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Preschool children's discourse competence in different genres and how it relates to iconic gestures

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Abstract

Based on the linguistic analysis of game explanations and retellings, the paper's goal is to investigate the relation of preschool children's situated discourse competence and iconic gestures in different communicative genres, focussing on reinforcing and supplementary speech-gesture-combinations. To this end, a method was developed to evaluate discourse competence as a context-sensitive and interactively embedded phenomenon. The so-called GLOBE-model was adapted to assess discourse competence in relation to interactive scaffolding. The findings show clear links between the children's competence and their parents' scaffolding. We suggest this to be evidence of a fine-tuned interactive support system. The results also indicate strong relations between higher discourse competence and increased frequency of iconic gestures. This applies in particular to reinforcing gestures. The results are interpreted as a confirmation that the speech-gesture system undergoes systematic changes during early childhood, and that gesturing becomes more iconic – and thus more communicative – when discourse competence is growing.

Keywords: Discourse competence; iconic gestures; multimodal development

Introduction

One important strand of research on multimodal utterances in children's speech has focused on different types of gesture–speech combinations (Alibali et al., 2009; Özçalışkan & Goldin-Meadow, 2005a, 2005b, 2009), their occurrences in varying contexts or tasks (Alamillo et al., 2013; Colletta et al., 2014), individual differences in the use of gesture type and frequency in relation to visuospatial and cognitive abilities (see Özer & Gökşun, 2020, for an overview), and their possible link to language development (Alibali et al., 2009; Colletta et al., 2010; Iverson & Goldin-Meadow, 2005; Özçalışkan & Goldin-Meadow, 2005a, 2005b, 2006; Özçalışkan et al., 2014; Stites & Özçalışkan, 2017). The overall aim of this research is to learn more about young children's speech–gesture system while it is still in the course of development.

The present article builds on this research by focusing on iconic gestures when looking at the broader question of how preschool children combine speech and gestures in different contexts. Additionally, we propose a new model of discourse competence that views global discursive structures from a developmental perspective while also taking the deeply interactive nature of conversational interaction into account. The overall aim is to present an operationalization of this model, and to study how children whose levels of discourse competence differ according to this model use various speech–gesture combinations. Our interest stems from several considerations. First, we still know little about how children in this age group (i.e., 3–4 years of age) use iconic gestures for different communicative purposes (Behne et al., 2014), even though they demonstrate what McNeill (2005, pp. 180–181) has called a “gesture explosion.” Second, and related to this, even though previous research has suggested that the constellation and use of speech–gesture combinations undergo changes during preschool children’s development (Alibali et al., 2009; Capone & McGregor, 2004; Colletta et al., 2010), little is known so far about the semantic relations between iconic gestures and interconnections with speech and discourse competence in this age group. Finally, developmental research on gesture use and linguistic abilities has indicated that children might use the expressive capacity of deictic and iconic gestures not only to compensate for their reduced vocabulary (Alibali et al., 2009; Austin & Sweller, 2018; Colletta et al., 2010) but also for communicative purposes (Behne et al., 2014). Therefore, we are especially interested in how iconic gestures are linked semantically to the content of speech, and how different combinations of gesture and speech relate to discourse competence in preschoolers’ talk.

To further explore the relation of iconic gesturing to discourse competence, we shall apply a model of discourse competence drawing on theories of language development that provide empirical evidence that coparticipants share the burden of organizing their talk in order to achieve a common goal, and thus participate according to their level of expertise. Inspired by Vygotsky’s (1978) concept of the “zone of proximal development,” Wood et al. (1976) coined the “scaffolding” metaphor to describe how adults, as the more competent speakers, actively help children to complete a discursive task by providing a supportive scaffolding structure. Such scaffolding simultaneously helps the child to acquire more knowledge about how to carry out a discursive task. Scaffolding is thus at heart a reciprocal process in which adults fine-tune their assistance to the competence displayed in a child by “controlling” those elements of the task that are initially beyond the learner’s capacity, thus permitting him [*sic*] to concentrate upon and complete only those elements that are within his range of competence” (p. 90). Thanks to studies taking a broader look at communication, we know that scaffolding can also take place in a multimodal way (Grimminger et al., 2010; Rohlfsing et al., 2022; Zukow-Goldring, 1996). This addresses the fact that children’s communication relies less on verbal behaviour than that of adults. Numerous studies, especially in the area of conversation analysis, have shown the many ways in which scaffolding processes are carried out by more competent speakers (Bateman & Carr, 2017; Theobald, 2019) and how they differ with regard to age (Rohlfsing et al., 2022) and task difficulty (Grimminger et al., 2010). Nonetheless, to the best of our knowledge, no attempt has been made so far to quantitatively investigate the interconnection between scaffolding activities and multimodal discourse competence in different contexts (such as different communicative genres) in order to provide further evidence for the fine-tuned reciprocity of scaffolding support. Early in development, children’s production competence depends strongly on the knowledgeable adult who guides the child toward a discursive goal. To assess the child’s multimodal

competence reliably, this must be separated from the scaffolding activities of the adult in a systematic way and in line with developmental theory.

A context-sensitive and interactive approach to discourse competence

Participants' discourse competence can be seen in the orderly methods they apply to complete the communicative tasks at hand and reach a mutual goal (Erath *et al.*, 2018; Quasthoff *et al.*, 2017). For the purpose of this article, we further developed a discourse competence model that can be used to assess an individual's contribution to a communicative task (such as a narrative or explanation) by simultaneously accounting for the fact that it is achieved interactively.

Rooting our approach in the notion of scaffolding (Wood *et al.*, 1976) and Vygotsky's (1978) notion of the zone of proximal development, we build our analysis of children's discourse competencies on an existing model: GLOBE (*globality and locality in the organization of both-sided constructed units*) provides an analytical tool with which to describe individual discourse competence as an interactive achievement (Erath *et al.*, 2018; Quasthoff *et al.*, 2017). Grounded in ethnomethodology (Garfinkel, 1967), the model conceptualizes conversational interactions as fundamentally co-constructed communicative tasks, and thus regards participation as a key notion with which to grasp the distribution of competencies across individuals talking to each other in a given situation. Differences in participation are seen in the varying ways participants contribute to organizing the ongoing discourse on a local and global level by solving the communicative tasks at hand. The GLOBE model integrates structural requirements regarding the local and global organization of the respective communicative tasks in order to achieve a comprehensive understanding of individual competence. On the local level, discourse competence pertains to the ability to respond to individual turns; on the global level, discourse competence refers to the ability to provide a longer contribution that is structured coherently and adapted to the ongoing discourse and partners. For the speaker, the latter competence is clearly more challenging than the former. However, the burden of globally structuring a contribution can be distributed among participants. Accordingly, the more competent speakers might take over more of the organizational burden in order to help the less competent speakers master the mutual task. In adult-child interactions, the adults' contributions to task completion are in fact scaffolding activities through which they also provide the child indirectly with knowledge – and models – about the structure and content of a given task (Kern, 2020). Describing different forms of participation therefore offers a solid basis for capturing individual proficiency in task completion while simultaneously taking into account that it is always an interactive accomplishment in which one participant can be more knowledgeable than the other and can thus provide scaffolding support. However, the scaffolding given will differ according to the competence a child demonstrates in a task.

