Zurich Open Repository and Archive
University of Zurich
Main Library
Strickhofstrasse 39
CH-8057 Zurich
www.zora.uzh.ch

Year: 2013

Early communicative development in two cultures: A comparison of the communicative environments of children from two cultures

Lieven, Elena ; Stoll, Sabine

Abstract: The nature of young children's communicative environment has been central to theoretical debates about the importance of innate and environmental factors in the development of communication and language. In this paper, we explore aspects of the communicative development and environment of young children growing up in two very different cultures, one in a village of eastern Nepal and the other in a rural area of Western Germany. We analysed longitudinal video recordings of 6 children from each culture in naturalistic settings, at age-matched time points over a period of 8 months. Four children were 8 months old at the outset of the study, 4 were 2 years and 2 months old, and 4 were 3 years old. There were major differences between cultures in the number of adults and children present during the recordings, with other children playing an increasingly important role for the older children in the Nepal recordings. We found no difference between cultures in the onset of pointing and imitation or of reaching, requesting and offering, indicating that these behaviours may be part of a human-specific timetable for socio-cognitive development. We also found that imitation by both the target children and those around them was strictly limited to the youngest group in both cultures. This suggests that imitation may be very important for early development in the prelinguistic phase, while around the age of 2, with the child's developing competence, other ways of interacting take over. The theoretical implications of our results are discussed with reference to the roles of child-intrinsic and environmental factors in the developmental process.

DOI: https://doi.org/10.1159/000351073

Posted at the Zurich Open Repository and Archive, University of Zurich
ZORA URL: https://doi.org/10.5167/uzh-86966
Journal Article
Published Version

Originally published at:
Lieven, Elena; Stoll, Sabine (2013). Early communicative development in two cultures: A comparison of the communicative environments of children from two cultures. Human Development, 56(3):178-206.
DOI: https://doi.org/10.1159/000351073

Paper

Human Development 2013;56:178–206
DOI: 10.1159/000351073

Human Development

Early Communicative Development in Two Cultures: A Comparison of the Communicative Environments of Children from Two Cultures

Elena Lieven[a, b] Sabine Stoll[c]

[a]University of Manchester, Manchester, UK; [b]Max Planck Institute for Evolutionary Anthropology, Leipzig, Germany; [c]University of Zurich, Zurich, Switzerland

Key Words
Cross-cultural studies · Early communicative development · Imitation · Interaction · Joint attention

Abstract
The nature of young children's communicative environment has been central to theoretical debates about the importance of innate and environmental factors in the development of communication and language. In this paper, we explore aspects of the communicative development and environment of young children growing up in two very different cultures, one in a village of eastern Nepal and the other in a rural area of Western Germany. We analysed longitudinal video recordings of 6 children from each culture in naturalistic settings, at age-matched time points over a period of 8 months. Four children were 8 months old at the outset of the study, 4 were 2 years and 2 months old, and 4 were 3 years old. There were major differences between cultures in the number of adults and children present during the recordings, with other children playing an increasingly important role for the older children in the Nepal recordings. We found no difference between cultures in the onset of pointing and imitation or of reaching, requesting and offering, indicating that these behaviours may be part of a human-specific timetable for socio-cognitive development. We also found that imitation by both the target children and those around them was strictly limited to the youngest group in both cultures. This suggests that imitation may be very important for early development in the prelinguistic phase, while around the age of 2, with the child's developing competence, other ways of interacting take over. The theoretical implications of our results are discussed with reference to the roles of child-intrinsic and environmental factors in the developmental process.

Copyright © 2013 S. Karger AG, Basel

KARGER
E-Mail karger@karger.com
www.karger.com/hde

© 2013 S. Karger AG, Basel
0018–716X/13/0563–0178$38.00/0

Elena Lieven
School of Psychological Sciences
University of Manchester
Oxford Road, Manchester M13 9PL (UK)
E-Mail elena.lieven@manchester.ac.uk

Downloaded by:
Universität Zürich, Zentralbibliothek Zürich
130.60.47.22 - 6/9/2016 12:25:48 PM

One of the main claims of usage-based accounts of language acquisition is that children's language development depends on general cognitive abilities that develop during infancy, such as joint attention, symbol recognition and imitation. However, so far quantitative studies have been mainly restricted to cultures of Western Europe or other industrialized societies. We know rather little about the development of these cognitive abilities in less industrialized societies and whether they are on a similar time scale with respect to their emergence. Comparative research allows us to discover universals and particulars in human development and to assess the extent of variation in developmental pathways.

The nature of young children's communicative environment has been central to theoretical debates about the relative importance of innate and environmental factors in the development of communication and language. We know that, within Western-influenced industrialized cultures, the amount and type of speech addressed to infants and young children has profound effects on their language development [Hart & Risley, 1995; Hoff-Ginsberg, 1991; Hurtado, Marchman, & Fernald, 2008; Huttenlocher, Vasilyeva, Cymerman, & Levine, 2002]. There is also evidence for a relation between the frequency of preverbal communicative interactions between caretaker and child and vocabulary development [Bakeman & Adamson, 1984; Tomasello & Todd, 1983]. However, we know very little about the limits on this variation. To add to our knowledge of this variation and to assess its implications for theories of communicative development, it is important to study as wide a range of cultures as possible. In this paper, we explore aspects of the communicative development and environment of two groups of young children growing up in two very different cultures, one in a village in eastern Nepal and the other in a rural area in western Germany. This allows us to investigate the time scale of emergence of communicative behaviours and any differences in this between the two cultures.

Cross-Cultural Studies of Infant Socio-Communicative Development

There are a number of studies suggesting that both the type of communicative interaction with infants and young children and the amount of speech addressed to them are very varied across cultures. Studies of middle-class groups in industrialized societies report that children are treated as intentional agents from birth, resulting in a lot of communicative interaction and talk with infants in the first year of life [Keller, 2007; Snow, 1977; Trevarthen, 1979]. However, studies on very different cultures suggest that, at least in some societies, there is very little communicative interaction between caretakers and the prelinguistic child and also very little child-directed speech. Until recently, these studies have been largely qualitative rather than quantitative. Two early examples are the study of the Kaluli of the New Guinea highlands by Schieffelin [1985] and the study of a Samoan community by Ochs [1982]. Both were qualitative studies of children's linguistic development, and both studies reported that adults did not speak very much to preverbal children. Interestingly, this related to the ideologies of child-rearing in the communities. Ochs and Schieffelin [1983] suggested that, for different reasons, the child-centred style reported as typical of middle-class families in industrialized societies was highly inappropriate to the cultural ideology of the people they were studying. In Kaluli, there was a belief that children had to be weaned away from the animal world and taught to talk, so there was little interac-

Downloaded by:
Universität Zürich, Zentralbibliothek Zürich
130.60.47.22 - 6/9/2016 12:25:48 PM

tion until the child started to use words. In Samoa, interactions were governed by status: adults, who had higher status than babies, were more likely to instruct older children in interacting and caring for them than to take part themselves in adult-infant interaction.

Some early studies addressed cultural variations in the amount of language addressed to children more explicitly – for instance, Brice Heath's [1983] study of the Trackton community in the Piedmont Carolinas of the USA and Pye's [1986] study of Quiche Mayan children. Here the ideologies underpinning the reported low level of speech to the children are almost the opposite of each other. Pye reports the belief that children are very fragile and need to be protected from high degrees of stimulation, hence there is little intense interaction and talk to the infant. On the other hand, Brice Heath [1983] reports that Trackton children have to learn to "break into adult conversation" (p. 93) and that they start to talk by using imitations of the ends of utterances in the conversations of others to engage in interaction.

The significance of low levels of preverbal interaction with infants depends on the theoretical stance taken [Lieven, 1994]. If such interaction is seen as critical to the development of the infant's ability to communicate intentionally, then low levels of interaction should impede development. However, if children's ability to communicate and to read the intentions of others is seen as a species-specific adaptation on a biologically given developmental timetable [Tomasello, 2008], then whether others interact with the baby as if it were an intentional agent from birth would be less important. Clearly, information about the limits on variation across cultures is relevant to clarifying these theoretical issues.

There are a number of recent studies that have taken up the challenge of quantifying cross-cultural similarities and differences in children's communicative environment and development. Keller and her colleagues [Keller, 2007] have conducted an extensive set of studies focussing mainly on parental attitudes and behaviour across a range of cultures and socio-economic groups (e.g., in Cameroon, India, Greece and Costa Rica). The research largely involves interviews with parents and coding of their behavioural interactions, usually with their very small babies (aged around 3 months). Keller [2007] describes a set of "parenting systems" (p. 22) which are used in all the cultures studied: body contact, body stimulation, object stimulation, and face-to-face contexts. However, the relative rates at which these behaviours occur vary widely across the cultures studied and are accompanied by differing ideologies. As a result of these studies, Keller describes two prototypical cultural models of parenting: one highlighting interdependence and the other autonomy. While she emphasizes that these are prototypes and that each culture partakes of them to a greater or lesser extent, these parenting models are broadly correlated with the extent to which the culture is small-scale, rural and non-industrialized. Parents in cultures towards the autonomous end of the continuum tend to emphasize that the child is an independent agent, and their interactions treat the infant as such from the beginning: behavioural correlates are, on the one hand, lots of talk to the child and, on the other, a desire to see the child play alone, sleep alone, and develop independence. This is more typical of industrialized, large-scale, cultures. By contrast, cultures at the more interdependent end of the continuum tend to emphasize the infants' membership in a community – for example, respect for elders. Babies never sleep alone, are fed on demand, and are much more frequently in bodily contact with either the parent or another caretaker, but they are less talked to, and many of the patterns of interaction

Downloaded by:
Universität Zürich, Zentralbibliothek Zürich
130.60.47.22 - 6/9/2016 12:25:48 PM

thought to be important for communicative and language development in technological cultures are much less prevalent. An example is the work of Gaskins [1999, 2006] on the Yucatec Maya. The culture is clearly on the interdependent end of Keller's scale, in that it is rural and there is rather little object-based interaction in terms of turn-taking and mutual gaze between adults and infants. Gaskins [1999] shows that while the Mayan infants spent almost the same amount of time in object play and in social interaction as the Euro-American infants, these two activities were completely separate for the Mayan infants: they almost never interacted with others while playing with objects, and adults did not use objects in their social interactions with the babies – a very different pattern from that observed in the Euro-American families. Gaskins makes the point, with Keller [2007], that parent behaviour reflects both the ideology and material circumstances of the culture. As both authors also make clear, despite differences between cultures and ideologies of parenting, there is also a biological framework to infant development and the resulting care that is required. At the most basic is physical care including feeding and carrying babies until they can walk.

