

**Certain Aspects of Visual Perception  
in Some "Autistic" Children.**

A thesis submitted to the University of Cape  
Town in fulfillment of the requirements for  
the degree of Master of Arts in Psychology

by

J. R. Lazarus, B.A. (Hons.) (Cape Town).

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To A, W and R  
who taught me  
more than can  
be conveyed  
in words

University of Cape Town

**VOLUME I**

University of Cape Town

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Certain Aspects of Visual Perception  
in some "Autistic" Children.

J. R. Lazarus

University of Cape Town

Identification strategies and patterns of visual inspection in relation to non-perceptual variables, rapport and discrimination set, were studied in 3 "autistic" Ss, using experimental materials relevant to various forms of visual perception. A qualitative, single case approach was followed, using as controls, individually matched Ss representing various points on a developmental continuum. Marked differences were found between 2 "autistic" Ss as compared with the third "autistic" S and the majority of control Ss in all variables, although 2 young normal Ss exhibited features similar to the 2 "autistic" Ss. It therefore appeared that in some "autistic" Ss, there was disturbance at selective and identifying levels of perception, associated with deficiencies in non-perceptual factors. The disturbance appeared developmental rather than deviant in nature.

Amongst the psychotic disorders of childhood, the syndrome of early childhood autism (ECA)<sup>1</sup>, delineated by Kanner (1943),

- 
1. Since, the term, "autism", may refer to either a diagnostic category or to a symptom (characteristic also of other childhood psychiatric syndromes) (Rutter, 1966), an alternative label for Kanner's (1943) syndrome has been sought. Wing (1966) has suggested that the terms, autism and autistic, be limited to denotation of the symptom, any shorthand use of such terms to refer to the symptom-complex or syndrome being indicated by the use of inverted commas. The syndrome itself might be referred to as "early childhood autism" (ECA) - a label which does not carry the implication of inevitable onset from birth, but does suggest that the condition is maximal in early childhood and may improve later.

has recently been the subject of extensive research. One of the nine diagnostic points (Creak et al, 1961) considered characteristic of the syndrome is abnormal perceptual experience, in the absence of discernible organic abnormality, implied by excessive, diminished or unpredictable response to stimulation. Reference has most often been made to the visual and auditory modalities, with some mention of kinaesthesia and touch. Other modalities have seldom been discussed directly, except insofar as observable behaviour, such as abnormal response to painful stimulation, has appeared to support an hypothesis of perceptual dysfunction.

Any attempt to evaluate perceptual dysfunction in "autistic" children has been complicated by the lack of satisfactory tools with which to assess perception in young children, particularly those whose language is poorly developed or absent (Rutter, 1966). Recently, attempts have been made to assess perception in "autistic" children by means of carefully designed experimental studies. The main burden of evidence, has, however, continued to rest on interpretations of certain behaviour patterns, frequently without reference to adequate control data. As pointed out by Hermelin & O'Connor (1970), however, developmental reference points are necessary in order to distinguish developmentally retarded from deviant behavioural phenomena.

The present study originated as an attempt to extend previous experimental studies of perception in "autistic" children by assessing

visual perceptual skill in relation to experimental materials relevant to different forms of stimulation, such as shape and colour. Serious difficulties were, however, encountered in attempts to follow a standard assessment procedure, arising from marked differences amongst Ss in the "autistic" sample (despite careful psychiatric diagnosis).

Further study thus necessitated major modifications in the design in order to permit study of qualitative differences amongst Ss, while still permitting some comparison across Ss. An approach conforming to these requirements was experimental study of single cases, based on the assumption that "the systematic objective investigation of ... a single case should lead to findings which are relevant to the general function of the individual concerned and which can be generalized to many other individuals" (Shapiro & Nelson, 1955, p.344). The greater precision possible in specifying relevant parameters in individuals as compared with groups, particularly in the case of somewhat vaguely defined psychiatric populations (Chassan, 1960) and the possibility of investigating the operation of a system of variables in individuals (Shapiro, 1964; Taylor, 1958) appeared to be important advantages of the single case approach in the context of the present study.

Hypotheses regarding the handicaps of individual Ss were, therefore, tested by appropriate, systematic modification of the

standard training and testing procedure. Subsequent comparison with individually matched control Ss, representing various points on a developmental continuum and with other individually studied "autistic" Ss permitted the investigation of trends across Ss and of whether any perceptual disturbance in "autistic" Ss was developmental or deviant in nature.

#### Method.

#### Subjects

The categories of control Ss studied and the rationale for their inclusion were as follows:-

- (1) Comparison with Ss of normal intelligence (labelled N/CA), with no serious behavioural or emotional problems, matched on the basis of CA with "autistic" Ss, would indicate whether perception in the "autistic" Ss was defective.
- (2) Comparison with Ss of subnormal intelligence, (labelled S/CA), assessed as non-psychotic, matched on the basis of CA with the "autistic" Ss and similar in MA, would indicate whether defective perception in "autistic" children could be attributed to low functional intelligence or whether other factors in addition to or independently of low functional intelligence were implicated.

- (3) Comparison with Ss of normal intelligence, (labelled N/MA), with no serious behavioural or emotional problems and matched on the basis of MA with subnormal Ss (S/CA) would indicate whether "autistic" Ss, despite differing from normal and subnormal Ss of the same CA, nevertheless followed a similar but retarded developmental sequence as regards perception.
- (4) The final category of control Ss was to be composed of older, intellectually subnormal, but non-psychotic Ss, (labelled S/OLD), matched on the basis of MA with normal Ss (N/CA). Comparison with other control categories would further clarify whether the perceptual functions under study were CA - or MA-linked and thus whether deviations from control Ss by "autistic" Ss represented developmental lag or a qualitative departure from the normal developmental sequence.

The three "autistic" Ss of this study, A, W and R, were selected on the basis of psychiatric diagnosis, the criteria used being those of Creak et al (1961). Two of the Ss, A and W, were considered relatively clear cases of "autism", while the third, R, was labelled "psychotic" because of certain reservations regarding the extent of identity with the nuclear diagnosis. None of these Ss showed clear evidence of brain damage, in contrast to other potential Ss, in whom there was reason to suspect brain damage or other possibly confounding factors and who were, therefore, excluded from the study. Descriptive information regarding normal and subnormal controls has been summarized in Table 1.

Table 1: Descriptive information regarding normal and subnormal control Ss of each "autistic" S.

"Autistic" S Control Ss	A (male; CA 5-6)				W (female; CA 7 - 10)				R (male; CA 7-3)				
	N/CA	S/CA	N/MA	S/OLD	N/CA	S/CA	N/MA	S/OLD	N/CA	S/CA	N/MA	S/OLD	
Sex	M	F	M	M	F	F	F	F	M	M	M	M	
Criterion age (CA) <sup>1</sup>	5-6	5-6	3-4	9-2	7-10	7-10	4-8	13-1	7-3	7-3	4-4	12-1	
Actual CA	5-5	5-10	3-7	9-2	7-11	7-10	4-9	12-11	7-1	7-3	4-5	12-0	
IQ	100	83	107	60	98	63	103	75	104	82	108	80	
Test	WPPSI	WISC	M-P	WISC	WISC	WISC	WPPSI	WISC	WISC	WISC	WPPSI	WISC	
Educational status <sup>2</sup>	NS	Ord.	NS	Spec.	Ord.	Ord.	NS	Ord.	Ord.	Ord.	NS	Ord.	
No. of yrs. in spec. class/repeated in ord. class	-	-	-	2	-	2	-	2	-	-	-	1	
Performance in school <sup>3</sup>	aver- age	sub- norm.	aver- age	border -line	aver- age	severe- ly sub- norm.	aver- age	aver- age	aver- age	aver- age	border -line	aver- age	aver- age
Emotional disturbance <sup>4</sup>	slight	slight	slight	serious	slight	slight	none	none	none	none	slight	none	
Relationships: teacher peers	good good	fair poor	fair good	fair poor	good good	fair fair	v.good good	fair good	v.good v.good	fair fair	good fair	fair fair	
Socioeconomic status <sup>5</sup>	II	V	II	V	IV	V	II	IV	V	IV	I	IV	

1. Varying according to whether matching was on the basis of CA or MA.
2. Whether in nursery school (NS), ordinary class (ord.), or special class (spec.).
3. The available categories ranged from "well above average" through "average" and "slightly below average" to "borderline normal", "subnormal" and "severely subnormal" (see Appendix C).
4. A rating based on teacher's comments; "slight" indicating reference to an isolated, probably temporary difficulty; "serious" indicating more widespread disturbance, probably meriting professional attention.
5. Based on parental occupation (Hollingshead and Redlich, *ibid*).

### Perceptual tasks

Certain variables, discussed below, were studied using experimental materials designed to assess various aspects of visual perception.

The tasks were as follows:

- (1) Shape (two-dimensional): Straight-sided, metric figures (Alluisi, 1960) composed of projections which varied in width and number, complexity of the shapes increasing in different items, resulting in greater difficulty in discrimination.
- (2) Shape (three-dimensional): The format of the task was the same as that of the two-dimensional form, except that plane figures were used.
- (3) Size (two-dimensional): Items were composed of circles or squares; size differences between alternatives ranged from  $3/16$  ins. (simpler items) to  $1/16$  ins. (most difficult items).
- (4) Size (three-dimensional): As for (3), except that plane figures are used.
- (5) Colour: Items were composed of different shades of colours, for example, blue, green, grey.
- (6) Configuration (synthesis): The standard figure was a pattern of dots or dashes, which had to be synthesized into a 'whole' in order to find the correct alternative from among one of five line drawings.
- (7) Configuration (analysis) (embedded figures): The standard figure was a relatively complex 'whole', in which was embedded a smaller figure, identical with one of the alternatives. The simpler items used overlapping figures; more difficult items displayed greater degrees of 'embedding'.

- (8) Object: Coloured drawings of familiar objects were used. The child had to select the alternative which constituted the functional complement to the standard, e.g., teapot - cup-and-saucer, knife-fork, driver-car.

In order to reduce the influence which any motor disabilities might have on the expression of what is essentially an unobservable ability, a discriminative rather than a representational response was utilized for all perceptual tasks. Thus the child was required to indicate, by pointing, which of five alternatives matched a standard figure. The response was the same for all tasks, thus reducing the extent to which possible learning difficulties might contribute to the difficulty of the different tasks.

Each perceptual task was presented in two stages, a training and an assessment stage. During training, a gradually increasing number of alternatives was presented to the S. This procedure was repeated with different standard stimuli, attempts being made when necessary, chiefly through masking of alternatives, to achieve matching, preferably in relation to five alternatives. Consistent perceptual behaviour in relation to a particular task over a series of choices served as a criterion for the introduction of the assessment stage of the task, during which twenty items, usually increasing in difficulty of discrimination, were presented. More than one session might be necessary for administration of assessment items.

### Variables studied

A general framework of variables was necessary in order that comparison amongst Ss be possible. Qualitative rather than quantitative measures were required - hence, there was an emphasis on how a response was achieved rather than on a single, final response. A number of measures were, therefore, used, focussing on several aspects of a process. Non-perceptual measures have, however, only been reported briefly.

Reference was made in each case study and across Ss to the following aspects of behaviour relevant to the achievement or non-achievement of discrimination:

#### (1) Rapport.

Rapport was conceived not only as a harmonious relationship between the E and the S, but also as a relationship such that the S was amenable to carrying out certain demands of the E. Notes regarding behaviour relevant to rapport were made as soon after the session as possible and later analysed and tabulated in terms of categories appropriate to the particular S, permitting assessment of trends in rapport over time.

#### (2) Discrimination set.

In order to induce in Ss behaviour appropriate to matching, a training procedure was devised. The essence of the procedure

was a carefully graded increase in the number and complexity of discriminative alternatives, appropriate behaviour initially being demonstrated by the E and the S's behaviour shaped accordingly. The acquisition of such matching behaviour was conceptualized in the present study as "discrimination set", a form of non-specific learning, in which the invariant features of otherwise dissimilar tasks are learnt, facilitating the solution of new tasks (Reese, 1963). Since some "autistic" Ss of the present study exhibited severe and characteristic difficulties in acquiring discrimination set, its acquisition appeared to constitute an important variable to be studied in an attempt to understand other aspects of perception.

Brief notes regarding the S's behaviour and any modifications in training procedure were made on a prepared record sheet during a session and later expanded, as soon after a session as possible. Subsequently, the record sheets and notes were analysed and tabulated in terms of categories of behaviour.

### (3) Perceptual factors.

Measures of the extent and nature of systematic perceptual behaviour which appeared relevant were, firstly, analysis of choice patterns of individual Ss, variously referred to as "error factors", "response dispositions" or "hypotheses" (Fellows, 1968; Levine, 1959; Reese, 1963) and here referred to as "identification strategies"; and,

secondly, assessment of patterns of visual inspection (Gardner, Holzman, Klein, Linton & Spence, 1959). Use was made in the present study of the set of identification strategies outlined by Fellows (1968), certain modifications being necessary, chiefly because of the greater number of alternatives presented to some Ss. The performance of each S on assessment items of each task was evaluated in terms of the set of strategies. In the absence of more accurate recording devices, patterns of visual inspection in each S during each session were observed by the E. Subsequently, the pattern of visual inspection in each session was considered in relation to the kinds of identification strategies employed by the S, in order to assess the extent and nature of any relationship between the two variables.

#### Results.

Statistical analysis was not undertaken because of the differences amongst Ss and with regard to experimental conditions under which behaviour was observed. It seemed, moreover, necessary to emphasize the tentative nature of the findings, arising from the many sources of unreliability both within Ss and in methods of observation.

## (1) Rapport.

Considerable inter-S differences in rapport were noted. Most marked were differences between, on the one hand, "autistic" Ss and, on the other, all control Ss, as indicated most clearly by the extended number of sessions necessary with the former prior to the introduction of training materials. Striking differences amongst "autistic" Ss were, however, also evident, most notably between R, on the one hand, and on the other, A and W, making it difficult to talk in general terms regarding rapport with the "autistic" Ss. Differences amongst control Ss in rapport were also evident, but were generally less marked. It seemed clear that such differences in rapport as did exist contributed to the findings regarding the acquisition of discrimination set and perceptual factors. The precise nature of the effects was less clear. It has, however appeared probable that, in the case of A and W, characteristics of rapport contributed a large proportion of the difficulties encountered in training discrimination set, if only because of the frequent interruptions of training; in performance on perceptual tasks, the effect of poor rapport was probably less, since any marked decline of rapport resulted in termination of assessment until rapport appeared re-established. For the majority of control Ss, however, characteristics of

rapport did not appear to exert a major influence on the acquisition of discrimination set or perceptual factors. R and two young normal control Ss appeared to fall between A and W, on the one hand, and the remaining control Ss, on the other, (and nearer the latter than the former), as regards the effect of rapport on the acquisition of discrimination set and perceptual factors.

(2) Discrimination set.

Marked differences in the course and manner of acquisition of discrimination set were evident amongst Ss. Greatest difficulty was encountered in the case of A and W, consistency in the use of matching strategy not being firmly established. Most control Ss, on the other hand, acquired discrimination set without difficulty, while R and, to some extent, also A(N/MA) and R(N/MA) experienced relatively slight difficulty only.

(3) Perceptual factors.

(a) Identification strategies.

The most striking difference between Ss was in the relative frequency with which matching as opposed to simple positional strategies were employed. Two "autistic" Ss, A and W, most frequently used simple positional strategies, the particular strategy

favoured depending largely on what the arrangement of alternatives permitted. Lateral and position preference were used most frequently, somewhat more primitive central strategies (central preference and central bias) and position perseveration also occurring, when permitted by the number and arrangement of alternatives. Matching strategy was, however, also used by both A and W on at least some items of most tasks. The presence or absence of matching strategy in these Ss appeared to be related in a complex fashion to task factors, such as number and arrangement of alternatives, item complexity and task complexity, as well as to non-task factors, such as the extent of rapport and task-orientation shown by the S (the latter factors being particularly important in the case of W). There was a tendency for matching to occur early in a session, giving way later to simple positional strategies as rapport and task orientation declined and distractibility increased.

In the case of R and all control Ss, the most frequently used strategy was matching in relation to five alternatives. Simple positional strategies were not, however, absent from the performance of most of these Ss, being present usually as constraints on matching and seldom as the predominant influence. In the case of W(S/OLD) and R(S/OLD), however, there was virtually no evidence of the use of positional

strategies, while, in the case of A(N/MA) and R(N/MA), simple positional strategies were sometimes the predominant determinant of choice. The kinds of positional strategies used by R and control Ss varied, but central bias (permitted by the presentation of five alternatives) occurred fairly frequently, as did position preference.

Strategies of position alternation and oddity responding did not appear to have been used by any Ss with any consistency, perhaps because the presentation of more than two alternatives in most cases and the arrangement of alternatives where only two alternatives were presented, discouraged the use of such strategies. Random choices were noted rarely, being evident in the performance of A(N/MA) twice towards the end of sessions, apparently associated with increasing distractibility, and, in the case of A(S/OLD), once, associated with increasing item complexity.

(b) Patterns of visual inspection.

In the case of A and W, great variability in patterns of visual inspection was evident from moment to moment, but general tendencies were nevertheless observable. In comparison with R and control Ss, scanning the range of alternatives and inter-alternative comparison were noted less frequently in A and W, apparently related to the greater distractibility shown by the latter Ss. In the case of A, however, there was a tendency for scanning the range of alternatives to occur early in a series, giving way later to minimal scanning,

whereas, in W, patterns of visual inspection showed greater consistency over time. R and most control Ss showed rather similar patterns of visual inspection, except that inter-alternative comparison in R tended to be somewhat cursory, as it was also in R(S/CA) and to a greater extent R(N/MA) and A(N/MA).

In all Ss, inter-alternative comparison occurred always in conjunction with scanning the full range of alternatives, but scanning occurred at times without inter-alternative comparison. There did not appear to be a relationship between patterns of visual inspection and number and arrangement of alternatives or with particular tasks.

(c) Identification strategies and patterns of visual inspection.

Matching versus simple positional strategies in relation to minimal scanning versus scanning the range of alternatives across Ss was investigated. Three patterns of relationship were evident. Firstly, in the case of A and W, minimal scanning tended to be associated with positional strategies rather than matching. Secondly, in the case of R and most control Ss, scanning the range of alternatives tended to be associated with the use of matching strategy. Thirdly, in the case of A(N/MA) and R(N/MA), a relationship exhibiting elements common to both the above-

mentioned relations, was suggested. Thus, there appeared to be a relationship between matching and scanning, similar to, but less marked than that shown by R and other control Ss. There also seemed to be a relationship between position strategies and minimal scanning, which was in the direction of the similar relationship shown by A and W.

#### Discussion.

The clearest finding of the study was that there were differences with respect to the variables investigated not only between "autistic" and control Ss, but also amongst "autistic" Ss. While it appeared that non-perceptual factors had contributed to such differences, it nevertheless seemed that, in some "autistic" Ss, there was evidence of perceptual disturbance. Even in the latter Ss, however, there nevertheless appeared to be some differences in the nature of interactions among variables resulting in disturbed perception. Perhaps of greater interest, however, was the fact that one "autistic" S differed relatively little from most control Ss and was, in some respects, more similar to control Ss of his own age than were younger normal control Ss.

Leaving aside, for the moment, the contribution of non-perceptual factors, at what level of perception was disturbance evident?

The perceptual factors investigated appeared to represent different levels of organization in the perceptual process. Patterns of visual inspection appeared relevant to the selective aspect of perception, involving differences in the degree to which stimuli are sampled from the environment. Identification strategies, on the other hand, appeared to involve predictions related to some pattern of stimulation - whether primitive positional cues or more complex forms of stimulation - subject to feedback concerning the appropriateness of the prediction and hence open to modification of future predictions. A relationship between the two variables might be posited. Thus, patterns of visual inspection, in the sense of extensive or restricted sampling from the environment, have appeared to be an influential determinant of identification strategy, through the possibility of their excluding aspects of stimulation relevant to the final prediction. Other, central aspects of perceptual processing have, however, seemed likely to modify the form of the final identification strategy, such that, even where sampling has been extensive, the identification strategy followed might not be optimal.

