Dynamic resonance and explicit dialogic engagement in Mandarin first language acquisition

The present paper aims to shed light on the relationship between priming and creativity throughout Chinese children's ontogenetic development. It has been suggested that priming in naturalistic interaction occurs not as an exclusively implicit phenomenon. New methodological desiderata beyond traditional acceptability judgements have been proposed, including large-scale corpus-based analysis (cf. Branigan & Pickering 2017; Lester et al. 2017), as it is noted that priming may correlate with interlocutors' engagement and intersubjectivity throughout naturalistic interaction (Authors 2021b). This study is centred on priming occurring creatively, in the form of dynamic resonance, viz. involving the re-elaboration 'on the fly' of a previously encountered construction. We fitted a conditional inference tree and mixed effects linear regression based on the normalised entirety of Child-Carer/Child-Peer interaction of the Zhou2 and Zhou3 Mandarin corpora of first language acquisition (cf. Li & Zhou 2004; Zhang & Zhou 2009), from 8 months to 5 years of age. The models indicate that children significantly acquire the ability to creatively re-use a constructional prime around age 4, distinctively in combination with sentence final particles of intersubjectivity (cf. Author 2017, 2018, 2020). The latter are non obligatory markers that speakers employ to express their concern about the addressee's reaction to an ongoing utterance. These results constitute a fundamental discovery in the research on priming, as they indicate that the ability to creatively re-use a prime is ontogenetically correlated with explicit dialogic engagement.

1.   Introduction

This study focuses on the relationship between priming and creativity throughout ontogeny. It is centred on cases where the child is able to re-use a previously encountered construction in order to express something new. This phenomenon is called resonance (Du Bois 2014; Du Bois & Giora 2014), and involves the repetition or creative variation of a linguistic item that occurs in some previous turn of naturalistic interaction. The present analysis is focused on the distinction between resonance occurring as mere repetition of a prime (i.e. static resonance) or whether it involves creativity and syntactic variation (i.e. dynamic resonance). We fitted a mixed effects linear regression drawing on all the normalised utterances of the Zhou2 and Zhou3 Mandarin corpora of first language acquisition (cf. Li & Zhou 2004; Zhang & Zhou 2009). The two corpora include

Child-Carer/Child-Peer interaction that progresses from age 0;8[1] to 5. Our model shows that children acquire the ability to creatively re-use a constructional prime around age 4, specifically in combination with sentence final particles (SFPs) of intersubjectivity (cf. Author 2017, 2018, 2020). SFPs are distinctive constructions of Mandarin and other languages of the South East, functioning as non obligatory markers that speakers employ to explicitly express their concern about the addressee's reaction to an ongoing utterance. Our results indicate that the ability to creatively re-use a prime is significantly correlated with use of SFPs and dialogic engagement after 42 months of age. What is key about this finding is that consistent usage of SFPs in combination with dynamic resonance is an important indicator of children's ability to respond to a prime with the aim to engage explicitly with a peer, rather than implicitly reacting to a stimulus. These results shed new light on intersubjectivity and dialogic processes that yield adjustments to, as well as understandings, of other personas stances and perspectives (cf. Hobson et al. 2012, Du Bois et al. 2014). Most importantly, they indicate that interactional engagement increasingly correlates with morphosyntactic and pragmatic creativity throughout ontogeny.

The paper is structured as follows: section 2 introduces the notion of resonance in usage-based linguistics. Section 3 reviews the recent literature on priming in first language acquisition and identifies the desiderata for methodologies going beyond traditional acceptability judgements, with more emphasis to be given to naturalistic interaction (i.a. Branigan & Pickering 2017; Lester et al. 2017). Section 4 is devoted to the illustration of the data retrieval, the novel annotation method of this study (4.1) and the multifactorial analysis of dynamic vs static resonance throughout the utterances of the Zhou2 and Zhou3 Mandarin corpora of first language acquisition (4.2). Section 4.3 examines the results of a mixed effects linear regression centred on the relationship between dynamic resonance and dialogic engagement. These results are further reviewed in the discussion in section 5. Finally, in section 6 are formulated the conclusions of this study.

2.   Resonance in usage-based linguistics

The usage-based linguistics literature has been traditionally centred on repeated use, acquisition and innovation of linguistic constructions. These are normally defined as pairings of form and meaning that are represented by a single speaker (i.a. Langacker 1987; Goldberg 1995, 2006; Fillmore & Kay 1999; Tomasello 2003; Traugott & Trousdale 2013). More recently, the notion of construction

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[1] The notation of children's age in the rest of this paper will include a first digit for the number of years and a second one after ; indicating the number of months in the form YEARS;MONTHS.

has been increasingly studied as a byproduct of dialogic interaction. This entails that both (or more) interlocutors cooperatively take part to the formation of meaning. In this sense, dialogic constructions are reviewed, revised and recalibrated by both speakers throughout turns at talk (Dingemanse 2020: 24), i.e. as forms of dyadic or collective cognising (North 2007; Arundale 2008; Arundale & Good 2002; Haugh 2010, Author forthcoming).

In first language acquisition (FLA), the ability to master complex constructions (e.g. complement constructions) generally begins among children between ages 2-3 (Bloom et al. 1984; Diessel 2004; Kidd et al. 2006). Most crucially, constructional complexity is shown to develop in combination with interactive goals and distinctive perlocutionary effects (cf. Searle 1976; Author 2020a, 2020b). This regards the capacity to encode functional constrast with previous utterances (Budwig 1995; Clancy 1996; Ervin-Tripp 1991; Kuntay & Slobin 1996; Kyratzis 2009; Kyratzis et al 2010; Slobin 1985; Tomasello 2003; Köymen & Kyratzis 2014) involving repetition and analogy. Repetitions through dialogue have indeed been studied to some degree in FLA research and are generally referred to with the notion of format tying (cf. Goodwin 1990, 2006, 2007; see also Corsaro & Maynard 1996; de Leon 2007; Evaldsson 2005; Ervin-Tripp 1991; Goodwin & Goodwin 1987). However, less attention has been paid to the key difference between mere repetitions and production of novel forms that bear some similarity – yet not perfect equivalence – with previous turns at talk.

The dialogic emergence constructional creativity from naturalistic interaction is one of the tenets of the dialogic syntax paradigm (cf. Du Bois 2014; Zima & Brône 2015; Author et al. 2018). Accordingly, constructions tend to emerge 'on the fly' as a result of interlocutors' dialogic engagement (Du Bois 2014; Du Bois & Giora 2014) and involve the creative re-elaboration of constructions that have just been heard (cf. Authors 2021a; 2021b). This phenomenon is defined as resonance (Du Bois 2014: 372). It hinges on different forms of analogy across turns at talk, and may involve some or all levels of a construction: phonetic, semantic, syntactical and pragmatic. Ad hoc constructions are thus produced as a result of structural similarity across turns, which allow for creative variation (cf. Brône & Zima 2014: 459). This means that speakers constantly 'abstract away' schematic structure out of their peer's utterances.

2.1   Resonance and dialogic creativity

Resonance may lead to mere replication of a previous linguistic input, or it may rather involve creativity. In FLA research, it is no secret children frequently copy the priming input as a form of

learning process, with linguistic input being simply repeated without any creative intervention. The present paper will refer to these instances as cases of **static resonance**. Conversely, resonating constructions may also involve creativity, therefore being characterised by similarity – albeit not perfect equivalence – with structural, semantic and pragmatic features of the prime. These are cases of **dynamic resonance** (cf. Du Bois 2014: 353), whereby a previously encountered input is creatively re-elaborated on the fly. Dynamic resonance is often expressed through parallelism and/ or analogy (i.a. Fischer 2008; Gentner & Christie 2010). From a pragmatic angle, it may underpin boosting, altering or reverting the illocutionary force of a preceding utterance (i.a. Veale et al. 2006; Author et al. 2018). A key aspect of dynamic resonance is that children are shown to rely on repetition and similarity to strategically and – often creatively – achieve interactional goals (Corsaro and Maynard 1996; de León 2007; Ervin-Tripp 1991; Goodwin 1990, 2006; Keenan 1977). The excerpt below illustrates this, as Sammy (female, 2;9) resorts to dynamic resonance to critically engage with her caregiver (CG):

(1)

CG: […] are you saying "no don't stand on me' ?

