

AN ETHOLOGICAL STUDY OF THE EXPLORATORY AND
PLAY BEHAVIOUR OF PRE-SCHOOL CHILDREN.

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BY

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ABSTRACT

The behaviour of a group of nursery school children with respect to a novel object in a familiar playground was recorded on videotape and film. Recording sessions of half an hour's duration took place on 5 consecutive days. The behaviour was analysed according to receptor-contact patterns, and recurring patterns of behaviour derived from McGrew's (1972) list of social behaviour patterns. Evidence is discussed to support the hypothesis that group exploratory behaviour contained elements of wariness and competition as well as a general trend from specific to diversive exploration (Berlyne 1960). Sex differences in exploratory behaviour are discussed as well as the proposition that boys are generally more suited to an active exploratory role whereas girls tend to perform a communicative role.

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It is formally stated that apart from the acknowledgments here and in the text, the opinions and observations reflected in this thesis are my own.

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A I M S.

This study attempts to investigate the following broad hypotheses:

That the ethological method is fruitful with humans.

That some fixed action patterns are found in all children of a given age. In particular the generality of some items listed by McGrew (1972) will be tested.

That there is a general trend from specific to diversive exploration as defined by Berlyne (1960) and C. Hutt (1966) in children confronted with a novel object.

That when a group is confronted with a novel object, individuals take on identifiable roles corresponding to age-sex classes.

REVIEW OF LITERATURE

1. THE ETHOLOGICAL METHOD:

1.1 The Characteristics of Ethological Studies.

Blurton Jones (1972b) summarises the current issues in ethological theory as:

- (a) Emphasis on the use of simple observable features of behaviour as raw data;
- (b) Emphasis on description followed by hypotheses generating as a starting point;
- (c) Distrust of major categories with unclear meaning;
- (b) Belief in the usefulness of an evolutionary framework.

P.K. Smith (1974) adds to this list a note about "natural environment". In human ethology we can only approximate to the characteristic environment of a hunter-gatherer society, so there are limitations to the type of behaviour that can be discussed in evolutionary terms and survival value as a concept must be used with caution. The ethological approach as applied to

humans / ...

humans presumes that we drop our privileged status as observers, that we ask 'biological' rather than 'psychological' questions and that we are concerned with sequences of behaviour and their components (Hutt and Hutt 1970).

1.2 The Sensitization Period and the Defining Criteria of Behavioural Elements:

Most ethologists emphasize the importance of the sensitization period on the initial stage of an ethological study. Hutt and Hutt (1970 P.29) regard Fraser Darling's (1937) pronouncements on the subject - "The observer has to go through a period of conditioning of the most subtle kind" - as canons of the ethological discipline. What probably happens during this time, says Blurton Jones (1972), is that the ethologist looks for variables which are repeated in the same form, look as if they affect other individuals and look as if they are responses to other individuals. These form the embryonic behavioural inventory. The criteria for these elements of behaviour may be basically of two types - morphological and functional. The problem is when to split and when to lump, and should be resolved as / ...

as an essential reflection of the "splitting" and "lumping" occurring in sequences of the animals' behaviour. These decisions should be made over an extensive period of observation and prior to any attempt at quantification (Hutt and Hutt 1970); J. Altmann 1973; Dunbar 1975).

1.3 Behaviour Inventories:

Charles Darwin noted a regularity in the expression of terror and rage in man and animals and the idea of behaviour inventories have their roots in this conviction of order.

Behaviour inventories seem to be of three general types:

- (a) A standardised vocabulary for describing all possible positions of component parts of the human body and Blurton Jones (1972a) is an example of this. It applies to an instant in time which means that movement descriptions are excluded, and is based on the human muscular organisation for its categories;
- (b) Inventories of behaviour chosen for different functions such as McGrew's Motor Pattern Inventory (Hutt and Hutt 1970) and his Social Behaviour Glossary (1972) as well as Grant's list of facial expression (Grant 1969). The internal organisation of these is, however, morphological, thus the Social Behaviour Glossary is organised under such

headings / ...

as Head Patterns and Leg Patterns;
(c) Complex Behaviour Classifications such
as accounts of "rough-and-tumble play",
"attachment behaviour" and "greeting
behaviour".

1.4 Quantification:

Hutt and Hutt (1970) list four parameters -
frequency of occurrence, total duration,
mean bout length and rate. These can be
applied to characteristics of the subject
or to his interaction with his environment
and probably both.

1.5 Sampling Strategies:

J. Altmann (1973) lists seven major types
of sampling for observational studies.
Ad libitum sampling involves the observer
recording "as much as he can" or whatever is
most readily observed. The most obvious
bias here is that certain individuals and
certain behaviours are more readily observed
than others. J. Altmann (1973) suggests
that the observer should attempt to look for
sampling techniques that are unbiased with
respect to the main variables of interest,
and suggests other techniques that should
be considered an improvement on the often
used Ad libitum samples under special

circumstances / ...

circumstances.

The technique of Matrix Completion involves observation of pairs in which the main focus of interest is the one-sidedness of a particular type of behaviour (such as winner/loser of fights) and the data is then represented in a matrix. Focal Animal Sampling involves choosing specific individuals and specific sample periods and the focus individual is followed to whatever extent possible during his sample period. In special cases where observational conditions are excellent, the amount of occurrences fairly infrequent, and the type of occurrence sufficiently striking, it is possible to sample all occurrences of some behaviours.

In Sequence Sampling, the focus is a particular sequence of behaviour and the sample period begins when an interaction begins. One-Zero sampling was developed for studying spontaneous behaviour in children and involves scoring the occurrence or non-occurrence rather than the frequency of a behaviour pattern at any time during one sample period. Both Altmann (1973) and Dunbar (1975) criticise this type of sampling on the grounds that the numbers reflect a little of both the duration and

frequency / ...

frequency of a behaviour and do not provide accurate information of either. Dunbar (1975) however, shows that the shorter the sample interval the more accurate the estimate of frequency. The technique has advantages in the study of complex behaviour patterns when the time of onset and completion cannot be measured with a stop watch for a duration count and for patterns of varying length where a frequency count does not adequately reflect the individual's performance of the behaviour. When an observer records an individual's behaviour at certain points in time, the technique is called Instantaneous Sampling and the same technique with a large number of group members is called Scan Sampling. Altmann (1973) favours this kind of sampling over one-zero sampling, saying that it is at least as easy and provides data appropriate to estimating the percent of time spent in various activities. For the purposes of the patterns of behaviour of interest in psychology, however, it is limited to very simple patterns, whereas one-zero sampling is not.

The main considerations in choosing a sampling strategy are (Altmann 1973; Dunbar 1975) :

(a) Whether the sampling strategy will

or / ...

or could bias the variables under consideration;

- (b) What is euphemistically called the exigencies of the actual field situation. This is presumed to mean how closely one can observe a subject without seriously disrupting his behaviour, and the ease of locating subjects;
- (c) The availability of suitable statistical procedures;
- (d) Certain strategies may be too time-consuming for a particular situation;
- (e) The expected duration of the behavioural elements.

1.6 Videotapes:

A number of techniques are available for recording purposes such as check-lists (discussed by Hinde (1973)) and audio-tapes. Hutt and Hutt (1970) discuss the merits of a number of observational techniques and suggest that videotapes are particularly useful where action is swift and complex and changes are subtle. A video camera can record sequential changes in complex behaviour, allows for precise measurements and is unobtrusive in social situations.

1.7 The Advantages of Ethological Methods
in the Study of Children's Behaviour:

There is widespread disenchantment with established methods. Blurton Jones (1972b) criticises rating scales on the grounds that the dimension is seldom empirically derived and in fact a single scale often presents a confused picture when analysed empirically; "normality" stems from the beliefs of the rater, and the scales themselves are very difficult to validate. While he defends the obvious value of interviewing as a technique for providing information about the subjective life of the mother, it is of very limited value for discovering what actually happens in an interaction between mother and child. Anyone's stated reason for doing something is not necessarily the only or the "real" reason. Hutt and Hutt (1970) point out that there are subjects who cannot or will not be tested in the conventional way, such as pre-schoolers and some psychiatric patients and here ethological techniques are the only means of gaining access to the subject's behaviour. Psychological testing and experimental situations customarily utilize a single response type. This lack of understanding
of / ...

of the behavioural repertoire may lead to experiments which are unsuitable, or an interpretation of results which is imprecise. An analysis of shifts in the structure of behaviour may be more appropriate than a single measure, particularly in clinical psychology.

Regarding the laboratory setting, certain behaviour patterns in the laboratory may have no counterpart in the subject's normal life and certain areas of human behaviour expressly concern the animal and his natural environment, for example exploration and social interaction.

Hutt and Hutt (1970), because of the nature of their work in the clinical field are very concerned with the measurement aspect of direct observational studies. They deride the correlations that are often made between precise physiological measures and so-called psychological measures. These last often are no more than judgments of raters, such as nurses in charge of psychiatric patients, with very little exactness or detail. Quantification techniques in measuring frequency and duration of a spread of behavioural elements are giving human ethology a more realistic basis for

comparison / ...

comparison with fairly sophisticated physiological measurements, and hence new insights into the physiological underpinnings of behaviour. Hutt and Hutt (1970) give the example of the proposed relationship between cut-off postures such as gaze aversion and the regulation of arousal levels.

From Corinne Hutt's (1970) work on exploration, she demonstrates that the evidence is that it involves complex responses to complex stimuli and that the sequence of events from specific to diversive exploration is of interest. It is therefore a classic example of an area of interest in psychology which lends itself especially to an ethological approach rather than a typically controlled experimental situation with a simple stimulus and a unidimensional record of responses.

Blurton Jones (1972b) mentions the fruitfulness of the current trend towards closer relationships between branches of the behavioural sciences :

- (a) The convergence of interests and methods of developmental psychologists and ethologists;
- (b) The use of animal studies as a source of hypotheses;

(c) / ...

- (c) Increasing use of empirical methods in social behaviour;
- (d) The use of an evolutionary framework to form a child attachment theory.

1.8 The Limits of Ethological Methods for the Study of Human Behaviour:

Blurton Jones (1972b) points out that the use of the ethological method in the study of human behaviour is still in its infancy. The following criticisms have been levelled at ethological studies of mother-child behaviour -

- (a) The observer sees only a small portion of their total behaviour;
- (b) Optimum observation conditions usually mean a strange environment for subjects (a strange playroom with one-way mirrors);
- (c) The alternative is to have the observer in view and probably affecting the subject's behaviour.

These conditions have to be reckoned with and minimized.

In addition to technical objections there is a more basic issue to be resolved. Can man be studied by an animal-based method? He suggests that there may be large areas of human behaviour, such as language, which are not readily investigated by these methods.

The / ...

The ethological method approach according to Hutt and Hutt (1970) "demands that we drop our preconceptions and assumptions of special inside knowledge about human behaviour" (P. 27). But does this then mean that we forgo many advantages as observers for the sake of "objectivity"? Blurton Jones (1972) quotes critics who claim that the limitation of observable behaviour on ethological data results in observations which miss the "flavour" of the event. He says that this simply means that not enough subtle social signals have been recorded. But, as experts in the reception and interpretation of these signals by virtue of our membership of the human species, ethological studies run a very real risk of expending immense energies to produce trite results. Blurton Jones (1972) still feels that idiosyncratic opinions are no substitute for systematic evidence and points out that our intuition as humans is not sufficiently specific to be of assistance in practical problems such as those of individuals showing pathological behaviour.

Dawkins (1976) has discussed the phenomenon of cultural transmission in man as opposed to genetic transmission "It is our own species", he says "that really shows what cultural transmission / ...

transmission can do. Language is only one example out of many. Fashions in dress and diet, ceremonies and customs, art and architecture, engineering and technology, all evolve in historical time in a way that looks like speeded up genetic evolution, but has nothing to do with genetic evolution". (P.208).

This and the point mentioned above about the ecological differences between industrial man and the hunter-gatherer of genetic evolution weaken evolutionary theory as an explanatory principle in much of human behaviour.

2. PATTERNS OF BEHAVIOUR ASSOCIATED WITH NOVEL OBJECTS.

2.1 Wariness:

Hutt (1970) denies that children experience fear in the presence of novel objects per se as they do with strangers and in strange places. She maintains that studies reporting fear of novel objects were confounding the effect with other events in the presentation situation such as fear of the strange experimenter, or the "looming" phenomenon.

Bronson (1972) reports about 6 month old babies "the only behaviour which was sufficiently

frequent / ...

frequent to indicate some degree of wariness was a hesitation before touching the object. In half the approaches, after starting towards the object the infants hesitated, either with hands on the floor in crawling position or, if closer, with one hand poised in the air preparatory to reaching out, and looking intently at the object for periods that ranged from 5 to 25 seconds before completing the approach and touching the object (and sometimes contact was never made). (Bronson 1972 P.34).

Weisler & McCall (1976) describe the considerable similarity in the sequence of exploratory behaviour across species and situations although the length of time spent at each stage may vary. They suggest the sequence is as follows :

- (a) Alerting;
- (b) Distance-receptor scanning;
- (c) Motor-aided perceptual examination;
- (d) Active physical interaction.

Berlyne (1960) maintains that outwardly visible orienting behaviour like postural changes and receptor adjustments forms part of a whole constellation of physiological processes / ...

processes. Most of the changes he says are readily recognizable as associated with the excitation of the Reticular Activating System or with excitation of the sympathetic nervous system. Many writers have connected the broad idea of the orientation reaction with an arousal or activation pattern; the skeletal musculature is mobilized for swift execution; changes occur in the sensory receptor organs, there is simultaneous vasoconstriction in the extremities and vasodilation in the head; and a change in E.E.G. patterns towards less regularity and higher frequency. The intensity of these responses is associated with the intensity of the stimulus. Since Hutt's (1970) novel object probably did not present an intense stimulus the orienting response would have been of low intensity.

Aldis (1975) describes the generally cautious approach to novel objects in many species. "If the stimulus is strange, it is approached slowly, or approached and retreated from in a vacillating manner, until the object becomes familiar. Postures that allow rapid withdrawal, such as an
outstretched / ...

outstretched neck, are often adopted. The body is tense, and the general body responses are often accompanied by physiological changes in heart rate, respiration, etc. that prepare the animal for emergency action" (P.67). He quotes Lorenz's (1956) description of the exploratory behaviour of the common raven and Bertrand's (1969) study of stump-tail macaques as examples of this generally cautious approach to novel objects. Vacillation and a multi-faceted approach with emphasis on receptor contact are said to be characteristic. L.E. Brown's (1966) vivid description of exploration of a novel object by a vole also emphasises these points.

It would appear then that caution in approach to novel objects is a feature of animal behaviour and is present to some extent in young children. From an evolutionary point of view a cautious approach to an unknown object would appear to have considerable survival value. So it is strange that Hutt (1970) does not find any

indication / ...

indication of wariness as measured by response in children in the presence of a novel object. Perhaps the answer lies partly in a distinction made by Bronson (1972) between fear and wariness and partly in Berlyne's (1960) description of the orienting response. Fear, Bronson (1972) says, is associated with specific unhappy expectations and could be relatively enduring in contrast to wariness which wanes with exposure. Schaffer, Greenwood and Parry (1972) refer to wariness as "essentially a period of immobility during which a stimulus is appraised in relation to stored experience and a response deemed suitable in the light of the appraisal process is selected". The object used by Hutt (1970) was probably easily appraised and discovered to have the general characteristics of a toy.

Halliday (1966) even goes so far as to suggest that stimuli may be explored because they evoke fear rather than because they are novel. Aldiss (1975) mentions observations where one motivational system influences another and cites cases where a slight degree of fear or novelty, after the initial exploration, actually stimulates play.

What are the behaviour patterns associated
with / ...

with wariness? Immobility is referred to by Brown (1966), Schaffer, Greenwood & Parry (1972) and Bronson (1972). The above descriptions all give the impression of underlying tension in vacillation, jerkiness and preparation for flight. Increased self-manipulation when the child is alone in a strange environment is described by Kalverboer (1971).

McGrew (1972) reports that in children in a novel situation (nursery group formation) a number of behaviour patterns were significantly different from those in nursery-habituated children. The inexperienced children scored significantly higher on Digit Suck, Automanipulate and Immobile. A similar study reported by McGrew (1972) focussed on individual differences on introduction to the group and measures taken 65 days later and found significant differences on the same patterns as well as Looking (Total, Adult- and Child-Oriented) defined as being looking of more than 3 seconds duration in one direction.

2.2. Competition and Aggression:

Very little account is made in the literature on exploration of competitive behaviour. This is an aspect of the general neglect of social behaviour.

Aldis (1975) / ...

Aldis (1975) mentions some features of playful competition among animals for objects (not necessarily novel ones). He says that social object play differs from solitary object play in that the most important interactions are between players in the former and not with the object as in the latter. He reports that in many species the object appears to have no intrinsic interest because the object is abandoned if others do not join in the game, and because the object frequently changes hands. A moderately novel object appears to be more stimulating. He finds that these general characteristics are similar in human play, and says that playful competition for objects is a very common form of human play.

Aldis (1975) also discusses competition for space under the heading of "King of the Castle", collecting accounts of playful competition for space in a number of species. This is relevant for the present study where the child sitting astride the object working the lever could be construed as King of the Castle and the position appeared to be because for competition.

Blurton Jones (1967 P.354) says "Among 3 to 5 year old children in nursery school, fights occur over property and little else". Smith and

Green / ...

Green (1975) in a study of aggressive behaviour in 15 child-care institutions, found that "most aggressive incidents could be classified as property fights - one child attempting to take possession of a toy or apparatus from another. The mean proportion of property fights was 73%, range 50% - 100%" (P.213)

McGrew (1968) takes issue with Blurton Jones' (1967) high frequency of property fights in aggressive behaviour because he found that only 31% of all interactions involved objects and there was no difference in the frequency of object involvement between non-agonistic and agonistic-quasiagonistic encounters. He suggests that Blurton Jones (1967) may have been including quarrels over favoured places. Another possibility is the difference in schools. Smith and Green (1975) show a table of composition of fights, percentage of property fights, adult intervention and times when the initiator was successful. The fifteen nursery schools, day nurseries and play groups show quite a wide range on each of these breakdowns. It would appear that there are a number of variables which could account for a variation in the percentage of property fights in the fighting of pre-school children. On balance, however, it seems a significant feature of the interactions of 3 and 4 year olds.

What / ...

What patterns are used in these kinds of interactions? Blurton Jones (1967) has made a distinction between agonistic behaviour and rough-and-tumble play. Smith & Green (1975) define an aggressive incident as "occurring when a child intentionally behaved (either physically or verbally, or both) in a way which hurt or clearly conflicted with the interests of another child - for example, hitting, pushing, fighting, taking or trying to take a toy, blocking entrance to the Wendy House, saying "go away". Rough-and-tumble play or "fantasy aggression" was not scored". (P.212).

Smith (1975), Blurton Jones (1967) and McGrew (1968) have all noted similar patterns in agonistic behaviour whether playful or not: hit, kick, bite, push, pull, beat, chase, flee, wrestle, pull and so on. McGrew (1968) constructed a dominance hierarchy on the basis of winning/losing; gaining/retaining or losing possession of an object or space which showed unidirectionality. He found that the six least aggressive males exhibited twice as much auto-manipulation as the six most aggressive.

3. THE CONCEPTS OF EXPLORATION AND PLAY.

3.1 C. Hutt's (1970) Distinction between Investigation and Play:

Berlyne (1960) had suggested that exploratory
behaviour / ...

behaviour could be classified as Specific or Diversive. This clarified a conceptually confused situation and made it possible to distinguish between curiosity and boredom motivation and their corresponding stimulus characteristics. C. Hutt (1970) took up Berlyne's (1960) dichotomy and tabulated seven points of distinction between investigation and play. Investigation was said to be characterized by synchrony of visual and tactile receptors, intent facial expression, a stereotyped sequence of behavioural elements and elements of relatively long duration. The converse of all these applied to play: desynchrony of receptors, relaxed facial expression, variable sequence of elements and elements that are essentially brief. Investigation in Hutt's (1970) article elicited by a novel stimulus, shows a linear decrement with time and answers the implicit query "What does this object do?" Play on the other hand is never manifest in the presence of novel stimuli, is a quadratic function of time and answers the implicit query "What can I do with this object?".

She also distinguished between the two types of activity on the question of survival value for the organism; investigation being an efficient means of obtaining information about the

environment / ...

environment and play being expendable in these terms, occurring only when other need states are satisfied.

3.2 The Criteria used by Aldis (1975):

Aldis (1975) in his book "Play Fighting" mentions that it is sometimes difficult to classify these two types of behaviour. They tend to occur in the same animals - the young of phylogenetically advanced species - and often are mixed in the same sequence of behaviour. He does however maintain that there is a dichotomy between exploration and play. He relates exploration to food-seeking behaviour in an evolutionary sense and contrasts it with play as a preparation for fight or flight. His criteria are as follows :

- (a) Approach - exploration is prefaced by a wary approach, temporary immobility, tense muscle tone, visual inspection from a distance and retreat, whereas in object play the approach is direct and relaxed;
- (b) Contact with the object - in exploration most responses are related to receptor contact whereas in object play most responses are predator or play fighting responses;
- (c) Intensity of response - most play is vigorous with an underlying relaxed muscle tone / ...

tone whereas in exploration caution reduces intensity of responses and vigour is not a useful attribute in receptor contact responses;

- (d) Temporal patterns - in exploration the sequence of responses is likely to follow a fixed pattern whereas in play the patterns are more variable;
- (e) Play signals which differ in different species occur only in play and never in exploration;
- (f) Stimulus conditions - stimuli that lead to food, are novel or potentially dangerous, elicit exploratory behaviour whereas Aldis (1975) maintains that the key stimulus in eliciting play is movement although novelty may sometimes stimulate a general predisposition to play;
- (g) Learning takes place in both play and exploration but differs in the former because exploratory learning is stimulus-discriminatory whereas play consists of learning by response differentiation i.e. exteroceptive vs. proprioceptive.

3.3 Weisler and McCall's (1976) Challenge to the Idea of a Dichotomy:

A recent paper however challenges the conceptual
dichotomy / ...

dichotomy between play and exploration. Weisler and McCall (1976) claim that the distinction is not a valid one and even go so far as to say that it has impeded the progress of research. They maintain :

- (a) "It may be quite difficult and not very useful to chop (a) sequence into discrete categories of exploration and play; in contrast, it may be more useful to analyse this stream of behaviour from the standpoint of the timing and sequence of qualitative acts";
- (b) That exploration and play are "admixed in natural behaviour patterns" and many of the criteria used to mark the distinction are not consistent.

3.4 The Forms of Exploration in Children:

A study by J.J. Samsky (1975) suggests that there are two basic styles of exploration; looking-verbal and active-manipulatory.

Hildy S. Ross (1974) provides a summary of the main types of studies on exploration and suggests that they are questioning, visual exploration, manipulation, approach and entry. She reports that such physiological responses as cardiac deceleration have been demonstrated and remain to be investigated. Regarding the preferred

form / ...

form of exploratory behaviour she says "These different responses come to serve an exploratory function at various times in the child's life, with the exact timing controlled more by the child's growing motor capacities than any other factor" (P.154). There is however a lag between the time when the child acquires a response and the time that he uses it in exploration.

".. the child is an active, involved explorer of his environment. Exploratory behaviour encompasses a wide variety of his responses and a significant proportion of his day"(P.175).

4. EXPLORATION STUDIES : DIRECTIONS AND SITUATIONS.

4.1 Visual Stimulus Studies:

"Novelty, ambiguity, incongruity, surprises and complexity are stimulus characteristics that elicit exploratory behaviour" (Switsky 1974, P.321). The great majority of recent studies are concerned with defining these stimulus characteristics. They have their roots in the work of Berlyne (1950, 1958, 1960) who distinguished between specific and diversive exploration on the grounds that the former was motivated by curiosity and the latter by boredom. He typically used an experimental situation with a visual stimulus (pictures) and /...

and measured the subject's visual fixation time.

Cantor & Cantor (1966) using this basic format showed that observing time decreased as a function of increasing amounts of familiarity. Freeman (1972) then investigated the question of affect and found that subjects also expressed liking for novelty. But they did not express a dislike for familiarity which would imply boredom. So questions regarding curiosity or boredom motivation for exploration were not resolved. In 1975 a series of experiments (C. Hutt; C. Hutt and P.L. McGrew, P.P. Aitken and C. Hutt) used a piece of apparatus where pictures were projected in three windows arranged in a console. The subjects could control the opening of the shutters to view pictures projected in the windows. Microswitches on the windows were connected to an event-recorder so that durations of window opening were automatically counted. The results of the three studies can be summarised as follows :

- (a) Novelty: influenced attention and expressed preference but not choice in / ...

- in 4 to 6 year olds. With fewer pictures and more boredom, choice was affected;
- (b) Complexity: viewing time decreased with age generally. 5 year olds viewed simple figures longer than complex ones, 11 year olds did the opposite and 8 year olds showed no difference;
- (c) Incongruity: was found to influence attention of children of all ages (3, 5 and 7 years). Its effect on choice were age-related; children of 7 showed a clear preference for incongruity; those of 5 showed this more ambiguously; those of 3 showed no reliable preference.

4.2 Other Formats:

In contrast to the picture stimulus used above, Brannigan, Duchnowski and Nyce (1974) used a nonsense syllable format in a study of partial reinforcement effects and curiosity motivation. They found that a partially rewarded one was evaluated as less "pleasant" than a continuously rewarded one, but evoked more "curiosity" than either the continuous or nonrewarded ones. Taylor (1974) in the tradition of Fowler (1965) used rats in a T-maze with floor insets with a number of small blocks glued to them as

novel / ...

novel objects. The low-complexity insert had two and the high-complexity insert had ten objects. He claims the results suggest that physical stimulus change to a stimulus of greater complexity is a more effective novel stimulus than change to a lesser complexity, although both changes may function as incentives. Hutt (1970) used a novel object which consisted of a box mounted on 4 legs with a lever, buzzer, bell and counters in an earlier series of studies investigating the relationship between specific and diversive exploration. The children were asked to wait on their own in a playroom with familiar toys and the unfamiliar object. Switsky, Haywood and Isett (1974) also used objects as the novel stimuli and left children in a playroom and recorded both play and exploratory behaviour. They summarise their results as follows :

"Exploratory time was predominantly an increasing linear function of the level of stimulus complexity for the older children and a curvilinear function of stimulus complexity for the younger children. Play time was a decreasing linear function of the level of stimulus complexity for the younger children and the older boys". (P.321).

4.3 General Conclusions:

This hotchpotch of situations and results is intended to indicate the kinds of questions being asked: those concerning the characteristics of the stimulus and the developmental changes in viewing these characteristics.

The answers seem to support the general hypothesis that exploratory behaviour varies as a function of subjective uncertainty which is determined by the amount of information to be gained and the age and experience of the subject (Weisler & McCall 1976).

More especially the above account is intended to show the kinds of experimental paradigms being used to answer these questions.

4.4 Exploration in a Social Setting:

A major concern of recent research on children is sex differences in behaviour, which will be discussed in the next section.

Another concern of recent research in the field of exploration and a very welcome one is to study the child in a social setting. Ainsworth (1971) and Kalverboer (1971) show the child with his mother in a strange room. Ainsworth (1971) relates individual differences in infant exploratory

behaviour / ...

behaviour to the nature of the interaction between mother and infant. Kalverboer (1971) uses the same situation to investigate the effect of the mother and the familiarity of the environment on the amount of specific and diversive exploration and their distribution over time. He reports that the amount of diversive exploration and self manipulation are smaller when the mother is present. Specific exploration decreases more quickly when the mother is present. Passman and Weisberg (1975) using a similar situation, compared the exploratory behaviour of blanket-attached children in the presence of their blankets and found that these children explored and played as much as children with their mothers present and more than children without the blanket or their mothers. Scholtz & Ellis (1975) looked at groups of children in play settings of varying complexity and found that "over preference for play objects declined with repeated exposure, the rate of decline being inversely determined by the complexity of the play stimuli. Preference for peers, however, increased as a function of repeated exposure, with the amount of increase being an inverse function of the complexity of the external setting" (P.448).

Rabinowitz, Molly and Finkel (1975) found that children with a same-sexed peer engaged in more specific exploration as well as play with the novel object. Boys spent more time playing with the object than girls. He suggested that girls are more fearful of novel objects than boys and another child was effective as a fear-reducer.

All the studies on exploration in the presence of others suggest that their presence has the effect of allaying the wariness in the approach of a novel object.

4.5 Critique:

Weisler and McCall (1976) have recently published an article called "Exploration and Play : Résumé and Redirection". Their criticisms of the research on exploration corresponds very closely with the ideas motivating the choice of methods and situation in the present study. The main points of their critique relevant to this study are :

- (a) Measurement - there is a need for more qualitative rather than quantitative measurements, a multivariate approach, and for certain aspects of the definition of exploration to be clarified.

In the latter case they
mean specifically behavioural indices
for / ...

for subjective uncertainty, and the kinds of attributes learned and remembered;

- (b) Stimulus Parameters - There is a need for a definition of complexity in organismic circumstances and the choice of stimuli in the past have little ecological validity;
- (c) Time Course - Changes in the qualitative nature of exploration over time and their relation to what is learned should be mapped out;
- (d) Comparative Approaches - The differences in exploratory behaviour across species could be associated with the animal's usual habitat and brain development.

5. SEX DIFFERENCES IN BEHAVIOUR.

5.1 Phylogeny:

Sex differences in behaviour are almost universal through the animal species not only in areas of life directly related to reproduction but also in more general types of behaviour. Wilson (1975) points out that the quality of these differences varies, probably systematically and can be described

in / ...

in terms of rigid and elaborate castes in the insect world, through to the more fluid concept of role in man. Where it is impossible for a member of what he calls a caste in insect society to fulfil the functions of the member of another caste; in primates and especially in humans, there is considerable overlap between the sexes in range of behaviour. Individuals can transfer their activities to those more commonly performed by the other sex, should the need arise. Nash (1975) quotes examples of the type of sex differences that have been found in a number of primate species :

- (a) More "threatening" behaviour and earlier manifestations of sex behaviour have been noted by Harlow and Harlow (1965) in male rhesus monkeys. Females initiated and indulged in more contact play;
- (b) Differences in behaviour towards infants have been noted in baboons, macaques, gorillas, langurs and chimpanzees;
- (c) There are well marked differences in play, particularly in the amount of playful fighting and the general level of activity in langur monkeys.

Lancaster / ...

Lancaster (1976) describes the relations between juvenile females and young infants in Vervet monkeys and has discussed and developed the idea of the juvenile period being critical for establishment of patterns to be used in adulthood. She says "The play of juveniles not only gives them opportunities to practise their motor skills but also contributes to the establishment of emotional attitudes that are essential to fulfilling their adult roles".