The question is whether, despite these major differences in child rearing, there are ways in which infants all over the world are on a similar developmental timetable, not only in terms of physical development but also in socio-cognitive development. Callaghan et al. [2011] set out to answer this question by studying the development of children's socio-cognitive behaviours in three different cultural settings: two rural communities, one in India, the other in Peru, and a university town in north-eastern Canada. The research involved interviews with parents about children's behaviours but was mainly focused on the experimental testing of the children on a variety of tasks involving intention reading and symbolic skills: imitation, helping, gaze following, pointing, collaboration, joint attention, pretence, and symbolic skills. Depending on the behaviour being investigated, children were between 8 months and 3.5 years old. The basic finding was of a similar developmental pattern, somewhat diverging as children got older. Thus, children started to imitate, point, help, and show joint attentional skills at very similar ages in all three cultures. A few differences were found at younger ages, and these were attributed to aspects of the environment.[1] There was little difference in parental reports of the onset of language comprehension, but Canadian infants were reported as being earlier to speak. The other major differences between the cultures showed up at later ages in the development of pretence and of symbolic skills where the performance of the Canadian children clearly reflected cultural differences in contexts – for instance, of play, book reading, and drawing. The authors argue from their results that basic skills of intention reading derive from species-specific aspects of human evolution and that they are on a similar developmental timetable largely independent of the specific cultural settings in which the children live. However, as they also point out, this does not exclude a major role for interaction and learning in the development of these behaviours.

In addition, the fact that there may be few differences between cultures in these basic socio-cognitive skills at the level of group measures still allows for individual

[1] Infants in the Indian group pointed significantly less than in the Canadian group, though mothers reported the same age for the onset of pointing. The authors provide two possible explanations: first, the stimulus set was smaller in India than in Canada and Peru, and second, the ambient heat when the Indian children were tested may have reduced their activity levels.

Downloaded by:
Universität Zürich, Zentralbibliothek Zürich
130.60.47.22 - 6/9/2016 12:25:48 PM

differences within a culture to be related to the type of interactions with caregivers that infants experience. There is considerable evidence that this is the case in studies of parent-child dyads in Western industrialized cultures [Hart & Risley, 1995; Hoff-Ginsberg, 1991; Hurtado et al., 2008; Huttenlocher et al., 2002]. However, the direction of causation in these correlations does need unpacking. For instance, Hurtado et al. found independent effects of mothers' input and the child's speed of lexical processing. It may well be that child-intrinsic features such as the age at which the child starts to engage in intention-reading behaviour affect the caregiver's interactions, and this then has a synergistic effect on the child's development. An example of this is a study by Markus, Mundy, Morales, Delagado and Yale [2000] which found that the frequency of maternal-infant episodes of joint attention at 18 months is related to measures of vocabulary at 18 and 24 months using the MacArthur-Bates Communicative Development Inventory [Fenson et al., 1994]. However, they also found that individual differences in infants' joint attentional behaviour in an experimental situation at 12 months made a unique contribution suggesting that factors intrinsic to the child may also be underpinning the frequency of the joint attentional episodes at the later age. In the general discussion below, we come back to the ways in which child-intrinsic and external factors are both involved in the developmental process.

There has been recent work on the development of pointing which allows us to see just how intricate the relation between child factors and caregiver factors probably is. Liszkowski, Brown, Callaghan, Takada, and de Vos [2012] used a semi-naturalistic procedure to elicit pointing by preverbal infants and their caregivers in seven cultures. By 10–14 months of age, infants across cultures were all pointing with similar frequencies. However, caretakers on Rossel Island were pointing at significantly higher frequencies than those of the other six cultures. Within cultures, the authors found that infant pointing was best predicted by the child's age and caregiver pointing. Thus, although the caregivers on Rossel Island (Papua, New Guinea) pointed at significantly higher rates than those of the other cultures, and although individual differences between caregivers in these rates were correlated with differences between their children, the overall frequency of infant pointing on Rossel Island did not differ from the other cultural settings [see also Brown, 2011]. A study by Matthews, Behne, Lieven, and Tomasello [2012] also suggests separate contributions of infants' own socio-cognitive developmental timetable and their caregivers' interactions. In a training study, British mothers were asked to spend 15 min per day over 4 weeks engaging in enhanced pointing with their infants. As in the studies cited above, the authors found no influence either of caregivers' pointing in free play or of the training on the *age* at which infants started to point, but the *frequency* with which mothers pointed in free play did influence the frequency of their children's pointing. What influenced the onset of pointing, however, was infants' ability to gaze follow at the outset of the experiment. In addition, their ability to monitor their partners' gaze was affected by the pointing training and mothers' own frequency of pointing. This suggests, first, that the significance of infant pointing lies in the whole context of socio-cognitive development in which it is embedded and, second, that while socio-cognitive development in the infant is the prerequisite, socialization processes may start to affect how this plays out. One possibility suggested by Carpendale and Carpendale [2010] is that infants start by pointing in relation to their own attention but that pointing starts to become incorporated into a socio-cognitive framework as a result of interactions with their

Downloaded by:
Universität Zürich, Zentralbibliothek Zürich
130.60.47.22 - 6/9/2016 12:25:48 PM

caregivers. This would provide a possible scenario for the results in the study by Matthews et al. [2012]: early gaze following by the infant is affected by the mother's pointing, which gives rise to higher rates of gaze monitoring by the infant.

Although there may be worries about how culturally appropriate some of this testing in non-industrialized cultures is, the finding of similar results for the age of onset of these socio-cognitive behaviours suggests that these cross-cultural studies are capturing an important feature of infant development. However, this may be less true of the behaviour of adults to the children either due to cultural differences or because they may be more affected by the testing situation than the children. While observing infants in their naturalistic settings is also, of course, not free of observer effects, it is obviously important to complement experimental findings with naturalistic data. Experiments investigate what children can do. Naturalistic observations ideally complement this by attempting to document what children and their interactants actually do in their day-to-day lives. So far, however, most naturalistic studies of infant communicative development in Western cultures have concentrated on dyadic interactions between a single child and her caretaker, in most cases, the mother. The mother is usually asked to play with the child for the duration of a recording. This is probably not the typical context of the child's language exposure during the day. Usually the mother is engaged in other chores and plays intermittently with the child for short episodes, if at all. Other people may be around and conversation is not restricted to the child as is usually the case in longitudinal studies of language development. In addition, the focus on single caretakers may underestimate the role played by others in infants' lives, especially in societies where people spend much more time together in groups. For instance, a recent study by Mastin and Vogt [2011, July] of interactions with infants in Mozambique found that measures of joint attention only predicted later vocabulary size for children of urban families while *observational attention* was a predictor for children of the rural group and *person interaction* (which excluded joint attention episodes) was a predictor for both groups. To avoid the potential biases in the special dyadic recording environments which are outlined above, we chose settings which included as much of the natural environment of the child as possible. The idea was to get a comparative snapshot of the children's daily lives in terms of their communicative interactions.

In the current study, we investigated the interplay between child-driven and culture-shaping factors in a rural village of east Nepal and compared this to a group of children growing up in Germany. The study was observational: the children in both cultures were video-recorded and the videos subsequently coded for categories of communicative behaviour.

The Communities

Chintang

Chintang is a rural village development community (VDC) in the foothills of the Himalayas (at about 7,000 ft) in eastern Nepal. It is a remote place with only a dirt road operating during the summer. The local language is also called Chintang. There are about 5,000–6,000 Chintang speakers in the village development community. All of the adults and older children are bilingual, in Nepali the lingua franca of Nepal. Some Chin-

Downloaded by:
Universität Zürich, Zentralbibliothek Zürich
130.60.47.22 - 6/9/2016 12:25:48 PM

tang speakers also know Bantawa (Sino-Tibetan, Kiranti), a closely related language from the subgroup of Rai languages. People in Chintang largely live on subsistence agriculture, but a UK development project for growing tangerines has also been relatively successful. Nuclear families, sometimes with grandparents, live in small houses that are scattered around the hills with terraced gardens and fields in between. Women and men work long hours in these. There was no electricity line at the time of recording, and only a few households operated electric equipment such as a TV with a truck battery.

Babies are breast-fed till at least 3;00[2] or until the next child arrives. They are started on solids at around 6 months. Older children, often very young (mainly girls but also boys), carry the babies around on their backs from about 6 months of age. Children are often left in the care of older children or other adults, and they often play together without noticeable supervision, but there is almost always an adult within view and/or shouting distance. Boys and men also care for children. Babies and children are fed on demand, though less so as they get older. There are few Western-type toys apart from balls and books from school, but children play with all sorts of things available in their environment. During the day, children spend most of their time outside either in the area in front of their house (or that of other kin) or in the gardens and fields that adjoin the houses. The society is rather egalitarian, and women and men interact with each other freely. People spend little time alone, there are always a lot of people around, and there is usually a continuous flow of talk. This reflects the negative connotations of social separation and non-communication in the ideology of Rai cultures [Gaenszle, 2002, p. 46; Hardman, 2000, p. 187]. Kinship relations determine the social structure to a large degree. There is a clear division of labour and of behaviour in most parts of social life, but women do take part in decision making. Both men and women work in the fields with some different tasks. Mostly women look after the children and cook, but not exclusively. Children are present in most situations of life from early on.

The collection of data in Chintang was part of a project to document endangered languages (DOBES-Project, Volkswagen Foundation). Chintang belongs to the Eastern subgroup of Kiranti languages (Sino-Tibetan) and is considered to be endangered. However, children still learn Chintang as a first language, and it is prevalent in everyday conversation. Even some immigrants learn the language, which shows its relatively high status.

Germany

The recordings of the German children come from the Rigol corpus [for details, see the CHILDES database manual (http://childes.psy.cmu.edu/manuals/); MacWhinney, 2000, p. 55[3]]. Between 1990 and 2003, Rigol made, in all, 1,900 30-min video recordings of 21 different children aged from birth to 7;00. We selected 6 children who matched our Chintang sample in age and gender. Five of the children came from a township in the province of Hessen with a population of about 10,000 spread across 6 villages. Four children lived in a village of about 1,000 inhabitants, which is

[2] Ages are expressed numerically as follows: years;months (e.g., 3;02 means 3 years and 2 months).
[3] Two of the children included in the present study are also on CHILDES in the Rigol corpus.

Downloaded by:
Universität Zürich, Zentralbibliothek Zürich
130.60.47.22 - 6/9/2016 12:25:48 PM

part of the wider township. It is a workers' village (formerly, men worked in the cigar industry; in the 1990s, they commuted to the factories of nearby towns) with smaller agricultures. The village offered a rich natural landscape to the children, including woods and mountains. The children had close contact to house and farm animals as well as to plants (for instance learning to grow plants on their own). Sporting activities (e.g., football club, swim club) as well as longer hiking trips were part of their daily lives. At an early age, they participated in the activities of the local associations and clubs (e.g., gardening, small animal breeding) and in traditional festivities. Traditional hierarchies still existed and influenced social contacts. The parents' actual education and profession, for instance, was less important in terms of social reputation than their status within the old hierarchies of landowners and workers. The parents of these four children mainly had vocational training. The parents of the other two children are university graduates. One of these families lived in the township while the other child lived in a city about 300 km north of this. The grandparents of all the children worked as craftsmen (e.g., carpenter, mechanic) or clerks. During the period of this study, the mothers of five of the children did not work outside the home, while the mother of the 3-year-old girl returned to work when the child started kindergarten. The two children who were 3;00 at the start of the study had just entered kindergarten. Until this point, the children mainly spent their time with their mothers, grandparents, and siblings, meeting other adults and children in the company of their parents. Although most of the children were growing up in a somewhat rural environment, all families had cars and the other appliances of modern industrialized life, and parents had high expectations for their children in terms of educational achievement.

