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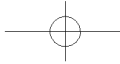
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THE ORIGIN OF LANGUAGE: Evidence from Longitudinal Research in Autism

Michael Siller, M.A., and Marian Sigman, Ph.D.

Abstract. *Long before children acquire an understanding of the semantic and syntactic characteristics of spoken language, children have already developed a vast knowledge about the pragmatics of human communication. To a large extent, this knowledge develops during preverbal interactions between the infants and their parents. Emphasizing the continuity between preverbal and verbal communication is of great intuitive appeal; however, it has proven difficult to empirically validate specific links between the infants' preverbal experiences and the subsequent origin of spoken language. The findings reviewed in this paper provide such a specific link. During the second half of the first year, typically developing infants and their parents start to collaborate in establishing a shared interest in the world around them. Our findings suggest that, at least in the case of autism, the success of the parent-child dyad in managing such a shared interest in external objects or events is developmentally linked to children's long-term language outcomes.*

Learning a native language is an accomplishment that is within the grasp of most toddlers. Yet, as Jerome Bruner and Virginia Sherwood put it, "discovering how children do it has eluded generations of philosophers" (Bruner & Sherwood, 1983, p. 41). Early accounts, stretching historically from St. Augustine to traditional learning theory, made us believe that language acquisition is essentially a process of forming associations between words on the one hand and agents, actions, and objects on the other (O'Connell, 1969; Skinner, 1957). The limitations of this associationist view became obvious in the late 1950s, particularly in the work of Noam Chomsky (Chomsky, 1957). Chomsky's insight was that the process of language acquisition is far more complex than connecting words with meaning. Children also acquire a grammar – an underlying system of rules enabling them to generate an infinite number of new sentences. Importantly, in shifting the emphasis from word learning to rule acquisition, traditional principles of associative learning suddenly appeared ill equipped to explain children's growth in language. It seemed unreasonable to assume that children could learn about the underlying structure of language just by imitating their elders and exposure to systematic reinforcement. Given the constrained view on learning predominant at the time, Chomsky took his argument as far as to question the learnability of language altogether. He argued that all human



languages share a common set of syntactic rules – these rules are part of children’s innate endowment, ready to be recognized as soon as children are exposed to their native languages. It wasn’t until the early 1980s that Bruner pointed out that parents participate in language learning in a manner far beyond serving either as a model to imitate or as a source of reinforcement (Bruner, 1981; Bruner & Sherwood, 1983). From early on, mother and child develop conventions for carrying out joint tasks. It is the structure inherent in these joint tasks that may shape children’s learning about the structure underlying spoken language.

Bruner’s proposal of developmental continuity between preverbal and verbal exchanges was sparked by John Austin’s insight that, even when mature language is considered, word meaning and grammar are insufficient to convey a speaker’s communicative intent (Austin, 1962). Bruner provides the example of a trivial question that is being asked at a dinner party: “Would you be so kind as to pass the salt?” Very likely, the listener will interpret this question as a polite request for the salt rather than an inquiry concerning his or her perceived kindness. This interpretation is possible a) because of the listener’s familiarity with the communicative context, and b) because the listener shares some of the speaker’s notions about intentions. For developmental psychologists, this characterization of mature language use is intriguing because it points in the direction where continuity may be found between preverbal and verbal exchanges. Long before children appreciate the semantic and syntactic characteristics of spoken language, they already have acquired a rich body of knowledge about the context in which communication takes place as well as intentional states that motivate people to communicate. This knowledge may serve as a “matrix into which syntactic and semantic achievements can be set” (Bruner, 1981, p.159).