In the present study, most control Ss, as well as the "autistic" S most like them, R, generally exhibited fairly extensive sampling of stimulation, in the sense of scanning the full range of alternatives and inter-alternative comparison. These Ss also tended to employ a

matching strategy most of the time, although simple positional strategies were occasionally present, usually as constraints on matching. In these Ss, therefore, it appeared that an aspect of perceptual selection, namely, patterns of visual inspection, was generally adequate in providing a basis for prediction, but that, at times, central factors operated to encourage a less than optimal strategy as regards processing all available information.

The relationship in the Ss described above seemed, moreover, to be CA-linked, since increasingly adequate patterns of visual inspection and identification strategies appeared to be employed with increasing age. Older sub-normal Ss used matching almost exclusively, while, in young normal controls, positional strategies were sometimes predominant rather than merely constraining influences. Young normal controls also tended to show less adequate patterns of visual inspection than did Ss chronologically older than themselves. There were, however, exceptions: one of the young normal control Ss, W(N/MA), tended to show more mature perceptual features than did others in her category, while one of the older subnormal Ss, A(S/OLD), tended to show less mature perceptual features than other Ss in his category. These exceptions appeared explicable in terms of non-perceptual factors, namely, in the case of W(N/MA) greater rapport and task orientation than was the case with other Ss in her category, and in the case of A(S/OLD), less rapport and task orientation than

was the case with other Ss in his category.

In comparison with the Ss described above, the two "autistic" Ss, A and W, tended to display restricted patterns of visual inspection, together with less than optimal identification strategies most of the time. In these Ss, therefore, it seemed that patterns of visual inspection were, generally inadequate in providing an optimal basis for subsequent perceptual prediction, by tending to exclude from the perceptual process aspects of stimulation relevant to identification. Such restriction of selection did, however, not invariably occur and, where more extensive scanning occurred, the form of identification strategy appeared to be determined by the complexity of stimulation requiring processing. Thus, the greater the number and complexity of alternatives, the more complex the arrangement of alternatives and of the form of stimulation presented, the less likely that a matching strategy would be employed. Non-perceptual factors - the degree of rapport, task-orientation and distractibility - also appeared to affect the extent to which stimulation was optimally processed.

It was in terms of the latter factors that there appeared to be a link between the two "autistic" Ss in question and the other Ss, since complexity of stimulation and certain non-perceptual factors seemed to affect two young normal control Ss in a similar manner, although not to as great an extent. Moreover, as regards the relationship between patterns of visual inspection and identification

strategies, the young normal Ss shared characteristics with both the two "autistic" Ss and other Ss. In addition to the above rather specific overlap between certain "autistic" Ss and some control Ss, in all Ss, there was evidence of order or system in identification strategies and patterns of visual inspection, random behaviour not being characteristic.

The existence of elements common to all the Ss made it appear unlikely that the perceptual disturbance in the two "autistic" Ss, A and W, could be considered deviant rather than developmental - that is, qualitatively rather than quantitatively different. Rather it appeared that a perceptual lag in the two "autistic" Ss was complicated by the interacting effects of relatively poor rapport and task orientation, relatively great difficulty in the acquisition of discrimination set and distractibility, the latter factors also, however, bearing a strongly developmental aspect.

The finding of developmental immaturity in certain aspects of visual inspection confirmed in general terms similar findings by O'Connor and Hermelin (1967) regarding the failure of "autistic" children to switch gaze between stimuli. The major difference between the present findings and those of O'Connor and Hermelin (*ibid*) was the closer similarity of the two "autistic" Ss of the present study, A and W, to younger normal controls than to

subnormal controls of the same CA. The difference might be explicable in terms of the slight difference in aspects of visual inspection studied in the two studies or might be attributable to S differences. A further difference was the apparently greater contribution of non-perceptual factors to the findings of the present study.

As regards identification strategies, findings of the present study complemented earlier findings (Evans, 1968; Hermelin, 1960; Hington & Coulter, 1967; O'Connor & Hermelin, 1963) which suggested that variability in certain aspects of sensory behaviour of "autistic" children was explicable in terms of the complexity of stimulation, referring not only to an artificially circumscribed stimulus, but also to the context in which it occurred. Thus, it appeared that relatively simple stimulation presented under conditions which maximized its impact - for example, when novel or when distractibility was minimal - could be adequately processed, leading to appropriate identification. In contrast, more complex stimulation, particularly when presented under conditions unlikely to enhance its distinctiveness, led to inappropriate and more primitive identification. The particular contribution of the present study in regard to clarifying conditions favouring various identification strategies was in emphasizing the role of quantity of stimulation (operationalized as number of alternatives), spatial arrangement of stimulation and of non-perceptual factors in increasing complexity of stimulation.

The closer similarity of one of the "autistic" Ss of the present study, R, to control Ss of the same CA than to younger normal control Ss or other "autistic" Ss, has a parallel in the work of Hermelin and O'Connor (1970), who, however, attributed differences within their "autistic" sample to differences in intellectual level. In the present study, while it appeared that intellectual differences might have contributed to some extent to the differences within the "autistic" sample, differences in the extent of rapport, acquisition of discrimination set, task orientation and distractibility were also very important.

With respect to the influence of non-perceptual factors on identification strategies, the findings of the present study were in accord with the suggestion of Reese (1963), that distractibility is associated with the use of positional strategies. Deficiencies in verbal mediation (Fellows, 1968; Reese, 1963) might also have been implicated, younger control Ss and "autistic" Ss with relatively poorly developed language using more primitive strategies than did older control Ss and one "autistic" S with relatively more developed language. Mediation difficulties might also account for the one respect in which R resembled other "autistic" Ss more closely than control Ss, namely, in experiencing relatively great difficulty in relation to the Object task. Thus, it appeared possible that although his language was sufficiently developed to permit

mediation of general aspects of task behaviour in a manner similar to control Ss, R was handicapped by his smaller vocabulary as regards aiding identification of specific objects. The other two "autistic" Ss, who were considerably more linguistically handicapped than R, were, however, probably unable to derive assistance from verbal mediation even in respect to more general aspects of the task. Differences in rapport also, however, appeared to be important interacting determinants of differences in strategies used.

As regards patterns of visual inspection, consistency in patterns of eye-movements in "autistic" and control Ss was observed, similar to that in other samples (McKinnon and Singer, 1969). However, contrary to other findings (McKinnon and Singer, *ibid*), a relationship did appear to exist between patterns of visual inspection and an independent measure of perception, namely identification strategies. The different findings possibly arose because patterns of visual inspection in children are more evident than in the case of adults, whose eye-movements are perhaps more economically deployed (Maccoby, 1969) and may be implicit (Fellows, 1968).

Finally, it should be noted that the discussion above has indicated that although perceptual disturbance in certain "autistic" Ss was severe, their perception was nevertheless capable of relation to more normal processes. Such a relation appeared to require noting, in view of a tendency in the literature to

discuss "autistic" children as if they constituted a group entirely distinct from both normal and other handicapped children.

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The psychotic child is separated from us by the extent to which we ourselves, the investigators, are alienated from our childhood and from our potential and latent psychoses.

Anthony, 1958, p. 212.

It has been a matter of some debate why childhood psychoses and, in particular, those forms occurring in early childhood have only relatively recently received attention. One suggestion has been that psychoses in childhood are a phenomenon peculiar to the twentieth century, related in some way to changed patterns of child-rearing and the stresses endemic in a technological society.

Anthony's view, quoted above, does however, appear to offer a partial explanation for the "dark ages" of child psychiatry, when many psychotic children led anonymous lives in institutions for the mentally retarded. Prior to this, as Bettelheim (1967) has suggested, it is possible that psychotic children were abandoned by parents unable to cope as adequately with their strange behaviour, as could the parents of more tractable mentally retarded children; hence, the legendary 'feral children'.

The late nineteenth century saw a change, as it became recognized that psychosis could occur or, at least, have its origin in adolescence. Kraepelin, in 1896, isolated from the various "insanities", a group of mental states which he designated "dementia praecox". Kraepelin maintained that the resemblances among this group of disorders warranted their being considered as a pathologic and etiologic unit, characterized by onset in early adolescence.

Subsequently, in 1911, Bleuler introduced the term, schizophrenia, to refer to the same group of disorders. The term was intended to indicate an essential feature of the disorders, namely, the splitting of mental processes, and reflected Bleuler's refusal to accept a uniformly gloomy prognosis for the disorders.

There was at this time, however, little direct reference to or interest in pre-adolescent behaviour disorders. Insofar as reference was made to disorders in childhood, it was in terms of classifications devised for adults, leading Kanner (1957) to characterize child psychiatry of the early twentieth century as "a sporadically considered miniature replica of nosographic adult psychiatry" (p. 20). The emergence from this state of child psychiatry as a recognized and legitimate speciality can be attributed largely to the development, in the first place by men such as Freud and Meyer, of genetic-dynamic principles with their emphasis on the continuity of ontogenesis and the necessity of studying personality developmentally.

Early efforts towards studying disturbances of child development continued to be hampered by the transfer of assumptions regarding psychopathology in adults to that in children. Such assumptions were implicit in the label, "dementia praecox", which De Sanctis, in the years 1905-1908, applied to a number of cases in which psychotic features were noted as early as four years of age.

During the next thirty years, the literature on psychotic disorders in childhood grew, some devoted to consideration of the nature of such disorders, but much disputing the existence of psychosis in childhood (Rutter, 1968). Gradually, however, the existence of psychotic disorders in childhood came to be accepted and it became recognized that adult classifications were inapplicable to childhood disorders.

There followed various attempts to isolate sub-groupings of childhood psychosis, but the various classifications proposed proved rather unsatisfactory, as it was frequently evident that the cases included within any classification were very heterogeneous. Against this background, Kanner's delineation in 1943 of the syndrome of early infantile autism appeared to constitute a major advance, in that it was based on careful study of the behaviour manifested by an apparently distinct group of children.

Since then, there have been a number of different trends in the literature. Some writers have argued against any attempt at diagnostic differentiation, preferring to use such terms as "atypical child" to cover any behaviour disorder in childhood. Others have advocated further sub-classifications, few of which have, however, received general recognition (Rutter, 1968).

There has, however, been a fair degree of agreement that a differentiation between cases of psychosis with onset in infancy or early childhood and those with onset in middle or later childhood, is warranted, although some writers (e.g., Creak, 1951; Bender, 1956; Goldfarb, 1956) have disputed even this distinction, preferring to consider all cases of psychosis in childhood (with the exception of depressive syndromes) under the term, "childhood schizophrenia". The use of the latter term - frequently to describe rather heterogeneous groups - has, however, been criticized because it implies a (disputed) relationship with a collection of adult conditions bearing the same label (Anthony, 1958; Wing, J.K., 1966) and may suggest unwarranted implications for treatment (Baer, 1961; Wing, J.K., 1966). "Childhood psychosis", as a diagnostic label, is equally unsatisfactory, in that it is non-specific (Anthony, 1958; Wing, J.K., 1966); it has, in fact, been most frequently used to refer to rather heterogeneous groups and, used in this way, has served to warn against unwarranted generalization.

Among those who have accepted a distinction on the basis of age of onset, some variant of the term, "autism", has been used to refer to cases with onset in infancy or early childhood, while cases with onset in later childhood have been referred to by the term, childhood schizophrenia, on the assumption that the latter condition may possibly be related to adult schizophrenia. The term "autism", is, however, unsatisfactory in that it may refer to either a diagnostic category or a symptom (a symptom, moreover, which is also characteristic of other childhood psychiatric conditions (Rutter, 1966a)) and the frequently ambiguous and non-explicit use of the term does not permit choice between these alternatives. The related term, "early infantile autism", while more specific, has the disadvantage of implying onset from birth or very early infancy and has, therefore, been regarded as unsatisfactory and misleading by certain authors (Wing, J.K., 1966).

As a less confusing alternative, Wing (*ibid*) has suggested that the terms, autism and autistic, be limited to denotation of the symptom, any shorthand use of such terms to refer to the symptom-complex or syndrome being indicated by the use of inverted commas. The syndrome itself might be referred to as "early childhood autism" (ECA) - a label which does not carry the implication of inevitable onset from birth, but does suggest that the condition is maximal in early childhood and may improve later.

It was with the syndrome of early childhood autism that the study reported here was concerned, a psychiatric category which is bedevilled by conflicting descriptions of symptoms and diagnostic criteria, and which has thus presented problems as regards the range of generalizability and theoretical significance of research findings. Some consideration of these problems was, therefore, necessary as a basis for any evaluation of theories and research regarding ECA.

## CHAPTER 11

### Diagnosis: Implications for Research.

A number of authors (Eisenberg and Kanner, 1956; Robinson, 1961; Rutter, 1966a) have suggested that the controversy regarding ECA relates to the interpretation of the observed behavior and the nature of the primary disorder rather than to what symptoms characterize the condition. Insofar as the diagnosis is made, it is probably true that the existence of psychosis in early childhood is generally accepted. A survey of the literature has not, however, confirmed the uniformity of diagnosis implied by the above-mentioned writers. Such lack of uniformity has posed problems for research in that there are no clear guidelines for the selection of samples for research and hence that generalization of results from heterogeneous samples may occur. Furthermore, there is no clear way of judging to what extent the samples employed by different researchers have been comparable.

There are, in the first place, no uniformly accepted methods for arriving at a diagnosis of ECA. Certainly, following Kanner's (1943) initial description, various diagnostic schedules (e.g., Creak et al, 1961; Rimland, 1964; Wing and Wing, 1968) have been drawn up. These schedules have, however, suffered from a number of defects limiting their usefulness; a lack of comparative data indicating the bases for distinction from other childhood disorders; the failure to provide norms, or a system of weights, indicating the relative importance of symptoms in the diagnosis; an absence of developmental data which might emphasize different symptoms at different ages and stages of the condition. Moreover, some criteria have been defined in highly inferential terms and the same behavioural indicant may serve as evidence for more than one diagnostic criterion (Rutter, 1966a).

Such shortcomings have been complicated by the widely differing interpretations employed by users of the schedules (Rutter, ibid); hence, a statement that a particular schedule has been used in diagnosis is no guarantee that the composition of the group studied conforms to the criteria as conceived by the author of that schedule. Thus, valuable as such comprehensive guides have been in focusing attention on the phenomenology of the syndrome, their use has provided only a partial solution to problems of diagnosis.

Secondly, it must be borne in mind that diagnosis involves a complex discrimination among a mass of stimuli and does not occur in a vacuum, but in the context of a theoretical framework, albeit implicit. Hence, the grouping and interpretation of symptoms has differed according to different theoretical viewpoints, resulting in low consensual validity for diagnosis (Baer, 1961).

Among the theoretical preconceptions which may affect diagnosis are, firstly, the diagnostician's conception of the nature and aetiology of the condition and the resultant characterization of certain symptoms as primary (and essential diagnostic criteria), or secondary (and variable, incidental criteria). Secondly, the significance attached to parental socio-economic status and intelligence may lead to the diagnosis of "autism" when the above-mentioned factors are assessed as high, or mental deficiency when such factors are assessed as low - frequently in the absence of objective evidence regarding these factors (Bettelheim, 1967). Thirdly, opinions regarding prevalence may affect diagnosis in that those who regard the condition as extremely rare and specific (e.g., Kanner, 1958), will be more cautious in making the diagnosis than will those who regard the condition as occurring more frequently and covering a wider range of symptoms. Finally, diagnosis may be dependent on who sees the child first. Referral to a neurologist, for instance, is more likely to result in the diagnosis of aphasia; to a psychiatrist, "autism" (Elgar, 1966).

A third area of difficulty is the varied terminology resulting from various attempts at sub-classification of the field of childhood psychosis, which have produced a "cult of names", signifying apparently distinctive syndromes (Anthony, 1958). Many of these terms have received no general recognition, although Mahler's (1952) concept of "symbiotic psychosis" remains fairly widely used (Rutter, 1968). References to less commonly used sub-classifications do, however, occur, with the consequent difficulty of establishing the extent of the clinical field covered by these terms (Creak et al, 1961). As mentioned earlier, (p. 3), even the more frequently used terms are not entirely free from such difficulties. As might be expected, a final terminological difficulty has been the use by different writers of the same term to describe different conditions, or different terms to describe the same condition (Rutter, 1966a).

Finally, in the field of child psychiatry, differential diagnosis poses tremendous problems. Frequently mentioned - but often ignored in practice - is the fact that childhood conditions have their impact, not on a mature and presumably fairly stable organism, but on one that is developing and will continue to do so, perhaps in compensatory ways, despite the effect of the condition. Thus a condition may be manifest in different ways at different stages of development, and what may pass for different conditions may represent different stages of the same condition (Anthony, 1958; Menolascino, 1965; Rutter, 1966a; Wing, J.K., 1966). Longitudinal and comparative studies might clarify the relative importance of differentiating symptoms, but lack of generally acceptable criteria for selection of samples has to date resulted in contradictory results from different studies, possibly because different selection criteria were used (Anthony, 1958).

Furthermore, interaction with different environments produces variable patterns of development and symptomatology (Rutter, 1966a; Wing, J.K., 1966), similar behavioural consequences arising from different causes and different behavioural consequences arising from similar causes (Baer, 1961). Goldfarb (1964), for instance, has noted, in a study of the effect of various types of parental reaction to a child's deviant behaviour, that "parental perplexity", involving passivity, little direction and an implicit encouragement of the child's behaviour, produced a clinical picture frequently diagnosed as "schizophrenic"; on the other hand, the child whose parents offered realistic acceptance and genuine direction, was more often assumed to be minimally brain-damaged.

Developmental considerations apart, the overlapping of symptoms, not only within the psychotic group, but with groups with assumed or demonstrated brain damage, is a further problem in differential diagnosis (Anthony, 1958; Baer, 1961; Rutter, 1966a; Wing, J.K., 1966). Even the pathognomonic symptom, autism, is now seen not to be exclusively restricted to psychotic conditions (Anthony, 1958; Menolascino, 1965), occurring even in clear cases of aphasia (Rutter, 1968). Nor is it clear to what extent evidence more commonly associated with other conditions precludes the diagnosis of ECA (Rimland, 1964). Usually, for instance, the acceptability of evidence of organic pathology, such as a positive EEG record, or a history suggestive of brain damage, is dependent on the diagnostician's theoretical viewpoint; particularly where such evidence is not considered acceptable, diagnosis by exclusion is a not infrequent phenomenon (Baer, 1961). It has been suggested that it is the severity of the symptomatology which distinguishes childhood psychosis (and ECA in particular) from non-psychotic conditions, but, as J.K. Wing (1966) has pointed out, general statements of severity are difficult to make in view of the extreme variability of the symptom pattern.

A further consideration is that ECA or related symptom-complexes may coexist with other conditions, such as mental deficiency, a possibility frequently overlooked in the rush to differentiate among childhood psychiatric conditions. A factor contributing to this tendency is no doubt the extreme difficulty of obtaining the "autistic" or psychotic child's co-operation for the purposes of administering standardized tests. Hence, subjective assessment has tended to characterize the "autistic" child as potentially of at least average intelligence (Kanner, 1943), a judgement not borne out by more analytical study of intellectual functioning (Alpern, 1967; Rutter, 1966b).

The foregoing survey has presented a rather gloomy picture of the state of diagnostic activity and has seemed to imply that research must inevitably be so hedged about with provisos regarding generalization, that it must necessarily be of limited value. The purpose of this discussion has not, however, been to propose a moratorium on research until problems of diagnosis are resolved. Indeed, research directed at the nature of the syndrome, its aetiology and treatment, must assist in providing a clearer picture of symptoms. The present confusion as regards diagnosis does, however, demand a cautious acceptance of findings, particularly as regards unwarranted generalization from very heterogeneous samples. Further discussion of research findings in this study should thus be viewed as taking place within this cautionary framework.

Such a proviso does not, of course, apply uniquely to the field of childhood psychosis, which merely mirrors the general inadequacy of psychiatric nosology (Rimland, 1964). Nor does it imply that no progress has been made in clearer delineation of the field. A number of carefully planned and executed studies have contributed to the more detailed descriptions so urgently needed.

Rutter's (1966a and b) study has provided both comparative data in relation to psychiatric disorders of a non-psychotic kind, as well as a longitudinal description, thus permitting evaluation of what symptoms are specific to "autism", as well as indicating the phasic character of certain symptoms. A detailed clinical description of behaviour observed in a number of sessions has also been provided by Norman (1954; 1955), whose study unfortunately lacked systematic comparisons with similar conditions. The domain to which the findings of both the above-mentioned studies can be generalized, however, is not clear, since somewhat heterogeneous samples, including subjects with onset at rather widely differing ages, were studied. Such studies have, nevertheless, indicated the direction for future research aimed at more precise delineation of the various syndromes of childhood psychosis. The work reported by Anthony (1958), in which attempts were made to compare the relative effectualness of a number of different bases for differential diagnosis, represents another possible line of investigation.