In terms of Keller's dimensions, the culture of the east Nepali village is clearly at the interdependent end, while the community in which the German children were growing up was situated in a modern industrial culture and might, therefore, be expected to be closer to the autonomous end of Keller's continuum. We focused on the following questions: (a) At what age do basic intention-reading skills develop in the two cultures? and (b) What differences are there in who cares for (and/or surrounds) the child and what caregivers do in the two cultures?

Methods

The Children

Chintang. Six children were video-recorded for 18 months: a girl and a boy from the age of 6 months ("babies"), a girl and a boy from the age of 2 ("twos"), and a girl and a boy from the age of 3 ("threes"). All the children came from different Chintang-speaking households, although some of them are related. They lived in individual houses together with their families. The baby girl has no elder siblings, but another child was born to the family during the study. All the other children have at least 3 older siblings, and 3 have younger siblings as well (both 2-year-olds and the 3-year-old boy).

Germany. The baby girl lived in the city north of the township in which the other 5 children lived. The baby boy was 1 of the 4 village children. The 2-year-old girl came from a household living in the township, and the other 3 children came from the village. The 2-year-old boy also has a younger sibling; the 2- and 3-year-old girls both have an older sibling, and the 3-year-old boy is a middle child with both a younger and an older sibling. The family of the baby girl shares

Downloaded by:
Universität Zürich, Zentralbibliothek Zürich
130.60.47.22 - 6/9/2016 12:25:48 PM

an apartment with a mother and small baby. In 4 families, grandparents live either in the house or next door. Grandparents, other adults, and siblings were present during a number of recording sessions.

Recording Contexts

Chintang. A Nepalese research assistant, in collaboration with local assistants who were native speakers and neighbours of the families, recorded the children. Recordings were made over a number of sessions within 1 week, monthly or bimonthly for the 2- and 3-year-olds and bimonthly or trimonthly for the babies. The children were recorded in their natural environment: either in the area outside their houses or in the nearby gardens or fields, and sometimes in their houses. Situations included free play, roaming around, having a snack, and teasing animals or other children. The only criterion for recording was that the child was alert and interacting with other people so that linguistic data could be obtained.

The recordings were conducted with a video camera on a tripod and an external microphone which was placed close to the area where the children were playing. A fisheye lens was used that gave a wide field of view. If the child went out of the camera view for more than a minute, either the camera followed the child or the recording was stopped.

Since no influence was imposed on the context of recording, there were usually a number of other children and adults present during the recording, either interacting with the child or talking to each other. This is typical of the children's daily lives. Sometimes the local assistants interacted with the child. In a few cases, this interaction took place to induce children to talk, but usually assistants did not actively take part in the interactions but took care of the filming.

We coded all the data collected in each of 4 recording cycles for the babies and 3 for each of the 2- and 3-year-olds. The recording cycles coded were evenly spread across 7–10 months of each child's development (see tables 1–3 and Appendix 1).

Germany. Rosemarie Rigol was well known to the children, and the recordings were made in relatively natural contexts (e.g., with siblings, grandparents, and friends around, indoors and outdoors). In matching for age, we took all the Rigol recordings that fell in the same month as that of each recording cycle for the matching Chintang child (see Appendix 1). However, it is important to note that there were differences in camera use,[4] and, as noted below, the total number of minutes of recording was always much less for the German children. Rigol was always the camera operator, and she also interacted with the children on occasion, particularly if the principal caretaker (PC) was absent for any time.

Coding

Recording sessions were coded for the following: *individuals present, objects handled,* and *interactive categories* (which were further subdivided and coded).

Individuals Present. This is the count of the maximum number of adults and children present during a session. For this measure, the mother or PC was coded as *present* as long as she was in shot for a least 90% of the session. Others are counted as present irrespective of how long they were there or if they were partially or fully invisible provided they could be identified. This includes the person behind the camera. Participants were coded as children if they were under 15 years old.

[4] Rigol operated a hand-held camera in the German study, while, in Chintang, the camera was on a tripod and was only moved if the child went out of the camera view.

Downloaded by:
Universität Zürich, Zentralbibliothek Zürich
130.60.47.22 - 6/9/2016 12:25:48 PM

Objects Handled. This represents the number and type of different objects handled by the child; objects are counted if they are deliberately touched, grasped or explored. This includes larger non-moveable objects (e.g., cars, tractors) and animals if they are treated as objects (e.g., grasping and throwing away a half-dead bird).

The Interactive Categories. This was subdivided into the major interactive categories of *pointing, imitation, attention-getting, offering, showing,* and *reaching-requesting*. All categories applied to actions either by the target child or directed towards him or her.

- *Pointing:* Points with fingers and hand were included.[5]
- *Imitation:* For participants other than the target child, imitations were only coded if they were of the target child. Imitations were coded if they imitated sounds, vocalizations, gestures, or actions. For the twos and threes, imitations of actual utterances were not coded but only non-linguistic noises such as groaning, whining, or animal sounds.
- *Attention-getting:* Drawing the attention of another by showing, making a sound with an object or touching the other person. By contrast with showing, attention-getting was only coded if the action occurred without a previously shared focus. However, it was coded whether or not it was perceived by the target participant.
- *Offering:* Offering an object to another person was coded whether or not the offer was perceived or accepted by the other. Throwing an object to someone else was also coded as long as it was not an act of aggression.
- *Showing:* Showing an object to someone within a joint attentional frame (in contrast to attention-getting) without the object being offered.
- *Reaching-requesting:* These are gestures that indicated some kind of request.

Attention-getting, offering, showing and reaching-requesting were combined into an *object-handling interaction* category. Since any given one of these interactive behaviours was relatively rare, a sum category was created.

We had 2 categories for *ambiguous* or *uncodable* behaviours. The first was for other meaningful gestures (for instance, offering hands without an object to be offered or pushing away hands) and the second was for uncodable actions and gestures. The numbers in these categories were very low and are not reported here.

Vocalizations/utterances at the end of each minute of recording were coded for each speaker (mother/PC, child) or category of speaker (other children, other adults) if at least one vocalization had occurred. All types of vocalization were counted (other than crying, groaning, or other vegetative sounds) whether or not they were child-directed.

General Coding Procedure

Once each recording session had been coded, we calculated the proportions of each category per hour per recording cycle because the lengths of sessions varied considerably and because there were much more data for the Chintang recordings than for the German recordings. In all, we coded the following: just under 19 h for the Chintang babies and 6.5 h for the German babies; 43 h for the Chintang 2-year-olds and 7 h, 56 min for the German 2-year-olds, and 45 h for the Chintang 3-year-olds and 7 h, 41 min for the German 3-year-olds (see Appendix 1).

To count the proportions, we took the total minutes of presence of the persons in question into account. For example, if the PC was not present for the whole session, the proportions per hour were calculated only on the minutes of her presence. For other adults and other children,

[5] In principle, head points were coded, but these were vanishingly rare for adults and children. Head points ranged from 0 to 1.7% of all points for the children and from 1 to 3% for the adults with the exception of two German sessions, each containing an episode with one sequence of head points by an adult.

Downloaded by:
Universität Zürich, Zentralbibliothek Zürich
130.60.47.22 - 6/9/2016 12:25:48 PM

Table 1. Comparison of sessions matched for length: babies

Age	Chintang				Germany			
	child	length min	max present	PC always present?	child	length min	max present	PC always present?
0;08	girl	0:12	A:4 C:0	yes	girl	0:19	A:3 C:1	yes
	boy	0:32	A:2 C:7	no	boy	0:34	A:2 C:0	no
		0:28	A:2 C:4	yes		0:26	A:4 C:0	yes
0;10	girl	0:21	A:5 C:0	yes	girl	0:20	A:3 C:1	yes
	boy	0:29	A:5 C:7	yes	boy	0:29	A:3 C:0	yes
		0:23	A:3 C:7	no		0:29	A:3 C:1	yes
		0:31	A:3 C:4	no		0:31	A:2 C:0	yes
1;00	girl	0:23	A:6 C:2	yes	girl	0:23	A:2 C:0	yes
	boy	0:21	A:3 C:4	yes	boy	0:31	A:2 C:0	yes
		0:17	A:3 C:0	no		0:32	A:2 C:0	yes
1;03	girl	0:21	A:3 C:2	yes	girl	0:30	A:3 C:2	yes
		0:30	A:6 C:1	yes		0:26	A:2 C:0	yes
		0:23	A:6 C:1	yes		0:30	A:2 C:0	yes
	boy	0:28	A:5 C:5	no	boy	0:30	A:3 C:0	yes
Total		5:39				6:30		

A = Adults; C = other children.

proportions were based on the total number of minutes during which at least one other adult or child was present.

For the results presented in figures 1–4, we coded the interactive behaviours of the target children, the PCs, all other adults, and other children. The definition of *principal caretaker* was non-problematic for all sessions except for those of the Chintang baby girl. In some sessions, the baby was cared for exclusively by her mother, in others by her aunt, and, in some sessions, by both her mother and her aunt. In the latter case, the interactive behaviours of both mother and aunt were coded into the category of PC.

Reliabilities were calculated from 10% of the babies' data and 10% of the twos' and threes' data together (5% each) – that is, 10 or 5%, respectively, of each child's recordings for each cycle within one file beginning at minute 5. Kappas were good: 0.76 for numbers of individuals present; 0.88 for minutes with at least one vocalization/utterance, and 0.68 for the action categories.

Results

People Present

In tables 1–3, we compare the Chintang and German recordings for the number of adults and other children present. In these analyses, we have matched the length of the Chintang sessions to those of the German sessions since there were many more sessions for the Chintang children. To do this, we took the first Chintang session that matched in length to the sessions available for the German child or, when there was

Downloaded by:
Universität Zürich, Zentralbibliothek Zürich
130.60.47.22 - 6/9/2016 12:25:48 PM

Table 2. Comparison of sessions matched for length: 2-year-olds

Age	Chintang				Germany			
	child	length min	max present	PC always present?	child	length min	max present	PC always present?
2;02	girl	0:30	A:6 C:2	no	girl	0:30	A:3 C:1	yes
	boy	0:28	A:3 C:2	no	boy	0:30	A:2 C:0	yes
		0:28	A:3 C:3	no		0:30	A:5 C:0	yes
2;06	girl	0:11	A:5 C:0	yes	girl	0:16	A:2 C:1	yes
	boy	0:29	A:4 C:4	no	boy	0:29	A:4 C:1	yes
		0:33	A:4 C:2	no		0:33	A:4 C:0	yes
2;10–11	girl	0:20	A:3 C:5	yes	girl	0:21	A:2 C:1	yes
	boy	0:19	A:4 C:1	no	boy	0:20	A:2 C:1	yes
		0:27	A:3 C:1	no		0:30	A:2 C:1	yes
Total		2:45				2:59		

A = Adults; C = other children.

