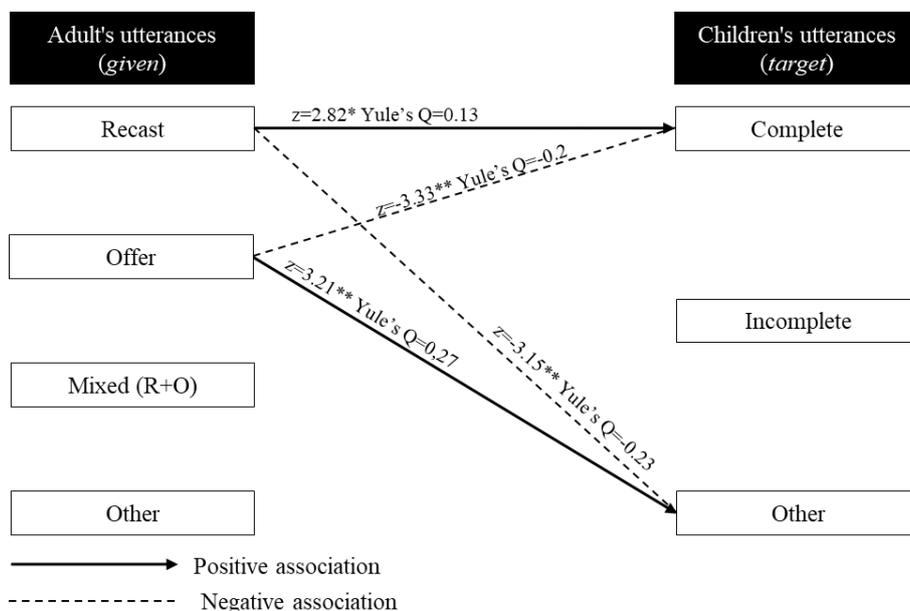
Figure 3. Associations between discursive strategies and syntactic structure of children's utterances



Compared to the distribution expected by chance, recasts were significantly more likely to be followed by complex utterances and less likely to be followed by "other" utterances. Offers, in contrast, were significantly more likely to be followed by "other" utterances. Speaking turns classified as "other" in teachers' speech were significantly less likely to be followed by complex utterances.

Figure 4 illustrates the associations revealed for the sequential analysis investigating the relationship between teachers' discursive strategies and the completeness of children's utterances, irrespective of the recording period (see table A4 for detailed results).

Figure 4. Associations between discursive strategies and syntactic completeness of children's utterances



Compared to the distribution expected by chance, recasts were significantly more likely to be followed by complete utterances and less likely to be followed by “other” utterances. Offers, on the other hand, were significantly less likely to be followed by complete utterances and more likely to be followed by “other” utterances.

These results suggest that recasts may facilitate children's production of complex and complete utterances. For example, in one observed sequence (Example 4), an utterance was co-constructed through alternating speaking turns between the teacher and the child, with the teacher providing scaffolding. Initially, the teacher encouraged the child to elaborate on the story. Following this, the teacher produced a recast to restructure the utterance into a complex and complete form that encapsulated the entire event (CHI12 to ADU14). The sequence concluded with a complex and complete utterance from the child, which was not a mere repetition of the teacher's utterance (CHI14). By contrast, when teachers provided an offer, children did not incorporate it into their own speech (Example 5).

Example 4. Zakaria, T2

CHI12	il va entrer à l'école	CHI12	he's going to go to school
ADU13	elle va rentrer à l'école pour quoi faire ?	ADU13	why is she going to school?
CHI13	parce que il va voir la maîtresse	CHI13	because he's going to see the
ADU14	elle va voir la maîtresse pour se faire	teacher	
soigner		ADU14	she's going to see the teacher to be
CHI14	Sophie i(l) entre à l'école pour se faire	treated	
soigner		CHI14	Sophie is going to school to get
		treated	

Example 5. Aboubacar, T2

CHI66	le pull de Zorro	CHI66	Zorro's jumper
ADU65	et là sa maman l'aide	ADU65	and then his mum helps him
CHI67	oui	CHI67	yes

It seems that recasts support the production of complex and complete utterances to a greater extent than offers, which appear to function as a "counter-scaffolding" move in children's syntactic use.