SAMMY: No.

      Standing on the castle.

CG: You know what,

      I don't know if that castle belongs to you or not.

      You ### with everybody.

SAMMY: I'd want him to stand on it.

(Köymen & Kyratzis 2014: 509)

In the exchange above, Sammy creatively intervenes on the caregiver's complement construction [MATRIX$_{SAY}$ (NEG) *stand on* PLACE] through dynamic resonance, in the form of [MATRIX$_0$ *standing on* PLACE] and [MATRIX$_{WANT}$ *stand on* PLACE]. This occurs through analogy, as these are all instantiations of the more abstract [MATRIX COMPLEMENT] schema, whereby the MATRIX elaboration site (cf. Langacker 1987) is either occupied by a volitional verb or a verb of saying.

   Constructional analogy occurs across turns in the form of a diagraph, viz. a syntactic structure that emerges from the coupling of two or more utterances (or utterance portions), through the mapping of resonance relations between them (Du Bois & Giora 2014: 354). This is reported in

Table 1 below, where creative alteration of the original ad hoc construction is marked as underlined text (in case of <u>replacement</u>) and in brackets (in case of (<u>addition</u>)):

	MATRIX	AUX	STAND	*on*	PLACE
CG:	*Are you saying*	*don't*	*stand*	*on*	*me*
SAMMY:			*stand<u>(ing)</u>*	*on*	<u>*the castle*</u>
SAMMY:	<u>*I'd want him to*</u>		*stand*	*on*	<u>*it*</u>

Table 1.

Dynamic resonance out of the [MATRIX COMPLEMENT] schema

Sammy strategically formulates a novel complement construction out of a prior discourse input. What is key here is that overt engagement and formal re-elaboration of the caregivers's original structure is functional to the expression of Sammy's new information transmission and perlocutionary effects. In this case, constructional similarity involves a contrary intensifying parallelism (cf. Author et al. 2018, Author 2021), whereby disagreement is achieved by means of lexical replacement. This occurs via the echoing of a preceding proposition p – or a more schematic constructional structure – in a that an element x (*me*) is markedly replaced with y (*the castle*). Sammy's interactional goal is further spelt out through self-expansion, as he produces a new matrix clause, [*I'd want him*], leading to the third repetition of the complement construction [*stand on PLACE*]. This indicates that constructional analogy is strictly connected with pragmatic engagement (cf. Author 2021), as Sammy formally resorts to the caregiver's construction with the perlocutionary effects (cf. Searle 1976) of 'repairing' (i.a. Schegloff 2007) her original assumption [*stand on me*].

The Mandarin example below is drawn from our dataset and shows something similar, as the child (CHI2) creatively resonates with both his Mother (MOT) and his peer's (CHI1) utterances:

(2)

CHI1: 我在给小牛洗澡呢。

wǒ zài gěi xiǎo niú xǐzǎo ne

I be to little cow bath NE

'I am just giving a bath to the little cow.'

MOT: 她是客人。

tā shì kèrén

she be guest

'She is a guest.'

CHI2: 不是客人。

bù shì kèrén

not be guest

'She is not a guest.'

CHI2: 我也要给小牛洗澡

wǒ yě yào gěi xiǎo niú xǐzǎo

I also want to little cow bath

'I also want to give a bath to the little cow.'

CHILDES / Zhou3 / 6943 / 2;8

In (2) above, a contrary parallelism is similarly used to express disagreement, as the Mother's (MOT) original construction [她 *tā* 'she' 是 *shì* 'is' 客人 *kèrén* 'guest'] is reformulated by the child (CHI2) with negative polarity in the new form of [不 *bù* 'not' 是 *shì* 'is' 客人 *kèrén* 'guest']:

	Subj	BE	NP
MOT:	她	是	客人
CHI2:	她	(丕)是	客人

Table 2.

Diagraph [Subj AUX PROG *to* Obj Verb]

As shown in the diagraph in table 2, if creative variation is present structural similarity naturally involves schematic abstraction. In fact, both utterances are specific instantiations of the more schematic copula construction [Subj BE NP]. Here constructional analogy is functional to disagreement and the negative operator 不 *bù* constitutes the only dissimilar element between MOT and CHI21's utterances.

Similarly, dynamic resonance is also present after the priming dative construction uttered by CHI1 [我 *wǒ* 'I' 在 *zài* 'stay' 给 *gěi* 'to' 小牛 *xiǎoniú* 'little cow' 洗澡 *xǐzǎo* 'give-bath'], which is

then creatively recycled by CHI2 in the form of [我 *wǒ* 'I' 也要 *yěyào* 'also-want' 给 *gěi* 'to' 小牛 *xiǎoniú* 'little cow' 洗澡 *xǐzǎo* 'give-bath'], with a surplus of meaning overtly expressing CHI2's specific wants and intentions.

	Subj	AUX	PROG	*to*	Obj	Verb
CHI1:	我		在	给	小牛	洗澡
CHI2:	我	(也要)		给	小牛	洗澡

Table 3.

Diagraph [Subj AUX PROG *to* Obj Verb]

The diagraph in table 3 shows that CHI1's progressive construction, originally construed in the progressive form and assertive illocutionary force (cf. Searle 1979: 12), is then re-elaborated by CHI2 with the volitive auxiliary 要 *yào* 'want' and a new commissive illocutionary force (Ibid.). CHI2 therefore creatively intervenes on the linguistic material of CHI1 in order to achieve a new goal, viz. the *one of giving a bath to the little cow*.

Goldberg (2019) identified three important dimensions underpinning conceptualisers' social cognition and engagement in relation to creativity:

i. Expressiveness: Linguistic options must be sufficient for conveying speakers thoughts, beliefs, and attitudes in ways that listeners are able to understand.

ii. Efficiency: Fewer and shorter constructions are easier to learn and produce than more or longer constructions.

iii. Obeying conventions: learners attempt to use language in the ways that others in the language communities do.

(Goldberg 2019: 8)

Priming and resonance are constantly involved in the dialogic formation of constructional pairings of form and meaning. The persistent role played by local routinisation of resonance and dialogic alignment in naturalistic spoken interaction (e.g. Brône & Zima 2014: 466) is an important clue of both socio-cognitive mechanisms of obeying interactional conventions of a community of practice (iii) and efficiency of meaning transmission (ii) contribute to same type of entrenchment processes in language acquisition (Pickering and Garrod 2004) and grammaticalisation (cf. Diessel 2006; Brône and Zima 2014). Most crucially, expressiveness (i) is at play as a crucial source of creativity

and the realisation of ad hoc constructions. The latter involves dynamic resonance and dialogic constructional alteration as a mechanism competing with systemic and repetitive linguistic behaviour (see also Author 2019).

What is key here is the fact that schematicity is strictly connected with dialogic creativity. Schematicity in Construction Grammar essentially boils down to conceptual and syntactic abstraction. The construction [*I am tired*] is less schematic than [*I am* ADJ], which is less schematic than [*I BE* ADJ], which in turn is less schematic than [*I* V ADJ], which is less schematic than [Subj V ADJ], which is less schematic than [SUBJ PREDICATE] and so on. The phonetic realisation of *I am tired* corresponds to all of these representations. What is at issue for the present study, is the degree of schematicity characterising the child's construction once s/he creatively re-uses his/her mother's utterance. This gradient capacity can be assessed empirically as shown in examples (1, 2, 3) and can inform – on a large scale – the relationship between constructional abstraction and creativity through dialogue.