Table 3. Comparison of sessions matched for length: 3-year-olds

Age	Chintang				Germany			
	child	length min	max present	PC always present?	child	length min	max present	PC always present?
3;00–01	girl	0:34	A:3 C:8	yes	girl	0:33	A:2 C:0	yes
	boy	0:30	A:4 C:10	no	boy	0:30	A:3 C:1	yes
		0:30	A:6 C:5	no		0:30	A:2 C:1	no
3;04–05	girl	0:27	A:3 C:3	no	girl	0:31	A:3 C:1	yes
	boy	0:26	A:3 C:5	no	boy	0:27	A:2 C:1	no
3;09–10	girl	0:19	A:1 C:6	no	girl	0:19	A:2 C:0	yes
	boy	0:34	A:4 C:4	no	boy	0:30	A:3 C:3	no
		0:26	A:2 C:6	no		0:30	A:3 C:2	no
Total		2:46				2:50		

A = Adults; C = other children.

no such session, to the number of minutes from the start of the Chintang session up to the length of the German session. The tables show the age of the child, the maximum number of adults and other children present in the time period, and whether or not the PC was present for the whole session. PC refers to the person who, for a particular recording session, was the main adult interactant for the target child. As described in the Methods section, the PC was defined as not always present if he or she was absent for more than 10% of the session.

Downloaded by:
Universität Zürich, Zentralbibliothek Zürich
130.60.47.22 - 6/9/2016 12:25:48 PM

The Chintang baby girl was often cared for by her mother's sister, but the PC in almost all other children's sessions was the mother.[6] In the case of the German babies, the PC was *always present* in all but one session, but this was not the case for the Chintang baby boy. For the 2- and 3-year-olds, the Chintang PC was much more likely not to be always present than the German PCs. Although there are almost always more adults present in the Chintang sessions than in the German ones, a number of the latter showed the presence of more than the minimum 2 adults (i.e., the PC and Rigol).

There were clear cultural differences for most children and for most sessions in the number of other adults and children around. Although there was a maximum of only 2 other children present for the Chintang baby girl, almost all other Chintang sessions contained higher numbers of other adults and children than did the German sessions. For instance, there were more than 4 other children present in most of the Chintang baby boy's sessions. In Germany, the numbers were much smaller and almost exclusively consisted of other siblings. This difference was most important for the Chintang 3-year-olds, who spent a great deal of time playing in groups, unlike the German children, who would usually only experience this type of play in kindergarten rather than at home unless they had a number of siblings. In any case, the location and supervision of play would also be more restricted for the German children.

To sum up, there was a clear difference in the communicative environment of the two cultures. Chintang children were usually surrounded by more adults and many more other children than was the case in the German context.

Objects Handled

There was no variation in the number of objects handled by the children in the two cultures, but, for the twos and threes, the objects differed quite substantially between Germany and Chintang. Interestingly, this was less the case for the babies who tended to handle whatever came within their reach (e.g., parts of the PC's clothing, scraps of paper, sticks, lids, etc.). The twos and threes also played with a wide range of household objects, but the Chintang children played with objects such as sickles and brooms as well as with animals found outdoors (e.g., chickens and, in one case, a dead pigeon). By contrast, the German twos and threes played with a large variety of children's toys (including miniature tools, animals and vehicles). However, in one session, one of the children was outside feeding the family's pet rabbits with his father.

Interactive Categories

The remainder of the quantitative results are shown in figures 1–4, tables 4 and 5, and Appendix 2 and include all the recording sessions coded. We have made no attempt to analyse these data statistically given the small number of participants. However, the basic results can be seen clearly from the figures. Figures 1–3 all have the same format. The top row shows the data from the children with the data from the babies in the left-

[6] In one of the German baby boy's sessions, the PC was the child's grandmother, and in one of the German 2-year-old boy's sessions, it was the father.

Downloaded by:
Universität Zürich, Zentralbibliothek Zürich
130.60.47.22 - 6/9/2016 12:25:48 PM

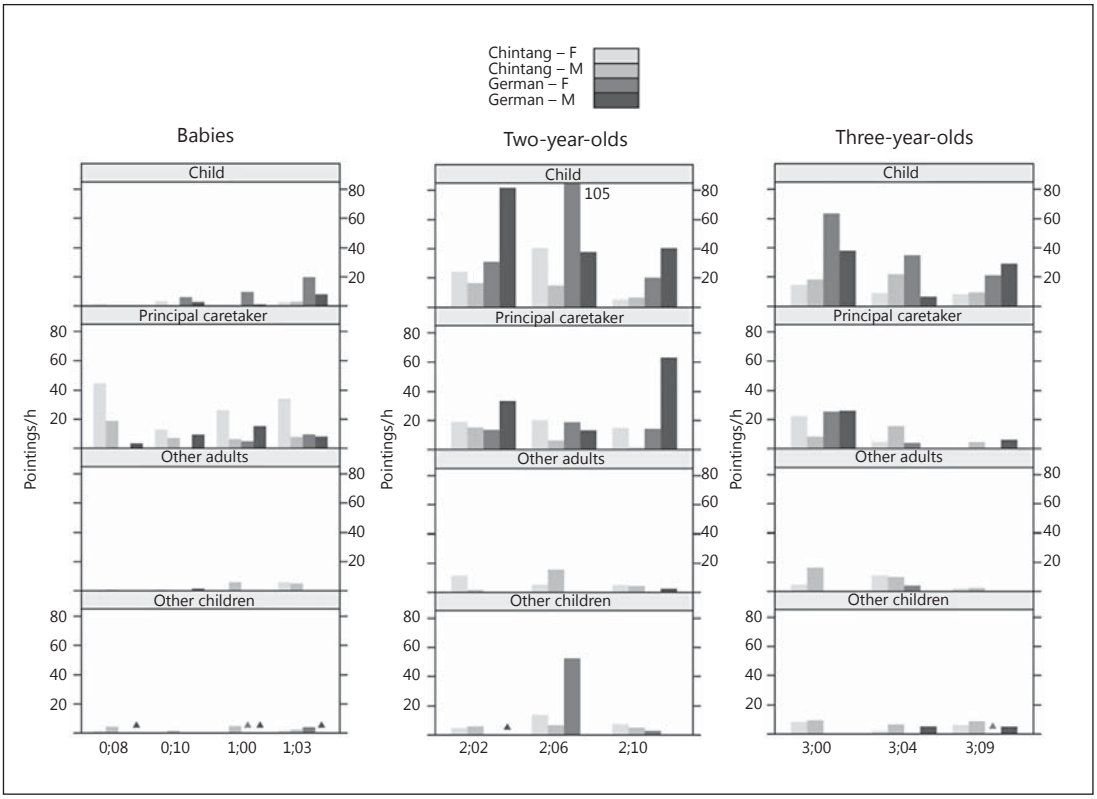

Fig. 1. Points per hour. ▲ = No other child present.

most column, the data from the twos in the central column, and the data from the threes in the rightmost column. Vertically under each are the figures for the PC, other adults, and other children, respectively. Sessions in which no other child was present are marked with a triangle. The x-axis gives the children's ages. The two Chintang children are to the left, and the German children are the two on the right of each box. The y-axis always shows proportions per hour. We first present the data on pointing and imitation since these have been the focus of specific theoretical claims. Then we present the object-handling interaction categories before dealing with vocalizations.

Pointing. Figure 1 shows the results for pointing data. At 0;08, 3 of the 4 babies were not pointing, but they had all started by 0;10 (albeit at very low rates: the Chintang baby boy produced roughly one point per every 2 h of recording). PCs pointed more for the Chintang babies in their first session at 0;08 than they did for the two German babies and at similar rates in both cultures for the other three sessions, but this is not reflected in the relative rates of pointing by the babies. The PC of the Chintang baby girl pointed by far the most across all four sessions, but the baby pointed at low rates. On the other hand, the German baby girl pointed at relatively high rates

Downloaded by:
Universität Zürich, Zentralbibliothek Zürich
130.60.47.22 - 6/9/2016 12:25:48 PM

Table 4. Pointing by children for others (percentages of total points)

Age	Chintang								Germany							
	girl				boy				girl				boy			
	self	PC	OA	OC	self	PC	OA	OC	self	PC	OA	OC	self	PC	OA	OC
1;03	37	50	13	–	11	44	–	22	10	81	6	3	25	75	–	▲
2;02	1	51	25	23	2	29	–	40	–	100	–	–	–	96	–	▲
2;06	–	69	8	22	2	15	31	25	–	52	–	48	7	46	37	–
2;10	32	16	11	42	5	15	10	40	–	100	–	–	12	33	55	–
3;00	2	28	23	47	–	7	49	43	–	60	40	–	3	66	32	–
3;04	–	20	57	23	1	52	13	24	–	17	83	–	–	67	33	–
3;09	–	–	19	81	3	3	6	81	–	71	29	▲	–	69	28	–

Rows at each age do not always add up to 100% due to (a) rounding and (b) a small number of points where it was not clear who the point was for. ▲ = No other child present; OA = other adults; OC = other children.

while her mother was not different from the other PCs. These results are in line with those studies of Callaghan et al. [2011] and Matthews et al. [2012] in terms of the age at which children start pointing. They indicate large individual differences in rates of pointing, but the numbers are too small to draw any conclusions about correlations in rates between caregivers and infants. However, in terms of the onset of pointing, there is no evidence that the Chintang children differ from the German children. There was a peak in pointing at 2;02 and 2;06 for children in both cultures. The twos and threes were all pointing more than the babies from their own culture, but in all three age groups the German children were almost always pointing at higher rates than the Chintang children, possibly because they were continuing to interact on a more one-to-one basis with adults rather than increasingly in "packs" of children playing together. There is also no obvious pattern of relationship for the twos or threes between rates of pointing to the children and the children's own rates with the exception of the German girl's session at 2;06, which involved a lot of pointing to a book. In both cultures, when other adults and children were present, they also point, albeit at low rates.