While confirmation of the findings of these studies is required, they have emphasized the need for caution in the application of criteria whose diagnostic status is as yet uncertain. It has seemed advisable, therefore, to adopt the point of view put forward, among others, by Evans (1968), who has advocated de-reification of the concept of "autism" and the use of the term in a descriptive sense, without any connotation that ECA is an entity. Such an approach implies that the use of the term, "autism", or related labels (such as ECA), to refer to a particular set of behavioural characteristics or to a group of children exhibiting such behaviour, is for convenience only and that no assumptions regarding a necessary relationship among either the symptoms or the children making up such a group is intended. Such a viewpoint has seemed particularly desirable if Creak et al's (1961) statement, that "diagnostic classification ..... rests ultimately on a clear understanding of causes" (p.501), is accepted.

Furthermore, the extent to which the various psychiatric disorders of childhood shade into each other (and into non-psychiatric disorders (cf. Wing, L., 1969)) has underlined the need for a multifactorial approach, with an emphasis on careful assessment of individual strengths and weaknesses, rather than injudicious labelling. Thus, Baer (1961) has noted that the regrettable tendency to dichotomize leads to classification which can neglect essential data, while Wing (1969) has pointed out that "when a child has a wide range of handicaps in all cognitive and motor functions ... and all the typical handicaps and behaviour of autism, ... a diagnostic label is much less use than a description of his handicaps, and the level of his development" (p.19). Such remarks are particularly apt with regard to treatment and education based on diagnosis, but apply also to research, where assumptions regarding the distinctiveness of particular syndromes may dictate not only the focus and method of research, but also the interpretation of results.

A conclusion which may be drawn from the fore-going discussion is that over-zealous attempts to obtain large samples of supposedly "nuclear" cases of an as yet incompletely defined condition, may have detracted from a more detailed understanding of the processes underlying the observed behaviour in individual cases. Indeed, comparative study of particular cases may offer a means of clarifying the importance of various symptoms, and even, the validity and usefulness of regarding ECA as a definable entity.<sup>1</sup> For purposes of generalization, however, selection of individual cases should nevertheless be based upon available criteria, some discussion of which was necessary also as a prelude to evaluation of theories regarding "autism" and a description of the present research.

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1. The potential usefulness of individual case studies has, of course, recently received renewed attention and has been discussed at greater length elsewhere in this study.(cf. Ch. X )

CHAPTER 111

Symptomatology and differential diagnosis.

As has been discussed above, a number of factors affect the relative importance attributed to various behaviour patterns as distinguishing criteria of "autism". There is, however, sufficient agreement regarding the pathognomonic symptom cluster to assure at least a fair degree of diagnostic consensus over a range of cases, if not invariably for any single case.

It should, therefore, not be necessary to discuss in detail the extensive and often contradictory literature on symptomatology. In order, however, to clarify the use of terms in the present study, some reference to diagnostic criteria - particularly as regards their application in differential diagnosis - and terminology was necessary.

The starting point for any discussion of symptoms must be Kanner's (1943) classic description of the syndrome which he later termed "early infantile autism". The major symptoms observed in the 11 cases which he reported were (a) "extreme autistic aloneness"; (b) a delay in the acquisition of speech, together with abnormalities of language (particularly pronominal reversal and echolalia); (c) excellent rote memory; and (d) an apparently obsessive desire for the maintenance of sameness. Kanner emphasized that an important feature differentiating the syndrome from other forms of childhood psychosis was the relatively early onset in infancy.

Subsequent writers (e.g., Eisenberg and Kanner, 1957; Creak et al, 1961; Rutter, 1966; Wing and Wing, 1968) have contributed to a more detailed description of the syndrome, although the extent of comparability of samples has not been clear.

The descriptions offered by these writers, however, although differing in detail, have provided a working framework within which discussion and study of the condition can proceed. The details of such a framework have been set out in Appendix C (in the form of a set of descriptions, used in the present study to obtain information about subjects) and need not be repeated here.

It should be borne in mind, however, that many of the features used as diagnostic criteria, have not been studied in controlled comparison among various psychiatric disorders of childhood. As Rutter (1968) has pointed out, such comparisons are essential to provide information regarding the clinical characteristics specific to any of the disorders.

Since Rutter's (1966a) study has been one of the few such comparative studies available, his findings have been noted in some detail, particularly since they included follow-up data. Unfortunately the sample studied was not entirely homogeneous, as the term "psychotic" to describe the group indicated. Nevertheless, the data regarding age of onset suggested that the sample would probably have been considered "autistic" by other workers in the field. (Rutter reported that onset was in early infancy, without a preceding period of normality, in the majority of cases, while about one-fifth of the sample had shown normal development until about 18 - 30 months).

Rutter (ibid) found that there was no symptom which was exclusively characteristic of the psychotic group as compared with the other groups. Moreover, only two characteristics, abnormal peer relationships and retarded language development, were present in all the psychotic children. Other features displayed by the majority - but not all - of the psychotic children were ritualistic and compulsive phenomena, unusual motility patterns, self-injury and a combination of poor concentration and non-distractibility.

The extent of overlap of symptoms among the various groups led Rutter to conclude that the differentiation between the psychotic group and the other groups lay to a large extent in the patterning, consistency and severity of the abnormalities, a conclusion also reached by Rimland (1964) and Wing (1966).

In summary, Rutter's (*ibid*) findings were similar to other general descriptions of "autism", but differed in certain details from commonly accepted assumptions regarding the syndrome. For example, autism, in the sense of aloofness and a lack of interest in people was a continuing characteristic, but social withdrawal, in the sense of actual physical withdrawal from people, was limited to a phase in early childhood. Sleep disturbance was not found to be more common amongst the psychotic group and occurred in only about one-quarter of the group. Similarly, hyperkinesis was not more common in the psychotic group and, where it was present, the pattern was very similar to that of non-psychotic groups. Finally, the "good cognitive potential" of "autistic" children (Eisenberg and Kanner, 1956) - frequently assumed on subjective grounds - was not confirmed, in that IQ was found to be remarkably stable and a good predictor of adjustment in all spheres in adolescence and adulthood, while improvement in emotional and social behaviour was not accompanied by a similar change in IQ.

The difficulties involved in any attempt to apply the above-mentioned criteria are, of course, formidable, as should be clear from the foregoing discussion. Hence, only the major areas of difficulty have been mentioned. Initially, consequent on the observation of abnormal reaction to sensory stimuli, differential diagnosis may be from deafness and, less frequently, blindness. Exclusion of any peripheral abnormality of hearing or sight and the variability of response to sensory stimuli would, however, tend to preclude either of these diagnoses (Wing, 1966).

Because of the difficulty of obtaining the co-operation of "autistic" children, even this differentiation may be impossible to make.

A further possible confusion is with mental retardation, particularly when speech is severely retarded. Such a diagnosis would, however, be excluded on the grounds of the extreme variability of intellectual functioning, as evidenced by the so-called "islets of intelligence", which contrast with the generally low level of intellectual functioning in ECA (e.g. Creak et al, 1961; Rimland, 1964; Rutter, 1966a). Excellent rote memory, relatively good performance on spatial tasks, such as the Seguin Formboard, and the lack of motor retardation are features which differentiate ECA from mental subnormality. Furthermore, the even course of mental retardation contrasts with the more variable pattern of development in ECA (Baer, 1961).

As regards brain damage, evidence of gross brain damage has tended to exclude the diagnosis of ECA (Baer, ibid). Differentiation from minimal brain damage in the absence of evident cortical involvement - the "brain damage syndrome" - is less easy. Differential diagnosis here involves distinction between (a) the incessant hyperactivity of the "brain-damaged" child and the more variable activity pattern of the "autistic" child; (b) the perseverative behaviour typical of "brain damage" and the more ritualistic nature of the stereotyped, repetitive activities in ECA; (c) the evident attempt to communicate by the "brain-damaged" child, as contrasted with the lack of interest and more consistent withdrawal of the "autistic" child (Robinson, 1961).

The communicative and language difficulties of ECA bear numerous resemblances to those characteristic of severe developmental aphasia - to the extent that a relationship between the two conditions has been suggested (Rutter, 1966a; Wing, 1966). Differentiation between these conditions has tended to rest on the severe social and emotional problems more characteristic of ECA (although they are also often present in aphasia) and on the more evident communicative attempts made by aphasic children (Wing, 1966).

The distinction from childhood schizophrenia is another area of difficulty, particularly as there has been considerable disagreement as to the grounds for such a distinction. When the distinction has been made, however, it has usually been on the basis of age of onset and the extent of freedom from disorder prior to onset. Thus, four to five years of age has usually been considered the upper limit for the onset of ECA, while normal development until this age has tended to preclude the diagnosis (Wing, 1966). The label, childhood schizophrenia, it has been suggested (Wing, 1966), should be reserved for a syndrome in which a recognizably schizophrenic picture develops in childhood, but prepubertally and after a period of normal development.

Further sub-classifications of childhood psychosis have been attempted, involving yet other problems of differential diagnosis; their uncertain nosological status has not, however, warranted their consideration here. It must be noted however, that this brief review cannot claim to have indicated the full complexity of the problems of differential diagnosis as they relate to ECA.

CHAPTER 1V

Approaches to Understanding ECA.

Attempts to bring theoretical order into the rather chaotic field of ECA have tended to be made in terms of the possible aetiology of the syndrome and the nature of the primary disorder. Since the findings of the present study did not bear directly on the question of the aetiology of ECA, a detailed discussion of the controversy regarding this question has not been included.<sup>1</sup> Some reference to the differing points of view was, however, considered necessary, inasmuch as aetiological assumptions have borne an intimate, but not always explicitly formulated, relation to conceptions of the nature of ECA.

The controversy regarding the aetiology of ECA has related to whether any defect assumed to be basic to the syndrome, is primarily psychogenic in origin, or whether such a defect can be attributed more directly to what might be termed constitutional factors, such as genetic, organic or maturational factors. Such a dichotomy is, of course, an over-simplification of the views expressed in the literature; few writers would deny that the behavioural pattern seen in ECA results from a complex interaction between constitutional and environmental factors. To the extent, however, that relatively greater emphasis has been placed on either of these factors, such a dichotomy does reflect the essential points of the controversy.

The implications of the above-mentioned controversy for conceptions of the nature of ECA have been, firstly, that any discussion of aetiology assumes the existence of a defined condition or group of conditions. Whether this assumption is justified as regards ECA, is open to question; the current lack of consensus regarding diagnostic criteria and the doubt which has been expressed regarding the value of regarding the syndrome as a disease-entity, has argued against too facile an acceptance of this assumption.

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1. For a critical discussion of theories regarding the aetiology of ECA, see Rutter (1968).

Thus, although research into aetiology may throw light on the nature of the processes involved in ECA, acceptance of aetiological data must be qualified by the uncertainty regarding symptomatology and the nature of the syndrome.

Secondly, it was necessary to consider the significance of the extent to which certain aetiological assumptions have been associated with particular conceptions of the nature of ECA. It has seemed noteworthy that the psychogenic-constitutional aetiological dichotomy has been paralleled by and linked to an affective-cognitive dichotomy as regards conceptions of the nature of ECA. Thus, psychogenic conceptions of aetiology have tended to be associated with the conception that ECA is primarily an affective disorder, the cognitive features being derivative. Constitutional conceptions of aetiology have tended, on the other hand, to be associated with an emphasis on the cognitive features of ECA, affective disturbances being regarded as secondary.

The relative merits of each of the above-mentioned combinations have not required consideration here. It is, however, necessary to be aware of the extent to which these opposing points of view have tended to obscure such issues as the mutual interaction between cognitive and affective aspects of the condition, or the quality of disorder implied in the terms cognitive and affective. For instance, as Ornitz and Ritvo (1968) have pointed out with regard to psychogenic theories of aetiology, "the predominance of disturbances of relating [at certain stages and with certain degrees of severity of ECA] coupled with the prevailing belief in the 1940's and 1950's that specific syndromes in children must be outgrowths of specific parental behaviours or attitudes ... led to a teleological view of disturbed behaviour. Thus, disturbances of relating, perception and motility have been described as defensive or protective ... " (p. 76). Such a viewpoint contrasts strikingly with an emphasis on the cognitive features of ECA, assumed to be constitutionally based, where affective disturbances, considered as secondary, have generally been described in terminology relatively free of psychodynamic interpretations.

Attempts to delineate more clearly the nature of a disorder primary to ECA have also tended to foster an approach which has appeared, in some respects, to be dedicated more to achieving a pleasing degree of theoretical tidiness, than to assisting in the formulation of a model capable of providing a coherent understanding of both cognitive and affective-social features of ECA. Thus, explanations of the syndrome have tended to be mutually exclusive, in terms of either cognitive or affective-social factors, a dichotomy which has ignored the fact that there may be many more than one determinant of any given abnormality.

Failure to take account of the multi-determination of behaviour has, moreover, resulted in contradictory interpretations of particular behaviours in accordance with different preconceptions regarding the nature of ECA. There has, for example, been considerable variation in the connotation of the term, affective disturbance, attributable, at least in part, to the difficulty of defining operationally those behaviours which contribute to the subjective experience of affective contact between persons. Creak et al (1961), for instance, justifying their inclusion of interpretations, rather than merely descriptions, of behaviour thought to be characteristic of ECA, stated that description alone proved inadequate "to convey what we all felt to be the heart of the matter - namely, the presence of an impaired capacity for human relationships, which observation alone, however acute, cannot discover" (p.502). Only comparatively recently have attempts been made (e.g. Norman, 1955; Rutter, 1966; Wing, 1966; Ornitz and Ritvo, 1968) to define those behaviours which, in "autistic" children, by their presence or absence, imply an affective disturbance: for example, apparent lack of response or inappropriate responses to emotion-provoking stimuli; sudden, inexplicable changes of mood; lack of eye-contact; failure to show sympathy or empathy with others.

Yet, as Wing (1966) has pointed out, such behaviours do not in themselves imply emotional disturbance - except as they are so interpreted by the observer. Nor are affective interpretations the only ones possible; indeed, other writers (Rutter, 1968; Wing, J.K.1966) have argued that such behaviour speaks more strongly of perceptual-cognitive disorder than of affective disturbance.

Means of choosing between alternative interpretations have been few, although experimental studies, still in their infancy, have begun to delineate more clearly the nature of the particular behaviours, providing less partisan definitions of the phenomena for which any theory of ECA must account. Such experimental studies have, however, been attempted mainly in relation to one group of hypotheses regarding ECA, namely those proposing a cognitive basis for the syndrome, whereas affective and social disturbances, considered primary in ECA, have tended to be referred to external factors as explaining their development, without much contextural study of the particulars of such disturbance. For example, Bettelheim (1967) has attached considerable significance to the supposed avoidance by "autistic" children of the personal pronoun, "I" - an avoidance subsequently disconfirmed in two independent studies (Bartak, 1969; Cunningham, 1968), in which the use of language in ECA was assessed in a carefully controlled fashion.

Nevertheless, in the absence of much experimental evidence regarding ECA, evaluation of interpretations has been dependent on the acceptance of debateable assumptions regarding aetiology and nature. Yet, where such assumptions have not been accepted, the creation of a straw man cannot do justice to the complexity of any given theory, which, while it may have failed to provide a comprehensive model of ECA, has frequently offered at least a partial understanding of certain "autistic" phenomena, not adequately dealt with by alternative theories.

Hence, in the present discussion, no attempt has been made to deal with the many conceptions of the nature of ECA - as a form of schizophrenia, or of mental subnormality, as an affective disturbance, as representing withdrawal from a hostile environment or as primarily based on anxiety.

Cognitive and, in particular, perceptual hypotheses regarding the nature of ECA have, however, been reviewed, both as a prelude to description of the present study and because there does currently appear to be a greater tendency to regard ECA as a syndrome stemming from some fundamental cognitive dysfunction, which has as its secondary, but, nevertheless, profound consequences, affective and social abnormalities. While the changing emphasis may represent the prevailing Zeitgeist, it has appeared that cognitive hypotheses are less subject to criticism on formal grounds. That is, such hypotheses, as compared with those proposing an emotional or social disturbance as the basis of ECA, show relatively greater parsimony and internal consistency, and are relatively more susceptible of experimental verifications.

## CHAPTER V

### Cognitive Dysfunction in ECA.

A number of hypotheses have been proposed in which perceptual and/or language dysfunction have been regarded as the primary source of disturbance in ECA. The consideration of ECA in these terms has arisen from the observation of certain behavioural analogies between ECA and, on the one hand, specific sensory defects, such as blindness, as well as behaviour under conditions of experimentally induced "sensory deprivation", and, on the other hand, severe developmental aphasia. Differences among cognitive hypotheses have, however, tended to represent largely differences in emphasis; in particular, hypotheses in which an important role has been assigned to language factors, have tended to carry the implication that language and perceptual factors are intimately associated in the production of the primary disturbance.

#### Perceptual dysfunction as primary in ECA

One of the nine diagnostic points listed by Creak et al (1961) was abnormal perceptual experience, in the absence of discernible organic abnormality, implied by excessive, diminished or unpredictable response to stimulation. Such behaviour has given rise to a conception of ECA in which some form of perceptual dysfunction has been regarded as primary, emotional and social disturbance being regarded as secondary. The terms in which the perceptual dysfunction have been conceived, have varied considerably; the various hypotheses have, however, appeared to share a characterization of the basic dysfunction as a disturbance in the ability to integrate and to provide organization and meaning to patterns of stimulation. Such hypotheses have referred most often to the visual and auditory modalities, with some mention of kinaesthesia and touch.

Other modalities have seldom been dealt with directly, except insofar as observable behaviour, such as abnormal response to painful stimulation, has appeared to support an hypothesis of perceptual dysfunction.

Any attempt to evaluate the perceptual dysfunction hypothesis has been complicated by the paucity of data concerning perception in "autistic" children. This lacuna has been largely due to the lack of satisfactory tools with which to assess perception in young children, particularly those whose language is poorly developed or absent (Rutter, 1966a). Recently, attempts have been made to assess perception in "autistic" children by means of carefully designed experimental studies. The main burden of evidence has, however, continued to rest on interpretations of certain behaviour patterns - with all the pitfalls consequent on interpretation. Only brief reference to the evidence, as it has usually been presented by proponents of the hypothesis that perceptual dysfunction is the basic disturbance of ECA, has been made here, for the sake of completeness. A more detailed critique, in the framework of the present study, has been reserved for a later chapter.

The behaviour patterns which have been considered suggestive of perceptual dysfunction are, firstly, the unusual pattern of reaction to sensory stimulation, manifest as hyper- or hyposensitivity (Anthony, 1958; Ornitz and Ritvo, 1968; Wing, J.K. 1966; Wing, L. 1969). Such abnormal patterns of sensitivity have been considered suggestive of disturbance in modulating sensory input, a defect which has been considered likely to interfere with the ability to integrate stimulation (Ornitz and Ritvo, 1968).

Secondly, there has appeared to be some evidence that "autistic" children make relatively greater use of proximal as opposed to distal sense modalities, at an age when distal modalities are achieving greater dominance in normal children (Goldfarb, 1956; Ritvo and Provenca, 1953; Schopler, 1965; Wing, 1969), suggesting a failure to utilize the distal modalities maximally in gaining knowledge of the environment.

Thirdly, it has been suggested that certain behaviour patterns of "autistic" children can be interpreted as indicative of failure to achieve perceptual constancy and object permanence, and of "body image" disturbance. For example, a tendency to treat parts of the body in a way which implies failure to appreciate the continuity of the body has suggested that "autistic" children may have difficulty in integrating into a whole all the experiences relating to the body (Norman, 1954).

With disturbances of a perceptual nature as primary, it has been proposed that the emotional and social abnormalities of ECA are a logical consequence. For example, where no distinction between self and other exists, relationships could not develop (Schopler, 1965) and, where complex stimulation, epitomized by the unpredictable, changing human, remains chaotic and unintegrated, such stimulation might be avoided (Evans, 1968). The characteristic, repetitive motor behaviours - rocking, whirling and the like - have usually been conceived as in some way compensatory, possibly providing a certain, minimal amount of predictable stimulation, or serving as a means of modulating sensory input (Rutter, 1966a; Stroh and Buick, 1964).

