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ASPECTS OF THE DEVELOPMENTAL ETHOLOGY OF A FORAGING PEOPLE

M. J. KONNER *

SUMMARY

This paper is a preliminary report of the first few months of a study of infancy and early childhood in hunter–gatherer people in north-western Botswana. Neonatal reflexes, developmental tests and direct observation of mother and baby are used to give a detailed picture of Bushman infancy. The data are interpreted with the perspective provided by the theory of natural selection.

The paper describes birth, family planning and eugenics, the reflexive capacity and feeding of the newborn and early maternal behaviour and the circumstances of the infant's first year of life. Special attention is paid to the development of the very intense fear of strangers (both Bushman and European strangers) and the very close attachment of child to mother and the eventual development of independence. Some cross-cultural comparisons both at the level of motor patterns and higher levels are made. It is argued that the role of suckling in the development of attachment should not be underemphasized, and that attachment functions not only for protection from predators but also by ensuring exposure and attention to adult technology.

Introduction

Along the northern half of the border between Botswana and South West Africa, extending east and west for about a hundred miles and ranging north into Angola, lives a nomadic people most of whom hunt and gather for a living, and have always done so. They refer to themselves as 'Zhun/twasi',† which may be sensibly glossed as 'the real people.' In recent years they have been the subject of meticulous and stimulating research in social anthropology (Marshall, 1960, 1961, 1965) and of less intensive research in physical anthropology (Tobias, 1966) and health and nutrition (Bronte-Stewart *et al.*, 1960).

They live in an ecozone classed as semidesert, in villages or camps of roughly thirty people in which each nuclear family has its own small, temporary grass dwelling. Their subsistence ecology is complex and flexible in strategy and technique, but their technology, by Western standards, is extremely simple. There is much inter-band variation, but average diet

* Department of Anthropology, Harvard University.

† In recent literature they are usually referred to as !Kung Bushmen, or simply, !Kung.

consists of about half vegetable foods. They worry about meat and the gamble involved in going after it, but vegetable foods are always available within a few miles' walk. They are nowhere near the edge of starvation, their diet is well balanced, and they have at least as much leisure time as the average middle-class American (Lee, 1968). Nevertheless, the natural elements and the vagaries of water and food availability have a patent and extensive influence over their lives.

The research in infancy and early childhood to be described is part of a five-year multidisciplinary study of the Botswana part of the population which extends previous research, emphasizing subsistence ecology (Lee, 1968), health and nutrition (Trusswell and Hansen, 1968), population genetics, demography, child training and archaeology. The theoretical perspective of the project is that of the evolution of human behaviour and its goal is the discovery of selective forces that may have acted during the Pleistocene, and their possible effect on behaviour evolution.

The present research in developmental ethology aims at a general description of infancy and early childhood among the Zhun/twasi. The necessarily small sample size makes it possible to examine very diverse aspects of early behaviour, the growth of primary attachment and separation, cognitive and motor development in the first eighteen months, and the growth of peer-directed social behaviour during what corresponds to our American 'pre-school period.' The methods used include cognitive testing, simple experimentation, neuromotor assessment, physical measurement and, most important, systematic and casual observation of mother–infant pairs and groups of 2- to 5-year-olds in their natural setting. Such observation is easy and rewarding in a society in which everyone is outdoors most of the time and the inside of the small houses open and accessible.

While many different theories have provoked the various aspects of the research, the theory we are using to make sense of them together is natural selection. This perspective has organized the research along two major lines of inquiry. First, what items and patterns of early behaviour and development can be said to be present in a sample of infants very disparate in culture, physical characteristics and subsistence ecology from the one in which they were first observed? The answers to this question will help to establish a species-specific ontogeny and early behaviour catalogue for man, so that he can be assigned a place in a phylogeny of such catalogues. Second, what is it about the hunting and gathering way of life, which dominated more than 95% of our species' history, that has given the observed developmental patterns and behaviours adaptive value? What evidence can be found of selective forces which may have acted on maternal behaviour, infant behaviour and developmental patterns during man's long foraging experience during the Pleistocene?

The results of the first few months of this research, reported below, are

preliminary and non-quantitative. They consist of the impressions we have gained from our first efforts to apply instruments and codes for assessing behaviour which were designed to describe infants and children in Western societies. They deal only with the most coarse similarities and differences. Except for the data on fear of strangers, the descriptions are based on observations of eight newborns, eighteen infants in the first year and a half, and ten children between ages 1½ and 5, living in four small villages distributed over about one hundred miles.

Perinatal selective effects: Birth, family planning, and eugenics *

Zhun/twa women are remarkable for the equanimity and independence with which they approach pregnancy and childbirth. There is no medical supervision of pregnancy or delivery, and there are no midwives or other expert native persons traditionally concerned with birth. A woman is very much on her own. When the first uterine contractions begin, she simply leaves the village alone or with one or more other women. The delivery is completed in the bush a short distance away. If the infant lives, she returns with it to the village.

She may resume her normal activities at once, or rest for a few days, depending on her inclination and condition. There is no ritual lying-in period before or after delivery. The infant is not put to the breast until the colostrum has run out, and he may be nursed by another lactating woman or simply wait for two or three days until his mother's breasts engorge with milk.