Whom the children were pointing for seemed simply to depend on who was around and interacting with the child (table 4). By the time the babies were producing a reasonable number of points at 1;03, they were pointing not only for the PC, but also for other adults and children if they were present. Points for the PC formed a high proportion for the German babies, and the Chintang children pointed for various people from this age onwards. For the German children, points for the PC stayed high up to the latest age of analysis (3;09), whereas between 22 and 48% of the points by Chintang twos and of the points in the first two sessions by Chintang threes were for other children, which reached 80% at 3;09 for both Chintang children. All the children also pointed for other adults if they were present. Interestingly, up to age 3, there were many sessions in which considerable proportions of points were points for self without any obvious interactant. For the threes, points for self were nearly absent.

Downloaded by:
Universität Zürich, Zentralbibliothek Zürich
130.60.47.22 - 6/9/2016 12:25:48 PM

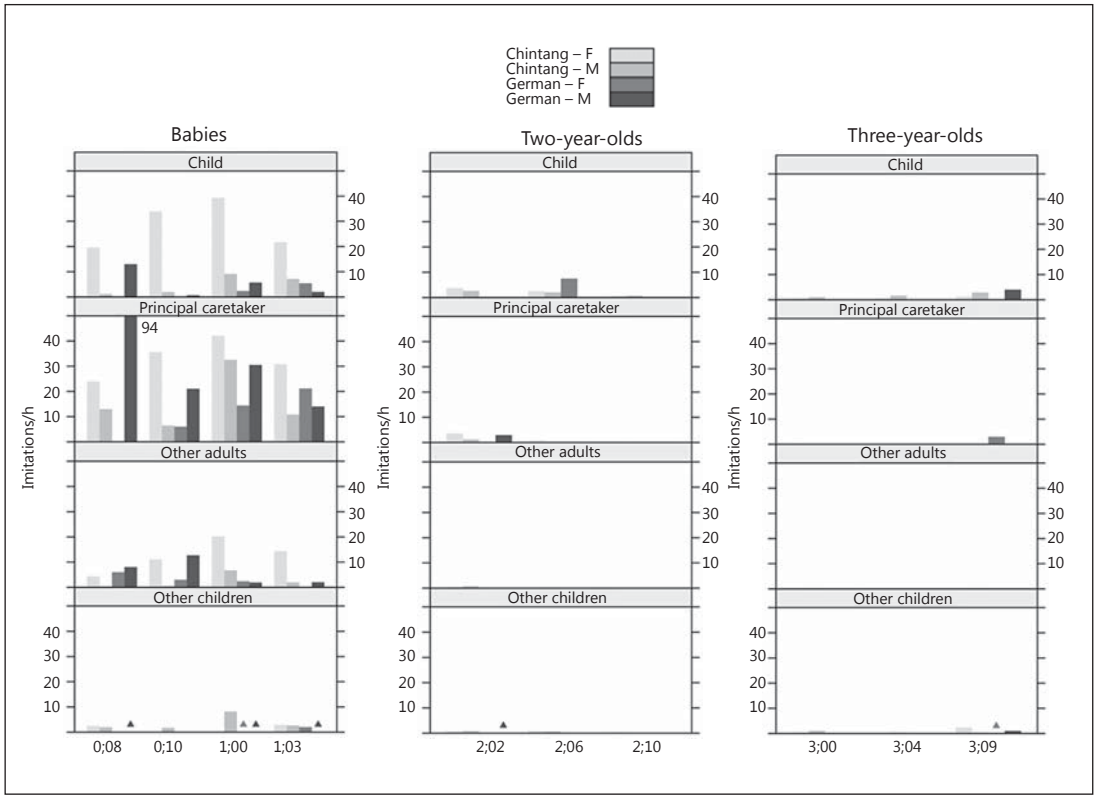

Fig. 2. Imitations per hour. ▲ = No other child present.

Imitation. Figure 2 shows the results for imitations. The picture looks clear. Unlike pointing, imitation seems to exclusively characterize interactions between the babies and their interactants. There is virtually no imitation by interactants of the children in the recordings of the twos and threes, and children are all imitating at a rate of less than 10 imitations per hour, often less than 5. We should note, however, that imitations of utterances are not included here. Individual differences seem more prevalent than cross-cultural differences, with the Chintang baby girl imitating at much higher rates (about 20–40 imitations per hour) than the other 3 babies.

While all the PCs of the babies are imitating at equal rates or higher rates than the babies, the rate of PC imitation is variable across sessions for all but the PC of the Chintang baby girl for whom the rate is fairly constant. In all the sessions of the German babies, except for the German boy at 0;10, it is predominately the caretaker that the child imitates (minimum 80% of the imitations are imitations of the PC). For the Chintang babies, the picture looks different starting at the earliest session at 0;08 for the boy and at 0;10 for the girl. The Chintang boy divides his imitations between the PC and other children, whereas the girl mainly imitates the PC and other adults.

Downloaded by:
Universität Zürich, Zentralbibliothek Zürich
130.60.47.22 - 6/9/2016 12:25:48 PM

Table 5. Imitation by babies of others (percentages of total imitations)

Age	Chintang						Germany					
	girl			boy			girl			boy		
	PC	OA	OC	PC	OA	OC	PC	OA	OC	PC	OA	OC
0;8	90	8	–	–	–	100	–	–	–	92	8	–
0;10	82	18	–	50	–	50	–	–	–	–	100	–
1;00	21	79	–	63	5	32	100	–	–	83	17	–
1;03	46	50	2	45	10	45	100	–	–	100	–	–

Rows at each age do not always add up to 100% due to rounding. OA = Other adults; OC = other children.

We cannot, of course, tell whether the relatively high rate of PC imitation of the babies is a response to the independent emergence of imitation or whether the babies are learning to imitate from the PCs. But it is very interesting how time-limited this non-verbal imitation is: whichever the direction of causation, it certainly seems that it would reflect and support the development of self-other identification.

Object-Handling, Interaction Categories: Attention-Getting, Showing, Offering and Reaching-Requesting. Looking first at the children (fig. 3), the sum of these categories ranges from a low of just over 5 interactions per hour (for the German girl at 3;04–5) to a high of 60 per hour (for the German girl at 2;02). However, there are no obvious developmental trends and no differences between the cultures.

When we come to those interacting with the children, we can see that for the babies and twos, the PCs were always higher on this overall measure than were other adults (albeit with high variability). For the Chintang twos and threes and for the Chintang baby boy, other children are much more in evidence than they are for the German twos and threes. The Chintang baby boy and the 2-year-old girl are experiencing rates on these measures of interaction from other children which are as high as those from their PCs.

Looking at the individual categories that have been combined into this measure (see Appendix 2), behaviour was very rarely coded as *attention-getting* at any age and for any of the participants. This was almost certainly because it was superseded by the other categories. At the youngest age, the babies' behaviour fell only into the *reaching-requesting* category, and their interactants were coded as almost exclusively *offering*[7]. At 10 months, 3 of the 4 babies were also *offering,* and all were doing so at 1;00 and 1;03. The babies were very rarely coded as *showing*. This suggests a possible development by the infants from a more dyadic type of interaction based on their own desires towards triadic interaction with a more explicit representation of the other. By 1;00

[7] Detailed breakdowns of the object-handling, interaction categories for those interacting with the children are available on request. Data for the target children are in Appendix 2.

Downloaded by:
Universität Zürich, Zentralbibliothek Zürich
130.60.47.22 - 6/9/2016 12:25:48 PM

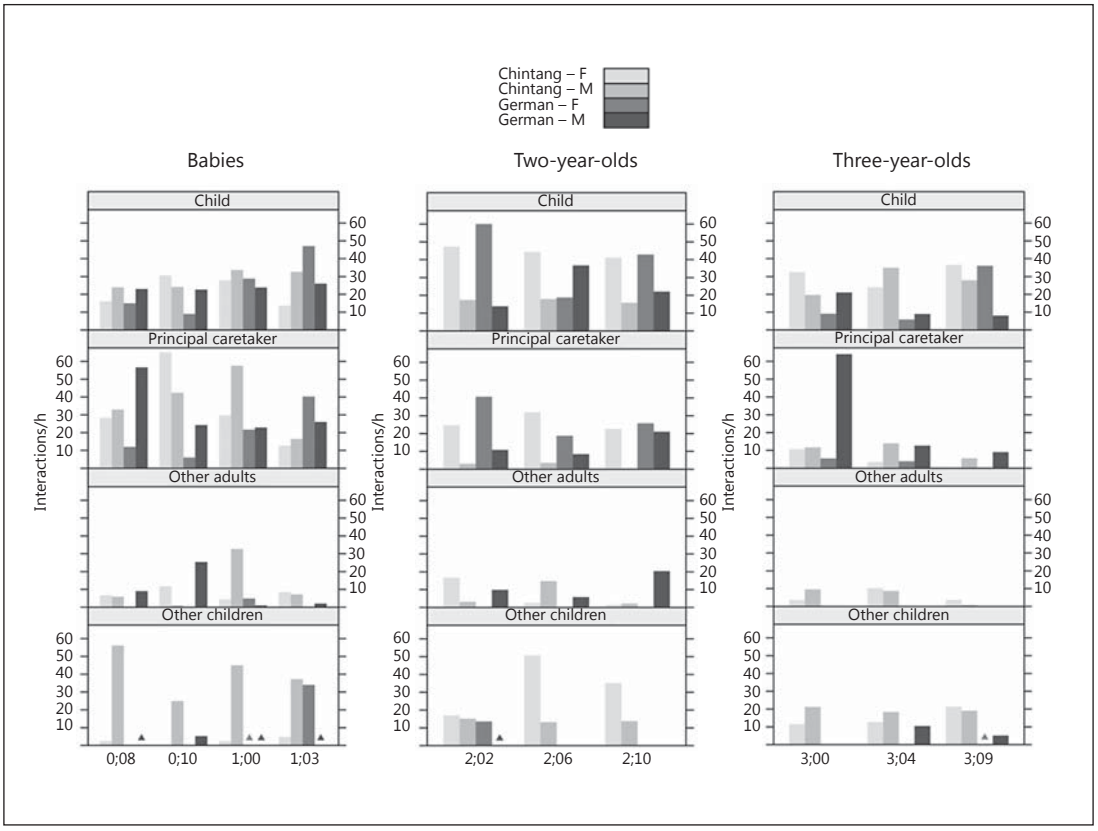

Fig. 3. Object-handling, interaction categories. ▲ = No other child present.

and 1;03, the Chintang babies were *offering* at roughly the same proportions as they were *reaching-requesting,* although this was not the case for the two German babies who both *reached/requested* much more than they *offered*. *Offering* was still the most frequent code for those interacting with the babies at the 3 later ages, but there were small amounts of *showing* and *reaching-requesting*. The Chintang babies showed their usual interactional pattern, namely for the Chintang girl, there was a high proportion of *reaches* and *offers* to other adults but not to other children and, for the Chintang boy, to other children as well as sometimes to other adults. The involvement of other children increased greatly for the twos and threes with rates for *reaching-requesting*, *offering* and *showing* often higher for interacting with other children than with the PC or other adults. Figures for the German children were very low once the overall interaction category was broken down into these 3 subcategories, but most interaction was with the PC and/or the researcher, with very little interaction with other children even when they were present.