Multiple interactions between the primary dysfunction, the secondary disturbances and the response of the environment, particularly the family, have appeared likely to complicate the expression of each of these factors (Wing, 1966).

Criticisms of the perceptual hypothesis have, in the first place, revolved around the validity of the interpretations of behaviour, made in terms of the assumption of a basic perceptual dysfunction. Thus, it might be argued that there is no reason intrinsic in the perceptual hypothesis, which permits choice between it and alternative interpretations, such as, for example, those offered by Bettelheim (1967), in terms of withdrawal by the "autistic" child consequent on overwhelming rejection by his parents; or by Bender (1956), in terms of differing modes of defense against anxiety. It has, however, seemed that a greater range of behaviour can be explained in terms of the perceptual hypothesis. For example, as Evans (1968) has stated, in discussing the hypothesis that the "autistic" child's behaviour is not well integrated with complex environmental stimulation, "the autistic preoccupation with patterned stimuli and behaviour directed towards the preservation of order and sameness in the environment seems .... to be far better considered in this same light than in terms of obsessions and compulsions, which are extrapolations from adult psychiatry and quite inappropriate" (p.5).

Certain behaviour patterns characteristic of "autistic" children have, nevertheless, not easily been accommodated within the perceptual hypothesis.

Thus, extremes of visual avoidance, such as those reported by Norman (1955), in which "autistic" children actively interposed some obstacle or took up positions by which they avoided face-to-face contact with others, have appeared to go beyond the bounds of compensating for an inability to cope with complex stimulation.

While the above-mentioned anomalies have reflected on the adequacy of the perceptual hypothesis, the ability of the hypothesis to account for data from more carefully controlled studies of perceptual functions has appeared to be a more crucial test of the worth of further investigations in terms of the hypothesis. Such studies have been relatively few, but have provided some evidence regarding responsiveness, dominance relations among modalities, perceptual-motor integration, discrimination, discrimination learning and object perception. Evidence from such studies has tended to confirm the general concept of perceptual disturbance in ECA, but has indicated that the hypothesis requires considerable refinement. In particular, reconceptualization must make allowance for fluctuations in the level of perceptual functioning, incorporating the effect of changing conditions both within and without the perceiver.

Speech abnormality as primary in ECA.<sup>1</sup>

One of the most striking and persistent symptoms of ECA is the abnormality of speech development, its importance being evident in the fact that the diagnosis is frequently in doubt until the age when the child should be beginning to speak (Wing, L., 1966). Yet, because difficulties in understanding language are seldom apparent in early childhood and because of the presence of other, more obvious and pressing behavioural abnormalities, speech disturbance has, until recently, tended to be regarded as a secondary consequence of some other disturbance, such as social withdrawal. Within the last decade, however, attention has been turned to the possibility that the basis of ECA may lie in the speech abnormality.

The hypotheses arising from the study of speech abnormalities in ECA, as mentioned above, have differed from those which propose a fairly general perceptual disturbance as the basis of ECA, mainly in emphasis.

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1. Insofar as the present study has been concerned with aspects of visual perception in ECA, extended reference to hypotheses regarding other aspects of cognitive functioning has not seemed necessary. It has, however, seemed important to mention the major alternative cognitive hypothesis, not only because it has been advocated by some of the most prominent investigators of ECA, but also to emphasize that the focus of the present study on one aspect of perception was not intended to imply that other aspects of perception (and of psychological functioning in general) may not prove to be as or more important in ECA. The dichotomizing tendencies among workers in the field of ECA may be judged from the necessity for this caution.

Thus, in what may be termed the language hypothesis - more accurately, the auditory imperception hypothesis - greater emphasis has been placed on hypothesized auditory perceptual disturbance than on other forms of perceptual disturbance, although it has usually been acknowledged that the latter may also play an important role in ECA.<sup>2</sup> Stated more formally, the auditory imperception hypothesis has assumed that the basic dysfunction in ECA is an impairment in the comprehension of sounds - or, more narrowly, speech - such that the "autistic" child, while possessing intact receptors at the peripheral level, is incapable of understanding what he hears (Rutter, 1966a ; 1968).

In terms of the auditory imperception hypothesis, other characteristic features of ECA are either directly derivative of the inability to integrate auditory stimulation or arise indirectly as attempts to compensate for the primary dysfunction. Thus, for example, "some aspects of the disturbance in affective contact may stem fairly directly from an inability to comprehend the spoken word and especially the nuances and subtleties of abstract concepts, humour and expression of emotions ... [which] may result in a lack of empathy ..... and difficulties in forming interpersonal relationships" (Rutter, 1968, p.21).

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2. In the interests of brevity, the present discussion has been confined rather narrowly to auditory imperception, as related to the speech abnormalities of ECA. The discussion of perceptual disturbance in the previous section should, however, be considered complementary to the outline given here.

The evidence for the primacy of auditory imperception in the genesis of ECA has been admirably discussed by Rutter (1968). Firstly, absent, retarded or deviant language development is almost invariably a prominent feature of ECA and is frequently evident very early in life. Secondly, language is significantly associated with outcome and speech remains most the symptom recalcitrant to improvement. Thirdly, the pattern of cognitive abilities displayed by "autistic" children is highly associated with the level of speech development and is similar to that found in severe, developmental language disorders. Finally, both syntactic and semantic structuring have been shown (Hermelin, 1968) to be adversely affected in "autistic" children.

Objections to the hypothesis have been made, mainly with regard to supposed selectivity in the language usage of the "autistic" child and to the fact that not all children with defects in the perception of sounds become "autistic". Rutter (1968) has, however, argued that selectivity in language usage has not been adequately established, but has acknowledged that additional intellectual or perceptual defects or psychogenic factors are probably important in the development of ECA.

In conclusion, the hypothesis of a basic defect in auditory perception, particularly of speech, has appeared to offer a partial explanation of certain features of ECA. Study of the nature of the processes involved and their relation to other psychological processes has, however, appeared necessary for a fuller understanding of the extent of the "autistic" child's difficulties in comprehending his world.

CHAPTER VI

Definitions of Perception

Much research into ECA has appeared to have been based upon a discontinuity hypothesis, in which qualitative rather than merely quantitative differences between states of mental health and illness are assumed (Eisenberg, 1966). However, it has seemed that such discontinuity can only be demonstrated by exploring the extent to which differences reflect real rather than apparent disturbances of functioning, within a framework which permits comparison, both empirically and theoretically, with normality and with other childhood psychiatric conditions. Furthermore, developmental reference points have appeared necessary so that the influence of changing capacities and changing environmental demands on the clinical picture and the underlying processes may be assessed. Such a framework has appeared necessary in order to permit understanding of both that which is abnormal and bizarre, as well as the more normal features of functioning in ECA.

With regard to the provision of a theoretical framework, it should not be thought that theoretical considerations have been ignored in the field of child psychosis. Particularly where emotional-social abnormalities have been the focus of study, much reference has been made to psychoanalytic concepts.

It may be argued, however, that excessive reliance by some writers on psychoanalytic concepts - particularly where cognitive features have required explanation - has resulted in the over-extension of the meaning of these concepts and in the introduction of new concepts only tenuously related to the key constructs of the system.

On the other hand, much research into child psychosis has been characterized by an empirical approach in which little attempt has been made to relate findings to a unifying explanatory system, extending beyond the narrow confines of childhood psychosis.<sup>1</sup> It seems possible that this narrow view has been at least partially responsible for "a conception of childhood psychosis as a bizarre, atavistic condition that transforms the affected person into some kind of psychological monstrosity" (Anthony, 1958, p. 211).

Choice of a theoretical framework has, however, presented certain problems, in that most theories of cognitive processes have not explicitly indicated how abnormalities may arise. It has, therefore, been necessary to attempt to reconstruct a psychopathology by inference from a model of normal processes.

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1. A notable exception has been the work of Hermelin and O'Connor, now summarized and integrated in "Psychological Experiments with Autistic Children" (Pergamon, 1970), in which an approach similar to that adopted here, has been followed.

Since, however, similar inferences may be drawn from alternative theories, choice of any particular theory in the present context seemed largely arbitrary. Hence, it seemed advisable to consider a number of theories in attempting to deduce how abnormalities may arise, the degree of consistency of inference achieved serving as a partial test of validity of inference.

There have appeared to be at least two approaches to the definition of perception which are relevant to the study of perception in ECA. The first involves reference to theoretical conceptions of the psychological processes denoted by the term, perception.

One view has it that perception is indistinguishable from and isomorphic with the responses which indicate its existence and character. Brown (1961), for instance, has suggested that a sufficient account of behaviour can nearly always be given in terms of stimuli and responses and that it is, therefore, unnecessary to invoke perception as an explanatory concept. Indeed, according to Mann (1970), the term, perception, represents no more than an organizing word which facilitates communication by describing certain phenomena, circumscribing areas of investigation and summing up a range of behaviours from visual discrimination to social appreciations.

The above-mentioned views have, however, been criticised, insofar as they imply that rules and modes of organization are entirely given in the environment, thus ignoring the contribution of the organism to the perceptual process.

Neglect of organismic factors in perception has resulted in a failure to account for the flexible execution of learned responses (Campbell, 1956); the invariance of certain percepts such as object, space, constancy and motion, which are not directly given in the environment, but are abstracted from the total array of stimulation (Gyr et al, 1966); and the effect of language, set and attention on perception (Kanfer, 1956). Such phenomena testify to the active role of the organism in exploration, involving a search for stimulation and variation in sensory input (Gyr et al, 1966); selective attention to certain aspects of the environment (Campbell, 1956); processing of sensory input, through the special contribution of the organism's past experience, neurophysiological structure and through interaction with other aspects of psychological functioning (Gyr et al, 1966).

In the light of the above criticisms, it has appeared that perception cannot be considered merely a descriptive label for a field of study, or for a particular kind of association between stimulus and response. Rather perception has been conceived as a theoretical construct, referring to processes which have been assumed to intervene between stimulus conditions and the various overt responses which, together, indicate the existence and nature of these processes. Moreover, the intervening processes have been considered not merely a passive link between stimulus and response, but an active system, transforming sensory input, through selective, organizational and predictive operations.

Most relevant to the focus of the present study has been, firstly, that since the organism's capacity for processing stimulation is limited, perception involves selection of the relevant from a variety of competing inputs (McGhie, 1969). Certain aspects of input are supported and magnified, the influence of competing aspects is attenuated and certain characteristics of input are isolated (Fellows, 1968).

The selective aspect of the perceptual process has been assumed to be initiated by an orienting response which serves to expose the receptors to a given range of stimulation (Fellows, 1968) and to alert the organism to the general features of stimulation. According to Fellows, orienting responses may be elicited by stimulation other than, for example, the discriminative stimulus in a discriminative learning situation, and may be unlearned (dependent on factors such as novelty, intensity or complexity of stimulation) or learned (as, for example, when the orienting response is elicited by the invariant features of a familiar situation).

Perceptual decoding of some set of stimulus characteristics then occurs, consisting perhaps, as Piaget has suggested, of a succession of samplings ("encounters"), involving on each occasion different elements of the perceptual system and of the stimulus pattern (Flavell, 1963). Although Piaget has not specified in concrete terms the nature of such samplings, the concept appears analogous to what Zaporozhets (1965) has termed effectory components of perception, such as the movements of the hands in touching an object or of the eyes in following the outline of a figure. Zaporozhets has proposed that effectory components of perception, through their exploratory, reproductive and corrective nature, facilitate preliminary analysis and synthesis of stimulation. Fellows (1968) has made a similar suggestion with regard to visual decoding. He has suggested that voluntary eye-movements and implicit scanning, (an internalized, faded version of overt eye-movements), facilitate perception by focussing on and analysing important distinguishing features of patterns of stimulation.

Comparison amongst patterns of stimulation has also appeared to facilitate decoding (Jeffrey, 1969), as do repeated glances, involving different samples of visual stimulation (Alluisi, 1960). The detrimental effects on visual perception of stabilizing the retinal image, thus preventing involuntary nystagmus, or of tachistoscopically exposing figures, thereby preventing effective exploration (Fellows, 1968) have appeared to bear out these views.

Stimulus selection is not accomplished entirely through selective orientation of the receptors, however. "The perceiver can modulate centrally the stimuli which have impinged upon his sense organs ... depending on the significance of the stimulus [to the perceiver]" (Maccoby, 1969).

The preliminary analysis and synthesis involved in perceptual decoding may operate in accordance with informational models, in which stimulus characteristics containing most information have been assumed to receive priority at the expense of other characteristics which are predictable, and, therefore, of low information value (McGhie, 1969). The question of what stimulus characteristics are informative is difficult to answer, since there is not yet available a means of determining which of many possible physical measurements is psychologically relevant (Attneave and Arnoult, 1956). One approach to the definition of information value has been to consider rational procedures which might deliberately be used to reduce redundancy (Attneave, 1954). Such procedures, operating in perception, may be derived from experience of naturally occurring distributions of information, such as, for example, in the case of shape, contour, differentiation of stimulation and relations among stimulus factors, or, in the case of colour, variations in saturation, contrast and type of surface.

Furthermore, experience of the interdependence of stimulus events in space and time, within a context, may be assumed to facilitate information selection. Procedures such as those mentioned, probably function in a complementary and, to some extent, over-lapping fashion, ensuring that most percepts are over-determined and, hence, consistent over time.

Secondly, perceptual processing serves to organize input, supplementing and transforming it in terms of the existing characteristics of the perceptual system, but also permitting modification where novel inputs cannot be accommodated within the existing system. Such perceptual processing has been conceived in terms of Forgas's (1966) suggestion that perception involves a hierarchy of stages, each stage involving progressively more complex organizations of input, in which the active, selective aspect of perception becomes increasingly apparent. These stages, identifiable in terms of the resultant responses, are the following:-

- (1) detection of stimulus energy (for example, light) and discrimination of changes in stimulus energy;
- (2) discrimination of a unified brightness or figural entity, separate from the background;
- (3) resolution of finer details and the emergence of a more differentiated figure;
- (4) the identification or recognition of a form of pattern;
- (5) the manipulation of the identified form or pattern as in problem solving or naming, still however dependent on immediately present stimulation.

The third phase of perceptual processing, resulting from perceptual organization, is a prediction regarding the nature of stimulus input, in the form of an initial, identifying (perceptual) response, related to some dimensional pattern of stimulation, followed sometimes, by an instrumental response contingent on one or more identifying responses (Kanfer, 1956). Thus, although perception is measurable only in terms of relationships between patterns of stimulation and instrumental responses, perception has been conceived as occurring preparatory to the instrumental response. Such a distinction has been supported by the differential results obtained when recognition as opposed to reproduction is required (Diller and Birch, 1964), while the flexibility with which learned responses are executed, has suggested the existence of prior, selective perception of the environment (Campbell, 1956). Originating from both identifying and instrumental responses, feedback concerning the appropriateness of such responses occurs, contributing to reinterpretation and re-evaluation of the central organizational and selective aspects of perception in particular, but also modifying the basis for future predictions.

Perceptual processes have been assumed to be distinguished from other cognitive processes chiefly by the probabilistic and sensorimotor nature of the former, stemming from their dependence on immediately present stimulation (Flavell, 1963; Gyr et al, 1966; Zaporozhets, 1965). In other respects, however, perceptual and other cognitive processes have not been conceived as sharply distinct. Indeed, such distinctions as have been made have tended to detract from the essential continuity of psychological processes, as illustrated by the frequently neglected possibility that such processes may mutually affect one another.

Forgus (1966) has pointed out that reciprocal interaction among psychological processes permits, for example, the production of more powerful systems of perceptual organization, mediated by concepts; thus the more complex aspects of perceptual processing appear to involve simple concept formation (for example, the perceptual constancies and perception of object character).

Finally, it has been assumed that perceptual processes are not given in the neonate, except insofar as the range of sensitivity of the sense receptors and reflexive reception of light, necessary to instigate perceptual processing, are in-built. Perceptual processes have been assumed to develop through progressive modification, integration and differentiation, involving qualitative and not merely quantitative changes.

This view of perceptual processes may be related to a second approach to the definition of perception, involving the classification of behaviour in terms of certain functional categories, such as the sensory modality or modalities involved, the form of stimulation processed and the nature of the final response. Examples of such categories are: visual size discrimination, auditory pitch discrimination, tactile form constancy, "body image" (involving various types of behaviour in response to many forms of stimulation relating to the body) and object character (involving behaviour in response to many aspects of stimulation relating to specific objects). Such functional categories have been conceived in terms of the hierarchical conception of perceptual processing outlined above which has appeared capable of accounting for functional differences and relations in terms of the complexity of organization involved.

Figure-ground discriminations, for example, appear to involve relatively simple organizational operations (stage two of Forgas's (1966) hierarchy), whereas perception of more complex patterns, object percepts and "body image" involve more complex organizations of input, involving integration of stimulation from various modalities and interaction with other psychological processes (stage four to five). Even although more complex cognitive operations contribute to some of the above-mentioned organizations of input, they have nevertheless been conceived as perceptual in that they are initiated and remain to a large extent dependent on immediately present stimulation.

In the light of the definitions of perception outlined above, certain preliminary remarks regarding perception in ECA could be made. Firstly, many of the symptoms displayed by "autistic" children can be interpreted as evidence of a failure to process input adequately. For instance, repetitive play and insistence on sameness appear to have the effect of limiting the range of stimulation which must be processed. Preference for the use of proximal as opposed to distal receptors is suggestive of a failure to process stimulation adequately, particularly as regards the integration of stimulation from the various modalities. Failure to treat objects as wholes might indicate failure to make use of information reducing techniques to group details into a whole. The apparent failure to comprehend the appropriate function of objects, too, is suggestive of a failure to process all the information relating to an object, or to make use of feedback regarding the appropriateness of responses.

Secondly, the available evidence has suggested that perception in "autistic" children cannot be considered uniformly disturbed. It has appeared that although certain stimulation can be adequately processed, the perceptual processes of "autistic" children have not become sufficiently broadened and complex to cope with more complex stimulation under certain conditions, the nature of which require clarification.

In attempting to provide the necessary clarification, it has appeared essential as a first step, to seek additional grounds for proposing the existence of perceptual dysfunction in ECA, since alternative interpretations of the behaviour, mentioned in connection with the above two points, are possible. Furthermore, the rather ambiguous results of the few available experimental studies of perception in ECA have needed to be taken into account. The difficulties of distinguishing the effects of a limited response repertoire from those effects more directly attributable to perceptual factors have appeared to demand a rationale capable of indicating that specifically perceptual processes are disturbed in ECA.

Chapter VII

Factors affecting perception and perceptual development in ECA.

Studies of perception in ECA have tended to be based on the assumption that perceptual-cognitive impairments are and can be shown to be basic in the genesis of ECA. The available evidence has, however, been ambiguous with respect to this assumption. Moreover, the presence in ECA of a variety of behavioural problems should serve to warn against exclusive concern with one aspect of psychological functioning. As Mann (1970) has pointed out, the co-existence of certain defects cannot be interpreted as necessarily indicating a causal relationship; unless a pan-cognitive or pan-perceptual position is adopted, it is invalid to treat perception as the prime or even the major deficit area to be studied or treated. That multiple influences and interactions are involved in the production of any pattern of behaviour characteristic of ECA has been commonly acknowledged, but few writers have made serious efforts to build these influences into their hypotheses regarding the nature of ECA.

In the present study, although it has not been assumed that perceptual impairment is the primary disorder of ECA, perceptual functioning has nevertheless been considered an important feature of the syndrome. Following Mann, however, consideration of psychological functions in isolation from one another has been considered untenable. Only an interactional approach has seemed capable of yielding any understanding of the complexity of ECA.

In attempting to adopt an interactional approach, reference has been made to factors which have appeared to influence normal perception and perceptual development. The way in which such factors are commonly manifested in the "autistic" child's development has permitted inferences regarding the "autistic" child's perceptual functioning.