As children progressively gain conversational experience, their discourse competencies cannot be seen as just one unitary skill. Instead, research suggests that children's competence may vary depending on the communicative task they have to cope with. One way to provide a theoretical framework that recognizes the specific linguistic prepatternedness of different communicative tasks is GENRE THEORY. Genres are considered to be part of a society's repertoire of knowledge that provides habitualized, prepatterned, and culturally bound communicative solutions for regularly occurring communicative problems (Günthner & Knoblauch, 1994). They generate expectations about the situations in

which they occur and the ways in which they are accomplished mutually. Notably, genres posit different discursive demands on the interactants. For example, in the communicative genre of storytelling, a principal speaker (Wald, 1978) is in charge of an adequate transformation of the story's underlying semantics (i.e., the course of the events to be told) into a verbal telling, whereas the listener has several options to attend to and regulate the story. To provide another example, in the genre of explanation, the principal speaker assumes the task of transferring relevant knowledge to the listener (Kern, 2020; Quasthoff et al., 2017).

Our adaption of the GLOBE model allows us to evaluate verbal discourse competence in terms of the independently produced – or scaffolded – relevant verbal content of a respective communicative task. Building on this, by analyzing the interconnection between verbal and gestural content in different genres, we are able to characterize and assess multimodal discourse competence in more detail. Using the concept of genre, discourse competence can be described context-sensitively for different genres and in terms of global structure and linguistic and multimodal resources. In the present article, we shall focus especially on the global semantic structure of the two genres EXPLANATION and RETELLING and on iconic gestures as multimodal resources with which to build this structure and elaborate on it. We shall now turn to the latter.

Children's multimodal utterances

Quite a lot of recent research has explored the interconnection between speech and gesture from a developmental perspective. According to studies on the early development of gesture and language, children coordinate both modalities – speech and gesture – from a very young age, but they start to reorganize them at approximately 30 months (Capone & McGregor, 2004). When speech then becomes the major resource of communication, children have been observed to shift from using predominantly deictic and pragmatic gestures toward a stepwise inclusion of more iconic gestures in their speech (Özçalışkan & Goldin-Meadow, 2009). Thus, while pointing gestures seem to be the first to appear, iconic gestures, beat gestures, and metaphoric gestures occur at later stages of development (Capone & McGregor, 2004; McNeill, 1992). This holds for both the production and the comprehension of gestures.

In the following, we shall concentrate on two strands of research that have laid the grounds for our own work. First, we shall present studies that focus on children's gesture–speech patterns in different communicative tasks/genres; second, we shall refer to research investigating the semantic content of gestures and their relation to speech at different stages of language development. In the following, we shall use the term “communicative genre” instead of “task,” but would like to stress the fact that these terms are used to describe similar phenomena albeit in different research contexts.

Studies on gestures agree that co-speech gestures represent event aspects, thereby supporting the embodied view on communication (Hostetter & Alibali, 2019). For learning and development, the beneficial effect of representational co-speech gestures proposed in the literature has referred to deictic and iconic types of gestures. In contrast, beat gestures (Vilà-Giménez & Prieto, 2020) were long considered to be nonrepresentational. Recently, however, the definition of representational gestures was challenged, and it was proposed that beat gestures benefit children's reception of narrative by providing it with structural elements (ibid). Whereas the controversy about beat

gestures is ongoing (see Bharadwaj *et al.*, 2022), we shall focus on iconic gestures, because through their semantic relationship to the referents, they deliver insights into the developing gesture–speech communicative system. In addition, there is empirical evidence for the beneficial role of iconic gestures for later narrative abilities (Demir *et al.*, 2015; Vilà-Giménez *et al.*, 2020). One common classificatory procedure divides gesture–speech relations into supplementary versus reinforcing (e.g., Iverson & Goldin-Meadow, 2005). Reinforcing gestures contain the same information as speech, whereas supplementary gestures add new information. There is some evidence that supplementary deictic gestures are relevant for the prediction of further syntactic development (see, e.g., Capirci *et al.*, 1996; Goldin-Meadow & Butcher, 2003). Research also suggests that children start off using the two modalities – gesture and speech – to communicate about what is the same element. As their language–gesture system develops, they employ both to refer to different elements or different aspects of the same event (Goldin-Meadow & Butcher, 2003). Supplementary gestures are thus seen as a pathway to language development. However, Furman *et al.* (2014) have shown that older Turkish children continue to use supplementary gestures even after acquiring the verbal means to express the relevant semantic content. This could be explained by argument ellipsis, which is possible for several arguments (Figure, Goal, Path) in Turkish (p. 631). There might thus be a language-specific component in the development of supplementary versus reinforcing gestures.

Özçalışkan and Goldin-Meadow (2009) investigated different types of gesture–speech combinations, starting from the observation that one-word utterances are often accompanied by deictic gestures that supplement speech. They found that supplementary combinations predict the production of more complex syntactic constructions in children between 14 and 34 months of age, and thus argued that these constructions signal the children’s readiness to produce two-word utterances. Their results also suggest that whereas gestures predict the emergence of specific linguistic skills at an early stage of development, they become more communicative as part of a speaker’s repertoire at a later stage. The authors assume that this change is reflected in the observed increasing use of iconic gestures over time. In another study, Alibali *et al.* (2009) found children to be less redundant (i.e., to use fewer reinforcing gestures) than adults when asked to retell a cartoon story, indicating that gesture–speech combinations change over time. The children were additionally found to use more non-redundant (i.e., supplementary) gestures than adults. This suggests that non-redundant gestures can compensate for “difficulties expressing ideas in words” (p. 306), which also might be linked to a lack of suitable vocabulary. In line with this, further studies suggest that gestures can have a compensatory function, thus supporting language production (de Ruiter *et al.*, 2012; Göksun *et al.*, 2013). Other studies found a correlation between higher spatial abilities and lower verbal abilities that resulted in more non-redundant gestures (Hostetter & Alibali, 2011). However, more recent research challenges theories about the primacy of compensatory functions of gestures, providing instead strong support for the view that speech and gesture form an integrated system (McNeill, 1992). For example, Graziano and Gullberg (2018) have demonstrated that in child and adult learners of a second language with varying degrees of linguistic proficiency, gestures occurred mostly with fluent speech, whereas they tended to be withheld during halting speech. The authors interpret their results as evidence against the assumed compensatory role of iconic gestures, and instead for the notion of gesture and speech forming an integrated system.

A more gradual approach to speech–gesture combinations going beyond the binary pair of redundant versus non-redundant was developed by Colletta et al. (2014). They proposed six types of combinations, thus suggesting a continuum rather than clear-cut categories. In a larger cross-linguistic study of narrative development, these authors found that older children who produced more complex narrative preferred “integrating” (i.e., gesture information adds precision to the information distributed verbally) gestures over other types.

In our own work on the semantic relation between gesture and speech (Abramov et al., 2021), we studied how 4-year-olds convey meaning across speech and gesture, and how this relates to their cognitive abilities. For this study, we applied a semantic feature analysis to systematically characterize the meaning of gestures and speech along predefined categories. We found that at this age, children convey more than 80% of their meaning in speech and less than 20% in gesture. In addition, we found that this relation can change in line with the communicative task and the cognitive skills of the children. For the latter, we found that the higher the children scored in a nonverbal IQ test, “the more the children tend to communicate meaning in gesture-only and the less in speech-only” (Abramov et al., 2021, p. 18). Moreover, given the result that it was mostly the children with high cognitive abilities who produced high rates of supplementary gestures, gestures may not only serve the function of lightening the speaker’s cognitive load in a given task but also have a communicative purpose (Abramov et al., 2021, pp. 24–25). This interpretation is supported by recent research reported by Behne et al. (2014) who found that children employ iconic gestures on the spot significantly more often when instructed to inform a novice about a task than in a control condition without such an instruction.

