

ATTACHMENT BEHAVIOUR OUT OF DOORS

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SUMMARY

This paper consists of deductions from observations made out of doors on the interactions between mother and infant with a view to ascertaining the distances he maintained when he was at liberty in a familiar environment. Thus, attachment behaviour, the infant's tendency to maintain proximity to its mother, hypothesized in Bowlby's (1958) account of the child's tie to its mother to be at its strongest during the period 18 to 30 months, came under observation in testing circumstances. It was found that infants whose ages were estimated to range from just walking to 2.5 years kept within sight or sound of the mother without 'their having to be recalled. Since cases in which prolonged feeding and other care-taking behaviour which cause a mother and infant to remain together had been excluded from the sample, the social basis of the bond which kept the child within a safe distance could be affirmed. Subjects did not know that they were under scrutiny; observation periods therefore yielded samples of spontaneous behaviour. For instance, conspicuous gestures of communication occur every now and then, and from them mild states of arousal can be inferred. Since Darwin's time, it has been known that the expression of emotion provides a means of communication both for animals and for men; modern ethologists describe in detail the signals and gestures that unite a pair in lasting bonds. This paper isolates some of the communications that occur in a natural setting, thus preparing for the study of attachment in terms of factors that identify a mother-infant pair.

Introduction

This paper gives some results of a study of attachment in human infants out of doors. The study arose from a consideration of the effects on the character of long early separation from the mother (Bowlby, 1951); from studies of imprinting; from work on mother-infant interactions in higher animals, which records the stages by which the infant enlarges his environment while maintaining contact with the mother; and from a reformulation of the psycho-analytical theory of the child's tie to his mother (Bowlby, 1958). A further influence was a description of the altered relationships between animals when the spatial distances between them changed (Hediger, 1955). In contrast to the theories of observers who record the social interaction of the young with its parents, there are views of writers who emphasize the permissive and restrictive aspects of parents' behaviour to ac-

count for the proximity of their infant; Smart and Smart (1967: 146), for instance, state that if parents did not set limits on their infants' behaviour, 'there would be no more babies, since babies creep and toddle right into danger'.

Mothers' statements when presenting a history of their child at child guidance clinics were highly material to the general thesis. Some mothers had noticed a peculiarity in their child's attachment beginning at the time he had learned to walk: how, instead of enjoying the freedom which his first outings to the park afforded, he would cling close, not mixing with other people, scarcely ever taking his eyes off his mother. Or, in contrast, so far from being anxious when away from her, a child had persistently sought opportunities to depart; unless she was vigilant, he would get lost and remain missing until he

was returned to her by neighbours, apparently untroubled by the loss of his mother.

Hence, one aspect of attachment, the tendency to remain in proximity to the mother, presented itself for testing. By making observations on mother—infant pairs when the infant had just begun to leave the mother's side, in surroundings where opportunities for exploring remote places might take him out of her control, it would be possible to isolate the social influence of the mother on his behaviour.

Method

The results below were derived from tape-recorded commentaries of infants' 'random' movements around a stationary mother in London parks, over observation periods which averaged fifteen minutes, without the subjects' awareness. The infants' ages were estimated to range from 15 to 30 months. The criterion of selection was that a mother should have positioned herself so far away from other people with children that interruption by them would be unlikely. The mother was not to be amusing the child with toys or otherwise deliberately influencing his behaviour. If she recalled him with an offer of food, recording was abandoned. It was hoped to exclude every feeding situation, but this requirement would have sacrificed most of the cases; however, it is not thought that what feeding that occurred biased the locomotion scores, for when a child went to his mother to fetch a feeding cup he simply resumed his peregrinations with it in his hand.

Results

RETRIEVAL BY THE MOTHER

The infants seemed to establish their own boundaries and with the exceptions noted below kept within a distance of approximately 200 feet from the mother without being recalled. Out of thirty-five infants, twenty-four were never far enough away to warrant retrieval. A further eight were followed by the mother; after he had been playing in her vicinity for a few minutes the infant would be attracted elsewhere (to a swing enclosure, for example) and the mother would leave her position to catch up and escort him to it. The remaining three infants were brought back when they wandered too far or remained out of their mother's sight.

