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From Interactions to Conversations: The Development of Joint Engagement during Early Childhood

Lauren B. Adamson, Roger Bakeman, Deborah F. Deckner, and P. Brooke Nelson

Georgia State University

Abstract

This research traces the development of symbol-infused joint engagement during mother-child interactions into the preschool years. Forty-nine children, who had been previously observed as toddlers (Adamson, Bakeman, & Deckner, 2004), were systematically observed during interactions with their mothers at ages 3½, 4½, and 5½ during activities related to the past and future, internal states, and graphic systems. Although the amount of symbol-infused joint engagement reached a ceiling by 3½, its focus continued to become more complex and its form more balanced. Individual differences in children's symbol-infused joint engagement were stable across four years. These findings highlight both how joint engagement is transformed as conversational skills develop and how it remains rooted in earlier interactions and supported by caregiver's actions.

A broad range of studies of early development has focused on how young children share attention to objects and events with a social partner. This body of literature stands on the strong theoretical foundation of Vygotsky's (1978) and Werner and Kaplan's (1963) seminal social cultural developmental theories and their several contemporary variations (e.g., Nelson, 2008; Rogoff, 1990; Tomasello, 2003). Recently, much of this work has coalesced around the concept of joint attention (see, e.g., Eilan, Hoerl, McCormack, & Roessler, 2005; Moore & Dunham, 1995; Seemann, 2011) to produce ample documentation of the emergence of specific joint attention behaviors and skills and their use within episodes of joint engagement. This literature also documents the role of joint activities in fostering cognitive, social cognitive, and linguistic accomplishments both concurrently and considerably later in both typically and atypically developing young children.

To date, descriptions of joint attention have been largely confined to the first three years when behaviors such as pointing, skills such as initiating joint attention and responding to joint attention bids, and behavioral states such as coordinated and supported joint engagement have been defined and systematically documented (for brief reviews, see Adamson & Dimitrova, in press; Mundy & Newell, 2007). We designed the present study to explore how joint engagement during parent-child interactions continues to develop into the preschool years, after children begin to routinely infuse symbols into episodes of joint

Correspondence concerning this article should be addressed to: Lauren B. Adamson Department of Psychology, Georgia State University, Atlanta, GA 30303, USA. ladamson@gsu.edu.

The authors were all affiliated with the Department of Psychology, Georgia State University, Atlanta, GA. Deborah F. Deckner is now at Clayton State University, Morrow, GA.

engagement. Our intent was to gain a longer view of developmental changes in the form and focus of joint engagement, one that includes not only the crucial entrance into language but also the emergence of connected conversations about represented events (Nelson, 2008). A closer inspection of typical trajectories after basic joint attention skills are acquired can contribute to theoretical accounts of the pivotal role joint engagement plays in guiding children's attention toward symbolized as well as concrete aspects of shared topics (Charman, 2003), to conceptualizations of the relation between infants' understanding of engagement and young children's burgeoning cognitive and social cognitive abilities (Doherty, 2011), and to the formulation of interventions that seek to foster the development of joint attention skills and encourage increased joint engagement experience (Kaiser & Roberts, 2011).

There is good reason to expect that substantial development of joint engagement would extend well into the preschool years. At age 2½, the impact of symbols on interactions is relatively modest (Adamson & Bakeman, 2006; Brown, 1973; Morford & Goldin-Meadow, 1997). Symbols initially allow brief mention of a past event, an anticipated occasion, an internal state, or a new word during exchanges that focus primarily on literal topics placed here and now. They are also evident when a child issues or responds to a verbal request or when the shared topic is elaborated with words, for example, when a child asserts ownership ("mine") or a partner highlights an attribute of an object ("it's red."). But, as Nelson noted, language is initially "more of an accessory to the activity than an essential part of it" (1996, p. 92). In other words, symbols do not at first distance the focus of interactions much beyond the immediate (Adamson & Bakeman, 2006; Sigel, 1970, 1993; see also Werner & Kaplan, 1963, for a related notion).

Moreover, there are several reasons to expect that caregiver's actions will continue to facilitate the transformation of joint engagement during the preschool years. During infancy, the initial sharing of objects is fully dependent on the partner's support of the communicative channel. Caregiver support remains prevalent as infants begin to actively coordinate attention to both shared objects (*coordinated joint engagement*) and their social partner at the end of the first year and as increasingly "symbol-minded" (DeLoache, 2002) toddlers infuse symbols such as words and symbolic gestures into periods of joint engagement (*symbol-infused joint engagement*). For example, in our longitudinal study (Adamson, Bakeman, & Deckner, 2004), we found that the time children were observed in *supported joint engagement* (when they focused on a shared topic but not on their social partner) held steady and high from age 1½ to 2½ (increasing from 50% to 56% of a 30 min mother child observation) even as symbol-infused joint engagement rose markedly (from 8% to 49%).

To gain a longer view of the developmental path of joint engagement, we extended our longitudinal study (Adamson et al., 2004). Our intent was to describe how our participants, first observed as toddlers 1½ to 2½ years of age in order to observe the emergence of symbol-infused joint engagement, would communicate during a range of age appropriate activities when they were preschoolers 3½ to 5½ years of age. This second wave of data collection positioned us to examine further changes in the form and focus of joint

engagement and to relate variations in these changes to earlier individual differences in the emergence of symbol-infused joint engagement and in the onset of language.

Methodologically, our use of systematic observation—asking trained observers to detect engagement states and assign codes to them (Bakeman & Quera, 2011)—has more in common with studies during early infancy that likewise use systematic observation (e.g., Sander, 1977; Tronick, Als, & Adamson, 1979) than with studies of conversations during the preschool years, for which researchers typically focus on transcribed utterances or turns of talk (e.g., Bartch & Wellman, 1995; Nelson, 2008). Studies employing textual analyses may allow a finer grained read of the connections between conversational turns (e.g., Ensor & Hughes, 2008), but observational, state-based analyses that are scaled in terms of seconds and perhaps minutes can offer a useful complement. In particular, by focusing on how children modulate their engagement with partners, shared topics, and symbols, we were able to sample communication over several years and across symbolic domains. The breadth of these observations allowed us to gain a fuller sense of both developmental transformation and stable variations as symbols begin to liberate shared activities from their immediate situation.