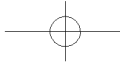
To a large extent, Bruner’s empirical work on the origin of language was concerned with describing and characterizing the early social experiences of infants. Based on a number of extensive longitudinal single case studies, Bruner emphasized that the communicative life of preverbal infants is limited to a rather small number of familiar interactive routines (Bruner & Sherwood, 1983; Ninio & Bruner, 1978; Ratner & Bruner, 1978). In his view, these familiar routines provide the infant with the experiences necessary to interpret the communicative intentions of other people: Infants and their mothers develop and conventionalize the rule structure governing the exchange, infants learn to make their intentions plain, and mothers learn to interpret the intentions of their children. Moreover, Bruner argues that the vast majority of early mother-infant exchanges are governed by three basic communicative intentions: affiliating, requesting, and sharing.

During the first six months of life, most social encounters between mother and infant are aimed at establishing affiliation. Initially, interactions are concerned with the mutual adaptation between the infant’s cycling physiological needs and the mother’s attempts to anticipate and fulfill these needs. For example, studying early feeding interactions, Kenneth Kaye was able to show that even during the first two weeks of life mothers and infants learn to read each other’s signals and to anticipate one another’s behaviors (Kaye, 1977, 1982). As infants achieve control over their own gaze during the second month (Bronson, 1974), the face-to-face encounter becomes

the primary context for social interaction. But again, interactions are directed towards establishing affiliation: Mothers and infants learn to regulate eye contact and arousal, to share each other's emotions, and to respond to each other's facial cues (Brazelton, Koslowski, & Main, 1974; Cohn & Tronick, 1988; Kaye & Fogel, 1980; Stern, 1974).

As infants move through the second half of the first year, mothers and infants increasingly communicate *about* objects and events outside the dyad (e.g. toys or food). In managing such a triadic setting, involving mother, infant, and a toy, two communicative intentions become visible. First, mother and infant develop interactive routines aimed at regulating each other's object directed behaviors. Initially, these routines have the exchange of objects as their common theme. The infants learn to request objects being held by their mothers and also to return them when being prompted to do so. Later, the interactive routines increase in sophistication, now being directed at obtaining help in carrying out one's own goal directed actions (e.g. blowing up a balloon). The second communicative intention emerging during the second half of the first year is directed towards achieving and maintaining a shared interest in surrounding objects and events. That is, mothers and infants develop interactive routines concerned with directing and following each other's attention. Here, communication is not instrumental in the sense that it is intended to obtain objects or services from another person. Rather, it serves the sole purpose of recruiting another person's attention to objects, states, and topics that are at the center of one's own attention.

Empirical evidence linking infants' experiences within these early interactive routines to children's subsequent rate of language acquisition has been scarce. Rare exceptions are a number of longitudinal studies that demonstrate the predictive significance of the dyad's success in managing a shared interest in surrounding objects or events. In several longitudinal studies on play interactions between 9 to 15 month old infants and their mothers, Melinda Carpenter, Michael Tomasello, and colleagues have demonstrated that infants who spent more time in a state of shared toy-engagement with their mothers subsequently developed language at a faster rate than infants who spent less time in shared toy-engagement with their mothers initially (Carpenter, Nagell, & Tomasello, 1998; Tomasello, Mannle, & Kruger, 1986; Tomasello & Todd, 1983). In addition, researchers have also studied the individual contributions of mothers and infants in establishing such a shared interest in the external world. Focusing on the parents' interactive behaviors, several longitudinal studies have shown that the tendency to describe objects or events occupying their children's current focus of attention reliably predicted the rate of children's subsequent language learning. (Akhtar, Dunham, & Dunham, 1991; Bornstein & Tamis-LeMonda, 1989; Dunham & Dunham, 1992; Smith, Adamson, & Bakeman, 1988; Tamis-LeMonda, Bornstein, & Baumwell, 2001; Tamis-LeMonda, Bornstein, & Damast, 1996; Tomasello & Farrar, 1986). Similarly, with respect to the infants' early communication skills, Jessica Markus and colleagues have shown that the twelve month olds' capacity to follow another person's pointing gesture to an interesting



object or event is a reliable precursor of children's subsequent language development. (Markus, Mundy, Morales, Delgado, & Yale, 2000). Taken together, these empirical studies suggest that episodes of shared interest between parent and infant provide a unique context for children's emerging language skills. They also provide some insight as to which behaviors of parents and infants are key in managing such encounters. That is, both the parents' responsiveness to the infants' focus of attention and the infant's responsiveness to the parents' bid for joint attention were shown to be linked to children's subsequent growth in spoken language.