Thus, in spite of the opportunities for wandering and the temptation to explore, the sam-

ple remain mother-oriented while establishing a distance which takes them out of her immediate control. This is not to say that the mothers relax vigilance when the children are at a distance, and it is broadly true that the infant's boundary coincides with that which she tolerates.

GENERAL LOCOMOTION

Infants move around in bouts which are typically short and (provided that they are not close to their mother) stop between each bout for similar brief periods. The distributions of walking and stationary bouts are, for all infants, positively skewed, that is, scores accumulate at the short end of the distribution, while long bouts tend to be very long and rare in comparison.

The median for the child with the shortest bouts of locomotion is 3 seconds, the median for the longest 8.5 seconds. The scores for stationary periods vary independently of the latter range, but the range of medians is similar; the lowest median is 2 seconds, the highest 9 seconds.

In order to determine whether the differences in infants' bouts of loco-motion signified genuine population differences or whether they represented chance variations, the data for fourteen infants were tested by the Kruskal-Wallis One-Way Analysis of Variance (Siegel, 1956). The resulting H of 67 has a probability under the null hypothesis of <0.001 from which it is concluded that infants differ from each other significantly in the duration of their bouts of locomotion.

Two factors probably account for this result: the various ages of the infants sampled and the habitual performance of the different children. It is expected, when a sample's scores are compared over a period of years, that cutting across the changes that take place with age, characteristic similarities within individuals will remain.

SORTIE, RETURN AND STOP

When making the running commentary it was quickest to describe bouts which reduced the distance between the infant and his mother as *return* and those which increased it as *sortie*. These bouts turned out to account for most of the infant's locomotion. Occasionally he described a small circle or semi-circle or walked in a line circumferential to the mother; or he would revolve on his axis; or he might fall,

crawl or jump, but most of his walking time is spent drawing nearer to or farther from the mother.

Another characteristic of the activity around the mother is the tendency to stop after a few seconds of locomotion rather than to run hither and thither. This period in which the child is not walking manifests such a variety of behaviours from immobility to energetic playing that an inventory was begun for subsequent analysis; for the present purpose, the terms stationary and stopped are used simply to mean not walking.

Since the stationary periods broke up those of locomotion, it was expected that the child's stationary bouts would occupy the largest proportion of the whole observation period. It was further hypothesized that since most of the children did not stray from their mothers, the time spent in *sortie* would be approximately the same as that spent in *return*. The data were ranked according to the proportion of total observation time which the infant spent under the three conditions of *sortie*, *return* and *stop* and these ranks put to the Friedman Two-Way Analysis of Variance test (Siegel, 1956). The result of chi-square $r=17.7$ for fifteen children leads to a rejection of the null hypothesis at the $p<0.001$ level; *return* occupies the least proportion of time, *stop* the greatest, and *sortie* comes intermediate. When the numbers of bouts in each condition constitute the ranks of the same test, the null hypothesis is rejected even more decisively; there are considerably more bouts of *stop* than of *sortie*, and of *sortie* than *return*.

Although the expectation in regard to stationary periods was confirmed, it was a surprise to learn that infants who do not need recalling to their mothers spend more time retreating from than returning to her. It is suspected that there is a difference in velocity, the infants tending to run to the mother but to walk away from her. The point could not be investigated because an infant's pace changes within one bout of locomotion.

STATIONARY PERIODS

The outline of graphs in which the infant's distance from the mother was plotted against time suggested that when a child was close to his mother he was stationary for longer periods than when he

was away from her, but that these periods were fewer in number than those spent further away. (By 'close to' a distance of some 3 feet is meant: a spot at which he could be reached by the mother without her leaving her position.) The median periods which the sample spent close to the mother range from 4 to 37 seconds. In contrast, the bouts spent away from her are shorter, the medians ranging from 2 to 9 seconds. When each infant is compared for his median period spent close to/away from the mother, the result is clear-cut; the longer median bout is spent beside the mother by sixteen out of seventeen infants. Then, each child's number of stationary bouts was divided into the proportions spent close to/away from the mother and the rank differences put to the Wilcoxon Matched-Pairs Signed-Rank test (Siegel, 1956) : the result is that fewer bouts are spent close to mother ($p=0.01$).