Unlike the patterns observed for functional strategies, the majority of these sequences were extracted from recordings at T2. This led to the hypothesis that the effects of discursive strategies evolved over the course of the year. This hypothesis was confirmed by the sequential analyses (Appendix C). The overall distribution between discursive strategies and both the syntactic composition and completeness of children's utterances differed significantly from chance only at T2 (Table C3 and C4, $p \leq 0.01$). Consequently, it can be inferred that the effects observed, irrespective of the recording period, were largely attributable to associations identified at the end of the year. Furthermore, recasts appear to foster the use of complex and complete utterances after one year of participation in the language intervention programme. This may indicate that children become increasingly aware of teachers' expectations following a recast.

5. DISCUSSION

The objective of this study was to examine the processes that foster syntactic structuration of three- to five-year-old children utterances. To do so, we analysed the functional and discursive strategies that facilitate children's immediate use of complex and complete utterances within interactional contexts. Although the findings did not point to a single factor that consistently increased children's use of complex and complete syntax, certain features of teacher speech were positively associated with the expected outcomes. However, not all aspects of children's syntactic configurations were influenced in the same manner by these features. The following sections discuss the findings in relation to the two research questions,

specifically examining (a) the role of functional strategies (i.e., prompts and assertions) and (b) the role of discursive strategies (i.e., offers and recasts) in teachers' speech on the syntactic structure of children's utterances.

5.1 The influence of functional strategies on the use of complex and complete syntax

The functional strategies employed by teachers influenced the syntactic complexity of children's utterances, irrespective of the recording period. The effect size was moderate to substantial for assertions and prompts, whereas it was small for speaking turns classified as 'mixed' (see Tables A1 and A2). Following such strategies, children tended to respond with utterances classified as "other", suggesting that these speaking turns may have contained excessive information to function effectively as scaffolding. Although the effects were statistically significant, they appeared to be limited in scope.

Contrary to expectations, prompts did not facilitate syntactic complexity to a greater extent than assertions. Instead, prompts were associated with an increased use of short or incomplete utterances, whereas assertions appeared to support the lengthening of children's utterances or the production of complete ones. Furthermore, prompts encouraged the use of "other" types of utterances, whereas assertions did not. Assertions may therefore serve as scaffolding for certain aspects of syntactic configuration, whereas prompts may function as a form of 'counter-scaffolding' with respect to the use of complex and complete syntax. Another important finding was the combination of assertions and prompts in a single speaking turn, which also appeared to act as 'counter-scaffolding'. After such speaking turn, children may have been confused, resulting in responses with less structured utterances.

These findings appear to contradict previous studies demonstrating the positive effects of open-ended questions, which are believed to elicit more than one-word responses and encourage children to engage in reasoning beyond the immediate context (Cabell et al., 2015; Farrow et al., 2020). Other studies have shown that such questions promote the lengthening of children's utterances, a key step in syntactic development (de Rivera et al., 2005; Deshmukh et al., 2019; Rowe et al., 2017). This discrepancy may be attributable to the specific types of prompts used by teachers in the present study or to the fact that, to our knowledge, this is the first study to systematically examine the completeness of children's utterances. Further analysis is required to investigate this issue.

Moreover, the effects of prompts did not evolve over the course of the year, whereas the effects of assertions did. By the end of the year, assertions were more strongly associated with the use of complex utterances. This suggests that as both children and teachers became more familiar with the activity, assertions became more effective in facilitating the use of complex syntactic structures. This finding may also reflect broader developmental changes over time. The observed effects of assertions align with the meta-analysis conducted by Rowe and Snow (2020), which

demonstrated that the characteristics of CDS used to scaffold syntactic development vary with age.

By identifying the relationships between the functional strategies in teachers' speech and the complexity of children's syntactic constructions, the present study complements existing research. Moreover, it makes a unique contribution by exploring the specific link between teachers' assertions and the syntactic complexity of children's utterances. Based on the results, it can be hypothesized that assertions encourage the use of complex or complete utterances because they provide children with examples upon which they can model their own speech.