As in our first wave of data collection, we observed children interacting with their mothers during the Communication Play Protocol (CPP), a series of scenes that use the conceit of a theatrical play in order to characterize the child's engagement with people, objects, and symbols. From the mother's perspective, her interactions showcase her child's current talents in a series of scenes during which she, the supporting actress, engages her child, the star, following directions on a cue card that specifies a scene's plot, props, and directorial suggestions but that does not provide an explicit script. From our perspective, each CPP produces samples of the child's current way of engaging in a range of shared activities.

Scenes in both waves encouraged familiar age-appropriate activities that children and caregivers usually enjoy doing together and that provide a broad sample of the child's communication. In Wave 1, we focused scenes on the communicative functions of social interacting, requesting, and commenting—contexts that are often the focus of toddlers' on-going interactions with caregivers. We also used two additional scenes to afford narrative—the discussion of past and future events—that we anticipated, and found (Adamson et al., 2004), would become a context that, like commenting, encouraged symbol-infused joint engagement. For Wave 2, we focused scenes on shared activities whose full realization depended heavily on symbols. Specifically, the Wave 2 CPP consisted of six scenes that focused on three *symbolized domains*—time (using the past and the future scenes from Wave 1), internal state (desires and beliefs), and graphic systems (drawing and writing). This design allowed us to compare joint engagement across waves, not only based on age-appropriate activities for each wave, but also based on two similar scenes (past and future) that occurred in both waves.

Using video records of the CPP, we sought to both characterize major developmental shifts in the form and focus of symbol-infused joint engagement and probe continuities between these shifts and earlier accomplishments. With respect to *form*, we emphasized interpersonal dynamics during shared activities in order to capture shifts in adult contributions as children

master more complicated ways of structuring joint engagement. In Wave 1, we used the distinction between supported and coordinated joint engagement that we first applied to observations of toddlers (Adamson et al., 2004). Key to this distinction is the way the interpersonal channel is sustained during an episode of joint engagement. During coordinated joint engagement, the child actively attends to both the partner and a shared object or event. During supported joint engagement, the child attends actively only to the shared topic and does not actively acknowledge the partner who is scaffolding the communicative channel.

For Wave 2, we sought to sustain the social constructivist essence of the distinction between *coordinated* and *supported* joint engagement that we made in Wave 1. However, we selected new terms to capture a qualitative difference between interactions and conversations. By age 3½, children were readily sustaining attention to both their mother and their shared activity; the emerging communicative challenge was to interweave conversations into these activities. The terms we selected were *balanced* and *scaffolded* because, like coordinated and supported, they capture the contrast between different ways partners facilitate communication about shared topics, but in a way appropriate for the older children. Specifically, *balanced* refers to periods when the preschooler actively participates in both the dialogue and the shared activities that constitute symbol-infused joint engagement, thereby contributing to a connected conversation which, as Nelson noted, involves meshing parts of a dialogue with those of the partner. For example, a period of engagement would be coded *balanced* when the child collaborates in conversation about the activity, making spontaneous suggestions and posing questions (“Mom, let’s do this picture instead.” “Can I have that crayon?”) as well as responding to the mother’s turns. In contrast, *scaffolded* refers to periods when the partner carried more than her share of the conversational load, asking questions and issuing suggestions (“What color is this one?” “Put this one here.”) that kept the conversation flowing during the shared activity.

As noted earlier, when symbols first infuse the joint engagement of children, they do not fully transform the scope of shared attention, which remains focused primarily on the present (Adamson & Bakeman, 2006). Instead, the child has just begun to embark on a long developmental path beyond the perceivable world and into a “symbolic world” filled with “abstract, hidden, or imagined constructs and relations” (Nelson, 2008, p. 152). One way to portray movement along this path is to describe the complexity of shared topics in order to discern if symbolic aspects of these topics become increasingly integrated. Thus, in addition to coding the *form* of joint engagement as described above, we also coded its *focus*. Specifically, we differentiated periods when the child’s symbol use is *elementary* in that it seems to refer to only one element of a shared symbolic topic at a time (e.g., “I’m drawing a cat.”) from periods when symbol use provides a more *complex* focus that contains not only single elements but also connections between elements (e.g., “This cat is eating its dinner.”)

Our overarching goal was to describe the trajectory of joint engagement over the 4-year span encompassing both the toddler and preschooler periods. To do this, we first focused on our new observations during the preschool years in order to document the developmental course of joint engagement from ages 3½ to 5½. In particular, we anticipated that by age 3½ children will spend substantial time during a CPP in symbol-infused joint engagement and

that its amount will remain high when children are observed again at ages 4½ and 5½. This finding would confirm our claim that the fundamentals of joint engagement, including the infusion of symbols that expand its scope from the immediate to the representational spheres of attention, are typically mastered during a child's third year. However while the amount of symbol-infused joint engagement might not change during this period, we anticipated that both the form and focus would, specifically that engagement characterized as scaffolded and elementary will decline and increasingly be replaced by engagement characterized as balanced and complex. This pattern of change would support our contention that development of joint engagement continues well after infancy with the gradual rise of more connected conversations of increasing symbolic depth.

Once we characterized the overall pattern of change of symbol-infused joint engagement during the preschool years, we addressed issues related to how context and gender affect its development and how development during the preschool years might be continuous with and predicted by earlier differences in joint engagement. First, we anticipated that the developmental course of joint engagement during the preschool year might be qualified by context (i.e., the domain of activity). Activities that stress shared contemplation have been shown to encourage symbol use earlier in development. For example, we found in Wave 1 that joint engagement was more often symbol-infused during scenes that afforded commenting rather than requesting or social interacting (Adamson et al., 2004). During Wave 2, we expected that the differing symbolic demands of activities might continue to affect symbol-infused joint engagement. More specifically, we hypothesized that scenes related to the symbolic domain of graphic systems might be less conducive to symbol-infused joint engagement than either the temporal or the internal state domains for two reasons. First, shared activities focused on graphic symbols likely involve more manipulation of the perceptible (such as crayons and pencils) than shared activities related to sharing imperceptible events such as plans and memories or beliefs and desires. Second, as Callaghan and Rankin (2002) argued, graphic symbolism is a late-emerging skill compared to language, in part because parents in Western culture scaffold language far earlier and more extensively than graphic symbols.