The hypotheses that infants differed from each other in the length of their stationary bouts when (i) close to the mother, and (ii) away from the mother, were tested. Under each of these two conditions, the scores made by eight infants (for this analysis I had to exclude cases where another infant intervened, and to separate those able to walk well from those just-walking toddlers, hence the reduced number of cases) over a ten-minute observation period were put to a Kruskal-Wallis One-Way Analysis of Variance and proved to represent only chance variations. Infants did not differ from each other in length of their average stationary periods whether they were close to or away from the mother. The generalization that remains from the stationary data is therefore the following : an infant stops close to his mother for long periods but infrequently; away from her, he stops for short periods frequently.

SORTIE AND RETURN IN FURTHER DETAIL

It was thought that the stationary mother might be the stimulus to a pattern of activities operating relatively independently of anything happening else-where. Thus, when an infant left her side, it need not have been that he wanted to pursue a remote object or because she urged him away but simply that he wished to put a distance between himself and her at that moment. Similarly, if an infant approached his mother, it would not necessarily be because he were called back to her, or be recoiling from strange objects. In short, locomotions to and from the mother are not specifically released in his external environment.

TABLE 8'1.
Evidence of Stimuli to 49 Bouts of
Return Made by 7 Infants

Any event to stimulate the return	<i>Full Return</i>	<i>Incomplete Return</i>	<i>Totals</i>
Yes	2	0	2
No	26	21	47
Totals	28	21	49

Taking the *returns* first, the records were perused for evidence that the infant had been instigated to approach his mother by being called or signalled, by being frightened, hurt or surprised in any way. Forty-nine *return* bouts made by seven infants were divided into *full return* (a bout that took him to his mother's side) and *incomplete return* (where he had moved towards her but stopped short or walked away again) and tested for independence of events which might have produced the approach (Table 8'1). The resulting fourfold contingency table yielded a χ^2 which was no larger than would arise by chance. In only two instances out of forty-nine – the mother's being joined by a female companion – could the observer infer a reason for the infant's being impelled back to her.

To test the hypothesis that the child had been stimulated to return to the mother by his seeing her do something that might have interested him, forty-six bouts of return made by seven infants were divided into *full* and *incomplete return* and classed according to whether or not the child was looking at his mother just before he made the approach. Another non-significant combination of frequencies demonstrates that the infant is as likely as not to be facing away from the mother just before his approach is made and therefore no specific stimuli emanating from her can be held to account for his return.

There is a similar paucity of evidence of external events to account for his walking away from his mother when the *sortie* data was scrutinized. After leaving the mother's side he usually stops to look around; he may approach a passer-by or seek a patch of ground which had interested him previously, but he so often ignores both novel and familiar stimuli that it would be pointless to try to count instances of objects that might have attracted him but did not. The mother's wishes are not effective in stimulating or discouraging a *sortie*. When an infant intends to leave his

mother's lap he sometimes struggles vigorously to get away; the mother may be holding, trying to feed or to amuse him, but with no evident motive other than the wish to be on his feet at a distance from her he wriggles free and moves some paces off, there to stand until the next bout of activity begins. Equally, her trying to send him off by pointing and exhortation or by throwing objects for him to play with is futile when he intends to remain at the base.

Finally, a feature of the *return* bouts – their tendency to end in some form of contact with the mother, was recorded. The end result of *full return* made by eight infants were grouped according to whether they terminated in *contact*, e.g. climbing on the mother's lap, leaning against her, pulling her hand; *near-contact*, e.g. handing an object to her, leaning against the bench where she is sitting; and *no contact*, e.g. squatting at the mother's feet, standing in front of her. The result of this grouping is that in 39 *returns*, the infants initiate 18 *contacts*, 6 *near-contacts* and 15 *no contacts*. With younger infants, the contact can be a part of the *return* itself. as when he runs into the mother, throws himself against her, his two arms striking her knees, or flops down upon her when she is recumbent. The vigour of the contact, which can evoke the mother's annoyance, suggests an aggressive element in the return.

EFFECT OF MOTHER'S CALLING CHILD

The effect of the mother's calling the child was put to test and it was ascertained that the majority of mothers do not recall their infant once he has begun his *sortie*. Out of 26 cases, the mothers of only 16 attempted to summon the child to their side and as often as not it was reasons other than excessive distance which prompted it : when he played with refuse, remained out of sight in bushes or was about to mingle with a passing group she would try to bring him back by calling. Of these 16 called cases, 12 infants either remained where they were or increased the distance from the mother, 2 decreased the distance slightly then went elsewhere and 2 returned to the mother. The mothers justifiably place little reliance on the efficacy of a call. The infant, on his side, never called his mother. Indeed, vocalization was rare : he would sing or talk to himself, or squeal with excitement. Whatever inaudible speech may have been taking place, no child addressed, from a distance, a verbal message to his mother at the base; talking to her was kept for around contact distance.