5.2 Physiology:

Hutt (1972) and Nash (1970) both take their discussion down to chromosomal level. The pervasive nature of the difference - "males and females differ in every cell of their bodies" - is not as illuminating for behaviour study purposes as one would wish. This is because of the indirect nature of the influence: genes controlling enzymes affecting biochemical processes which result in differential structures and functions at various levels of complexity. One fairly direct inference can be made however: greater masculine vulnerability to stress and disease is explained by geneticists as being due to the single x-chromosome, where the female has greater protection from 2 x-chromosomes

(Garai / ...

(Garai and Scheinfeld 1968).

The nervous system and the endocrine system co-ordinate function. It would appear that there are two critical periods in psycho-sexual differentiation :

- (a) The hormonal/anatomic one which occurs in utero;
- (b) The psychological one . Studies with hermaphrodites show that successful adaptation to the assigned sex is a process determined by apperception of one's own genitals in addition to experience during rearing derived from genital appearance at a very early age. Reports suggest that sex reassignment after about 18 months of age becomes increasingly likely to produce residual psychopathology, and by school going age is out of the question (Money 1965).

The possibility exists that hormones influence behaviour even at pre-school ages. Hutt (1972) reports that the breakdown products of testicular hormones can be detected in the urine of very young boys.

There appears to be evidence for central nervous system differences and differential hormonal action on the C.N.S. although they remain confusing at present. Examples of these are :

(a) /...

- (a) The brain lateralization studies reported by Maccoby and Jacklin (1974 P.126) which suggest that greater verbal skills in girls and spatial discrimination skills in boys are linked to greater localization of the function in the brain;
- (b) Papez and McLean's neurological theories reported by Money (1965) which suggest direct linkages between areas known to be controlled by hormonal action and areas concerned with changes of affect, and cortical areas concerned with experience and planning;
- (c) An experimental technique involving the implantation of radio-actively labelled sex hormones shows that these hormones are actually taken up by the neurons (Money 1965).

Moving in a more holistic direction, Nash (1970) states that men have a higher metabolic rate, a stronger heartbeat and blood which is richer in red corpuscles. They have different nutritional patterns with a greater calorie intake from the second month onwards, a higher calcium level, protein and potassium needs (Garai and Scheinfeld 1968). This means a generally greater action potential.

Men / ..

Men are about 6% taller and 20% heavier than women with larger bones and greater strength of muscles. In this study where the children are aged $3\frac{1}{2}$ to $4\frac{1}{2}$ the greater size is not particularly relevant because according to Tanner (1961) boys are larger than girls by only 1% to 3% in most body measurements before puberty. The greater strength is consistent for all ages and very marked, being almost certainly genetically determined (Garai and Scheinfeld 1968).

5.3 Ontogeny:

The children in the present study have an age range of $3\frac{1}{2}$ to $4\frac{1}{2}$ years. Early developmental differences are therefore particularly relevant.

Using very young children (8 month olds) Kopp (1976) examined the idea of "action-schemes" taken from Piaget and Inhelder (1969), in the interactions of infants with objects. Sex differences emerged, girls spending more time looking at and examining the object and this was attributed to their faster development. There was also a significant sex difference on what Kopp (1976) calls ballistic-type movements (waving, banging and sliding). Males showed more of these and were more
vigorous / ...

vigorous in manipulative activities.

Work by Bronson (1962) on critical periods suggests that the entire course of development differs radically between the sexes, and it is well established by a number of workers that girls mature faster than boys on linguistic aspects of development.

On the other hand a study by Thomas and Jamison (1975) shows boys to mature faster in a different area of intellectual ability. They tested an aspect of Piaget's stages of cognitive development involving the acquisition of understanding that still water is horizontal. Most boys made accurate predictions by 12 years of age but many college-age women continued to make errors.

Evidence suggests that there are broadly three possible origins for observed sex differences in the behaviour of pre-school children: physiological differences; parents reactions to physiological differences; and differential cultural expectations from boys and girls. The investigation of these origins has given rise to a tremendous amount of recent research probably aimed at establishing guide-lines for parents on the thorny issue of "sex-typing".

A / ...

A study by Moss (1967) describes higher rates of interaction between mothers and infant sons owing to the greater wakefulness, irritability and more frequent crying of infant boys. In a more recent study Jacobs and Moss (1976) investigate "Birth order and sex of sibling as determinants of mother-infant interaction". They find that whatever the sex of the first-born, more attention is given to second-born males than females. In addition to the 1967 suggestion that male infants are more demanding, they suggest that for a woman "dealing with a male infant might have been in itself enough of a novelty to have maintained a higher frequency of maternal behaviours with the male second-born infants" (Jacobs and Moss 1976 P.320). They also mention the possibility of the preferred status of males in our culture as a determinant of increased attention. Fagot (1974) in a study of actual child-rearing practices and parents' beliefs about them focussing on the 18 month to 2 years of age reported :

- (a) Boys played with blocks and manipulated objects significantly more than girls. Girls played with dolls, asked for help, danced and dressed up significantly more than boys;

(b) / ...

- (b) Both parents gave girls more praise and more criticism than boys. They joined boys' play more often than girls, but they left boys to play alone (unsupervised) more than girls;
- (c) In answer to questions about which behaviours were appropriate to girls only or to boys only, the parents placed fewer restrictions on girls' behaviour.

Cherry and Lewis (1976) found that mothers encourage verbalization from their daughters more than from their sons. The significant differences between mother-son and mother-daughter dyads involved the mothers' behaviour and not the children's. The authors suggest that the pattern of interaction identified may be encouraging the language development of girls, implying training for a more verbally responsive role later.

A number of cross-cultural studies have suggested that cultural differences in sex-appropriate behaviour are the result of training the children for later adult-economic roles Erchak (1976).

5.4 Specific Abilities:

Hutt (1972) reports that males excel in :

(a) / ...

- (a) Spatial ability as tested by Wilkin et al (1962) on the Rod-and-Frame test, and the Embedded Figure test, and the difference has been detected at 3 and 4 years of age by Eckert (1970);
- (b) The comprehension of mechanical relationships and also at mechanical tasks, the latter probably a function of superior visuo-spatial abilities;
- (c) numerical and mathematical abilities;
- (d) verbal reasoning as opposed to the executive aspects of verbal ability such as fluency. The difference on this aspect increases with age.

Hutt (1972) reports that females have the advantage in :

- (a) A number of sensory and perceptual categories other than vision. They have greater auditory sensitivity, a keener sense of smell, and are more sensitive to touch and pain;
- (b) All aspects of language usage except verbal reasoning;
- (c) Tasks requiring manual dexterity;
- (d) Role memory.

On the subject of intelligence quotients, it would seem that while male and female average scores are similar there is greater variability in male scores. Nash (1970) points out that

"While / ...

"While it might be said that it is generally agreed today, probably on democratic, rather than scientific grounds, that no difference in general intelligence exists between males and females, this is a very difficult question to approach, because we do not know which performances are the best indices of general intelligence. Because many of the tasks that might be used in general intelligence are known to involve a sex difference, we can readily prove that either males or females are superior by appropriate selection of these tests" (P.419). However, there is some information to be derived from differential ability on intelligence tests: an investigation of sex-difference on sub-test performance shows substantially the same pattern as reported by Hutt (1972) on other evidence. Girls do better on tests involving verbal skills and some types of memory situation while boys do better on arithmetical or numerical manipulations and tests involving spatial relationships. Most writers seem to adopt the view therefore that male and female intelligence scores reflect fundamentally different ways of thinking.

5.5 Behaviour Differences:

This leads us on to the question of general
behavioural / ...

behavioural differences. Hutt (1972) presents evidence from a variety of sources to show that boys are more aggressive especially to each other. Girls on the other hand are more affiliative and co-operative, the latter particularly as directed at young children. Smith and Green (1975) sampled aggressive behaviours in 15 child-care institutions. They found that in 13 out of 15 of the institutions boys had a greater probability of being involved in aggressive incidents than girls.

Blurton Jones and Konner's (1973) cross-cultural study on sex differences in children's behaviour shows that in both cultures studied boys indulge in more agonistic behaviour, more rough-and-tumble play, and interact more with children than with adults. The latter finding is in contrast to the one that girls interact more with adults. Other differences were that girls scored higher on the patterns "self-touch" and "head-on-side" whereas boys were higher on "lip bitten". Some sex differences in the London children that have been found in other British and North American studies were absent in the Bushman sample. This suggests obviously that they are cultural in origin. They are higher scores for males on activity, object

play / ...

play, sustained direct attention and the tendency to play with same-sexed playmates.

5.6 Exploration:

Particularly important in a study of exploration are findings such as that of T. Moore's (1967), that boys are more responsive to objects, whereas girls are more communicative. Lewis's (1972) and Moss's (1967) findings show that while mothers may interact more with sons in the first few weeks of life, "by 13 months boys were found to explore further from the mother in a free-play situation, and touch and vocalize to the mother less often (P.K. Smith 1974).

Moore and Bulbulian's (1976) article entitled "The Effects of contrasting styles of adult-child interaction on children's curiosity" discussed the differential effects of a critical adult and a friendly-approving one. The children ranged in age from $3\frac{1}{2}$ to 5 and it was found that exploratory behaviour and curiosity were less likely in the critical-alloof condition, but these condition effects were only significant for girls. The authors claim that girls are particularly sensitive to the criticalness of adults.

In a study of 1 year old children in a

standard / ..

standard play situation Goldberg and Lewis (1969) reported that boys were more exploratory and more active in overcoming obstacles than girls. "Girls more often passively accepted a barrier that kept them from the desired part of the play area or more often crying in passive frustration" (Nash 1970 P.405). Two authors have reported sex differences in the behaviour patterns associated with exploration. Kalveboer and Hutt (1970). Kalveboer (1971) conducted a study on children of approximately 5 years of age who were left with their mothers in a novel situation - a strange playroom. He found that males score higher on movements towards the one-way screen (or the only "object" in the room), gestures, visual fixations as opposed to visual scanning, object manipulations and verbal contact with the mother. Females score higher on visual scanning, self-manipulations and visual contact with the mother.

Hutt (1970) studied exploratory behaviour in about 120 two to five year old children. Each child was left to play for 10 minutes in a familiar playroom which contained 5 familiar toys and 1 novel toy. An experimenter recorded the behaviour from an adjoining cubicle.

Hutt / ...

Hutt (1972) reported that there was no difference in the amount of curiosity and interest shown by boys and girls. She recorded the following differences :

- (a) Of the children who failed to explore there were three times as many boys as girls;
- (b) She defined "creative play" as the use of the toy for longer than 20 seconds in an unusual or unconventional way. The boys were four times as likely as the girls to use the toy in inventive or creative play.

A follow-up study two years later made it possible for her to comment further on these two findings. Looking at the group of non-explorers, it appeared that the non-exploring boys were simply apathetic and inactive individuals. The non-exploring girls on the other hand seemed to be tense, anxious and timid as indicated by personality tests, parents' and teachers' ratings. Regarding the creative explorers group, both boys and girls seemed to be characterized by independence and assertiveness. Boys, however, scored higher on tests of creativity. It seems that there are two conclusions to be drawn here - boys generally have a more divergent cognitive

style / ...

style and this shows up as a consistent trend early on in boys but not in girls. Finally there is the question of how far the observed differences are culturally imposed. There is a latter-day variant of the nature-nurture controversy with the view that our culture indulges in crippling sex-typing socialization practices which limit female variability in behaviour. This argument has foundered in the same way as the nature-nurture controversy owing to what Wilson calls "the advocacy method" of arguing the case for one point of view by selecting supporting examples from the literature. This is then countered by the other side selecting a different set of examples. Blurton Jones and Konner (1975) cite Margaret Mead's cross-cultural studies in the thirties on sex differences. They and Nash (1970) point out that because of methodological inadequacies as well as bias, her claim for total cultural determination is rendered invalid. And indeed, the evidence for hormonal influences on behaviour and behavioural differences in neonates is hard to ignore. Blurton Jones and Konner's (1975) own study provides a less ambitious but more precise picture of particular sex differences which are consistent across two cultures and those which differ / ...

differ in those two cultures. There are certain methodological limitations, for instance the use of checklists where videorecords would be more accurate and informative. The potential is there however for mapping out sex-specific behaviour patterns and cultural variations.

6. THE ROLES CHILDREN PLAY.

Having outlined sex differences at a variety of levels, the intention is to present these differences in exploration tentatively as an expression of role behaviour. For this reason some characteristics of roles as outlined by Wilson (1975) will be enumerated (Chapter 14).

He defines role as a "pattern of behaviour that appears repeatedly in different societies of the same species", and that has an effect on other members of the society. It leads automatically to the differentiation of behaviour among categories of individuals within the society, especially age-sex classes.

He differentiates between direct and indirect roles, direct roles being behaviours which benefit the group as a whole and indirect behaviours only benefit individuals that display it. He quotes Gartlan (1968) as describing primate societies in terms of direct roles - "The group is an adaptive unit, the actual form of which is determined by ecological pressures. Different roles of relevance to particular ecological conditions are performed

by different animals".

All this applies to a number of species. Wilson (1975) maintains that role-playing in humans takes on a special significance related to high intelligence and language. Models are chosen, imitated and constantly re-assessed.

The group does not have to rely on ergonomic mix for the distribution of roles. There is an added and faster adaptive mechanism - "When too many human beings enter one occupation, their personal cost-to-benefit ratios rise and some individuals transfer to less crowded fields for selfish reasons".

The proposal that it may be appropriate to view sex differences in exploration as role behaviour comes from some previously mentioned sources in the literature -

- (a) The suggestion that the critical period for psycho-sexual adaptation takes place before 18 months of age;
- (b) The suggestion from a number of workers that differential training by adults takes place from a very early age for the expected adult role;
- (c) The evidence from a number of workers that there are behaviour differences from a very early age. These would tend to be collected into a characteristic male or female response style;

(d) /...

- (d) Lancaster's (1976) suggestion that the play of juveniles permits the practise of emotional attitudes, such as mothering, important to adult roles.

Grief (1976) studied the incidence of sex-role playing in pre-school children. She reports that - "Sex-role playing appears spontaneously when children are in a free-play situation. The occurrence of sex role playing indicates that children not only possess the requisite knowledge and skills for role play, but are able and eager to use them" (P.389).

Goffman (1959) in "The Presentation of the Self in Everyday Life", explains in the introduction how information about an individual helps others to know in advance what they may expect from him. This information is gained from different kinds of sign activity that he gives off, intentionally or unintentionally. He sees the interaction of a group in dramatic terms: performers giving performances of their roles. He gives as an example "power" - the attempts of one individual to direct others. "Thus the most objective form of naked power i.e. physical coercion, is often neither objective nor naked but rather functions as a display for persuading an audience; it is often a means of communication, not merely of action" (P.234). Goffman of course was writing about adults who are able to perform sophisticated and varied roles. It is, however, possible / ...

possible that sex differences in exploration
can be seen in terms of sex-roles where signs
and displays define the roles children play.

GENERAL METHODS AND PROCEDURE.

1. Sensitization Period:

Over a period of some months a number of behaviour inventories were examined; recording possibilities were practised; the general area of play and exploration in children was narrowed down and the problems were stated in operational terms. The chief issues were as follows :

1.1 Behaviour Inventories.

One of the main problems with the recording of children's behaviour was immediately apparent: at any one moment in time the number of observations that could be made are multitudinous and multidimensional. Faced with an overwhelming mass of data, it was decided to attempt to break it down in terms of some of the existing behaviour inventories. After a familiarisation period McGrew's "Repertoire of Pre-School Children's Behaviour Patterns, Arranged by Body Parts Involved" (McGrew, 1972 P.25) was chosen as
being / ...

being most appropriate. It offered a manageable number of items, a basis for categorising movement, and was focussed on social patterns as opposed to purely motor ones. It was found to be particularly useful for a number of reasons :

- (a) For an inexperienced observer these items provide useful building blocks for approaching more complex categories;
- (b) In a study of group behaviour the social or signal focus of the elements were of more interest than the motor elements such as the "Lift Upper Limb" and "Lift Lower Limb" type of element which characterises McGrew's Glossary of Motor Patterns (Hutt and Hutt, 1970 P.210);
- (c) It combined the collective experience of several workers showing that it is possible to reach considerable consensus on recurring patterns in human behaviour;
- (d) The broad categories of Facial Expressions, Head Patterns, Locomotion and Gross Body Movements provide a useful checklist in behaviour descriptions.

Throughout the study, however, a flexible attitude was maintained towards this inventory. Short descriptions of the elements and the situations in which they occur were stored in a card file, and these were then amended and expanded / ...

expanded from observations on this study and another on older children proceeding concurrently. Elements from other sources were added and an attempt was made to photograph as many of the patterns as possible.

1.2 An Observer Attitude.

With the use of McGrew's (1972) inventory the observer attempted to build up a verbal shorthand for behaviour description to increase the rate of recording information on audiotapes. This procedure was found to be very intrusive on children's play behaviour initially, but with experience and research accounts, notably Hutt and Hutt's (1972) book, an observer attitude was built up :

- (a) Questions by children were answered briefly and truthfully using a rather monotonous voice and expressionless face. Information was only given in response to a direct question;
- (b) Eye contact was largely avoided. When it occurred however, the observer smiled briefly and shifted gaze direction. Dark glasses were found to be particularly useful in avoiding the intrusiveness of eye contact, and deliberately turning away from the target child;

(c) / ...

- (c) All adults were asked to limit their communication with the observer to greeting and matters of procedure. They were requested to ignore the observer and his recording equipment;
- (d) A habituation period was necessary before starting on recordings. (Conolly & Smith, 1972).

1.3 The Use of Audiotapes.

Fairly extensive use was made of audiotaped commentaries during the sensitization period and some conclusions were reached as to the nature of the information which could be recorded this way for the purposes of the present study. As the only record of behaviour in a group situation it was too limited for the speed and multiplicity of activity. It was therefore decided to use it as a supplementary procedure to the use of videotapes. Using it as a supplementary record also avoided the problem of having to categorise the exploration behaviour too early in the study. It was therefore decided to record by this means only events taking place out of the reach of the cameras and to do a scan at approximately 5 minute intervals to allow for placing of the subjects around the playground and with respect to the novel object.

1.4 The Use of Checklists.

This was rejected for the early stage of the study because it was by no means certain which items of behaviour should be pre-selected for a checklist. Like audiotaped commentaries, checklists are too limited in their recording speeds for group behaviour where the target behaviour is occurring simultaneously in a number of subjects. However the suggestions for the construction of checklists made by Hinde (1973) were noted and the method was used at the analysis stage of the study.

1.5 The Use of Video-Recorders and Films.

These provide valuable visual records and make the pre-selection of categories unnecessary. During this period trials with video-recorders showed that children lost interest remarkably quickly in the video-recording equipment. Because this was silent and unattended children found it hard to believe that it was "working". It also became apparent that the human element in audio recording and checklists often meant that reports based on them were inaccurate as compared with video-techniques :

- (a) Dramatic events are mentioned at the expense of everything else - a fight excluded all other / ...

- other activity from mention;
- (b) The sequence of fast-occurring events is often reported incorrectly;
- (c) Miscellaneous errors such as attributing an action to the wrong individual or guessing incorrectly at half-observed activity cannot be detected;
- (d) Overload of information means that frequency counts become increasingly unreliable during very active periods.

2. The Choice of the Situation:

2.1 There is evidence from a study in our research group (Basckin & Lucas, in press) that when vervet monkeys are faced with novel objects, the vervet troop functions as a unit rather than as an aggregation of individuals. Troop members take on different roles, certain individuals being primarily the innovators for the group. A number of studies mentioned in the Literature Review point out that the presence of others is an important variable in exploration. The major research worker in the field of children's exploratory behaviour has studied single children in a playroom (C. Hutt, 1966). It was felt that in accordance with the aims and advantages of an ethological approach such restrictions should be avoided if one wished to elicit a

wide range of exploratory behaviour patterns. Indeed for most children in a nursery school context at least, the lone exploration of a novel object may be a rather strange situation

2.2 Age of Subjects:

Nursery-school age children were selected as having a more varied behaviour repertoire than infants and not being as dependent on speech content as older children. Hutt (1966) mentions "non-explorers" among the children in her sample and notes quite strong sex differences in exploration of novel objects. These factors suggest that a sex-role system may be operating. From the literature review it would appear that the critical period for psychological sex-identification has already passed and that by the age of $3\frac{1}{2}$ years preparations for later sex-roles, if any, should be apparent.

2.3 The Playground.

The nursery-school playground was chosen for two reasons :

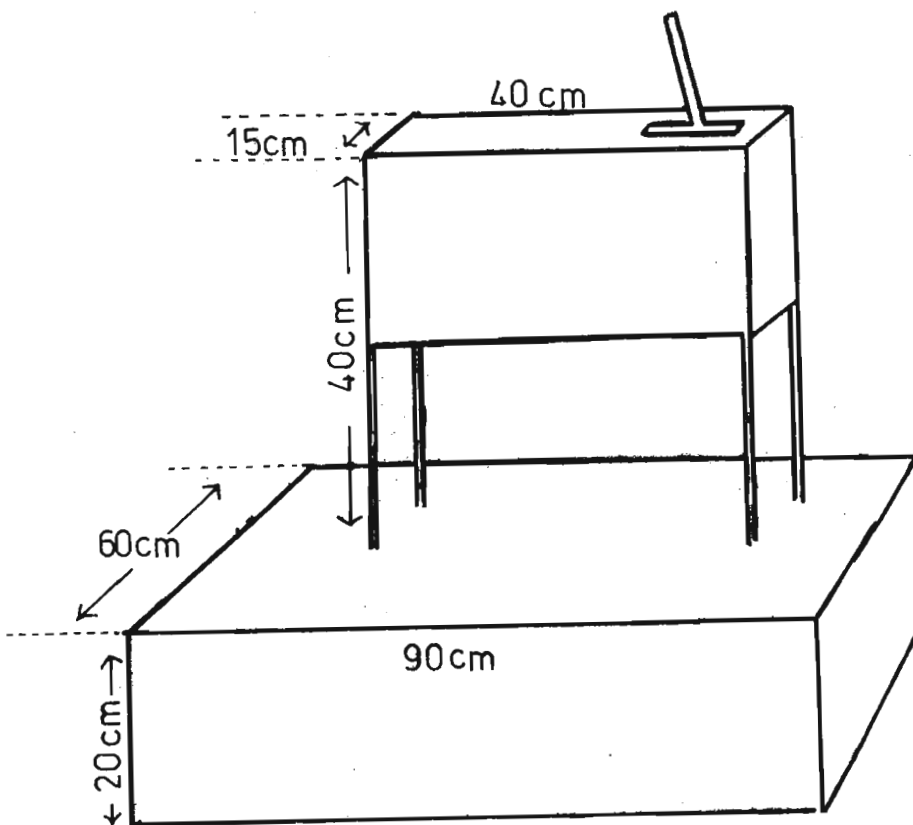
(a) It was very familiar to the children.

Recordings were made in October and November which means that the children had been using it since the beginning of the school year in early February;

(b) / ...

- (b) It was believed that an open-air situation was more likely to elicit a variety of activities than an indoor situation. Moreover it provided more scope for approach or avoidance responses than the smaller playroom used in previous studies.

2.4 The Novel Object.



To facilitate comparison with C. Hutt's (1966) findings a simplified version of the novel object used in her study was built. It was made of wood, painted in bright colours and the lever made a "bonking" sound when manipulated. It was mounted on a platform so that the children on it should not be obscured from the camera when there were a number of children in the immediate vicinity and to prevent it from being moved easily.

2.5 Selection of Schools.

Four nursery schools were selected for observational purposes. The first was intended for intensive study, to test the exploration situation and because there was reason to believe that a sex-role effect would be maximized.

The main criterion for selection of the other three schools was diversity. Since most studies on pre-school children have been conducted in Britain and North America, it was felt that some indication of generality was an important consideration. Within the Durban region there are a number of cultural groups with separate dwelling areas, schools and recreational facilities. One black African, one white and one Indian school were selected so that children came from backgrounds which differed from each other in language, religion, diet and educational resources, and indeed many other factors. A minimum of contact takes place between the groups although the schools are situated within a few kilometres of each other and are identical so far as climate and surrounding topology are concerned. Observations and recordings were made by a single research worker within the space of four weeks. All this has the effect of maximizing group

differences / ..

differences while minimizing methodological differences. The following are brief descriptions of the schools :

School A: At this school the children were white and English speaking. The school was administered by a Jewish organisation for the purpose of providing a nursery school with a Jewish religious policy, although very few of the children were Jewish and the school later came under a different administration and religious policy. At the time of the study, however, Shabbath was celebrated every Friday, Jewish religious festivals were observed and Hebrew songs were taught to the children.

School B: The children were black and Zulu-speaking. The school had been in existence for 30 years with black teachers and principal although white financial administration. School administrators were faced with the conflicting ideals of providing high quality pre-school education on the one hand and on the other providing adequate child-care facilities for a community where absentee fathers and working mothers are common and other child-care facilities scarce. The pupil-staff ratio is therefore high - 100 children to 3 teachers and funds that might be channeled into quality equipment and extra classrooms are directed to food / ...

food and equipment for large numbers. The grounds are however large and the teaching ideals and methods similar to School A and School C.

School C: White, very similar in teaching ideals, methods, equipment and grounds to School A and much the same socio-economic pupil backgrounds. English-speaking and celebrates Christian holidays although no strong religious teaching policy.

School D: Indian, differing from the other 3 schools in teaching ideals and premises. Socio-economic background of pupils shows considerable variation, children are English-speaking and school religious policy is Hindu.

3. Recording Apparatus and Procedure.

A minimum of 5 visits were paid to each school for the purposes of preliminary observations and to allow the $3\frac{1}{2}$ to $4\frac{1}{2}$ year old children to become accustomed to the observer and recording apparatus. The recording apparatus consisted of :

- (a) A video-camera and microphone for direction at the novel object to record all interactions on and around it;
- (b) An 8 mm movie camera was modified to take bursts of shots every 2 seconds to record the children's positions / ...

positions from a different angle;

- (c) An audiotape commentary was made by an observer as well as still photographs of groups of children outside of the range of the other cameras.

During the preliminary visits the observer :

1. Learnt to identify the children to facilitate commentary;
2. Made audiotape commentaries on each visit for the purpose of increasing background observations on the children's normal choice of playmates and normal school routine. This also served to accustom the children to the audiotape procedure;
3. Took still photographs for records and to accustom children to procedure;
4. Answered questions from children;
5. Discussed procedure with teachers and settled on convenient recording dates and times;
6. Paced out playground for plan and recorded children's age;
7. Placed all cameras in position and decided on position of novel object.

Recording in the first and second schools took place on 5 consecutive days, Monday to Friday. In schools 3 and 4 recording started on Mondays but on three occasions rain prevented outdoor play so recording

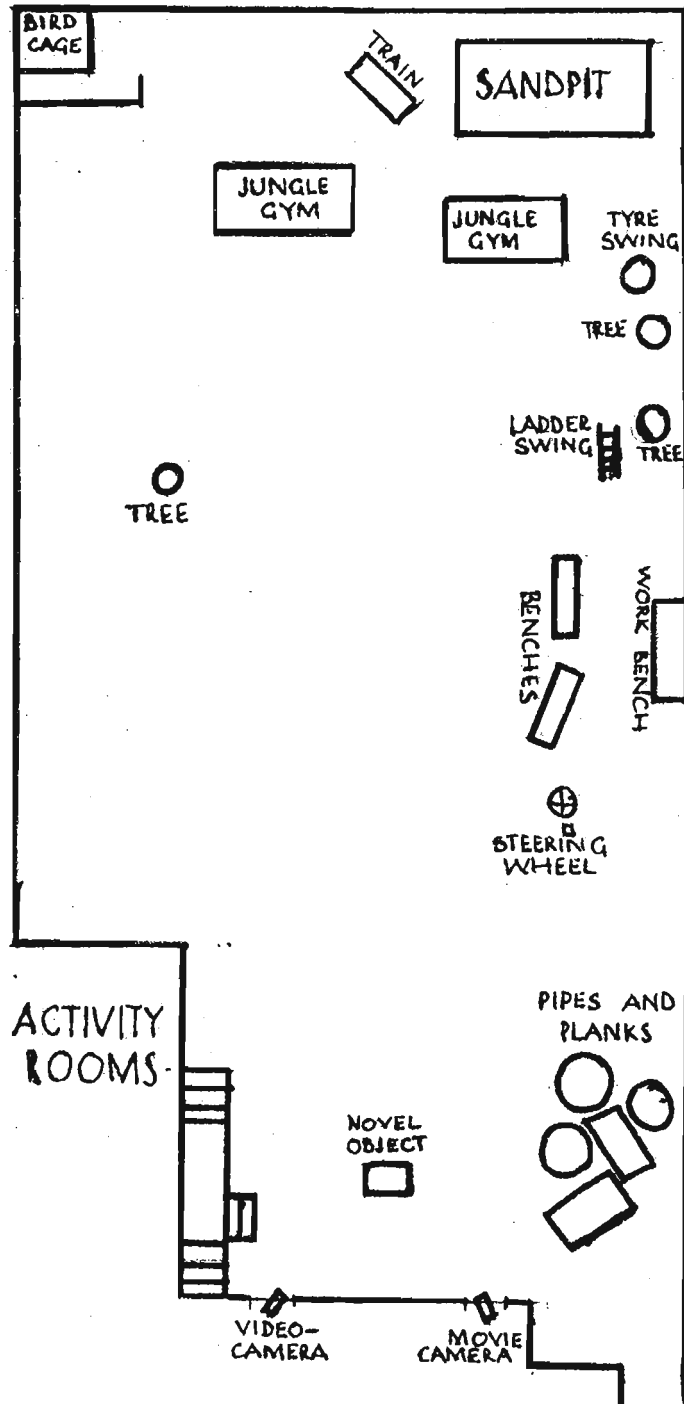
had / ...

had to continue into the following week. Recording sessions were half an hour long. The novel object was placed in the playground at the start of the session and before the children were called into the playground. After half an hour the novel object and cameras were removed.

School A	21st to 25th October (Monday to Friday)
School B	28th October to 1st November (Monday to Friday)
School C	4th to 6th, 8th and 11th November
School D	18th, 21st, 22nd, 25th and 26th November.

Thus all recordings were made as nearly as possible consecutively, with only rain and weekends intervening.

4.1 PLAN OF SCHOOL A.



SCHOOL "A"
PLAYGROUND

SCALE 10 METRES

4.2 PHOTOGRAPH OF THE LOWER PLAYGROUND IN SCHOOL A.



5. Preliminary Work on Records:

5.1 All Schools.

Preliminary work involved co-ordination of all recordings and photographs and cross-indexing them. This also served the purpose of providing a broad comparison of the process of exploration in all schools before starting on detailed analysis of the target school. In this way it was hoped that analysis would proceed on lines that had more generality than just one group and detailed attention to the idiosyncracies of each group would be avoided to some extent.

A detailed weather report was obtained for the whole of the Durban region for the days of the study. The Meteorological office indicated that none of the readings were extreme and likely to have caused discomfort to people.