The Zhun/twasi believe that the foetus is formed by the union of semen with menstrual blood, and they abstain from sexual intercourse during menstruation in an effort to avoid pregnancy, and also because it may 'make a man sick'. In addition to this unfortunate error, two successful methods of population control have been reported by Zhun/twa informants.

The first is post-partum abstention from sexual intercourse for periods varying from two to fifteen months. Here also, the conscious effort to avoid another pregnancy is supported by the belief that sexual relations during this period are injurious to the man.

The second method, which many Zhun/twasi report to have been practised commonly until recent years, is infanticide. This was accomplished by burial of the infant within seconds after birth, probably before it breathed. Infants reported to have been abandoned in this way include those born too soon after a sibling (provided the latter was still alive), one of a pair of twins, and certain instances of malpresentation and malformation, such as breech birth, or agenesis of limbs or ears.

* The statements in this section are based on casual interviewing of the Zhun/twa adults undertaken in connection with the present research.

With the exception of the last-mentioned use of infanticide, all these population control measures have the same rationale in the folk-view: a woman cannot nurse more than one infant at a time, and in order to grow strong and healthy an infant should nurse for at least two to three years. A mother's only responsibility is to the infant alive and growing, and therefore births must be well spaced.

Another possible source of pressure for birth spacing is that a woman out gathering cannot routinely carry two infants in addition to sometimes half her own weight in bush foods. Therefore an infant should be able to walk some distance without tiring or fussing before his mother bears another child. As Bowlby citing personal communication from J. W. Anderson has pointed out (Bowlby, 1969: 254–5), an apparently well-coordinated 2-year-old can decline into neuromotor chaos as soon as mother is up and moving. One Zhun/twa 3-year-old with a 3-month-old brother pestered his mother and her gathering companions incessantly with his begging to be carried. One morning his mother decided to leave him at the village with his father and grandfather and go gathering with the baby only. Before she had walked a hundred yards his wailing brought her back again, and she didn't go gathering that day.

In addition to these deliberate efforts there is some evidence that lactation itself may reduce the likelihood of conception (Birdsell, 1968). Thus the Zhun/twa prolongation of it for reasons of health and growth may inadvertently help space births.

The practice of abandoning breech presentations was eugenic in purpose. When we asked what would happen if such a baby were kept, one man said, 'People would talk about it and say it had no sense because it was born backwards'. Research on infants delivered after a breech presentation has demonstrated large departures from the normal pattern in intensity of certain leg reflexes during the first ten days (Prechtl 1961). Sequelae of these signs are as yet unknown, but breech birth is generally considered dangerous by obstetricians. According to a basic obstetrics text, 'In breech delivery possible trauma is fracture of the thigh, ruptured spleen or liver, fracture of ribs, fracture of the humerus, rupture of the cords of the brachial plexus, as well as serious cerebral damage' (Rhodes, 1967: 228).

Whether the Zhun/twa belief about breech presentations is a matter of coincidence or of quasi-scientific tradition is open to speculation, but the latter seems not beyond the capacities of people who have discovered the two genera of indigenous beetles that make effective arrow poison. Malformed infants were abandoned because they were 'not good' and because 'people wouldn't like them'. Zhun/twa informants say the practice of infanticide has died out as a result of the threats and advice of Bantu and Europeans.

Normal infants of either sex born thirty months or more after their siblings are as desired and precious to men and women as anything in

their lives. A new infant born at an opportune time does not restrict a woman's life, it expands it, drawing attention and help to her from everyone around. A woman of child-bearing age without an infant on her hip or toddling behind her most of the time is an unusual and somehow awkward sight. Barren women are profoundly sad and ill-adjusted, from the Zhun/twa point of view as well as ours. They seem always to be looking for something to do.

The biological background of development

THE REFLEXIVE CAPACITY OF THE NEWBORN

One aspect of the research involves the administration of an instrument for the neurological assessment of newborns * (Prechtl and Beintema, 1964) in connection with naturalistic observation and follow-up studies. To date, examinations have been made of only eight newborns and observations of three more, but it seems worthwhile to make some very general remarks about this admittedly tiny sample.

Of some forty-five scorable responses in the examination, we have failed to elicit only two (biceps reflex and magnet response), and these are among the most subtle and difficult to elicit in European newborns (Beintema, 1968). Two others (pupillary reflex and corneal reflex) have not been administered. All the remaining responses are present in form and degree very reminiscent of infants we saw in Massachusetts and Holland. Specifically, the findings of Geber and Dean (1967, orig. 1957) for African neonates in Uganda – absence of the Moro reflex after four days, absence of 'snapback' in the arms, absence of the 'doll's eye reflex', absence of the stepping reflex, and extreme control of the head and spine in pulling to sit, sitting and prone suspension – none of these departures from the European pattern has been observed in these few infants.