Second, we expected that the child's gender might affect the pace of the development of symbol-infused joint engagement during the preschool years such that the movement towards increasingly balanced and probing conversations may occur earlier in girls. Girls often lead boys in early communication development, and indeed exploratory analyses in Wave 1 revealed that, as toddlers, girls spent more time in symbol-infused supported joint engagement than boys, whereas boys devoted more time to object engagement (Adamson et al., 2004). Thus, we anticipated that during the preschool years girls might devote more time than boys to symbol-infused joint engagement generally and perhaps to balanced and complex symbol-infused joint engagement specifically. Also, given the considerable (though not always consistent) evidence that girls produce more emotion talk (e.g., Dunn, Bretherton, & Munn, 1987) and display more rapid development of false belief reasoning (Charman, Ruffman, & Clements, 2002; Nelson, Adamson, & Bakeman, 2008), we anticipated that gender might affect the amount of symbol-infused joint engagement measured when dyads focus on the domain of internal states rather than those related to either time or graphic systems.

Third, we asked whether individual differences in the amount and form of symbol-infused joint engagement evident during the toddler years would continue into the preschool years. We expected that the answer, when phrased simply in terms of overall amount of symbol-infused joint engagement, would be no. Although the amount of symbol-infused joint engagement varied considerably during Wave 1 (the range was 0–53% and 10–87% at 18 and 30 months), we expected that by age 3½ almost all of the children would have mastered the basics of infusing symbols into joint engagement. However, we did expect conceptually interesting continuities across the two waves. First, in line with several recent analyses of stability in how parents guide shared activities with young children (e.g., Adamson, Bakeman, Deckner, & Nelson, 2012; Fivush, Haden, & Reese, 2006; Masur & Turner, 2001), we expected to find a relation between supported joint engagement in Wave 1 and scaffolded joint engagement in Wave 2. Such a converging finding would reinforce the notion that variations in caregivers' contributions may be an enduring characteristic of children's communication development and that they can be an important aspect of interventions for young children with severe language delay (e.g., Ronski et al., 2010) and with autism spectrum disorders (Kasari, Gulsrud, Wong, Kwon, & Locke, 2010). Second, we expected to find continuities across periods that reflected enduring variations in toddler's early accomplishments. Thus, we expected that toddlers who sustained more coordinated joint engagement would tend to sustain more balanced symbol-infused joint engagement as preschoolers, a relation that might stem in part from persistent variations in children's propensity to display interest in their social partners (Adamson, Deckner, & Bakeman, 2010; Mundy, 1995). Moreover, we anticipated that there would be continuity in children's propensity to focus on and explore the symbolic realm such that there would be a relation between how often toddlers sustained symbol-infused joint engagement and how often preschoolers sustained symbol-infused joint engagement that has a complex focus.

Finally, we expected that differences in when toddlers begin to speak (Thal, Bates, Goodman, & Jahn-Samilo, 1997) would still be evident during the preschool years. During the first wave of observations, we found that toddlers who started to speak relatively early spent more time in symbol-infused engagement, which in turn seemed to differentially influence further language acquisition. Here we sought to see if this cumulative advantage extended to the preschool period. Specifically, we predicted that children who were classified as early onset language users during the toddler period would continue to display more advanced expressive and receptive language and that they would devote more time to symbol-infused joint engagement generally, and to balanced form and complex focus specifically, than children who, as toddlers, were classified as average or late onset language users.

Method

Participants

As reported in Adamson et al. (2004), the original sample comprised 56 full-term typically-developing children (equal number of boys and girls and first- and later-born children) and their mothers who had volunteered to participate in a longitudinal study of early communication development. Mothers and children were observed five times (one child

missed the fourth and one the fifth session); the children's mean ages were 18.1, 21.0, 24.1, 27.0, and 30.0 months and the mother's mean age at first visit was 32.4 years. Mothers tended to be well educated (all had completed high school and 75% were college graduates); 78% were European American, 16% African American, and 4% Hispanic American.

For the second wave of data collection, mothers were contacted when their child was nearing 3½ years of age and asked if they would return for observations when their child was 3½, 4½, and 5½ years of age. The response was uniformly positive, with 52 coming in for at least one of the three sessions (43 for all three, 6 for two, 3 for one; children's mean ages were 42.1, 54.1, and 66.1 months). The four children (2 males; 1 first born) who did not participate in the second wave of observations were all European American whose mothers were college graduates and who were on average 2.5 years older than the other mothers.

Sessions

Observational Procedure—The recording sessions for the second wave took place in the same 4.6 × 3.1 m laboratory playroom as the sessions in the first wave. At the beginning of each visit, we discussed the study with the mother and answered any questions she had; at the beginning of the first visit, the mother signed a new consent form. As in the first wave, a visit lasted approximately 2 hours with the first half devoted to preliminary activities and the Communication Play Protocol (CPP) and the second half to standardized assessments. The CPP was recorded with two digital cameras situated behind one-way mirrored windows on opposing walls of the playroom.

Observational Conditions—Observations of mother-child interactions during both waves of this study were made using the CPP. This procedure obtains a varied sample of communication using a series of scenes during which the mother (the supporting actress) is encouraged to follow a plot so that we can observe how the child (the star of the play) is currently communicating. Before each scene, the research coordinator (the play's director) provides the mother with props that can be used during the scene and a cue card that specifies the scene's plot and offers directorial suggestions. No specific script is provided. (Manuals for both versions of the CPP are available upon request.)