5.2 Producing Working Tapes.

In School A the original videotapes were copied onto working tapes with the addition of a buzzer and the time every 10 seconds on the sound track. A system of recording all activity from all data sources on filing cards was used for Day 1. Each filing card represented 10 seconds and consequently the information was very detailed but the procedure was /...

was also very time-consuming. Since the insights obtained were more suited to a study of individual differences than to one of group changes, it was decided to change to a scan-sampling technique as described by J. Altmann (1974). (See Appendix II).

ANALYSIS : PHASE 1.

1. Methods:

A feature of C. Hutt's (1970) distinction between exploration and play was the type of receptor contact that characterised each. At every 10 second signal the number of children engaged in receptor contact with the object or object-related activity was recorded, as well as the nature of the contact. Day 1 was analysed in this way and graphs drawn taking the data from 10 second and 30 second intervals. The graphs were compared and it was found that the major changes in activity were reflected adequately in the graph based on 30 second counts. 30 second intervals were used for the remaining tapes. (see Appendices III and IV).

1.1 The Categories.

- (a) Touch-and-Look, where both occurred simultaneously;
- (b) Touch, which referred to any part of the body touching the object;
- (c) Look (near), referred to looking at the / ...

the object from a distance of 3 paces or closer. A subject was judged to be looking at the object when his head was turned towards it, or towards someone on it;

- (d) Look (far), where the subject is further than 3 paces from the object. This count includes only those subjects who were in view of the video camera. The visual inspection which took place from a distance is probably far higher than reflected in this count;
- (e) Activity refers to an activity closely related to the object where the child is not touching the object and probably not looking at it either. A child for instance who had jumped off the object and was running round it to climb on the other side would be classified under "activity". This classification was only used in cases where there was immediate return to the object when the pattern had ended.

1.2 Format of Tables and Graphs.

The results were then tabulated for all interactions together and each category separately / ...

separately. The counts for each 5 minute period during the 30 minute recording session were summed. The same format was used for all tables.

	Day 1	Day 2	Day 3	Day 4	Day 5
Time 1					
Time 2					
Time 3					
Time 4					
Time 5					
Time 6					

To emphasize overall trends dark-toned shading was used for high frequencies, graded tones for intermediate frequencies and light tones for the lowest frequencies. In this way a frequency which decreases uniformly should show the darkest tones in the upper left triangle of the table and light tones in the lower right triangle.

Graphs were drawn using the totals for the days

to / ...

to give expression to the change from day to day, and the totals for the time intervals to express the change through the day, i.e. through the half hour exposure to the novel object.

These figures were broken down into figures for male and female.

1.3 Significance Testing:

A fourfold χ^2 test has been used to check the following frequencies for significant differences :

1. Day 1 and Day 5;
2. Time 1 and Time 6;
3. Total male frequency and total female frequency.

2. Results.

GRAPHS 1 to 14.

GRAPH 1 : FREQUENCY OF ALL INTERACTIONS.

After a small initial rise (probably as the effects of wariness wear off) to a peak on Day 2 there is a decline in frequency to Day 5. The difference between Day 1 and Day 5 is statistically significant ($p < .001$). The interval showing the highest frequency is Day 2, Time 2. Of the times, Time 1 is the highest and Time 6 the lowest and this difference is significant ($p < .001$)

	Day 1	Day 2	Day 3	Day 4	Day 5
Time 1	48	43	41	11	24
" 2	18	32	24	10	5
" 3	20	37	17	9	4
" 4	21	17	9	9	4
" 5	32	19	6	15	12
" 6	28	20	14	6	10

Notes:

- Timing errors resulted in the last intervals being shorter than the others. Adjustments were made on Time 6, increasing the base from 50 to 60 to make it comparable to the other times.
- The variation in the number of subjects present on different days was so small that it was not deemed necessary to adjust the frequency for this.

GRAPH 2 : ALL INTERACTIONS - MALE/FEMALE
COMPARISON.

Males show a higher frequency than females generally ($p < .001$) with higher points at the beginnings of Days and Times and strong downward trends. By comparison the female graph show very little change over time. There is a slight rise in frequency on Days 3 and 4 and Times 5 and 6 which suggests that there is a response to increased opportunity, as the male interactions wane. By Day 5 the frequency has dropped again to slightly below that of the males.

Day 1	Day 2	Day 3	Day 4	Day 5		Day 1	Day 2	Day 3	Day 4	Day 5
6	8	9	0	0	Time 1	42	35	35	11	24
3	9	3	2	0	" 2	15	43	21	0	5
3	0	7	5	3	" 3	17	37	10	4	1
7	1	2	3	2	" 4	14	16	7	1	2
2	0	0	14	10	" 5	30	19	6	1	2
0	5	14	6	10	" 6	28	15	0	0	0

FEMALE

MALE

GRAPH 3 : SIMULTANEOUS LOOK-AND-TOUCH.

Simultaneous Look-and-Touch shows an initial high point and a downward trend. There is a significant difference between Day 1 and Day 5 ($p < .001$) and Time 1 and Time 6 ($p < .025$).

	Day 1	Day 2	Day 3	Day 4	Day 5
Time 1	24	16	19	2	10
" 2	9	17	7	3	2
" 3	13	21	4	5	1
" 4	18	10	3	2	1
" 5	18	7	4	6	5
" 6	16	7	10	3	2

Notes:

- (a) On the graph adjustments were made to Time 6 to make it comparable to other times, to compensate for timing errors See Graph 1.
- (b) No adjustments were made for the small variation in the number of subjects over days.

GRAPH 4 : LOOK ONLY

Look Only is high on the first 2 Days and Time 1 and drops down to a very low level on Days 4 and 5. There is a significant difference between Day 1 and Day 5 ($p < .001$) and between Time 1 and Time 6 ($p < .001$).

	Day 1	Day 2	Day 3	Day 4	Day 5
Time 1			14	0	1
" 2	4	11	3	1	0
" 3	4	5	2	0	1
" 4	3	0	0	1	2
" 5	9	2	0	4	3
" 6	4	5	3	1	2

Notes:

- (a) On the graph adjustments were made to Time 6 to make it comparable to other times, to compensate for timing errors. See Graph 1.
- (b) No adjustments were made for the small variation in the number of subjects over days.

GRAPH 5 : TOUCH ONLY

This pattern has its lowest frequency on Day 1 and its highest on Day 2, showing a steady decline thereafter. The difference between Days 1 and 2 is statistically significant ($p < .01$). As the graph shows, on the first 2 days frequencies generally increased slightly through the day perhaps reflecting the dissipation of wariness (see discussion on Wariness and Competition). Days 4, 5 and 6 showed higher frequencies initially and then decreasing, perhaps showing a lessening of interest in the object.

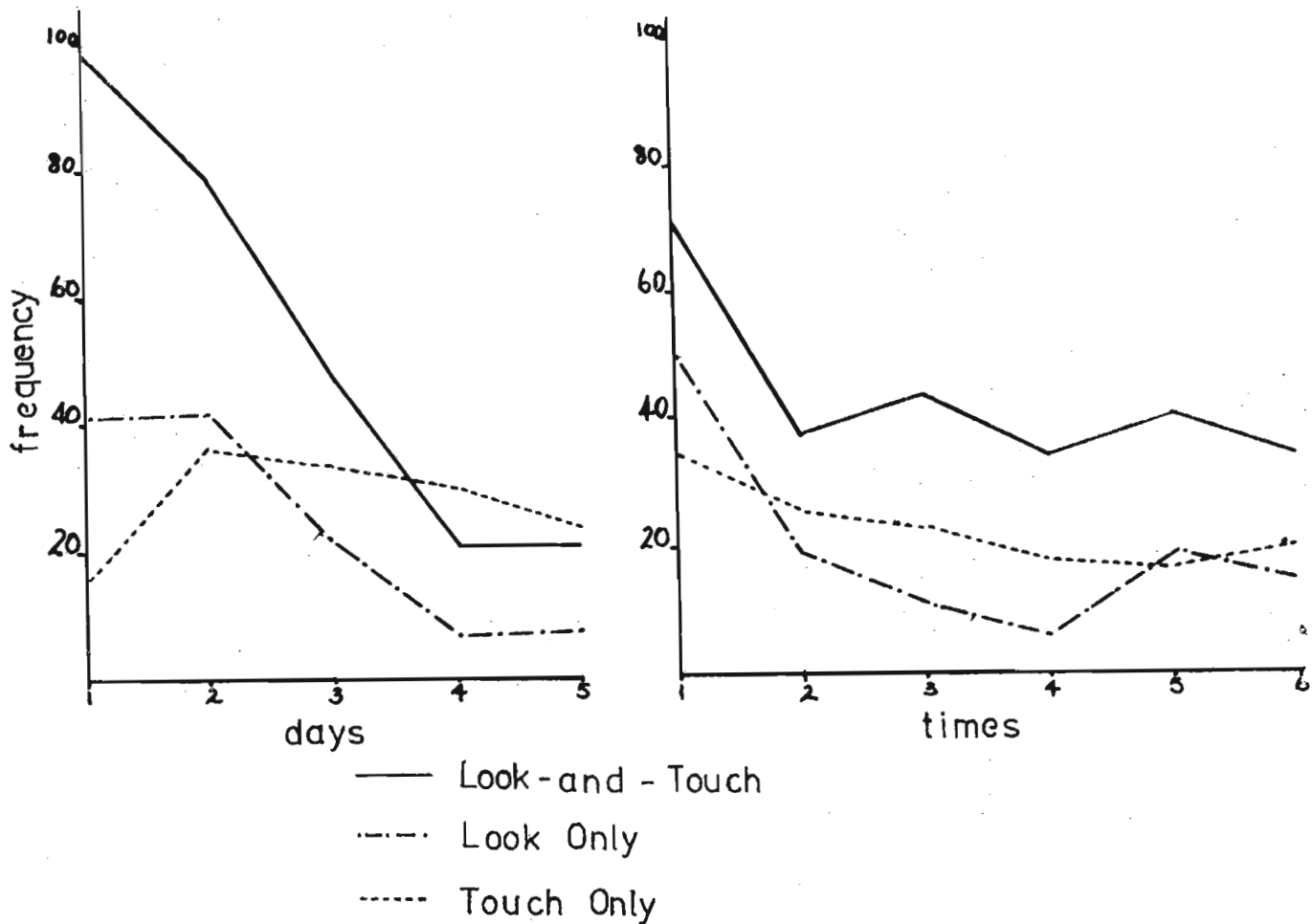
	Day 1	Day 2	Day 3	Day 4	Day 5
Time 1	3	5	7	9	11
" 2	3	6	11	4	2
" 3	2	6	9	4	2
" 4	0	6	5	6	1
" 5	1	6	1	3	4
" 6	6	7	1	2	4

Notes:

- (a) On the graph adjustments were made to Time 6 to make it comparable to the other times, to compensate for timing errors. See Graph 1.
- (b) No adjustments were made for the small variation in the number of subjects over days.

GRAPH 6 : ALL INTERACTIONS - COMPARISON OF MAJOR COMPONENTS.

The dominant pattern for the first 3 Days is simultaneous Look-and-Touch, which is then superseded by Touch Only.



Notes:

- (a) On the graph adjustments were made to Time 6 to make it comparable to other times to compensate for timing errors. See Graph 1.
- (b) No adjustments were made for the small variation in number of subjects over days.

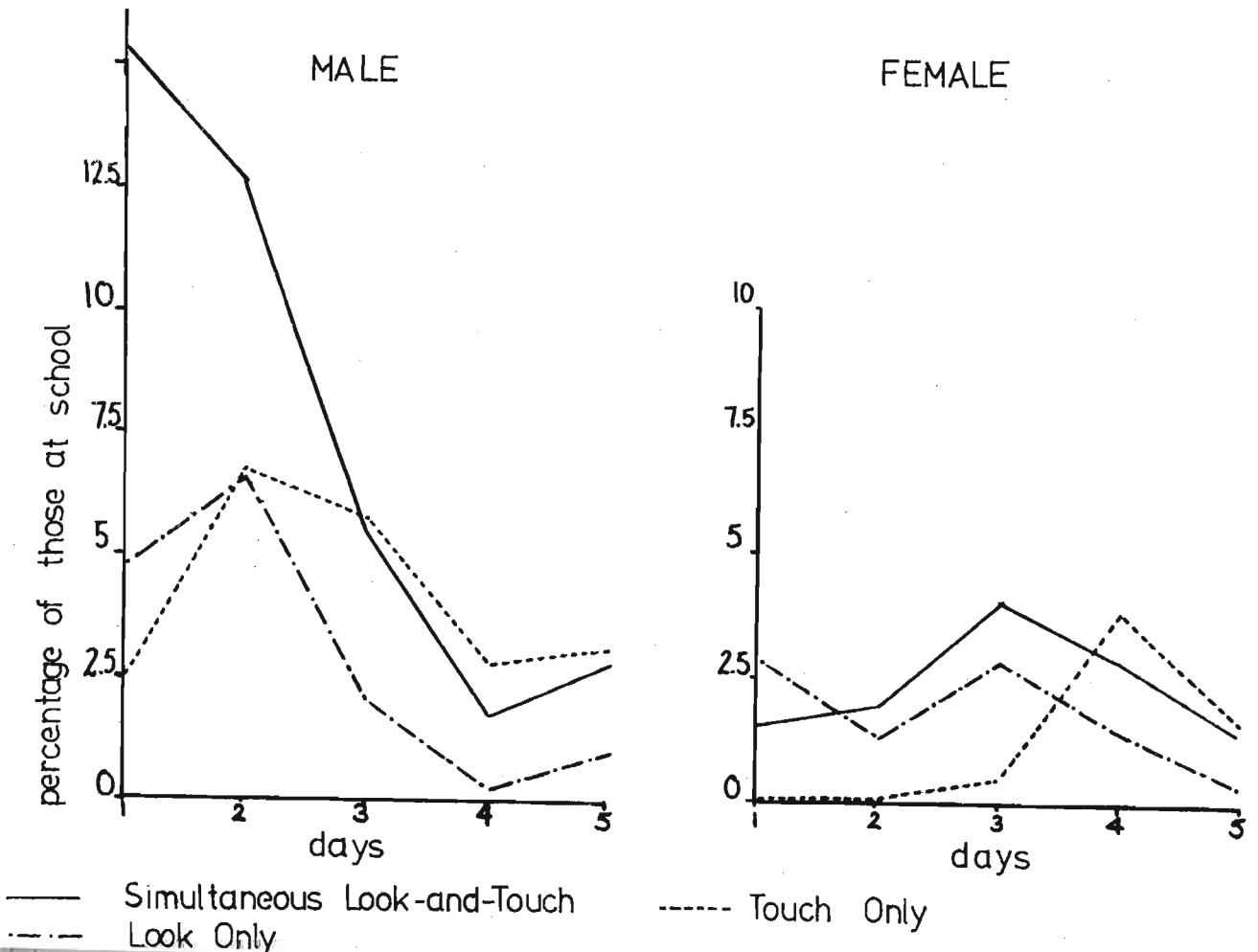
GRAPH 7 : MAJOR COMPONENTS - MALE/FEMALE
COMPARISON (DAYS).

It is important to notice that the receptor-contact patterns discussed here are all close-range. The Look Only pattern refers to looking from a distance of 3 paces or less because the recording of visual fixation from a distance was too unreliable.

In boys simultaneous Touch-and-Look is the dominating pattern on the first 2 days. On the 3rd day it drops sharply and is superseded by Touch Only.

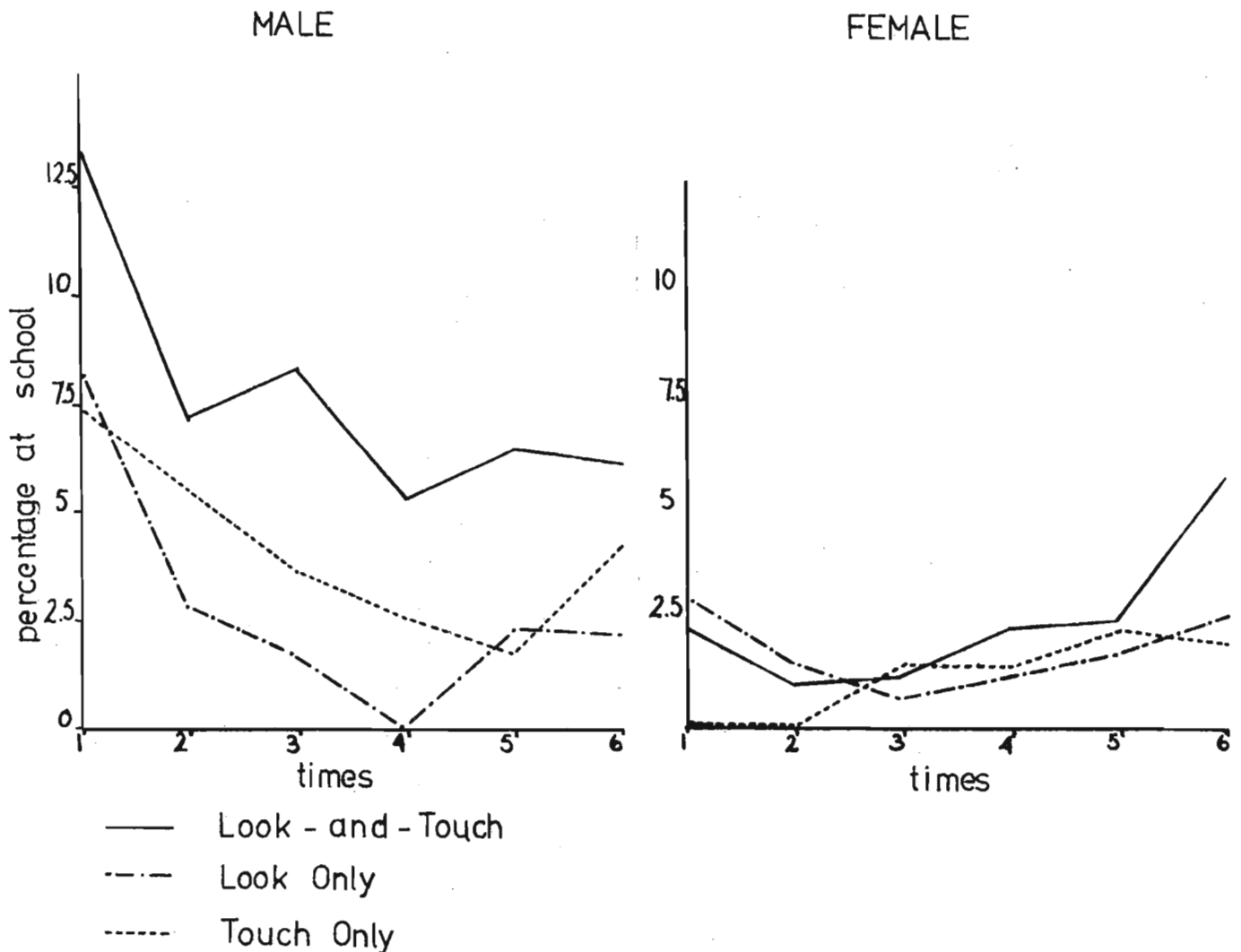
Receptor contact in girls shows an entirely different form. The lack of variability in comparison to the boys is again striking on this graph.

Here it is also noteworthy that there is a difference in the dominating pattern: On Day 1 it is Look Only, on Days 2 and 3 it is Simultaneous Look-and-Touch and on Days 4 and 5 it is Touch Only. This suggests a more cautious sequence, Touch Only not occurring at all on the 1st two Days and minimally on the 3rd (see summaries of points emerging from these graphs in the Discussion of Sex Roles).



GRAPH 8 : MAJOR COMPONENTS - MALE/FEMALE
COMPARISON (TIMES).

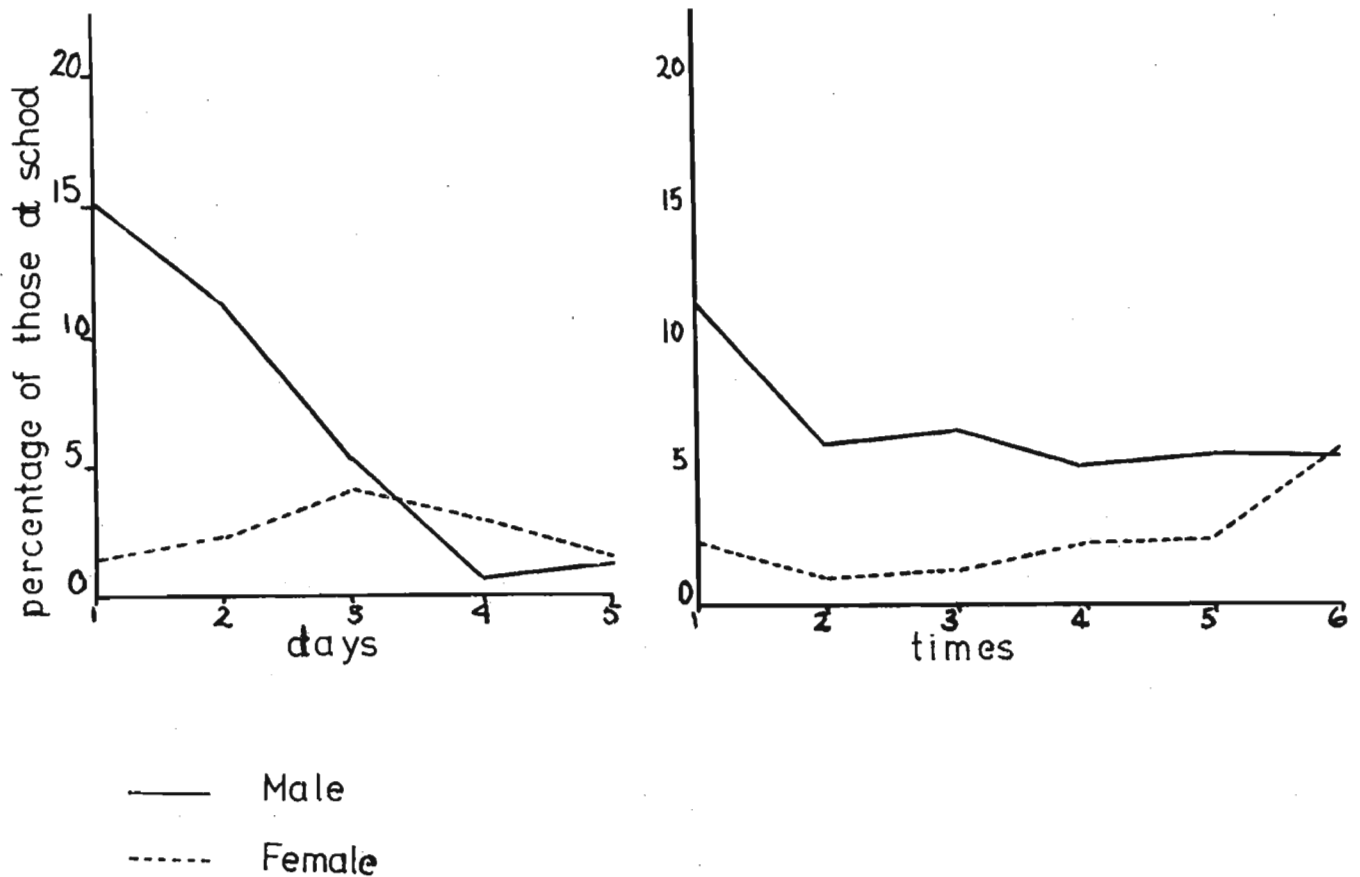
In boys all patterns are highest in the first 5 minutes with Simultaneous Look-and-Touch leading the field. In contrast, for girls the major variation is at Time 6. The idea of a more cautious approach for girls is reinforced (see discussion on Sex-Roles) by the fact that Look Only is the predominant pattern on Times 1 and 2, with Look-and-Touch rising to a peak at Time 6 and Touch Only not occurring at all until Time 3 and never dominating.



GRAPH 9 : SIMULTANEOUS LOOK-AND-TOUCH -
MALE/FEMALE COMPARISON.

In males this pattern dominates the first 2 days dropping steeply down to Day 5 whereas the female graph does not show much variation over days. On the graph for times, the male frequency drops while the female frequency rises.

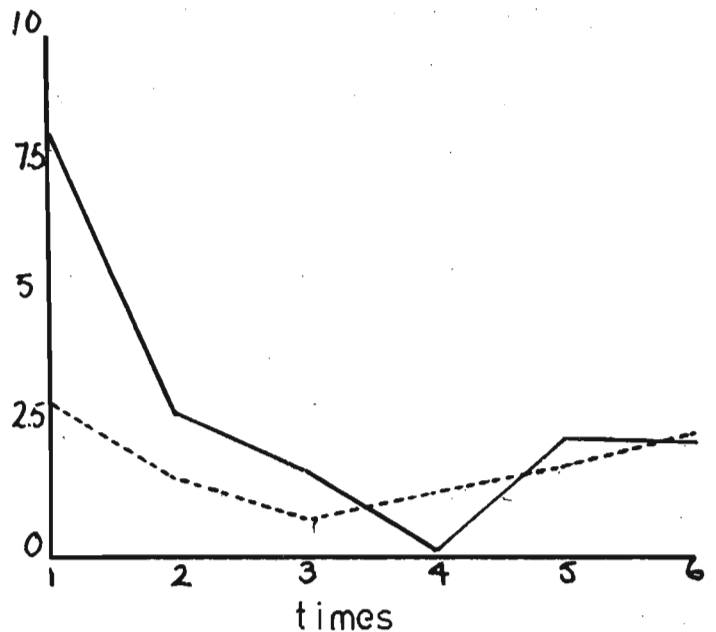
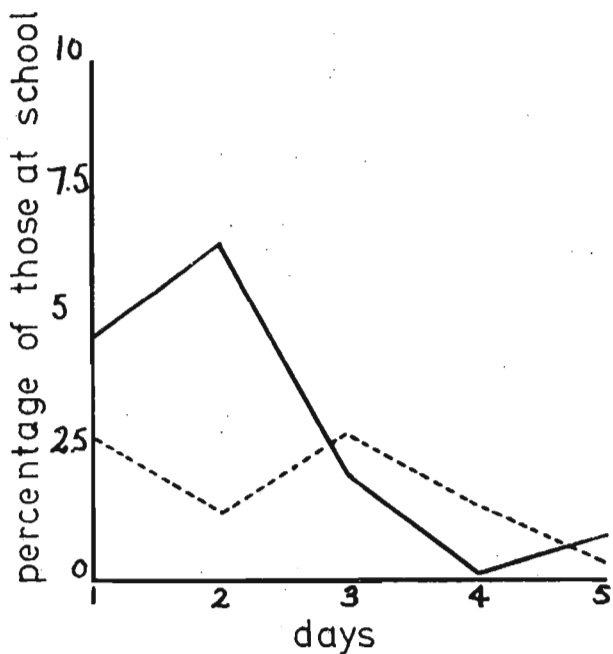
The total frequency for males is significantly higher than for females ($p < .001$).



GRAPH 10 : LOOK ONLY - MALE/FEMALE COMPARISON.

This count excludes looking from a distance of more than 3 paces. It has a descending pattern over days for both males and females but the male graph is steeper. On the Time graph it can be seen that it loses importance for males after the first 5 minutes, whereas the female graph shows very little variation but rises to meet the male frequency on Time 6.

There is a significant difference between total frequencies for males and for females ($p < .001$).



— Male
----- Female

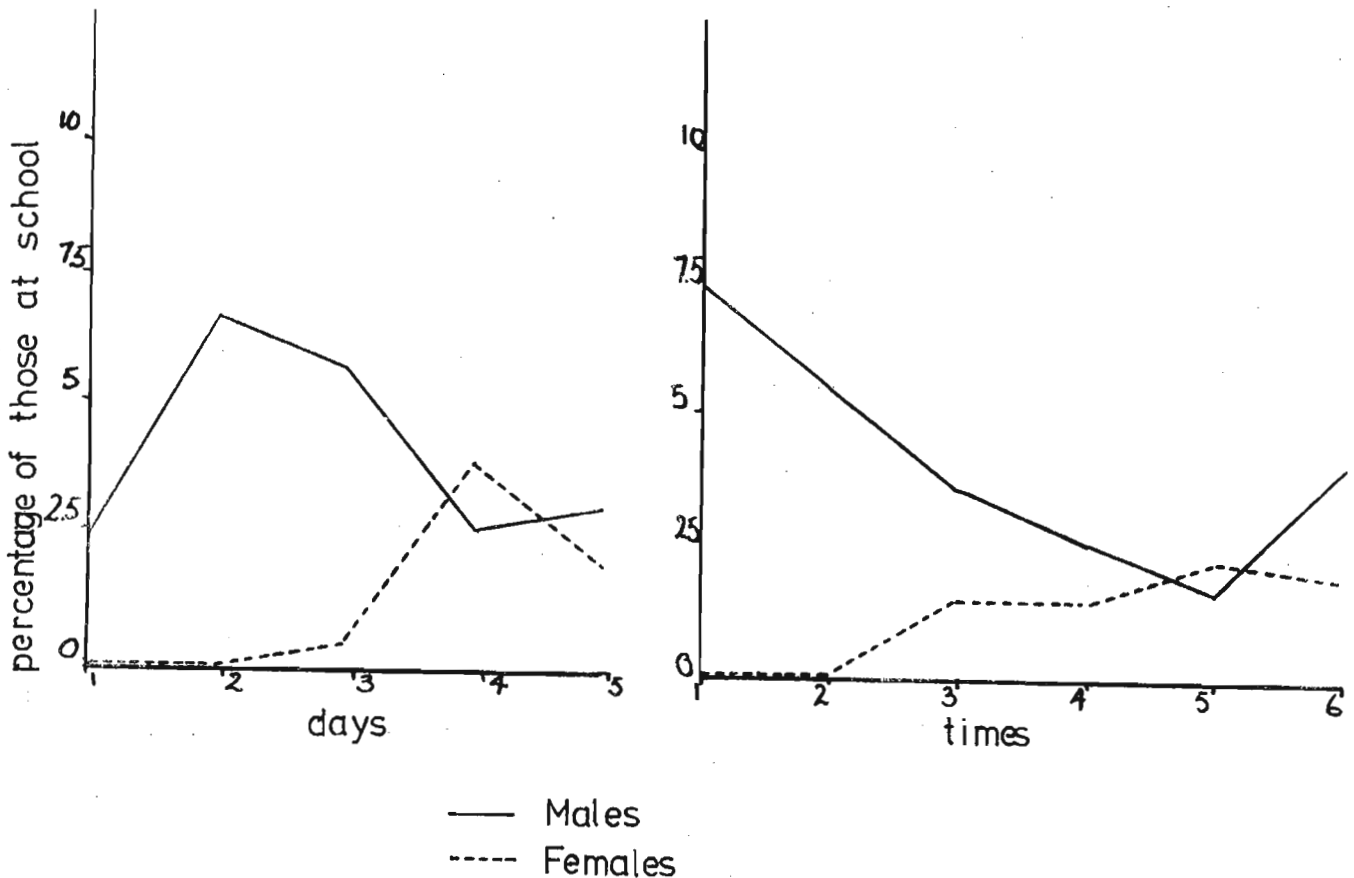
GRAPH 11 : TOUCH ONLY - MALE/FEMALE COMPARISON.