5.2 The influence of discursive strategies on the use of complex and complete syntax

Sequential analysis revealed that discursive strategies (i.e., offers and recasts) could influence the completeness and complexity of children's utterances, but with a small effect size, predominantly observed towards the end of the year (see Tables A3, A4, C1, and C4). Although some effects were observed regardless of the recording period, the sequential analyses showed that, at the beginning of the programme, there were no associations between discursive strategies and the use of complex utterances by children.

At the end of the year, recasts were associated with the production of complete or complex constructions, whereas offers were positively associated with the use of "other" types of utterances. While these effects were statistically significant, their scope was limited. Previous work related to this programme did not find a positive correlation between recasts and the complexity of children's utterances (Canut et al., 2022). Our study demonstrates a temporal link between recasts and the use of complex or complete constructions after one year in the programme. Therefore, it can be hypothesized that over time, children either learned to rely on teachers' recasts to construct their utterances or became attuned to the expectations signalled by recasts, which could explain the observed lack of correlations and the small effect size.

Regarding offers, following the work of Canut, Jourdain et al. (2023) on the emergence of complex constructions in French, it can be hypothesized that they may be too distanced from the child's speech to be effectively integrated into a syntactically complete utterance.

Based on the sequential analysis, it is reasonable to conclude that the discursive strategies present in teachers' speech are associated with the use of syntactic complexity in children with language difficulties. Specifically, recasts, in contrast to offers, appear to promote the use of complex and/or complete utterances. These findings are consistent with studies that have highlighted the importance of contingent responses in general language acquisition and lexical development (Masek et al., 2021).

5.3 *Implications for the programme*

Our results can be partially attributed to the language intervention programme, which aimed to support the development of syntax in children. During training, teachers were instructed to use complete, assertive sentences that tended to be complex, adjusting their language according to each child's current level. Teachers were also encouraged to avoid using prompts and offers. Our findings confirmed the positive effects of assertions and recasts on the completeness and complexity of children's speech and that offers and questions do not support the syntactic structuring of utterances. Another important finding concerned the combination of assertions and prompts in a single speaking turn, which appeared to confuse the children. Further training could be beneficial, with more emphasis placed on these different results, especially on avoiding combining these two strategies.

This study has several limitations. First, it did not explore the effects of different types of prompts on children's syntactic configurations. Given that closed-ended questions typically elicit one-word responses, it can be speculated that the effects of closed and open-ended questions on children's syntactic production may differ. Future research should examine how different prompt types influence the complexity and completeness of children's utterances to further complement the findings of this study. Also, the goal of the present study was not to assess the efficacy of the intervention. Further studies, including active and passive control groups, are necessary to disentangle the role of developmental effect and the effect of the intervention programme.

Second, only one level of exchange between teachers and children was examined. As a result, the conclusions drawn are limited to contiguous utterances in the interactions, whereas the effects of various features of teacher speech may extend over multiple speaking turns. It would be beneficial to conduct a two-level sequential analysis to determine whether longer sequences contribute to the construction of complex utterances by children.

Third, the study did not investigate the combined effects of different interactive moves and scaffolding strategies. Future research should explore whether an assertion containing a recast has the same impact on children's utterances as a prompt containing a recast, or whether an offer embedded within a prompt has a similar effect to one within an assertion.

This study has demonstrated the proximal effects of different strategies. However, further research is required to ascertain whether social participation and the use of complex syntax evolved during the year in other activities. Future studies should utilise mixed methods and a control group in order to assess the programme's efficiency.

6. CONCLUSION

This study identified the effects of various aspects of teachers' speech on the syntactic configuration of children's utterances. Children tended to respond to teachers' assertions with longer, more complex, and/or complete utterances, whereas prompts typically elicited shorter, simpler, and/or incomplete responses. After one year in the programme, recasts appeared to encourage the production of complex and/or complete utterances, while offers were more likely to result in one-word or incomplete utterances. Both interactive moves and scaffolding types influenced the syntactic composition of children's productions, with changes occurring over the course of the programme. These findings are promising and offer insights that can enhance intervention programmes for children with language and/or communication needs. In particular, they provide valuable information to inform the professional training embedded in these programmes.