During all five sessions of the first wave, the CPP (CPP-1) included six 5-minute scenes that probed three communicative contexts—*social interacting*, *requesting*, and *commenting*. Beginning with the second visit (when the child was 21 months of age) two additional scenes—*the past* and *the future*—were added in order to observe interactions that involved displacement in time (Adamson et al., 2004).

The CPP (CPP-2) for the second wave included six 5-minute long scenes that probed three symbolized domains—*time* (the past and the future), *internal state* (desires and beliefs), and *graphic systems* (drawing and writing). The two scenes associated with the temporal domain were titled “Remember When...” and “Plans for the Future”. Adapting the procedure used by Fivush and colleagues (e.g., Fivush & Haden, 1997), we asked the mother to talk with her child about one or two unique events that they had or will be sharing. In a phone conversation prior to each session, the mother identified two special, one-time events that took place during the past year or were planned for the coming year. Mothers were asked not

to discuss the events with her child prior to the visit. A synopsis of each selected event was printed on a cue card.

Two scenes focused on internal states. In the *desire* scene, the plot involved discussing why different people have different desires. Props were a collection of items such as hats or pretend foods. Our directions suggested that the mother select items, reveal the reasons for her choices, and prompt the child to do likewise. In the *belief* scene, the plot involved a hiding game. The director brought three toys into the room, put two of them in a covered box, and explained that she would come back to get them later. Our directions suggested that the mother ask the child to hide the toys in a different location and then inquire where the director would believe the toys to be when she returned (see Nelson, Adamson, & Bakeman, 2012).

In the two scenes related to the domain of graphic systems, shared activities were encouraged using a variety of props including utensils (e.g., pens, crayons, pencils, chalk, magnetic letters and pictures) and surfaces (e.g., chalk board, paper, magnetic board) as well as prepared materials such as magnetic letters and pictures. In the *printing* scene, the plot involved having the child and mother write together, and in the *drawing* scene, it involved creating a picture together, with the expectation their product would be shared with the director later.

In both CPP versions, the order of scenes was randomized with the constraint that one of the two scenes from each of the communicative contexts or symbolized domains occurred during the Play's first half. Sets of comparable props (5 for the CPP-1; 3 for the CPP-2) were randomly assigned to a visit with the constraint that each participant used a set only once.

Codes and Variables

This study focuses on the codes for joint engagement and symbol infusion defined in Table 1. In both waves, a state of *joint engagement* was characterized by the child actively attending to an object or event that is shared with a partner. Joint engagement was considered *symbol-infused* when the child appeared to be engaged at least in part with some aspect of the situation that was presented via a symbol. The most common indicator was the child's verbalizations, as when the child evoked an absent object by saying its name or when the child stipulated a property of a present object (e.g., "mine."). Other indicators were a child's response to the partner's language that indicated language comprehension (e.g., a child retrieves a specific toy after the mother requests it); the child's use of pretense (e.g., the child playfully uses a block as a phone); and the child's production of a symbolic gesture (e.g., the child moves his or her fingers as if they were a spider crawling up a water spout).

The Wave 1 codes listed in Table 1 were complemented with additional codes, making the set exhaustive. In most subsequent analyses (e.g., Adamson, Bakeman, Deckner, & Ronski, 2009), including this one, we derived three variables from the four given in Table 1: percentage of total time that was coded *supported* or *coordinated*, and percentage coded *symbol-infused* joint engagement. Supported and coordinated were mutually exclusive, whereas symbol-infused could be either supported or coordinated.

For Wave 2 visits—which occurred at ages when essentially all joint engagement is symbol-infused, at least for the typically developing children who are the subject of this report—we coded episodes of symbol-infused joint engagement, but distinguished two forms: *scaffolded* and *balanced*. These codes (see Table 1 for definitions) were designed to differentiate episodes based on the balance between partner and child contributions to their symbol-infused interaction. We derived three variables for analysis: percentage of total time that was coded *symbol-infused* joint engagement (whether scaffolded or balanced), coded *scaffolded* symbol-infused joint engagement, or coded *balanced* symbol-infused joint engagement. The last two necessarily correlate with the first (part-whole relation, but the first can be compared with symbol-infused joint engagement percentages computed for Wave 1 visits. Two additional codes were defined. These codes characterized the child's focus as either *elementary* or *complex* based on whether the child was using symbols in a way that suggested attention to single elements of the theme or whether he or she was integrating several elements (see Table 1 for definitions). Thus two additional variables derived for analysis were percentage of total time that was coded *elementary* or coded *complex* symbol-infused joint engagement. (Manuals for the engagement state coding for waves 1 and 2 are available upon request.)

Coding Procedures

We asked trained coders to observe video records of the CPP and segment the child's engagement into a series of mutually exclusive and exhaustive states. By definition, an engagement state has some duration (at least 3 seconds, as in Bakeman & Adamson, 1984, and Adamson et al., 2004). Coders viewed and reviewed the video recordings, at variable speeds as seemed warranted and in as many passes as required, selecting whichever of the two recordings provided the better view. Codes and times were entered automatically into computer files (James Long Company software for Wave 1—<http://www.jameslong.net>; Mangold International's INTERACT for Wave 2—<http://www.mangold-international.com>). All times were rounded to the nearest second for subsequent processing.

To maintain vigilance and assure reasonable uniformity, coders, unaware of the study's hypotheses, worked in teams of two. To check observer agreement, 15% of the corpus, randomly selected with the constraint that different ages be about equally represented, was independently coded by two teams unaware of the dual assignment. Observer agreement for the dually coded sessions was assessed with Cohen's kappa (Cohen, 1960; Bakeman & Gottman, 1997); the GSEQ program (Bakeman & Quera, 2011) was used to compute time-based kappas with a two second tolerance (for each second, an agreement is tallied if the second observer codes the same state within two seconds of the first). For Wave 1, the pooled kappa for the seven-code scheme—the four in Table 1 plus unoccupied, object-only engagement, and symbol use outside of joint engagement—was .74 (for additional details, see Adamson et al., 2004). For Wave 2, the kappas for the scaffolded–balanced–other set of codes and the elementary–complex–none set were .71 and .77, which with three codes suggests observers who were 90% and 92% accurate, respectively (Bakeman & Quera, 2011).