In addition to our study, several other developmental studies have delivered empirical evidence for interdependence between co-speech gesture, verbal competence, and conversational context. Colletta et al. (2010) have provided empirical evidence for a connection between the narrative complexity (both syntactic and pragmatic) and frequency of gesture types and grammatical markers. Studies with older children (from the age of 6) have shown that representational and beat gestures form part of their gestural repertoire in different tasks (narratives and explanations), and that age has an effect on the construction of multimodal utterances (see, e.g., Colletta et al., 2010; McNeill, 1992). Colletta et al. (2010) found that children use more ABSTRACT representational gestures in explaining, whereas they more frequently use CONCRETE representational gestures in narrating (among other communicative tasks). This outcome, however, could not be replicated in a later study (Alamillo et al., 2013). The authors assumed major differences in the explaining task that was said to contain more narrative elements in the latter study. In a more controlled setting, Alamillo et al. (2013) further studied the link between age, different communicative tasks, and the use of linguistic and gestural resources in 6- and 10-year-old children. Discourse abilities were measured in terms of the numbers of connectives and anaphors, both providing information about discourse cohesion (p. 520). Results revealed a higher overall gesture rate in explanations than in narratives. However, this was due mainly to framing, performative, and interactive gestures (p. 530). Interestingly, the authors related the higher frequency of these gestures to the more interactive nature of the explanatory dialogues in their specific experimental setting. They concluded that task effects in gestural behaviour “correspond mostly to differences in the extent of the interlocutor’s involvement in the task” (p. 534). It thus seems to be important to take the conversational context into account in order to gain a fuller understanding of a child’s discourse competencies.

To sum up, we do not yet have a systematic analysis of how speech-gesture patterns relate to discourse competence in pre-school children – despite the considerable enlightening research reviewed earlier about the ways in which children combine speech and gesture in different communicative tasks at different ages, and despite the clear evidence of age and task effects on verbal and gestural behaviour. Moreover, research has yet to focus on iconic gestures in particular and their link to discourse competence. However, in view of above-mentioned studies that assume changes in the speech-gesture combinations during early childhood, we are especially interested in studying how iconic gestures relate to speech in the context of different genres. The representational nature of iconic gestures and their closely linked potential to refer to objects and events absent from the physical environment make them extremely valuable resources for the two genres studied in this article: explanations (without the game material used in the study being present) and retellings. Furthermore, looking at different ways in which iconic gestures are combined with the accompanying speech allows us to gain more insight into the development of the speech-gesture system in early childhood.

Additionally, and with reference to previous research (Quasthoff *et al.*, 2019), we take a different approach to discourse competence: based on the GLOBE model, we assume that children become increasingly independent while also being scaffolded by caregivers in ways that vary according to the conversational context. Unlike the studies reported here (e.g., Alamillo *et al.*, 2013), we do not operationalize discourse competence by studying it in terms of linguistic and gestural complexity and therefore mostly as clauses or gesture types, linguistic (anaphors, connectives), or gestural (beats) markers of coherence. Instead, we chose the GLOBE model because it provides empirical access to individual competence as part of a context-sensitive mutual accomplishment of genre-specific global structures using appropriate multimodal resources. Finally, the children in our study (age 4) were younger than those in previous research. In fact, little is known about how the integration of iconic gestures and language develops in preschool children. As the overview of previous research shows, studies on changing gesture-speech combinations have so far concentrated mostly either on toddlers, thus providing insights into the beginning of the developing speech-gesture system, or on older children from the age of 6 onward. In addition, whereas several studies indicate that gesturing becomes more communicative in function, this has not yet been investigated further – not only with regard to children's discourse competence in different communicative genres, but also within a theoretical and empirical design that accounts for the deeply interactive and situated nature of discourse competence. We intend to start to fill this gap with our study.

Hence, this article will adhere to the claim that iconic gesturing is intertwined with discourse development, and it will attempt to explore this connection further with a focus on the correlation between discourse competence as an interactionally co-constructed and observable phenomenon and semantic relations in iconic gesturing. Based on previous research, we asked the following research questions:

- (1) Is there a relation between children's discourse competence and the context-sensitive, fine-tuned supportive scaffolding behaviour provided in different conversational contexts?
- (2) Is there a relation between genre competence and iconic gesture production?
- (3) More specifically, is there a relation between the use of different combinatory types of iconic gestures (i.e., supplementary vs. reinforcing) and genre competence?

Methods

The data used in our current study stem from a collection of videotaped explanations and story retellings by 4-year-old children that were recorded as part of a larger study¹ in a university children's lab in the state of North Rhine-Westphalia, Germany. The study was designed to elicit close-to-natural conversational and gestural behaviour of children in different genres (EXPLANATIONS, RETELLINGS, and ILLUSTRATIONS, see Abramov et al., for more detail) in order to explore relations between children's context-dependent gestural and verbal behaviour. Illustrations were excluded from the present study, because there is no previous linguistic research on the development in this genre. An important consideration was to build up a relaxed atmosphere in order to elicit a conversation that would be as naturalistic as possible despite the unfamiliar environment.

Participants

Participants were children ($n = 46$, 19 girls) aged 4 years ($M = 50$ months, $SD = 3.4$ months, range: 45–61 months). Originally, 55 children were recruited for the study. However, 9 children had to be excluded, because 6 of them had not prepared for the visit at home (did not watch a video or read a book), 2 did not narrate about the book, and 1 caregiver already knew the story in the retelling task. The children visited the lab twice together with their caregivers. In the first session, children participated in different communicative genres; in the second session, their fluid intelligence was assessed with a nonverbal intelligence test. This, however, will not be reported here (see Abramov et al., 2021).

Procedure

After a short warm-up phase, we explained a specially developed board game to the children that we had designed to elicit form-related iconic gestures. This is composed of a board with holes shaped as geometrical forms (circle, triangle, rectangle, star) and matching jigsaw pieces. Further game material included a dice depicting the geometrical forms on its sides and a little PLAYMOBIL® figure. The game was embedded in the short story that – for the purpose of eliciting story retelling – resembled a story from a book/video that had been given to the children's families beforehand (see below for further explanation). After being introduced to the game, the children played it with a student experimenter. Playing entailed fitting the geometrical jigsaw pieces into the matching holes on the board and then throwing the dice to push them out again one by one with the PLAYMOBIL® figure that was intended to represent the little boy or girl in the story.

Afterwards, the student experimenter put away the game and left the room. Now the caregiver (mother or father) joined the child and asked her or him to explain the game they had just played. This prompted the genre of EXPLANATION. After a few minutes, the experimenter re-entered the room and told the child that the game reminded her of a book/video story. She then asked the child if she or he could tell the story to the present parent. This prompted the genre of STORY RETELLING. Thus, and contrary to other studies, retellings were not based on cartoon stories that can lead to picture descriptions instead of narratives.

¹Project EcoGest (<https://scs.techfak.uni-bielefeld.de/ecogest/>).

To investigate possible external influences of input on the gestural behaviour of children in the respective genres, we initially created two conditions for each genre. The EXPLANATION situation had the conditions “verbal only” and “verbal + gesture.” In one condition, the experimenter explained the game verbally; in the other condition, she additionally employed iconic gestures depicting the geometrical forms on the board (and dice). Conditions were developed on the basis of the hypothesis that the use of gestures by the adult interlocutor would exert a positive influence on the number of gestures by the child.