For males this is at its lowest on Day 1, high on Days 2 and 3, and drops on Days 4 and 5 possibly reflecting loss of interest. The female graph shows the same form at a lower frequency and later in the week with no Touch Only on Days 1 and 2, and a peak on Day 4, descending again on Day 5.

Over times the male graph shows a basically descending pattern whereas the females show no Touch on the first two Times and an ascending graph thereafter.

There is a possibility here that the presence of the males serves to keep the females away because on both the Days and Times graphs the female frequency rises as the male frequency descends.

There is a significant difference in total frequency between males and females ($p < .001$).



GRAPH 12 : COMPARISON OF ALL LOOKING AND ALL TOUCHING.

The Count of All Looking refers to any instance of looking at the object which could be detected from a video tape or the time-lapse film, whether it was from a distance of more than 3 paces or closer and accompanied by touch. All Touching is the sum of Touch Only and Touch-and-Look.

The All Looking graph shows that looking as a possible source of information has a higher frequency than Touching but loses importance after Day 3. Touching on the other hand peaks later and is more diffuse through the graph only really losing importance after Day 5, Time 1.

ALL LOOKING.

ALL TOUCHING

Day 1	Day 2	Day 3	Day 4	Day 5		Day 1	Day 2	Day 3	Day 4	Day 5
42	35	34	2	11	Time 1	27	21	26	11	21
14	52	11	4	2	" 2	12	23	18	7	4
17	26	8	5	2	" 3	15	27	13	9	3
21	11	4	3	3	" 4	18	16	8	8	2
28	11	5	10	8	" 5	19	13	5	11	9
20	13	13	4	4	" 6	22	14	11	5	6

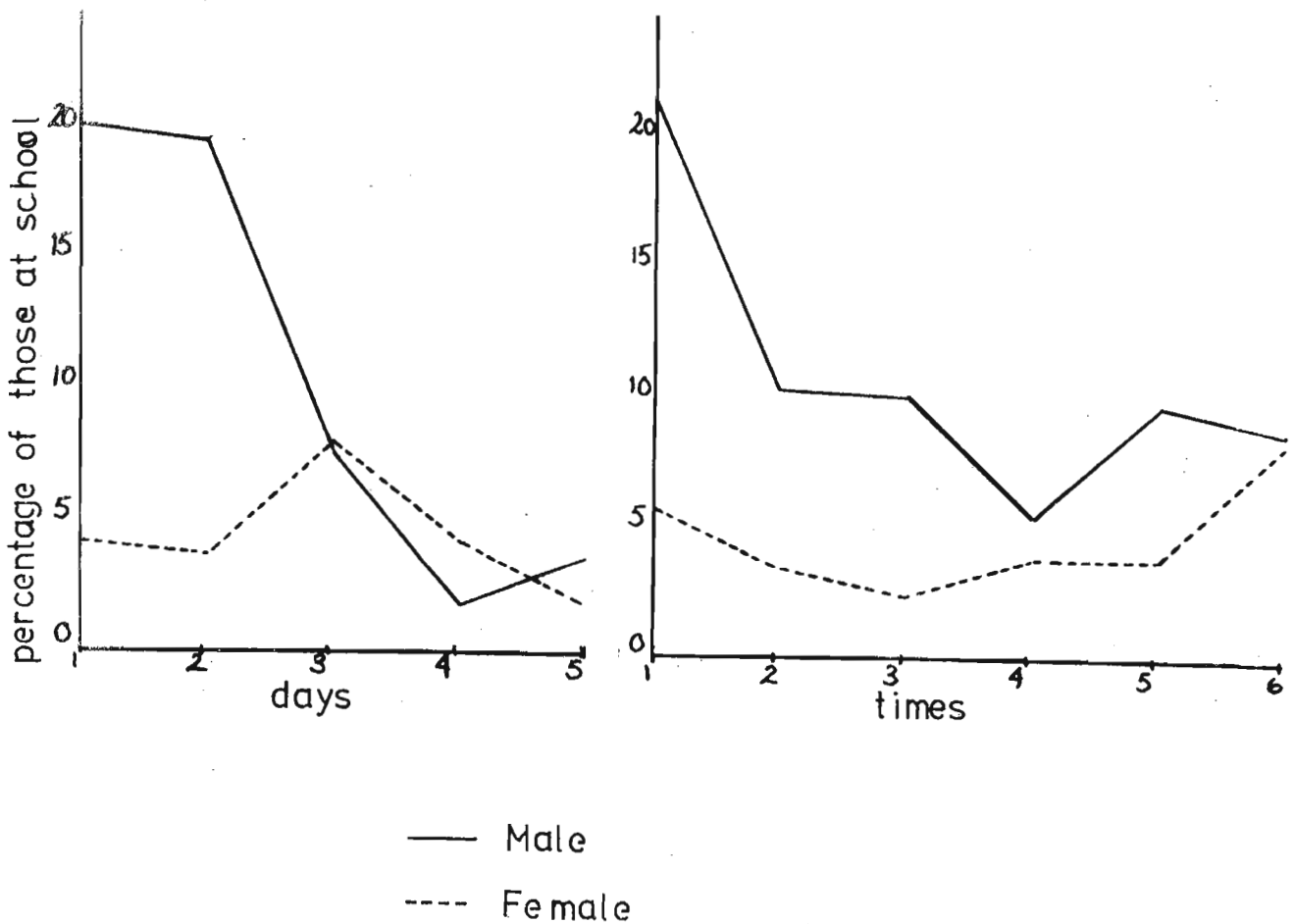
The frequencies of All Looking show significant differences between Day 1 and Day 5 ($p < .001$) and Time 1 and Time 6. The frequencies of All Touching show significant differences between Day 1 and Day 5 ($p < .001$) and Time 1 and Time 6 ($p < .01$).

Notes:

- On the graph adjustments were made to Time 6 to make it comparable to other times, to compensate for timing errors (see Graph 1).
- No adjustments were made for the small variation in the number of subjects over days.

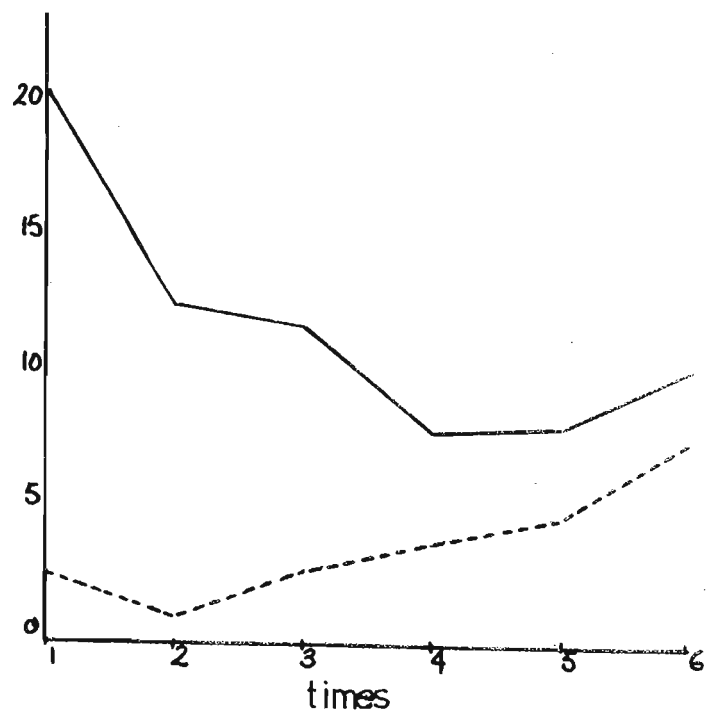
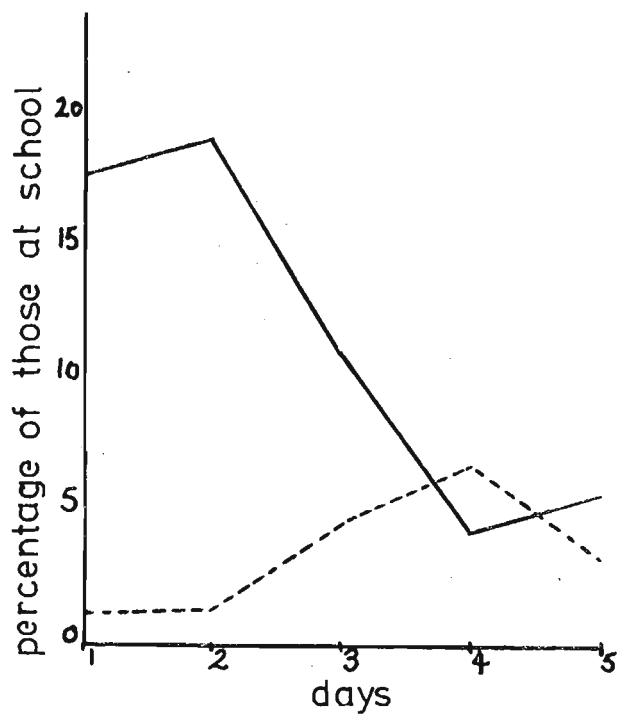
GRAPH 13 : ALL LOOKING - MALE/FEMALE COMPARISON.

Males show a significantly higher overall frequency of looking ($p < .001$) than females and in comparison to the females, much more variation from beginning to end of the recording period.



GRAPH 14 : ALL TOUCHING - MALE/FEMALE COMPARISON.

Males show significantly more touching than females ($p < .001$) and more variation from the beginning to the end of the recording period.



— Male
----- Female

ANALYSIS : PHASE 2.

1. Methods:

1.1 Constructing a Short-List.

It became obvious during Phase 1 that the information to be gained from a simple count of receptor contact was limited, and that a more sensitive breakdown was needed. Using McGrew's patterns (1972), eight 10 second sample times were chosen so as to cover the beginnings and ends of the $5\frac{1}{2}$ hour sessions and the beginning and end of the week. The sample area was defined as the area covered by the video-screen to a depth of about 5 metres behind the object (in practice this was the grassy patch in the sun). A careful account was made of each child in the sample area both in terms of the sequence of events and the items of behaviour observed. The information for each item was collected and filed. These records were then scrutinized item by item for items which appear to change over time in this situation. Finally a checklist was constructed of these items and operational definitions were drawn up.

1.2 /...

1.2 Time-Sampling.

Experience with preliminary observations led us to believe that most changes took place during the first few minutes of each day, so sample times were arranged so as to have this period represented more thoroughly than later stages of the day. 10 seconds was fixed on as a convenient interval for measurement for purely practical reasons, as was the grouping of 10 second intervals in pairs. This grouping meant that additional information on the same child could be obtained relatively quickly if it followed immediately, although spaced intervals were needed to show the regular changes over time. Thus the time intervals were as follows on all days :

<u>Interval:*</u>	<u>Time measured from the start of the tape:</u>				
	<u>Mins.</u>	<u>Secs.</u>		<u>Mins.</u>	<u>Secs.</u>
1	(0	30	-	0	40
	(0	40	-	0	50
2	(1	0	-	1	10
	(1	10	-	1	20
3	(2	30	-	2	40
	(2	40	-	2	50
4	(5	0	-	5	10
	(5	10	-	5	20
5	(10	0	-	10	10
	(10	10	-	10	20
6	(15	0	-	15	10
	(15	10	-	15	20
7	(20	0	-	20	10
	(20	10	-	20	20

<u>Interval:*</u>	<u>Time measured from the start of the tape:</u>			
	<u>Mins.</u>	<u>Secs.</u>	<u>Mins.</u>	<u>Secs.</u>
8	(25	0	-	25 10
	(25	10	-	25 20

* Footnote:

The word Interval is always used in connection with these 20 second intervals. Times 1 to 6 indicate 5 minute periods through the 30 minute recording sessions.

Two types of measurement were used, frequency and duration counts. The frequency counts were of the type called by J. Altmann (1974) "one-zero sampling". An item was ticked in a frequency count if it occurred at least once in that interval. This obviated the necessity for deciding whether a hesitant performance of an item was scored one or two. The duration count was much more exact and involved measuring with a stop watch the amount of time spent in a particular activity and also the amount of time that the child was visible. The duration count could therefore be expressed as the proportion of time spent in a particular activity.

1.3 Definition of the Sample Size:

- (a) Only children who are present in the sample area are counted;
- (b) In the frequency count only children who are seen to act are counted, but the sample size includes / ...

- includes children who could have acted unseen;
- (c) Only children who were present for the whole 10 second interval were included in the sample size for the frequency count;
 - (d) For the duration count, children are counted for the amount of time they are in the sample area and not obscured. Reasonably frequent evidence from the time-lapse photography is accepted where the child is obscured on the video-tape.

1.4 Evaluation of the First Count.

It became obvious during the first count of the recurring patterns that the definitions of some of the patterns were too inclusive and needed to be refined. Graphs were drawn up and difference between days were tested for significance. Trends seemed to be emerging but tests did not reach acceptable levels of significance. In general the results were sufficiently encouraging to warrant pursuing this line of analysis, with some changes. (For examples of the first and second check sheet see Appendices VI and VII).

1.5 Changes made in the Analysis Procedure.

- (a) The number of sample intervals were increased from eight 20 second intervals to thirteen 20 second intervals. The new time intervals were as follows :

Interval: / ...

<u>Interval:</u>	<u>Time measured from the start of the tape:</u>					
	<u>Mins.</u>	<u>Secs.</u>		<u>Mins.</u>	<u>Secs.</u>	
1	(0	30	-	0	40	
	(0	40	-	0	50	
2	(1	0	-	1	10	
	(1	10	-	1	20	
3	(2	30	-	2	40	
	(2	40	-	2	50	
4	(5	0	-	5	10	
	(5	10	-	5	20	
5	(7	30	-	7	40	
	(7	40	-	7	50	
6	(10	0	-	10	10	
	(10	10	-	10	20	
7	(12	30	-	12	40	
	(12	40	-	12	50	
8	(15	0	-	15	10	
	(15	10	-	15	20	
9	(17	30	-	17	40	
	(17	40	-	17	50	
10	(20	0	-	20	10	
	(20	10	-	20	20	
11	(22	30	-	22	40	
	(22	40	-	22	50	
12	(25	0	-	25	10	
	(25	10	-	25	20	
13	(27	30	-	27	40	
	(27	40	-	27	50	

(b) The Sample Size was increased. In frequency counts any child present in the sample area at any time during the interval was included, except those present for less than .4 second. The first count was found to lose too much information in categories such as "run" or "fight" which / ...

which are infrequent in any case, and usually lead to the child leaving the sample area;

- (c) The definitions were refined and the final definitions are discussed in the following section;
- (d) It was felt that sufficient information on the amount of gaze directed towards the object had already been gathered to warrant the exclusion of this pattern;
- (e) The duration count on Passive Touch was dropped from the final count because it was felt that a single child sitting on the object for the total interval inflated the score and was misleading. The frequency count which favoured the numbers of different children performing this pattern was more informative and appropriate;
- (f) No meaningful distinction had been made between the patterns of Touch Lever and Manipulate so the two were combined.

Tables and graphs were made in the same form as for previous patterns but included 13 time intervals.

2. The Patterns : Final

2.1 The number of Children in the Sample Area:

The sample size and sample area have been defined in Section 1 of the Analysis : Phase 1. Since the group was led into the playground for free play at the start of the recording /...

recording session and no attempt was made to direct them to the novel object, the children who were in the sample area were presumably there as a matter of choice. Children were not prevented from leaving the playground if they wished to play in the school building or use the toilets. This was the normal school policy for playtime.

2.2 Immobile.

Description: Gross movements of the trunk, limbs and head ceases for at least 3 seconds. It may be combined with incomplete actions or Passive Touch, but not with Vocalization or Shifting Feet. Immobile as part of a game is not scored (From McGrew 1972 - see Appendix V).

Situation: Common during the first few minutes of exposure to a novel object, the child often standing in the Slope position with Chin In.

2.3 Chin In.

Description: This is a variation of McGrew's (1972) pattern (see Appendix V) but more inclusive. All instances of the chin being moved towards the chest for a duration of more than two seconds were scored, regardless of whether / ...



ILLUSTRATION 2 - CHIN IN, SLOPE, TOUCH LEVER AND PASSIVE TOUCH.

whether it was simply a function of gaze direction. The two second stipulation eliminated transitory chin-to-chest positions. It was found in the first count that any child observed for 10 seconds usually looks down briefly at least once.

Situation: Seen as an initial reaction in children faced with a novel object, there is usually an absence of gross body movement or vocalization. It is often combined with Immobile standing, Slope posture, Digit Suck or other Incomplete Actions. It is also seen in children who are watching others explore, fight or play.

2.4 Incomplete Actions.

Description: Any movement of the arms and hands up and outwards from the body where no contact is made with an object or another person, and the action has no observable effect on others. The arm movement is not related to any other simultaneous activity. This category includes such items from McGrew (172) (see Appendix V) as :

1. Automanipulate;
2. Digit Suck;
3. Hand Cover;
4. Forearm raise;

5. / ...

5. Forearm sweep;
6. Repel (if not effective)
7. Arms Akimbo;
8. Flinch;
9. Reach.

Situation: Seen in children faced with a novel object. Particularly when there is no opportunity to touch or examine the object themselves. Also seen in onlookers to a fight.

Originally more than one tick was scored when different kinds of Incomplete Actions occurred in the same individual in the same interval. On inspection, however, it appeared that this was a fairly infrequent occurrence and confined to a few individuals, so the scoring was changed to the "one-zero" type used for the other patterns.

2.5 Passive Touch.

Description: Any part of the body touching the novel object, unless connected with other simultaneous body movement or a game.

Situation: Often seen in children who have no opportunity for investigating the object personally because another child is already engaged with it. Or in children who have completed their investigation but not yet relinquished possession.

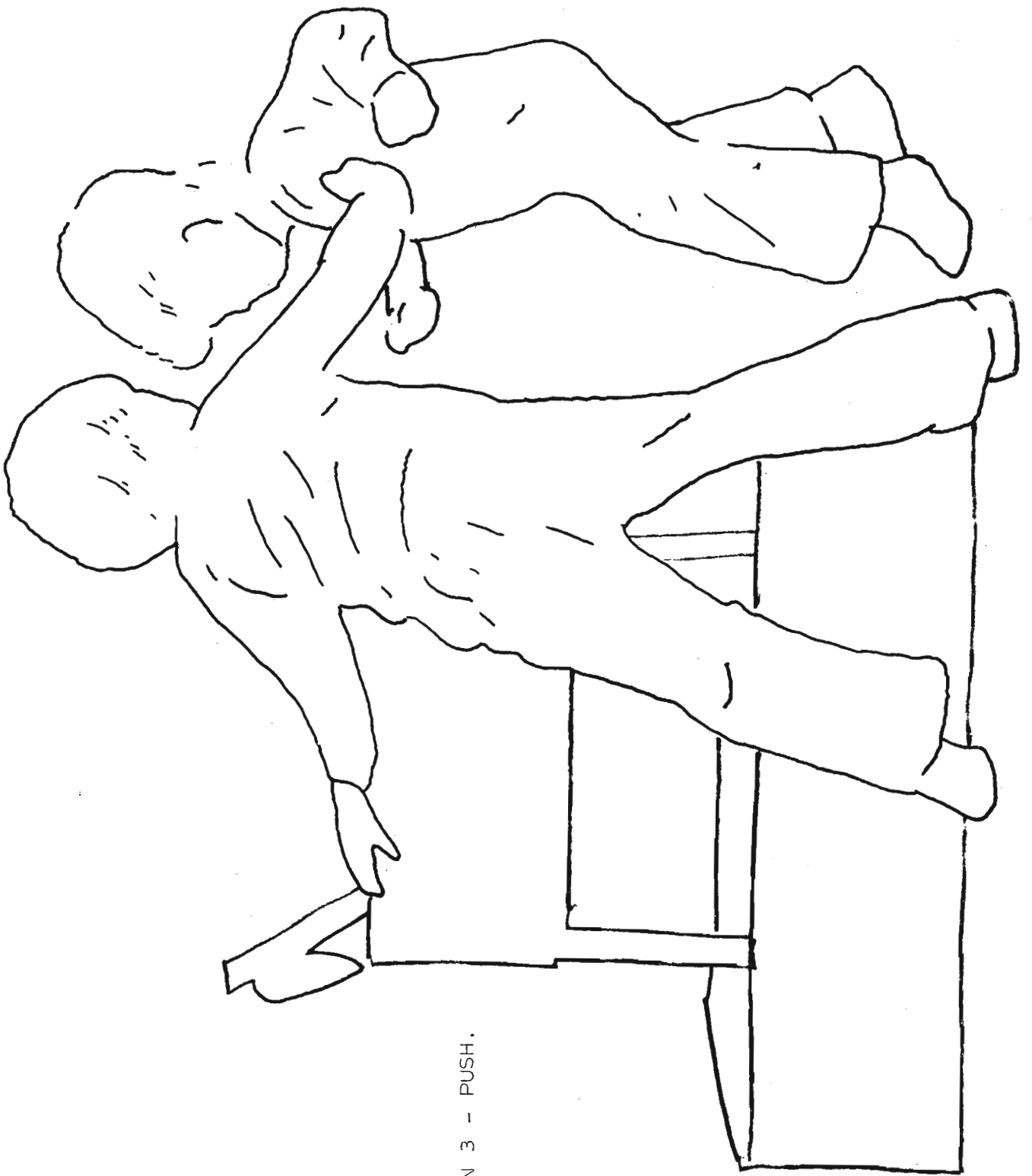


ILLUSTRATION 3 - PUSH.

2.6 Touch Lever.

Description: Any touching or manipulation of the lever.

Situation: This could be as part of an investigation of the object, as part of a game, or for its own sake as a possessive act.

2.7 Fight.

Description: Any instance of the following patterns of physical co-ercion of sufficient force for the effect on the reactor to be perceptible -

1. Bite;
2. Beat;
3. Pull;
4. Push (only if evidence of impact);
5. Wrestle;
6. Punch;
7. Body oppose;
8. Repel (where effective);
9. Chase.

These are from McGrew (1972 - see Appendix V.)

Situation: In the general novel object situation, fighting occurred over possession of a favourable position with relation to the object. Once the favoured position had been attained the child then fought off other children. Very marked sex differences in

fighting / ...

fighting behaviour.

The literature distinguishes between "rough-and-tumble play" and true fighting. This distinction was not made in the present study for two reasons. The two patterns seemed to merge on many occasions and distinguishing between them would have involved a number of fairly subjective judgments. The two patterns seemed to serve the same purpose with respect to the novel object which was the main concern of this study. They were used in gaining or maintaining access to the novel object.

2.8 Energetic Locomotion.

Description: All non-walk locomotion, that is cases where more energy is expended than is strictly necessary to get the child to a different location.

Situation: Rare in the first few minutes of exposure to a novel object, gradually increasing.

3. Tabulation by Computer.

The scores for each individual at each sample time were stored on computer cards and a tabulation program on an I.B.M. 5700 computer printed out totals and breakdown totals for time intervals, sex and individuals.

4. INTEROBSERVER / ...

4. INTEROBSERVER RELIABILITY CHECK.

A second observer was given the above definitions of the Sample Intervals, Sample Size, Sample Area and the patterns. She had had experience in an application of the ethological method and in using the pattern Energetic Locomotion, but had done no previous work on this study. She was told that it should be possible to identify the behaviour patterns from the description alone and with no other training. She was asked to analyse sample intervals from the beginning, middle and end of the recording period in order to cover a wide variety of behaviour. She worked only from the working videotapes - that is, those with the buzzer on the soundtrack. This made it impossible to identify Passive Touch because the definition relies on information about what the children were saying, to know whether their actions were part of an imaginative game. It was felt that the scoring for the Immobile pattern was likely to be more accurate than the others because it was a duration count instead of one-zero sampling and the definition was less complex, so in the interests of saving time it was omitted.

The observer continued identifying patterns until she had reached a total score of 100.

5. RESULTS / ...

5. RESULTS.

5.1 Interobserver Reliability Check:

The first observer had two main sources of information - the videotape and the time-lapse film - so where a child was obscured by another on the videotape, it was usually possible to fill in the missing information from the film. The second observer only had access to videotapes so where one child was partially obscured by another the results had to be discarded. The final amount scored then came to 99 behaviour patterns. Of the 99 behaviour patterns there was concurrence on 73 cases. This is a conservative estimate of concurrence because it only applies to positive cases and no account was taken of concurring negatives. There were 3 instances of the second observer scoring an Incomplete Action where the first observer scored a Fight pattern. This was due to an inadequacy in the definition of Incomplete Actions. Of the remaining non-concurrence 12 cases involved Chin In. There was however concurrence on 19 cases of Chin In.

GRAPHS / ...

GRAPH 15 : NUMBER PRESENT IN SAMPLE AREA

A : GRADED TONE GRAPH.

	Day 1	Day 2	Day 3	Day 4	Day 5
Interval 1	19	14	18	7	10
" 2	16	12	14	3	6
" 3	11	3	10	2	9
" 4	11	14	10	6	13
" 5	10	4	5	4	2
" 6	a	16	4	2	2
" 7	5	10	5	5	3
" 8	5	10	8	3	2
" 9	11	6	2	4	3
" 10	10	4	0	1	3
" 11	8	4	9	2	6
" 12	6	5	2	3	6
" 13	8	2	7	2	a

Note "a":

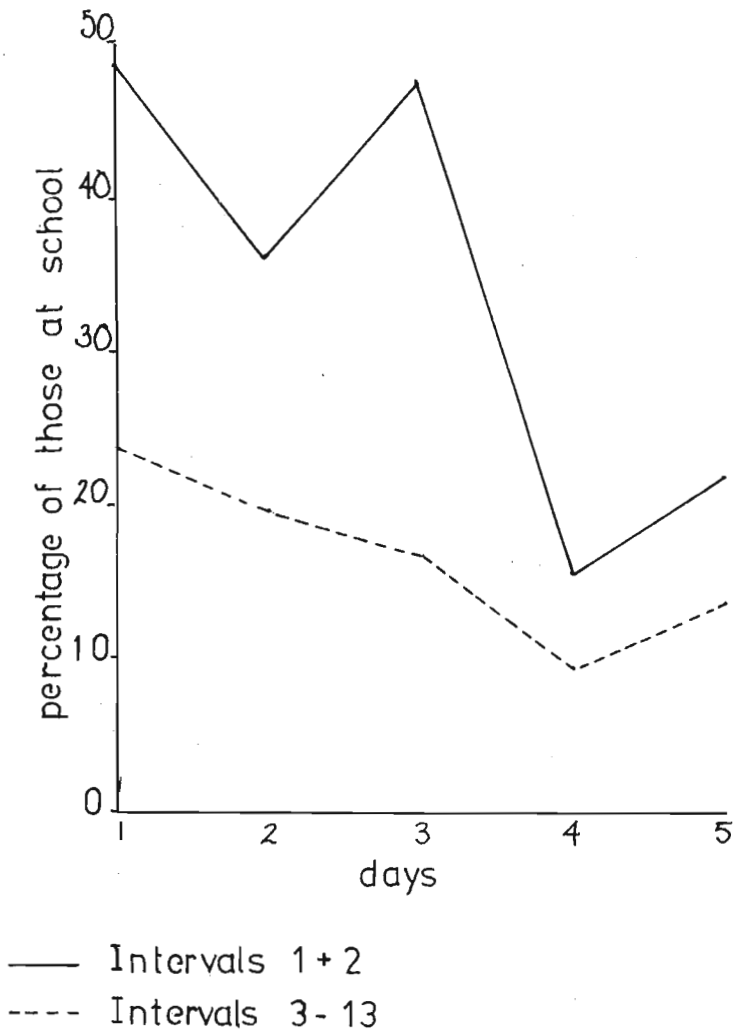
No information was available for these 2 Intervals. In one case the object was moved by one of the children out of the sample area and the other is due to an error in timing on Day 5.

GRAPH 15 : NUMBER PRESENT IN SAMPLE AREA

B : LINE GRAPH.

There was a downward trend in numbers here both over days and over times. Day 1 is significantly higher than Day 5 ($p < .001$). Intervals 1 and 2 were significantly higher than Intervals 3 - 13 ($p < .001$).

These figures are used as the base for the tables showing the percentage of children exhibiting a particular pattern.



GRAPH 16 : NUMBER PRESENT IN THE SAMPLE AREA -
MALE/FEMALE COMPARISON.

A : GRADED TONE GRAPH

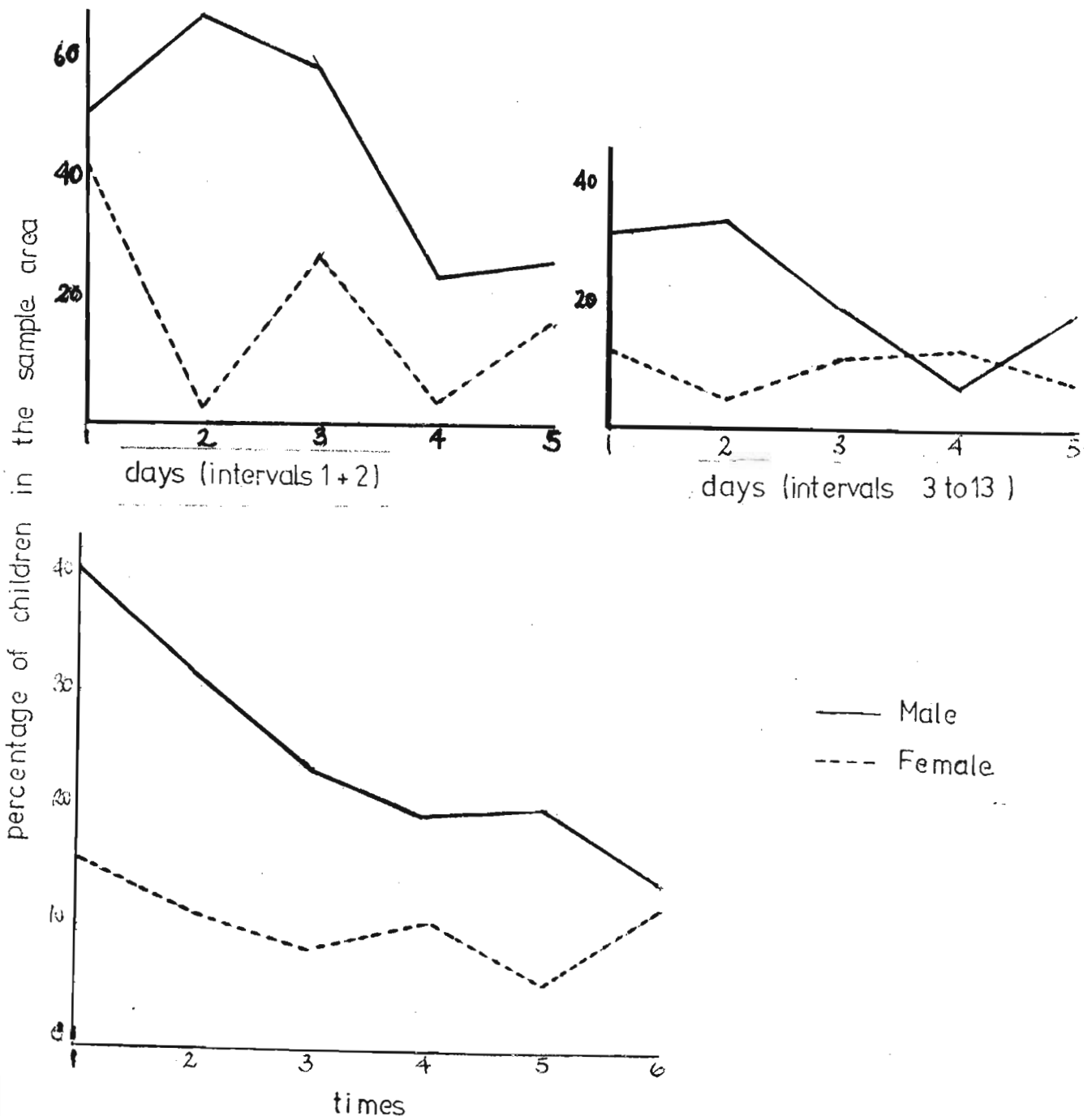
MALE:						FEMALE:				
Day 1	Day 2	Day 3	Day 4	Day 5		Day 1	Day 2	Day 3	Day 4	Day 5
12	18	14	7	4	Interval 1	7	1	4	0	6
9	12	10	2	6	" 2	7	0	4	1	0
9	2	7	2	7	" 3	2	1	3	0	2
9	8	9	5	12	" 4	2	6	1	0	1
5	4	5	1	2	" 5	5	0	0	3	0
0	14	2	2	2	" 6	0	2	2	0	0
4	10	3	0	3	" 7	1	0	2	5	0
4	10	6	3	1	" 8	1	0	2	0	1
4	6	2	0	1	" 9	7	0	0	4	2
8	4	0	0	3	" 10	2	0	0	1	0
8	4	7	0	4	" 11	0	0	2	2	2
6	5	2	0	0	" 12	0	0	0	3	6
8	2	1	0	0	" 13	0	0	6	2	0

Note: There is no information regarding these intervals.
In one case the object was moved by one of the children out of the sample area and the other is due to an error in timing on Day 5.