Such inferences have, however, been tentative since much developmental research in perception has been characterized by inadequate sampling techniques (for example, the use of selected age groups), inappropriate statistical analyses and mechanical application of techniques of assessment, without regard to the effect of chronological age (Wohlwill, 1960). In neonatal research, the limited response repertoire of the infant has been a major handicap. The frequently used method of stimulus preference has the disadvantages that, firstly, failure to exhibit preference cannot be taken - as has been done - to indicate inability to discriminate; and, secondly, the method does not provide much information regarding the course of development or the mechanisms underlying the discrimination (Epstein, 1967). Thus, although it is possible to demonstrate a number of general and specific unconditioned reflexes - for example, sensitivity to light - the nature of the processes involved, has remained unclear. Spears and Hohle (1967), in a recent review, concluded that "nearly a century of observations and formal experimentation has failed to provide consistent information on the development of colour discrimination in the young child" (p. 67). Nor were these authors more sanguine regarding current understanding of other aspects of perceptual functioning. Even where age differences have been reliably demonstrated, the further, crucial problem of identifying the underlying processes has frequently been neglected (Epstein, 1967).

It has, nevertheless, appeared worthwhile to attempt to show that factors which have been considered by a number of writers to be related to perception and perceptual development, do not exert their full influence in ECA. While such factors may (and probably do) affect other functions as well, it has been argued that the relative deficiency or altered manifestation of these factors jointly in ECA is also particularly likely to result in some form of perceptual disability.

(1) Characteristics of stimulation.

In recent years it has been recognized that a variety of dimensions may influence growth and that an intricate chain of causation underlies what was once thought to be simple and straightforward relationship among relatively few, rather grossly defined variables. The nature and quality of stimulation provided in infancy and early childhood has been seen as one class of variables which may have enduring effects on psychological development (Elkind, 1967).

Stimulation characteristics have been highlighted, in particular, by research into the effects of so-called sensory deprivation on behaviour and development.

The initial enthusiasm regarding the implications of these studies has, however, been somewhat dampened by a number of serious criticisms of the studies and the concept, such as the unsystematic use of the term, sensory deprivation (Kubzansky and Leiderman, 1961), failure to control adequately the large number of potentially confounding variables (Kubzansky and Leiderman, 1961; Freedman, Grunebaum and Greenblatt, 1961; Ruff, Levy and Thaler, 1961) and methodological defects, such as inadequate methods of data collection (Kubzansky and Leiderman, 1961).

Many of the findings arising out of sensory deprivation research have, as a result, appeared incapable of integration and the underlying mechanisms have remained obscure (Dember, 1960; Kubzansky and Leiderman, 1961). On one point, however, most investigators of sensory deprivation are in agreement, namely that stimulation cannot be regarded as merely one element of an S-R chain, or something to be acted upon in a process of cognitive reorganization. Sensory deprivation research has emphasized the nature and patterning of stimulation - that, in the absence of certain characteristics, variously described as variety or heterogeneity (Bruner, 1961; Kubzansky and Leiderman, 1961; Solomon et al, 1961), complexity (Kubzansky and Leiderman, 1961) and a certain repetitiveness or order (Kubzansky and Leiderman, 1961; Freedman et al, 1961), psychological functioning and development in general (Solomon et al, 1961; Kubzansky and Leiderman, 1961) and perceptual organization and development in particular (Bruner, 1961; Freedman et al, 1961) become considerably less efficient.

Research into normal perceptual development has tended to confirm that certain stimulus characteristics are importantly related to perceptual functioning. Investigation of stimulus selection behaviours, in particular, has suggested that orienting behaviour is evoked more easily by relatively novel or complex stimulation (Bronshtein and Petrova, 1967; Cantor, 1963; 1969), or discrepancies between familiar and novel stimuli (Bronshtein and Petrova, 1967; Jeffrey, 1969), while the more central aspects of selection are facilitated by the extent of difference and variety in and the relative familiarity of stimulation (Maccoby, 1969).

Observation of certain behavioural similarities between "autistic" children and Ss of sensory deprivation research has led to the postulation of a more fundamental link between the two conditions. Thus, Stroh and Buick (1964) have considered the behavioural similarities as supporting the view that perceptual dysfunction is the basic disturbance in ECA. Adopting a more definite stance, Solomon et al (1961) stated that "the symptoms of the deprived child with 'atypical' or 'autistic' reactions are without doubt related to the phenomena seen in adults after experimental sensory deprivation" (p. xviii), while Rimland (1964) has assumed that ECA is in fact a "sensory deprivation psychosis".

Any broad equation of the consequences of sensory deprivation with the behaviour of "autistic" children is, however, open to serious criticism. Comparison with adult Ss must take account of the relatively short periods of confinement and the existence of a framework of memories, providing some means of compensating for the lack of patterning in stimulation.

As Bettelheim (1967) has pointed out, moreover, experimental studies of sensory deprivation "exclude the one fact that .... makes an experience extreme: its inescapability. To know that one can interrupt an experiment at will keeps the experience from being totally overwhelming. It is precisely the irrevocable .... that so destroys personality" (pp. 7 - 8). In respect of developmental level and relative psychological immaturity, the use of young animals has been slightly more analogous, but assessment of similarities has been subject to all the hazards of cross-species comparison. Moreover, account must be taken of possible differential mechanisms in sensory deprivation imposed through the experimental reduction of certain external cues, versus deprivation arising out of some presumed limitation of the perceptual apparatus.

It has, therefore, appeared necessary to investigate the existence of common aspects of the process of deprivation rather than of the consequent behaviour. In this regard, what has appeared significant is that certain aspects of the behaviour of "autistic" children seem likely to produce conditions similar to those of sensory deprivation. Thus, firstly, the characteristic simple, repetitive mannerisms (for example, head-banging, scrutiny of slow, writhing movements of the hands, as well as more vigorous hand-flapping, rubbing surfaces and whirling or spinning tops) (Ornitz and Ritvo, 1968) and the long periods of non-directed gazing have appeared likely to produce simple, unvarying stimulation. Such behaviour of a non-object oriented kind was observed under a number of conditions and found to occur more frequently in psychotic SS than in subnormal controls, although the amount of exploration and orientation towards stimuli was similar in both groups (Hermelin and Connor, 1963).

Further investigations (Hermelin and O'Connor, 1970), discussed more fully below (p.48), have suggested that stereotyped behaviour, while not interfering with responsiveness in terms of orientation, may reflect inadequate central processing of stimulation.

The relationship between stereotypies and complexity of environmental stimulation is unclear. Hutt, Hutt, Lee and Ounsted, (1964) have reported that stereotypies in "autistic" children increase with increasing complexity of the environment, but are much reduced under conditions of relative sensory deprivation, as in an empty room. Hermelin and O'Connor (1970), on the other hand, found no increase in stereotypies with increasing complexity of the environment and concluded, therefore, that such behaviour could not be interpreted in terms of stimulus avoidance due to a state of over-arousal. Of importance in the present argument, however, has been the fact that whatever the intent of such stereotypies and non-object directed behaviour and whatever other functions they may serve, their effect is to reduce severely the possibilities for full encounter with those qualities of stimulation considered essential to perceptual functioning and development.

Secondly, obsessive insistence on the maintenance of sameness, considered by Kanner (1943; 1951) to be a key characteristic of ECA, would automatically restrict the extent of variety of stimulation. Thus "the totality of an experience .... must be reiterated, often with all its constituent details, in complete photographic and phonographic identity. No one part ..... may be altered ...." (Kanner, 1951, p.23). However, as pointed out by Hermelin and O'Connor (1970), concepts such as "insistence on sameness" and "resistance to change" cannot be treated as unitary, but should be defined and tested for their relevance to particular situations.

For instance, exploratory and orienting responses to relatively novel stimuli were not found to differentiate "autistic" from subnormal children, but there seemed to be faster adaptation to stimulation in "autistic" children.

Investigations of task-directed behaviour suggested a tendency in "autistic" children to persist in a once-given response rather than select an alternative one, despite changes in stimulation (Hermelin and O'Connor, 1970). The findings of faster adaptation and rigidity of response have suggested that limited processing of information, in stereotyped ways, rather than lack of attention to novel stimulation occurs in "autistic" children, implying that "exclusion" of variety occurs at a central level.

Any departure from the accustomed appearance or sequence is likely to provoke paroxysmal anxiety, such as is further likely to discourage attempts by others to introduce novelty and complexity into environmental stimulation (Wing, 1966; Elgar, 1966).

It has thus seemed that, whether or not other factors, such as a constitutional barrier (Anthony, 1958), or conditioned inhibition of sensory reception (Evans, 1968) exclude stimulation, the kinds of behaviour mentioned above must have far-reaching effects in terms of reducing the extent of variety, novelty and complexity of stimulation which the "autistic" child encounters. Hence, in terms of the earlier discussion, to the extent that such qualities of stimulation are reduced, the perceptual functioning of and development of "autistic" children has seemed likely to be adversely affected.

(2) Affect and Perception.

The role of affect in the development of perception, highlighted by Schachtel (1959) who described perceptual development in terms of a shift in modes of perceptual relatedness with the world, has recently received renewed attention. Elkind (1967) has pointed out that for the infant, much more than for the older child and adult, intellectual and affective functions are undifferentiated and that affective factors play a crucial role in perceptual development. Thus, for example, the recognition by the end of the first year of a variety of objects and patterns of stimulation across changes in context is achieved on the basis of affective rather than cognitive features. That is, constancy is achieved largely in terms of the positive or negative feeling tone associated with the patterns of stimulation. As the child grows older, "objects come to mean 'what they can be used for' in addition to 'how they make one feel' " (Elkind, 1967, p. 382), but functional and affective meanings continue to co-exist, although the importance of the latter becomes considerably reduced, except in certain circumstances.

Thus, "for the growing organism whose intellectual capacities are in the process of development, emotional disturbance can be catastrophic" (Elkind, 1967, p. 365). Anxiety, in particular, has been shown to reduce the effectiveness of a wide range of cognitive functioning. As regards perception, anxiety has been found to restrict attention-span and narrow the perceptual field, making individuals less aware of features of the environment and less able to utilize relevant information (Broadbent, 1958; Lazarus, 1963).

Anxiety may in addition result in the avoidance of novelty and complexity (Lazarus, 1963), limiting perceptual development insofar as such development depends on interaction with a varied environment. Anxiety does not always have such destructive consequences, on occasion even mobilizing individuals towards more effective performance, as, for example, when dealing with simple or familiar stimulation (Lee, 1961). But there has appeared little doubt that, in many circumstances, anxiety does impede perceptual functioning and development.

Kanner's (1943) characterization of ECA as being primarily a disturbance of affective contact has remained influential and affect in general and anxiety in particular have continued to be regarded as key features of the syndrome. As mentioned earlier (p. 19) however, there has been considerable variation in the connotation of the terms, affect and anxiety, and behaviours frequently interpreted as evidence of lack of affect, are capable of alternative explanations, based on arguably sounder grounds. Tubbs (1966), for instance, has shown that expressive gestures in demonstrating the use of objects are notably disturbed in "autistic" ss as compared with subnormal and normal controls, suggesting that the absence of expressive gestures is not confined to social situations, but must be regarded as a more general, cognitive rather than affective disability (Hermelin and O'Connor, 1970)

Such affect as is displayed by "autistic" children, however, frequently appears inappropriate, in that it is inadequate, abnormally intense or apparently unrelated to the situation which evokes it (Norman, 1955; Ornitz and Ritvo, 1968). In terms of the discussion above of the role of affect in early cognitive development, such atypical affect has seemed likely to interfere with cognitive development.

As regards perception, the absence of consistent affective patterns must severely limit the extent to which patterns of stimulation can be organized and recognized in terms of feelings consistently associated with the stimulation. Moreover, if affective bases of meaning are poorly developed, it might be expected that the development of functional meanings, dependent in part on the prior existence of the more primitive basis, would be distorted and delayed. Similar views have been expressed by Deslauriers and Carlson (1969), who have implied that the failure of "autistic" children to experience affect at milder levels handicaps them in the integration of experience; and by Norman (1954) who has concluded that the failure of integration of the various aspects of body experience in "autistic" children is in part attributable to failure to link "the child's feelings ..... with himself as .... moving, active ... tangible and at least partly visible" (p. 137), the inconsistency of affect and its tendency to be delayed being particularly damaging.

A further aspect of the affective functioning of "autistic" children relevant to the development of perception is the "acute, excessive and seemingly illogical anxiety" (Creak et al, 1961, p. 502) which has been considered an important diagnostic criterion and, in the opinion of certain writers (Mahler, 1952; Creak, 1953; Bender, 1956), the key process in childhood psychotic conditions, including ECA. Such anxiety has been reported as occurring most frequently in the context of even minor changes in the rigid and exact ordering of the environment on which many "autistic" children seem so dependent (Kanner, 1951; Norman, 1955).

Such anxiety might be expected to interfere with perceptual development by constricting attention at any given moment and, as mentioned above (pp. 47-48), by limiting the range of novel stimulation which the child encounters. Furthermore, as Bettelheim (1967) has suggested, the need constantly to re-establish percepts in the face of threatened change must restrict the extent to which the "autistic" child can extend and manipulate identified percepts.

It has thus seemed that the disturbances of affect and extreme anxiety characteristic of ECA, are likely to contribute to perceptual maldevelopment.

(3) Developmental changes in modality relations.

There have appeared to be two main hypotheses regarding developmental changes in relations among sense modalities (Stroh and Buick, 1964; Pick, Pick and Klein, 1967). Firstly, according to what might be termed the "differentiation" hypothesis, "individual sensory modes develop out of a more undifferentiated [and qualitatively different] sensory unit, and similarly further differentiation occurs within modes ...." (Stroh and Buick, 1964, p. 296). Secondly, in terms of the "dominance" hypothesis, one or more modalities are functional from birth or before and subsequent development is characterized by orderly changes in patterns of dominance among the modalities. More specifically, it has been held that initial dominance of the proximal modalities is gradually superseded by dominance of the distal modalities, based on prior tactile, kinaesthetic or proprioceptive experience.

In the latter hypothesis, two meanings of the term, dominance, have been used. Thus, the term has been used to refer to a consistent tendency, under conditions of simultaneous presentation of stimulation in conflicting modalities, for a response related to one source of stimulation (for example, visual) to occur, rather than to another (for example, tactile). It should be noted that, in the foregoing use of the term, dominance is assessed in terms of an instrumental response only, without reference to whether identifying responses also occur in other modalities simultaneously. The term, dominance, has also, however, been used to refer to a tendency for stimulation relevant to one modality to be processed more adequately and for responses related to that modality to occur more frequently than is the case for other modalities, without any implication that such responses invariably predominate under conditions of conflicting stimulation.

Definitional problems apart, attempts to test the above-mentioned hypotheses have been hampered by serious methodological problems (Diller and Birch, 1964; Hermelin, 1969; Pick *et al*, 1967) which render premature categorical statements, such as that "distal receptors can only come into action meaningfully as a growing out of the product of the sensations of movement and touch" (Stroh and Buick, 1964, p. 297).

The relatively diffuse reactions of neonates to complex stimulation, associated with other relatively specific reflexes have, however, been considered suggestive of a state of relative undifferentiation within modalities, except insofar as certain elementary processes are constitutionally inbuilt or arise as a result of intra-uterine enteroceptive and kinaesthetic sensations (Forgus, 1966).

Evidence from sensory deprivation studies, involving neonatal animals, has suggested that continued contact with a rich sensory environment subsequently permits increasing differentiation, both within and between modalities (Bruner, 1961). Illustrative of within-modality differentiation are findings regarding age changes in the nature of sensory reception (Maccoby, 1969; Zaporozhets, 1965) and differential utilization of cues with age (Diller and Birch, 1964).

As intra-modal differentiation occurs, it has appeared likely that distinctions between modalities become more apparent. For example, as compared with the earlier, relatively diffuse reactions, the increasing specificity of responses to various forms of stimulation is suggestive of greater sensitivity to the variables of the stimulus array (Forgus, 1966).

Inter-modal differences in the rate and degree of differentiation might lead to orderly hierarchical shifts in patterns of relative dominance among sense modalities, in the sense of relatively more adequate processing of stimulation and greater frequency (but not invariable precedence) of behaviour related to particular modalities rather than others. Factors such as the kind of stimulation most frequently encountered, the association of particular forms of stimulation with pleasurable or unpleasurable affect (Schachtel, 1959) and the extent of reliance on overt activity in processing stimulation (Denner and Cashdan, 1967; Zaporozhets, 1965) might be related to such dominance patterns.

Evidence for the hypothesized shift in dominance has, however, been inconsistent and subject to criticism on methodological grounds, for example, unwarranted generalization to the nature of development based on only one age group and one form of stimulation. It can, therefore, only be said that in early infancy and childhood, no clear hierarchy of dominance is evident, different response measures yielding different hierarchies. With increasing age, however, there has appeared to be increasing reliance on distal modalities.

As regards dominance, conceived as a consistent preference, under conditions of simultaneous presentation of conflicting stimulation, for stimulation related to one modality rather than another, Pick *et al* (1967) concluded, after reviewing available evidence, that vision is clearly dominant at all ages.

Such changes in dominance as may occur are, however, probably accompanied by increased intersensory liaison. Birch and Lefford (1964) have pointed out that, even for relatively simple functions, effects produced by stimulation of one sense receptor are continually modified by ongoing activity in other sense modalities. At a more complex level, veridical perception is to a large extent entirely dependent on the integration of information from different modalities for confirmation and elaboration (Forgus, 1966; Freedman *et al*, 1961; Maier, 1965; Schachtel, 1959; Zaporozhets, 1965). Both differentiation and dominance must, therefore, be seen within the context of an increasingly multimodal and intersensory, rather than unimodal control of behaviour; of perception as involving corroboration of a variety of different types of information both within and between modalities.

The relevance of the above analysis to perception in ECA lies in the persistent view that "autistic" children display a relatively greater use of proximal modalities than do normal children of the same age, coupled with a relatively diminished or altered use of the distal modalities. The implication has been that dominance changes seen in normal development are relatively less marked in ECA. Hence, a developmental rather than a clinical interpretation of dominance relations in ECA has been implied (Hermelin and O'Connor, 1970), although the extent of developmental lag has sometimes been viewed as severe enough to constitute deviance.

As regards the degree of differentiation of the perceptual system, little can be said about the "autistic" child in infancy. However, neither at the time of diagnosis, nor on the basis of retrospective reports are peripheral abnormalities characteristic. No differences in specific reflexes have been reported. At a central level, few measurable abnormalities are characteristic in early and middle childhood, although abnormal EEG records have been reported in a fair proportion of cases (Hermelin and O'Connor, 1970) and, in up to one sixth of cases, convulsive episodes occur later, usually in adolescence (Rutter, 1968). Available evidence has, therefore, not suggested that perceptual processes in infants later diagnosed "autistic" differ markedly from those of normal infants, which are characterized by relative undifferentiation intra- and inter-modally.

As regards subsequent intra-modal differentiation, observational studies have indicated that, in contrast to the increasing specificity of response shown by normal children, extreme variability in response to stimulation is characteristic of "autistic" children, underreactivity and paradoxical overreactivity both occurring in the same

child (Ornitz and Ritvo, 1968). In more controlled experimental studies (Metz, 1967; O'Connor and Hermelin, 1965), the altered responsiveness of "autistic" children has appeared to lie in characteristics shared with severely subnormal children. Similarities between "autistic" and severely subnormal children have also been reported in regard to certain patterns of visual inspection (O'Connor and Hermelin, 1967). Psychotic SS were, however, found to differ from subnormal and normal controls in engaging in more undirected gazing and briefer fixation of displays (O'Connor and Hermelin, 1967), these two factors constitute an additional bar to effective perceptual processing and suggesting that the altered pattern of visual inspection in "autistic" children is not entirely explicable in terms of low intellectual level.

The evidence regarding intermodal differentiation in ECA has referred, in general, to questions of relative dominance of modalities. An hypothesis opposing distal and proximal modalities is, however, oversimplified in view of the reported lack of response to heat, cold and pain (Hermelin and O'Connor, 1970), and sensitivity to some aspects of distal stimulation.

Findings, from a number of studies, (Elgar, 1966; Hermelin, 1966; Hermelin, 1969; Hermelin and O'Connor, 1965; Norman, 1954; Norman, 1955; Ritvo and Provence, 1953; Rutter, 1966a; Wing, L. 1969), have however, tended to suggest that whereas perception involving certain proximal modalities is age adequate, unusually developed or relatively frequently observed, that involving the distal modalities is in some way abnormal, relatively less developed and relatively less frequently observed.