Language Onset Groups and Language Outcome

To characterize children's language we used scores from the *MacArthur Communication Development Inventory* (CDI; Fenson et al., 1993) and the *Mullen Scales of Early Learning* (Mullen, 1995) administered at the 18-month visit and the Peabody Picture Vocabulary Test (PPVT-III, Dunn & Dunn 1997)—a measure of receptive language skill—and the Expressive Vocabulary Test (EVT, Williams, 1997) administered at the 3½ and 5½ year visits. Caregivers completed the CDI before each visit; trained examiners administered and scored the Mullen Scales and the PPVT-III and EVT during the relevant visit after the CPP was completed.

As in Adamson et al. (2004), we used the CDI and Mullen scores to assign children to groups that reflected their symbolic facility at the beginning of our longitudinal study. Toddlers who scored in the top quarter on the combined Mullen receptive and expressive scores and in the top half on the CDI were assigned to the *early language onset group*, in the bottom quarter on the combined Mullen receptive and expressive scores and in the bottom half on the CDI to the *late language onset group*, otherwise to the *average language onset group*. The effect of these dual criteria was to move a few bottom quartile Mullen but top half CDI, and a few top quartile Mullen but bottom half CDI toddlers into the middle group. When analyzing language outcome, we averaged the 3½ and 5½ year PPVT and EVT scores (they correlated .58, and .60, respectively). Due to missing data, $N = 52$ for the PPVT; the number of children in the early, average, and late onset groups were 10, 34, and 8 with 3, 17, and 6 males, respectively. $N = 51$ for the EVT with one fewer female in the average group. When analyzing Wave 2 symbol-infused joint engagement variables, $N = 49$; the number of children in the early, average, and late onset groups were 10, 32, and 7 with 3, 16, and 5 males, respectively.

Results

Preschooler Development: Form and Focus of Symbol-Infused Joint Engagement

To describe trajectories characterizing the development of the form and focus of symbol-infused joint engagement during the preschool years, we computed intercepts and slopes for the 49 dyads with at least two Wave 2 visits. For these simple regressions, age was coded so that intercepts reflect the expected percentage at 4½ years of age and slopes the expected change in percentage per year. To determine whether slopes and intercepts for the five key variables—total symbol-infused joint engagement, balanced and scaffolded joint engagement, and complex and elementary joint engagement—varied by domain or gender, we conducted mixed design analyses of variance with sex as the between-subjects factor and domain as the repeated measure. Mean values for slopes and intercepts are given in Table 2 along with selected analysis of variance results. Trajectories generated by the mean slopes and intercepts are shown in Figure 1.

As expected, from 3½ to 5½ years of age levels of total symbol-infused joint engagement were consistently high (averaging over 83%); their trajectories did not differ from zero ($p > .05$, all three domains, one-sample t -test). In contrast, all other trajectories differed from zero ($p < .05$, all three domains, one-sample t -test) with the exception of elementary focus in the

time and internal state domains. Again as expected, balanced and complex joint engagement increased with age, whereas scaffolded joint engagement decreased (see Figure 1). At the individual level, balanced form increased more than scaffolded form for 33 of 49 children ($p = .022$ per binomial test), and complex focus increased more than elementary focus for 42 of 49 children ($p < .001$).

Domain effects—Mean intercepts differed by domain for total symbol-infused joint engagement and for its form and focus, whereas mean slopes differed only for focus (see Table 2). As expected, total symbol-infused joint engagement was higher for time and internal state than graphic system domains. With regard to form, balanced was higher and scaffolded lower for graphic system than for time and internal state domains. With regard to focus, complex was lowest for internal state, intermediate for graphic system, and highest for the time domain, whereas elementary was just the reverse. In contrast, mean slopes varied among domains only for focus: Elementary focus decreased with age and complex focus increased with age more for graphic system than for time or internal state domains (see Table 2 and Figure 1).

Sex effects—In contrast to domain, and counter to our expectations, no slopes differed by gender ($p = .19-.93$) nor did any intercepts ($p = .17-.73$) except for complex focus ($p = .007$), which averaged 37% for females but 29% for males. Additionally, and again counter to our expectations, there were no significant interactions with domain for either slopes ($p = .11-.99$) or intercepts ($p = .19-.73$). Previously we reported that girls during Wave 1 (1½–2½ years) tended to score higher than boys on symbol-infused joint engagement generally (Adamson et al., 2004). For example, percentages for symbol-infused joint engagement when discussing the past and future scenes from 21 to 30 months were significantly higher for girls than boys (30% vs. 14%, 45% vs. 29%, 61% vs. 43%, and 64% vs. 48%, $p < .01$ for all, at 21, 24, 27, and 30 months, respectively). Percentages for the corresponding Wave 2 scenes were likewise higher for girls than boys, but not significantly so (87% vs. 85%, 90% vs. 85%, and 87% vs. 82%, $p = .56, .083$, and $.22$, at 3½, 4½, and 5½ years, respectively).

Toddler–Preschooler Development: Continuity of Symbol-Infused Joint Engagement

By 3½ years of age the steady increase in symbol-infused joint engagement, so clearly evident earlier, seems over. Figure 2 shows box-and-whisker plots (Tukey, 1977) for percentage symbol-infused joint engagement during Wave 1 (the five left-hand boxes) and Wave 2 (the three right-hand boxes). The percentages for Wave 1 are based on the interacting, requesting, and commenting contexts and for Wave 2 on the time, internal state, and graphic system domains. The slope for symbol-infused joint engagement was positive from 1½ to 3½ years (average median increase = 9.7% per 3-month period) but, as expected, was relatively flat from 3½ to 5½ (average median decrease = 1.8% per year). A figure based on percentages for just the Wave 1 and 2 past and future scenes showed essentially the same pattern and slopes. These findings support our expectation that the amount of symbol-infused joint engagement would stabilize at a relatively high level around age 3½ for typically developing infants.