Downloaded by:
Universität Zürich, Zentralbibliothek Zürich
130.60.47.22 - 6/9/2016 12:25:48 PM

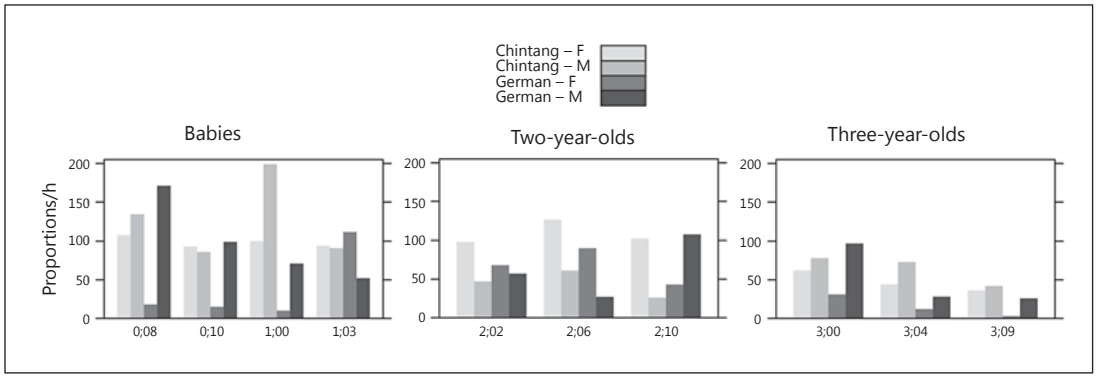

Fig. 4. Total interactions with the children per hour.

How Much Overall Interaction Are the Children Experiencing? If we combine these object-handling, interaction categories with those for pointing and imitation to get a measure of the total amount of interaction with the children (see fig. 4), there are no clear differences between cultures for the babies and 2-year-olds, the differences between sessions depending on who is present and the situation. There are clearly lower rates of overall interaction with the 3-year-olds, which become even lower across the three cycles. This may reflect children's increasing independence and ability to occupy themselves but also, in the case of the Chintang children, the fact that a lot of the play involves chasing around outside, much of which does not lend itself to being coded into the interactive categories of the present analysis. Despite this, it does seem as if the Chintang 3-year-olds are interacting at somewhat higher rates than the German 3-year-olds in addition to the total amount of interaction being spread between different interactants to a much greater extent than is the case for the German children.

Vocalizations and Utterances. To get a preliminary assessment of how much talk there is in the children's environment, we coded whether there was at least one vocalization by the relevant participant(s) per minute of recording. This does not tell us how many utterances are actually being produced, but it gives us an overview of how prevalent verbal interaction is in the two cultures and whether children encounter periods in which there is no talk. In brief, the 2- and 3-year-olds and all PCs are nearly at ceiling on this measure in all sessions. Babies, although not at ceiling, are producing at least one vocalization in a minimum of half the minutes in the sessions and often in many more. Although there are no clear differences in the number of minutes filled with at least one utterance by other adults, we should remember that there were usually more adults around in the Chintang sessions than in the German sessions. Not surprisingly, in Chintang sessions, other children are usually taking a greater conversational part than they are in the recordings of the German children. Again, this is spread over a greater number of children, while for the German children, if other children are present at all, it is usually just one sibling.[8]

[8] These data are available on request.

Downloaded by:
Universität Zürich, Zentralbibliothek Zürich
130.60.47.22 - 6/9/2016 12:25:48 PM

General Discussion

The goal of this study was to compare the non-verbal communicative behaviour of prelinguistic children and toddlers in two very different cultures. In both studies, the observer effect was minimized, and daily routines and situations were recorded. A major aim was to find out if the timetable on which these behaviours started to appear and the communicative context in which they do so were similar in the two cultures.

What Is a Naturalistic Recording Environment?

Most of the available child language data, including much of our own in previous studies, have been recorded (often only on audio) in situations which maximize the audibility of the child's language: at home, alone with the mother, in play, or in a book-reading situation that keeps the child within the range of the camera. These situations may not be very typical of children's normal days and activities and may, indeed, heighten the impression of cultural difference. Despite the fact that the data collected for the present study were primarily intended for the collection of language corpora, they do manage to move somewhat outside these restricted contexts. For Chintang, this was made easier because the children were mostly outside, and the camera was therefore less intrusive than it might otherwise have been. We could follow the children around relatively easily and move from one recording context to another. In Germany, too, the fact that grandparents and other siblings were sometimes present and that Professor Rigol lived in the community made for a more natural setting. Quantitative analyses of such natural settings are relatively new, and they allow us to study the contexts in which children grow up, in contrast with more artificial situations that may have little to do with the daily lives of children and could yield results very different from what might be obtained in a more naturalistic context. There is obviously no one perfect way to investigate these questions, and any data-gathering context will have an effect on those being observed. But when the results of different methods (naturalistic, semi-naturalistic, training studies and experiments) converge, we can have some confidence in a robust, culture-wide finding.

At What Age Do Basic Intention-Reading Skills Develop?

Broadly speaking, we found that babies from both cultures were on a similar timetable for the emergence of basic skills involving communicative interaction: pointing, imitation, and the combined categories of offering, reaching, requesting, showing, and attention-getting.

In the Callaghan et al. [2011] study, mothers from all of the three cultures were reported as saying that their infants began to imitate at around 10 months, and, in their imitation experiments, infants showed at least one successful imitation by 9–12 months in all cultures. In our study, 3 of the 4 babies were imitating at 8 months and all by 10 months but, in the case of 3 of the children, at very low levels. By 1;00, all were reliably imitating. One child was imitating at much higher rates than the other 3 in all four sessions, but there was no clear difference between the other 3,

Downloaded by:
Universität Zürich, Zentralbibliothek Zürich
130.60.47.22 - 6/9/2016 12:25:48 PM

nor did rates of imitation appear to be related to the rate at which PCs were imitating the children. This varied across sessions and between individuals but with no cultural difference. One interesting finding is how limited high rates of imitation were, in these naturalistic settings, to interaction with the babies in our study. There was very little imitation of the target children by anyone in the data of the 2- and 3-year-olds, although the children themselves were still imitating, albeit considerably less than the babies – at rates of about 5–10 times per hour (i.e., once every 6–12 min). The high rates of imitation by babies and their interactants suggest how important this type of interaction may be in the development of infants' communication skills such as turn taking and their development of the distinction between self and other. On the one hand, non-verbal imitation is an "easy" way to play with a baby, becoming much more difficult as children become mobile. But it may also be a key "automatic" feature of interacting with babies, playing an important role in initiating the child into the community and making it rewarding for the interactants to be "the same as each other." We know that infants have an early capacity for imitation which becomes much more sophisticated in the latter half of the first year [Tomasello, 2008, p. 210]. Perhaps as infants become more communicatively competent and able to initiate interaction with others in a more sophisticated way, they can move away from the "pseudo-conversation" of imitation, and this becomes a less important means of maintaining interaction. Future research will have to determine whether these pseudo-conversations with babies are culture-independent ways of introducing the child to human conversation and, thus, constitute a possible behavioural universal of child rearing. Note that, while a potential challenge for such a hypothesis would be cultures with less one-to-one parent-child interaction, the Chintang babies are being imitated by other adults and children at rates which are similar to those of PC imitations, suggesting that others, if present, can fulfil the same interactive function.

For pointing, Callaghan et al. [2011] found that mothers across the three cultures reported their infants as starting to point at 9–10 months but found a difference in the experimental results between the Canadian and Indian infants (aged between 10 and 14 months), with more Canadian infants engaging in at least 1 instance of a finger point and pointing at higher rates. They conclude "… it is clear that some infants in all three settings do point around 12 months, and in no culture did all infants point, in the age range studied" (p. 78). In our study, at 0.10 and 1;00, all 4 babies are pointing at least once and at somewhat higher rates at 1.03, though at this age the German babies are pointing more than the Chintang babies, and this is also largely true for the twos and threes. Callaghan et al. [2011] suggest that the differences they found in pointing between cultures may have been due to a slight change in the experimental set-up, especially since there were no cultural differences in the onset of pointing in the parental reports. However, it is possible that, once pointing is established in the infant repertoire, cultural differences start to develop as a function of the types of differences in parental attitudes to socialization detailed by Keller [2007]. For example, there may be some very culture-specific contexts for pointing (e.g., book-reading in specific subcultures). In addition, there is evidence from other studies in semi-experimental settings with larger groups of mothers and children that, although the onset of pointing does not vary as a function of either culture or maternal rates of pointing, the frequency with which mothers point, once the child starts to point, is related to the frequency of the child's own pointing [Liszkowski et al., 2012; Matthews et al., 2012]. However, Salomo and Liszkowski [2012] suggest that differences in rates of

Downloaded by:
Universität Zürich, Zentralbibliothek Zürich
130.60.47.22 - 6/9/2016 12:25:48 PM

triadic interaction between the three cultures they studied were implicated not only in the rates at which children use interactional gestures such as pointing but also in their onset. They utilized scan sampling by an observer combined with 1 h in total of recordings, in contrast with the 4 h of recording per longitudinal session of our study. In the early stages of development, rates of pointing can be very low, making it difficult to pick up onset reliably, which may account for the different results. Alternatively, the differences in rates of interaction may have been greater than those between the Chintang and German families in our study.

Despite these possible cultural differences, there is a peak of pointing at 2;02 and 2;06 for all the children. This may be related to the intricate relationship between gesture and emerging language. It is clearly important to measure pointing as part of a whole pattern of interaction, including language, in naturalistic contexts (as Brown [2011] has done for the relationship between joint attention and pointing).

Our categories of reaching-requesting, offering and showing all involve intentional communicative behaviour directed at another person. In our data, all the children are reaching-requesting at 8 months, but there is only evidence of offering at 10 months. Again, all the children seem to be on a similar developmental timetable with the more instrumental behaviour of reaching and requesting from others developing in advance of offering and showing, which one could argue require a more fully developed internalization of the other.

What Is the Role of Other Adults and Children in Interacting with Infants?

There were frequently many more adults and children around in the Chintang sessions than in the German ones, and they were clearly interacting with each other (as we can see from the figures on vocalization). This is in line with the negative connotations of social separateness that characterizes Rai cultures. And although we do not have data on the cultural beliefs of the German families, children clearly spent more time on their own with adults and, as they got older, more time playing alone, in line with Keller's characterization of this type of industrialized context as emphasizing children's independence. Despite this, we found that the mother (or in some cases another adult acting as the PC) was usually the most frequent person directing interaction to the babies and 2-year-olds, though other adults and children did play a greater role in Chintang than in the German families, especially in the later sessions of the babies and older children. However, apart from at 0;08, the Chintang children are directing reaching-requesting and offering to other adults and children at similar or higher rates than to the PC. Here we should note that we did not code for the infants' non-interactive attention to what is going on around them or to speech not addressed to them. It is clear that infants are quite capable of, and interested in, attending to the activities and interactions of multiple people in their immediate environment and that they did so when the opportunity was there, as it was in Chintang. Working out what children can extract from these situations is a critical issue for future studies.