It is our initial impression, then, that they begin life with the same basic reflex repertoire as do their European counterparts.† Only a few items in this repertoire have evident survival value for European infants: rooting, sucking and stripping actions of the mouth; staring, following and blinking of the eyes; crying and 'smiling.' Naturalistic observations of Zhun/twa infants have begun to suggest possible survival functions of other patterns, usually thought of simply as signs of an immature nervous system.

* I am grateful to Dr T. B. Brazelton, Dr B. Touwen and Dr Y. Akiyama for familiarizing me with procedures for examining newborns, though my imperfections in applying them are no fault of theirs.

† We have by no means ruled out the possibility of more subtle differences, such as differences in activity level, response strength, muscle tonus, etc., and we are examining these and similar variables as the sample expands.

For example, most newborns (East African, European, or Zhun/twa), after the first few days, when placed in the prone position, exhibit some effort to lift the head and move it from side to side, and show supportive 'crawling' movements in the legs. Most, also, when held in the upright position, will exhibit 'placing' and 'stepping' responses to appropriate stimulation of the feet (Beintema, 1968). Infants supine in cribs have little use for these patterns, except to enlighten neurologists. Zhun/twa newborns, however, are carried in a sling which keeps them upright and pressed against the mother's side. No clothing separates the infant's skin from his mother's, and one typically sees sleeping babies with faces pressed into the mother's flesh. From time to time, either spontaneously or in response to postural changes of the mother, the newborn will press his arms against her and twist his head from side to side, or, using his legs as well, twist his entire body. These movements, the components of which appear to be the same as the elicited movements mentioned above, may function to reduce the necessity for the mother to readjust him, and may even prevent him from smothering in her skin.

Bowlby has remarked (discussion of Prechtl's paper in Foss, 1963) that, in connection with the presumed late appearance of clinging in human infants (cf. Bowlby, 1969: 279), it would be interesting to observe an infant raised by a mother who continuously wore a fur coat. While a study of Eskimo infants would be more to the point, Zhun/twa infants fulfil this condition to some extent by virtue of the mothers' beads. Almost all Zhun/twa women wear many long strands of small beads which are ideal for grasping in the same way that hair is. Zhun/twa infants may be seen on occasion to grasp and cling to these masses of beads for brief periods, and with one or both hands, from the first few days of life, usually during a feed. While beads are the most common target for this behaviour at first, infants also cling to clothing and to the skin of the breasts, and later in the first year these targets take precedence.

It is necessary to distinguish this behaviour from the clinging of monkey infants on several grounds. First, it occurs much less frequently and for much shorter periods of time. It never functions to support all of the infant's weight, and it doesn't occur at all in transport contexts during the first few months. Its function in the early months is probably only to stabilize the hold of the infant's mouth on the breast, thus reducing the need for constant vigilance on the part of the mother.

Some light may be thrown on the origin of this behaviour by the fact that spontaneous Moro reflexes during feeds sometimes terminate in one- or two-handed grasping and clinging, and, also, that when a Moro occurs during a one-handed cling, the extension-adduction phase engages only the free arm, while the other continues to cling. This is in keeping with the findings of recent electro-myographic research on the Moro reflex (Prechtl, 1965; Prechtl and Lenard, 1968) demonstrating that if the infant

is grasping with both hands at the onset of the reflex, only the flexion–adduction phase occurs. These authors argue that this finding returns the reflex to the phylogenetic status Moro originally assigned to it, that of a vestige of the embracing reflex of infant monkeys – an abrupt, strong flexion–adduction of the limbs, and clinging elicited by the mother's rising and walking off while the infant is holding loosely onto her belly-fur. Our research suggests that Moro was wrong only in considering the reflex in humans completely vestigial.

VEGETATIVE ACTIVITIES

'Demand' feeding in America means feeding the infant when he cries, and this conception of it developed because crying is the only signal that can be perceived at the distance mothers in western society often maintain from their infants. Zhun/twa infants are certainly fed when they cry, but more often long before they cry. The mother, with the infant against her skin, or in her arms, can literally feel his state changes. She makes every effort to anticipate hunger. Waking up, moving, gurgling, the pucker face, the slightest fret, a change in the rate of breathing – any of these may result in nursing. No strict diaries have as yet been kept, but infants through at least the first year are nursed many times a day (twice an hour would be a conservative estimate), for from thirty seconds to ten minutes each time. It would be most sensible to describe Zhun/twa infants as 'continual feeders' (cf. Blurton Jones, Ch. 12).

Maintenance of temperature and state is facilitated through skin-to-skin contact with the mother's body. Whenever it is cool, or when there is a breeze, mothers are very reluctant to break this contact. They are also fairly careful about keeping infants out of the sun for the first two or three months, but since they are often in light shade, or part of the infant's body is exposed to direct sun at times, there is no sunlight 'deprivation'. Babies asleep on the mother's side are constantly rocked by her walking and by the movements of her ordinary activities. When the baby is small enough his body is rocked by her very breathing.

Elimination has no social consequences for Zhun/twa infants (though it does for problem 'bedwetters' in later childhood). Before he can crawl easily the infant routinely urinates and defecates in someone's lap. Usually he is not even moved until it is finished, and it is cleaned up with no comment whatever. Gradually, as he acquires control and mobility, he is told to leave the house and, after he is walking well, to leave the village. In many observed episodes no infant or child has ever been in the least upset in connection with elimination (except infants in the first two or three months upset by the change in position required for cleaning), nor, for that matter, has any adult.