Managing a shared interest in typical development

In the late 1920s, Lev Semonovich Vygotsky argued that the origin of new skills is typically embedded in social situations where children are prompted or scaffolded by an expert, for example a parent (Cole, John-Steiner, Scribner, & Souberman, 1978). During recent decades, a variety of authors including Jerome Bruner, Kenneth Kaye, Roger Bakeman, and Lauren Adamson have used Vygotsky's framework to conceptualize infants' emerging abilities to actively manage social encounters with their parents (Bakeman & Adamson, 1984; Bruner, 1981; Kaye, 1982). The authors argue that initially the roles of managing shared and reciprocal interactions are not distributed evenly between infants and parents. At first, it is the primary responsibility of the parents to respond to the infants' built in rhythms and contingencies, to interpret and complete their intentions, to imitate certain aspects of their behavior, and to be responsive to their actions. Only gradually, as the infants develop the skills necessary to play a more active role in managing the social encounter, parents relinquish increasing amounts of responsibility to their children.

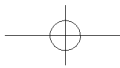
A similar framework has been applied specifically to describe the infants' emerging ability to manage a shared interest in surrounding objects or events. Since infants achieve control over their own gaze during the second month, the predominant context for social interaction with their parents is the face-to-face encounter. This changes around five months of age as infants increasingly develop an interest in the world of objects. Initially, however, infants still lack the social understanding necessary to coordinate their interest in objects with their interest in people. "Objects are perceived and used, and persons are communicated with—but these two kinds of intention are expressed separately" (Trevarthen & Hubley, 1978, p. 184). During these early stages of development, parents carry a large share of responsibility to assure that a shared interest in an object or event is established. In a variety of studies, researchers have documented the parental eagerness to convert the single object orientation of their infants into a social situation. The predominant strategy used to do so is to join the infants' spontaneous interest in an object, and to provide them with a simultaneous vocal or gestural commentary (Collis & Schaffer, 1975; Newson, 1978). In providing such a commentary, mothers and infants were described to develop games where a certain object-directed behavior of the infant 'causes' an effect in the expressive body parts of the mother (hands, face, voice). Based on longitudinal observations of a sin-

gle mother-infant dyad, Trevarthen & Hubley (1977) described that it was in the context of such a game that the infant for the first time attended to the mother's face while playing with an object. Using a larger longitudinal sample of 28 mother-infant dyads, Bakeman and Adamson were able to provide further documentation of this maternal tendency to tune into the infants' ongoing engagement with objects (Adamson & Bakeman, 1984, 1985; Bakeman & Adamson, 1984, 1986). Importantly, even though at first infants may show no explicit acknowledgement of their mothers' attempt to join their ongoing toy engagement (for example by alternating their gaze between the toy and their mothers' face), findings from this longitudinal study suggest that these episodes of supported joint engagement provide an important context for the infants' social learning. First, the authors reported that the infants' earliest referential gestures (e.g. pointing) emerged in situations where parents had tuned into their infants' ongoing engagement with a toy. Second, Bakeman and Adamson were able to show that episodes characterized by a shared interest in an object are generally accompanied by elevated levels of affective involvement on behalf of the infant. Similar levels of affective involvement are rarely observed when children played with the toys on their own. Interestingly, infants showed the same elevated levels of affective involvement during joint engagement, independently of whether they explicitly acknowledged their mothers' presence or not.