To probe individual-difference stability in symbol-infused joint engagement, we computed correlations between all pairs of sessions; first for percentages based on Wave 1's interacting, requesting, and commenting contexts and Wave 2's time, internal state, and graphic system domains; and second for percentages based just on both waves' past and future scenes (see Table 3). Most correlations adjacent in time (those on the diagonal) were strong ($r = .50$, Cohen, 1988) or nearly so, and even the between-Wave 2½–3½ year correlations were moderate ($r = .30$, $p < .50$), and this was true for both context–domain and past–future correlations. The only weak correlation ($r = .10$, $p < .30$) was the 4½–5½ year one based on the past and future scenes. Not surprisingly, when moving further from the diagonal (i.e., further apart in time), strong correlations become less frequent. More noteworthy is that the 27-month scores significantly predicted outcome more than 3 years later, for both context–domain and past–future correlations, and the 30-month scores predicted outcome 3 years later for the past–future correlations.

To probe continuity further, and in line with our three specific predictions, we computed supported–scaffolded, coordinated–balanced, and symbol-infused–complex correlations between Wave 1's 2½ and Wave 2's 3½ year session. These correlations were $-.05$, $.08$, and $.53$, $p = .75$, $.60$, and $< .001$ for context-domain percentages and $.13$, $.09$, and $.19$, $p = .39$, $.54$, and $.19$ for past–future percentages. Thus, we did not find the predicted continuity for form—the supported–scaffolded and coordinated–balanced correlations were small and not significant—but did find continuity for focus: the symbol-infused–complex correlation was large and significant for the context–domain but not the past–future scenes.

Language Onset and Symbol-Infused Joint Engagement

We used analyses of variance to determine whether toddler's language onset (categorized as early, average, or late; details in the Method section) would affect their language ability and amount of symbol-infused joint engagement when they were preschoolers (see Table 4). As expected, children assigned to the early-onset language group scored higher on both the PPVT and the EVT (average 3½ and 5½ year scores) than children assigned to the late onset group (although the omnibus EVT effect was marginal). They also scored higher than the average-onset group on the PPVT but not the EVT. This accords well with the pattern of findings for 2½ year PPVT and EVT scores (Adamson et al., 2004) when early- and late-onset groups differed, but the average-onset group did not differ from the other groups for the PPVT and differed only from the early group for the EVT. Given that the 2½ year PPVT and EVT scores correlated $.80$ and $.61$ with the mean PPVT and EVT scores analyzed here, a similar pattern of results is not surprising.

Otherwise, and counter to expectation, the language-onset groups differed only with respect to complex focus. Complex focus averaged 54% for the early onset group but 31% and 29% for the average and late onset groups. No slopes differed by language group ($p = .58$ – $.90$; not tabled) nor did any intercepts except for complex focus (see Table 4): No interactions with domain were significant for either slopes ($p = .71$ – $.93$) or intercepts ($p = .11$ – $.70$).

Discussion

This longitudinal study provides an extended view of the developmental course of symbol-infused joint engagement from the time when children are first using symbols sparingly during object-focused social interactions to the time when they can sustain conversations about topics displaced in time and space. Our findings highlight both the length of this course and the crucial role caregivers play during a child's movement towards balanced conversations with symbolic depth.

One of the crucial questions in the communication development literature concerns when important milestones are typically achieved (Adamson, 1996). Our longitudinal observations indicated that stabilization in the amount of symbol-infused joint engagement occurred between ages 2½ and 3½. In our observations from ages 1½ to 2½ (Adamson et al., 2004), the amount of symbol-infused engagement had increased from 6% to 47%. When observations were resumed a year later, its amount had increased to over 80% and remained above 80% for the next two annual observations. The possibility that the increase between waves was largely due to changes in communicative context is unlikely since the rise occurred both when comparisons were made in the same context (the time domain) and across age-appropriate contexts (interacting, requesting, and commenting in the first wave; time, internal state, and graphic systems in the second wave).

A more plausible explanation is that the increase we documented reflects a surge in children's interests in and parents' expectations for connected conversation that occurs as children become more facile language users. As Nelson (2008) suggests, when children enter the symbolic world, they also engage more fully in discourse that encourages further exploration of this world. A related explanation is that children who at age 2½ years were still not facile language users had acquired by age 3½ sufficient symbolic skills to sustain symbol-infused joint engagement with ease. Such a pattern of "catching up" has been documented using language assessments in late talkers (Dale, Price, Bishop, & Plomin, 2003; Rescorla, Mirak, & Singh, 2000). Our observations replicate this pattern during mother-child interactions. Although a rise in amount of symbol-infused joint engagement between 2½ and 3½ years of age occurred for almost all of our participants, it was especially pronounced in those who were classified at 18 months as relatively average or late language onset toddlers. Compared to their peers with early language onset, they had significantly lower levels of symbol-infused joint engagement throughout our first wave of observations. However, consistent with the notion of catch-up, the three groups did not differ significantly during any session in the second wave and, at 66-months, mean symbol-infused joint engagement percentages were uniformly high and virtually identical for the three groups. These ceiling effects may account, at least in part, for the diminished effect of gender on the amount of symbol-infused joint engagement in Wave 2 as compared to Wave 1.

Such a convergence at near-ceiling levels contrasts markedly with the prolonged presence of relatively low levels of symbol-infused joint engagement observed in children with severe, persistent expressive language deficits (e.g., Adamson et al., 2009; Adamson, Ronski, Bakeman, & Sevcik, 2010). More closely spaced observations that can specify the shape of typical trajectories from 2½ to 3½ will be especially helpful in interpreting observations of

atypical trajectories for which issues related to distinguishing patterns of delay and deviance are often paramount.

There are interesting parallels between the changes in the focus and form of symbol-infused joint engagement during the toddler and the preschool. During both periods, the child's attention to aspects of the shared topics expanded gradually, first edging beyond the here and now to include aspects of the past and future, the imaginary, and the absent (Adamson & Bakeman, 2006), and later connecting elements. However, in contrast to these changes in focus, changes in form, although significant, were considerably more modest during both periods. Throughout both, there was evidence that children were increasingly able to actively involve the partner in joint engagement, first through coordinating attention to both the partner and shared object, later through balanced conversations.