FOR RETELLING, the families were sent a commercially available book or video with the story of a mole (*Der Maulwurf und der grüne Stern*) to prepare for the retelling at the lab. We hypothesized that children who had seen the film would use more gestures than those who had read the picture book due to more visual input. The story is about a little mole finding a green star during spring cleaning and trying to bring it back to the sky with the help of its friends. However, a magpie steals the star, and mole and friends have to retrieve it before they can bring it back to the sky. The book contains a small number of pictures, whereas the film was silent without verbal content. In the book condition, one parent was asked to read the story to the child; in the video condition, one parent was asked to watch it with the child. Notably, it was the other parent who was invited to accompany the child to the research center. There was, from a methodological standpoint, no need to control the time spent with the film/book, the parents’ behaviour, and so forth. The primary rationale was to create a close-to-natural conversational situation in which the children could develop a strong incentive to tell the story to the unknowing parent, because they possessed epistemic primacy over the story and thus “owned” it (Takagi, 2019, p. 107). There was no intention to investigate the relation between the interaction at home and the children’s performances in the lab.

For our present research questions that focus on a relation between children’s discourse competence and use of two combinatory types of iconic gesturing in different genres, and caregivers’ scaffolding activities, we did not consider the conditions (verbal only/verbal + gesture for explanation; book/film for retelling) to be decisive. Therefore, we collapsed them and treated them as variations of a naturally occurring situation that would create more “noise” in our data.

Data treatment and coding

All data were transcribed and coded in a frame-by-frame analysis using the tool ELAN to annotate the audio and video. The transcription procedure followed the conventions of GAT 2.0 (Selting *et al.*, 2011) and included the segmentation into intonation phrases (Cruttenden, 1997; Szczepek Reed, 2010). Because children were free to talk as much as they wanted, we controlled for children’s verbosity by dividing the amount of children’s use of gesture by the total number of intonation phrases (IPs): all speech that the children produced in a topic-related manner was transcribed and separated into IPs (Selting *et al.*, 2011). We chose IPs because speakers have been found to segment their speech into them (Szczepek Reed, 2010). Hence, they are pragmatically relevant segments of spoken language. Relating to such research on spoken language, we also considered IPs to be more adequate segments of spoken speech than utterances or clauses. IPs often correspond to smaller syntactic components such as syntactic phrases, but there is no one-to-one relationship between syntactic phrases and IPs (Selting *et al.*, 2011). Even though IPs are coded independently of syntax and on the grounds of prosodic features alone, they regularly form a multimodal package with the syntactic phrase and semantic content

(Cruttenden, 1997, p. 30). Another reason for using IPs as analytical units rather than the number of sentences/utterances was that we found that, in children, it is difficult to determine what could count as a complete sentence/utterance. IPs – even though they do not necessarily cooccur with syntactic phrases – are meaningful units carrying semantic information. Hence, they appear to be more appropriate to measure children's verbosity rather than simple word counting or any other category derived from adult language.

The following example from our study illustrates the results of such differences in segmentation:

1a: Utterance

da ist nen KIND durch n MOND und durch_n STERN und durch_n DACH
und durch_n KIRCHturm °h geflogen UND (---) durch (2) n ein
fenster gefliegt

(*a child flew through the moon, and through a star, and
through a roof, and through a church steeple, and flew through
a window*)

1b: Syntactic units

(1) da ist nen KIND durch n MOND und durch_n STERN und durch_n
DACH und durch_n KIRCHturm °h geflogen

*a child flew through the moon, and through a star, and through a
roof, and through a church steeple*

(2) UND (---) durch (2) n ein fenster gefliegt

and flew through a window

1c: Intonation Phrases (IPs)

da ist nen KIND durch n MOND
there is a child through the moon

und durch_n STERN=
and through a star

und durch_n DACH=
and through a roof

und durch_n KIRCHturm °h geflogen
and through a church steeple flown

UND (–) durch (2) n ein fenster gefliegt
and through a window flown

Segmentation into utterances is not only unproblematic, but it also provides a comparatively rough grid for measuring the children's verbal production. Although breaking the utterance down into syntactic units leads to a finer grid, it is unclear whether the second syntactic unit really is either independent or a continuation of the previous one, and should therefore be treated as part of it. Finally, the segmentation into IPs provides a comprehensive grid of the child's verbal production. They allow for a relatively precise alignment with nonverbal activities while simultaneously avoiding questions about syntactic completeness.

To address the objectives of this article, we developed two coding procedures designed to assess both genre competence and the alignment of iconic gestures with speech.

Coding of genre competence

A linguistically driven description of the two communicative genres EXPLANATION and RETELLING provided the theoretical basis for assessing the children's competence in each

genre. For coding, the main focus was on realizing the global structures of both the event reconstructed through the storytelling and of the game explanation. For EXPLANATION, the global structure included the game material, the central game activities, and the goal of the game (Kern, 2020). For RETELLING, we roughly followed Labov and Waletzky (1967) in assuming a story's global semantic structure to be composed of an orientation phrase containing information about character(s) and actions, location and time: the complicating action that usually constitutes the story's "highpoint" (Peterson & McCabe, 1983, p. 37), which carries important functions for its so-called "tellability" (Norrick, 2004, p. 86); and, finally, its resolution.

The coding procedure was as follows: First, the individual occurrences of the two genres EXPLANATION and RETELLING were divided into the components described in previous research in order to map the content of the respective genre. For EXPLANATION, the following components were identified and annotated when applicable: MATERIAL, comprising (1) dice, (2) PLAYMOBIL® figure, (3) board, and (4) geometrical forms; ACTIONS OF THE GAME, involving (5) doing the jigsaw, (6) throwing the dice, and (7) "flying through"; and (8) GOAL OF THE GAME, which was the removal of all forms from the board. For RETELLING, the respective parts and components were ORIENTATION, comprising (1) place (the mole's cave), (2) the main character (the mole), and (3) his occupation (spring-cleaning); THE COMPLICATING ACTIONS consisting of (4) finding a precious stone that turns out to be a star and (5) the wish to bring it back to the sky; (6) the HIGHPOINT in which a magpie steals the star (because the story comprises three complicating actions, we coded the last and most important one as the high point because it leads to the main events of the story, i.e., finding the star); the RESOLUTION (7) when the star is finally back in the sky with the help of the moon; and finally (8) the coda that included any utterance that marked the ending of the story. Thus, each genre was divided into eight components.

After coding the segments, we measured genre competence in terms of independent production versus scaffolding scores. For each child, we documented how many and which of the components were produced in each of the two genres. Additionally, and in line with the GLOBE model, we annotated whether children produced the component either by themselves or after adults' queries that we identified as scaffolding activities. By collecting the number of components the children produced either by themselves or after a caregiver's scaffolding activity, these annotations resulted in measures of what we labelled **independent production scores** and **scaffolding scores**. This enabled us to account not only for children's discourse competencies in a naturally occurring interaction but also for caregivers' scaffolding activities in this interaction – albeit indirectly. These scores were then used to rate the children's relative genre competence and to indirectly assess the parents' scaffolding activities, thereby drawing on the theoretical assumption that a higher scaffolding score reflects more supportive/scaffolding behaviour on the side of the parent.

We assessed the reliability of our coding of discourse competence by giving 10% of the data to two independent coders. Interrater reliability (Cohen's, 1960, Kappa) was $k = .90$ (for both independent and scaffolding score).