At a distance, he remained in contact visually. The extent to which the infants looked at their mothers varied greatly amongst them; they were recorded more often looking away from than towards her, and for briefer periods (around two seconds) when looking at mother than when staring at novelties (around eight seconds).

ARM GESTURES DURING NATURAL PLAY

The infant's play which results from the absence of customary park equipment, toys and food, is best described as experimentation. He runs a short distance from the mother, stops to look around, fixates the sources of sounds and visual stimuli and, in some cases, attracts the mother's attention to them. Intermingled with this scanning of the remote is an examination of the ground : he handles leaves, grass, stones and refuse; crawls or jumps backwards and forwards over verges, and attempts the shaking or climbing of obstacles; this section is a summary of activities emerging from a classification of the arm gestures.

Dealing with the infant's immediate surroundings first, the most common gesture in the area of manipulation is *picking up objects* from the ground (and, since most infants drop, at least once, what they are holding, the proportion for this category could be considerably augmented). The retrieved object may be dismembered, put into the mouth, discarded or carried back to the mother. One-half of the whole sample take an object back to the mother. Some infants do not wait for the mother to accept it; when she extends a hand, they carry it off again. Throwing away, in the manner of older children, rarely occurs in this sample; the object is more likely to be cast down and trampled on.

When studying a patch of ground, the infant usually scrapes his hand and/or foot in it. *Scraping the hand* on the ground would be among the commonest gestures, but its frequency cannot be compared with others' since some infants are reproved by the mother if they are about to dirty their hands.

Holding on to a fixture which offers support or a possibility for climbing or shaking is the second most common movement which could be called manipulatory. A bench, railings, tree-cage or push-carriage, besides the mother herself, provide a stimulus which infants react to by

grasping. Whether the purpose is manipulation or balancing is not always clear. It is not long since these infants will have been making assisted walks around a room with furniture as support; their continuing dependence on support is demonstrated by the extent to which they fall when out of doors : two falls in ten minutes is the median frequency for the sample.

Other manipulatory movements are concerned with the particular object which the infant is handling, such as *pushing* his push-carriage to and fro or *playing* with its working parts, *holding up* a leaf to be blown away by the wind, *dusting his hands* with hand open, wiping palm against palm, after touching (or in resisting the temptation to touch) the ground, etc.

The second class of gestures occurs when the hands are not grasping an object; the infant is most likely to be seen scanning the environment between bouts of locomotion, fixating the direction of new sounds and nearby sights. Consequently, most gestures in this context indicate the direction of the stimulus which elicits them. Occurring particularly in the newly-walking is the gesture of *one arm straight forward* at or a little above shoulder level. The simplest context is when infants who have just attained the erect posture walk with one arm forward (an observation made in an early analysis of walking by Burnside (1927)). Even when the infant has abandoned this balancing aid for ordinary locomotion, it will recur when he is pursuing or hurrying for any other reason. Preceding an approach, it marks an intention to proceed. It is also a component of reaching - grasping; the fingers may open and close whether or not the infant can ever reach the object to be seized. The gesture also occurs *in vacua* at least once in ten minutes, whether the child is moving, standing still or sitting down, with no identifiable stimulus to elicit it. That it is a signal whose meaning is distinct from pointing is apparent from the following three criteria : (1) Reaching - grasping can be directed to the mother; pointing is always directed away from her. (2) It can be made when the infant is walking; pointing is done when he is still. (3) The body-orienting response is to the stimulus and not, as in pointing, to the midline between the stimulus and the mother.

Flapping the extended arm and *waving the hand* are, when newly walking, at around 12 months of age, almost identical movements. The infant hurrying to his mother, flapping the ex-

tended arm excitedly as he nears her, makes a similar gesture as he stands in front waving 'goodbye', apparently about to depart on a sojourn. The end result, in both cases, is the same - the child will be beside his mother in a few seconds. His parting salute announces but the briefest sojourn. There is no goodbye sign - or any other - to precede a long sortie. It predicts rejoining rather than parting.