Such findings have, therefore, suggested that patterns of dominance, in the sense of relative frequency of behaviour related to particular modalities, are altered in ECA.

In contrast, studies which have investigated the question of dominance, by observing patterns of response in the presence of simultaneous stimulation in more than one modality, have not confirmed the invariable dominance of proximal over distal senses in ECA. Under such conditions of simultaneous, bimodal stimulation, "autistic" Ss have not differed from subnormal controls in responding most frequently to light in preference to touch or sound (O'Connor and Hermelin, 1963) or to sound or a verbal command (O'Connor and Hermelin, 1965). In respect of visual dominance, therefore, "autistic" children have not appeared to differ from normal children who have been reported to show visual dominance at all ages (Pick et al, 1967). "Autistic" children have, however, been found less responsive to sound than subnormal controls, the former choosing touch more often than sound (O'Connor and Hermelin, 1963). It has, therefore, appeared clear that no simple relative dominance hypothesis, in which proximal and distal modalities are opposed, is capable of accounting for the evidence regarding modality relations in ECA.

In this author's view, it has appeared that the altered pattern of ECA lies in the fact that, although at times, all modalities, including the distal, can be appropriately employed, there frequently occurs a distorted, reduced or inappropriate use of the distal senses, together with unusual and striking use of the proximal senses.

The relative dominance of modalities under conditions of conflicting stimulation is, however, not markedly different from that shown by normal children.

It has appeared that such variability in sensory behaviour may be explicable in terms of the complexity of stimulation, referring not only to some artificially circumscribed stimulus, but also to the context in which it occurs. Thus, it has appeared that simple stimuli (a light, a tone) can be adequately processed (Evans, 1968), particularly when presented under conditions which maximize their impact, such as minimizing distraction (Hington and Coulter, 1967) or associating stimuli with rewards (O'Connor and Hermelin, 1963). In contrast, where the distinctiveness of stimuli is not enhanced, responses (in terms of which perceptual processing is evaluated) may appear unrelated to the stimulus as defined by the experimenter. Hermelin (1966), for example, reported that psychotic children seemed as dependent on positional as on sensory cues, suggesting that in the absence of clear definition of the stimulus, recourse was had to a more primitive method of responding, characteristic of very young children (Fellows, 1968). Lack of clear stimulus definition might also account for the fact that under conditions requiring response to no stimulus rather than to one of two stimuli, "autistic" children continued to respond to the stimulus (Hermelin, 1966), implying an inappropriate transfer of earlier behaviours in an attempt to define a new situation. Difficulties in the integration of more complex stimulation - exemplified by that affecting the distal rather than the proximal senses, the latter being in addition subject to a greater degree of control by the individual - may furthermore, result in aversion to such stimulation, leading to overt and covert avoidance of such stimulation (Evans, 1968) and, by contrast, preference for the more easily integrated proximal stimulation.

As regards intersensory integration in ECA, few studies have specifically investigated this problem. Norman (1954), however, reported that "..... the integration of experience and the capacity for one part to serve for the rest seems to be reduced. He has to reinstate a large number of particular experiences of the object, .... viewing .... touching .... weighing .... sucking, mouthing and biting. Even so, the child often seems to fail to achieve the object as such and is left with a colour or a shape or a number of details poorly organized as a whole" (p. 131). Such a description is reminiscent of findings regarding brain-injured children who, in contrast to normal children, were found to perform most adequately when stimulation was applied in one modality rather than multimodally (Deutsch and Zawel, 1966). The findings regarding the inability of "autistic" children to derive maximum benefit from visual information in addition to manipulative cues (Harmelin and O'Connor, 1970) have suggested not only an altered pattern of dominance, but also difficulty in integration of information from various sources.

As Birch and Lefford (1964) have pointed out, delay in the emergence of intersensory relations may seriously limit the possibilities for normal utilization and integration of environmental stimulation. Furthermore, given such a primary defect, opportunities to develop bizarre integrations may be enhanced and aberrant development reinforced. The apparent impairment of integration of information from various sources in "autistic" children has thus appeared likely to contribute significantly to an abnormal response to stimulation.

In conclusion, it has appeared that the evidence regarding modality relations in ECA, although fragmentary and inconsistent, does indicate certain disturbances of development and functioning. The altered pattern of visual inspection, the apparently different hierarchical order of modalities, the relatively greater utilization of motor cues and difficulties in integrating information relevant to different modalities have appeared suggestive, not only of developmental lag, but also of deviance. Such a conclusion must, however, as pointed out by Hermelin and O'Connor (1970), be qualified by the evidence of inhomogeneity within the "autistic" group, not only as regards developmental levels, but also as regards processes underlying the attainment of any particular level.

(4) The effect of motor activity, play and imitation on the development of perception.

(a) Motor activity.

The effect of voluntary motor activity has also been considered in relation to perceptual development. It has been argued that some forms of perception are largely dependent on changes in stimulation accompanying movement. For example, separation of an object from its surround has appeared to be facilitated by movement through the accompanying motion parallax (Jeffrey, 1969) and movement is similarly also an important cue to depth (Vernon, 1962). Motor activity has thus been seen as providing one source of variation in stimulation necessary for perceptual development.

In addition to providing a context for perceptual development, however, motor activity has been considered important in determining the nature of perceptual processes.

Piaget's basic assumption (Maier, 1965) has been that all mental processes, including perception, develop from inborn motor processes (reflexes), since "in experiencing his own reflexes, the individual is led to use them and apply them, resulting in the acquisition of new behavioural processes" (Maier, *ibid*, p.85) and the discovery of the separate existence of what he experiences.

Similarly, Zaporozhets (1965) has argued that, as a result of practical actions with objects, in which, initially, perceptual processes assume a dependent, secondary role, an increasingly adequate perceptual model of an object can be created, through continual comparison with the object in the course of action. He has considered the formation of such practical or sensorimotor models as decisive in the early development of perceptual processes which, in the course of action, are themselves changed and begin to perform the function of reproducing and depicting reality. Schachtel (1959), too, has stressed the importance of motor activity, especially for the development of allocentric perception, since it is through movement that the young child approaches and seeks out stimulation.

The capacity to separate sensory cue or object from an action sequence is, according to Piaget, initially confined to situations where the child can nevertheless relate the object to the action sequence directly. Piaget has, therefore, stressed an additional effect of movement on perceptual development, namely that motor activity permits confirmation or correction of perception under fluctuations in before-the-eye stimulation when the child is not yet capable of abstraction (Gyr *et al*, 1967). Similar conclusions have been inferred from the results of studies involving the resolution of visual and visual-motor distortions through self-induced movement by the S (Dember, 1960; Freedman *et al*, 1961) and from observations of handicapped children (Cratty, 1967; Diller and Birch, 1964).

The above-mentioned views have, however, been criticized insofar as they imply that motor activity aids or is necessary to the development of all perceptual processes (Cratty and Martin, 1969). It has been argued that "..... the pairing of visual-motor impressions represents only one combination of sensory information available to the maturing infant. There are other channels through which the infant may collect information about his world, several of which are independent from the ability to move" (Cratty and Martin, ibid, p. 12) Evidence from the study of learned behaviour as contrasted with trial-and-error behaviour (Campbell, 1956) and the conditions under which certain prism-induced visual-motor distortions are resolved (Kilpatrick, 1954) have also supported the view of some degree of independence between motor activity and perception. A more restricted view of the role of deficiencies of motor activity has thus appeared necessary, namely that such deficiencies may exacerbate the effect of other factors operating to retard or distort perceptual development.

Although the deficiencies of motor activity observed in ECA are neither as obvious nor as severe as those imposed by such conditions as cerebral palsy, it has been argued that motor activity in "autistic" children exhibits a lack of precisely those properties considered important in perceptual development. Firstly, as discussed in a previous section (pp. 46 ff.), the motor activity, together with other forms of behaviour characteristic of "autistic" children, is such as to severely curtail variation in stimulation.

Secondly, insofar as motor activity constitutes one important avenue of exploration of the environment, leading to the discovery of the properties of objects and, in so doing, to the development of increasingly adequate means of perceptual processing, "autistic" children have seemed to be handicapped by the circumscribed nature of their exploration.

For example, a reduced activity level, insofar as spontaneous movement is concerned, has been noted (Ornitz and Ritvo, 1965), together with repetitive, stereotyped motor activities of a non-object oriented kind (Hermelin and O'Connor, 1963; Hutt et al, 1964), a lack of the normal young child's intentional provocation of novelty (Bettelheim, 1967) and failure to experiment with objects (Bosch, 1962) - behaviours which have appeared the very antithesis of the practical actions underlying the sensorimotor models emphasized by Piaget and Zaporozhets. Certainly, motor sequences are repeated, but not meaningfully and in relation to novel stimulation, as discussed by Piaget. Similarly, the continual comparison with the object in the course of practical action described by Zaporozhets is absent from the non-object directed flicking, whirling and tapping, repetitive movements of "autistic" children.

Thirdly, the confirmatory and corrective roles of motor activity in perception have appeared somewhat altered in ECA, the confirmatory role appearing to predominate at the expense of the corrective. For example, objects necessary to a stereotypy may be selected on the basis of one attribute, such as shape, while other attributes - size, texture, weight and function - tend to be ignored, no noticeable adjustment for these attributes being made in the stereotyped movement. Bettelheim (1967) has made a similar observation, with regard to the achievement of object permanence by "autistic" children. He noted that objects may be recognized, but usually only within a context of personal action and attributed this lack of true object permanence to a failure to interact with objects in the environment. This altered relationship between confirmatory and corrective aspects of motor

activity has appeared to represent, or be likely to foster an imbalance at a perceptual level between, on the one hand, assimilative and autocentric processes and, on the other hand, accommodative and allocentric processes.

There has, therefore, appeared to be some justification for assuming that certain characteristics of motor activity in "autistic" children may contribute to perceptual maldevelopment.

(b) Play.

Two major categories of motor activity which have been regarded as important in perceptual development (and cognitive development in general) are play and imitation, both of which, of course, include other factors besides motor activity.

Play has been viewed by Piaget as "the primary tool for adaptation .... [bringing] the child in contact with the questions and objects of everyday life. In a spiral-like fashion his contacts evolve more and more into realistic experience .... the absence or severe retardation of play .... leaves a child in his autistic world and less subject to the impact of his environment" (Maier, 1965, pp. 109-110, 111). Similarly, Schachtel (1959) has stressed the allocentric nature of play, in its openness to the qualities of objects, while Zaporozhets (1965) has pointed to the practical modelling which takes place in games and constructional activities and the reproduction of features of the environment by means of movements and posturing of the child's body.

The activities with which "autistic" children occupy themselves, however, do not appear calculated to bring them into contact with a broader range of experience, leading, through interaction, to concomitant growth of perceptual processes and to increasingly veridical perception. In a comparative study (Wing, L., 1969), "autistic" children were rated as showing a significant lack of appropriate play - for example, doing nothing when left alone, engaging in repetitive, apparently pointless activities, needing adult supervision to stimulate them to purposeful activity and showing no interest in stories. The only group of children in this study who were not significantly different from "autistic" children as regards lack of play was the partially blind/partially deaf.

Similarity in respect of play between "autistic" and blind children has been fairly frequently remarked upon (e.g., Hermelin and O'Connor, 1970; Rimland, 1964). A paper by Wills (1968), on problems of play in the blind child, has highlighted some of the similarities; for example, "the ease with which [blind children] stop playing at an age adequate level and withdraw into simple primitive activities unless an adult constantly stimulates and supports their interest" (p.213); the slight attraction of toys; reliance on sensory impressions conveyed through the body; restricted exploration, particularly when anxious; and undifferentiated, repetitive play which "gives the child little or no insight and therefore leads to little or no mastery of the situation which has prompted it ...." (p.216). The lack of interest shown by "autistic" children in toys and their tendency to engage in repetitive, stereotyped behaviour sequences unrelated to objects have been documented by Hermelin and O'Connor (1963). In regard to the similarities of play between blind and "autistic" children, it has seemed possibly significant that Piaget has considered that the blind may be more seriously handicapped

in conceptual operations than the deaf (Hermelin and O'Connor, 1970). Such similarities as do exist between "autistic" and blind children might lead to the expectation of difficulty in the more complex aspects of perception.

It has, therefore appeared that, as in motor activity in general, so in the play of "autistic" children, qualities likely to enhance perceptual development are lacking.

(c) Imitation.

The importance of imitation, according to Piaget, is that, like play, it forces the child to constantly evaluate and re-evaluate his perception of the environment. That is, as a result of the processes of accommodation involved in imitative activities, changes in central organizational processes are brought about which permit more accurate perception, such perceptual development being reflected in concomitant changes in imitative behaviour. Thus, initially, "the child imitates .... with little concern for accuracy ... [he] tries to incorporate often in one gesture his own perception of the entire action sequence, demonstrated by the model .... [But] the process of shifting his attention from himself to others and then back to himself further helps to refine his imitation to more closely approximate to the action sequence of the model" (Maier, 1965, pp.110-111).

In ECA, however, "imitative behaviour is fragmented, greatly delayed, or does not appear" (Ornitz and Ritvo, 1968, p.88). As early as 10 or 11 months, infants later diagnosed as "autistic", do not imitate baby games, such as "peek-a-boo" and "pat-a-cake", or waving good-bye (Ornitz and Ritvo, *ibid*). Ritvo and Provence (1953),

in a developmental appraisal of six "autistic" boys, aged 22-39 months, noted a paucity of imitation as observed in drawing, movement activities and sounds made by the E's voice. In Lorna Wing's (1969) comparative study, referred to in the previous section, "autistic" children were also rated as showing significant difficulties in comprehending and using gestures - for example, never indicating the position of objects by pointing, never demonstrating needs by miming, not understanding the expression on other people's faces.

The only area of behaviour in "autistic" children in which imitation might be said to occur readily is that of speech, which, when present, is usually characterized by echolalia. It has appeared doubtful, however, whether echolalia can be considered imitative in the sense implied above, since it has not appeared to involve shifting attention between the model and the speaker. Certainly, it has not appeared to constitute more than a primitive form of imitation.

Failure to engage in imitative behaviour might be dependent on any of a number of factors, both perceptual and non-perceptual. Berges and Lézine (1965), for example, in devising their test of imitation of gestures, considered that factors related to perception, conceptualization, intelligence, motor ability and co-ordination were involved. It has in fact appeared possible that the paucity of imitation in "autistic" children may be related to other difficulties of gestural expression (Tubbs, 1966).

Of interest in the present context, however, has been the fact that lack of imitative behaviour constitutes yet another factor potentially inhibiting perceptual development in ECA.

(5) Language.

The acquisition by the child of language, both as a means of comprehending the communications of others and as a means of expressing his own experience of the world, profoundly affects his perceptual development. Thus, Bosch (1962) has referred to "the essential collaborating role of language in creating a world of experience ,... " (p.68).

Firstly, insofar as it permits him to communicate his own egocentric perception of his environment in the form of assertions, language performs an assimilative function (Maier, 1965), by providing the child with additional means of identifying stimulation (Vernon, 1962) and stabilizing and clarifying his percepts. " .... experience is put into language, and language in turn serves to define, to make available memories of experience, and to compare them with the actual situation .... " (Bosch, 1962, p.72). Much of the stabilization and clarification necessary to achieve consistency in perception does, of course, occur without the aid of language. Even the more complex aspects of perception, which overlap with conceptualization, may occur without the aid of language - or, at least, speech. Some patients with speech disorders due to brain injury, for example, fail to name objects presented to them and cannot describe simple events which they observe; yet their behaviour with respect to such objects or events is perfectly appropriate, suggesting that their perception is unaffected. The fact, however, that perception can occur in the absence of speech and language, does not detract from the value of language as an added assimilative tool aiding perception.

Secondly, language as a means of social communication performs accommodative functions (Maier, 1965). Schachtel (1959) has pointed out that part of the child's growing knowledge of objects is acquired spontaneously, in immediate encounter with objects, but that increasing acquaintance with their meaning in the culture is conveyed primarily through language. Furthermore, "language is tremendously useful ... for validating and making objective all that would otherwise remain a solipsistic way of perceiving the world ... " (Bettelheim, 1967, p.57).

Thirdly, language, by permitting reflection upon an event and its projection into the future (Maier, 1965), contributes to the formation of preparatory sets and expectations, which may affect, in particular, the selective aspect of perception. Fourthly, more directly, language may serve as a tool of analysis of stimulation, through comparison with previous experiences. In this connection, it has been suggested that language may extend and refine discriminative processes (e.g. Spears and Hohle, 1967; Vernon, 1962).

The latter hypothesis has, however, been criticized on the grounds that the possession of verbal labels for patterns of stimulation does not invariably enhance their discrimination, but only under certain conditions (Denner and Cashdan, 1967; Lennenburg, 1961; Miller, 1967; Robinson, 1955; Vernon, 1962), through mediation of the behaviour required (Bryant, 1967; Lennenburg, 1961; Olver and Hornsby, 1966). Language is, of course, not the only agency of mediation affecting perception (e.g. Robinson, 1955), but it may, nevertheless, be argued that the clearer explication of identifying responses permitted by language as contrasted, for example, with autonomic responses, does allow more ready mediation of the cultural meaning of stimulation (Kanfer, 1956).

It is, however, necessary to recall that "the utilization of language as a mediating mechanism is still quite elementary in the preschool child and is apparently used in a systematic way only after the age of five or six ... Among young children verbal signs may only serve to prolong the kinaesthetic [and other] imagery rather than replace it as it seems to do for older children .... " (Elkind, 1967, p.8). The young child tends to approach complex discrimination problems in a concrete and non-mediated way and it is not until towards the end of the preschool years that the quality of discrimination, and particularly matching, changes and begins to exhibit a more focussed attack on the problem (Fellows, 1968). Moreover, young children may use language inappropriately as a mediator, for example, labelling a dimension common to discriminative stimuli rather than specific values along that dimension, the use of the common conceptual label interfering with performance (Reese, 1963). Nevertheless, "it is perhaps well to recognize that mediation has levels and degrees and that far from being a phenomenon that occurs only after school age, some forms of it may appear as early as the second year" (Elkind, 1967, p.380), if not in as clear a manner as may occur later.

Reference has been made above to the hypothesis that auditory imperception, particularly of speech, is the basic disturbance in ECA. Certainly, one of the most striking and most frequently occurring handicaps of "autistic" children is their inability to cope adequately with language. The concern of the present discussion has not, however, been to establish the linguistic disability as the primary handicap, but rather to investigate the possible effects of the linguistic disability on perceptual development in general and visual perception in particular.

Firstly, the difficulty of "autistic" children in expressing what they want to say (Elgar, 1966; Norman, 1954) - in particular, the tendency to repeat what they have heard without adapting it to their own intents and purposes (Norman, 1954) - has been seen as representing a relative lack of a powerful means of assimilation. In mute "autistic" children, this lack must be proportionately greater. That some means are available to assist in achieving stability of perception in "autistic" children has, however, been inferred from the fact that, despite the aphasic-like character of the speech of "autistic" children, other behaviour appropriate to given objects does occur. For example, although words which are usually paired (such as "brush" and "bomb") may be confused, the objects themselves are seldom confused (Wing, J.K., 1966). Consistent behaviour with respect to (and, presumably, perception of) particular objects or situations does, however, tend to occur under conditions either of repeated encounters with the same stimulation patterns, or of high emotional impact (DesLauriers and Carlson, 1969). In contrast, relatively unfamiliar or uncathected objects or events do not evoke consistent or appropriate behaviour of the kind which might be expected to flow from recognition and generalization mediated by language.

Secondly, the accommodative potential of language is limited.. Bettelheim (1967) has argued that "the more communication is interfered with .... the less he [the "autistic" child] can test his inner experience against something permitting a balanced judgement about it .... and the more likely he is to interpret signals from outside incorrectly and those from inside solipsistically.

Where communication is given up altogether or if it was never established in the first place, a person has nothing but his inner experience to guide him and he has nothing to go by in judging that" (pp. 78-79). Even in speaking "autistic" children, however, there is a characteristic egocentricity in their speech, in the excess of demands and non-communicativeness and the inability to adopt another's point of view or respond to more subtle social reinforcers (Cunningham, 1968). Such egocentricity has appeared likely to hamper ready modification of perception through language. Other writers (e.g., Norman, 1954) have commented on the tendency of some "autistic" children to reproduce what they hear, often with phonographic accuracy, but frequently with no indication that the meaning of the communication has been understood. A study reported by Hermelin (1968) has, in fact, confirmed that "autistic" children, like younger, normal children, tend to rely more on phonological stress than meaning (such as that conveyed by key words of a sentence) in recalling spoken material. This tendency has appeared to represent a further instance of a reduction in the extent to which language, through conveying the cultural associations of events and objects, can modify perception. Without such modification and validation, perception and, indeed, according to Bettelheim (1967), the entire inner life of the child, will remain unorganized and chaotic.