Coding of iconic gestures and semantic gesture–speech alignment

Iconic gestures, sometimes also called representational (Kita, 2000) or referential gestures (Graziano & Gullberg, 2018; Kendon, 2004), are a body posture, hand shape, or trajectory

and manner of a hand or arm movement that depict concrete aspects of events, objects, or actions that are also referred to simultaneously in speech (McNeill, 1992, p. 77). In contrast to other gestures, they have a sign-like character and can refer to absent objects or events (O'Reilly et al., 1997). For depiction, different techniques can be employed (Bergmann & Kopp, 2006; Kendon, 2004; Streeck, 2009): for example, a round shape can be depicted with a circular drawing movement of the hand, or with a static configuration of the hands. Furthermore, iconic gestures are seen to be systematically organized in relation to the speech they are synchronized with and, as such, meaningful (McNeill & Duncan, 2000), thus forming a multimodal unit of “opposite semiotic modes” (McNeill, 2018, p. 276).

Following this classification, iconic gestures were coded per IP when they were identified as depicting aspects of an event or object. Additionally, all iconic gestures were coded with a start and ending of their expressive phase (the so-called gesture stroke; McNeill, 1992). At the beginning, we attempted to code combinations of iconic gestures and speech building using the system developed by Colletta et al. (2014). However, this coding system turned out not to fit the actual data, and the distinctions between the single categories were blurry and thus notoriously difficult to apply. Therefore, we chose to follow Özçalışkan and Goldin-Meadow (2005b) by categorizing iconic gestures as either reinforcing or supplementing the verbal part of each separately coded IP. Reinforcing gestures provide the same semantic content as the verbal part of the utterance, or add precision to it (see Figure 1), whereas supplementary gestures add new information not coded in the linguistic content (see Figure 2; Abramov et al., 2021). With regard to the latter, we did not differentiate whether or not the gesture was a (grammatically) necessary component of the verbal clause.

Example 1: Reinforcing Gesture (Child_014). The child produces a dynamic gesture bringing both hands up over the head in synchrony with the word *Himmel* [sky].

Example 2: Supplementary Gesture (Child_08). The child produces a reinforcing gesture in synchrony with the word “put in.” The gesture adds new information to the



Figure 1. An example of a child's reinforcing gesture.



„dann müssen wir so sowas REINmachen“
 „then we have to put in something
 like this“

Figure 2. An example of a child's supplementary gesture.

verbal phrase, showing the exact movement required to place the puzzle piece in the board; the fingers demonstrably “holding” the puzzle piece.

With regard to the training of the coders and the reliability of coding, we applied the following procedures: both discourse competence and gesture coding were developed in several discussions in which all authors participated. After a first round of coding, we discussed especially doubtful cases at length in the lab session until we achieved agreement on classification. The outcome was discussed with the coders and a coding manual was written as a guideline. Moreover, two independent coders further assessed the reliability of the gesture coding in 10% of the data. Cohen's Kappa (Cohen, 1960) showed a significant ($p < .05$) level of agreement on the interrater reliability for all iconic gestures with $k = .84$. For the individual types, reliability was $k = .83$ for supplementary gestures and $k = .84$ for reinforcing gestures. For discourse competence (independent and scaffolding score), agreement was $k = .90$. Two independent coders assessed the reliability of the coding of IPs on 10% of the data. Agreement on the division of speech into IPs was 99%.

Results

We first provide a description of the children's genre competence (Figures 3 and 4) and then move to further analyses. An overview with absolute numbers for IPs and gestures in both genres is reported in the Appendix.

Children's discourse competence

The complete bars in Figure 3 depict how many children in our sample were able to produce which number of components in the genre explaining.

Children mentioned mostly part of the game material (the dice and the playing piece) and the game activities performed with these materials (throwing the dice and “flying through” with the playing piece). Other parts were produced less often, with the game board being mentioned especially rarely. Only a few children mentioned the game target. This result is in line with other studies of older children (6–8 years of age) showing that less than 50% of the youngest age group mentioned the game target in their explanations. According to Quasthoff *et al.* (2019), the number of children reporting this component increases with age.

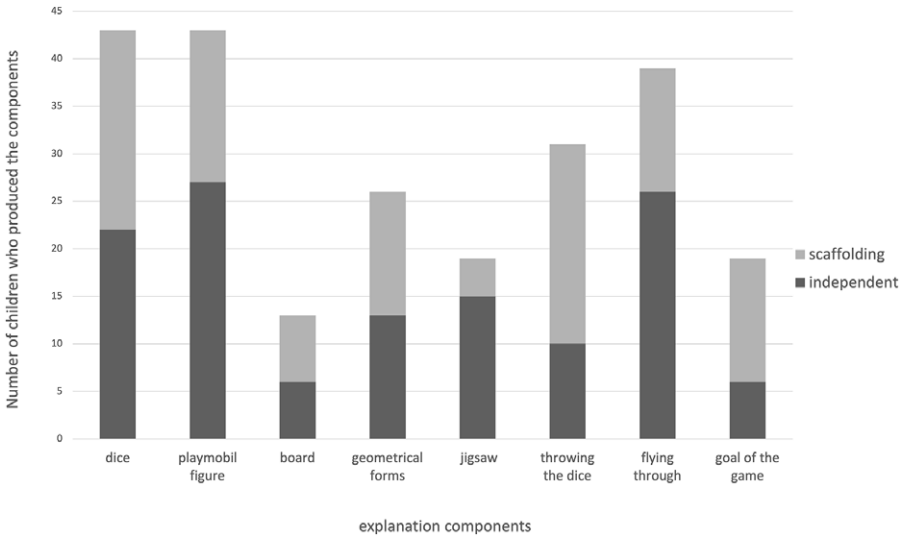


Figure 3. Number of children who produced explanation components independently (black) or by being scaffolded (grey) by their caregivers in the genre explaining.

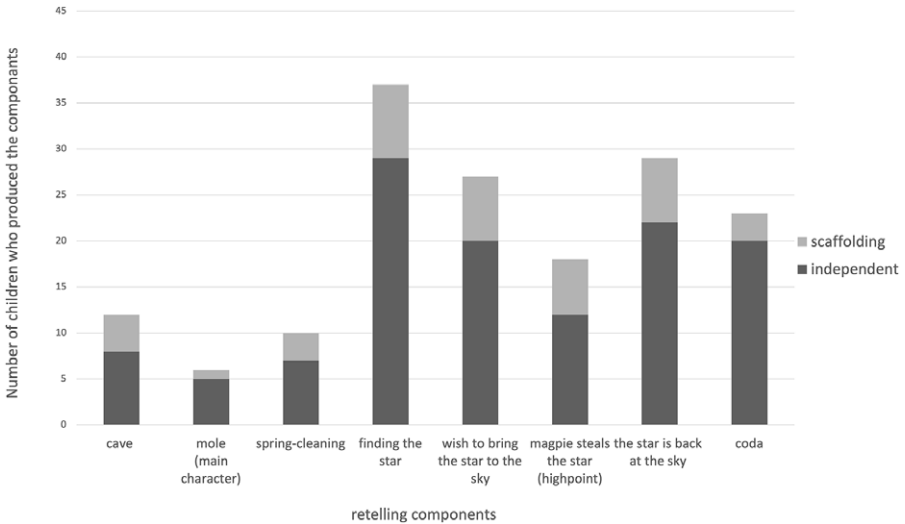


Figure 4. Number of children who produced narrative components either independently (black) or by being scaffolded (grey) by their caregivers in the genre retelling.