Among infants of the present age-range, the wrist is unstiffening and the older person's gesture of flapping the hand, rather than the arm, from a stationary position, has become established.

A feature is that, of the gestures recorded in this section, this is the one most readily imitated. If the mother waves to him from a distance, the infant stops to return the wave and may approach a few steps to fixate the mother, hand aloft, as if expecting a game of imitation.

When he is standing against the mother, the same wave-flap may be used to strike her knee, attracting her attention.

However, in the majority of instances, the observer cannot tell what elicits the gesture and the child is most often facing away from the mother when he makes it.

Two arms straight up. This is one of the commonest gestures which, in everyday life, a mother leading her child is seen responding to. The child moves to face the mother's front, looks up and stretches two hands above his head, whereupon the mother lifts him into the carrying position.

In the present situation (the mother is seated) the occurrence of the gesture was recorded for two-thirds of all infants at least once in ten minutes, whether the child was close to the mother or not, facing her or facing away, himself being stationary, walking or running. In the majority of instances, the infant can have had no expectation of being lifted. Nor was there any identifiable stimulus to elicit the gesture when the child was distant from the mother except when it was observed as an aid to balancing; if an infant of this age group loses balance, he falls back into the sitting position: the two arms may erect momentarily as he goes over or rectifies himself.

To evoke a response from the mother, the child must be close to her, preferably touching, and nearly always *en face*. If the seated mother

does not take him on to her lap, the infant tries to climb up beside her; failing to do this he returns to her front, his hands aloft, which he may bring down hard upon her thighs. Her attention secured, she leans forward to talk to him. Then the child may persist by reaching for the mother's face.

Besides proximity, the difference between the posture when it is addressed to the mother and when it occurs *in vacuo* is the length of time the arms stay up. When the mother is not involved, the arms can be raised and lowered within two seconds. If the infant expects to be lifted, he will maintain the posture, often thrusting himself against her at the same time, until the mother acknowledges it.

Putting a part of the hand into the mouth. Two-thirds of the infants put a finger or thumb into their mouth at least once in ten minutes. To find some unity amongst the contexts in which the infant does this, positive and negative criteria must be introduced. He is not making a long sortie away from the mother, nor running about energetically. He is not engaged in an easily definable activity, like scraping a patch of ground or arranging small material. If other people are close by, he may stop to watch, but will not engage them. He is likely to be facing or be about to face the mother. He is likely to be stationary, and his next walk will take him to or towards the mother. To generalize: the gesture accompanies vacillation rather than involvement in a course of action and it presages increasing proximity to the mother.

POINTING: AN ORIENTATION RESPONSE

Pointing is the most common gesture made in the field. The sight or sound of any remote object that catches his attention is sufficient to elicit it. Its most conspicuous feature is that it is done only when the infant is stationary. The frequency of the occurrence of pointing varies greatly amongst infants, ranging from 0 to 14 times over ten minutes. The amount of pointing is not related to interesting events as an adult sees them, but to the individual child's tendency. An observer can seldom identify the source of the stimulus; mothers sometimes can, especially when the child is old enough to talk, but it can be imaginary things that engage his attention; a child will point to a part of the horizon where nothing is moving and tell the mother that a man is coming.

Pointing does not often occur in the newly walking, but by 15 months of age it is part of every infant's repertoire. Amongst the features of this gesture which distinguish it from other arm signals are the following. First, the mother herself is never pointed at. The hand points outwards; and the mother is fixated. Then the object is given scrutiny. Second, it is the most reliable criterion for the identification of a mother-infant pair. When other criteria fail to apply, the child will always relate the event which surprises him to the mother: when he is distant, by looking at her; when he is beside her, by tapping her with the other hand if she does not pay attention. In this respect, it differs from waving, smiling and other expressive gestures which are directed to strangers as well as to the mother. Third, it is the terminating point of a course of activity. Once an infant has run outwards, stopped to look at the mother and point into the distance, he does not usually proceed in the same direction but looks around and goes off else-where. Fourth, it is not mimicked from the mother. She and the child are never seen to imitate each other's pointing, as they do some other signals. Indeed, the mother seldom pays attention; she is unlikely even to be looking when he points, yet the frequency of the gesture does not decrease with age. Nor does its purpose appear to have been learned imitatively. In everyday life at home, mothers use it as an intention movement usually to indicate the involvement that will follow: she will either reach for the object he wants, or use it to select amongst alternatives. Infants, on the other hand, do not use it as an intention movement until they are around 3 years of age, by which time its conventional, adult applications have come into operation alongside the earlier.