The milieu of development in the first year

From the first weeks of life Zhun/twa infants, when awake, are carried not on the back, but on the hip or side in a sling contoured to support the back, buttocks and thighs, leaving the head, arms and, in older infants, the lower legs, free. The kind of support it gives is very much like that of one device designed to make reaching easier for young infants in an experimental situation (Bruner, 1968). In connection with this posture, it is worth noting some remarks of Gesell and Amatruda concerning the 6-month-old sitting up: 'His eyes widen, pulse strengthens, breathing quickens and he smiles when he is translated from the supine horizontal to the seated perpendicular. This . . . is more than a postural triumph. It is a widening of horizon, a new social orientation' (1947: 42). Zhun/twa infants are held in this position virtually from birth. The horizontal is almost unknown to them during their waking life. From their position on the mother's hip they have available to them her entire social world, the world of objects (particularly work in the mother's hands) and the breast, and the mother has immediate easy access to the infant. When the mother is standing, the infant's face is just at the eye-level of desperately maternal 10- to 12-year-old girls who frequently approach and initiate brief, intense, face-to-face interactions, including mutual smiling and vocalization. When not in the sling they are passed from hand to hand around a fire for similar interactions with one adult or child after another. They are kissed on their faces, bellies, genitals, sung to, bounced, entertained, encouraged, even addressed at length in conversational tones long before they can understand words. Throughout the first year there is rarely any dearth of such attention and love.

Nor is access to the world of objects in any way restricted, although there are no infant toys. Infants are always swiping at, grasping and manipulating beads and other objects hanging around the mother's neck, or playing with, or just staring fixedly at some object or work in the mother's hands. When they can sit alone and begin to crawl the entire natural world is open to them – sticks, grass, rocks, nutshells, insects, dung and the ubiquitous sand – and they exploit it just as Western infants use toys, with the difference that nature never gets boring, and yet is somehow orderable. Furthermore, because all objects and work belonging to adults exist on the ground, infants are never restrained from exploring them, or separated from them by tables, cupboards, or other barriers. Exploration is actively encouraged by adults and such objects are often used to distract fretting babies. They become regular targets for the phrase 'look at that' by the second week.

INFANT SIGNALLING AND ADULT RESPONSES

Crying, the pucker face, and sub-cry vocalizations are the infant's most powerful survival weapons. They appear on the first day of life and remain

prominent items in the behaviour repertoire throughout early childhood. While sound spectrographic analysis might conceivably reveal differences between Zhun/twa infants' and Western infants' crying, the naked ear does not. It is the same intensely unpleasant sound, the one one wants to hear stopped immediately. The rhythmical cry and the pain cry, described for infants in Boston (Wolff, 1969), are easily differentiated, the latter being much longer for the first few cries, higher in pitch, and arhythmical. They also produce different responses. While rhythmical crying in infants over a year old produces no response in anyone but the mother or caretaker, one observed instance of a pain cry in a 4-year-old (the boy had burned himself) elicited orientating reactions from everyone in the village and approach responses from a dozen adults. It is not the case, however, as Wolff found for American infants (1969), that mothers are very variable in their responsiveness to rhythmical crying, either in speed or style. Zhun/twa mothers never ignore rhythmical crying during the first year, whereas Wolff's mothers often did, at least temporarily. This is partly because one or more walls routinely separate infant and caretaker in Boston, while here infants are never alone in a distant room. The crying is much more disturbing to the caretaker and to everyone else.

If the infant is with a caretaker other than the mother, the caretaker will make a brief attempt at quieting and then carry the infant to the mother. Unless the infant is completely satiated the mother almost always responds by trying to nurse him. Mothers never use objects other than the breast as pacifiers. If nursing is ineffective or partially effective, rocking and singing are the next responses, often with the infant pressed, front-to-front, against her chest and shoulder. Often the singing is done loudly into his ear in an effort to drown out other stimulation. Sometimes, when he first begins to fret, she will say 'Uhn-uhn, uhn-uhn' (meaning 'no') repeatedly and rhythmically, or talk loudly but pleasantly into the infant's face in an effort to distract him. During the course of these efforts she will try nursing several times, and often the infant must be partially quieted through rocking and singing before he will nurse. If he does not quiet in a few seconds, she will rise and walk him while rocking, singing and nursing, and maintain a distance of at least twenty feet from the group she was sitting with when the crying began.

Some common causes of crying are hunger, over-stimulation (including being played with too much), frustration in pursuit of a goal and 'wind'. Since infants are unclothed and soiling attended to immediately, wetness is never a cause of crying. At about five months offering an interesting object emerges as an effective way to stop crying.

Smiling appears in the first few days of life, though not quite in its mature form. But people recognize and respond to it as smiling, with announcements to each other, laughing and increased social and physical stimulation of the infant. By at least the second month people try

repeatedly, with some success, to elicit social smiles by bouncing the infant or stroking his cheeks with simultaneous face-to-face interaction. Positive vocalizations are treated with similar, though not as intense, interest.