NUMBER PRESENT IN THE SAMPLE AREA - MALE/FEMALE
COMPARISON.

B : LINE GRAPH

The general downward trend was more consistent in males than in females. There is some indication that females were present more often during intervals where males were absent, or only present in very low numbers. The overall frequency of males being present in the sample area was significantly higher than females ($p < .001$).



GRAPH 17 : IMMOBILE(expressed as a percentage of the time spent in the sample area not obscured by other children).

A : GRADED TONE GRAPH

		Day 1	Day 2	Day 3	Day 4	Day 5
Interval 1		45	31	37	22	0
"	2	26	16	46	0	0
"	3	17	0	41	0	0
"	4	17	13	9	0	8
"	5	5	0	0	0	0
"	6	2	17	7	0	0
"	7	0	0	0	0	0
"	8	13	2	12	0	0
"	9	11	44	0	0	33
"	10	13	0	6	0	0
"	11	5	0	0	0	0
"	12	0	0	0	25	13
"	13	0	0	0	0	2

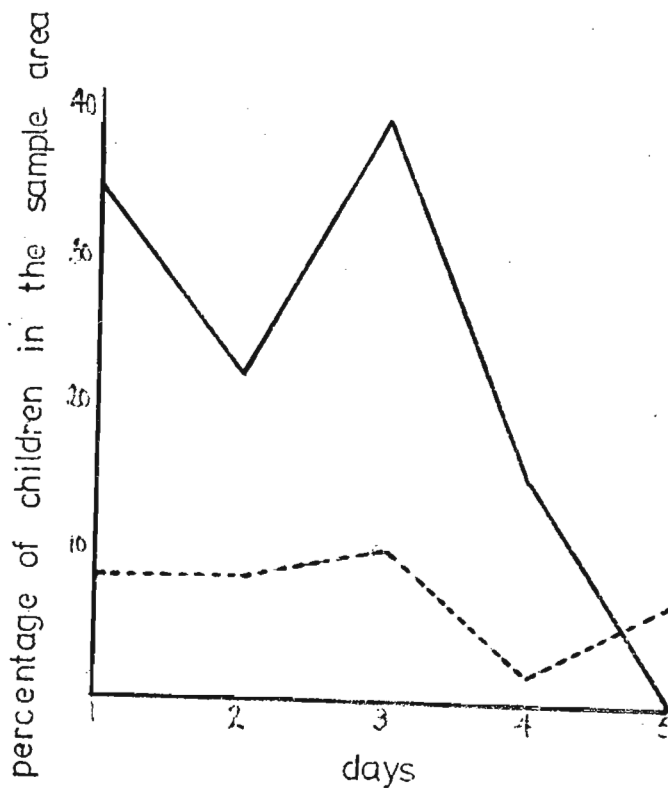
Notes:

- (a) There is no information regarding these intervals (see Graph 16).
- (b) There were no subjects in the sample area in this interval.

GRAPH 17 : IMMOBILE (expressed as a percentage of the time spent in the sample area not obscured by other children).

B : LINE GRAPH

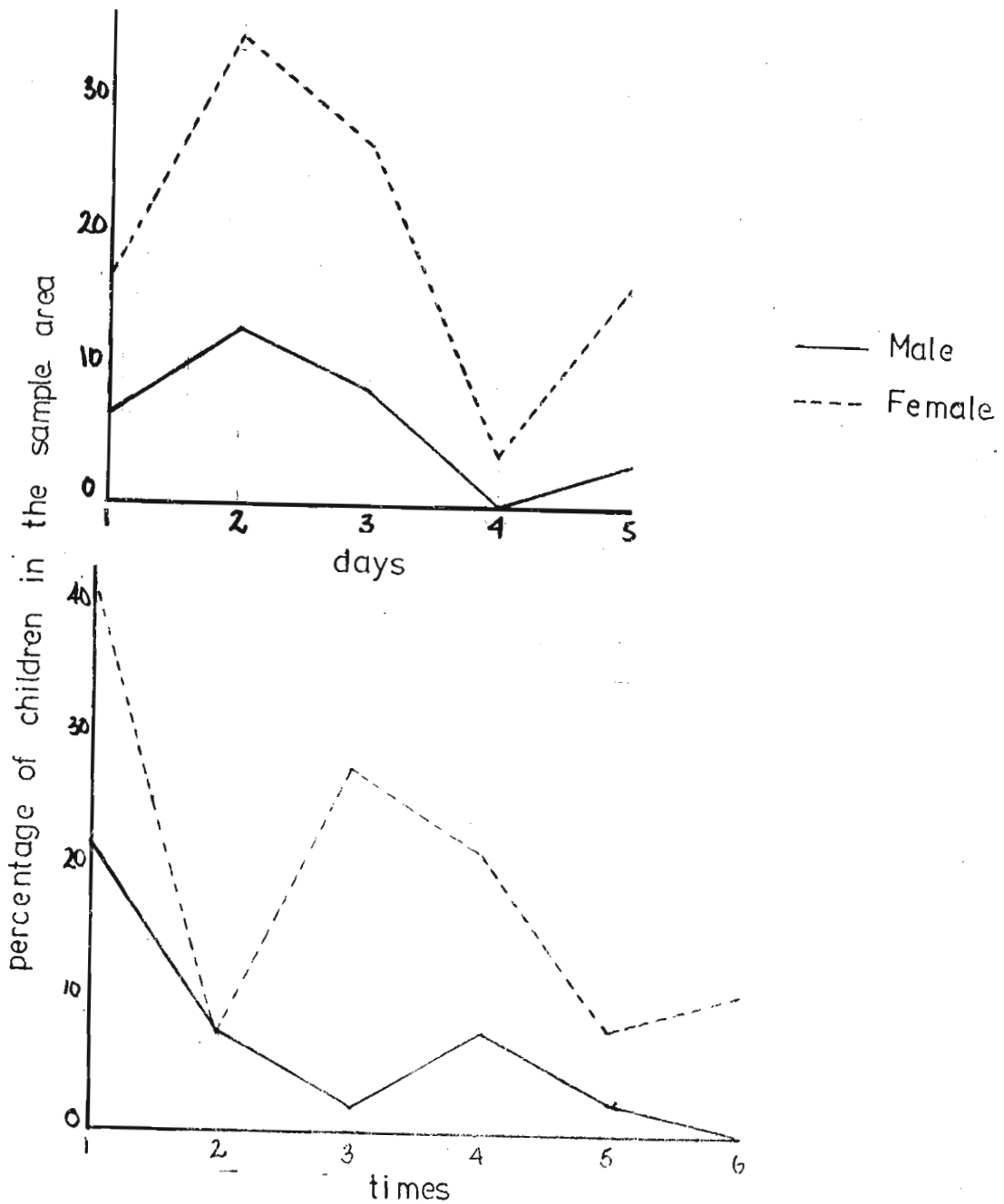
This was measured as a duration count and is therefore a more accurate measure than the other Recurring Pattern measurements which are "one-zero" frequency counts. There was a general downward trend over days and times. The Day 1 frequency is significantly different from Day 5 ($p < .001$) and Intervals 1 and 2 are significantly different from Intervals 3 - 13 ($p < .001$).



— Intervals 1 + 2
---- Intervals 3 to 13

GRAPH 18 : IMMOBILE - MALE/FEMALE COMPARISON

Females show a consistently higher incidence of the pattern and this is statistically significant ($p < .001$).



Note:

- (a) There were insufficient females present in the sample area during the first 2 Intervals for any meaningful ratio to be stated in these Intervals.

GRAPH 19 : CHIN IN (expressed as a percentage of the number of children in the sample area in that interval).

A : GRADED TONE GRAPH.

	Day 1	Day 2	Day 3	Day 4	Day 5
Interval 1	79	57	72	57	50
" 2	69	42	29	0	33
" 3	36	0	90	50	67
" 4	18	43	40	20	54
" 5	50	75	30	0	0
" 6	a	63	75	50	0
" 7	40	60	0	40	0
" 8	40	30	13	67	0
" 9	18	67	0	50	67
" 10	50	0	b	0	0
" 11	25	100	33	100	85
" 12	33	30	100	0	33
" 13	38	100	14	100	a

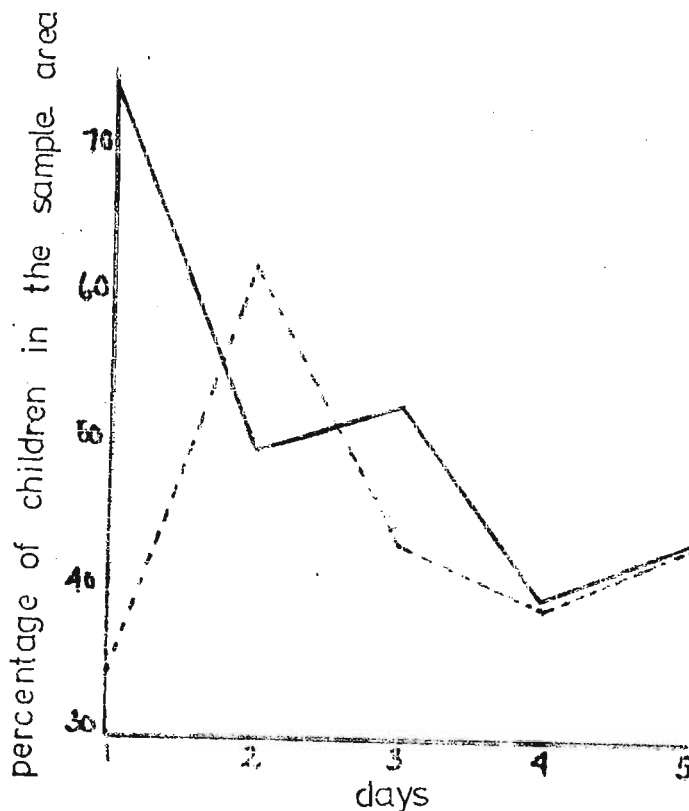
Notes:

- (a) There is no information regarding these intervals (see Graph 16).
- (b) There were no subjects in the sample area in this interval.

GRAPH 19 : CHIN IN (expressed as a percentage of the number of children in the sample area in that interval).

B : LINE GRAPH.

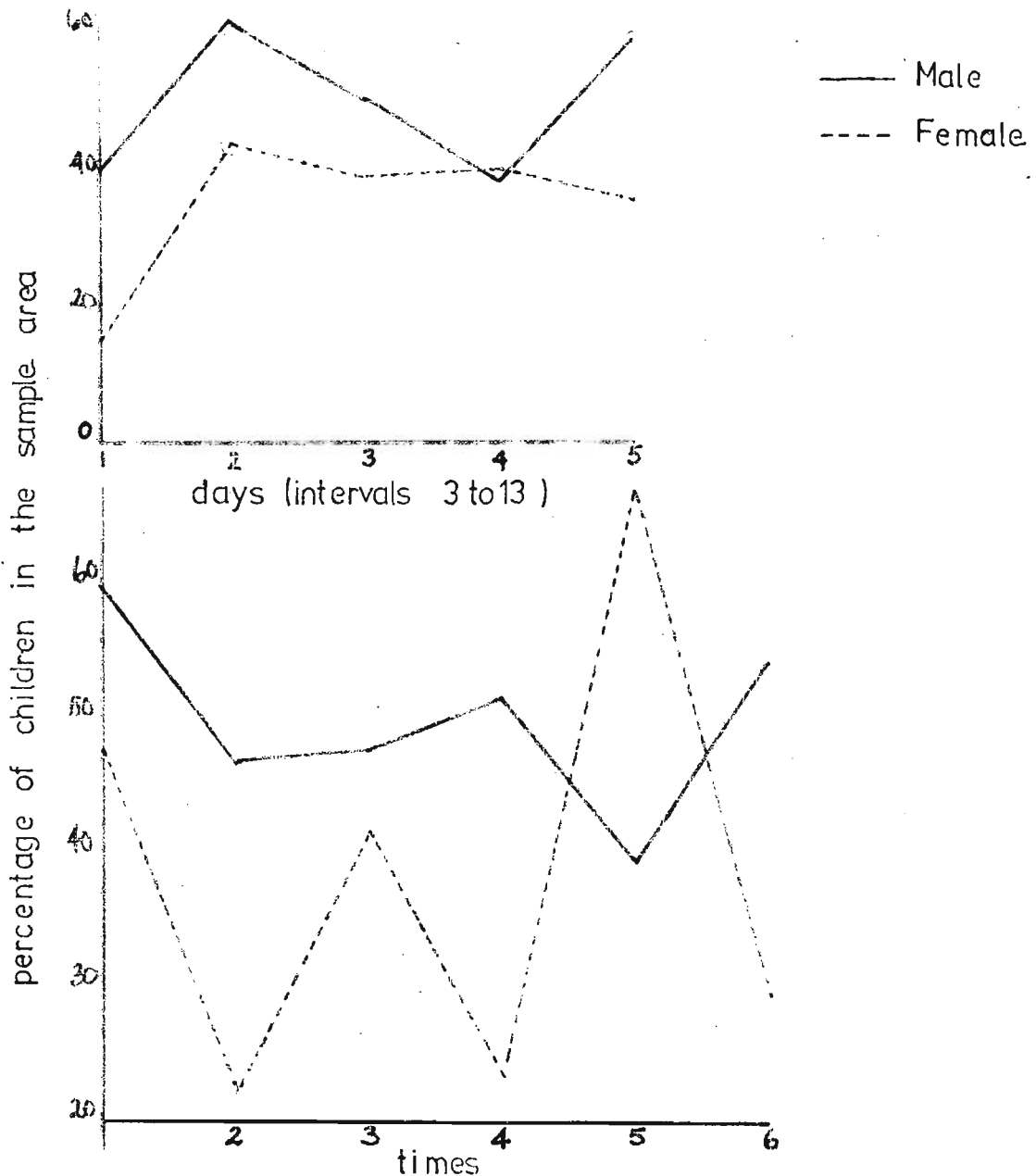
These graphs are more ambiguous than in the other patterns probably because McGrew's original pattern (see Appendix V) with the neck flexed was too difficult to detect with enough certainty to score and the compromise definition is probably partly a function of gaze direction. Using a χ^2 test with one degree of freedom there was no significant difference between Day 1 and Day 5, but there was a difference between Intervals 1 and 2 and 3 - 13 ($p < .05$).



— Intervals 1 + 2
---- Intervals 3 to 13

GRAPH 20 : CHIN IN - MALE/FEMALE COMPARISON.

This shows the Female graph to be so variable as to be impossible to interpret. Overall frequencies show the incidence in males to be significantly higher than in females ($p < .025$).



Note (a) There were insufficient females present in the sample area during the first 2 Intervals for any meaningful ratio to be stated during these intervals.

GRAPH 21 : INCOMPLETE ACTIONS (expressed as a percentage of the children in the sample area in that interval).

A: GRADED TONE GRAPH

	Day 1	Day 2	Day 3	Day 4	Day 5
Interval 1	59	43	61	29	60
" 2	50	59	50	0	17
" 3	27	33	30	0	11
" 4	9	43	40	0	0
" 5	20	0	50	25	0
" 6	a	25	20	50	0
" 7	0	40	38	0	0
" 8	40	30	0	0	50
" 9	18	33	0	50	0
" 10	10	0	b	0	0
" 11	25	0	67	0	33
" 12	0	20	0	33	0
" 13	13	0	29	0	a

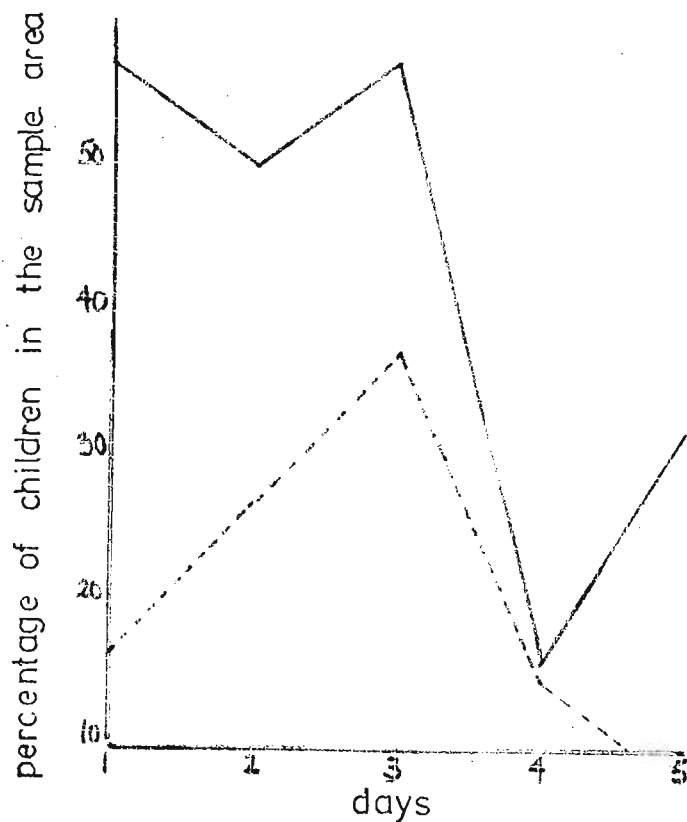
Notes:

- (a) There is no information regarding these intervals.
(see Graph 16).
- (b) There were no subjects present in this interval.

GRAPH 21 : INCOMPLETE ACTIONS (expressed as a percentage of the children in the sample area in that interval).

B : LINE GRAPH.

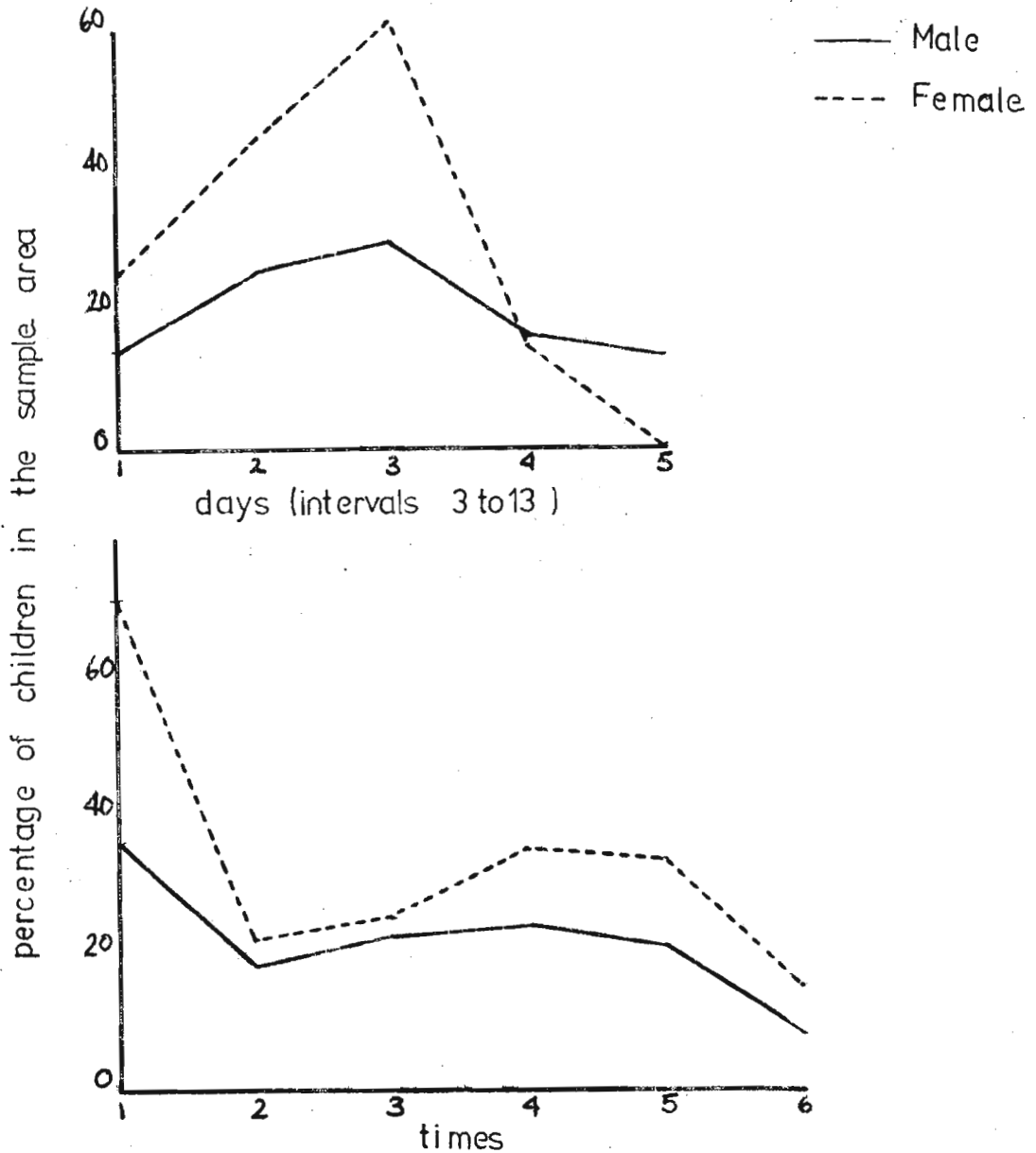
Intervals 1 and 2 show a consistently high level for the first 3 days, dropping down thereafter. Intervals 3-13 show a similar pattern to the Chin In one, with the highest concentration on Days 2 and 3, and possibly reflect a reaction to competition (see Discussion on competition). The frequency for Intervals 1 and 2 is significantly higher than the frequency for Intervals 3 - 13.



— Intervals 1 + 2
---- Intervals 3 to 13

GRAPH 22 : INCOMPLETE ACTIONS - MALE/FEMALE
COMPARISON.

There is a significantly higher frequency of this pattern in females ($p < .01$).



Note (a) There were insufficient females present in the sample area during the first 2 intervals for any meaningful ratios to be stated during these intervals.

GRAPH 23 : PASSIVE TOUCH X (expressed as a percentage of the number of children at School).

A : GRADED TONE GRAPH.

	Day 1	Day 2	Day 3	Day 4	Day 5
Interval 1	19	25	27	16	3
" 2	22	6	0	6	3
" 3	6	6	21	6	6
" 4	11	0	21	4	6
" 5	11	0	6	6	0
" 6	11	0	6	3	0
" 7	11	6	6	0	0
" 8	6	11	6	6	3
" 9	0	11	6	13	0
" 10	6	0	6	3	0
" 11	0	0	0	6	11
" 12	6	0	6	6	14
" 13	0	0	3	6	0

Notes:

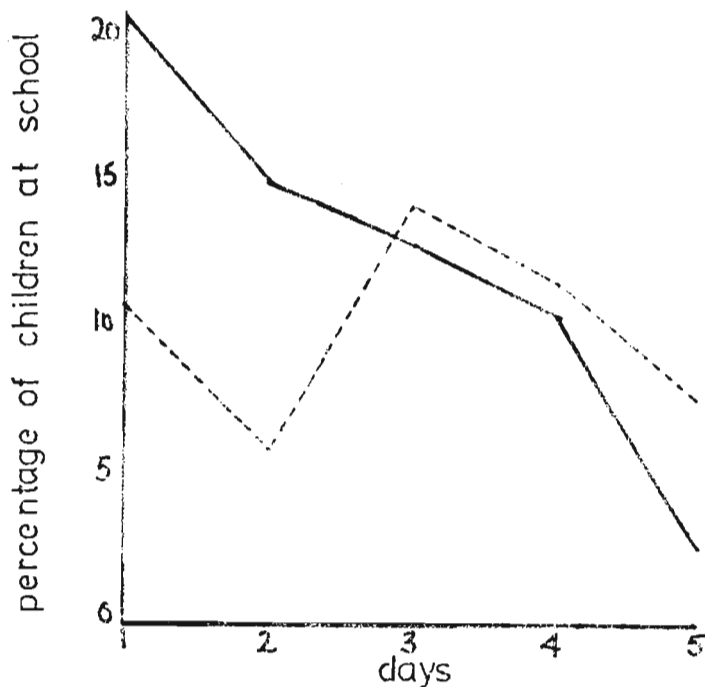
- (a) There is no information regarding these intervals (see Graph 16).
- (b) There were no subjects present in this interval.

GRAPH 23 : PASSIVE TOUCH X (expressed as a percentage of the number of children at School)

B : LINE GRAPH.

The raw scores for Passive Touch can be seen either in relation to the number of children at school or in relation to the number of children in the sample area. The former is an expression of the total amount of Passive Touching and the latter a comment on the amount of time the children in the sample area spend touching the object.

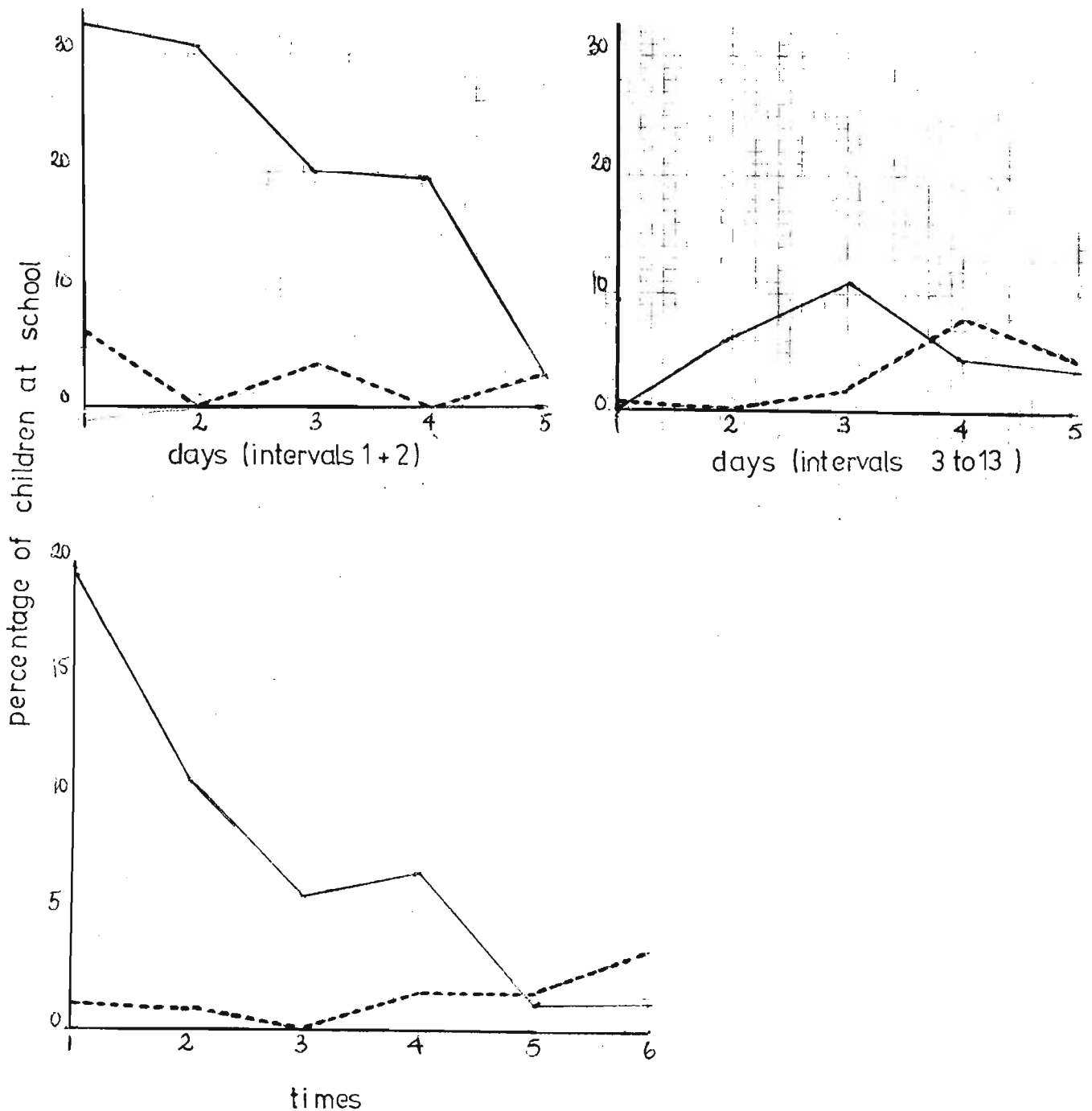
There is a decline over time in the amount of Passive Touch shown on this graph. There is a significant difference between Day 1 and Day 5 ($p < .01$) and between Intervals 1 and 2 and 3-13 ($p < .001$).



— Intervals 1 + 2
---- Intervals 3 to 13

GRAPH 24 : PASSIVE TOUCH X - MALE/FEMALE
COMPARISON.

There was a significant difference between males and females on this measure ($p < .001$). The frequencies for females were low throughout although there is some indication that rises in the female graph correspond to decline in the male graph.