The role of other children differs depending on the age of the child and the culture. In both cultures, whether other children interacted with the babies depended on whether older sibling(s) were present, but, for the 2- and 3-year-olds in Chintang, other children played a more important role in the combined interaction cat-

Downloaded by:
Universität Zürich, Zentralbibliothek Zürich
130.60.47.22 - 6/9/2016 12:25:48 PM

egories, and, in the case of the 3-year-olds, they were interacting at the same or a higher rate than the PCs. However, note that pointing, which is a feature of PC and target child behaviour for the 2- and 3-year-olds, is rather low for other children by comparison with the object-related, combined interaction categories. This may hint at different interaction styles between PCs and other children, and it raises interesting issues about the role of peers in children's socialization. We know from a number of studies in industrialized cultures that peer relations are very important to children once they start attending school [Ladd & Coleman, 1997]. But we know very little about the significance of peer interaction in the development of social and linguistic skills for much younger children if they spend large parts of the day in relatively independent groups. Since this is the case for many cultures in the world, if not most, the study of peer interaction is also an important focus for future research.

Theoretical Considerations

What accounts for the similarity in age of onset of these basic interactive skills? The two extreme answers would be, on the one hand, that it is all attributable to learning through interaction and, on the other, that in some form or other, these skills are innate. Although, as we will discuss below, interactive learning is clearly involved, it seems unlikely that it is sufficient to account for the similarities in the age of onset results in this paper and those of other studies given the evidence of differences across cultures in the amount and type of interaction with infants. In addition, while human-enculturated, non-human primates do show imperative pointing and can learn a vocabulary of up to 400 words [Savage-Rumbaugh et al., 1993], so far there is little or no evidence that they point informatively or develop anything other than the simplest syntax [Gomez, 2004]. This suggests that there is some biological underpinning to these behaviours in human children.

There have been many suggestions as to what was the crucial underpinning to the evolution of language. Suggestions include the capacity to manipulate symbols and/or modules for various aspects of language. But many have argued that the crucial evolution that gave rise to these abilities was the understanding of "other-mindedness," that others have intentions that are similar to one's own [Levinson, 2006; Tomasello, 2008]. This goes beyond the ability to know what others are perceiving visually or auditorially and to react to this, which non-human primates are certainly capable of [Gomez, 2004]. It involves knowing that others have intentions and that these can be shared. Imitation, informative pointing, and joint attention to objects are all underpinned by this understanding of other-mindedness. And, arguably, it is this capacity to understand that others have intentions in communicating that gives rise to infants' ability to learn to use and understand language. However, even if this is a uniquely evolved human capacity with biological underpinnings, this does not mean that it can emerge without developmental precursors or environmental support.

Here models derived from dynamic systems theory may be appropriate [Fogel & Thelen, 1987; Thelen & Smith, 1996]. The idea is that there is no innate factor underpinning a developmental change but a range of different factors both internal and external to the developing organism. In the case we are considering here, these different developmental strands would include all the non-human primate skills of physi-

Downloaded by:
Universität Zürich, Zentralbibliothek Zürich
130.60.47.22 - 6/9/2016 12:25:48 PM

cal cognition (e.g., object permanence) and gaze following, together with behaviour typical of human interaction with babies. Thus, the turn-taking and mirroring exchanges that take place in infancy (whether vocalizations, rhythmic jiggling, or tickling) may all be contributions to the dawning recognition of parallelism with other minds. In fact, we would guess that it is highly unlikely that a child reared without such interaction would develop imitation, informative pointing, or the capacity for triadic joint attention. However, dynamic systems theory suggests that these various strands of interaction become integrated into a novel form of representation that can be related to Karmiloff-Smith's [1994] ideas of "representational redescription." At this point, the baby's previously dyadic interactive behaviours show clear evidence of understanding shared intentions. The reason that this occurs at around 9 months may well have a basis in some developmentally time-specific aspect of brain maturation, but, as outlined above, it will also depend crucially on universal features of interaction with small babies.

We can tentatively sketch how our results would fit such a scenario. First, the mother may initially be the most important interactant, in many cultures in part as a natural consequence of breast-feeding. However, interactions with babies do not always have to involve the mother [see, for instance, Martini & Kirkpatrick, 1981]. Indeed, our study shows the increasing role of other adults and children as early as the last two sessions of the Chintang babies at 1;00 and 1;03. Babies may initially provide an affordance for interaction which is likely to be primarily dyadic. This then sets up a context for mirroring interactions which could set the stage for the realization of "other minds." As already noted, this may well be supported by the mutual imitation that seems to characterize infant-caretaker interactions. Next, it is interesting that when pointing is fully established at 1;03, a considerable proportion is coded as *pointing for self* while this is definitely not the case for the 2- and 3-year-olds (except for the 2;10 session for the Chintang girl). There is a major debate in the literature as to whether pointing first develops in non-triadic contexts and is then incorporated into these once children have developed shared intentional skills [Carpendale & Carpendale, 2010] or whether pointing demonstrates shared intentionality from the outset [Liszkowski et al., 2012]. Our data have shown that, in the first year of life, a sizeable proportion of points are for the self, but this changes considerably in the third year of life and rarely occurs at all in the fourth. This suggests that, as children move into the third year of life, their points become almost exclusively incorporated into joint interactional sequences. Thus, early pointing could be another independent strand of development that takes on a symbolic and interactional meaning once the understanding of triadic joint attention is established. Finally, in terms of the object-handling, interactional categories, Chintang babies reach-request to other adults and children if they are present from the earliest age we studied, and this is also the case as soon as they start offering at 0;10. By 0;10, they are already offering to other adults and children at rates equal to or higher than to the PC, and this continues for the Chintang twos and threes.

What we see here is a variety of actions and interactions which have emerged during infancy, some in interaction with others (e.g., reaching-requesting, turn-taking), some possibly internally generated (e.g., pointing) that all become incorporated in a realization of shared intentionality which seems to emerge around 9–12 months. The developmental stage of the infant and its affordances for particular types of interaction will both shape and be reinterpreted by the emergence

Downloaded by:
Universität Zürich, Zentralbibliothek Zürich
130.60.47.22 - 6/9/2016 12:25:48 PM

of an understanding of joint attention and shared intentionality. Thus maturational factors will always be read through the current developmental stage of the infant which is, in turn, an outcome of previous biological and environmental affordances, interactions, and learning. There will already be ways that differences in children's environments will be starting to make themselves felt, but this will become much more marked as development proceeds. For instance, the increased rate of pointing by the German 2- and 3-year-olds may well result from different practices such as book reading and naming as well, possibly by higher rates of pointing to them by adults. These older children also play with very different objects to the Chintang children, including toy animals and vehicles. This, in turn, may give rise to the differences in symbolic skills noted by Callaghan et al. [2011] (e.g., drawing). Symbolic skills may be more manifested in the Chintang children by the attempt to reproduce the actions of elders (as we observed, for instance, in "pretend" religious rituals and ploughing).

Clearly, this theoretical framework requires testing with a great deal more empirical work in different cultures. One implication of these ideas is that, as a result of differences in interaction with babies between cultures, some of these skills may be on different temporal trajectories prior to the development of shared intentionality. Would this delay its onset or could it emerge in the absence of one or more of these skills or on the basis of others? We know that the emergence of pointing, imitation, and joint attention was highly correlated in a study by Carpenter, Nagell, Tomasello, Butterworth, and Moore [1998] of a group of US children. But this may not be the case in other cultures, as Brown [2011] suggests in her study of emergence of joint attention and pointing in two non-industrialized cultures. Moreover, the question of what children can learn from observing others is an important issue that research is only just beginning to answer [de Léon, 2011; Floor & Akhtar, 2006]. In fact, Mastin and Vogt [2011] found that vocabulary development in a group of rural Mozambican children was correlated with onlooking attention to the actions of others and not, as has been frequently found for groups of children in modern industrial cultures, with joint attention skills.

Working out precisely how aspects of the child's development interact with the specificities of particular environments cross-culturally is a major enterprise, but it is essential to our understanding of how the similarities and differences in human development emerge, which is, in turn, central to the whole enterprise of developmental psychology.

Acknowledgements

This research was made possible by two grants from the Volkswagen Foundation, DoBeS program Grant No. BI 799/1-2 and II/81 961, 2004–2009, PI, Balthasar Bickel and Dilthey Fellowship, II/81 730, 2007–2012 PI, Sabine Stoll (http://www.spw.uzh.ch/clrp/index.html). We warmly thank the children and families who took part in this study. We are grateful to our team in Nepal of Chintang and Nepali assistants for their work on recording, and our student assistants in Leipzig for their work on annotating the Chintang data. Prof. Rosemarie Rigol generously made the data that she had single-handedly collected available to us. We thank Kristin Wolter, Silke Harbodt, Nicole Lorenz, Tatjana Kraemer and Mathias Zeiske for the effort, skill and patience that they showed in helping to develop and implement the coding scheme and Lukas Wiget for drawing the figures. Finally, thanks to Danielle Matthews and Michael Tomasello for very helpful comments on a previous version.

