

Transmission of the Communicative Competence: Genetic, Cultural, When, and How?

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Several recent contributions from various disciplines have improved the interpretation of determinants influencing the interrelated processes of speech acquisition, and cognitive and emotional development. The existence of precursors of abstract symbolisation and of words in the animal world suggest a continuity in the evolution of communicative capacities. In man, evolution has not only favoured a specific precocity in communicative development in infants, but also the co-evolution of a species-specific environmental support for speech acquisition in caretakers. Thus, speech acquisition results from both biogenetic predispositions and environmental support as it becomes evident in micro-analysis of parent-infant interactions and experimental verifications. The pre-verbal period of communicative development appears in a new light from theoretical and clinical views.

La question des facteurs qui influencent les processus d'acquisition du langage et le développement cognitif et émotionnel a bénéficié de plusieurs contributions récentes venant de disciplines diverses. L'existence chez l'animal de précurseurs des symboles abstraits et des mots suggère une continuité dans l'évolution des capacités de communication. Chez l'homme, l'évolution n'a pas seulement favorisé une précocité particulière du développement de la communication chez les bébés, mais également le développement conjoint spécifique à l'espèce, du soutien par les adultes de l'acquisition du langage. Ainsi que le montrent des microanalyses d'interactions parents-bébés, et des vérifications expérimentales, l'acquisition du langage se fonde à la fois sur des prédispositions biogénétiques et sur un soutien de l'environnement. D'un point de vue théorique aussi bien que clinique la période préverbale du développement de la communication prend donc une nouvelle signification.

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INTRODUCTION

The development of verbal communication is an aspect of human development that has recorded a particularly interesting history in relation to theories on development. This history brought about arguments for keen speculation, illustrated intellectual achievements, suffered from simplifications, and witnessed the collapse of sophisticated interpretation in the face of simple observations. It would go beyond the limits of one presentation to describe that rich and exciting history in details. Hopefully a few simple reminders will do.

The first word that slips past the baby's lips has the potential of an explosive. Prior to this, the baby was a real 'infant' in the original meaning of the word, an individual 'unable to speak'. Now, all of sudden, it sounds like a member of society, capable of rational thinking. From now on, this member is able to abstract verbal symbols from reality and use them for constructing concepts, for logical thoughts, for descriptions of internal feelings, and for entering the domain of human culture. This at least is the view of naive audience, some philosophers, and some mythologies to whom the word appears in sudden, miraculous ways to enable new forms of existence.

Is there really a mythical element in the emergency of words, or does the overwhelming impression merely result from the audience's own tendency to perceive and interpret the world in categories, to remain blind to continuities and dialectic interactions, but to look for borders among phenomena or classes, and for distinct markers of phasic transitions, such as the first smile, the first step, the first word, or the first million on account?

Speech acquisition is too complex a process to be studied by solitary scientists. More than other research areas, it calls for interdisciplinary team work, but further than other areas, it has been able to profit from team approaches. From a comparative perspective, humans do not seem to be as unique in the use of verbal symbols and in their capacity to speak during the whole of their existence as we formerly assumed. Some other primates are intelligent enough to use symbolic communication and even some cultural transmission (Chevalier-Skolnikoff, 1982; Gardner & Gardner, 1969; Kawai, 1963). However, they cannot speak because their vocal tract does not allow the production of finely differentiated vocal sounds in fast chains (Lieberman, 1984). Some tropical birds can modulate vocal sounds finely enough to at least imitate human speech; some honeybees use dance movements as abstract communicative symbols (von Frisch, 1965); and real verbal symbols have already been found in some smaller monkeys, such as vervets, cottontop tamarins, or squirrel monkeys (Seyfarth, Cheney, & Marler, 1980).