The next overview (see Figure 4) shows what kind of components children were expected to produce in the genre of retelling, and how many children were able to do this either independently (black) or with the aid of the adult (gray).

Few 4-year-olds in our sample were able to realize a complete orientation phase to the story with setting information about location (*cave*), time (*morning*), character(s) (*mole*),

and action (*spring-cleaning*). However, more than one half of the children ($n = 29$) independently produced what was identified as the main event of the story's complication (*finding the star*); an additional 8 children produced it at least after a request. Nine children did not produce this component at all. Thus, the overwhelming majority of children (re)constructed the narrative's major complicating event that led to the story's highpoint and resolution. In contrast to the first aspect, the second aspect of the story's complication – that is, that the star needs to be brought back to the sky – was mentioned by fewer children ($n = 20$). Even fewer children produced the story's highpoint – that is, the magpie stealing the star ($n = 18$). However, a renewed increase could be seen with regard to the final structural components of the story – that is, the resolution (*bringing the star back to the sky*) and its coda. In sum, whereas numerous children had difficulties in starting the story, many were able to finish it adequately.

In further analyses, we investigated correlations. The results from the matrixes (see [Table 1](#) for explaining and [Table 2](#) for retelling) are considered in more detail below.

Table 1. Correlations between children's discourse competence scores, their gesture behaviour, and caregivers' scaffolding scores in EXPLAINING

Spearman's correlations ($N = 46$)						
	Independent	Scaffolding	Genre competence	Iconic	Supplementary	Reinforcing
Independent	1.00					
Scaffolding	-.43**	1.00				
Genre competence	.65***	.35*	1.00			
Iconic	.55***	-.31*	.34*	1.00		
Supplementary	.29	-.03	.29*	.64***	1.00	
Reinforcing	.55***	-.32*	-.32**	.95***	.41**	1.00

* $p < .05$; ** $p < .01$; *** $p < .001$

Table 2. Correlations between children's discourse competence scores, their gesture behaviour, and caregivers' scaffolding scores in RETELLING

Spearman's correlations ($N = 46$)						
	Independent	Scaffolding	Genre competence	Iconic	Supplementary	Reinforcing
Independent	1.00					
Scaffolding	-.39**	1.00				
Genre competence	.77***	.23	1.00			
Iconic	.21	-.33*	.05	1.00		
Supplementary	.23	-.23	.11	.84***	1.00	
Reinforcing	.22	-.32*	.06	.94***	.32*	1.00

* $p < .05$; ** $p < .01$; *** $p < .001$

Interconnection between children's discourse competence and scaffolding

To investigate the interconnection between children's discourse competence and caregivers' scaffolding activities, we computed Spearman's correlations for all children. For the genre of explaining, this revealed that children's independent production scores correlated negatively with the scaffolding scores ($r = -.43, p < .01$). The same was true for the genre of retelling in which we found a significant negative correlation between the independent production and the scaffolding score ($r = -.39, p < .01$). Taken together, findings suggest that the less the children provided relevant content themselves, the more support they received, and vice versa.

Children's discourse competences and caregivers' scaffolding activities across conversational contexts

We also computed a Spearman's correlation to analyze whether children's discourse competence in one genre was related to their competence in another genre. However, the result failed to attain significance ($r = .16, p = .28$). A Wilcoxon test revealed that children's production scores differed significantly when compared across genres ($Z = -2.68, p < .01$). This result speaks against a general discourse competence, suggesting rather a genre-specific discourse competence in 4-year-olds. Results were similar for scaffolding activities. The correlation of scaffolding scores across genres did not yield a significant result ($r = .04, p = .82$). Again, a Wilcoxon test revealed that the two scores differed significantly ($Z = -4.55, p < .001$).

Interconnection between children's discourse competence and their iconic gestures

Exploring the interconnection between children's discourse competence and their iconic gestures, we first analyzed children's proportion of iconic gestures and their semantic relationship to speech. Figure 5 provides an overview of different types of iconic gestures for both genres per number of IPs (see absolute numbers in the Appendix). As can be seen, the proportions of gestures per IP were higher in explaining than in retelling.

We then related the children's gestural behaviour to their independent production score as a measurement of discourse competence. For explaining, we found that the children's proportion of iconic gestures correlated highly with their independent production score ($r = .55, p < .01$). Further, analyzing the semantics of the gestures, children's independent production scores correlated significantly with the proportion of reinforcing gestures ($r = .55, p < .01$) but only marginally with the proportion of supplementary gestures ($r = .29, p = .052$).

In the genre of retelling, however, children's proportion of iconic gestures did not relate significantly to their independent production score ($r = .21, p = .16$). Further analyses of the semantics of the gestures did not reveal any significant results ($r = .22, p = .15$ for reinforcing and $r = .23, p = .13$ for supplementary gestures).

Interconnection between children's iconic gestures and scaffolding activities

Finally, we related children's iconic gestures to caregivers' scaffolding activities. In explaining, the children's proportion of iconic gestures in total ($r = -.31, p < .05$) and reinforcing gestures in particular ($r = -.32, p < .05$) correlated negatively with the overall

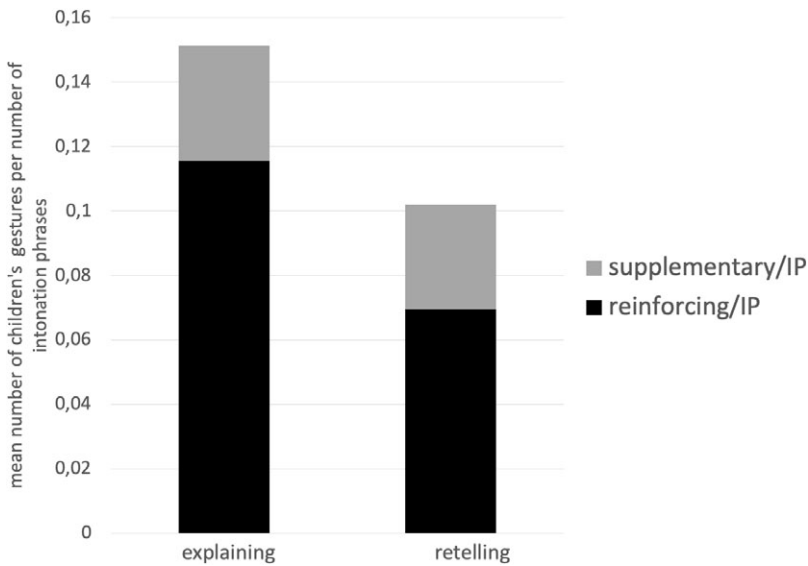


Figure 5. Distribution of children's iconic gestures per IP, subdivided into types of reinforcing (black) versus supplementary gestures (gray).

scaffolding score, whereas supplementary gestures did not correlate with scaffolding scores at all ($r = -.03, p = .83$). A similar pattern can be seen in retelling, in which genre we found the children's proportion of iconic ($r = -.33, p < .05$) and reinforcing ($r = -.32, p < .05$) but not supplementary ($r = -.23, p = .11$) gestures to correlate negatively with caregivers' scaffolding scores. These results suggest that the more scaffolding the children receive from their caregivers, the less iconic (or reinforcing) gestures they produce.