In summary, by joining the infants' ongoing toy engagement, parents assure the infants' participation in social encounters that involve a shared interest in an object or event. Frequent participation in such encounters provides the infant with the experiences necessary to acquire the social skills needed to play a more active role in managing such encounters. Around nine months of age, a range of such social behaviors emerge in the behavioral repertoire of typically developing infants: infants start to follow their mothers' gaze direction and pointing gesture in order to determine the target of mom's interest, infants alternate their gaze between an interesting object or event and their mothers' face in order to check 'if she also sees', and they start to point to and show objects in order to capture their mother's interest. This group of behaviors is frequently referred to as joint attention behaviors (Tomasello, 1999; Tomasello, Kruger, & Ratner, 1999).

Managing a shared interest in autism

Children with autism show a specific and unique deficit in behaviors used to establish and maintain a shared interest with other people. In two previous studies conducted in our lab, we compared the nonverbal communication skills of children with autism to language matched controls of typically developing children, children with Down syndrome, and a heterogeneous group of children with developmental delay (Mundy, Sigman, Ungerer, & Sherman, 1986; Sigman & Ruskin, 1999). In these studies, nonverbal communication skills were assessed using a procedure called the Early Social Communication Scales (ESCS, Mundy, Hogan, & Doehring, 1996; Seibert, Hogan, & Mundy, 1982). In this procedure the child and the tester sit facing



each other at a small table. A set of toys is in view but out of reach of the child. The tester presents a variety of toys and plays a series of games aimed at eliciting requesting, sharing, and affiliating behaviors. In addition, on several trials, the tester points to the left, right, and behind the child to evaluate whether the child follows the experimenter's bids by turning his or her head in the designated direction. The procedure is videotaped and coded for the frequency of specific social behaviors. These behaviors fall into five mutually exclusive categories: a) *initiates social interaction (affiliation)*: e.g. initiates a turn taking game by rolling a ball towards the experimenter; b) *responds to bids for social interaction (affiliation)*: e.g. establishes eye contact with an adult during a pause in a face-to-face game, or returns the ball to the experimenter during a turn taking game; c) *initiates joint attention (sharing)*: e.g. alternates gaze between an active mechanical toy and the experimenter's face, establishes eye contact while examining a toy, points to toys within reach, or shows an object to the experimenter; d) *responds to bids for joint attention (sharing)*: e.g. follows the experimenter's pointing gesture towards a poster on the wall; e) *initiates behavior regulation (requesting)*: e.g. reaches towards a toy that is out of reach, establishes eye contact with the experimenter when a mechanical toy ceases, or points to a toy out of reach. Interrater reliability for this scale has been established multiple times and mean generalizability coefficients are at about .80.

Findings from this research suggest that children with autism show deficits across a range of joint attention behaviors. As compared to language matched controls, children with autism were less likely to respond to the experimenter's pointing gesture; they were less likely to initiate joint attention by alternating gaze between a toy and the experimenter's eyes; and they were less likely to initiate a shared interest by pointing at a toy or by showing a toy to the experimenter or a parent. In contrast, a mixed picture of deficits and strengths emerged with respect to requesting and social interaction (affiliating) behaviors. Although children with autism were found to initiate social interaction less than children with Down syndrome, no group differences were found between children with autism, typically developing children, and children with heterogeneous developmental delay. Similarly, children with autism did not differ from matched controls in their responsiveness to social interaction. Finally, with respect to requesting behaviors, we found that typically developing children showed on average more requesting behaviors than any of the other three groups. In turn, a deficit in requesting behaviors is characteristic not only for children with autism but also for children with other developmental delays. However, we also found evidence that the deficit in requesting behaviors is somewhat more profound in children with autism than it is in children with heterogeneous developmental delays.

In reviewing the literature on typically developing infants, we emphasized that a shared interest between parent and infant emerges based on contributions from both partners. We also emphasized that especially during early stages of development the responsibilities for assuring a shared interest are not distributed evenly between parent and infant. Early in development, when infants still lack the skills necessary to play an active role in managing a shared interest in an object, parents respond to the