GRAPH 25 : PASSIVE TOUCH Y (expressed as a percentage of children in the sample area).

A : GRADED TONE GRAPH.

	Day 1	Day 2	Day 3	Day 4	Day 5
Interval 1	37	67	50	71	10
" 2	50	17	0	67	17
" 3	18	67	70	100	22
" 4	36	0	70	60	15
" 5	40	0	40	50	0
" 6	0	0	50	50	0
" 7	80	20	40	0	0
" 8	40	40	25	67	50
" 9	0	67	100	100	0
" 10	20	0	0	100	0
" 11	0	0	0	100	67
" 12	33	0	100	67	83
" 13	0	0	14	100	0

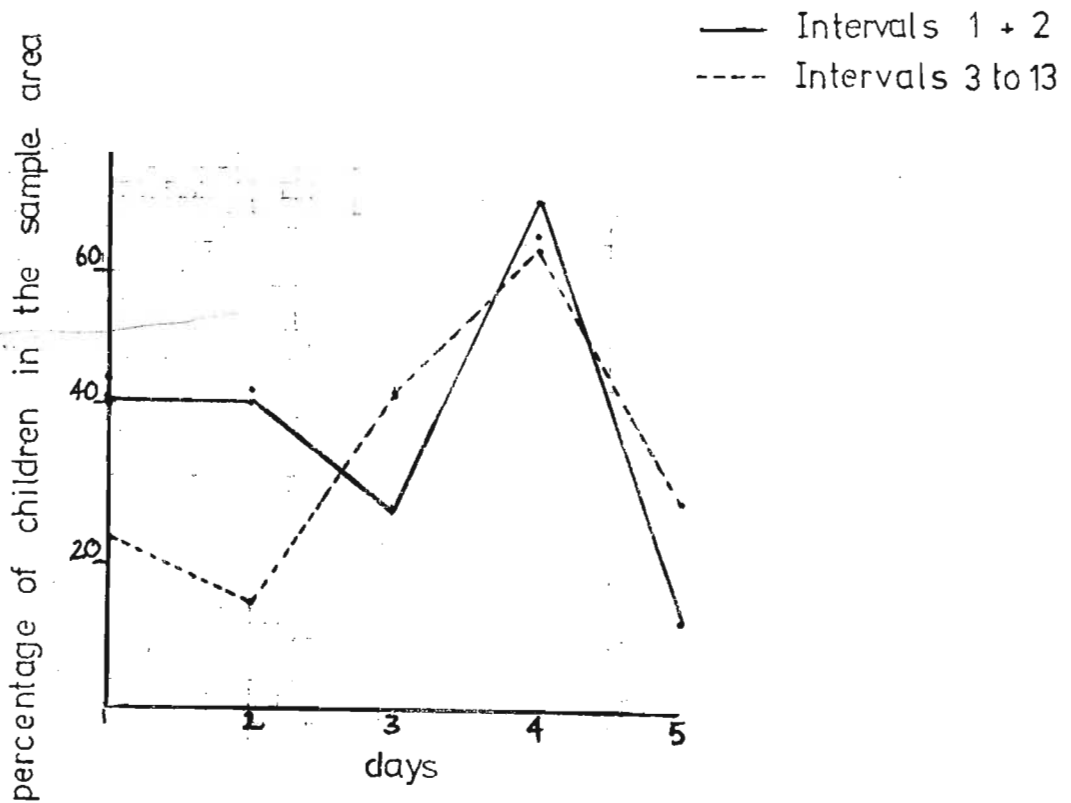
Notes:

- (a) There is no information regarding these intervals (see Graph 16).
- (b) There were no subjects present in this interval.

GRAPH 25 : PASSIVE TOUCH Y (expressed as a percentage of children in the sample area).

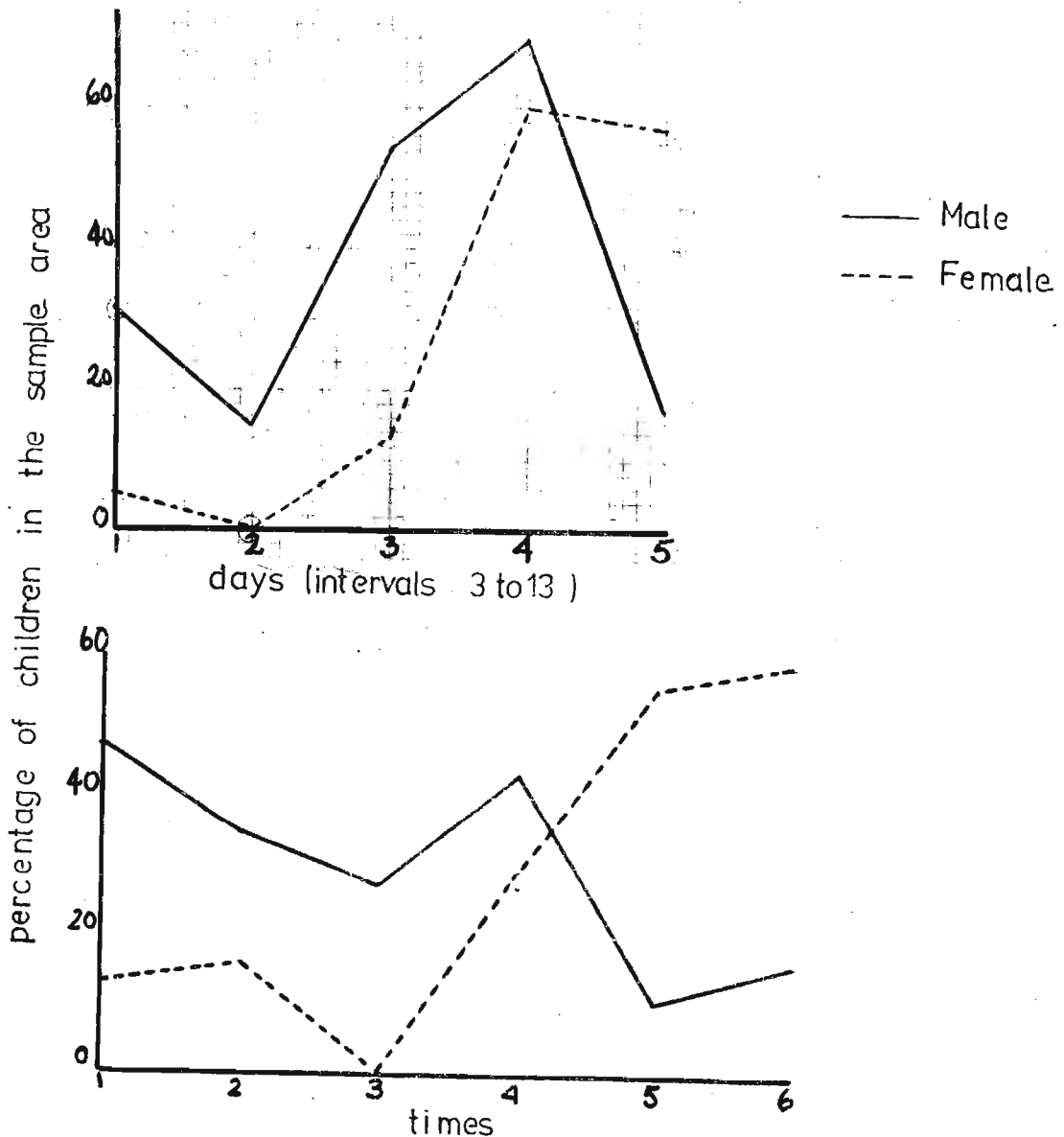
B : LINE GRAPH.

Of the children in the sample area, most were showing the Passive Touch pattern on the fourth day. In contrast to Graph 23, the high frequencies are concentrated towards the end of the recording period.



GRAPH 26 : PASSIVE TOUCH Y - MALE/FEMALE
COMPARISON.

The graphs show that the high points for males and females are different. The males in the sample are show consistently more Passive Touching on Days 1 to 4, but the females show far more on Day 5. The males show more of the pattern on Times 1 to 4 and less on Times 5 and 6.



Note (a) There were insufficient females present in the sample area during the first 2 intervals for any meaningful ratio to be stated in these intervals.

GRAPH 27 : TOUCH LEVER X. (expressed as a percentage of children at school).

A : GRADED TONE GRAPH.

	Day 1	Day 2	Day 3	Day 4	Day 5
Interval 1	17	11	9	9	6
" 2	14	11	6	6	6
" 3	11	6	6	6	8
" 4	6	11	9	6	11
" 5	8	6	12	6	0
" 6	2	6	6	3	0
" 7	11	6	6	6	0
" 8	6	8	6	6	3
" 9	6	6	6	6	0
" 10	8	6	6	3	0
" 11	14	6	0	6	8
" 12	6	6	6	3	6
" 13	3	6	6	6	2

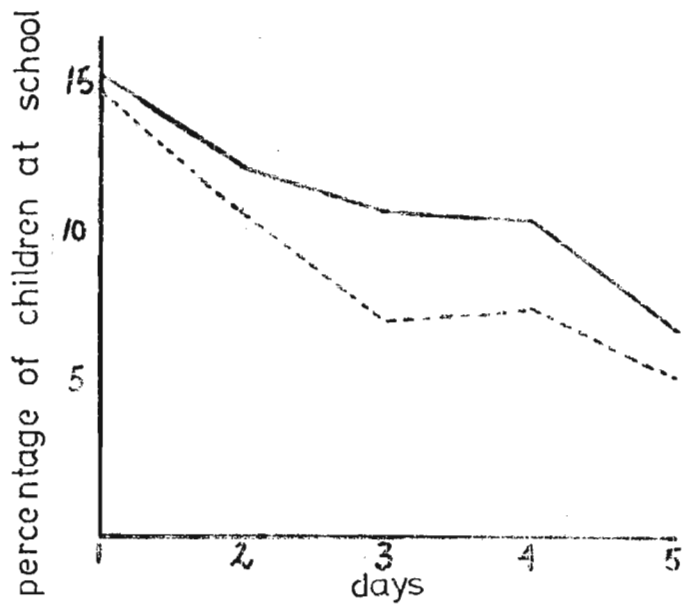
Notes:

- (a) There is no information regarding these intervals (see Graph 16).
- (b) There were no subjects present in this interval.

GRAPH 27 : TOUCH LEVER X (expressed as a percentage of children at school.)

B : LINE GRAPH.

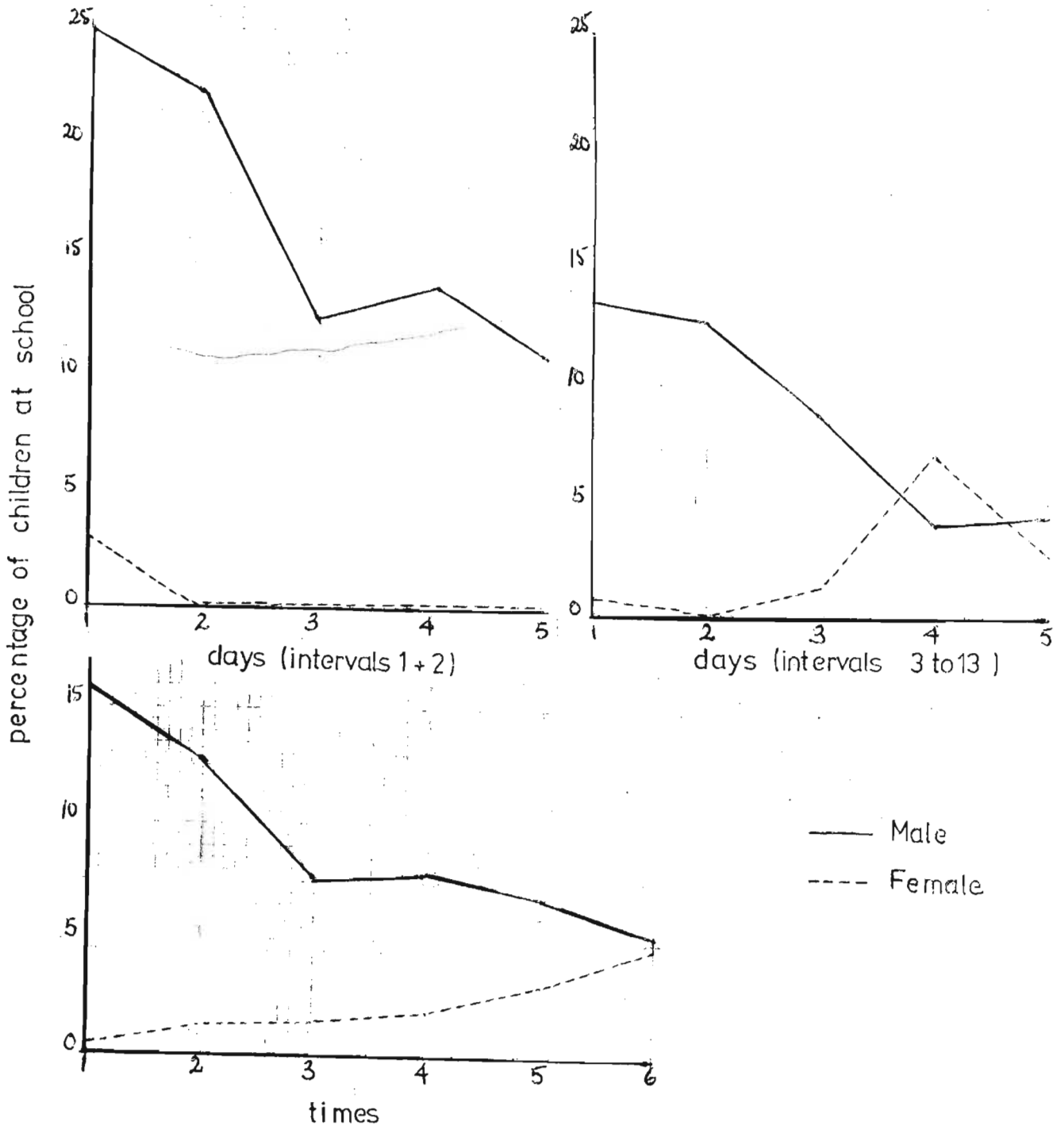
The graphs for this pattern follow very much the same form as the Passive Touch graphs. This graph shows a decline over days and times. There is a significant difference between Day 1 and Day 5 ($p < .01$), and intervals 1 and 2 and 3-13 ($p < .01$).



— Intervals 1 + 2
---- Intervals 3 to 13

GRAPH 28 : TOUCH LEVER X - MALE/FEMALE
COMPARISON.

There were many more incidents of males touching the lever or manipulating it. The difference in overall totals between males and females was statistically significant ($p < .001$). Once again there is a similarity to the corresponding Passive Touch graph (Number 24) in that rises in the female graph seem to correspond with falls in the male graph.



GRAPH 29 : TOUCH LEVER (expressed as a percentage
of children in the Sample Area)

A : GRADED TONE GRAPH

	Day 1	Day 2	Day 3	Day 4	Day 5
Interval 1	32	29	17	43	20
" 2	31	33	14	67	33
" 3	36	67	20	100	33
" 4	18	29	30	40	31
" 5	30	50	30	50	0
" 6	a	13	50	50	0
" 7	30	20	40	40	0
" 8	40	30	25	67	50
" 9	18	33	100	50	0
" 10	30	50	b	100	0
" 11	63	50	0	100	50
" 12	33	40	100	33	33
" 13	13	100	29	100	a

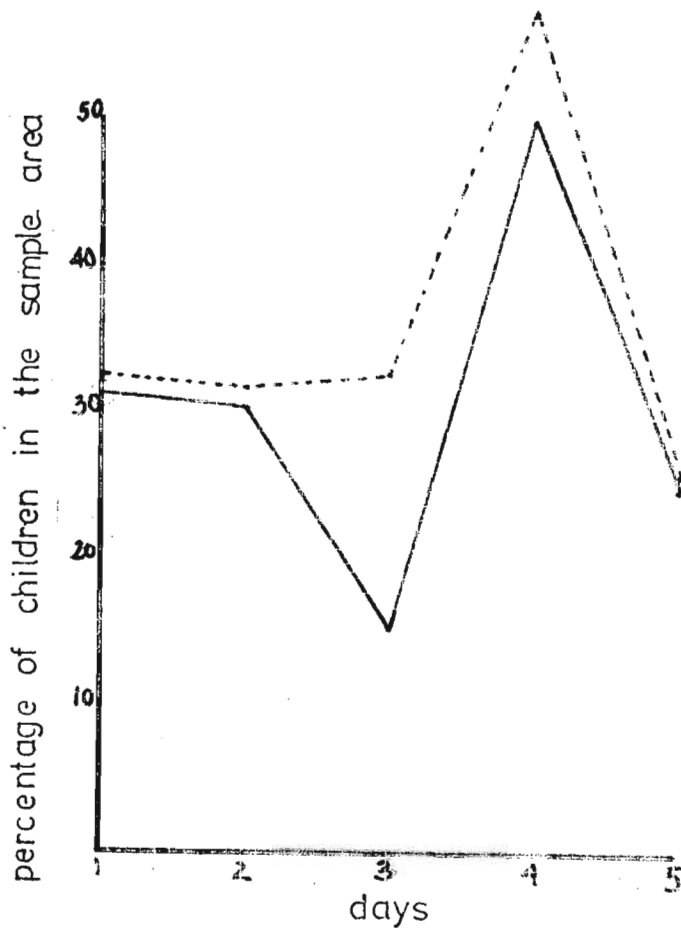
Notes:

- (a) There is no information regarding these intervals
(see Graph 16).
- (b) There were no subjects present in this interval.

GRAPH 29 : TOUCH LEVER (expressed as a percentage of children in the Sample Area).

B : LINE GRAPH.

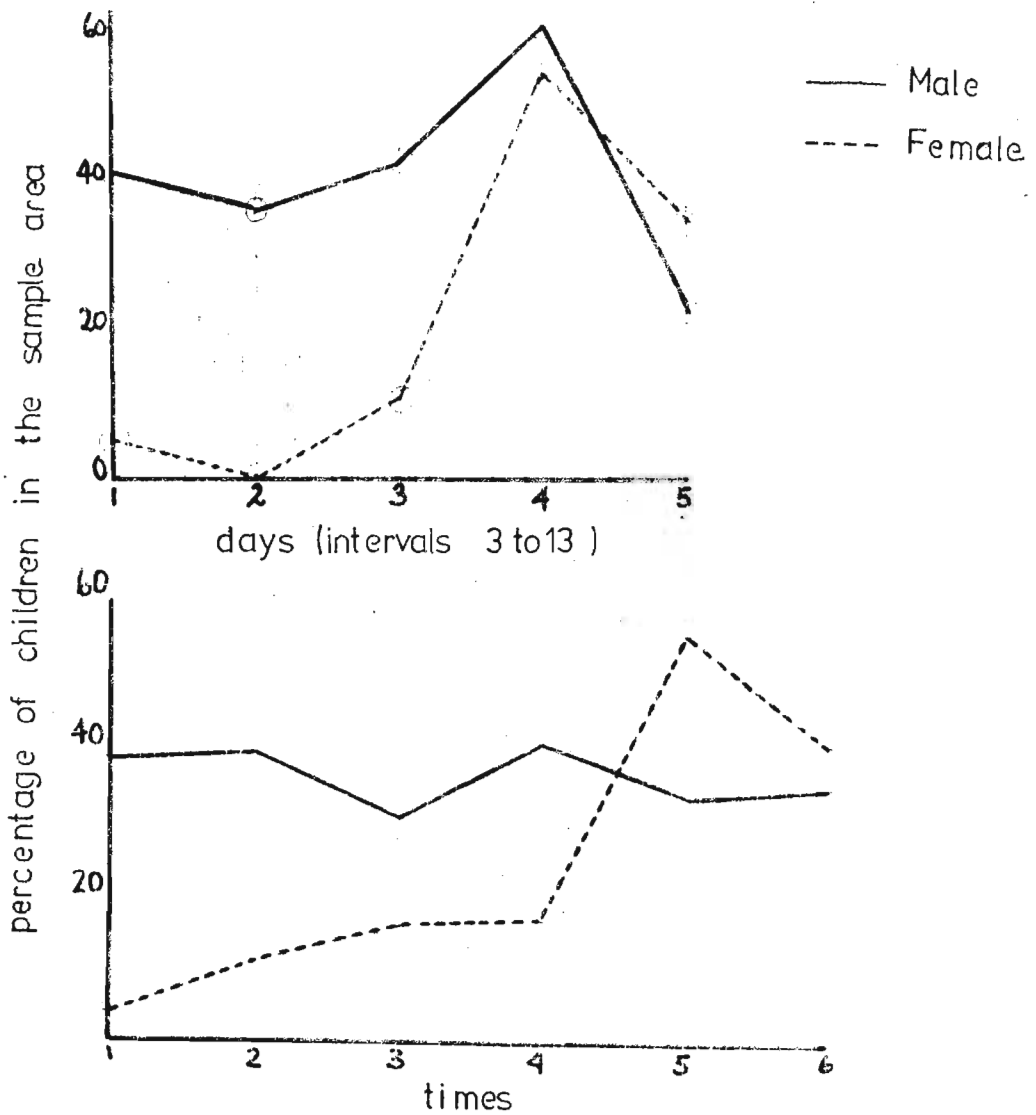
The graph reaches its highest density on Days 3 and 4 (compare Graph 25).



— Intervals 1 + 2
---- Intervals 3 to 13

GRAPH 30 : TOUCH LEVER Y - MALE/FEMALE
COMPARISON.

There is the same crossing over phenomenon that one finds in the Passive Touch graph (Graph 26). Males do more Lever Touching except on Day 5 and Times 5 and 6.



Note (2) There were insufficient females present in the sample area for the first 2 intervals for any meaningful ratio to be stated.

GRAPH 31 : FIGHT (expressed as a percentage of children in the sample area).

A : GRADED TONE GRAPH.

	Day 1	Day 2	Day 3	Day 4	Day 5
Interval 1	0	7	6	0	10
" 2	25	25	29	0	0
" 3	36	0	10	0	0
" 4	27	21	10	40	0
" 5	0	0	20	0	0
" 6	2	69	0	0	0
" 7	40	30	0	0	0
" 8	0	40	0	0	0
" 9	0	17	0	0	33
" 10	0	0	6	0	0
" 11	13	0	0	0	0
" 12	0	0	0	0	0
" 13	0	0	0	0	2

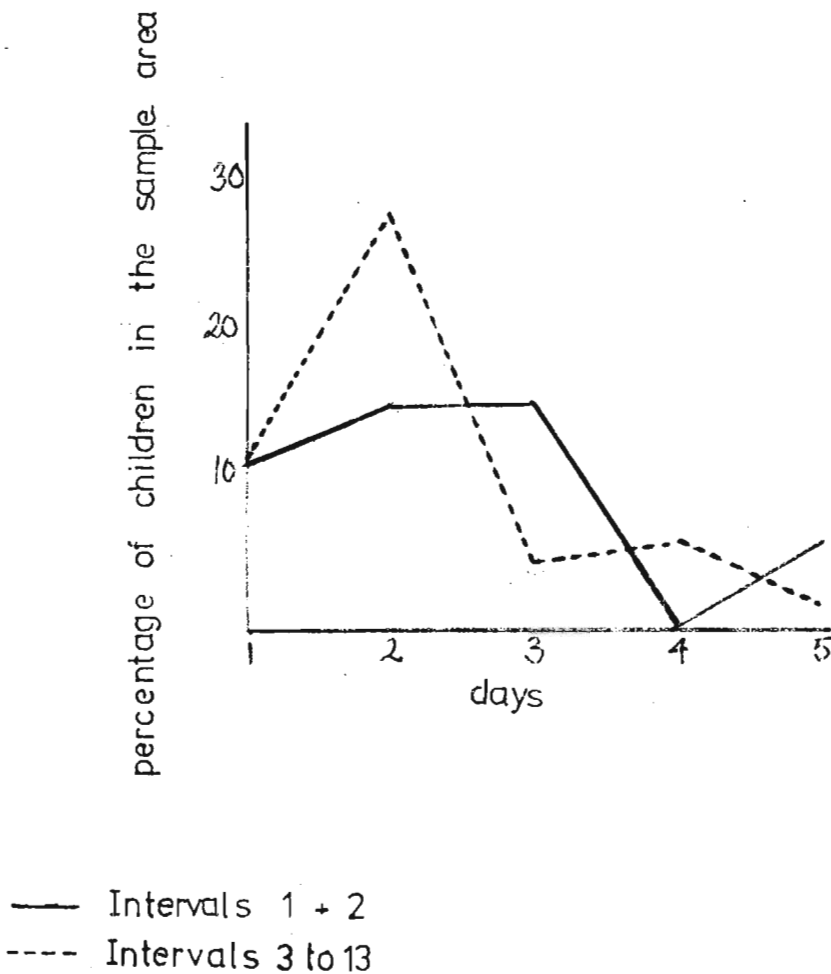
Notes:

- (a) There is no information regarding these intervals.
(see Graph 16).
- (b) There were no subjects present in this interval.

GRAPH 31 : FIGHT (expressed as a percentage of children in the sample area).

B: LINE GRAPH.

The Fight pattern was exclusively recorded in males (52 incidents) in this school and for this reason no separate graph showing a male/female comparison will be presented here. As a note of caution however, there were a few instances of Fight behaviour occurring in girls in other schools and in this school outside the sample periods so the pattern is by no means exclusively male. The highest density shown on the graph was on Day 2 and in Intervals 2 to 7.



GRAPH 32 : ENERGETIC LOCOMOTION (expressed as a percentage of children in the sample area).

A : GRADED TONE GRAPH.

	Day 1	Day 2	Day 3	Day 4	Day 5
Interval 1	11	14	6	29	30
" 2	13	8	7	33	50
" 3	9	0	0	0	44
" 4	27	21	10	0	46
" 5	10	25	20	75	100
" 6	a	38	0	100	0
" 7	0	20	40	40	33
" 8	0	0	25	33	50
" 9	36	33	0	50	33
" 10	10	0	b	0	67
" 11	75	0	11	0	17
" 12	17	20	0	100	0
" 13	13	0	43	0	a

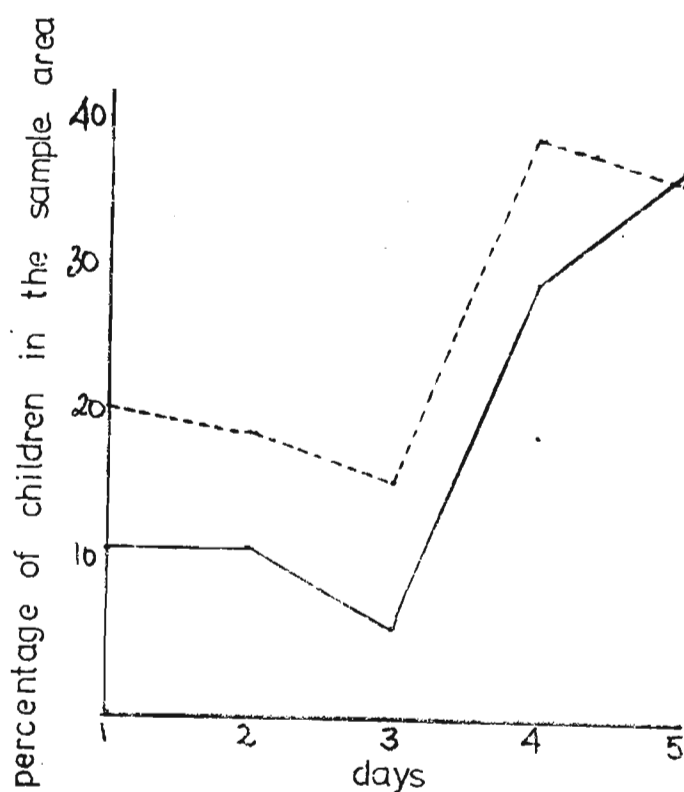
Notes:

- (a) There is no information regarding these intervals (see Graph 16).
- (b) There were no subjects present in this interval.

GRAPH 32 : ENERGETIC LOCOMOTION (expressed as a percentage of children in the sample area).

B : LINE GRAPH.

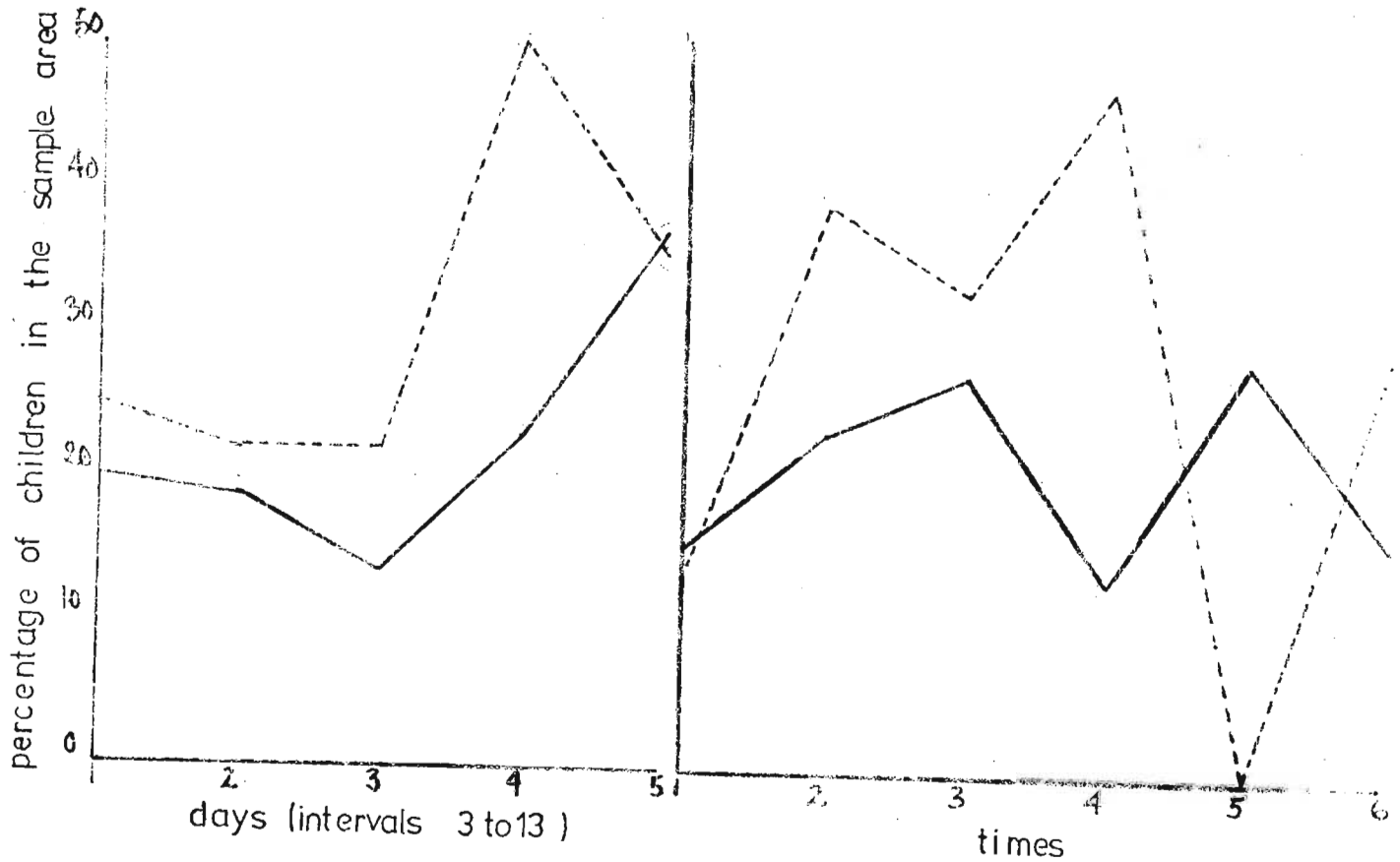
This pattern is the converse of the Immobility graph (Number 17), the highest density being on Days 4 and 5 and Intervals 3 - 13. There was a statistically significant difference between Day 1 and Day 5 ($p < .01$) and between Intervals 1 and 2 and 3 - 13 ($p < .05$).