Discussion

The development of a language – with all its facets – is deeply embedded in its use in social interaction. One goal of this article has been to provide quantitative evidence for a context-sensitive interactive support system that is fine-tuned to a child's discourse competence across different communicative genres. We pursued this by operationalizing the GLOBE Model to assess both children's independent production scores and caregivers' scaffolding scores separately in each of the two genres and in each of the conditions.

The results demonstrate that children and adults regard the accomplishment of the genre as a mutual task, thereby confirming the GLOBE model (Quasthoff *et al.*, 2019): caregivers and children collaborate in order to achieve both the telling of the story and the explanation of the game. By establishing the shared goal of accomplishing the genres, the adults as “masters” guide the children as “apprentices” into ways of participating in them, in consideration of their competence. This is shown in the strong negative correlation between caregivers' scaffolding and children's independent production scores across not only the two genres EXPLANATION and RETELLING: the more independently the children produced the respective genre – measured as independently produced semantic components – the less support through scaffolding they received from their caregivers. Thus,

whereas the more competent children received less scaffolding support, less competent children received more.

Moreover, this strong negative correlation persisted across the two genres, even though children's independent scores did not correlate with each other. Together with the finding that caregivers' scores in scaffolding were also not related to each other, our results support a genre-specific development of discourse competence that evokes a specific scaffolding from caregivers. Taken together, the caregivers can be seen to behave consistently across genres in that they attune their scaffolding activities context-sensitively to their child's genre-specific discourse competence. The outcome of the quantitative analyses can thus be interpreted as empirical evidence of Bruner's scaffolding concept: in our data, the adults' support given to their children is clearly fine-tuned to their discourse competence. If the results had shown the reverse effect (i.e., a positive correlation between independent and scaffolding score), the caregivers' scaffolding activities could have been interpreted as simple echo or alignment effects (Pickering & Garrod, 2004). From a developmental perspective, scaffolding can thus be seen to provide a helpful and adaptive resource that guides the children to become more and more sufficient in accomplishing communicative genres independently.

Another goal of our study was to explore how the independent production score as a measurement of children's discourse competence relates to their gestural behaviour. We followed literature suggesting that children's conversational performance is multimodal (Alamillo et al., 2013; Kern, 2011). First, we found a strong positive correlation between the independent production scores and the proportion of iconic gestures in explaining but not in retelling. This difference might be due to the fact that the proportion of iconic gestures to intonation phrases (IPs) was higher in the genre of explaining than in retelling. This means that regarding their amount of speech, children gestured more in explaining than in retelling. It thus seems reasonable that a higher rate of gesturing is required to provide enough statistical power and reveal any relation to speech – also in the form of the independent production score. The results for explaining in particular indicate an interesting aspect of the interdependence between discourse competence and iconic gesturing that seems to be somewhat inconsistent with previous studies: it is the reinforcing gestures that accompany more competence, and not the supplementary gestures (Özçalışkan & Goldin-Meadow, 2009). However, not only were the children in these studies toddlers and thus much younger than those in our study, we also concentrated on other aspects of children's language competence – that is, the global semantic structure of prepatterned communicative genres rather than one- or two-word constructions. Finally, the speech–gesture combinations annotated by Özçalışkan and Goldin-Meadow (2009) (reinforcing, disambiguating, supplementary) included pointing instead of iconic gestures. The children's increasing use of iconic gestures from 30 months of age onward was interpreted as their moving toward a more adult-like pattern of use, as McNeill (1992) also suggested. In this sense, our results may well not contradict their findings at all, but instead confirm that a child's path toward more adult-like gestural behaviour includes an increase in the use of SPECIFIC iconic gestures (Colletta et al., 2014). However, whereas some research suggests that an increase in iconic gesture production is associated with growing language proficiency (Özçalışkan & Goldin-Meadow, 2005a, 2009) and can serve as a forerunner of future narrative (Demir et al., 2015; Stites & Özçalışkan, 2017), other studies indicate that iconic gesturing depends on the structure provided by the language (Furman et al., 2014; Özyürek et al., 2008). Indeed, older adults have been found to score worse than younger adults when carrying out a comprehension task in which they were asked to integrate different

information from gestures and speech (Cocks *et al.*, 2011). Whereas research on the link between iconic gesturing and language thus indicates the complexity of the relationship between the two, we nevertheless suggest that our study of preschool children provides insight into a later window of development when speech–gesture patterns are reorganized. We shall expand on this argument further below.

Second, following the assumption that the discourse competence of 4-year-olds is deeply embedded in social interaction, we explored the relationship of children's gestures and found a negative correlation between the caregivers' scaffolding scores and children's proportion of iconic gestures in both genres. The results suggest that children's discourse competence (rated on an independent production scale) and their use of iconic gestures are intertwined. The more competent the children are rated, the more iconic gestures they seem to produce. In contrast, when children's discourse competence is low and they require more scaffolding, their gestural behaviour unfolds less. This suggests that gestures might not foremost serve compensatory functions in this age group. In contrast, it indicates that children use gestures for communicative purposes as they become more competent in discourse, and that iconic gestures are especially well suited for this. Iconic gestures play an important role for communication (Kita *et al.*, 2017; Özyürek, 2002; Streeck, 2009), and it has been stated that children increasingly use gestures for communicative purposes as their verbal system evolves (Alamillo *et al.*, 2013; Behne *et al.*, 2014; McNeill, 1992; Özçalışkan & Goldin-Meadow, 2009). However, empirical support for the function of iconic gesturing in young children's natural conversations is still scarce. Nevertheless, children at the age of 2 create iconic gestures on the spot and use them for communicative purposes (Behne *et al.*, 2014). Conversely, the use of iconic gestures facilitates comprehension on the side of the (child) listener, because they can help to schematize complex information in appropriate ways (Kita *et al.*, 2017). Observing gestures also helps children to memorize events (Aussem & Kita, 2019). From a developmental perspective, the frequent use of iconic gestures indicates the children's growing awareness of their interactive and communicative functions. Addressing this gap, our result in the form of a positive correlation between discourse competence and frequency of iconic gesturing indicates that language and gesture do indeed already form an integrated system at this age. Support for this comes from a recent study by Graziano and Gullberg (2018, p. 11) who found that L2 learners of different age groups and languages and with varying degrees of linguistic proficiency showed similar patterns with regard to speech–gesture production: gestures occurred overwhelmingly with fluent speech, whereas they tended to be withheld during disfluent speech.

Moreover, looking at the types of iconic gestures in more detail, our analyses suggest that this effect may be driven mainly by the reinforcing gestures. Further analysis showed that the children's rate of iconic and reinforcing gestures correlated positively with their independent production scores and negatively with the scaffolding scores reflecting the caregivers' support activities: the higher the children scored with regard to their independent production – that is, the more content they provided by themselves – the less scaffolding they received, and the more reinforcing gestures they used.

The significant correlation between reinforcing gestures and independent production scores indicates that children employ reinforcing gestures depending on their discourse competence. The findings paint the same picture regarding the link between discourse competence and iconic gesturing: the more competent the children are in retelling the story, the more reinforcing gestures they produce. This account is in line

with other studies proposing that supplementary combinations of gestures and speech foreshadow changes in children's speech development (Özçalışkan & Goldin-Meadow, 2005a, 2009). We therefore suggest that children use reinforcing iconic gestures as an especially useful communicative resource for modifying and/or putting an additional emphasis on what is being expressed verbally. This is in line with previous research reporting that iconic gestures implement discourse-pragmatic principles such as highlighting new information or specifying referents (So et al., 2010). Yet, because existing research points to language-specific phenomena (Furman et al., 2014), it is questionable whether our finding will be generalizable across languages – an issue that needs to be addressed in future research.