When a mother rises, looks at the infant and points, the effect, is to make herself conspicuous to him. For example, if she wants the child to come away from one area to go to another, her indication of the desired direction by pointing to it only results in the infant's gazing at her face or hand. It is generally believed (though no data are available) that the first year of life will pass before an infant can detach his gaze from the mother's hand, even in his own home, to look in the direction indicated. When he is out of doors, his inability to detach the gaze lasts longer. He will be around 2 years old before she can expect an adequate response to her signalled command to move away to another place. Until then, her pointing only draws attention to

herself. Though the mother may emphasize the gesture and shout, the infant continues to stare blankly at her face, and this seems to be the only response that it evokes.

The child, in his turn, makes himself highly conspicuous to her by his orientation response. He comes to an abrupt stop, angles himself to the midline between the stimulus and the mother and raises one arm towards it while his head turns simultaneously towards her. The rigidity of this posture suggests that it should convey information. No obvious emotional state other than heightened alertness is transmitted. In the field, states of high arousal are accompanied by sounds. When distressed, the infant cries; when angry, he screams; when frightened, he whimpers; when excited, he squeals. Otherwise, his utterances during natural play consist of talking to himself. Hence, lack of vocalization during the orientation response has a communicative significance, i.e. the information is conveyed in the posture; no reinforcement by sound is necessary.

Something else is communicated by this gesture. Although mothers whom I have questioned do not give enlightening answers, their own reactions show an understanding of the difference between a sign to proceed and one of the unlikelihood of proceeding. When a toddler is going to move outwards from the mother, he faces the intended direction and erects one arm: this gesture seems to be a prolongation of the habit of putting an arm up for balance. It is common to see a child being given a smack when, after being reproved for going to a forbidden place, he puts an arm up in that direction. But when the child points, the mother is unconcerned. She seems to know that his pointing will disengage his attention from a source of interest.

The pointing has a definite referent. It can be elicited by any disturbance evoking surprise, by stimuli evoking mild fear, or those which if close by would arouse strong fear. An observer who cannot locate the referent will bear in mind the lack of veridicality in infant's distance vision: large objects which are far off appear to be small objects nearby. One mother stated that her infant was pointing at birds; another infant was pointing at aeroplanes; another at the absence of aeroplanes, because he expected to see them; another at the sound of wind in the trees; another at the noise of traffic in the distance. Although mothers'

replies are not helpful in explaining the high frequency of infants pointing, they do indicate a feature that accords with the general interpretation of this gesture: the separateness or inaccessibility of the stimulus. Added to this might be the condition of inaccessibility without the mother's company: some infants point to where they want the mother to take them: if she refuses to go the child does not proceed in that direction.

The fact that the gesture of pointing has a sender, receiver and external referent brings it into the category of a purposive communication, the function of which is to relate two persons by way of an independent object in the environment. It is the first — and only — purposive communication at a distance which the child is able to make until he can vocalize intelligibly. What is symbolized by other gestures in the field is appropriate to a simpler context, communicable by action, such as presence-seeking (by looking), proximity-seeking (by locomotion), contact-making (by touch), play-seeking (by waving) and other dyadic transactions which bring the pair together to prepare for other forms of interaction. When the referent is a remote object, however, a new relationship between the parties is set up. It has become a learning situation, appropriate to other kinds of experience. For instance, were the family's sojourn taking place in primitive territory, it would be important for the mother not only to be kept aware of possible dangers in the vicinity, but to be alerted before the situation developed into an emergency. Hamburg (1969) writes, on the basis of observations on non-human primates: 'The early learning of what to fear, what is dangerous in a particular environment, seems to be quite flexible; such fear may attach to different objects, in different circumstances, in different environments ...' The orientation response of pointing, which signals minor disturbances in the environment, would serve just this function. The infant, in turn, learns by the mother's indifference to his communication what events are not dangerous.