Intentionality may seem to be a specifically human attribute of mental capacities, and one of the assumptions for verbal communication. However, some researchers see this capacity to be based upon the existence of feed-forward loops in the central nervous system that allow the organism to

conceptualise an intended act in advance and then control its course (Bruner, 1974). Such nervous substrata exist in many species and may function early during ontogeny. Their studies were initiated by observations on insect behaviour (von Holst, 1954) and enriched by neurophysiological experiments in cats (Teuber, 1961). In humans, intentionality was experimentally demonstrated to function in the form of purposeful head movements in newborns (Papoušek, 1967).

Even more enigmatical are the relationships between speech acquisition and development of consciousness. All attempts to define, describe or assess consciousness are necessarily speculative as long as neither physicists, nor neuroscientists and psychobiologists can identify substantial properties of consciousness. A common human urge to define and categorise has led to dualistic differentiations between body and mind or between human and animal forms of existence. Due to gaps in scientific knowledge, any similar attempts are premature and perhaps irrational as long as it cannot be excluded that substantial properties of consciousness cannot be found within the limits of human cognition.

Present concepts view mental phenomena as complex processes of highly dynamic, self-regulating interactional systems and offer both new hypotheses for interpretation of consciousness and metaphors for communication on it. They allow an assumption that the level of consciousness has evolved together with the evolution of brain, from reptiles and simpler mammals to primates and humans, as MacLean (1982) suggests. Similarly, one can assume that adult consciousness in humans develops from preverbal, precultural, and pre-logic levels, due to a growing proportion of verbal and rational recognition of self during ontogeny. However, firm arguments for these assumptions are still missing: three decades after the discovery of hemispheric specialisation, the problem remains enigmatical (Eccles, 1989) even though new research procedures promise an interesting approach to the role of speech as a mediator between consciousness and cultural or rational cognition.

Humans are unique in the animal world in the possession of all predispositions for speech that otherwise exist as isolated capacities in other species. Humans are also unique in the ways in which their culture has exploited the potentials of abstract symbolisation. Only humans have invented permanent records of written or otherwise coded symbols and established cultural institutions that can accumulate, store and process enormous amounts of information across ages, continents and cultures, or even across borders among animal species. However, the human way towards the use of languages took a long time and paralleled—at least in its origins—the way of communicative development in other animals.

To many students of speech acquisition, the first word also meant a transition from emotional to rational expressions. Preverbal human sounds, very much like most animal sounds, used to be viewed as graded expressions of

emotions. The first word signalled the start of cognitive processes opening the avenue of categorical expressions, concept formation and logical thinking. However, inquisitive baby-watchers developed methods for studying cognitive development in younger and still younger infants and found that, in fundamental forms, those complex cognitive capacities, including abstraction and numerical concepts, function long before the first word appears (Papoušek & Bernstein, 1969).

Infancy researchers also took a closer look at preverbal vocal sounds and—in close cooperation with phoneticians and psycholinguists—introduced micro-analytical methods and experimental verifications for studying the functions of vocal sounds in social parent-infant interactions (Fernald & Simon, 1984; Papoušek & Papoušek, 1981).

Our own studies were perhaps the earliest to show, in polygraphic records of head movements in 4-to-5-month-old infants, how early infants are capable of detecting and conceptualising regularities—or rules if you wish—in environmental events and cope with them behaviourally.

Infants first learn how to switch on attractive visual 5-second-displays in the midline with the help of headturns off the midline by at least 30 degrees. In the next series of experiments, the availability of reinforcement was conditional upon detection and behavioural application of various rules (Papoušek & Bernstein, 1969). For instance, infants had to regularly alternate left and right head-turns or carry out two, three or four consecutive ipsilateral head-turns without any instruction in order to switch on the visual displays. It was surprising to us in the 1960s, that infants appeared capable of coping with similar tasks and displayed novel, smooth and fast movement patterns which had never been found in spontaneous behaviour before.