Downloaded by:
Universität Zürich, Zentralbibliothek Zürich
130.60.47.22 - 6/9/2016 12:25:48 PM

Appendix 1: Data Collection Summary

Age	Chintang			Germany		
	child	sessions	h:min	child	sessions	h:min
Babies						
0;08	girl	5	2:32	girl	1	0:19
	boy	6	2:31	boy	2	1:00
0;10	girl	5	1:58	girl	1	0:20
	boy	4	2:02	boy	3	1:29
1;00	girl	6	1:47	girl	1	0:23
	boy	9	2:02	boy	2	1:03
1;03	girl	6	3:04	girl	3	1:27
	boy	10	3:02	boy	1	0:30
Total			18:57			6:30
Twos						
2;02	girl	10	4:18	girl	1	0:30
	boy	7	3:47	boy	2	1:00
2;06	girl	7	3:57	girl	1	0:16
	boy	4	3:26	boy	2	1:02
2;10–11	girl	10	3:21	girl	1	0:21
	boy	9	2:46	boy	2	0:50
Total			43:12			7:56
Threes						
3;00–01	girl	6	3:53	girl	1	0:33
	boy	5	3:50	boy	2	1:00
3;04–05	girl	5	3:59	girl	1	0:31
	boy	6	3:34	boy	1	0:27
3;09–10	girl	12	3:53	girl	1	0:19
	boy	11	3:27	boy	2	1:00
Total			45:10			7:41

Downloaded by:
Universität Zürich, Zentralbibliothek Zürich
130.60.47.22 - 6/9/2016 12:25:48 PM

Appendix 2: Percentages of Reaching-Requesting, Offering and Showing by Children to/for Others

		Babies											
		0;8			0;10			1;00			1;03		
		PC	OA	OC	PC	OA	OC	PC	OA	OC	PC	OA	OC
Reaching-requesting													
Chintang	girl	67	5	8	48	23	–	24	16	12	39	43	13
	boy	28	4	37	23	–	–	12	15	46	25	2	51
Germany	girl	–	–	20	67	–	–	33	–	▲	85	–	5
	boy	90	–	▲	16	48	–	88		▲	80	10	▲
Offering													
Chintang	girl				15	85	–	39	43	13	7	80	7
	boy				37	–	62	26	41	32	36	27	36
Germany	girl				–	–	–	100	–	▲	83	13	–
	boy				25	75	–	100	–	▲	33	–	▲
Showing													
Chintang	girl				–	–	–	33	67		100	–	–
	boy				8	8	17	80	10	–	40	60	–
Germany	girl				–	–	–	–	–	▲	100	–	–
	boy				60	20	–	60	–	▲	–	–	▲

		Two-year-olds								
		2;02			2;06			2;10		
		PC	OA	OC	PC	OA	OC	PC	OA	OC
Reaching-requesting										
Chintang	girl	19	7	16	29	3	39	14	–	61
	boy	22	4	57	6	26	54	6	6	41
Germany	girl	50	–	50	–	–	–	100	–	–
	boy	67	–	▲	25	25	–	100	–	–
Offering										
Chintang	girl	49	15	36	57	5	36	25	4	72
	boy	–	10	90	–	56	45	6	28	67
Germany	girl	68	14	18	100	–	–	100	–	–
	boy	100	–	▲	47	40	7	25	75	–
Showing										
Chintang	girl	48	28	24	76	20	5	25	4	72
	boy	13	27	53	–	94	6	6	28	67
Germany	girl	62	37	–	75	25	–	100	–	–
	boy	50	–	▲	47	37	–	–	100	–

Downloaded by:
Universität Zürich, Zentralbibliothek Zürich
130.60.47.22 - 6/9/2016 12:25:48 PM

		Three-year-olds								
		3;00			3;04			3;09		
		PC	OA	OC	PC	OA	OC	PC	OA	OC
Reaching-requesting										
Chintang	girl	50	2	41	14	20	46	–	4	91
	boy	–	15	40	10	–	74	4	7	57
Germany	girl	–	–	–	100	–	–	33	–	▲
	boy	33	–	–	–	–	–	–	–	100
Offering										
Chintang	girl	24	5	53	8	16	52	–	4	96
	boy	2	23	75	13	26	62	–	–	98
Germany	girl	100	–	–	–	–	–	100	–	▲
	boy	–	100	–	–	–	100	100	–	–
Showing										
Chintang	girl	43	22	35	29	52	19	–	5	95
	boy	–	87	13	24	39	16	4	30	43
Germany	girl	25	75	–	–	100	–	75	25	▲
	boy	25	69	6	–	100	–	50	33	–

When rows do not add up to 100%, it is because the recipient of the action was not clear. ▲ = No other child present; OA = other adults; OC = other children.

References

Bakeman, R., & Adamson, L.B. (1984). Coordinating attention to people and objects in mother-infant and peer-infant interactions. *Child Development, 55,* 1278–1289.

Brown, P. (2011). The cultural organization of attention. In A. Duranti, E. Ochs, & B.B. Schieffelin (Eds.), *The handbook of language socialization* (pp. 29–55). Malden: Wiley-Blackwell.

Callaghan, T., Moll, H., Rakoczy, H., Warneken, F., Liszkowski, U., Behne, T., & Tomasello, M. (2011). Early social cognition in three cultural contexts. *Monographs of the Society for Research in Child Development, 76,* 1–142.

Carpendale, J., & Carpendale, A. (2010). The development of pointing: From personal directedness to interpersonal direction. *Human Development, 53,* 110–126.

Carpenter, M., Nagell, T., Tomasello, M., Butterworth, G., & Moore, C. (1998). Social cognition, joint attention, and communicative competence from 9 to 15 months of age. *Monographs of the Society for Research in Child Development, 63,* i–vi, 1–143.

de León, L. (2011). Language socialization and multiparty participation frameworks. In A. Duranti, E. Ochs, & B.B. Schieffelin (Eds.), *The handbook of language socialization* (pp. 81–108). Malden: Wiley-Blackwell.

Fenson, I., Dale, P.S., Reznick, J.S., Bates, E., Thal, D.J., Pethick, S.J., Tomasello, M., Mervis, C.B., & Stiles, J. (1994). Variability in early communicative development. *Monographs of the Society for Research in Child Development, 59,* 1–173; discussion 174–185.

Floor, P., & Akhtar, N. (2006). Can 18-month-old infants learn words by listening in on conversations? *Infancy, 9,* 327–339.

Fogel, A., & Thelen, E. (1987). Development of early expressive and communicative action: Reinterpreting the evidence from a dynamic systems perspective. *Developmental Psychology, 23,* 747–761.

Gaenszle, M. (2002). *Ancestral voices: Oral ritual texts and their social contexts among the Mewahang Rai in east Nepal. Vol. 4.* Münster: LIT Verlag.

Gaskins, S. (1999). Children's daily lives in a Mayan village: A case study of culturally constructed roles and activities. In A. Goncu (Ed.), *Children's engagement in the world* (pp. 25–81). Cambridge: Cambridge University Press.

Downloaded by:
Universität Zürich, Zentralbibliothek Zürich
130.60.47.22 - 6/9/2016 12:25:48 PM

Gaskins, S. (2006). Cultural perspectives on infant-caregiver interaction. In N.J. Enfield, & S.C. Levinson (Eds.), *Roots of human sociality: Culture, cognition, and interaction* (pp. 279–298). Oxford: Berg, as part of the Wenner-Gren Foundation International Symposium Series.
Gomez, J.C. (2004). *Apes, monkeys, children, and the growth of mind*. Cambridge: Harvard University Press.
Hardman, C.E. (2000). *Other worlds: Notion of self and emotion among the Lohorung Rai. Vol. 320*. New York: Berg.
Hart, B., & Risley, T.R. (1995). *Meaningful differences in the everyday experience of young American children*. Baltimore: Paul Brookes Publishing.
Heath, S.B. (1983). *Ways with words: Language, life, and work in communities and classrooms*. Cambridge: Cambridge University Press.
Hoff-Ginsberg, E. (1991). Mother-child conversation in different social classes and communicative settings. *Child Development, 62,* 782–796.
Hurtado, N., Marchman, V., & Fernald, A. (2008). Does input influence uptake? Links between maternal talk, processing speed and vocabulary size in Spanish-learning children. *Developmental Science, 11,* F31–F39.
Huttenlocher, J., Vasilyeva, M., Cymerman, E., & Levine, S. (2002). Language input and child syntax. *Cognitive Psychology, 45,* 337–374.
Karmiloff-Smith, A. (1994). Précis of beyond modularity: A developmental perspective on cognitive science (with peer commentary). *Behavioral and Brain Sciences, 17,* 693–706.
Keller, H. (2007). *Cultures of infancy*. Mahwah: Erlbaum.
Ladd, G.W., & Coleman, C.C. (1997). Children's classroom peer relationships and early school attitudes: Concurrent and longitudinal associations. *Early Education & Development, 8,* 51–66.
Levinson, S.C. (2006). On the human 'interaction engine'. In N. Enfield & S.C. Levinson (Eds.), *Roots of sociality: Culture, cognition, and interaction* (pp. 39–69). Oxford: Berg.
Lieven, E. (1994). Crosslinguistic and cross-cultural aspects of language addressed to children. In C. Gallaway & B.J. Richards (Eds.), *Input and interaction in language acquisition* (pp. 56–73). Cambridge: Cambridge University Press.
Liszkowski, U., Brown, P., Callaghan, T., Takada, A., & de Vos, C. (2012). A prelinguistic gestural universal of human communication. *Cognitive Science, 36,* 698–713.
MacWhinney, B. (2000). *The Childes project: Tools for analyzing talk* (3rd ed.). Mahwah: Erlbaum.
Markus, J., Mundy, P., Morales, M., Delagado, C., & Yale, M. (2000). Individual differences in infant skills as predictors of child-caregiver joint attention and language. *Social Development, 9,* 302–315.
Martini, M., & Kirkpatrick, J. (1981). Early interactions in the Marquesas Islands. In T. Field, A. Sostek, P. Vietze, & P. Leiderman (Eds.), *Culture and early interactions*. Hillsdale: Erlbaum.
Mastin, J.D., & Vogt, P. (2011, July). *Joint attention and vocabulary development: An observational study of Mozambican infants*. Poster session presented at the 12th International Congress for the Study of Child Language, Montreal.
Matthews, D., Behne, T., Lieven, E., & Tomasello, M. (2012). Origins of the human pointing gesture: a training study. *Developmental Science, 15,* 817–829.
Ochs, E. (1982). Talking to children in Western Samoa. *Language in Society, 11,* 77–104.
Ochs, E., & Schieffelin, B. (1983). *Acquiring conversational competence*. London: Routledge & Kegan Paul.
Pye, C. (1986). Quiché Mayan speech to children. *Journal of Child Language, 13,* 85–100.
Salomo, D., & Liszkowski, U. (2012, E-pub ahead of print). Sociocultural settings influence the emergence of prelinguistic deictic gestures. *Child Development*.
Savage-Rumbaugh, E.S., Murphy, J., Sevcik, R.A., Brakke, K.E., Williams, S.L., Rumbaugh D.M., & Bates, E. (1993). Language comprehension in ape and child. *Monographs of the Society for Research in Child Development, 58,* 1–252.
Schieffelin, B. (1985). The acquisition of Kaluli. In D.I. Slobin (Ed.), *The crosslinguistic study of language acquisition. Vol. 1* (pp. 525–593). Hillsdale: Erlbaum.
Snow, C.E. (1977). Development of conversation between mothers and babies. *Journal of Child Language, 4,* 1–22.
Thelen, E., & Smith, L. (1996) *Dynamic systems approach to the development of cognition and action*. Cambridge: Harvard University Press.
Tomasello, M. (2008). *Origins of human communication*. Cambridge: MIT Press.
Tomasello, M., & Todd, J. (1983). Joint attention and lexical acquisition style. *First Language, 4,* 197–212.
Trevarthen, C. (1979). Communication and cooperation in early infancy: A description of primary intersubjectivity. In M.M. Bullowa (Ed.), *Before speech: The beginning of interpersonal communication* (pp. 321–348). New York: Cambridge University Press.

Downloaded by:
Universität Zürich, Zentralbibliothek Zürich
130.60.47.22 - 6/9/2016 12:25:48 PM