FOLLOWING

If the mother moved off unexpectedly, following did not occur among field cases whose ages at the time of observation went up to about 22 months. Out of seventeen instances chosen for observation, the infant's response to the mother's departure was:

Continue playing	1
Make brief approach, then stop	2
Retreat briefly, then stop	2
Refuse to move, 'freeze'	12
	17 cases

When the infant is older, there is usually verbal exchange with the mother before she moves away, so following behaviour, the primitive animal's response to a parent's departure, is not applicable. When the mother persuades the child to accompany her, especially by making a game of the move off, he follows, though her leading has to be punctuated by stopping to wait.

FATIGUE AND CONFLICT

When an infant is tired (as confirmed by some mothers in an arranged sample), he wanders in different directions, not walking for long in a straight line nor stopping for long, alert, to scan. He looks to and from moving people, but his thumb is often in his mouth, or his hand flicks an ear or rubs the head or eyes, and the general direction of his locomotion takes him towards his mother, where he leans against her or 'asks' to be lifted.

One form of conflict, decision at a choice point, came to light as a result of recording the arm movements of infants following the mother as she walked. The child's attention captured by an attraction which would take him along a different route to that taken by the mother, he would pause to look in each direction, touch the back of his head with the flat of his hand, then set off to rejoin the mother. Instead of an alternative path, a familiar person who brings the child to a stop by talking to or offering him something could elicit the same gesture just before he ran to pursue the mother. If the infant tended to suck his fingers, part of the hand was put into the mouth when the mother was about to be followed after the interruption.

When hesitancy is accompanied by either of these two gestures, it is resolved by the infant's seeking the mother; if he is going to separate himself from her, there is no prior indication of it. When the mother is stationary, the disturbing stimulus is not so easy to identify and the gestures are accompanied by vacillation: the child is obviously unsettled.

The appearance of apparently irrelevant gestures at this point occurs in the kind of situation which is usually contrived for experimental purposes to produce conflicting alternatives. In the full form of the expression movements, the arms are in a position infants commonly adopt in sleep; one hand cradles the head, the other is up to the mouth for thumb-sucking. Mothers recognize varieties of it as signs of tiredness: the infant tugs at an ear lobe, rubs his scalp or eyes, holds a cloth toy to his cheek and probably puts a thumb into his mouth as well. The adopting, at a choice point, of a posture indicative of sleep, brings to mind the phenomena called 'displacement activities' in lower animals whereby a behaviour pattern determined by either of two incompatible tendencies can be superseded by one more often induced in other circumstances.

Behaviour comparable to that of these infants was noted in adults by Tinbergen (1951) who suggested that scratching behind the ear and sleep (at low intensity, in the form of yawning) occurred as displacement activities in situations of conflict. In Grant's (1968) study of adults and children, scratching and head grooming were 'observed in situations where ambivalence was clearly demonstrated, these situations consisting essentially of the (behaviour sequence) triad approach-X-retreat'. From his own and others' experiments on gulls, cats and rats, Delius (1967) presents evidence that grooming or preening, which are commonly involved in displacement behaviour, are 'largely controlled by neurophysiological mechanisms which are also responsible for de-arousal and sleep'; the occurrence of some displacement activities would cancel, through the activation of an arousal inhibiting system, the arousal increment generated by conflict or thwarting. Delius concludes that the occurrence of sleep as displacement in several species might be regarded as a regulatory overshoot, and grooming and other patterns as activities which conduce to de-arousal through stimulus reduction, switch of attention onto stimuli of little novelty, or generation of repetitive stimulation.

Amongst human infants, the evidence for displacement activity would be stronger if ear-flicking and thumb-sucking could be shown to be occurring out of their normal functional context. 'Brief skin-care activities' such as

chewing, scratching and shaking have been located in monkeys subjected to mildly stressful situations by Rowell and Hinde (1963); it is likely that these activities partake, with the head-stroking and thumb-sucking of human infants, of a common base in the reaction to increased awareness of discomfort.

IDENTIFICATION OF THE MOTHER

Although the mothers' activity was marginal to the topic, one feature was noted which distinguished them from other women with whom the infant might mix; that is, the ventral orientation to the infant, which is maintained even in those cases where mother and child are not seen to be in contact during the observation period. When she is sitting or lying on the ground, she positions herself and changes position to face whatever direction he is playing in.