3.   Priming and engagement in first language acquisition

Syntactic/structural priming results from speakers repeating a grammatical structure that they have previously heard or said (Bock 1986; Pickering & Branigan 1999). Traditionally, priming has been argued to underpin the transient activation of already-existing static knowledge (e.g., Bock & Loebell 1990; Pickering & Branigan 1999). It is often acknowledged to be a key mechanism for learning (e.g., Bock & Griffin 2000; Bybee 1998; Chang, Dell, Bock, & Griffin 2000; Luka 1999) and in some accounts for strengthening and expanding linguistic representations (e.g. Savage, Lieven, Theakston and Tomasello 2006). It is often suggested that for adults, priming can occur for abstract linguistic structures, independently of particular words or morphemes, with a distinct emphasis on abstract representation of the construction in question, hence the term structural priming (Bock & Griffin 2000).

In first language acquisition (FLA), priming is taken as evidence of children's capacity to abstract knowledge of structure (Benicini & Valian 2008; Huttenlocher, Vasilyeva & Shimpi 2004; Savage, Lieven, Theakston & Tomasello 2003, 2006). Priming effects have been traditionally observed in presence of underlying abstract rather than lexically-based syntactic representations in children aged three and older (e.g. Branigan, McLean, & Jones 2005; Messenger, Branigan, & McLean, 2011; Shimpi et al. 2007, but see Savage, Lieven, Theakston & Tomasello 2003). For instance, Pickering and Branigan (1998) found that the effect of priming of dative constructions

was unaffected by changes in lexical items and their morphology across primes and to get responses.

Priming is generally treated as an implicit phenomenon (e.g., Chang, Dell, & Bock 2006), nonetheless explicit processes have also been invoked when lexical overlap is at play between prime and target (Branigan, Pickering, & Cleland, 2000). Priming testing methods have been highly debated in FLA research. For instance Savage et al. (2003, 2006) tested children only on transitive scenes where one inanimate entity acted upon another (e.g., t*he arrow got shot by the target*). This has been argued to involve a highly atypical situation, especially when compared with the type of utterances that children produce in naturalistic interaction. Highly infrequent event structures as such may indeed have cued the children in their study to be more likely to use passives in subsequent testing sessions. In the experimental FLA literature large individual differences in children's propensity to be primed have also been observed (Kidd 2012). In some cases it is noted that such individual variability may reflect experimental noise (e.g., Shimpi et al., 2007), in others, it is assumed that priming does not principally correlate with ontogenetic development, but also depends on knowledge and abilities that vary within and between age groups (Kidd 2012). Rowland et al. (2012) provide evidence to suggest that abstract syntactic knowledge can develop independently of verb-specific frames, viz. in cases of so-called lexical boost. They argue that different mechanisms may be needed to explain abstract structural priming and lexical priming, as predicted by the implicit learning account (Bock & Griffin 2000). In this regard, Peter et al. (2015) show that structural priming effects are apparent across development from age three to adulthood, however also indicate that lexical boost is only apparent in adults.

To our knowledge, the FLA literature has scarcely focused on whether a consistent tendency towards priming occurs in naturalistic interaction, i.e. with interlocutors re-using linguistic material spontaneously, viz. as a byproduct of dialogic engagement (cf. Goodwin 2013; Du Bois 2014; Author 2021), rather than as a response to an ad hoc stimulus. In the pioneering paper 'Structural priming and the representation of language' (2017), Branigan & Pickering contend that the representations underlying language use need not and, in fact, should not be investigated only via acceptability judgments. They encourage a future programme of interdisciplinary research on linguistic representation as a possible byproduct of priming. In this respect, it is noted that acceptability judgments must stand alongside the use of large-scale corpora to identify the types of utterances that occur and the contexts in which they occur (Lester et al. 2017). It is indeed not farfetched to suggest that large scale naturalistic interaction can be a fundamental resource to assess whether priming occurs as an exclusively implicit phenomenon. The present case-study in section 4

will shed new light on this issue, as it will show that in Mandarin naturalistic interaction priming indeed functionally correlates with an extra-propositional and extra-grammatical 'surplus' element of sentence final particles (SFPs) in order to markedly express dialogic engagement.

3.1 Engagement and overt use of sentence final particles (SFPs)

Mandarin has a very rich system of sentence final particles (SFPs), which can occur in the form of markers of expected agreement (e.g. 吧 *ba*, cf. Author 2017b, 2021) and attention getting (e.g. 呢 *ne* with a function similar to *hey, look, listen* in English, cf. Jiang 1986, Jin 1996 Wu 2005). They can function as intersubjective particles, such as 啊 *a* and 啦 *la*, to express the mood of the speaker, which can be of surprise, excitement, etc. (also see Chu 2002). They can overtly emphasise the obviousness of the fact that the sentence states as in usages of 嘛 *ma* and 呗 *bei* (cf. Pan 2021). These are all highly grammaticalised markers of intersubjectivity, in that they express – in different ways – the speaker overt awareness of his/her interlocutors potential reactions to what is being currently said (Author 2021). What is key about this is that South Asian languages with a grammaticalised system of sentence final particles – of which Mandarin is a case in point – are an extremely precious resource for the systematic study of intersubjectivity as an overt surplus of meaning throughout naturalistic interaction (Author 2021). Most crucially, it has been shown that children develop the ability to express intersubjective functions of SFPs as markers of overt engagement around the age of four (Author 2021). This is also the stage where increasingly sophisticated Theory of mind abilities are argued to allow children to pass false-belief and other minds' perspective-taking tasks (e.g. Goldman 2006; Apperly 2010)

In the excerpt (3) below, the child (CHI) resonates with his mother's (MOT) directive, in two ways. He first statically resonates with part of her utterance, thus without providing any creative contribution to the ongoing interaction. Subsequently, he enquires about the original directive speech act whilst resonating with the original verb 拼 *pīn* 'arrange' with the surplus addition of a sentence final particle (SFP) 啊 *a*. The latter is often employed to set up close relations and express engagement in questions (cf. Chappell & Peyraube 2016: 323; Authors 2020). In this case the Mandarin SFP 啊 *a* is also often used assertively, with the overt influence attempt of soliciting the addressee to acknowledge the state of affairs of p (i.a. Xu 2007; Author 2018, 2020).

(3)

MOT: 我们把这个四边形拼好。

wǒmen bǎ zhège sìbiānxíng pīnhǎo

we BA this CLAS[2] quadrilateral/cube arrange

'Let's arrange these cubes.'

CHI: 四边形。

sìbiānxíng

quadrilateral/cube

'Cube.

CHI: 怎么拼的啊?

zěnme pīn de a

how arrange DE A

'How do you arrange them then?'

<div align="right">CHILDES / Zhou3 / 1878 / 2;05</div>

The one above is an example of the dialogic intersection of priming with markers of intersubjective engagement, such as the non-obligatory sentence final particle 啊 *a*. The child's second turn, in fact, shifts from static (merely repeating a new word 四边形 *sìbiānxíng* 'quadrilateral/cube'), to dynamic resonance, whereby the verb 拼 *pīn* 'arrange' is re-used to gather further information about how to achieve the perlocutionary effects to fulfil a specific task. This occurs in combination with usage of the sentence peripheral marker of intersubjectivity and dialogic engagement 啊 *a*.