Thirdly, the linguistic disabilities of "autistic" children have appeared likely to diminish the effectiveness of language in contributing to the formation of preparatory sets. Such characteristics as confusion of subject and object of a conversation, excessive literalness and concreteness, and loose, free or fragmented associations (Ornitz and Ritvo, 1968) have not appeared likely to foster greater clarity in preparatory sets. It has, moreover, been suggested that "autistic"

children cannot separate ordering in space and time, for instance, regarding the word, "dining room", as signifying both a place and a time (Bettelheim, 1967). Such confusion would tend to restrict severely the projection of perceived events into the future.

Fourthly, the analytical and refining role of language, particularly under conditions where simultaneous matching and recognition are not possible, must be greatly affected by the characteristics mentioned in the preceding paragraph. In addition, the relatively small vocabulary - and that often closely tied to particular situations in which it is used, not for purposes of communication, but as an element necessary to complete the resemblance between the present situation and past experiences of the situation (Bosch, 1962) - must limit the extent to which language can serve as a classificatory or articulatory device, providing reference points for perceptual judgements (Lennenburg, 1961). Thus, Hermelin (1966) has suggested that the frequently observed inability of "autistic" children to attach a name to a pattern of stimulation may increase their difficulties of discrimination, insofar as the attaching of a name to a stimulus pattern may enhance its distinctiveness. Within the limits of their vocabulary and, more particularly, of familiar situations, however, this relationship cannot necessarily be assumed to apply, in view of the failure of "autistic" children to confuse objects, the names of which are confused (Wing, J.K., 1966).

It might be argued that other groups of severely linguistically handicapped children would be subject to similar detrimental effects on perception. Lorna Wing's (1969) study included comparisons with a number of groups:

with regard to degree of linguistic impairment, the only groups which were not significantly different from the group of "autistic" children (and hence, were of interest here) were the receptive aphasic and the partially blind and deaf in comprehending speech and the receptive aphasic in the use of speech (which could not be rated for the partially blind and deaf Ss because of the severity of their handicaps in this area); patterns among individual items of the categories dealing with language was essentially similar for the "autistic" and other groups. With regard to the categories dealing with primarily "perceptual" functions, in comparison with the receptive aphasic Ss, "autistic" Ss were rated as not significantly different in displaying abnormalities in the use of vision and preference for and abnormalities in the use of the proximal senses. No significant difference was found in any of the categories between "autistic" and partially blind or deaf Ss, leading Wing to comment that the latter group of children "are also, though for different causes from those affecting the autistic children, cut off from verbal and non-verbal communication" (1969, p. 18). It has thus appeared that certain of the perceptual handicaps of "autistic" children are present also in other linguistically handicapped children such as receptive aphasic children, lending credence to the view that linguistic impairment may affect perception adversely. Perhaps of greater interest, however, has been the closer similarity with partially blind and deaf children, suggesting that it is the joint operation of linguistic and other handicaps which, in the case of "autistic" children, is of importance for perception.

A final point to be considered - one that has frequently been overlooked in general discussions of the role of language in ECA - is the extent of variability

in linguistic impairment amongst "autistic" children (Cunningham, 1968; Rutter, 1966a; Wing, L., 1969). It might, of course, be argued that such linguistic variability is explicable in terms of differences in intellectual functioning. If this were the case, low intelligence would be a confounding factor in any attempt to establish a relationship between linguistic impairment and perceptual development. But a number of studies (Cunningham, 1968; Hermelin and O'Connor, 1963; Tubbs, 1966; Wing, L., 1969) have suggested that, although low intelligence may contribute to the linguistic difficulties of some "autistic" children, in considering the possible effects on perceptual development of a linguistic disability, the latter factor may be discussed independently of intellectual functioning.

In view of the quite considerable variability amongst "autistic" children in the degree to which expression of language (and, to some extent, comprehension) is disturbed, it might be expected that, to the extent that language affects perception, similar variability might be found in perceptual functioning. Lorna Wing (1969), however, found little difference between speakers and non-speakers in rather grossly observable perceptual functioning. In contrast, studies by Hermelin and O'Connor (1965, 1970), at a considerably more analytical level, did reveal differences between speaking and non-speaking psychotic Ss in certain aspects of visual discrimination.

Any conclusion regarding the relationship between variability in linguistic functioning and perception in ECA based on the above-mentioned studies must, however, be made in the light of the fact that Wing's findings were the result of a retrospective study involving parental

ratings of grossly observable behaviour and certain technical criticisms regarding the use of the Peabody test in the studies by Hermelin and O'Connor. In the latter regard, for example, the cut-off point differentiating speakers from non-speakers appeared to have been rather arbitrarily selected, while use of the Peabody test as a measure of linguistic impairment appeared inappropriate in the context of a study of perception insofar as poor performance on the test may result either from inability to understand verbal cues or from inability to discriminate between the four adjacent pictures.

In conclusion, therefore, it has appeared that the likely effects of the linguistic disabilities of "autistic" children on their perceptual development - in terms of diminished potential for accommodation, assimilation, formation of preparatory sets, analysis and refinement - may be lessened to the extent that any given "autistic" child is relatively less impaired linguistically than are others. But it has nevertheless appeared probable that even most so-called speaking "autistic" children are handicapped in their perceptual development to a greater extent by their linguistic disabilities than are severely subnormal children.

#### (6) Learning.

Pastore (1956) has suggested that there are at least three meanings which can be attached to an empiricistic view of perception. It may be argued, firstly, that the processes underlying perception, although autochthonously determined, require stimulation for their emergence or development. Stimulation is thus conceived in a matura-

-tional sense, as providing opportunities for the development of perceptual processes, without altering the direction of that development. The second viewpoint also assumes that the direction of development is at first determined by intrinsic characteristics, but admits the possibility of changing the perceptual processes as a result of experience. Thirdly, it may be argued that, prior to the advent of some learning process, a given stimulus pattern evokes a variable perceptual process, whereas following learning, the stimulus pattern evokes specific perceptual processes only. Perception is, therefore, conceived as initially fortuitous in relation to stimulation; only later, following learning, does stable perception, having the form of an S-R relationship, develop.

The rather extreme form of empiricism represented by the third viewpoint above has been criticized on the grounds that firstly, any initial variability of perceptual processes must nevertheless occur within a given range, largely determined by the pattern of retinal stimulation (Pastore, 1956), if the process is not to be termed hallucinatory. Secondly, any given organism has only a certain range of adaptational possibilities; thus learning is, in a sense, merely a selection among the available set of alternatives, rather than the creation of new alternatives (Staddon, 1967). Learning may, nevertheless, be necessary, if more than a limited number of available possibilities is to be fully exploited. Thirdly, it has been suggested that it is only under certain conditions that past experience is important in determining how stimulation is organized, for example, under conditions of reduced stimulation (Epstein, 1967), or when stimulation is complex (Forgus, 1966). Finally, the relative rarity of inter-individual differences in perception has appeared somewhat incompatible with an assumption

that learning or past experience is a major determinant of all perception (Prentice, 1956).

That learning, while not the only determinant of perception, has some effect on perception beyond a simple maturational one has been implied above. The conditions under which this effect occurs and the nature of the effect have, however, required further clarification.

As regards the conditions under which learning affects perception, as mentioned above, Forgas (1966) has argued that sensory factors are dominant in the detection and discrimination of changes in stimulus energy and in the discrimination of figural unity. Experiential factors, however, appear to contribute increasingly important effects at more complex levels of perception, involving the resolution of a more differentiated figure, identification and manipulation of perceptual patterns, for example, discrimination of identity and the development of perceptual constancy, as compared with perception of brightness and simple unity.

Another variable which has appeared relevant to the effect of learning on perception has been the extent to which stimulation is reduced or ambiguous. Epstein (1967) has stated that, under normal conditions of stimulation, past experience probably plays a minimal role in determining perception, a point of view supported by the relative rarity of interindividual differences in perception (Prentice, 1956).

How then does learning affect perception? Attneave (1954) has suggested that "the extension of the visual field in time .... introduces new varieties of redundancy involving the temporal continuation or recurrence of

spatial configurations which may be non-redundant at any instant considered in isolation .... predictions are not possible merely on the basis of the present visual field, but depend also on previous fields .... ecological principles of very broad generality may be derived from experience" (p. 192). For example, the frequency with which an observer has encountered symmetrical objects in his past may determine the way in which selection operates at the present time, determining how easily a stimulus can be identified in a noisy background (Maccoby, 1969). Bruner (1961) has also remarked that inference in the presence of relatively unfamiliar stimuli testifies to the existence of a store of previous experience from which the inference is made. He has argued that through experience, the individual builds up means of evaluating cues in terms of the probability of their relationship with other cues.

A second way in which learning may affect perception and one, it has been suggested (Eckstrand and Wickens, 1954), that possibly occurs more frequently than simple stimulus generalization, is through non-specific learning, involving solutions to classes of problems rather than to particular problems. That is, the individual learns how to learn, or learns strategies for organizing common features of the environment (Bruner, 1961).

That learning may play an important role in ECA has been suggested, notably by Ferster (1961), who has argued that the abnormalities and deficits in the behavioural repertoire of the "autistic" child are traceable to lack of or inconsistent positive reinforcement by parents for adaptive behaviour and inappropriate reinforcement for non-adaptive behaviour such as tantrums and regressive behaviour. Although it has seemed possible that certain aspects of behaviour are maintained by contingent adult

attention (Evans, 1968), there has, however, been little evidence to support the hypothesis in its general form (Rutter, 1968). It has, nevertheless, appeared possible that learning deficits, while not the sole determinant, may contribute to perceptual maldevelopment.

Systematic investigation of learning in "autistic" children has tended to be concerned mainly with specific training in a limited experimental context rather than with the effects of long-term, cumulative experience. The results of these investigations have indicated that "autistic" children are capable of learning simple associations in an operant situation (Ferster, 1961; Ferster and DeMyer, 1961, 1962; Hingten and Coulter, 1967) under a variety of reinforcement schedules (although multiple schedule performance did not develop) (Ferster and DeMyer, 1961) and of developing generalized reinforcers (Ferster and DeMyer, 1961). On the other hand, "autistic" children have been shown to differ from normal children in their rate of acquisition of conditioned responses, even at the simplest level requiring a relatively large number of repetitions of the operant situation (Ferster and DeMyer, 1961, 1962). Moreover, maximization of even this slow rate of learning depended on minimizing all extraneous distraction (Hingten and Coulter, 1967) and ensuring that tasks were broken down into suitably small and simple units and the negative stimulus faded in very gradually (Evans, 1968). In the normal trial-and-error presentation, learning was achieved only with extreme difficulty, if at all (Evans, 1968). Perhaps the clearest indication of the handicaps of "autistic" children in the area of learning has, however, been the extremely limited generalization of any learning which does occur (Ferster, 1961; Ferster and DeMyer, 1961, 1962; Rutter, 1968).

The results of the above-mentioned experimental studies have been compatible with and have helped to clarify observations regarding learning behaviour in "autistic" children. The remarkable memory of many "autistic" children (for example, for specific events, relative positions of objects and sets of words) which tends, however, not to elaborate with learning or the association of experience, the repetitive, stereotyped behaviour, often closely tied to particular aspects of stimulation (Norman, 1954, 1955; Rimland, 1964; Schopler, 1965) have appeared to illustrate lack of generalization and a stress on the exact details of the original situation. That learning occurs only under certain conditions, one such condition being repeated encounter with the same stimulus situation - analogous to the slow rate of learning reported in experimental studies - has been noted by DesLauriers and Carlson (1969), who have also suggested that conditions of high emotional impact may, through their unusually strong reinforcing effect, bring about learning to "autistic" children.

The limited capacity of "autistic" children for learning has been conceived as reflecting an inability to relate current stimulation to prior experience (Rimland, 1964; Schopler, 1965) or a failure of inhibition of the incidental aspects of stimulation in favour of its central features (Norman, 1954, 1955). Reconceptualizing these hypotheses in terms of the earlier discussion regarding the effect of learning on perception, it has appeared, firstly, that "autistic" children, while displaying remarkable retentivity in certain areas, nevertheless, do not make use of these or other memories in evaluating current stimulation in terms of the probability of certain cues and cue relationships. Failure of generalization thus limits the "autistic" child in situations

where redundancy is dependent upon previous experience of similar stimulation. Secondly, "autistic" children have seemed to lack efficient strategies for evaluating information, relying on certain rather than probable cues - and hence dependent on excessive repetition or affective impact (DesLauriers and Carlson, 1969).

The above-mentioned fairly direct effects of the learning disabilities of "autistic" children on their perception have appeared to be complicated by a number of secondary consequences of the learning disabilities. For example, Evans (1968) has proposed that an internal avoidance response, the conditioned inhibition of sensory reception, may be learned by "autistic" children to counter the aversive qualities of certain forms of stimulation. Such patterns of avoidance must further restrict the "autistic" child's already limited capacities for learning.

It has therefore appeared that where stimulation is complex or ambiguous, "autistic" children are likely to be handicapped in processing such stimulation by relative inability to make use of past experience in evaluating the probability of cue relationships and by inability to learn strategies for organizing common features of the environment.

CHAPTER VI

Perception in ECA : Some Hypotheses.

In the previous chapter, an attempt was made to show that, apart from interpretations of behaviour suggestive of perceptual disturbance, evidence regarding other factors related to perception suggested a strong possibility that at least certain aspects of perception in "autistic" children are disturbed. It has remained to consider the likelihood of disturbance in certain specific aspects of perception, including both relatively simple and more complex aspects, but confined mainly to the visual modality.

(1) Form perception.

Shape has been defined as that quality of an object which remains invariant under changes in size, colour, brightness, orientation, material, time and place (Alluisi, 1960; Attneave and Arnoult, 1956). The psychological process of differentiation amongst shapes, a necessary prerequisite for the perception of objects, has been termed form perception and, to the extent that such differentiation remains invariant under the changes in stimulation mentioned above, form constancy is said to be achieved.

Shape is in fact a multidimensional variable (Attneave and Arnoult, 1956; Brown and Owen, 1967; Forgas, 1966); the number of dimensions necessary to

describe a shape is not fixed, but increases with the complexity of the shape (Attneave and Arnoult, 1956). Thus, any given shape may give rise to form perception in terms of one or more dimensions rather than others. Form discrimination in infancy, for example, has appeared to be facilitated by the presence of certain form cues rather than others (Vernon, 1962; Wohlwill, 1960). Moreover, certain discriminations may be more easily made in terms of some dimensions than others; stars and crosses, for example, have appeared to be more easily discriminated in terms of perimeter, while ellipses and triangles have appeared more easily discriminated in terms of area (Forgus, 1966). A further factor is that some dimensions may be especially relevant to particular modalities, such as orientation, for example, for vision and texture for touch (Pick et al, 1967). Generally, however, the various dimensions of a shape are utilized in form perception to confirm one another, although conflicting perceptions may occasionally arise.

Renewed interest in and somewhat clearer definition of the dimensions of shape has been generated by attempts to utilize information theory in the study of form perception. Problems of definition, particularly with regard to specification of the stimulus dimensions governing perception in the young infant have, however, continued to cloud the interpretation of results (Spears and Hohle, 1967). Moreover, different assessment procedures have produced quite widely differing estimates of the rate and nature of the development of form perception. Discrimination between a few shapes, for instance, has been reported as developing considerably earlier than matching shapes (Vernon, 1962), while response to the odd member of a series has appeared to be a less complex

task for young children than is matching (Fellows, 1968). Discussion of the development of form perception has, therefore, to take account of both stimulus characteristics and mode of response in relation to age.

It has appeared that form discrimination is possible at an early age, within the first six months of life (Fantz, 1958; Thompson, 1962; Vernon, 1962; Wohlwill, 1960), but that shape "is not a very potent aspect of the stimulus in the perception of young children" (Wohlwill, 1960, p. 269), although shape tends to be used more than colour in the solution of problems having both cues available, (at least by retarded children) (House and Zeaman, 1963). Nevertheless, consistent visual preferences have been demonstrated as early as two months of age (Fantz, 1958). But, although visual discrimination among certain shapes and under certain conditions is possible in the six-month old child, discrimination learning is slow and immediate perception of shapes limited (Vernon, 1962). Among the dimensions of shape which have appeared to facilitate form perception at a fairly early age are angularity as contrasted with smoothness or flatness, straight edges and angles versus continuous, curved edges, open versus closed shapes and shapes with holes in them or one shape surrounding another (Vernon, ibid).

As regards redundancy, in comparison with adults, young children appear to require more redundancy in a shape or pattern in order to perceive it correctly. Wherever a stimulus pattern permits of several alternative modes of perceptual organization, there has appeared to be a tendency to respond in terms of the aspect involving the least amount of information. For example, young

children tend to follow along continuous lines and focus on the general outline rather than internal details (Wohlwill, 1960).

As mentioned earlier, form constancy is achieved when form perception persists under certain changes in stimulation. In general, the attention to detail and form cues necessary to achieve form constancy has appeared to be beyond the capacity and experience of the young infant (Spears and Hohle, 1967), except under certain conditions. Thus, when shapes are familiar, concrete (Haeussermann, 1958), simple or solid (rather than outline) (Thompson, 1962; Vernon, 1962; Wohlwill, 1960), they may be recognized regardless of orientation, size, position and context as early as six months of age.

Changes in orientation, however, constitute one major exception to the general trend regarding the development of form constancy. Infants and young children have appeared to be little affected by such changes and easily recognize shapes under changes in orientation (Thompson, 1962; Vernon, 1962; Wohlwill, 1960). Orientation is in fact observed only with difficulty by young children up to the age of five or six years, as seen most notably in reversal errors in reading and writing (Fellows, 1968). Increasing ability to discriminate orientation is, however, not solely a function of maturation, since it is a skill quite sensitive to training (Fellows, ibid).

The apparent sensitivity of orientation discrimination to the effects of experience may account for the findings of two studies in which orientation of shapes appeared related to ease of discrimination.

In the first study (Ghent and Bernstein, 1961), simple geometric forms which had previously been shown to elicit strong preferences regarding "correct" orientation, were presented tachistoscopically to preschool ss. The "correct side up" forms were recognized significantly more frequently than "upside down" forms. In the second study (Kerpelman and Pollack, 1964), the position of form discrimination cues within shapes was found to affect ease of discrimination. Attributes at the bottom of shapes were most salient for all ages between three years six months and seven years six months, although with increasing age, attributes nearer the top began to assume more importance. It is arguable that both the above findings arise from cultural experiences regarding the appropriate structuring of stimulation in terms of orientation.

The processes underlying the development of form perception outlined above are not well understood. Increasing capacity to abstract the invariance of a shape and utilize it appropriately as redundancy, permitting more efficient utilization of the information contained in a shape or pattern may, however, be involved. Thus, there has appeared to be decreasing dependency with increasing age on multiple cues in achieving constancy. Overtly, increasingly efficient utilization of information may be seen in changes in perceptual decoding processes. In the development of visual form perception, therefore, eye-movements and implicit scanning are likely to be devoted increasingly to areas of stimulation high in information value, such as "contours .... and .... those points on the contour at which its direction changes most rapidly" (Attneave, 1954, p.184). Kerpelman and Pollack's (1964) study, mentioned earlier, did in fact suggest an increasingly

more comprehensive sampling of informative areas of stimulation with increasing age.

Reference was made earlier to the role of language in perceptual development. Although the ability to perceive shape precedes the acquisition of verbal labels for shapes, language undoubtedly extends the range of equivalence (Spears and Hohle, 1967; Thompson, 1962).

Findings regarding form perception in "autistic" children are somewhat sparse and limited by failure to specify the dimensions of shape relevant to discrimination or the stimulus domain to which results may be generalized (which has, however, in most cases appeared to be rather narrow). The use of a variety of response measures in which perceptual and other functions have frequently been confounded, has added to the difficulty of assessing the nature of form perception in ECA.