DECLARATION OF CONFLICTING INTERESTS

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article. The authors alone are responsible for the writing and content of this paper.

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SUPPLEMENTARY MATERIALS

Contingency tables in Appendix A, B and C were set up using GSEQ software. It consists of tallies. The adjusted residuals are based on the raw residuals which indicates the difference between the observed joint frequency and the expected frequency. The expected frequency is the probability of a target behaviour multiplied by the frequency of a given one. It is the frequency expected if there were no association between given and target codes. Adjusted residuals are distributed

approximately normally. Yule's Q is an index of effect size which varies between -1 and +1 with 0 indicating no effect. (Bakeman & Quera, 2011).

1. APPENDIX A

<i>Functional strategies</i>	<i>Adjusted residuals</i>				<i>Yule's Q</i>			
	<i>Simple</i>	<i>Conjoined</i>	<i>Complex</i>	<i>Other</i>	<i>Simple</i>	<i>Conjoined</i>	<i>Complex</i>	<i>Other</i>
<i>Assertion</i>	-1.5	6.57**	1.55	-6.98**	-0.07	0.41	0.09	-0.5
<i>Prompt</i>	0.6	-5.64**	-0.74	6.36**	0.03	-0.52	-0.05	0.44
<i>Mixed</i>	0.42	-3.16**	0.08	2.83**	0.02	-0.27	0.01	0.22
<i>Other</i>	1.34	1.61	-2.09*	-1.42	0.13	0.19	-0.31	-0.26

Table A1. Sequential analysis between syntactic composition of children's utterance (target) and adults' functional strategies (given) - $G^2=116.39$, $df=9$, $p\leq 0.01$
* $p\text{-value}\leq 0.05$; ** $p\text{-value}\leq 0.01$

<i>Functional strategies</i>	<i>Adjusted residuals</i>			<i>Yule's Q</i>		
	<i>Complete</i>	<i>Incomplete</i>	<i>Other</i>	<i>Complete</i>	<i>Incomplete</i>	<i>Other</i>
<i>Assertion</i>	5.64**	-1.29	-6.98**	0.25	-0.06	-0.5
<i>Prompt</i>	-7.19**	3.21**	6.36**	-0.4	0.17	0.44
<i>Mixed</i>	-0.74	-1.02	2.83**	-0.04	-0.06	0.22
<i>Other</i>	2	-1.12	-1.46	0.19	-0.11	-0.26

Table A2. Sequential analysis between completeness of children's speaking turn (target) and adults' functional strategies (given) - $G^2=98.87$, $df=6$, $p\leq 0.01$.
* $p\text{-value}\leq 0.05$; ** $p\text{-value}\leq 0.01$

<i>Discursive strategies</i>	<i>Adjusted residuals</i>				<i>Yule's Q</i>			
	<i>Simple</i>	<i>Conjoined</i>	<i>Complex</i>	<i>Other</i>	<i>Simple</i>	<i>Conjoined</i>	<i>Complex</i>	<i>Other</i>
<i>Recast</i>	-1.37	1.2	3.26**	-3.15**	-0.06	0.08	0.2	-0.23
<i>Offer</i>	-0.49	-0.73	-1.31	3.21**	-0.03	-0.06	-0.11	0.27
<i>Mixed</i>	0.88	-1.27	-0.55	0.7	0.08	-0.17	-0.06	0.09
<i>Other</i>	1.46	0.05	-2.3*	0.41	0.08	0	-0.17	0.03

Table A3. Sequential analysis between syntactic composition of children's utterance (target) and adults' scaffolding strategies (given) - $G^2=28.84$, $df=9$, $p\leq 0.01$
* $p\text{-value}\leq 0.05$; ** $p\text{-value}\leq 0.01$

<i>Discursive strategies</i>	<i>Adjusted residuals</i>			<i>Yule's Q</i>		
	<i>Complete</i>	<i>Incomplete</i>	<i>Other</i>	<i>Complete</i>	<i>Incomplete</i>	<i>Other</i>
<i>Recast</i>	2.82**	-0.86	-3.15**	0.13	-0.04	-0.23
<i>Offer</i>	-3.33**	1.33	3.21**	-0.2	0.08	0.27
<i>Mixed</i>	-0.72	0.29	0.7	-0.06	0.02	0.09
<i>Other</i>	0.1	-0.35	0.41	0.01	-0.02	0.03