Over-generalisations in children's spontaneous speech, involving analogy and schematicity (e.g. *don't giggle me*, in which and intransitive verb is used in a transitive construction) seem to never occur before 2-1/2 years of age and mostly after 3 years of age (Pinker 1989, based on Bowerman 1982, 1988 data; Savage et al. 2006). This suggests a comparatively more sophisticated ability to engage with a prime via dynamic resonance in contrast with static resonance. What has yet not been studied is whether dynamic resonance combines with markedly overt dialogic engagement, as in spontaneous use of SFPs. A significant correlation of the two may indeed suggest that interactional creativity occurs in combination of engagement. The case-study of this paper will be thus centred on the following research questions:

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[2] Classifier.

1) Does dynamic resonance (viz. resonance involving creativity and structural manipulation of a priming construction) significantly increases throughout Chinese children's ontogenetic development?

2) If so, does this increase correlate with interactional engagement and overt usage of sentence peripheral markers (SFPs) of intersubjectivity?

4.   Data retrieval and analysis

The data of this project were retrieved respectively from the Zhou3 (cf. Zhang & Zhou 2009) and Zhou2 (cf. Li & Zhou 2004) corpora of Mandarin first language acquisition, which are both based on naturalistic interaction among children, peers and caregivers. Both corpora contain interactions between children and their caregivers, including parents, grandparents, or occasional visitors. Children were also invited to interact with research staff in a number of conversations. The age-span of the Zhou3 corpus ranges from 0;08 to 4;05, while the Zhou2 corpus comprises an age-span between 3;05 and 5. We normalised the data of the two corpora so that the Zhou3 corpus would not exceed 37 months, so as to avoid overlap between the two corpora. with children's turns therefore amounting to a total of 6143. We then randomly retrieved the same number of utterances from the Zhou2 corpus. Our corpus finally included 49520 utterances made by the mother and 12286 by the child. The context of the interactions was restricted to episodes of play among the child and the mother. The length of the interactions was quite stable, ranging from 150 to roughly 400 utterances, although no specific documentation on this is provided on the talk-bank repository concerning this point. This was yet not a major issue for our analysis as the aim was to capture a randomised large-scale capacity to engage in dynamic resonance, independently from the length of each interaction in which this would happen.

4.1   Annotation and methodology

We annotated our data with a distinctive focus on the presence of resonance, viz. the overt repetition of reformulation of a lexical item, an interjection or a construction in a preceding utterance. We designed a multifactorial scheme of annotation by taking into account the age of the child (the number of months), whether the utterance included a sentence final particle (SFP), the source of resonance (i.e. whether the child resonated with his/her interlocutor, with him/herself or with both), whether resonance occurred dynamically or statically, the degree of phonetic resonance,

the degree or syntactic resonance and finally the distance from the prime to the point of the exchange where resonance occurred. A sample line of the input of all these dimensions is given in table 4 below:

Months	SFP	Source	Res type	Phon Resonance	Synt Resonance	Distance
29	*a*	*other*	*dynamic*	*2*	*3*	*2*

Table 4.

Sample of the annotation.

The distinction between static and dynamic resonance involved whether the child merely repeated the priming stimulus of the mother of his/her peer or whether s/he would creatively use part of the priming construction in order to express something new (cf. the first vs the second turn of CHI in example (3)).

Phonetic resonance was treated as a continuous variable by looking at the number of words or interjections that were re-used by the child after a priming construction. In contrast, syntactic resonance was measured by taking into account the internal constituency of resonating ad hoc constructions. This was therefore not limited to mere repetition of words, but regarded the internal constituents of schematic constructions displaying structural similarity. This means that if a construction such as [*I'm gonna go*] is resonated in the form of [*I wanna stay*], the phonetic resonance value would be 2 (i.e. *I + 'm*), while the syntactic resonance value would be 3. This is because the latter would include all the internal constituents of the emergent schematic form [*I'm AUX V*]. The dimension of distance was then measured with reference to the number of intonation units (IU) (cf. Chafe 1994), occurring between the prime and the resonating construction. IUs involve a single intonation contour (Chafe 1994; Croft 1995; Du Bois et al. 1993; Tao 1996), they tend to end with continuing or falling intonation and are typically separated by at least a brief pause. They normally consist of a single clause, which contains one verb plus commonly known phrases that are associated with it (Chafe 1994:14). We can look at example (4) below as an illustration of this annotation method:

(4)

MOT:　　　这个好像是带帽子的吧。

　　　　　zhè ge hǎoxiàng shì dài màozi de ba

this CLAS apparently be wear hat DE BA

'It looks like this is wearing a hat isn't it?'

CHI: 嗯。

en

yeah

'Yeah.'

CHI: 这个好像是这样搞的。

zhè ge hǎoxiàng shì zhèyàng gǎo de

this CLAS apparently be so make DE

'It looks like this is made like that.'

<div align="right">CHILDES / Zhou2 / 55068 / 4;06</div>

In (4) above MOT and CHI are looking at the characters from an illustrated book. MOT establishes joint attention with CHI with the construct [这 *zhè* 'this' 个 *ge* CLAS 好像 *hǎoxiàng* 'apparently' 是 *shì* 'be'] and the sentence final particle (SFP) 吧 *ba* 'isn't it'. CHI is 54 months old, and his utterance, in turn, does not include a SFP. The source of CHI's resonance is to be marked as 'other', viz. specifically being primed by MOT's utterance (i.e. not from what the child had just said, or as a combined phenomenon of both). MOT's construction is then partly re-used by the child, as he further suggests how the character was realised [这 *zhè* 'this' 个 *ge* CLAS 好像 *hǎoxiàng* 'apparently' 是 *shì* 'be' 这样 *zhèyàng* 'so' 搞 *gǎo* 'done' 的 *de*], which is a clear indicator of dynamic resonance, as CHI here is not simply copying what he just heard. Both constructions are ad hoc instantiations of the more schematic structure [DEM CLAS EVD 是 *shì* VP 的 *de*]. In fact, the [是 *shì* VP 的 *de*] construction is commonly known as emphatic or cleft construction in the Chinese linguistic literature (Li & Thompson 1981, Chao 1968, Yue-Hashimoto 1969, Teng 1979, Paris 1979, Simpson & Wu 2002, Lee 2005; Li 2008; Cheng 2008; Paul & Whitman 2008; Hole 2011; Prince 2012; Zhan & Traugott 2015). Its main function is to provide some more specific information about some state of affairs that is already part of the common ground (i.a. Clark & Brennan 1991; Koschmann & LeBaron 2003; Author 2016a). In MOT's case it used to specify that one of the characters in the book is wearing a hat, while in CHI's case the [是 *shì* VP 的 *de*] construction is recycled to suggest how one of the characters was made. Constructional analogy from MOT to CHI's utterance indicates that resonance occurred both phonetically and syntactically.

At the phonetic level, the resonance value of the utterance is 5, i.e. the total number of words or interjections that are re-used by the child: 这 *zhè* 'this' 个 *ge* 好像 *hǎoxiàng* 'it seems' 是 *shì* and 的 *de*[3]. At the syntactic level, resonance has a value of 6. This depends on the internal constituents that match the 'locally' more schematic construction [DEM CLAS EVD 是 *shì* VP 的 *de*] at a syntactic (i.e. not exclusively phonetic) level of analysis. Finally, the distance from the prime to the CHI's resonating construct is 2, comprising the first IU 嗯 *en* 'right' and the following one. The constructional mismatch between the two utterances is illustrated in the diagraph in table 5 below:

	DEM	CLAS	EVD	*Shi*	VP	*De*
MOT:	这	个	好像	是	戴 帽子	的
CHI1:	这	个	好像	是	这样 搞	的

Table 5.

Diagraph: [DEM CLAS EVD *shi* PREDICATE *de*]

Another example of dynamic resonance from MOT to CHI is given in (5) below:

(5)

MOT:　　　你接呀！

　　　　　nǐ jiē ya

　　　　　you grab YA

　　　　　'Grab it come on!'

CHI:　　　怎么接不住呀!

　　　　　zěnme jiē bù zhù ya

　　　　　how grab-not-hold YA

　　　　　'How come I can't grab it come on!'