The growth of mother–infant interaction

By the time an infant can crawl away from his mother (around 8 months) and begin to explore the world alone, he has developed two important patterns of social behaviour: first, a strong attachment to his mother as a specific person; second, an, at least incipient, fear of strangers. He is born with the basis of social behaviour. His crying draws his mother to him and produces responses in her that relieve his distress. His hunger and oral reflexes result in interaction with her breast, and his skin-to-skin contact with her gives him warmth and tactile comfort. His interest in complex, changing, noisy things makes him look at his mother's face. By smiling he can make her smile and vocalize, or even make his surroundings explode with human sounds. By dint of these powers he is a social animal at birth. But he is not capable of attachment, which takes several months to develop. From the point of view of selection, attachment must be fully developed by the time independent locomotion begins, so that following and flight to the mother will develop simultaneously with crawling and walking. A young child lost in the bush would be subject to thirst, hunger, freezing temperatures in winter, and the predation of leopards, lions, hyenas and other carnivores, which even adults are afraid of. Attachment is top priority adaptive behaviour from the time the first exploratory creep is taken. By European standards, as indicated by all proximity-maintaining behaviours, Zhun/twa infants are strongly attached to their mothers, and it may be this very attachment that makes possible the exploration of so hostile an environment.

Considerable attention has been given in recent years to describing the behaviour patterns that make up attachment (Ainsworth, 1963; Bowlby, 1969). These patterns, covering a broad span of levels of development and levels of behaviour description, include the following: visual–postural orientation; rooting and sucking; crying and stopping of crying; smiling; non-cry vocalization; grasping and reaching; separation anxiety; approach; following; greeting; climbing and exploring; burying of face; use of the mother as a base for exploration; flight to the mother; and clinging. When these behaviours occur more often in relation to the mother than anyone else, attachment, by Ainsworth's definition, has begun.

All these patterns have been observed in Zhun/twa infants during the second half-year. But listing all these behaviours and giving them a label does not make an explanation of the growth of attachment. While Bowlby's (1969) 'ethological' formulation – which greatly de-emphasizes the role of feeding and reinforcement learning – is very helpful in terms of what to

look for, it is somewhat confusing in terms of the etiology of attachment behaviour, at least in Zhun/twa babies. This is probably because (in observable, not theoretical, terms) nursing is a manifestly important part of their lives and of their relationship to their mothers. The frequency of nursing and freedom of access to the breast from birth to weaning are very high. The first instance of the use of the mother as a base for exploration occurs when, by the second month, the infant stares at interesting sights while relaxed by suckling. At 5 months he may vocalize continually while nursing and from time to time be answered by his mother. By 8 or 9 months he begins to fondle the free breast while nursing, and though this behaviour is persistent and not entirely gentle, most women in no way discourage it. It continues until weaning, which, if the mother does not conceive again, may be as late as 6 or 8 years. Nursing is an experience engaging the whole body, associated with extension-flexion movements in the legs and pelvis, moving skin-to-skin contact with the mother, sometimes dramatic state changes, the pleasure of sucking and the assuagement of hunger. As the infant passes through the second year, it gradually becomes the one reason for approaching the mother's body for which the approach is never refused. Finally, all attachments of any kind between Zhun/twa *adults* involve continual giving and receiving of food. Perhaps feeding is an unimportant aspect of attachment in England, or even in Uganda, but here it emphatically is not.

In assigning an important role to feeding I do not mean to rule out other factors already mentioned; merely to stress one factor that has been de-emphasized in recent theorizing. It is suggested that both the innate features of social behaviour – crying, interest in faces, smiling – *and* reinforcement learning, with not only feeding but also warmth and tactile stimulation as reinforcers, contribute to the growth of attachment during the first half-year.

The growth of responses to strangers

Between 7 and 9 months of age, Zhun/twa infants (like their Western counterparts) who formerly played happily with anyone, develop a discriminating uneasiness in the presence of people they don't know. With a kind of Hebbian perspicacity, Zhun/twa mothers see it as a sign of wisdom. The fear of strangers (also called 'stranger anxiety' and '8-months anxiety') has been a popular subject for research in developmental psychology (e.g. Ainsworth and Wittig, 1969; Morgan and Ricciuti, 1969), and its etiology a subject for extensive theoretical controversy (e.g. Bowlby, 1969). It is of interest to ethologists because it is the earliest instance of agonistic behaviour, and because it has the apparent adaptive function of removing the infant from a potentially dangerous, or at least unknown, individual.

In order to examine cross-sectionally the development of fear of strangers, responses to the standard approach of a female stranger were observed in 36 infants and young children (20 girls and 16 boys). The stranger approached the infant slowly, smiling and repeating the infant's name with high inflection while the infant was seated or standing within a few feet of the mother. Then the stranger touched or picked up the infant. (Only the oldest subjects were not picked up, and they were held firmly in both arms.)