— Intervals 1 + 2
---- Intervals 3 to 13

GRAPH 33 : ENERGETIC LOCOMOTION - MALE/FEMALE
COMPARISON.

The females showed a higher frequency of Energetic Locomotion on the first days but the graph is variable. Males show a consistent ascending trend over days but not much trend over times.



Note (a) There were insufficient females present in the sample area for the first 2 intervals for any meaningful ratio to be stated.

DISCUSSION

1. The Process of Exploration:

An individual encountering a novel object needs to know whether it is harmful or useful.

If he is alone he tries to reconcile two strategies: approach and avoid. Both have survival value in different circumstances so he must compromise; he will probably approach with caution. Once he has eliminated the possibility of danger he relaxes and diversifies his activities. This is the situation studied by Corinne Hutt (1970).

As soon as other individuals are present the situation is more complex. The individual does not need to risk exploring personally; he can monitor the exploration of others from a safe distance. The individual who first approaches and touches the novel object has the supporting presence of the others. Once the possibility of danger has been eliminated there is a problem regarding the benefits that might accrue from the object. There are now several claims to it and competitors become an issue.

1.1 Classificatory Hypotheses.

In order to classify the large amount of data certain hypotheses were generated.

A species frequently needs to seek out new resources when its own are depleted through population increase
or / ...

or changing environmental conditions. There will therefore be mechanism :

1. To determine whether the object is dangerous;
2. To deal with competition;
3. To determine whether the object is useful.

In order to describe the exploration process with clarity these three aspects will be dealt with separately although they occurred concurrently, progressed at different rates in different individuals and are functionally interdependent.

1.2 Wariness:

When a child encounters a novel object he needs information about it to make a decision to approach or avoid. The most obvious procedure would be to approach to a monitoring distance, then remain immobile while he visually explored the object, all the while maintaining a readiness to flee. The visual exploration corresponds to the use of distance receptors such as smell in other species. In the absence of any contra-indications he would then approach the object and finally touch it, still remaining alert and watchful. As time passed and no unpleasant incidents occurred, he would relax.

A number of measurements taken support this view.

One would expect frequencies of patterns associated with / ...

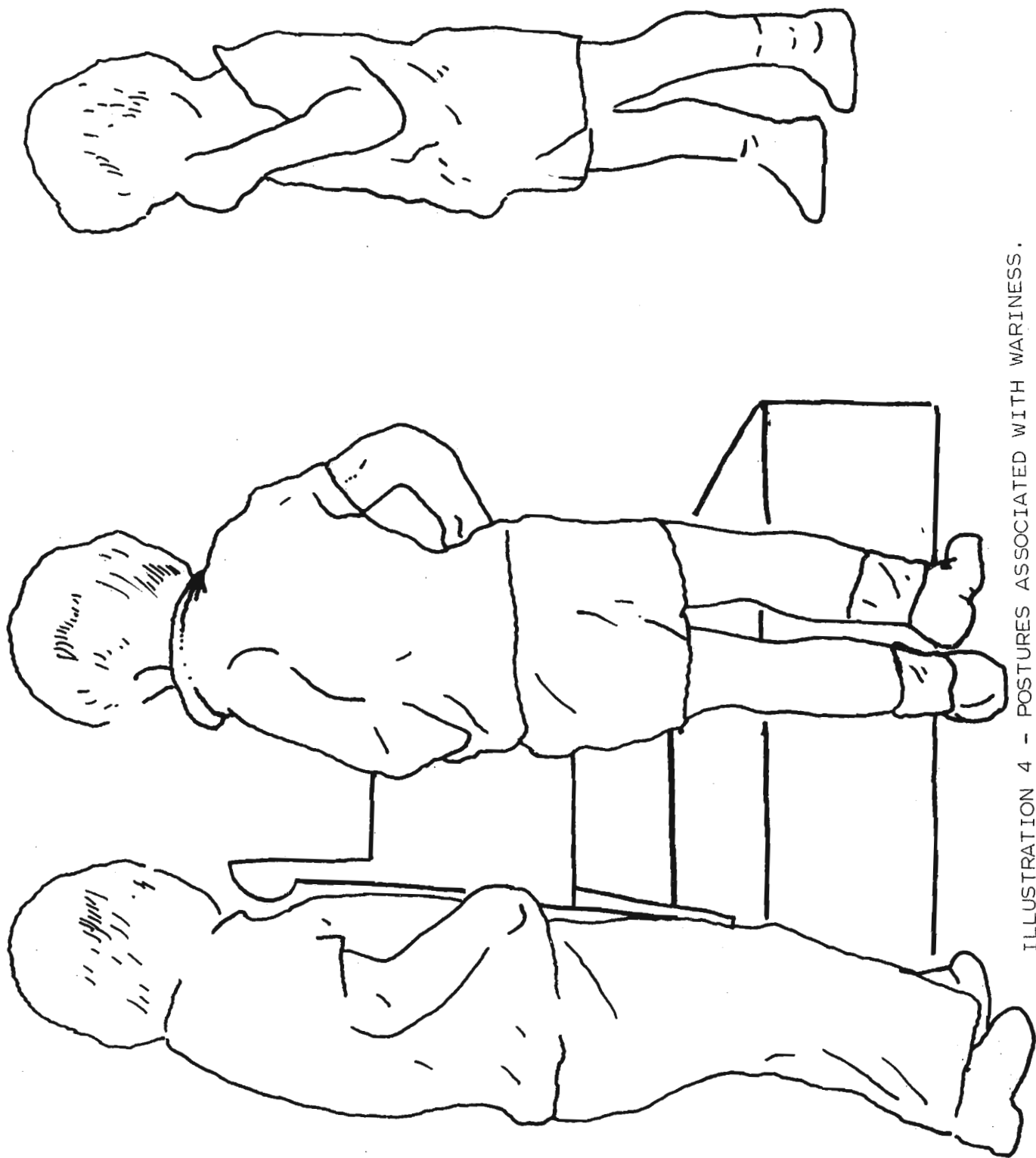


ILLUSTRATION 4 - POSTURES ASSOCIATED WITH WARINESS.

with a cautious approach to show an initial high point which drops down rapidly because the novel object in this study is simple and easily seen to be harmless.

There are however several incidents of fighting on and around the object and caution could extend to this as well as the novel aspects of the object. In fact fighting reached a peak on Day 2. The expected graph would therefore maintain its high point through to Day 3 to cover these incidents.

Looking then at the patterns which according to the literature imply wariness, or are consistent with a wary approach, these are :

(a) The number of Children in the Sample Area:

Presence in the sample area implies among other things that the child is in a position to monitor the object. Because presence could also imply interest in or competition for the object, one would expect a slow decline rather than a rapid one, as is indicated in Graph 15.

(b) Immobility:

Graph 17 conforms to the expectations of a pattern which could be a reaction to fighting as well as a cautious approach to a novel object;

(c) Look Only:

This measure refers to children who are
three / ..

three paces or less from the object. The frequency declines rapidly after the first 5 minutes. The pattern declines in importance after the second day (see Graph 1Q).

(d) Chin In:

Chin In and Incomplete Actions suggest underlying tension during the initial periods of immobility. This is reminiscent of Berlyne's (1960) description of an orienting response. Chin In is a position which facilitates visual monitoring of a situation (McGrew, 1972 P. 54) and Graph 19B shows that the frequency declines rapidly in the first 5 minutes of the day. There is an interesting difference between Intervals 1 and 2 and Intervals 3 - 13, the former having its high point on Day 1 and the latter on Day 2, whereas on Days 4 and 5 they vary together. It is possible that during Intervals 1 and 2 the emphasis is on a response to novelty and Intervals 3 - 13 emphasize the response to competition.

(e) Incomplete Actions:

The above impression concerning the different kinds of response at different times is reinforced here because the graphs for Chin In and Incomplete Actions are remarkably similar in this respect. Graph 21 shows that the frequencies for Intervals 1 and 2

dropped / ...

dropped after Day 3 while the frequencies for Intervals 3 - 13 were low initially, rising to a peak on Day 3 and then dropping. Generally the pattern seems more persistent than Chin In and is made up largely of the pattern Automanipulate as described by McGrew (see Appendix V). He remarks that it occurs mainly in situations of social stress. Arms Akimbo as consistently performed by one member of the sample functions more as Fumbling than as the somewhat aggressive pattern described by McGrew (1972). Other patterns grouped under the general heading of Incomplete Actions seem to function as rudimentary defensive patterns or cut-off postures except for Reach and Repel. These seemed to denote a hesitant approach to the object or the competition over it.

(f) Simultaneous Look-and-Touch:

Once contact is made, it would be prudent for the investigator to concentrate receptor contact on the object till all uncertainty is dissipated. Although this pattern is more properly seen as an information-gathering pattern, it is also consistent with wariness and Graph 6 shows the same trends as other cautious patterns.

(g) Passive Touch:

It would also be prudent for the investigator simply to touch the object before attempting

any / ...

any more active or creative use of it while still uncertain of its properties. This pattern appears to be primarily a competitive pattern but the form of Graph is consistent with caution as well.

1.3 Competition.

In dealing with competition, the child has first to get himself into a favourable position, then to repel or be repelled, and ultimately to take possession of the object. It is assumed that in School A the most favourable position for investigating and enjoying the novel object was considered to be sitting astride it, manipulating the lever. The pattern was set early on the first day by D who repelled all other comers and finally was left alone. He sat astride the object, manipulating the lever for some time before he finally left it, only returning once briefly at the beginning of the second day when he sat astride it again. Thereafter he did not appear to take any further notice of it. The second child to take up this position then held it in spite of entreaties for the remainder of that session and most of the following by sheer persistence and watchfulness. Thereafter there was a period when a number of children took up the position for a short while and finally by the last day there were long periods of total lack of interaction with the object.

This / ...

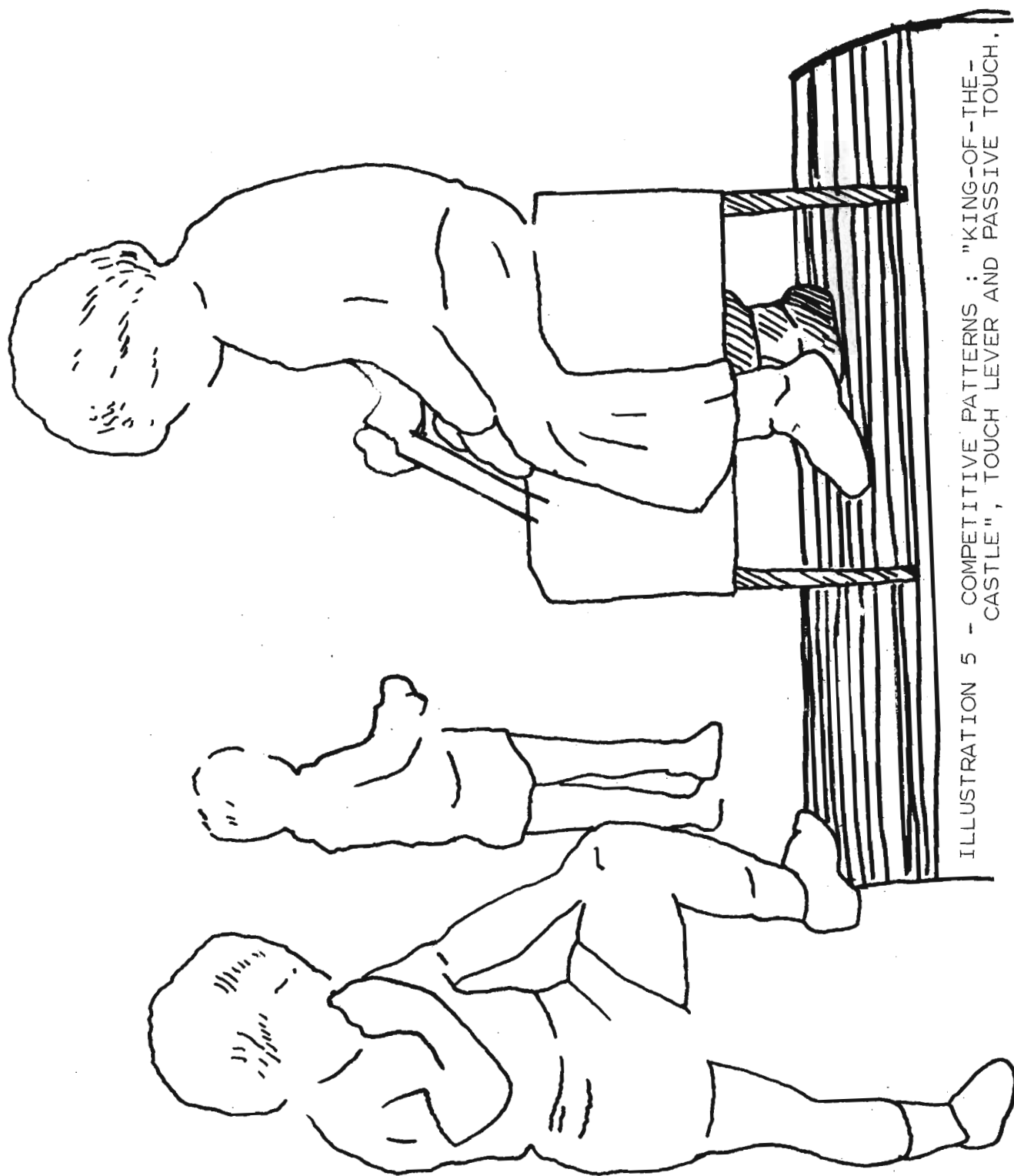


ILLUSTRATION 5 - COMPETITIVE PATTERNS : "KING-OF-THE-CASTLE", TOUCH LEVER AND PASSIVE TOUCH.

This is reminiscent in form of the King-of-the-Castle games mentioned by Aldis (1975) that occur in many species although initially it seemed more serious in intent and the role-reversal mentioned by him was not evident. There is also evidence to suggest that in the case of the second "King", the position was maintained long after his interest in the object had dissipated and only as long as other children were actively petitioning him for the position.

The following patterns were thought to have relevance to the competitive phase of interaction with the novel object :

(a) Frequency of all Interactions with the Object:

Because it was impossible for all eighteen children to conduct a close investigation of the object at the same time, it is expected that competition will develop at the time when most children are showing an interest in the object, and after the initial caution. This Graph would appear to indicate Day 2 and Time 2. (Graph 1)

(b) Passive Touch: (Graphs 23 and 25)

It was noticed that in the early stages of encounter with the novel object a number of children appeared to be touching the object simply for the sake of being in contact with it. They had a hand or foot on the platform

of / ...

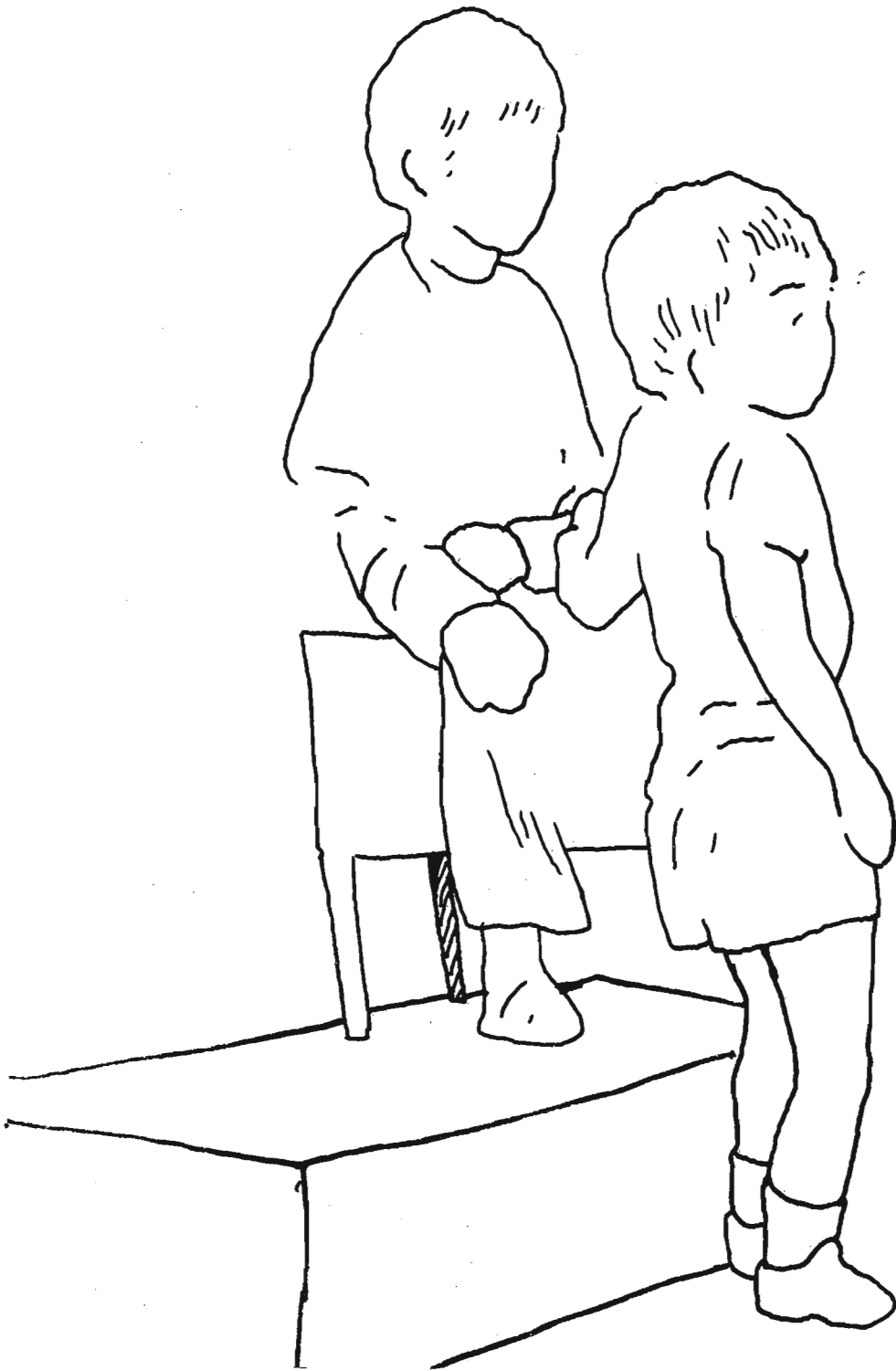


ILLUSTRATION 6 : COMPETITIVE PATTERNS MAINTAINED
AFTER INTEREST HAS WANED.

of the box or they stood on the edge of the box and appeared at some pains not to sever contact. For instance when one child was pushed backwards off the platform, he managed to break his fall and resume his position on the box without lifting his foot from the platform, in spite of the fact that this required some awkward manoeuvres. Because of the negative nature of the definition this pattern has proved difficult to classify. It may be a mild but persistent form of taking possession and has the effect of excluding others from close contact with the object. If this is so, the peak in the Graph after the peak in the more violently competitive fight pattern is understandable. As mentioned in the results, Passive Touch and Touch Lever have striking similarities in form. Where the base is the number of children at school, the highest points are the beginnings of the week and the beginnings of days. Intervals 3 - 13 reach a peak later in the week on Day 3 which corresponds with the proposed competitive times. Where the base is the number of children in the sample area, the peak is on Day 4 showing probably that individuals felt free to touch the
object / ...

object with impunity. Where there had been constraints firstly and briefly from fear and secondly from competition, they were gone by Day 4.

(c) Touch Lever:

Graphs 28 and 30 have the same form as the Passive Touch pattern and the theory that the wary and competitive phases have ended by Day 4 is supported.

(d) Fight:

The fight pattern can be seen as an extreme form of the competitive display and Graph 31 indicates that the peak over days is Day 2 (for Intervals 3 - 13) and over times is Intervals 2 - 7. (See Illustration 3).

1.4 Determining whether the Object is Useful :
Receptor Contact.

The main issue remains: that of the information to be gained. The general hypothesis from the Literature Review is that exploratory behaviour varies as a function of subjective uncertainty. Hutt (1970) and Aldis (1975) have seen this variation as a dichotomy. Investigatory behaviour when subjective uncertainty is high and Play when it is low. Aldis (1975) maintains that one of the distinguishing features of investigation is that most responses are related to receptor contact. Hutt (1970) specifies that it is synchrony of
receptor / ...

receptor contact that distinguishes it from play. Phase 1 of the Analysis in this study was concerned with receptor contact and these trends emerged :

(a) All Interactions Graph 1:

This showed a slight increase on Day 2 followed by a steep decline to Day 5. Within days there was a steep drop between the first and second 5 minute intervals, levelling somewhat thereafter to a low point between 15 and 20 minutes and rising slightly again. This last rise appeared to be the result of a general shifting in activity after 20 minutes. The inference is quite simply that there is a general trend for receptor contact to decrease.

(b) Comparison of Looking and Touching Graph 12:

Visual attention appears to be highest on Day 1 and complete by Day 4 whereas the amount of touching is greatest on Day 2 and is still decreasing between Day 4 and Day 5. This is what one would expect considering that looking requires less effort and places one in less danger than touching and its possibilities are probably exhausted sooner. This is also in accordance with the reports on different species in the

Literature / ...

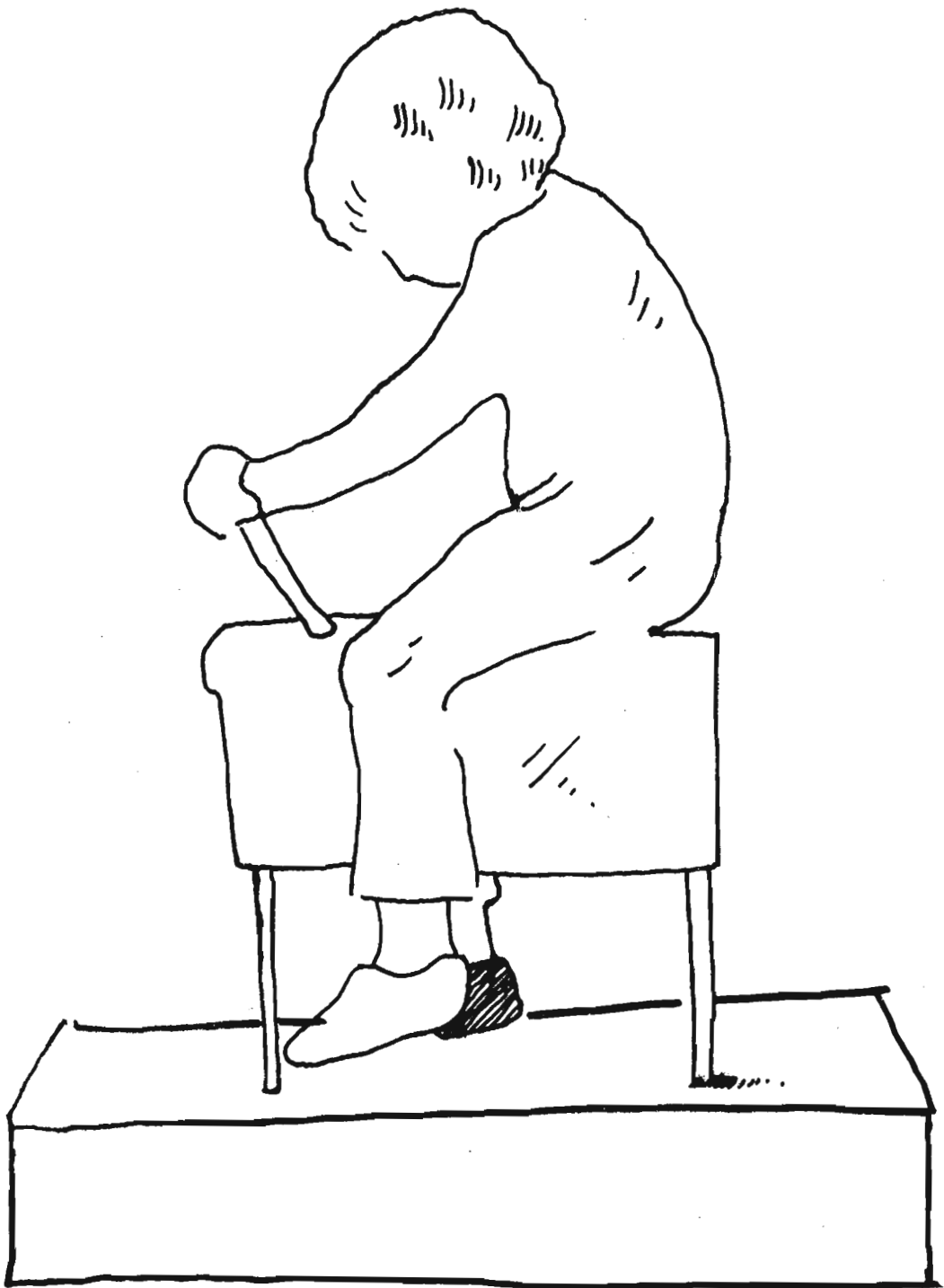


ILLUSTRATION 7 - SYNCHRONY OF LOOK AND TOUCH.

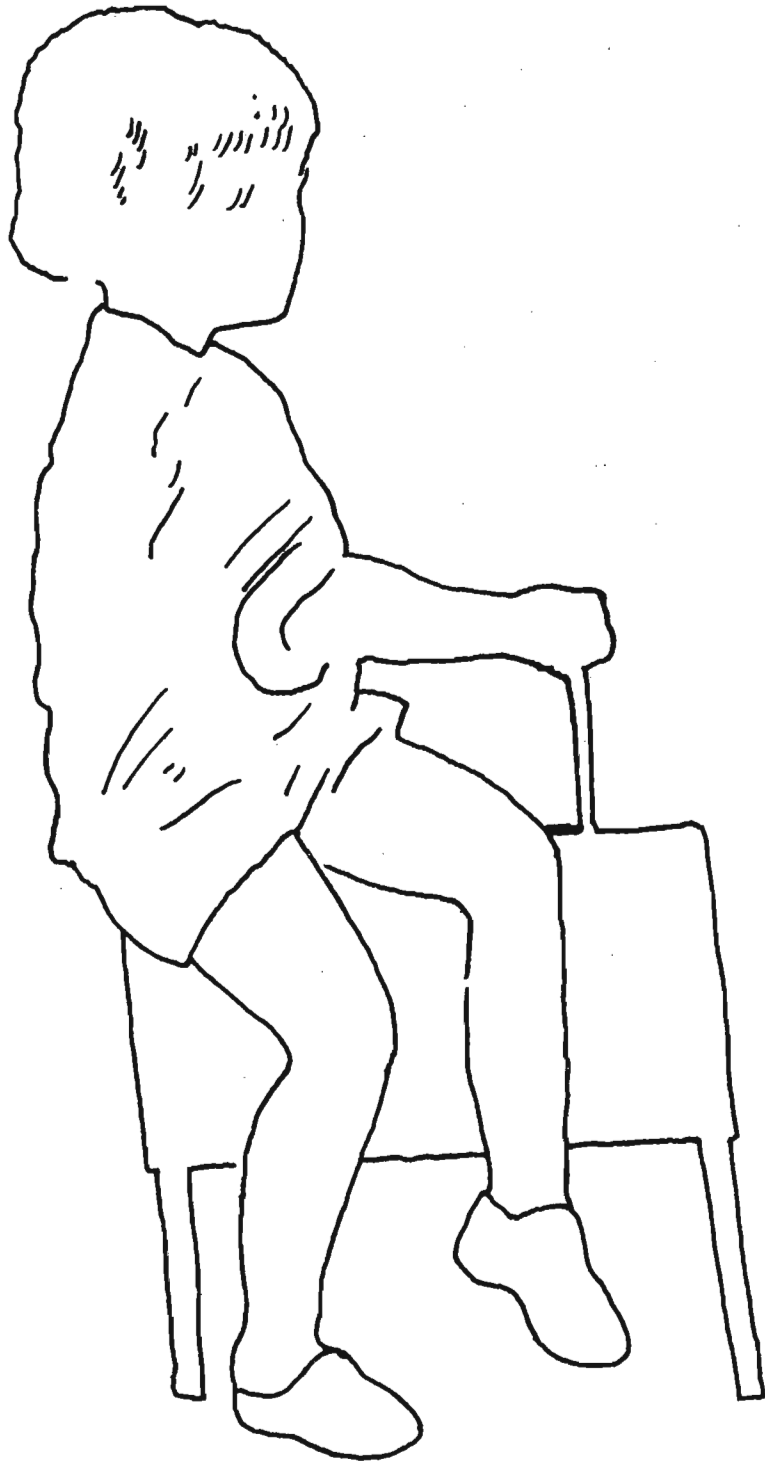


ILLUSTRATION 8 - DESYNCHRONY OF LOOK AND TOUCH.

Literature Review where distance receptors are used first. The trend within days on this graph is very similar to that over days except that the rise in the last 2 times is more pronounced in the case of looking.

(c) Simultaneous Look-and-Touch Graph. 6:

The graph shows that this pattern drops steeply from Day 1 to Day 4 and remains level to Day 5. Moreover the graph shows that on the first two days this synchrony accounts for the major part of the receptor contact with the object. By the last two days it is exceeded by "Touch Only" which corresponds with Hutt's (1970) suggestion of synchrony followed by desynchrony.

(d) The role of auditory receptors in investigation

could not be measured but it was noticed that one child who made very little visual and tactile contact with the object initially did however spend a great deal of time in the vicinity of the object and was thought to be listening to the chatter of the children around it. Auditory monitoring probably is used in much the same way as a glance from a distance as a means of gaining information without having to enter a

competitive / ...

competitive situation. It is difficult to see how these two types of receptor contact could be measured since they are probably purposely surreptitious.

1.5 Determining whether an Object is useful :
Intensity of Response:

Berlyne's (1960) description of the orienting response shows how pervasive it is and how it combines immobility with increased muscle tone. Aldis (1975) claims that "most play is vigorous with an underlying relaxed muscle tone whereas in exploration caution reduces the intensity of the responses, and vigour is not a useful attribute in effector contact responses".