CHILDES / Zhou2/ 55068 / 4;8

In (5) above MOT throws a ball at CHI and utters the imperative construction [你 *nǐ* 'you' 接 *jiē* 'grab' 呀 *ya*], the directive illocutionary force of which is intersubjectively mitigated with the

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[3] The term phonetic resonance is employed here (instead of lexical) as to capture the mere repetition of a sound, which can be a word, but also a simple interjection.

sentence final particle 呀 *ya* (a spelling variant of the particle 啊 *a*, which has been discussed after example (3) in section 3). CHI subsequently re-combines some elements MOT's construction to convey an expressive speech act: [怎么 *zěnme* 'how' 接不住 *jiē bù zhù* 'grab-not-hold' 呀 *ya*]. Both utterances are token variations of the 'locally' schematic structure [Subj 接 *jiē* 呀 *ya*], as exemplified in the diagraph below:

	Subj	*Jie*	*Ya*
MOT:	你	接	呀
CHI:	/	(怎么)接(不住)	呀

Table 6.

Diagraph: [Subj *Jie Ya*]

According to our scheme (cf. Authors 2021a, 2021b), CHI's utterance in (5) needs to be annotated as follows: CHI is 58 months old, her utterance includes a sentence final particle (呀 *ya*), the source of resonance is other (her mother). Resonance here occurs dynamically, as she recycles part of the priming structure to creatively express something new. The value of phonetic resonance is 2, namely 接 *jiē* 'grab' and 呀 *ya.* The value of syntactic resonance in this case is 3, as the comparatively more schematic construction that matches both turns is made of 3 constituents: [Subj 接 *jiē* 呀 *ya*]. Finally, the value relative to distance is 1, as there are no IUs between the prime and the resonating construction.

One important issue that schematic structure is extremely common in dialogic conversation, which could represent a problem for the delimitation of syntactic resonance. We tackled this issue by positing phonetic resonance as a condition for the annotation of syntactic resonance. This entailed the presence of at least one priming lexical item, particle or interjection as one of the internal constituents of a resonating construct, e.g. the presence of respectively 接 *jiē* and 呀 *ya* in CHI's turn as necessary conditions for the presence of syntactic resonance for the construct [Subj 接 *jiē* 呀 *ya*] in example (5). Finally, all instances in which no form of repetition was present in the CHI's utterance would constitute rows with values for both static and dynamic resonance being equal to 0.

As discussed throughout this section, the model of analysis of this project was exclusively based on formal criteria of annotation. Nonetheless, three stages of inter-rater reliability among

three different annotators were established to provide replicable results. All the quantitative variation could therefore be disambiguated both for phonetic and syntactic resonance throughout all the 12286 occurrences that were present in our dataset. The rate of accuracy, reflected in Cronbach's Alphas, among the annotators at each stage of analysis was respectively $\alpha = .71$, $\alpha = .74$ and finally $\alpha = .93$. At each stage, a 25% sample of the data was independently annotated. Cases of variance where resolved through discussion among the annotators before moving to the annotation of a new randomised sample.

4.2   Analysis and results

This section illustrates results of our analysis. In Figure 1 below are first reported the distributions of respectively syntactic, phonetic resonance and distance across all the CHI's turns in our dataset.
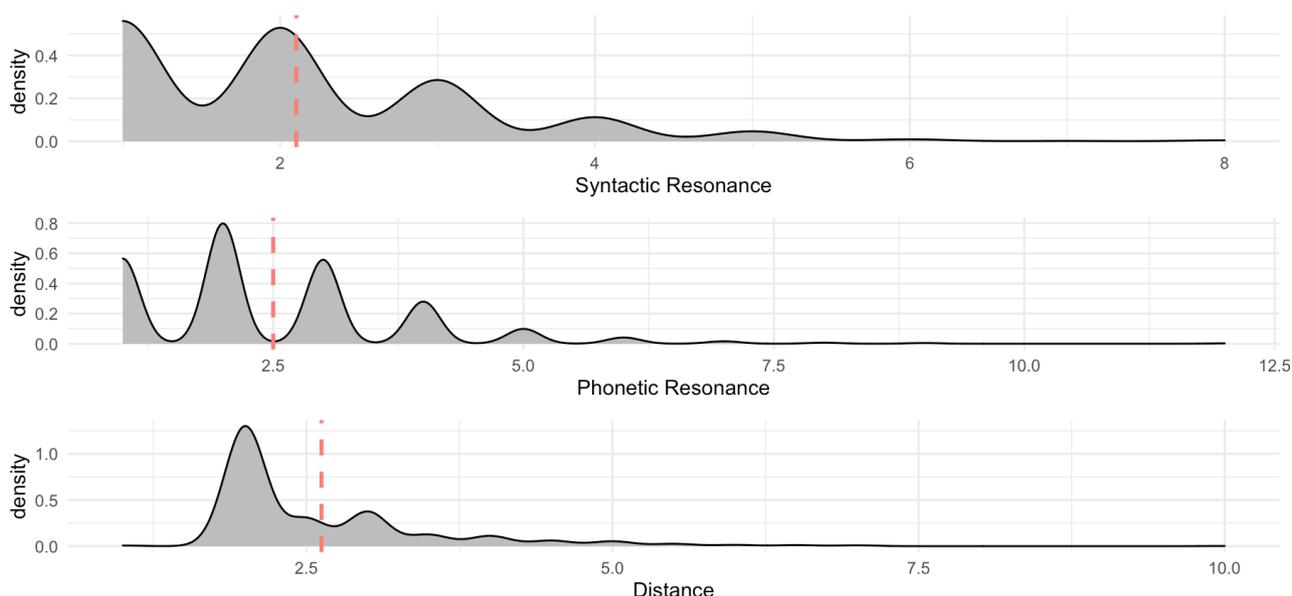

Figure 1.

Distribution of CHI's syntactic, phonetic resonance and distance in the Zhou3 & Zhou2 corpora

The mean of the distributions is marked with a vertical red dashed line, indicating values respectively around 2 for syntactic resonance, 2.5 for phonetic resonance and slightly above 2.5 intonation units (IU) for distance[4]. This suggests that resonating constructions tend to be relatively short from age 1 to age 5. Similarly, it appears that resonating turns are also very close to the initial prime. Concerning this point, it is not farfetched to hypothesise that the mean of each value from

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[4] All the values in Figure 1 are continuous, with the density representation of the data including their fractional distribution. Not surprisingly almost 50% percent of the child's utterances do not include overt element of resonance, hence the dips around 0.5 at zero level both in syntactic and phonetic resonance.

Figure 1 will increase after age 5, as data from adults indeed show longer lasting primes across turns in naturalistic interaction (cf. Authors forthcoming).