The responses scored by the observer and the weights assigned them are listed in Table 11·1. Higher weights were assigned to those responses which only appeared when lower-weighted responses also appeared (for example, laugh was weighted more than smile, because laugh never occurred unless smile occurred, whereas the reverse was not true). Weights of all responses observed in a subject during the episode were summed algebraically to yield a 'fear of stranger' score. Each possible response was scored only once, however frequently it occurred.

TABLE 11·1. *Responses to strangers according to weights assigned them*

−3	−2	−1	0	+1	+2	+3
Laugh Touch stranger	Smile Non-fret vocalization	Stare at stranger's face (more than 10 sec)	Mouth hand	Gaze avert (within 2 sec) Look at mother Withdraw from stranger Pucker face	Approach mother Touch mother Fret	Cling Nurse Cry

Eighteen infants were tested by both European and Zhun/twa female strangers, and the remainder by the European stranger only. (It is often impossible to find a woman who is unknown to an infant.) Since the more foreign a stranger is, the more dangerous he should be, it was reasoned that there would be a clearly more fearful response to the European, but this expectation was not confirmed. In twelve cases the scores for the two were identical. Three were more fearful of the European, and three more fearful of the Zhun/twa. The only difference was that in the ones more fearful of the European the difference in scores was larger. There were too many ties for non-parametric procedures to be applied to discrimination between the groups.

Where different, the European and Zhun/twa scores were averaged, and the scores for all subjects were ordinally ranked. The results of this ranking, in relation to age, are displayed in Fig. 11·1. The first unequivocally fearful response was in an 8-month-old, and the strength of response wa

greatest in the second half of the second year. The oldest child showing a clearly fearful response was 40 months old, but fearful responses were absent in a number of children between 24 and 40 months. Although squirming and reaching toward the mother in younger infants were counted as 'withdraw' or 'approach mother', and touch, cling and nurse were coded even if the mother approached the infant first, the curve for at least the first year is steepened by simple neuromotor maturation. However, even if the locomotor responses are subtracted there is no decline in fear scores before the end of the second year.

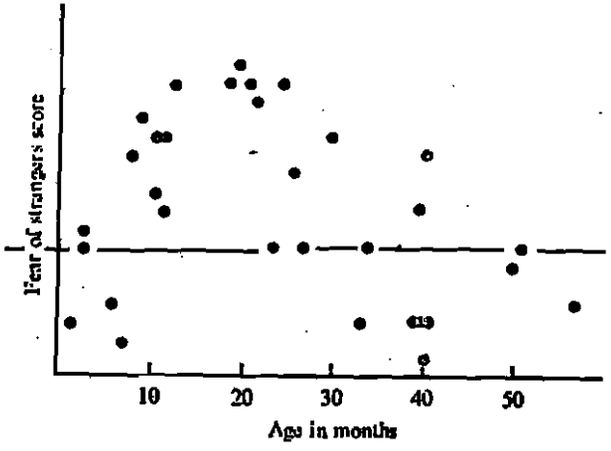

Fig. 11.1. Responses to strangers. The ordinal ranking of subjects by fear of strangers scores (y-axis, increasing fearfulness) is shown in relation to age in calendar months. The broken line indicates the rank of individuals whose algebraically summed responses were equal to zero (neither fearful nor positive). Each dot represents a child.

The reaction is markedly more extreme than what we are familiar with in Western infants, often characterized by immediate loud screams, headlong flight to the mother, clinging and nursing, even though she is only a few feet away. Clinging and nursing may be maintained for as long as the stranger is close by (compare the mild responses of 1-year-olds to a similar test in America by Ainsworth and Wittig, 1969). The fear is more difficult to overcome, sometimes requiring days of familiarity, giving of food, entertaining, and so on, with the active co-operation of the parents. It also persists much later in development. The response to strangers reported for British pre-school children by Blurton Jones (1967) and by Connolly and Smith (Ch. 6) of presenting the stranger with an object has never been observed among Zhun/twa children of a comparable age in any context. There is no approach at all until familiarity has been established.

There are several possible explanations for these differences, but the simplest is that Zhun/twa infants have much less experience with strangers. Western infants, or at least the urban ones that have been the subjects of most studies, see or meet strangers many times a day, and so their fearful responses to strangers in general and to any given stranger habituate more quickly. Though Zhun/twa infants do see some strangers, as people move from camp to camp, it is only a tiny fraction of the number Western infants see. To Zhun/twa infants the class of strangers, as well as the individual stranger, is strange.

From an adaptive viewpoint it is worth noting that Zhun/twa children between 18 months and 5 years old spend considerable time playing together on the outskirts of a sedentary camp, though never out of earshot of adults. This pattern of social behaviour may produce a selective advantage for fearful responses to strangers beyond the first 18 months. (This is a different order of explanation. It does not remove the problem of etiology, i.e. the developmental mechanism through which natural selection gets translated into child behaviour.)

The distribution of several specific fearful responses may be of interest. The flight response appears as soon as the motor capacity for flight exists, and it invariably carries the infant not only away from the stranger, but *to* the mother. Like the crying response, which emerges earlier, it functions to bring the infant and mother together, and not merely to separate the infant from the stranger.