In this study three measurements were taken of patterns consistent with restrained activity and underlying tension :

- (a) Immobility: as mentioned previously this restrained activity may be partly a fear reaction to novelty and competition. It may however also be partly a function concentrating attention on the objects and is higher on the first 3 days than the last 2 and in the first 5 minutes;
- (b) Incomplete Actions: This includes patterns such as Digit Suck, Eye Cover and Automanipulate which usually occur in situations of stress. The graph shows the same form as the immobility graph. The high incidence of / ...

of this pattern suggests that quite a considerable tension underlies the lack of real action;

- (c) Chin In: It was noticed that in the initial minutes of confrontation with the novel object, a number of children adopted a "slope" posture (see Appendix V) leaning slightly backwards from the hips. Usually the child was immobile with his neck flexed and the chin moved towards the chest and this was often accompanied by "digit suck". Because of the difficulty of obtaining a reliable count of this fractional movement of the upper trunk and neck, it was decided to count any movement of the chin toward the chest of over two seconds in duration, even though this was somewhat over-inclusive. In a number of instances it was obvious that the Chin In score was a reflection of the child's gaze-direction down to the object. It was however a pattern essentially combined with immobility or small arm movements. Chin In (Graph 19B) shows early high points and levels out on Days 4 and 5, and Times 4, 5 and 6.

1.6 Play:

This account has attempted to demonstrate that the major features of the initial confrontation were :

(a) / ...

- (a) A concentration on receptor contact and in particular synchrony of receptors;
- (b) Restraint of activity with underlying tension, in other words, an orienting response;

Play or diversive activity is by definition more difficult to count. Loizos (1966) and Millar (1968) discuss the many-faceted forms and functions of play. In an effort to demonstrate increasing vigour the Energetic Locomotion category was used. This is a frequency count of any locomotion from A to B in the vicinity of the object that expended more energy than simply walking there. For example a dramatic fall off the platform of the object in the manner of a cowboy being shot was counted as an instance of non-walk locomotion. It is interesting to note that on Graph 32 the exact converse occurs of the Immobility, Incomplete Actions and Chin In graphs. Days 4 and 5 show a considerably higher frequency than other days and the incidence was lower all through in Intervals 1 and 2. There was a sharp rise between 5 and 10 minutes.

2. Roles / ...

2. Roles in Exploration.



2.1 The Sex-Role Hypothesis:

In the situation of a group confronted by a novel object the immediate task of the group is to gain information about that object and to communicate

the / ...

the information to all group members as efficiently as possible. There is opportunity for division of labour here and the way in which this is handled seems to fall naturally into two roles - the manipulative and active exploratory role and the looking, verbal and communicative role. The hypotheses arising out of the careful observation and measurement of sex differences can be stated as follows :

- (i) Where a group of boys and girls is confronted with a novel object, the behaviour of the children can be described in terms of sex-roles;
- (ii) The boys tend to take on an active, exploratory role and the girls tend to take on a looking, questioning and discussing role.

2.2 Summary of the Receptor Contact Patterns shown by Boys and Girls:

The main points that emerge are :

- (a) That close range receptor-contact is much higher in males than in females; (Graph 2);
- (b) That females show very little variation over time in all receptor contact patterns compared with strong trends over time in males; (Graphs 9, 10 and 11);
- (c) That the sequence in dominating patterns is
different / ...

- different. The section on wariness implies that the wariness to relaxation sequence in dominating receptor contact is from distance receptors (Look Only) to synchronous receptors (Simultaneous Look-and-Touch) to desynchrony (Touch Only). Males move through this sequence much faster than females; (Graphs 7, 8, 13, 14);
- (d) That at the end of the recording period when the object is no longer very new to the children, there is very little difference between male and female receptor contact behaviour towards it, both in frequency levels and in dominating patterns. (Graphs 7 and 8).

2.3 Summary of the Differences in Recurring Behaviour Patterns shown by Boys and Girls:

Discussing this in terms of the main categories of behaviour suggested in the section on the process of exploration, the main points are :

- (a) Wariness: Girls are generally high on Immobility and Incomplete Actions and are not even present in the sample area as often during the first two intervals and the first three days; (Graphs 16, 18 and 22);
- (b) Competition: The girls generally show very little change over time in the total frequency of competitive patterns such as Passive Touch and Touch Lever (Graphs 24 and 28) except a slight / ...

slight rise as the graph for the male frequency comes down. No fight patterns at all were recorded in girls. Of those children in the Sample Area, however, the boys have a higher frequency of the "touching" pattern, with quite a dramatic cross-over on the fifth day and Times 5 and 6 (see Graphs 26 and 30). This implies that although the girls generally do not take part in the early competition for possession, they are not averse to taking over the prized positions when the boys have gone.

(c) Specific and Divergent Exploration:

The girls are not present in the Sample Area as often as the boys and their behaviour does not show much variation over time in this respect. The boys are much more involved with the touching and manipulation implied in Passive Touch and Touch Lever initially (Graphs 24 and 28). This implies that most of the specific exploration was done by the boys. The girls showed a higher frequency of Energetic Locomotion on the first 4 days (Graph 33) and this implies that they were already indulging in quite a lot of play behaviour. Energetic Locomotion is associated more with divergent than specific exploration and it is possible that the girls did not see specific exploration as part of their role. On all these patterns the graphs for males and females converged at the end of the recording session suggesting that the novel
object /

object had ceased to have a differential effect on the behaviour of the children.

2.4 The Active Explorer-Manipulator Role:

In any group exploration of a novel object there has to be someone who will take on the role of active explorer. Only a few individuals can be accommodated in the role and hence it may demand some highly competitive behaviour. The active explorer is more at risk than other group members so needs to be better equipped to deal with danger, but is more likely to gain any advantages that may accrue from the unknown object.

2.5 Reasons why Boys are more suited to the Active Explorer-Manipulator Role:

- (a) The Literature Review on sex differences shows that a number of writers consider boys to be more active, aggressive, bigger, stronger, interested in object play and skilled in mechanical abilities;
- (b) The measurements obtained on this study imply that boys generally approached the object more; responded more with regard to close range receptor-contact with the object; they were more manipulative and competitive than the girls and less cautious;
- (c) An evolutionary perspective on the dangers attached to the role suggest that in primate groups males and particularly young males are more expendable than females;

(d) / ...

- (d) An evolutionary perspective on the possible benefits in improved nutritional resources attached to novelty leads to reflection on the greater nutritional needs in men noted in the literature and the need for practising skills in childhood that will be useful later.

2.6 The Passive Explorer and Communicator Role:

There is a necessity within a group for evaluating the information gained from active exploration and for passing it on to all present group members and in the sense of a cultural heritage, to future members. Many individuals can be accommodated in this role so there is no need for competitive behaviour, but communicative skill is an advantage. It is also advantageous in a communicative role to survive long enough to communicate, in other words to be cautious.

2.7 The Reasons why Girls are particularly suited to the Communicator Role:

Although the arguments presented here apply particularly to girls, they also apply to those boys whose skills are evaluative rather than competitive because numbers need not be restricted and a variety of evaluations would be advantageous.

- (a) The evidence from the Literature Review is that girls are more cautious, linguistically competent and socially sensitive;

(b) / ...

- (b) The measurements on this study show that they approached the object less and were more cautious and less manipulative. They nevertheless learned from the experience of the active explorers because by Day 5 their behaviour with respect to the object was strikingly similar in all patterns.

Unfortunately the study lacked measurements on questioning and the use of distance receptors. The best evidence that can be offered is the impression that the teacher in the playground was usually accompanied by a few girls and together they talked and watched the proceedings on the object from the steps or benches;

- (c) There is evidence in the literature that girls are less vulnerable to stress and disease and that females generally live longer as befits the communicator role. They also have more opportunity to communicate information to future generations in their later maternal function, and are less expendable in group survival terms;
- (d) Their nutritional needs are smaller than males which means that they do not need increased food resources to the same extent as males, and there are also implications for greater individual survival.

3. The Generality of the Hypotheses:

The data from the present study can only give rise to a limited statement about generality. The hypotheses propounded in this discussion arose out of measurements on one school and impressions gained on two more about the process of exploration and the existence of sex-roles.

The behaviour observed in the fourth school was quite different in that the object was not visually examined or touched until the second day, and no competitive behaviour was seen on any of the five days. A re-examination of school conditions suggested that these children were not comparable to the others in a number of respects, the main being :

- (a) There was no age-group system in the school and very little free play so the children in the study were not necessarily very familiar to each other;
- (b) The Courtyard and play apparatus set out in it during the recording sessions seemed to be relatively unfamiliar to the children. It was not seen in use during the habituation period although assurances were made by the teachers that it was used frequently.

Only one age-group was used. It was mentioned in the Literature Review that the play of juveniles is commonly regarded as a testing ground for behaviour to be used later, it is felt that
exploratory / ...

exploratory behaviour occupies a large part of a juvenile's time, and sex-role play is spontaneous and frequent in pre-school children. For these reasons the hypotheses put forward are felt to be appropriate to the $3\frac{1}{2}$ to $4\frac{1}{2}$ year old age group and probably of relevance to later behaviour.

There appeared to be a variation between schools on the fight pattern. The amount of fighting over the novel object was thought to be a function of the availability of other attractions, the personalities of children in the group and the school policy towards aggressive behaviour. Other aspects of competitive behaviour were seen in three out of four schools.

The favoured use of the object differed from school to school and the pattern seemed to be laid down in the first few minutes of encounter with it.

In two schools sitting astride it and manipulating the lever seemed to be the popular choice and in one sitting on the platform with the elbows resting on the object, manipulating the lever was the most consistent position. In the fourth and atypical school, it was used as a structural addition to conglomerations of toys.

4. Interobserver Reliability.

The results of the interobserver reliability check showed that of the patterns checked only Incomplete Actions and Chin In presented problems. In the confusion between Incomplete Action and Fight patterns the action involved was a Beat Gesture which did not connect with, and had no observable effect on the person at which it was aimed. The ambiguity in the Incomplete Action definition would be remedied by making some reference to the lack of vigour implied, as for instance calling it "a minor movement of the arms and hands".

The difficulties with Chin In were not really surprising considering the difficulties in detecting such a small and indefinite movement from certain viewing angles.

CONCLUSIONS.

The conclusions are stated in terms of the aims of the study.

1. The fruitfulness of the ethological method:

The data have been examined in two main respects, the process of exploration and the observed sex differences, and interesting results obtained. The competitive aspect of exploration which has been largely ignored in the literature is a logical part of exploration when seen from an ethological viewpoint. The same information is sufficiently comprehensive to allow for other sets of measurements to be made, such as cross-cultural comparisons of specific patterns, or a focus on play or social behaviour. Another study is in progress using the methods developed on this study and particularly the Energetic Locomotion pattern as a means of comparing the behaviour of children suffering from Bilharziasis with a control group. The ethological method with its close physiological underpinning is thought to have use here where conventional testing has failed to show a difference.

The / ...

The interobserver reliability check showed that quite good concurrence is possible. The ambiguity in the Incomplete Actions definition and the inadequacy of the operational definition of Chin In were demonstrated by the check and show the importance of reliability checks in obtaining objective definitions. Training the observer to recognize patterns empirically has limited usefulness while research workers communicate mainly through the written or spoken word. The laboratory method of studying children's exploratory behaviour gives scores for individuals. In this study the emphasis of the discussion has been on the total behaviour of the group, and the behaviour of the subgroup of males and females. Computer tabulations have been obtained however, giving individual scores on different patterns on different days, but they have not yet been assessed. This means that using the ethological method generally and these video techniques in particular, it is possible to study individuals just as well as in the playroom/laboratory studies. There is also opportunity for comparison of the group and individual levels of analysis.

2. Some fixed action patterns are found in all children of a given age:

McGrew's (1972) list was used without any major difficulty particularly the Immobile, Chin In, Slope, Digit Suck and Automanipulate constellation of behaviours. These patterns were all seen with reasonable regularity in the novel object situation in groups of children with very different cultural backgrounds in Durban and who differed in culture and environment from the British children observed by McGrew (1972).

3. There is a general trend from specific to diversive exploration as defined by Berlyne (1960) and C. Hutt (1966) in children confronted with a novel object:

This account supports a dichotomy between play and exploratory behaviour in the general sense that the major part of activity on and around the object does seem to move from exploration to play.

However, it was found to be difficult to isolate and classify sequences of behaviour as exploratory or play on the basis of Hutt's (1970) criteria mentioned in the Literature Review. Hutt intended these criteria as operational definitions and in fact uses them as such, but it would appear that the judgments are very subjective. On the other hand for Weisler and McCall (1976) to say the "progress in understanding exploration/play has been impeded

by artificially separating them" (P.497) is an exaggeration. This distinction settled a good deal of early controversy and confusion regarding motivation and focussed attention on detailed observation and description. Perhaps exploration is best regarded as a set of constraints placed on the individual. It has been shown to be a high-priority activity (Aldis 1975). As the necessity to check a novel object for danger, for usefulness and to deal with the accompanying competition dissipates, the individual becomes freer to pursue other activities, and in the case of children, usually to play.

4. When a group is confronted with a novel object, individuals take on identifiable roles corresponding to age-sex classes:

From the observations made in this study, an attempt has been made to identify an active-explorer role for which boys are better suited and a passive explorer role for which girls are better suited. This is a crude preliminary attempt and it is hoped that more detailed and explicit measurements will be more illuminating in this respect.

APPENDIX I - LIST OF CHILDREN.

<u>CODE NAME:</u>	<u>SEX:</u>	<u>AGE:</u>
D	M	4 years 4 months
JAN	F	4 years 3 months
A	M	4 years 3 months
N	F	4 years 2 months
JON	M	4 years 2 months
MUN	M	4 years 2 months
B	F	4 years 1 month
K	M	4 years 1 month
MAR	M	4 years 0 months
IR	F	4 years 0 months
JUS	M	3 years 11 months
JOJO	F	3 years 10 months
KF	F	3 years 10 months
AY	M	3 years 9 months
MF	F	3 years 8 months
G	M	3 years 7 months
C	M	3 years 6 months
IE	F	3 years 5 months
JAC	F	3 years 4 months

APPENDIX II - EXTRACT FROM WORKING
NOTES (10 SECOND ACCOUNT)

Day 1. Time 0.50

Someone says "Where are you going?" Machine noises from D. D and Jus on platform examining Object and Ier, Jan, C, and Jac watching. Ay moving down playground. Mun crosses to right. JoJo in mid-playground.

Day 1. Time 1.00

Jan leaves Object. D and Jus sit astride Object facing each other. They rock. Jus pushes D off backwards. JoJo walking slowly down mid-playground. Kf and JoJo next to blackboard.

Day 1. Time 1.10

Jus moves up on box and D stands up to get back on, and is pushed again by Jus. They struggle. C and G watch closely. B is skipping across mid-playground. Jan walks across mid-playground, right to left.

Day 1. Time 1.20

Ier wanders off left. Jon comes back. Jac leaves. D and Jus wrestle. G and C on platform and Jon watching from grass. Mun walks round object.

APPENDIX III - EXAMPLE OF A RECEPTOR - CONTACT WORK

SHEET

TL Simultaneous Touch-and-Look

T Touch Only

LN Look Only (near)

LF Look Only (far)

A Activity (Object-related)

Other: refers to position in the playground .

TIME DAY	BOYS										GIRLS									
	D	A	Jon	Mun	K	Mar	Jos	Any	G	C	Jean	Nat	B	Ir	Jo	Kf	Mf	le	Jac	
30	S	MY		LN		M	LN	LN	TL		LF	S	G		S				LN	
1 00	TL					TL		LN	LN		G	S	I		M				LN	
1 30	TL		LN	B		TL		TL	TL			LN		MX					LN	
2 00	TL		TL			TL		TL						S	B				E	
2 30	TL			LN		TL		TL						J	B					
3 00	T		LN	LN		A		LN	P					J	B					
3 30	T		TL	B		TL		LN				J	S	J	TL				J	
4 00	TL		TL	B		TL		LN				J	S	J	LN				J	
4 30	TL		LN	B		TL		TL				J	S	J	B				J	
5 00	T	SY	A	B		MY	A	TL						J	B				J	
5 30	T	MY		B			M	F				J		J	B				J	
6 00	TL	MY		B		MY	V	F			S	J		J	B				J	
6 30	TL			B				G				S			B					
7 00	T			B			S					S			SX	B				
7 30	TL			B				TL				S			SX	B				
8 00	TL			B								S			LN	LN				
8 30	T		G	LF								S			LN	G				
9 00	TL		S	LN								S			S					
9 30	TL			M			M	A							E					
10 00	TL						M	TL				E			E					
10 30	TL					MY	M	TL							G	M				
11 00	TL	MY						LN							G					
11 30	T							TL							E	E				
12 00	TL	SY						TL							LN					
12 30	TL	S						TL												
13 00	T							TL												
13 30								TL												

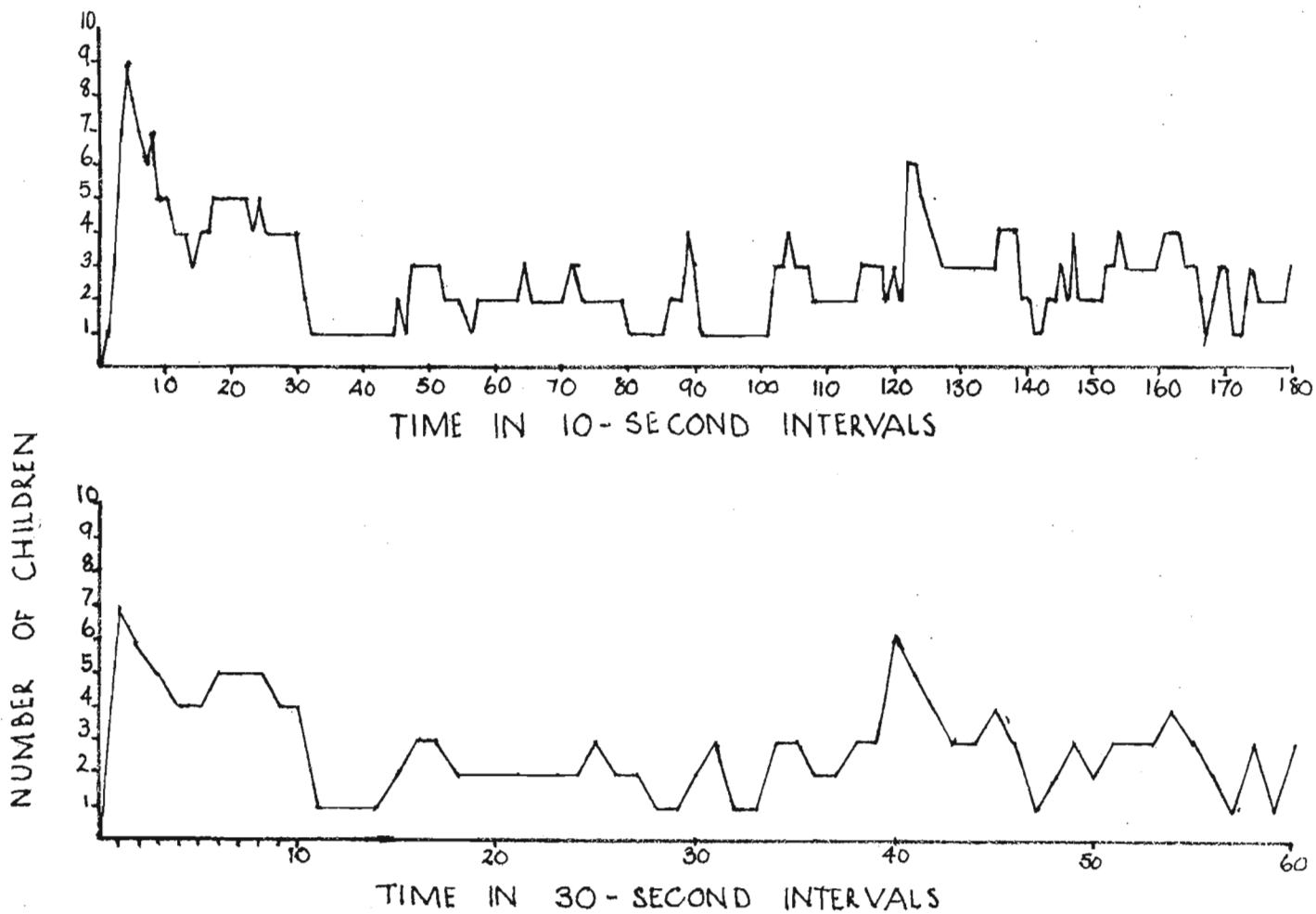
Note :

Dark tone :
Interacting
with object.

Medium tone :
Position
identified on
film or video
tape, but not
interacting.

Light tone :
Position
inferred from
previous
movements.

APPENDIX IV - COMPARISON OF READINGS TAKEN EVERY 10 SECONDS
AND READINGS TAKEN EVERY 30 SECONDS



APPENDIX V - RECURRING PATTERNS OF BEHAVIOUR.

- (1) Denotes abbreviated description of patterns from McGrew (1972)
- (2) Denotes abbreviated description of patterns from Grant (1969).

ARMS AKIMBO (1)

Description: The arms are flexed at approximately a 90° angle with the palms, finger forward, resting on the hips. The trunk is upright and the legs spread wider than shoulder width.

Situation: Rare in pre-school children, and meaning unclear. Sometimes seemed to denote exasperation. Also used in imitation of mother with appropriate scolding. More aggressive variation with knuckles resting on hips.

AUTOMANIPULATE (FINGERING AND FUMBLING) (1)

Description: Fingering:- the use of the fingers, particularly thumb and forefinger to manipulate part of one's body, usually mouth, nose, ears, or hair. Also hands, arms, legs, genitals or anal region.

Fumbling:- similar movements directed to a small object or part of a large object.

Automanipulation appears superficial, unconnected to other simultaneous body movement, additional sensory modalities appear "disengaged".

Situation: Appears frequently in social stress situations. Child often seems nervous or distracted. Often combined with digit sucking and immobility.

BEAT (1)

Description: "An overarm blow with palm side of lightly clenched fist. The arm is bent at the elbow and raised to a vertical position then brought down with great force on the opponent hitting any part of him that gets in the way".

(a) Beat up - initial movement of raising the arm to the vertical position. Down beat does not always follow. Least intensive form of Beat and functions as a threat.

(b) Incomplete beat - initial movement to the vertical plus only partial and sometimes spasmodic overarm movement down. Less intense than completed movement and rare.

(c) Open beat or slapping - less intense than the fisted form but performed equally forcefully.

(d) Object beat - the complete beat performed with an object held in the hand.

Beat may strike any part of the opponent's body as contrasted with punch which is more aimed.

BITE (1)

Description: Upper and lower rows of teeth brought rapidly and forcefully together, usually with lips retracted. Usually directed to arms, neck or upper trunk and usually does not break skin.

Situation: Aggressive and rare. Sudden and quick followed by leaning back and quick glancing up with wide eyes to nearby adults.

Common in imaginative rough-and-tumble play.

"Fierce" face, accompanied by vocalized roars and growls.

BODY OPPOSE (1)

Description: The trunk is forcefully inclined into contact / ...

contact with another's trunk; the body is upright and the feet spread wide. Arms do not exert force and are usually held away from the body, to its side. Orientations may be chest-to-chest, side-to-side, back-to-chest, chest-to-back.

Situation: Agonistic or quasi-agonistic encounters. Resembles pushing but differs in that - (i) it occurs when hand-pushing is undesirable (ii) it is less conspicuous (e.g. in lining up for the slide (iii) can be used when hands are otherwise occupied.

CHASE (1) CHASE AND FOLLOW (2)

Description: The child runs with sudden direction changes and veering, frequent speed changes, arms flailing, quick head-orienting movements. It is always directed to others, and the reactor usually flees simultaneously from the chaser. The trunk usually tilts forward.

Situation: Children chase in agonistic and non-agonistic bouts but the latter occurs more frequently and bouts are of longer duration. Agonistic bouts are usually diadic, but non-agonistic chases may involve several individuals and role reversals between pursuer and pursued frequently occur. No distinction between the two types could be made on motor patterns alone, but accompanying patterns do differ.

CHIN IN (1 and 2)

Description: The neck is flexed, moving the head forward on the atlas vertebra, so that the chin is moved toward the chest, and the face is kept approximately vertical.

Situation: 'One of the commonest submissive elements in human behaviour'(2). Exhibited by losers of encounters, children scolded by adults and

children / ...

children apparently frightened of encounters with strangers or more dominant individuals. Also children new to the nursery, even in solitary situations.

DIGIT SUCK (1), FINGER IN MOUTH (2)

Description: The lips are closed around a digit which is inserted into the mouth. Most often the thumb.

Situation: Occurs in social stress situations and also when uncertain or anxious, as in the presence of novelty.

FLINCH (1), SHOULDERS FORWARD and HUNCH (2)

Description: Shoulders are flexed, the face moves partially down and back, the arms are flexed towards the shoulders, the trunk leans away. May be accompanied by Turn, Blink or Pucker Face.

Situation: High intensity flight posture in response to immediate aggression. Also startle response particularly by social threats.

FOREARM RAISE (1) ARM OVER FACE and ARM OVER HEAD (2)

Description: The forearm is raised to a horizontal position over or in front of the head; the elbow is partially flexed at approximately 90°

Situation: In agonistic and quasiagonistic encounters as a defensive posture, or where the performer was startled and mistakenly perceived danger. It seems to occur in situations where fleeing is not desirable.

FOREARM / ...

FOREARM SWEEP (1)

Description: The arm is extended horizontally or obliquely (hand down) between waist and shoulder level, away from the body. The forearm precedes and the hand is open. The trunk is upright and the feet may be spread further apart than normal. Contact most often with the other's trunk or arms.

Situation: Mild aggressive pattern which functions to enlarge the space around an individual (to brush others from their path, to squeeze through a crowd, or to prise themselves into a line).

HAND COVER (1) COVER EYES and HAND ON MOUTH (2)

Description: The open, partially flexed hand moves to the head, where the bunched fingers and palm are held close to or in contact with the eyes, ears, nose and/or mouth.

Situation: Apparently functions to shield the sense organs and other important facial features from either transmitting or receiving signals e.g. covering ears in response to loud noise, whole face in response to threat, or nose, and also in imaginative play eye cover to denote fear.

IMMOBILE (1), STILL (2)

Description: Gross movement of the trunk, limbs and head ceases for at least three seconds. Often gaze is fixed. May be restrained, inconspicuous finger movements, often automanipulative. Any posture although most common while standing or sitting.

Situation: / ...

Situation: Children who lost possession of toys or were aggressed against. During group formation and in first few days of nursery attendance. In 'socially stressful' situations, not directed at themselves. In social play while 'stalking,' accompanied by Wide Eyes and Smile.

PULL (1)

Description: The arms are flexed toward the body, drawing an object or person toward the body or vice versa.

Situation: Agonistic - directed to specific body parts of the opponent, or to an object in property disputes, or pulling opponents from large toys. Quasi-agonistic - directed to the trunk or appendages, part of rough-and-tumble play and a component of wrestling. Friendly interactions:- two children holding hands may pull each other about without resistance.

PUNCH (1)

Description: The arm is moved rapidly from an approximate horizontal position at the side, forward approximately 180° (or until contact) in a sidearm motion. The arm is held partially flexed; the fist is tightly clenched and the knuckle side of the hand precedes.

PUSH (1)

Description: The arms are extended forward, usually parallel and horizontal, wrists flexed and vertical palms preceding. Force directly applied to object or person. Usually with trunk leaning forward, but also in forward, upright locomotion.

Situation / ...

Situation: Aggressive, to offender's trunk, shoulders or possessions. Also in social destruction (pushing down another's blocks).
Quasi-agonistic: Component of wrestling, jostling in line, pushing through doors, etc.

REACH (1)

Description: Arm extended horizontally, fingers partially extended and separated, palmar side usually down. Directed to object or person, and usually followed by grasping and picking up. Incomplete form: partially flexed arm with grasping hand, palm vertical.

Situation: In all social and non-social behaviour from infancy. In friendly situations reactor responds by reaching out hand or object; in agonistic or quasi-agonistic situations, reactor may lean back, turn away or flee. In 'monster' games incomplete pose used.

REPEL (1) PUSH GESTURE (2)

Description: Arms extended spasmodically away from and in front of the body, not necessarily horizontally, hands open and palm first. Negative expletives. Resemble pushing intention movements or lowered incomplete open beating.

Situation: Agonistic: seem to mean 'get away', accompanied by Lean Back, Flinch and Wide Eyes. Also in excited imaginative play.

SLOPE (1)

Description: The actor is standing facing another person, his body is leaning back from the hips, his chin is tucked in and he is looking at the
other / ...

other person, and his hands are frequently clasped behind his back. May also be in front, usually at waist level.

Situation: Expression of ambivalence. In conflict between fleeing and complying with a dominant individual's wishes.

WRESTLE (1)

Description: Variable, but in general it is gross body movement by two or more children while grappled in physical contact. Incorporates Push, Pull, Fall, Lean and Body Oppose. Each tries to control the movement of the other.

Situation: A rough-and-tumble play pattern which often occurred with Laugh, Run, Jump and Open Beat. Sometimes occurs in genuine agonistic interactions, usually over large rather than small toys. Quasi-agonistic wrestling was often accompanied by pants, grunts and other expirations of exertion which agonistic wrestling lacked.

APPENDIX VI - CHECK LIST 1

Time	IncA	ChinA	Run	Main	Touch	Pass	Imm	Look	DURATION Pass	Imm	N Look	
0.30	✓	✓	-	✓	✓	-	-	✓	6.6 -	6.6 20	17.4 20	① A Day
0.40	✓	✓	-	-	-	-	✓	✓	20			
0.30	-	✓	-	-	-	-	✓	✓	6	17.8	20	
0.40	-	✓	-	-	-	✓	✓	✓	20	20	20	has
0.30	✓	✓	-	✓	✓	-	✓	✓	-	9.6	19	
0.40	✓	✓	-	-	-	-	✓	✓	20	20	20	has
0.30	✓	-	-	-	-	✓	✓	✓	14	14	20	F
0.40	✓	-	-	-	-	✓	✓	✓	20	20	20	
0.30									-	120	40	
0.40									10	18	410	

APPENDIX VII - CHECK LIST 2

Time	Name	Base	Chinlin	In A	Pass T	T. Load	Fight	Loco.	Inmch		
0.30	C	10	✓	-	-	-	-	-	17.8		
0.40	C	10	✓	-	✓	-	-	-	20		
1.30	G	10	✓	✓	-	✓	-	-	9.6		
1.40	G	10	✓	✓	-	-	-	-	20		
2.30	Ay	10	✓	✓	-	-	-	-	12.0		
2.40	Ay	10	-	✓	-	-	-	-	18.0		
3.30	Mun	7.4	✓	✓	-	-	-	-	5.0		
3.40	Mun	2.2	-	✓	-	-	-	-	9.6		
4.30	D	4.4	✓	-	✓	✓	-	✓	0		
4.40	D	10	✓	-	✓	✓	-	-	14.4		

①
day

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