At this point, given the multifactorial nature of our annotation, it was necessary to operate a variable selection and assess the contribution of each dimension to the encoding of syntactic resonance as the more important response variable of this study. The 'weight' of each dimension was thus calculated with a random forest model (i.a. Biau & Scornet 2016). The latter is an ensemble learning method for classification, regression and other tasks that are based on a multitude of decision trees or conditional inference trees and which can handle from very few up to thousands of input variables (Breiman 2001). Inference trees, in turn, are models of regression and classification based on binary recursive partitioning, involving recursive tests of whether independent variables are associated with the given response variable, and choosing the variable that has the strongest association with the response (cf. Levshina 2015: 291). The dotchart in Figure 2 below illustrates the conditional importance of each dimension for the realisation of syntactic resonance in our dataset. As we mentioned in section 4.1, while phonetic resonance accounts for mere repetition of sounds, syntactic resonance is key to capture schematic abstraction during the here-and-now of the interaction and involves the speakers' ability to create analogies among utterances and therefore categorise constructions as a byproduct of dialogue:

Conditional importance of variables
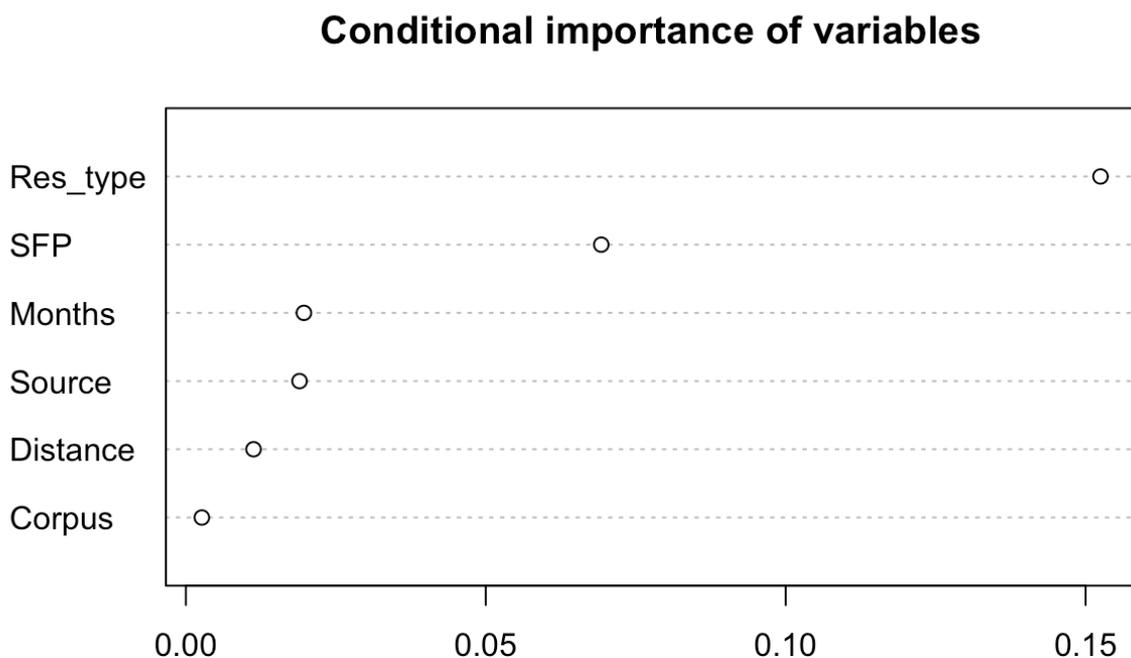
Figure 2.

Random forest of the conditional importance of variables for the encoding of syntactic resonance

The values projected on the x axis represent the weight of each dimension in relation to the others. If a variable is irrelevant, its importance values will vary around zero. The cut-off value of the plot can then be considered as the absolute importance value of the variable with the smallest score (cf. Levshina 2015: 298). This entails that the magnitude of the values above is not absolute and changes depending on the data that are being investigated. The R^2 of a random forest regression can be obtained with the predict.rfsrc() function from the randomForest library (cf. Strobl et al. 2009). In the case of the present data, it corresponds to 0.0749, with error rate of 1.618, that is reached after the generation of 500 trees. R^2 values indicate the proportion of the variance for the dependent variable as predicted by the covariants. Error rates here are calculated by bootstrapping the test data and using out-of-bagging (i.e. subsampling with replacement to create training samples) to ensure unbiased estimates. The values above aggregate the results from the individual regression trees. To predict the response value for an individual observation, the algorithm gathers information about all relevant observations that have the same properties as the one of interest, in all trees (cf. Levshina 2021: 617). This means that the predicted value for that observation corresponds to the average value of the response variable in all those observations of the 500 regression trees that have been generated. This makes random forest an extremely powerful method for the identification of the covariants that most decisively contribute to the prediction of the response variable.

The plot indicates that the strongest predictor of dynamic resonance is resonance type (Res_type), that is whether resonance occurs statically (viz. as mere repetition of the prime) rather than dynamically (viz. as a creative re-elaboration of the prime). After that, presence of sentence final particles (SFP) and CHI's age (measured in months) are in turn the most important predictors or spontaneous expressions of syntactic resonance. This was already a very important result, as it suggested a very strong interplay between constructional priming and presence/absence of sentence final particles of intersubjectivity. The latter, as argued in section 3, are a fundamental resource to assess whether ad hoc efforts are made to overtly address the awareness of the hearer's potential reaction to what is being said (i.a. Haselow 2012; Chor 2018; Authors 2020, 2021a, 201b).

Having assessed the most important predictors of syntactic resonance as such, we then fitted a conditional inference tree (cf. Hothorn et al. 2006; Tagliamonte & Baayen 2012) to account for the effect of resonance on intersubjectivity (controlled via SFP). This model is particularly useful for explanation and interpretation – as it allows a visual illustration of the conditional dependencies leading to the outcome – whereas random forests are usually better for prediction (cf. Levshina

2021: 614). Here, our response variable was the non-obligatory presence of SFP, as we were interested in understanding the conditions that would lead the child to overtly encode intersubjectivity at sentence periphery when resonance was at play, while the independent variables were Resonance type, Syntactic resonance and Age.
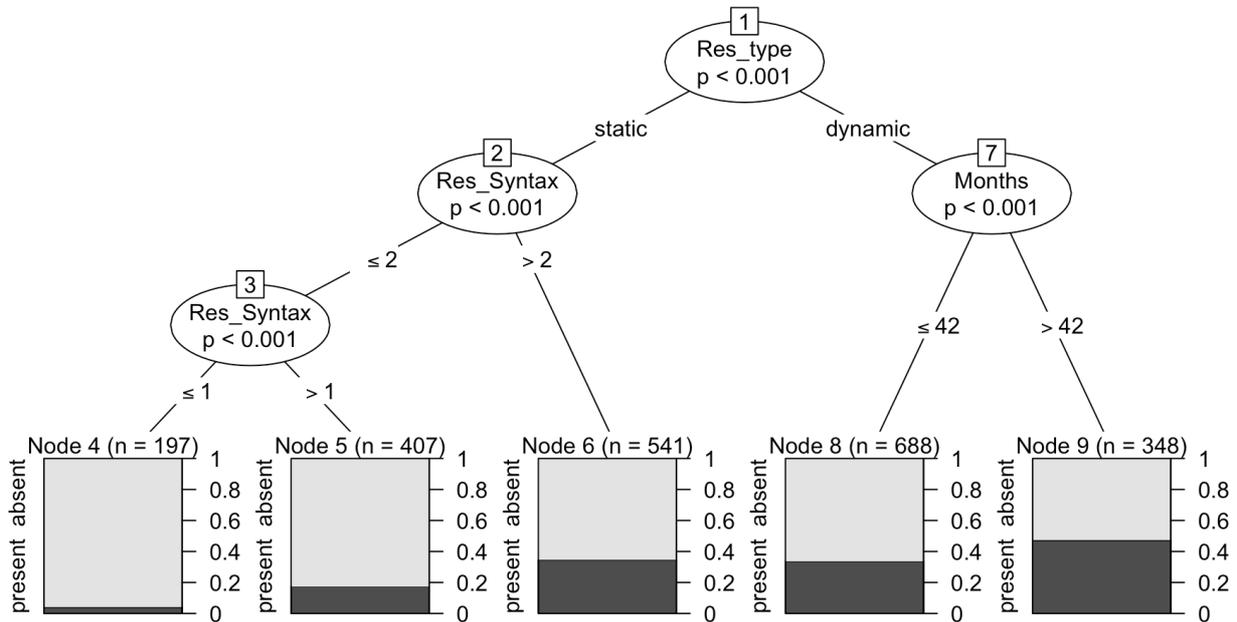

Figure 3.