Another example demonstrated infant capacity of abstraction prior to the use of first words at the age of nine months (Papoušek & Papoušek, 1984). At that age, some infants can symbolise the bird with arm movements similar to movements of wings. In such cases, we had the opportunity to show various two- or three-dimensional, artistic representations of birds, and to test whether infants would identify and symbolise the bird on their own. Positive results evidenced in our observations that cognitive processes, including abstraction, are not necessarily determined by the use of words. On the contrary, verbal communication seems to be determined by cognitive capacities of concept formation and abstraction. When speech appears, it lends new dimensions to learning and cognition. No matter how dramatic the change can be, it does not contradict the fact that there is a continuity in the development from preverbal to verbal cognitive processes as well.

In 1967, and repeatedly afterwards, we drew attention to emotional behaviours accompanying infant learning or problem solving (Papoušek, 1967; Papoušek & Papoušek, 1984). For instance, if you confront a 9-week-old infant with a new mobile and videotape attempts to gain control over

sounds which the mobile may produce, you will see that behavioural coping with this situation includes facial expressions reminiscent of adult attention, concentration, tension, and finally pleasure on success in a sequence which corresponds to the course of coping even if there is no social partner present.

In our learning studies, we could demonstrate a bidirectional interrelationship between emotional and integrative processes beginning with newborns (Papoušek, 1969). On the one hand, changes in emotional/behavioural states prior to trials significantly influenced the course and outcome of infant learning. On the other hand, the outcome of trials influenced the consecutive emotional behaviour. To the observer who is in a certain sense in the position of a teacher, emotional expressions in infants served as important feedback information on the course of black-box processes involved in infants' coping with problematic situations. Our interpretation opposed the common view of emotional behaviours as mere expressions of internal affective states; like Bühler (1933), we stressed the communicative significance and the relation to interactional context.

As Harris (1983) documented in his review, infancy researchers have gradually discovered an astonishing cognitive competence in human infants. Yet, they have also learned that the initial competence would not be fast and smooth enough to allow processing as rapid chains of information as those included in speech. Obviously, the acquisition of speech requires, during preverbal age, not only that the vocal tract becomes capable of producing adequate vocal sounds, but also that perceptual and regulatory prerequisites in the nervous system function fast and smoothly. Our former studies on infant learning confirmed that learning dramatically improved during preverbal infancy not only due to maturation, but also due to practice (Papoušek, 1967). Could we then assume that preverbal practising in speech-related cognitive functions might be crucial to a gradual acquisition of speech?

Two contradictory pieces of evidence tangled the answer to this question. On the one hand, we knew that cross-culturally adopted infants would soon adjust both perceptual and productive speech-related competence to the new linguistic environment. Thus, they would use the language of adoptive rather than biological parents when they would start speaking. On the other hand, all our attempts to trace the way in which parents might consciously teach infants how to master a language ended with the conclusion that parents had only a very vague knowledge of their teaching competence, knew no adequate programmes, and mostly did not consider it necessary to use any programmes.

Microanalyses of parent-infant dialogues into which particularly my wife Mechthild Papoušek invested an enormous amount of time, have brought about data which now allow a new interpretation of the significance of preverbal infancy in general. Let me summarise it in a few points:

1. We consider preverbal infancy no more a disadvantageous period of locomotor altricity. Rather, we interpret it as an adaptive circumstance allowing the care-taker to utilise infant dependency as an unparalleled opportunity for training the infant's cognitive and communicative predispositions in which the infant is biologically precocious (Papoušek & Papoušek, 1984). Dyadic interchanges are particularly suitable and, in the first postpartum months, crucial forms of environmental support to infant speech acquisition.

2. The parental capacity of supporting infant speech acquisition seems to be based on biological predispositions to a larger degree than on cultural predispositions. Since direct experimental analyses of their origin are not possible in humans, we use indirect pieces of evidence. We found that behavioural tendencies underlying the parental capacity are universal across sex, age, and several cultures, investigated thus far. They also develop early in ontogeny and do not depend on a conscious, rational control. Therefore, they allow a faster and less tedious responding to cue signals from infants.