Yet, except for the interesting exception of the domain of graphic system that we discuss later, the most striking finding was that approximately half of all symbol-infused joint engagement during all eight observation sessions was supported by the caregiver in ways that freed the child to focus predominantly on their shared topic. The continued persistence of caregiver support fits well with Vygotsky's (1978) seminal image of a zone of proximal development, which features caregivers' scaffolds that are continually updated to suit a child's current accomplishments and anticipated achievements. Moreover, it invites further study of how caregivers both lead and respond to their child's engagement in ways that display the inherently bidirectional influences that help children compose periods of joint engagement. One especially intriguing possibility is that the different trajectories for focus and form are related, that changes in focus are facilitated, in part, by the relative stability of scaffolding during joint engagement. This contention is in line with Sigel's (1993) provocative argument that distancing should be conceived not only from the child's perspective, but also in terms of the partner's social acts. These acts, which in some contexts Sigel labeled distancing acts, may stimulate representational development as the child is stimulated to separate from the immediate environment and to attend to "the nonpresent... or the nonpalpable" (p. 142). In addition, variations in parents' contributions need to be considered in order to discern whether (and how) the form and focus of episodes of symbol-infused joint engagement is influenced by variations in adults' conversational styles (such as those that have been documented during parent-child reminiscing; Fivush, et al., 2006; Melzi, Schick, & Kennedy, 2011), by the overall quality of scaffolding, and by the use of specific strategies such as following the child's focus and elaborating topics (see, e.g., Adamson et al., 2012).

Our findings also underscore how variations in shared activities may affect symbol-infused joint engagement. The parents in our study readily enacted different plots related to different symbolic domains in the Communication Play Protocol, and preschoolers were sensitive to these differences. In line with compelling arguments that the development of episodic memory and of theory of mind are intertwined (Nelson & Fivush, 2004; Perner, Kloos, & Gornik, 2007), we expected and found few differences in the amount and form of symbol-infused joint engagement between the time and internal state domains. This reinforces arguments that these domains are often linked, especially as children engage in conversations about people, including themselves, in time. However there was also an

unexpected difference in focus, with complex states occurring over twice as often in conditions probing time rather than internal states. One possible explanation is that even simple narrative structures about the past and the future draw attention to the relation between elements (including internal states) and thus facilitate higher-level distancing. In contrast, conversations about desires and beliefs may initially entail primarily the labeling of individual states such as an emotion, an exercise, albeit important, that would have been coded as having an elementary focus.

Comparisons with what transpired when scenes focused on graphic systems provide an informative contrast. As predicted, we found lower amounts of symbol-infused joint engagement during these scenes, which agrees with suggestions that props related to drawing and writing such as crayons and chalk are more likely than other props to interfere with attention to symbols (see Tare, Chiong, Ganea, & DeLoache, 2010, for a similar phenomenon during shared reading of picture books containing manipulatives). Even more intriguing is the unanticipated finding that engagement was more likely to be balanced during scenes related to graphic systems than in the other two domains. This finding reinforces the claim that cultural scaffolds may be more limited for graphic systems than for verbal language during the preschool years even though, as we observed, this may be a period when there are profound developmental changes in the complexity of children's focus related to graphic representations as they begin to more fully appreciate their symbolic aspects (Callaghan & Rankin, 2002).

Finally, the findings reveal impressive continuities in individual differences related to symbol use. The more toddlers devoted time to symbol-infused joint engagement, the more likely that this state would focus on more complex shared topics when they are preschoolers. Further, children who distinguished themselves with an early onset of language at age 1½, as well as girls, who were more likely than boys to have early language onset, more often displayed complex focus during symbol-infused joint engagement than peers with either average or relative late language onset. These continuities across many years likely reflect, in part, persistent variations in children's interest in and skills related to symbolic representation.

In conclusion, this study provides a systematic view of significant changes that occur in children's joint engagement as they share an increasingly symbolized world with caregivers. Both methodologically and substantively, our findings demonstrate the benefits of capturing these transformations in ways that bridge the developmental path between toddlerhood, when children are initially infusing symbols into interactions focused on objects and immediate events, and the preschool years, when they are increasingly engaging in conversations about distant and imaginary topics. The observations presented here display both dramatic shifts between these two periods in the children's capacity to sustain symbol-infused joint engagement and the impressive continuities in caregiver's supportive actions and in early individual differences in children's symbolic skill development. Future studies are now needed to detail the dynamics of the transactional processes involved in the development of symbol-infused joint engagement into and during the preschool years. Moreover, it is important to discern how culture influences the developmental course including the relative importance placed on engaging a social partner and the shared

exploration of objects and how developmental disorders such as autism that affect joint engagement continue to exert their influence as children become increasingly verbal.

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Figure 1.

Percentage of time coded symbol-infused joint engagement total and by form (balanced vs. scaffolded) and focus (complex vs. elementary) for the 3½, 4½, and 5½ year sessions of Wave 2. Trajectories were generated from the mean intercepts and slopes for the three different domains; $N = 49$. For details, including domain differences, see Table 2.

Figure 2.

Box-and-whisker plots for percentage of time coded symbol-infused joint engagement. The five left-hand boxes represent percentages based on Wave 1's interacting, requesting, and commenting contexts ($n_s = 56, 56, 56, 55$, and 55 ; $1\frac{1}{2}$ – $2\frac{1}{2}$ years) and the three right-hand boxes represent percentages based on Wave 2's time, internal state, and graphic system domains ($n_s = 49, 48$, and 47 ; $3\frac{1}{2}$ – $5\frac{1}{2}$ years). The circles represent scores more than 1.5 times the interquartile range above the 75th percentile or below the 25th percentile.