Clinging to the mother is a common component after 9 months. It is also a component of non-fearful attachment appearing during nursing and in other attachment contexts from the first few days, and a component of the infant's posture during certain kinds of transport by around 8 months.

Nursing is commonly associated with visual fixation of the stranger's face in infants who, when not nursing, immediately avert. This is an instance of the use of the mother as a base for exploration.

Mouthing of the hand is a very common response in older infants who show no other scored behaviour, fearful or positive, but seem to be trying to make up their minds, or perhaps just 'waiting it out'. This may have a function similar to nursing at a lower level of arousal, but it is in no sense derived from nursing, since hand-to-mouth activity resulting in self-quieting can be seen from the first few days of life.

Attachment, Imitation and Subsistence Play

While attachment has important immediate adaptive dividends, it has some long-range ones as well, because it functions to maintain proximity with effective models of subsistence and reproductive behaviour. By the end of the first year (within a few months after attachment itself develops), well-*differentiated*, deferred imitation (Piaget, 1962) of the elementary com-

ponents of adult subsistence activities appears (pounding with a mortar and pestle, digging with a digging stick, and others), as does the imitation of singing, clapping and dancing. Adults delight in these early accomplishments, and spend much time trying to encourage and re-elicit them. Infants under a year of age may be encouraged to inspect and chase after, and even bite, large insects, which they gladly do.

By the second half of the second year autonomous exploration is well-established, two-word phrases are replacing baby noises and infants engage in social play with slightly older children, usually in imaginative imitation of adults. The interest of both boys and girls in animals continues to expand, and by the age of 5 they take interest and pleasure in bothering and killing them. It is very striking that most of the component behaviours in rough and tumble play – chasing, fleeing, laughing, jumping, play-noise and play-face (Blurton Jones, 1967) along with completed 'object beats' (striking with an object) can be seen in Zhun/twa children annoying large animals (dogs, or cows belonging to neighbouring herding people) or trying to kill small ones.

All these activities take place within earshot, if not within sight, of adults, and the activities themselves are obviously child versions of adult life. Such imitation is characteristic of British children as well, but there it is not often something the child will eventually do for a living that is imitated, but rather things like astronaut, cowboy and soldier. Girls in both societies, though, occupy themselves with 'playing house' – cooking and serving food, going to bed, and so on.

The continuous acquisition of subsistence behaviours from 1 year of age into adulthood is very evident among the Zhun/twasi, and imitation is a primary mode of learning such behaviours. Attachment, or the maintenance of proximity to models, makes this process possible. Bowlby's emphasis on protection from predators thus accounts for only part of the survival value of attachment behaviour.

Separation and the growth of social behaviour

The attachment which ensures the infant's immediate survival and enables him to learn social interaction patterns and elementary subsistence behaviour must finally decline, to prepare the mother for a new infant and to prepare the child for independent social interaction outside the family. The mother, the infant and attractiveness of the world outside the mother all contribute to the development of separation.

Exploration, using the mother as a base, begins by 7 or 8 months, at the same time that flight behaviours and the more advanced components of attachment – approach, clinging, following and flight to the mother – are emerging. During the first half of the second year, these components combine with several earlier components of attachment – smiling, laughing,

positive vocalizations – to form a new social interaction pattern between mothers or other adults and infants, usually initiated by the adult. The adult runs slowly away from the infant, eliciting the following response, then turns and makes a frightening face or noise, eliciting the flight response, and gives chase, only to turn and repeat the pattern again. The presence of smiles, laughing and especially of clinging when the infant catches the adult before he turns around, makes the roots of this pattern in attachment very plain. At the same time, the flight response derives from earliest agonistic behaviour seen in relation to strangers.

This pattern, an elementary adult–child form of rough and tumble play, thus derives its components from both attachment and agonistic patterns and is in an objective sense what psychoanalysts call *ambivalent* behaviour. It is the first tiny dent in the unequivocal indulgence of infants by adults that is characteristic of the first year. Its adult–child form continues into middle childhood, but shortly after it emerges it gives rise to several child–child variations.

By 18 months to 2 years the child spends considerable lengths of time playing with children of 2, 3, 4 and 5. At any time a village may have five such children, or three, or only one or two. They may play among themselves or with older children, who play an important part in their lives. For much of the time, though, their world is a kind of large playground in which adults and older children are going about their business. It differs structurally from the nursery schools of England and America in several important respects. First, there is unlimited space, and most objects of interest – sticks or grass – are available in unlimited quantity. Second, there are often no peers, strictly speaking, because village populations are too small for there to be, say, several 3-year-olds. Differences of a year or less at this age are large and obvious to the children. They are enjoined by adults to look on older children as models and objects of dependence, and on younger ones as responsibilities. For these reasons there is comparatively very little real or play fighting among children in this age group here. Rough and tumble play is usually either stylized, as when one child pretends to be an animal that the others are attacking, or else it takes a mild form that consists, in spite of the available space, of laughing, hugging and rolling around on the ground together. In this mild form it grades into another kind of social play discussed below. However, when five or six children of roughly the same age *do* have the opportunity to play together (as when two formerly separate camps merge), rough and tumble play appears prominently, and in the same form as in British children. As in the animal-directed variety, completed object beats are included in the pattern.