We call such behaviours 'intuitive' in order to stress their biological origins; however, we consider them to be neither any prewired instincts, nor any relics of animal behaviours for which an educated person should feel ashamed. They are subjected to learning and play important roles in the highest cognitive and artistic achievements. Short latency periods of around 200ms serve as objective criteria if measurable in suitable cases (500–600ms cortical activation is necessary for awareness of cortical processes).

An astonishingly good functional fit between infantile and parental predispositions, together with their universality and nonconscious character indicate biological origins of the predispositions, selected during co-evolution as it is characteristic to the most relevant means of evolutionary adaption (Papoušek & Papoušek, 1978; 1987; 1992).

3. Preverbal forms of vocal communication deserve particular attention. On the parental side, infant directed speech exemplifies adjustments to infant constraints, for instance, in a higher pitch of voice (Fernald, 1992; Fernald & Simon, 1984); or in a slower tempo and longer pauses, in simplified and repetitive structures or in a careful dosage of stimulation with respect to infant alertness (Papoušek, 1992; Papoušek & Papoušek, 1984; 1987). Moreover, parental speech also represents a didactic lead towards higher levels of vocal production as evident in the display of models for imitation and affectively enriched vocal rewards for infants' successful practising. Long before infants can produce real words, they are able to modulate melody while producing cooing sounds (Papoušek & Papoušek, 1981), and to segregate and holistically group melodies from environmental auditory stimulation (Demany, 1982; Fassbender, 1989).

Parents unknowingly utilise this first communicative potential and deliver the first categorical message in the form of highly repetitive prosodic melodies (Papoušek, Papoušek, & Bornstein, 1985). The messages do not relate to

objects and, therefore, have no declarative meaning. They relate to interactive, biologically relevant situational contexts, and like many gestural and other parental interventions concern procedural learning (Papoušek & Papoušek, 1984; 1987). This finding appeared to fit the recent neuroscientific evidence on differential development of hemispheric dominance (de Schöenen & Mathivet, 1989) where structures responsible for processing procedural informative develop earlier during preverbal age than structures involved in processing declarative information.

4. The increasing evidence that infant speech acquisition is not only a cultural process, but first of all an outcome of co-evolution of biological predispositions corresponds to the assumption that verbal communication has been favoured during human evolution as an important means of biological adaptation. It truly brought about not only culture with immense technological achievements, but also enabled man to compensate for locomotor and other constraints, to increase resistance against biological risks, such as diseases or hostile climates, and to facilitate reproductive propagation (Papoušek & Papoušek, 1987).

5. From clinical perspectives, it is important to understand that preverbal communication not only satiates the need to be together with a conspecific and interchange, but also offers a convenient medium for practising integrative competence in general. If defects on any side disturb preverbal communication, they can also cause a delay in mental development in general. Diagnostic investigations on infants at risk should, therefore, screen communicative deviations and introduce adequate measures to prevent mental retardation if communication is defective (Papoušek & Papoušek, 1992).

CONCLUSION

To conclude, I wish to stress that the early development of communicative competence deserves attention from both theoretical and clinical points of view. A closer look reveals new aspects on both sides of interchanging dyads—in infants, and in caregivers. The new aspects make it evident that superficial approaches may let slip basic findings concerning not only ontogenetic, but also phylogenetic significance of human communication. The transmission of communicative competence is a complex and dynamic process in which genetic predispositions interact with environmental and cultural interventions from the very beginning. Cultural interventions assert to an increasing degree, however, that they themselves are based partly upon innate predispositions.

Transmission of communicative competence is intimately interrelated with the transmission of integrative competence and with the development of human consciousness. It concerns personality development just as much as the

main means of biological and cultural adaptations. Not surprisingly, attempts to capture the complexity with the help of linear mathematical models do not lead to satisfactory results, and researchers turn increasing attention to highly dynamic systems of self-regulation. In this connection, it may be particularly important to be aware of gaps in our knowledge on determinants of communicative competence and to fill them up in order to facilitate the application of new models.

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