Table A4. Sequential analysis between completeness of children's speaking turn (target) and adults' speaking turn contents (given) - $G^2=20.93$, $df=6$, $p\leq 0.01$.
** $p\text{-value}\leq 0.01$

2. APPENDIX B

<i>Functional strategies</i>	<i>Adjusted residuals</i>				<i>Yule's Q</i>			
	<i>Simple</i>	<i>Conjoined</i>	<i>Complex</i>	<i>Other</i>	<i>Simple</i>	<i>Conjoined</i>	<i>Complex</i>	<i>Other</i>
<i>Assertion</i>	0.99	3.86**	-1.55	-3.88**	0.07	0.37	-0.16	-0.4
<i>Prompt</i>	-1.57	-3.42**	2.23*	3.61**	-0.13	-0.49	0.24	0.37
<i>Mixed</i>	-0.41	-2.08*	0.83	1.92	-0.03	-0.26	0.09	0.21
<i>Other</i>	1.38	1.58	-2.09*	-1.56	0.2	0.27	-0.61	-0.43

Table B1. Sequential analysis between syntactic composition of children's utterance (target) and adults' Functional strategies (given) at T1 - $G^2=53.03$, $df=9$, $p\leq 0.01$.
* $p\text{-value}\leq 0.05$; ** $p\text{-value}\leq 0.01$

<i>Functional strategies</i>	<i>Adjusted residuals</i>				<i>Yule's Q</i>			
	<i>Simple</i>	<i>Conjoined</i>	<i>Complex</i>	<i>Other</i>	<i>Simple</i>	<i>Conjoined</i>	<i>Complex</i>	<i>Other</i>
Assertion	-2.75**	5.27**	2.93**	-5.97**	-0.17	0.44	0.22	-0.61
Prompt	2.31*	-4.52**	-2.66**	5.41**	0.17	-0.54	-0.26	0.51
Mixed	0.71	-2.27*	-0.29	2.02*	0.05	-0.26	-0.03	0.23
Other	0.51	0.78	-1	-0.43	0.07	0.13	-0.18	-0.10

Table B2. Sequential analysis between syntactic composition of children's utterance (target) and adults' Functional strategies (given) at T2 - $G^2=83.59$, $df=9$, $p\leq 0.01$.
* $p\text{-value}\leq 0.05$; ** $p\text{-value}\leq 0.01$

<i>Functional strategies</i>	<i>Adjusted residuals</i>			<i>Yule's Q</i>		
	<i>Complete</i>	<i>Incomplete</i>	<i>Other</i>	<i>Complete</i>	<i>Incomplete</i>	<i>Other</i>
Assertion	3.23**	-0.73	-3.88**	0.21	-0.05	-0.4
Prompt	-4.25**	1.91	3.61**	-0.34	0.15	0.37
Mixed	-1.38	0.15	1.92	-0.11	0.01	0.21
Other	3.05**	-2.03*	-1.56	0.39	-0.28	-0.43

Table B3. Sequential analysis between completeness of children's speaking turn (target) and adults' Functional strategies (given) at T1 - $G^2=41.6$, $df=6$, $p\leq 0.01$.
* $p\text{-value}\leq 0.05$; ** $p\text{-value}\leq 0.01$

<i>Functional strategies</i>	<i>Adjusted residuals</i>			<i>Yule's Q</i>		
	<i>Complete</i>	<i>Incomplete</i>	<i>Other</i>	<i>Complete</i>	<i>Incomplete</i>	<i>Other</i>
Assertion	4.69**	-1.09	-5.97**	0.29	-0.07	-0.61
Prompt	-5.88**	2.62**	5.41**	-0.44	0.2	0.51
Mixed	0.38	-1.6	2.02*	0.03	-0.12	0.23
Other	-0.17	0.43	-0.43	-0.02	0.06	-0.1