If she is sitting on a bench and therefore unable to orient her body towards the infant, she looks round frequently whenever he moves about behind her. It can be deduced that a mother is ill at ease unless her child is playing in front of her. This is not through fear of the distance he might go undetected, for there is usually a fence behind the bench she sits on; he may be allowed to go as far as he wishes in the forward direction, getting lost to sight through mingling with people, or pushed over by other children without her showing much concern, but he does not play in the rear for long without her looking round impatiently. Thus a mother can be singled out amongst a group of women when no other criteria of mother-infant identification apply, such as when the child comes under the influence of age-mates and no longer makes periodic returns to the base.

Discussion

There is ample evidence for the view that attachment, assessed in terms of proximity which the infant maintains to the mother, is strong at a 'period of life after the child is capable of free and independent locomotion but before he is able to fend for himself in an emergency' (Bowlby, 1958).

The criteria of attachment in a study of this nature are the factors which assist the identification of a mother-infant pair under field conditions.

In a few minutes of liberty a child will give evidence of his affiliation by:

- (1) frequently running to and from the mother;
- (2) keeping within sight or sound of the mother;
- (3) stopping for longer by the mother's side than he does when he is away from her;
- (4) glancing at the mother from a distance; on the move he orients him-self to two objects simultaneously, looking back to the mother while moving away from her or at something afar when he is returning to her;
- (5) physical contact of a quick make-and-break nature, not prolonged, as in the case of other higher primates at a comparable age.

These standards can only be disrupted by the presence of other children who come to play in the vicinity. Once the infant has joined two or three age-mates, he will go farther from the mother than usual and may stay away until she fetches him.

The ability to maintain contact also breaks down if the mother moves away unexpectedly. Once mother and infant are on the move, an illusion of successful following can be given when a mother waits frequently on her route, for whenever she stops the child's ability to regain contact with a stationary mother takes effect.

Other criteria belong to the areas of expression and communication. Returning to greet the mother, especially by touching and putting two arms up to be lifted are behaviours rarely directed to anyone but the mother, though the newly-walking have been seen to approach and cling to companions of the mother, and even to strangers. Picking up small objects from the ground to take back to the mother is a good indicator of affiliation, but if another woman offers to accept what the infant has retrieved, he may playfully bring back things to her. The infant's waving to a person is no guide at all to the degree of familiarity with him. The best way to identify a mother-infant pair is to see whom a child looks at when he is astonished or startled by

external events like a noise in the distance or passing animal; only the mother's attention is sought in such circumstances and the orientation response, in addition to the purposes already mentioned, re-locates, for the infant, the mother's whereabouts when he turns to look at her.

There is probably survival value in the infant's tendency to use gestures out of context and with no expectation of a response from people. For there is no evidence that fear of a specific class of object (strangers, animals) operates in its absence to keep the child close to his mother. Persistence in the use of gestures such as raising the arms to be lifted, reaching for unattainable objects and pointing to imaginary novelties suggests a prolongation of that medium of communication (overlapping with speech development) the functional significance of which would be to increase the probability of a response from the mother and other adults in the vicinity. By rendering conspicuous the sight of an unescorted infant, gesturing would protect him against some dangers which his new locomotor ability, coupled with inadequate distance vision, could lead him to. The identification of a particular infant amongst his age-mates is, of course, assisted by the sight of his arm movements, owing to the individual differences between children in this medium of expression.

Finally there are some internal conditions of the infant, such as being cold, hungry or ready for sleep, exerting an influence on proximity-seeking. The most obvious one seen in the open is that of fatigue, the signs of which are those given by infants at bed-time and which are observed to occur in some situations of conflict. Behaviours in fatigue and conflict may be connected through a common state which would subserve the function of attachment out of doors. For, although in fatigue, as in sleep, the child's interest is withdrawn from external stimulation, the mother's taking him on to her knee, cradling and talking to him, substitutes another kind of stimulation one which is not incompatible with his going to sleep. The occurrence of such a common state, recognizable by the signs of tiredness as the child turned to face the mother when a remote stimulus competed for his orientation during a bout of following, would have an adaptive value in that stimuli from afar, likely to produce in the child decreased proximity to the mother, would become blocked in favour of stimulation provided by her.

In work in progress, sequences of behaviour are related to finer groupings within the 1 to 3-year-old age range. Besides randomly drawn cases, a sample of infants provided by volunteer mothers who attend Infant Welfare Clinics is under observation in field conditions.

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