Table 1

Engagement State Code Definitions

Wave	Engagement state	Definition
1	<i>Supported joint</i>	The child and mother are actively involved with the same object or event, but the child is not actively acknowledging the mother's participation.
	<i>Symbol-infused supported joint</i>	The child and mother are engaged with the same referent and there is evidence that the child is actively attending to symbols, but the child is not explicitly attending to the mother; e.g., the mother may be assisting the child as she focuses on naming and manipulating pieces of a puzzle.
	<i>Coordinated joint</i>	As is the case with supported joint engagement, the child and mother are actively involved with the same referent, and the child is actively and repeatedly acknowledging the mother's participation, likely by visually referencing the mother at critical junctures in the interaction.
	<i>Symbol-infused coordinated joint</i>	The child is coordinating her attention between the mother and a shared referent, and the child is actively attending to symbols; the child may indicate her attention to the mother either by glancing toward her and/or by talking to her (e.g., <i>Mommy, it's your turn!</i>).
2	<i>Scaffolded symbol-infused</i>	The child and mother are actively involved with the same referent that may be a present object or event or a represented topic, and the child is actively attending to symbols, but the structure of the conversation is largely maintained by the mother. For example, the mother actively elicits the child's contributions by, for example, asking questions. Or, the child merely repeats or rephrases the mother's utterances.
	<i>Balanced symbol-infused</i>	As is the case with scaffolded symbol-infused joint engagement, the child and mother are actively engaged with a shared referent and the child is actively attending to symbols. In addition, the child is taking an active role in maintain the conversation by, for example, introducing new elements into the conversation or elaborating upon the mother's prior utterances. The sense is that both partners are meshing their contributions with their partner's contributions in a way that distributes the responsibility for the form and flow of the conversation.
	<i>Elementary</i>	The child's use of symbols appears elementary in that it stays close to the present, focusing on only one element such as a label or a single aspect of a description (e.g., "That's red!" "It's hidden.").
	<i>Complex</i>	The child's use of symbols moves beyond elementary in that he or she focuses on more than one symbolized element and their relationship such as their sequence, similarity, causal relation (e.g., "I like red but I don't like blue." "We know and she doesn't!").

Table 2

Domain Differences in Total Symbol-Infused and Form and Focus Trajectories

Symbol-infused joint engagement	Domain		η^2_p	<i>p</i>
	Time	Internal state		
<u>Intercept</u>				
Total	85.9 _b	86.8 _b	78.6 _a	.34 <.001
Balanced form	37.8 _a	40.8 _a	50.6 _b	.36 <.001
Scaffolded form	48.2 _b	46.0 _b	28.0 _a	.55 <.001
Complex focus	46.2 _c	15.0 _a	38.4 _b	.70 <.001
Elementary focus	21.9 _a	45.1 _c	38.3 _b	.65 <.001
<u>Slope</u>				
Total	0.1	-0.7	-2.5	.030 .23
Balanced form	4.4	4.1	5.1	.002 .90
Scaffolded form	-4.3	-4.8	-7.6	.029 .25
Complex focus	5.3 _a	4.6 _a	19.6 _b	.25 <.001
Elementary focus	-1.9 _b	0.2 _b	-14.0 _a	.32 <.001

Note. Mean intercepts are percentages centered on the 4½ year visit and mean slopes are change in percentage per year; *N* = 49. Partial eta-squares and *p*-values are from a repeated measures analysis of variance. Means that do not differ, *p* < .05, per a Tukey post-hoc test share a common subscript.

Table 3

Correlations for Percentage Symbol-Infused Joint Engagement Between All Sessions

Age	21 mo	24 mo	27 mo	2 ½ yr	30 mo	3 ½ yr	42 mo	4 ½ yr	54 mo	5 ½ yr	66 mo
<u>Context-domain</u>											
18 mo (1½yr)	.51**	.57**	.45**	.35**		.19		.36*		.33*	
21 mo	—	.78**	.66**	.56**		.29*		.25		.30*	
24 mo (2 yr)		—	.79**	.69**		.28		.30*		.34*	
27 mo			—	.79**		.42**		.37*		.41**	
30 mo (2½ yr)				—		.37**		.30*		.18	
42 mo (3½ yr)						—		.52**		.37*	
54 mo (4½ yr)								—		.47**	
<u>Past-future</u>											
21 mo	—	.64**	.57**	.47**		.29*		.17		.17	
24 mo (2 yr)		—	.63**	.57**		.23		.11		.18	
27 mo			—	.72**		.43**		.24		.41**	
30 mo (2½ yr)				—		.42**		.42**		.44**	
42 mo (3½ yr)						—		.50**		.50**	
54 mo (4½ yr)								—		.25	

Note. The top set of correlations is based on Wave 1's interacting, requesting, and commenting contexts and Wave 2's time, internal state, and graphic system domains. The bottom set of correlations is based on both waves' past and future scenes. Wave 1 includes 18–30 months (*ns* = 55–56) and Wave 2 includes 3½–5½ years (*ns* = 47–49).

* *p* < .05

** *p* < .01

Table 4
Language Onset Group Differences in Preschooler Language and Joint Engagement

Variable	Language onset group				η^2	<i>p</i>
	Early	Average	Late			
PPVT	119 _a	108 _b	103 _b		.189	.006
EVT	118 _a	110 _{ab}	107 _b		.097	.087
Symbol-infused total	97	83	83		.063	.23
Balanced form	67	41	44		.088	.12
Scaffolded form	60	42	39		.032	.47
Complex focus	54 _a	31 _b	29 _b		.248	.001
Elementary focus	40	35	38		.087	.13

Note. Peabody Picture Vocabulary Test (PPVT) and Expressive Vocabulary Test (EVT) scores were averaged over the 3½ and 5½ year visits; *N* = 52 and 51, respectively. Their eta-squares and *p*-values are from a one-way analysis of variance. The other variables are percentages, specifically mean intercepts centered on the 4½ year visit; *N* = 49. Their eta-squares and *p*-values are for the group effect of a mixed design, group by domain analysis of variance. Means that do not differ, *p* < .05, per a Tukey post-hoc test share a common subscript.