Conditional inference tree of the relationship between CHI's age, resonance type and SFPs

The plot in Figure 3 above is fitted with the 'ctree' function of the R package 'party' (cf. Levshina, 2015: 291). The method lies on testing the null hypothesis that the distribution of the dependent variable D(Y) is equal to the conditional distribution of the dependent variable given some predictor D(Y|X) (cf. Levshina 2021: 616). By default, the algorithm returns the asymptotic p-values, with a X^2 distribution, which can be manipulated to get multivariate normal distribution (Hothorn et al. 2006).

The plot is entirely usage-based and data-driven, with conditional dependencies among variables based exclusively on statistical significance (the higher the node, the more significant the partition of each split). The descending order of each node represents a significant condition for assessing whether children spontaneously make use of SFPs while they resonate with their interlocutors' prime or with their own. This means that every partition depends on degrees of significance, as indicated by the p value that is reported at each split. This top-down classification finally leads to the bar plots at bottom of the figure, which illustrate percentages of usages that include a SFP (present) vs ones that are without (absent). As also suggested by the random forest

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results, 'resonance type' even in this case is the most crucial element that determines the use of SFPs. In particular, when resonance is static (viz. occurring as mere repetition), presence of SFPs increases significantly with higher resonance values (expressed by the Res_syntax nodes), i.e. from around 5% of SFPs when static resonance is 1 in node 4, to around 20% of SFPs when static resonance is greater than 1 in node 5, to finally lightly less than 40% of SFPs when static resonance is greater than 2 in node 6. However, what is most crucial is that the proportion of SFPs is higher with dynamic resonance and therefore when creativity is at stake. In particular, the split at node 7 at the right hand-side of the plot indicates a significant increase of this intersection after 42 months of age, with spontaneous usage of SFPs increasing from around 38% (node 8) to almost 50% (node 9). To better understand the relationship between SFPs and dynamic resonance, consider example (6) below:

(6)

MOT: 她吃了跳跳糖啊！

　　　tā chī le tiàotiàotáng a!

　　　she eat LE crackingcandy A

　　　'She ate a crackingcandy, you see!'

CHI: 跳跳糖我也吃过啊！

　　　tiàotiàotáng wǒ yě chī guo a!

　　　crackingcandy I also eat GUO A

　　　'I also ate crackingcandies before, you see!'

<div align="right">CHILDES / Zhou2 / 52909 / 4;5</div>

In (6) above, MOT directs CHI's attention to the fact that a little mouse ate a 'crackingcandy' and further emphasises this piece of information with the SFP 啊 *a*, which is used with the expectation that p will be of great interest to CHI. CHI, subsequently re-combines MOT's priming construction [Subj 吃 *chī* 'eat' (Obj) 了 *le* 啊 *a*] in the new form of [Subj 吃 *chī* 'eat' (Obj) 过 *guo* 啊 *a*]. At this point, the original perfective marker 了 *le* is replaced by the experiential perfect particle 过 *guo*, here specifically signalling an animate subject's past experience (cf. Author 2013, 2015, 2020). At this stage of development, CHI already shows the capacity to construe a contrary intensifying parallelism, which is functional to signal the failure of MOT's presumption of optimal relevance

(cf. Sperber & Wilson 1995) and, more specifically, the fact that p is not as informative as MOT would have thought, given that CHI himself ate cracking candies before.

Both constructions are specific instantiations of the 'locally' more schematic construction [Subj 吃 *chī* 'eat' (Obj) PERF 啊 *a*] as shown in the diagraph from table 7. below:

	Subj	*Chī*	PERF	(Obj)	*A*
MOT:	她	吃	了	跳跳糖	啊
CHI1:	我	(也) 吃	过	/	啊

Table 7.

Diagraph: [Subj 吃 *chī* 'eat' (Obj) PERF 啊 *a*]

This is a clear example where dynamic resonance is creatively combined with SFPs, illustrating the correlation of syntactic mastery of a dialogic prime and overt attempts of intersubjective coordination.

These results indicate that there is a significant interplay between dynamic resonance and overt dialogic engagement, in combination with increasing ontogenetic development. Simply put, children's ability to resonate creatively with a prime increases significantly after 42 months of age. This increase is matched by children's capacities to overtly engage dialogically with their interlocutors via the spontaneous use of non-obligatory SFPs of intersubjectivity. Interestingly, it is around indeed the critical age of 4 that neurotypical children start to develop the ability to make overt attempts to 'read' other people's minds and make inferences about their intentions, knowledge, feelings and interpret their behaviour (Onishi & Baillargeon, 2005; Surian et al. 2007; Kovacs et al. 2010). Spontaneous usage of non obligatory peripheral markers of intersubjective engagement – of which Mandarin SFPs represent a grammaticalised category – constitutes an important indicator of children's increasing ability to pro-actively account for the addressee's potential reactions to what is being said (cf. Author 2017a, 2017b; 2020a, 2020b), rather than implicitly reacting to a priming stimulus. It is finally important to note that this phenomenon could be exclusively captured from large scale naturalistic data. This shows the importance of expanding the range of data sourcing and manipulation in the research on priming, which has been so far mostly based on more traditional acceptability judgments and 'lab-bound' experimental design.

4.2.1 Mixed effects linear regression of dynamic resonance and ontogenetic development

Based on the results from the conditional inference tree given in Figure 3, we fitted a mixed effect linear regression model (cf. Baayen & Davidson 2008) by as we specifically focused on resonance occurring dynamically (i.e. creatively) in presence of SFPs. Syntactic resonance was fitted as a continuous response variable, source of resonance (e.g. whether the prime originated from a peer, from the child or both) as a random effect, and children's age as a continuous fixed effect. It was then possible to specifically target the incremental correlation between the degree of resonance occurring syntactically as a creative phenomenon and children's increasing developmental ability to make use of SFPs. In table 8 below are reported the results of our analysis:

Random Effects

Groups	Name	Variance	Std. Deviation	
Child	(Intercept)	0.0256	160	

Fixed Effects

	Estimate	Std. Error	T value	Pr(>|t|)
(Intercept)	1.748	0.21281	8.214	1.26e-08 ***
Age (months)	0.011	0.0047	2.260	0.0244 *

Table 8.

Mixed effects linear regression of the FLA of syntactic resonance in combination with creativity and SFPs

At the top of table 8, the random effects section includes the standard deviation, showing the variability from the predicted values due to the random effects added to the model, i.e. the IDs of each child. The fixed effects section is given in the lower part of the table. Here, the Estimate column indicates the coefficients of the slope for the fixed effects on the degree of syntactic resonance, i.e. CHI's age, which were measured in months. From the above, we can see that there is a significant increase of dynamic resonance occurring creatively in combination with age when SFPs are spontaneously added as an overt surplus of meaning at the end of the sentence ($t(394)=2.260$, $p=.0244$)). With reference to the Estimate columns, the model predicts an increase of syntactic resonance by 0.011 per every month of age of the child. It may be argued here that both sentence final particles and the ability to repeat and elaborate linguistic material encountered in the input emerge independently in the course of development. However, the linear trajectory of