Table B4. Sequential analysis between completeness of children's speaking turn (target) and adults' Functional strategies (given) at T2 - $G^2=66.4$, $df=6$, $p\leq 0.01$.
* $p\text{-value}\leq 0.05$; ** $p\text{-value}\leq 0.01$

3. APPENDIX C

<i>Discursive strategies</i>	<i>Adjusted residuals</i>				<i>Yule's Q</i>			
	<i>Simple</i>	<i>Conjoined</i>	<i>Complex</i>	<i>Other</i>	<i>Simple</i>	<i>Conjoined</i>	<i>Complex</i>	<i>Other</i>
<i>Recast</i>	-0.39	1.06	0.66	-1.18	-0.03	0.11	0.07	-0.12
<i>Offer</i>	-1.48	-0.39	-0.3	2.93**	-0.13	-0.05	-0.04	0.33
<i>Mixed</i>	1.01	-1.28	0.15	-0.35	0.12	-0.25	0.03	-0.06
<i>Other</i>	1.1	-0.01	-0.61	-1.01	0.09	0	-0.07	-0.13

Table C1. Sequential analysis between syntactic composition of children's utterance (target) and adults' Discursive strategies (given) at T1- $G^2=10.76$, $df=9$, $p=0.29$.
* $p\text{-value}\leq 0.05$; ** $p\text{-value}\leq 0.01$

<i>Discursive strategies</i>	<i>Adjusted residuals</i>				<i>Yule's Q</i>			
	<i>Simple</i>	<i>Conjoined</i>	<i>Complex</i>	<i>Other</i>	<i>Simple</i>	<i>Conjoined</i>	<i>Complex</i>	<i>Other</i>
<i>Recast</i>	-1.36	0.6	3.47**	-3.27	-0.09	0.05	0.26	-0.34
<i>Offer</i>	0.6	-0.57	-1.32	1.54	0.05	-0.07	-0.14	0.19
<i>Mixed</i>	-0.18	-0.35	-0.5	1.42	-0.02	-0.06	-0.08	0.25
<i>Other</i>	1.15	0	-2.57**	1.62	0.08	0	-0.24	0.18

Table C2. Sequential analysis between syntactic composition of children's utterance (target) and adults' Discursive strategies (given) at T2 - $G^2=21.4$, $df=9$, $p=0.01$.
* $p\text{-value}\leq 0.05$; ** $p\text{-value}\leq 0.01$

<i>Discursive strategies</i>	<i>Adjusted residuals</i>			<i>Yule's Q</i>		
	<i>Complete</i>	<i>Incomplete</i>	<i>Other</i>	<i>Complete</i>	<i>Incomplete</i>	<i>Other</i>
<i>Recast</i>	0.83	-0.07	-1.18	0.06	0	-0.12
<i>Offer</i>	-2.45**	0.55	2.93**	-0.21	0.05	0.33
<i>Mixed</i>	-0.75	0.97	-0.35	-0.09	0.11	-0.06
<i>Other</i>	1.74	-1.08	-1.01	0.13	-0.08	-0.13

Table C3. Sequential analysis between completeness of children's speaking turn (target) and adults' Discursive strategies (given) at T1 - $G^2=12.67$, $df=6$, $p=0.05$.
* $p\text{-value}\leq 0.05$; ** $p\text{-value}\leq 0.01$

<i>Discursive strategies</i>	<i>Adjusted residuals</i>			<i>Yule's Q</i>		
	<i>Complete</i>	<i>Incomplete</i>	<i>Other</i>	<i>Complete</i>	<i>Incomplete</i>	<i>Other</i>
<i>Recast</i>	3.09**	-1.12	-3.27**	0.19	-0.07	-0.34
<i>Offer</i>	-2.25*	1.32	1.54	-0.19	0.11	0.19
<i>Mixed</i>	-0.2	-0.65	1.42	-0.03	-0.08	0.25
<i>Other</i>	-1.51	0.53	1.62	-0.11	0.04	0.18

Table C4. Sequential analysis completeness of children's speaking turn (target) and adults' Discursive strategies (given) at T2 - $G^2=17.35$, $df=6$, $p=0.01$.
* $p\text{-value}\leq 0.05$; ** $p\text{-value}\leq 0.01$