Children are not lacking, however, in real aggressive behaviours (or, by inference, aggressive feelings). They do snatch food or objects from one another, but this is mediated by the age difference. The older child either

nurtures the younger one, or overpowers him; in either case there is no struggle. More elaborate fighting behaviour can be seen, however, in relation to parents. Unlike the passive tantrums we are familiar with, a Zhun/twa tantrum is often characterized by beating, object beating and throwing of objects, all directed at the mother, in addition to frowning, grimacing and crying. Mothers are quite serene as the tantrum progresses, often laughing and talking to other adults while they ward off the tiny blows. They do not respond with the immediate anger characteristic of Western mothers hit by their children, but usually allow the episode to run its course. The Western tantrum, characterized by aimless thrashing and flailing of limbs with the same facial expressions and vocalizations, may be the result of parental 'training out' of real aggressive acts. If aggression *is* something that can be *displaced* or *redirected*, then this difference in the acceptability of real aggression against parents may help to account for the relative lack of fighting among young children in Zhun/twa society.

Similarly, the aggressive feelings expressed in rough and tumble play, may, among Zhun/twa children, find an adaptively appropriate 'outlet' in relation to animals. In evolutionary terms, the basic primate pattern of rough and tumble play has become, in part, specialized in man to serve the acquisition of hunting behaviour.

One further pattern of social play is common among 1- to 5-year-olds. Its components are mutual touching, tangling of legs, clinging and rolling while lying on the ground. The absence of laughing, the slowness of movement and the unlikelihood of standing up are what distinguish it from the mild form of rough and tumble play. Unless it includes explicitly genital activity (which also occurs during this age period) this behaviour, which might be called 'gentle and tumble' play, is ignored by adults. Its derivation from parental attachment behaviour is very apparent, both from the shared behaviour components and from the fact that this play may take an imaginative form in which the older child takes the role of parent. The influence of parents as models is all-pervasive.

In later childhood gentle and tumble play is never publicly seen (although grooming shares several of its components). Rough and tumble play very much like that of British nursery school children becomes increasingly common until late adolescence. In contrast, the attitude toward animals at first becomes more serious and restrained, but the final adult pattern, with respect to game animals, at least, is reminiscent of the excitement of 4-year-olds chasing butterflies.

Discussion

Many psychologists now recognize the importance of evolutionary perspective in theorizing, but this is often limited to the view of an infant as

developing *into* an adapted organism. While this is certainly true, it is sometimes allowed to obscure the fact that an infant is first of all, and at every point in his development, an adapted organism. He is first of all surviving, and in the meantime developing.

As in most populations, but especially non-technological populations, the mortality rate among the Zhun/twasi in the first five years of life is much higher than in any comparable span before the end of the breeding period. Consequently selection pressures during this period, however obscure, may be very strong. Selection asks, as it were, 'How well is the child surviving *now*?', and not just 'what will he be when he grows up?'.

To put the case at its strongest, we should be prepared to consider the possibility that the characteristic features of adult human behaviour have evolved not because they are an ideal adaptation, but because they are the result of an ideal adaptation in infancy. Just as blood-group frequencies among adults are, in part, the result of perinatal selection through maternal-foetal incompatibility, some adult behaviour patterns (for example, marriage) may be in part the result of selective forces favouring certain infant behaviours (for example, strong attachment).

The implication for Western urban behaviour and development is that selection pressures, both those affecting adults and those affecting infants, have changed, and we can understand (and perhaps influence) the course of behavioural evolution by understanding the changing factors affecting species-specific human infancy. If such speculation is unconvincing, it is at least provocative, and it is in any case impossible without studies of infancy in hunting and gathering societies.

Conclusion

This report – fragmentary, diffuse, but hopefully emergent – has described what we have learned so far about the first five years of life among a hunting-and-gathering people, and the selective forces that may be affecting it. Certain preliminary conclusions are possible.

First, ethological methods of research developed in animal studies are as appropriate for research on infants and children in primitive societies as they are in Britain.

Second, in the most complex behaviour patterns there are uniformities which extend across the widest cultural gaps, in behavioural capacity at birth, in patterns of attachment and fear of strangers, and in the social behaviour of toddlers. While this will come as no surprise to ethologists, it may to some cultural anthropologists who suppose human behaviour to be malleable almost to the point of being unlawful. On the other hand, there are variations beyond what some ethologists would expect. The differences are due partly to differences in ecological pressures, and partly to the unsystematic cultural variation anthropologists are concerned with.

The way to determine which is which is through studies of infancy and early childhood in other hunting-and-gathering societies. At the same time, hypotheses derived from such studies (such as the proposed relationship among various modes of expressing aggression in early childhood) can be tested on large, variable samples of Western infants and children.*

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* For those convinced that it is worthwhile to do ethological research on man other than at his (for now) most successful, Murdock (1968) provides a comprehensive annotated list of the foraging populations of the world among which behavioural research is still believed to be possible. Those interested are urged to act in haste.

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