syntactic resonance does not increase significantly throughout the period considered in absence of SFP and creativity (*t*(2179)=-.584, *p*=.559)). Similarly, this is a significant result specifically with respect to resonance occurring syntactically, while a non statistically significant increase was observed for mixed effect linear regressions with respectively phonetic resonance and distance as outcome variables. This contrast is illustrated in the heat maps in Figure 4 below:
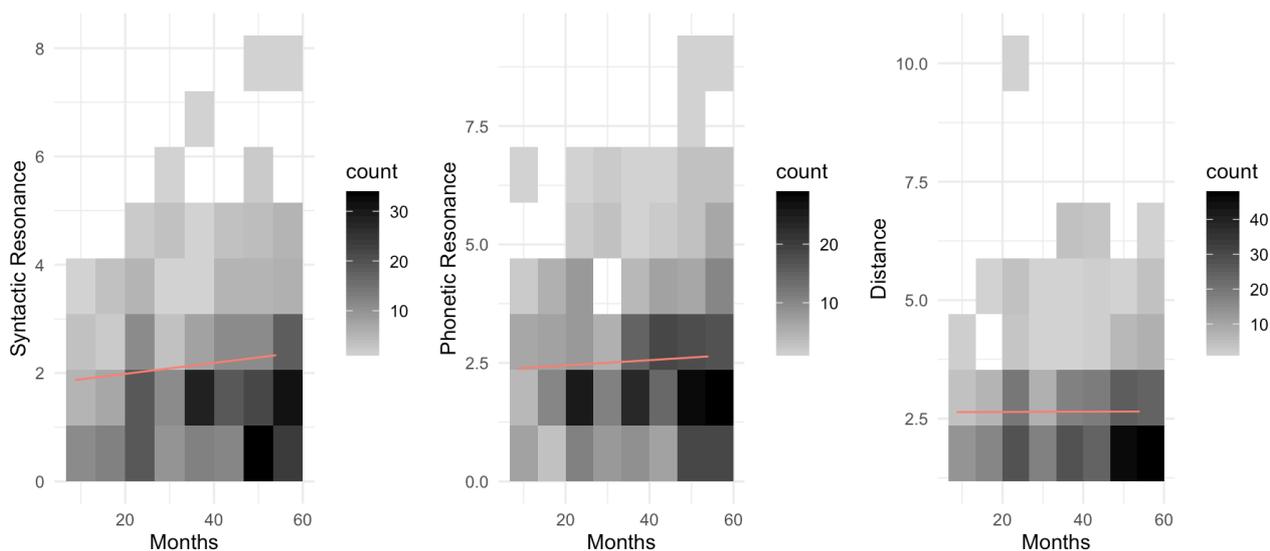
Figure 4.

Heatmap of the increase in syntactic, phonetic resonance and distance in Manarin FLA

Figure 4 above reports the ontogenetic increase of values for respectively syntactic, phonetic resonance and distance (all appearing on the y axis) in combination with resonance occurring dynamically and in presence of SFPs. Darker areas on the plot indicate higher density, hence frequency of use in combination with age (given in months on the x axis) and, therefore, three different visualisations are given. As shown by the linear regression lines in red, despite all the three values tend to increase from age 0;8 up to age 5, syntactic resonance shows a comparatively more pronounced slope[5]. This is likely due to dynamic resonance underpinning the creative re-cycling of a prime at schematic levels of abstraction, rather simply repeating a number of lexical items. It therefore makes sense to suggest that when engagement is at play, children tend to do so creatively, in order to achieve distinctive perlocutionary effects, rather than implicitly repeating a prior stimulus as such. On the other hand, the almost flat tendency of distance, at the right hand-side of Figure 4, supports the conclusion that distinctively explicit priming processes (Branigan, Pickering,

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[5] P values for phonetic resonance and distance with source as a random effect are respectively *p*=.252 and *p*=.879.

& Cleland 2000) tend to be relatively short-lived, with most priming effects of this kind decaying relatively quickly. This similarly may suggest that further ontogenetic development is required to creatively engage with a dialogic prime stimulus at distances that are significantly longer than 2.6 IUs.

5. Discussion

A key result of this study is that when analogy and similarity underpin creativity, they correlate with dialogic engagement. The child's capacity to creatively re-use the linguistic input that s/he has been primed by – rather than merely repeating it – is an important indicator of a developing ability to engage grammatically and pragmatically with a peer and to meet intersubjective expectations of originality and transmission of new information. Throughout ontogeny, there is a progressive shift from resonance occurring statically (viz. as mere repetition) to dynamic resonance (viz. as involving creativity). This shift correlates with the child's increasing ability to re-use the priming material that s/he recently encountered throughout an interaction in order to express something new and achieve novel perlocutionary effects. Most importantly, this capacity develops significantly in combination with non-obligatory sentence final particles (SFPs) of intersubjective engagement. In Mandarin and other languages of the South East, SFPs occur as non-obligatory grammaticalised markers that speakers employ to overtly express their concern about the addressee's reaction to an ongoing utterance. For instance, an assertion such as *Linguistics is extremely fun*, in Mandarin may include the SFP 吧 *ba* (cf. Author 2021) to mark the intersubjective expectation that hearer will agree with what is stated (as in 语言学 *yǔyánxué* 'Linguistics' 非常 *fēicháng* 'extremely' 好玩 *hǎowán* 'fun' 吧 *ba*). In this sense, the complex system of SFPs of Mandarin and other languages of the South East constitute a key typological resource for the study of intersubjectivity and mindreading in cognitive science. The present analysis shows that the ability to combine dynamic resonance and SFP occurs significantly after 42 months of age, which is also a developmental stage when ToM capacities are normally found to become increasingly complex. Our results further suggest that this shift occurs at locally schematic levels of constructional organisation, and therefore underpins syntactic resonance, rather than mere repetition of lexical words and/or interjections (phonetic resonance). This indicates that dialogic creativity unfolds as a recombinant mechanism in which interlocutors overtly engage with the linguistic material produced by their peers. Such form of recombinant creativity is a gradient one and increases in complexity throughout ontogeny.

Among the limitations of the present study there is perhaps the issue of utterance length, which may also become an important predictor of resonance weight and type. Similarly, the paper is distinctively focused on Chinese children, in this population sentence peripheral marking of intersubjectivity can be easily controlled via presence vs absence of SFP. Data from other languages are needed to confirm whether the correlation between intersubjectivity and dynamic resonance is a language-specific phenomenon. Similarly, further multimodal variable, such as gestures and facial expressions are also key components of resonance and pragmatic engagement. We believe that a way to enhance the present findings would be to incorporate theses dimensions and assess how they also inform speakers' ability to engage with a peer and categorise meaning.

The recent literature on priming has been increasingly geared towards assessing whether priming in interaction occurs only implicitly or also as a form of explicit cooperation. The present study shed new light on this phenomenon, as it revealed an ontogenetic cline from static to dynamic resonance, in combination with a transition from absence to presence of SFPs in first language acquisition. Similarly, it informs both theoretically and methodologically the new paradigm of dialogic syntax, as it is the first to shed large-scale quantitative and qualitative light on the relationship between resonance and creativity as byproducts of engagement and categorisation throughout ontogeny. Finally, it provides a novel method based on formal criteria of annotation that can be easily replicated for future corpus-based enquiries centred on priming and catalytic activation of affinities across utterances.

6. Conclusion

This study tackled the relationship between creativity and engagement throughout Chinese ontogeny. Our focus has been on priming occurring interactionally as an explicit vs implicit phenomenon. New evidence has been provided indicating that engagement in naturalistic interaction correlates with dynamic resonance, which involves the creative variation of a linguistic item that occurs in some previous turn of spontaneous interaction (Du Bois 2014; Author et al. 2018).

We focused on the child's ability to spontaneously re-use a previously encountered construction in order to express something new. Our results show that children increasingly develop the capacity to creatively re-use a constructional prime after age 4, specifically in combination with sentence final particles (SFPs) of intersubjective engagement (cf. Author 2017, 2018, 2020). SFPs are grammaticalised non obligatory markers that Mandarin speakers employ to overtly express their

concern about the addressee's reaction to an ongoing utterance. Dynamic resonance (i.e. resonance involving creativity) and SFPs are significantly at play around the same developmental stage in which children acquire mindreading capacities. The key of this result is that developmentally, interactional engagement correlates with creativity, as children show an increasing capacity to re-elaborate a dialogic prime with the aim to engage explicitly with a peer, rather than implicitly reacting to a stimulus.

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