Taking up the discussion about the ongoing development of the speech-gesture system above, our findings contribute a new complexity to current research. Following Colletta et al.'s (2010) and Colletta et al.'s (2014) observation that there is a link between narrative complexity and a higher frequency of iconic (and nonrepresentational) gestures across age, our study could be seen as refining the view that both gesture and discourse production develop with age. It suggests a link between discourse competence, reinforcing gestures in particular, and scaffolding behaviour: the higher the independent score in children, the less scaffolding behaviour they require and the more they make use of their (reinforcing) gestures. From this complex relationship, we can propose that later in development, by modifying and/or putting an additional emphasis to what is being verbally expressed, reinforcing gestures may bootstrap children's discourse production by easing recall (Bharadwaj et al., 2022). In this sense, beat gestures were found to bootstrap children's production as well (Vilà-Giménez & Prieto, 2020). To some extent, our results contradict Colletta et al. (2010) who found both supplementary and reinforcing gestures to increase with age (and therefore presumably with narrative complexity). However, this could possibly be explained by the different settings in which data were collected, and the different communicative demands these posed on the participants: our setting in which the children told a story to a parent unfamiliar with it, provided the children with highly authentic reasons for producing the narrative, also because the parents showed genuine interest in the story as reflected by their many questions, especially with the less competent children. Considering that reinforcing gestures provide compelling communicative resources to emphasize important aspects in speech, the interaction engaged in by both children and parents in our settings might have led to a higher rate of reinforcing gestures.

Summary and conclusion

Our article aimed to address whether and how preschoolers' discourse competence, their iconic gesturing, and caregivers' scaffolding activities are linked in communicative task accomplishments. For this purpose, we developed a coding scheme to assess children's situated discourse competence while acknowledging that talk is deeply embedded in conversational interaction and thus should be regarded as being co-constructed by participants. We adopted the GLOBE model for this purpose, looking in particular at two communicative genres that pose different linguistic and communicative demands on children: explaining and retelling. Results clearly show an interdependence between children's discourse competence (measured by independent production scores) and caregivers' scaffolding activities (measured indirectly through scaffolding scores). We suggest this to be additional empirical evidence for the existence of a fine-tuned

interactive support system: the more competent a child is, the less scaffolding adults apply in order to guide the children into achieving more complex communicative tasks.

Another aim of this article was to explore the link between multimodal discourse competence and types of speech–gesture combinations in preschoolers’ iconic gesturing. One key result was indeed that iconic gestures – and reinforcing gestures in particular – correlated with increased discourse competence. Thus, rather than producing relevant genre content in one of the two modalities (speech or gesture), more competent children provided overlapping content in both gesture and speech. This result partly consolidates previous studies with older (i.e., post-toddler age) children (see, e.g., Colletta *et al.*, 2010, 2014), and additionally gives a more detailed view on the developing speech–gesture system: it could be confirmed that children use more iconic gestures when their discourse competence grows, presumably because iconic gestures are valuable communicative resources in ongoing interactions and can probably bootstrap their performance. However, the more stable results found in both genres indicate a negative relation between caregivers’ scaffolding activities and children’s reinforcing gestures. This can be interpreted as indicating a general feature of a speech–gesture system at this age when is still highly dependent on scaffolding – that is, when less scaffolding is required, discourse competence is accompanied by the use of iconic gestures in general and reinforcing gestures in particular. The findings thus add to previous research by suggesting that speech and gesture are tightly linked (Graziano & Gullberg, 2018), and that gestures seem to reflect general abilities such as grasping the communicative intention of others (Rowe *et al.*, 2022). In line with previous research (Alamillo *et al.*, 2013; Colletta *et al.*, 2010, 2014; Özçalışkan & Goldin-Meadow, 2009), findings also suggest that the speech–gesture system undergoes more than one substantial change during development: it changes with growing competence but also with growing independence from the caregivers’ scaffolding, thereby suggesting that children take over increasing responsibility for the communicative goal. This also indicates that children employ iconic gestures for communicative purposes and that their use of gestures reflects their orientation toward mutual understanding and intersubjectivity when performing the respective communicative genres. Nonetheless, more qualitative research will need to address this from an interactive perspective in order to find out more about the communicative functions of iconic and especially reinforcing gestures in natural conversational interaction with children in this age group. Another strand of future research will need to study the gestural practices (Streeck, 2009) of children with different discursive competences and in different communicative genres to find out whether practices change not only with age (Cartmill *et al.*, 2017) but also with context.

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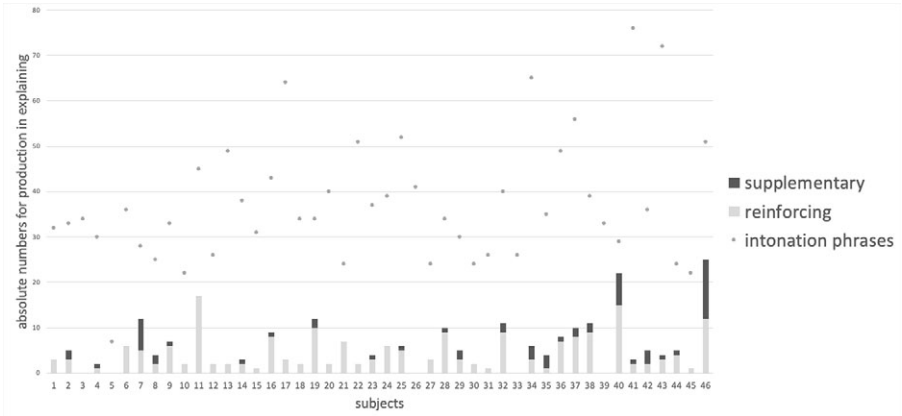
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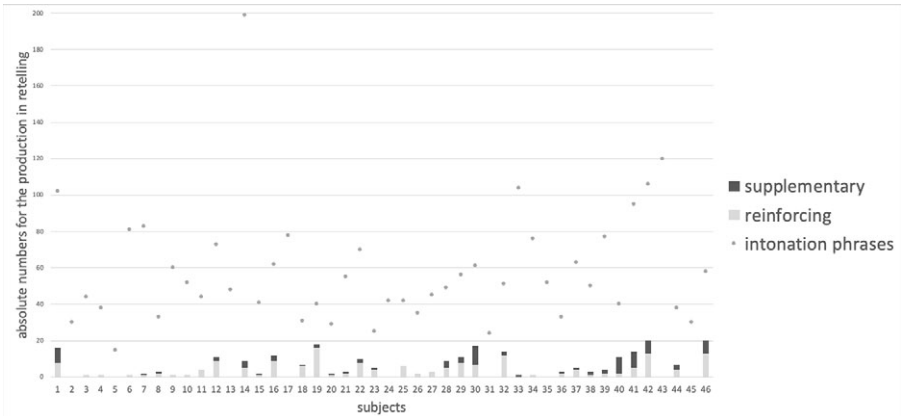
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Appendix

Overview of children’s production of gestures ($M = 4.2$ for reinforcing and $M = 1.3$ for supplementary) and intonation phrases ($M = 37.4$) in the genre of explaining



Overview of children’s production of gestures ($M = 3.7$ for reinforcing and $M = 1.9$ for supplementary) and intonation phrases ($M = 58.3$) in the genre of retelling.



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