Early studies (Kanner, 1943; Ritvo and Provence, 1953) reported age-adequate or superior performance on formboard items. Somewhat poorer, but still relatively adequate was perception of geometric and colour forms, attributed to the fact that whereas tactile manipulation provided additional information on the formboard, performance on the other tasks was dependent on visual inspection alone (Ritvo and Provence, 1953). Norman's (1954) observations tended to confirm that, although "touch was used conspicuously .... more often touch was used with vision" (p. 129) in inspection of the surfaces and contours of objects, suggesting that "autistic" children require confirmatory information from a variety of sources in order to achieve perceptual integration.

In a more recent study (Hermelin and O'Connor, 1965), no differences in visual form perception and perception of orientation were found between speaking "autistic" and severely subnormal SS, although differences were found between speaking and non-speaking "autistic" SS. The lack of a group of normal SS has prevented any direct comparison with earlier studies, although, in view of a finding that psychotic and subnormal SS showed patterns of visual inspection which were similar and less efficient than those of normal SS (O'Connor and Hermelin, 1967), it has appeared likely that both speaking "autistic" and matched subnormal SS would show poorer form perception than normal SS.

The available evidence has not permitted firm conclusions regarding the extent to which development of form perception in "autistic" children parallels that in normal children. It has, however, appeared likely that "autistic" children require more redundancy in patterns of stimulation in order to achieve form perception than do normal children. When such redundancy is present - as, for example, when tactile and visual inspection of three-dimensional shapes is permitted - form perception in "autistic" children may be similar to that of normal children. The greater the uncertainty of a shape and the less redundant information there is available, the more likely it has appeared that form perception will differ from that of normal children. Furthermore, to the extent that the language of "autistic" children is impaired, greater difficulty may be experienced in form perception and, particularly, in achieving form constancy.

As regards orientation, in the study referred to above (Hermelin and O'Connor, 1965), discrimination of

orientation was more difficult for the speaking "autistic" Ss than for the subnormal Ss, a finding which confirmed observations that "autistic" children have a characteristic dyslexic difficulty with letters differentiated by direction alone (Elgar, 1966). In respect of discrimination of orientation and form perception under changes in orientation, therefore, "autistic" children have appeared similar to younger normal children.

In conclusion, it has appeared likely that, in many circumstances, form perception in "autistic" children may be similar to that in younger normal children. Where, however, the structure of stimulation is highly redundant or modes of inspection, by supplementing each other, reduce the uncertainty of information, form perception in "autistic" children may be more similar to that of normal children of the same age. Further evidence is necessary in order assess the validity of the above hypotheses.

(2) Size perception.

The size of an object, particularly in relation to the sizes of other objects, is usually a highly informative aspect of stimulation and hence an important cue to the identity of the object. There has, therefore, been extensive investigation of size perception, particularly as regards the achievement of size constancy.

As regards equally distant objects, visual perception of size and transposition of the size relations of perceived objects have been found to be considerably poorer

in younger children of a sample ranging in age from 18 months to seven years (Zaporozhets, 1965). A number of factors have, however, been found to affect ease of size perception and may interact with age in a complex fashion. Thus, size discrimination has appeared typically better and has been reported to develop earlier for three-dimensional as compared with equivalent plane figures (Haeussermann, 1958; Vernon, 1962; Wohlwill, 1960). Familiarity has appeared to facilitate size discrimination, since size discrimination is usually possible amongst familiar, concrete objects earlier than amongst geometric figures (Haeussermann, 1958), but size discrimination of geometric figures has nevertheless appeared accurate in preschool children (Rosenblith, 1965). The relative size of objects has, itself, appeared to affect ease of discrimination: bigger objects are possibly more easily discriminated in terms of size than are small objects (Spears and Hohle, 1967). Finally, the instructions given by the E and the response measures used (for example, discrimination as compared with matching) have appeared to affect the form taken by results.

The processes underlying the development of size perception and the manner in which the above-mentioned factors are utilized in size perception are not well understood. In part, development may be dependent on changes in the nature of perceptual decoding, permitting more efficient utilization of information regarding the size of objects. Thus, Zaporozhets (1965) has reported that, following training in which the child was made to shift his glance from one object to another, there was a considerable improvement in size discrimination by children, aged five to seven years. In younger children, however, no improvement followed such training, suggesting

that, despite the increase in comparative eye-movements, the children were unable to utilize the additional information available. In another form of training, in which objects were compared practically with regard to size - that is, in addition to visual comparison, manipulation of objects occurred - perception of size also showed improvement. It has appeared possible that the improvement under the latter conditions might be explicable in terms of the creation of a certain amount of redundancy of information processed by more than one modality and hence the highlighting of informative aspects of stimulation. Familiarity with objects has also appeared likely to increase the redundancy of stimulation, permitting more ready perception of size.

Considerable attention has been devoted to the question of size constancy, that is, relatively constant perception of the size of objects under certain changes, such as colour, brightness, material, time and, in particular, distance. One of the difficulties of recognizing objects at a distance is that the actual size of the pattern of light projected on the retina by the objects is much smaller than the objects themselves. Attempts to understand how it is that appropriate perception of size nevertheless occurs has given rise to an extensive literature, only a brief summary of which has been possible here.

The relationship between size and distance is a complicated one and varies according to a number of factors (Epstein, Park and Casey, 1961). Familiarity of objects has appeared to be a particularly important cue affecting the relationship (Epstein *et al*, *ibid*). Children of six months have, for example, been shown capable of distinguishing between a rattle nearby and a larger rattle

presented further away, despite the fact that the retinal images of both rattles were the same size. Older children were, however, unable to make similar judgments when unfamiliar objects were used (Vernon, 1962). The nature of the effect of known size on size judgments has, however, not been clear. It has appeared that known size may sometimes affect the S's report of size, without affecting perception of size itself.

The number of objects in the visual field has also been considered to affect perception of size in relation to distance and may interact with familiarity (Epstein et al, 1961). In this case, perception of the relative size of objects has appeared to assist in maintaining size constancy. The relative distance away of objects has been a further factor which has seemed to affect size constancy. Over comparatively short distances, provided the individual can perceive the distance, no change in size is noted. But over greater distances, objects are perceived as small, even although fairly reliable estimates, based on reasoning from known size, are still possible (Vernon, 1962).

Procedural variables have also been shown to affect size constancy. Thus, the response measures used (Epstein et al, 1961), the instructions to the S (Epstein, 1967; Epstein et al, 1961; Vernon, 1962) and the time permitted for judgement (Epstein et al, 1961; Vernon, 1962) may alter the effects of the previously mentioned factors on size constancy.

As regards the development of size constancy, as mentioned above, children of six months can perceive the size of familiar, concrete objects, under certain changes in distance. Over comparatively short distances,

however, it has appeared that children see objects as slightly smaller when they are further away than when they are nearer.

It has appeared, therefore, that "children gradually acquire general schemes of the relationship of sizes of objects to their surroundings at varying distances. These develop comparatively early for near objects, but later for distant objects ..... " (Vernon, 1962, p.98). In this process, in addition to possible changes in perceptual decoding mentioned above, recognition that size remains unchanged despite changes in distance, is probably mediated by experience of seeing things gradually receding or coming closer and appearing to change size as they do so (Vernon, *ibid*). Furthermore, it has appeared that, with increasing age, the child responds increasingly to relationships between patterns of stimulation rather than to isolated aspects of stimulation (Forgus, 1966). Hence, the size of any object is increasingly perceived in terms of the sizes of all other objects in the visual field (Vernon, 1962). Increasing acquaintance with age with an increasing array of objects, too, has appeared likely to facilitate the achievement of size constancy in terms of known size of familiar objects. Similarly, in early childhood, increasing mobility has seemed likely to increase the distance over which size constancy can be maintained.

Size perception and the achievement of size constancy have not been extensively investigated in "autistic" children. Nor have there been many descriptions of behaviour likely to suggest the nature of these functions in ECA.

Obsessional sorting as to size, as in arranging all the books in the house or all the bottles on the kitchen shelves according to size has been observed in some "autistic" children (Norman, 1954). In contrast, in a seriation task, in which the S had to arrange five cardboard squares (ranging in size from 400 sq. cm. to 61 sq. cm.) from largest to smallest after observing a demonstration by the E, neither speaking nor non-speaking "autistic" Ss performed above chance level, although both normal and subnormal controls obtained scores well above chance (Hermelin and O'Connor, 1970). The contradiction between these two sets of findings has not appeared easily explicable, but might perhaps be due to sample differences or the manner in which the experimental task was presented. In a study of the cognitively simpler task of discrimination of size, presented in two-dimensional pictorial and abstract forms, however, no difference was found between psychotic speaking and non-speaking Ss and subnormal controls (Hermelin and O'Connor, 1965). Unfortunately, a normal control group was not included in this study, so that it was not possible to assess whether size discrimination was at the expected level for age. As regards size constancy, it has appeared suggestive that "autistic" children may not recognize their own house or parents seen at a distance (Wing and Wing, 1968). Factors other than poor size constancy, for example, failure to attend to objects at a distance or poor figure-ground differentiation, might, however, account for the latter observation.

The available evidence has been insufficient to permit firm conclusions regarding the adequacy of size perception and size constancy in "autistic" children.

In terms of the discussion above, regarding factors affecting size perception and constancy and the processes underlying their development, it has, however, been possible to suggest certain tentative hypotheses.

Firstly, in a study (O'Connor and Hermelin, 1967), discussed elsewhere, psychotic and subnormal SS were found to switch gaze between patterns of stimulation less frequently than did normal SS, thus exhibiting a relatively immature pattern of eye-movements. Hermelin and O'Connor's (1965) finding of no difference in size discrimination between psychotic SS and subnormal controls might thus be explicable partly in terms of similar patterns of comparative eye-movements which would be likely to result in poor size discrimination for both groups in comparison with normal children.

Secondly, discussion of perceptual functioning in various modalities has suggested that, where manipulation of objects in addition to visual examination is permitted, increasing the redundancy of stimulation, size discrimination in "autistic" children would not differ from that in normal children. Thirdly, the behaviour of "autistic" children which, as discussed earlier, tends to restrict the range of stimulation encountered, has also seemed likely to have the correlated effect of reducing the range of objects with which such children are familiar. Thus, the uncertainty of information has appeared likely to be increased, interfering with ready discrimination and perception of size.

As regards size constancy, in addition to the factors mentioned above, the circumscribed nature of exploration in "autistic" children, discussed earlier, has appeared likely to reduce the extent to which they

experience apparent changes in the size of objects with movement, as well as limiting the distance over which such experiences occur. In addition, that excursions outside familiar surroundings have appeared to be accompanied by an increase in peripheral and undirected gazing and a diminution in the range and amount of visual inspection (personal observation) has seemed likely to decrease the extent to which the processes involved in size discrimination or the achievement of size constancy may operate.

In conclusion, it has appeared that visual size discrimination and perception in "autistic" children might be somewhat poorer than that of normal children, but similar to that of subnormal children. In the achievement of size constancy, however, it has appeared likely that "autistic" children, by virtue of their more severe handicaps in exploration, would be poorer than both normal and subnormal children.

(3) Colour Perception.

Colour is a characteristic and identifiable quality of the appearance of objects. Indeed, certain objects may be differentiated from one another largely by means of colour. It has appeared, however, that, for both normal and subnormal children, colour is not an aspect of stimulation which evokes sustained attention, as it tends to be used less than shape as a means of solving certain kinds of problems (House and Zeaman, 1963; Vernon, 1962).

Investigation of the development of colour perception has tended to produce contradictory results, depending on the response measure used, for example, colour preference, discrimination learning or adaptation (Spears and Hohle, 1967). Certain trends have, however, been indicated. Discrimination of a coloured light moving against a differently coloured background has been demonstrated in a 15-day old child, while from 6 to 14 months of age, children have been reported to show increasingly strong tendencies to reach for a coloured disc rather than a grey one (Vernon, 1962). Matching colours has been reported to develop at about two to three years, selecting a colour in response to a name at about four years and grading shades within a colour between five and six years (Haeussermann, 1958). Increases in the accuracy and range of colour matching and naming have been reported to continue into adulthood (Thompson, 1962).

A number of factors have appeared to affect the accuracy and consistency of colour perception. Variations in brightness and saturation of colour, in the texture of the coloured surface and in the extent of contrast with surrounding surfaces affect the way a given colour is perceived. Thompson (1962), for example, has reported that children between the ages, 2 - 5½ years, could discriminate more accurately between different colours, such as red and green, than between different saturations of the same colour, such as more or less blue.

The role of language in colour perception has been much debated. Where discrimination or matching of simultaneously present colours is required, it has appeared that possession of labels for colours does not enhance

perception (Lennenburg, 1961; Vernon, 1962). Indeed, since colour discrimination is usually more advanced than colour naming, it has appeared that verbal symbols are learned for previously developed discriminations (Thompson, 1962). Where, however, simultaneous matching is not possible, recognition has seemed likely to be affected by language habits (Epstein, 1967; Vernon, 1962), although the facilitative effect of language is limited by the paucity of generally accepted colour names, especially for intermediate shades (Vernon, ibid). Moreover, naming colours usually develops later than naming familiar objects, since colours tend to be associated by the child with specific objects of which colours are considered an inherent characteristic, rather than an independent and variable quality (Vernon, ibid).

Colour constancy, that is, relatively invariant perception of colour under changes in illumination, has appeared to develop through experience of the effect of changes in illumination on the colour of objects. The familiarity of the objects concerned, whether or not they have a characteristic colour and the extent to which the effect of the changed illumination on the surroundings can be observed, are factors which have appeared to affect the achievement of colour constancy (Vernon, ibid).

Colour perception in "autistic" children has not been extensively investigated. Ritvo and Provence (1953) reported age-adequate performance in discriminating colours in six young "autistic" boys. In Norman's (1954) observational study, it was noted that "colour played a very large part in those children

who talked, [but] it was not easy to estimate its importance for children who were mute" (p. 129). Colours were in fact sometimes named by children who otherwise hardly spoke at all. In speaking children, a wide range of colour names was used, including lighter and darker shades of colour, although by no means always appropriately. Since, as mentioned above, the ability to name colours has appeared to develop subsequent to the ability to discriminate those colours and separation of colour from object has seemed to represent a relatively advanced level of perceptual growth, Norman's observations have suggested that at least some degree of colour perception was present in speaking "autistic" children. In an investigation of resistance to instructions (Cowan, Hoddinott and Wright, 1965), an incidental finding was that "autistic" children, aged four to nine years, were capable of discriminating objects in terms of colour, either by selecting the appropriately coloured object or by displaying systematic errors which suggested that they understood what was required, but avoided emitting the correct responses.

The available evidence has, therefore, not suggested any significant degree of impairment of colour perception in "autistic" children, at least in those who speak. Nor, in view of the apparently, relatively minor influence of language on colour perception, has it seemed likely that non-speaking "autistic" children would be significantly handicapped in this regard. Accurate discrimination of colours might, however, be interfered with by lack of comparative eye-movements referred to in connection with other aspects of perception.

Colour constancy might be less adequate because of restricted experience of the effect of changes in illumination on colour through limited exploration of objects and the environment.

(4) Perception of configuration.

The most basic form of perceptual organization is that in which figures are segregated from their backgrounds (Dember, 1960). Before a particular stimulus can be perceived, it must stand out from the general background of light, noise and other stimulation and, in the case of more complex patterns of stimulation, certain parts of the field must be selected as constituting a meaningful figure, in contrast with other, irrelevant parts of the field (Vernon, 1962). Such differentiation of the field has appeared to depend on the presence of a certain amount of heterogeneity of stimulation; that is, the emergence of the figure has appeared dependent on differentiation of the ground in terms of spatial, temporal, chromatic or intensity characteristics (Dember, 1960; Forgas, 1966).

Although there is no invariable rule regarding what will be perceived as figure and what as ground (Vernon, 1962), observation of regularities in the way in which the visual field is differentiated and organized perceptually led the Gestaltists to postulate "figural goodness" as the goal of perception and certain principles of perceptual organization as the a priori means to achieving that goal. Recently, however, the Gestalt principles have been widely reconceptualized in terms of information theory and have been seen as

pertaining essentially to information distribution (Alluisi, 1960; Attneave, 1954; Forgas, 1966; Vernon, 1962; Wohlwill, 1960). Thus, the Gestalt grouping principles, such as similarity, proximity, and continuation, have been conceived as referring to conditions which reduce uncertainty (Alluisi, 1960), or establish a certain amount of redundancy in stimulation, thus reducing maladaptive error in perception (Forgas, 1966). Hence, a "good Gestalt" is a figure with a high degree of internal redundancy (Alluisi, 1960), facilitating perception, in contrast to more complex figures which exhibit greater uncertainty and give rise to less stable percepts (Forgas, 1966). Similarly, the Gestalt "law of inclusiveness" - that is, the tendency of the Gestalt properties of the whole to change the identity of a subwhole included within it - might be reinterpreted in terms of Attneave's (1954) suggestion that essential information is concentrated along contours and at those points on a contour where its direction changes most rapidly. Thus, in a typical embedded figure, the extent to which the subwhole can be discriminated, has appeared dependent on the number of contours and directional changes in contour shared with the more inclusive whole. For example, a figure was found to be more easily discriminated from another with which it overlapped or intersected (sharing points but not contours), than from one with which it shared one or more contours (Ghent, 1956).

Perception of configuration, fundamental as it is to all perception, has appeared to develop in early infancy and certainly within the first six months of life (Fantz, 1958). Figures which are relatively simple and display a high degree of internal redundancy, have appeared to be fairly readily perceived, but, in the case

of more complex figures and patterns, displaying relatively more uncertainty, the role of experience has appeared to become more important (Forgus, 1966). The ability to discriminate between intersecting shapes and find hidden figures has been reported to show a rapid increase from three to approximately five years six months, levelling off after this age (Maslow, Frostig, Lefever and Whittlesey, 1964), although, in view of slightly different findings by other researchers (Ghent, 1956; Thompson, 1962), other factors, such as degree of embedding, have appeared likely to interact with age. As regards the effect of conditions of reduced cues, younger children have been shown to require relatively more completeness of representation for recognition of line-drawings of common objects than do older children (Gollin, 1960).

Changes in the capacity to process information might account for changes with age in the relative importance and manner of interaction of the various Gestalt principles. Thus, although there has appeared to be no appreciable change with age, from first grade to high school levels, in the utilization of proximity, where proximity was opposed to continuation or similarity, the influence of the former declined in relation to the latter two factors. In dot patterns, there has appeared to be an increase in the role of continuation as opposed to similarity, suggesting an increase in the ability to achieve closure of incomplete figures. In continuous patterns, however, continuation has been found to be well developed in young children (Wohlwill, 1960).

While not a complete explanation, a relative inability to make use of all the information contained in a shape or pattern might account in part also for the syncretic nature of perception in young children. It has appeared that such global percepts are superseded in middle childhood by a phase in which large and small details predominate and later, by a more integrated perception of the whole (Wohlwill, ibid). The findings have, however, varied according to the manner in which the stimuli have been presented, for example, whether an outline was present or not. It has, therefore, appeared that young children lack the ability to attend to both whole and parts simultaneously, the predominant aspect in any given instance being determined by the degree of structure (Wohlwill, ibid) - that is, the amount of redundancy - present.

Similarly, an inability to process information exhibiting some degree of uncertainty might account for the relative difficulty of young children in perceiving boundary lines as belonging to more than one shape and hence their relatively poor performance in discriminating embedded figures (Ghent, 1956). That recognition of line drawings of common objects under conditions of reduced cues was relatively more difficult for younger children (Gollin, 1960) has also appeared explicable in terms of difficulty in processing relatively uncertain information.

Familiarity with a figure forming part of a larger, relatively unknown configuration has, however, appeared to facilitate perception of the figure (Thompson, 1962), suggesting that familiarity may reduce uncertainty. On the other hand, reduction or removal of contour lines and internal lines has been shown to disrupt previously

possible recognition of relatively simple representations of familiar objects in Ss, aged 2½ - 5½ years, although not to the same extent in older Ss, (Gollin, 1960). It has, therefore, appeared that familiarity interacts in a complex fashion with degree of uncertainty in relation to age.

Specific training has also appeared to affect the ease with which configurations are perceived, particularly, in the case of masked or embedded figures, when training results in the induction of a "search" attitude. Thus, in the study referred to above (Gollin, 1960), training decreased the amount of representation required for recognition.

There has been little systematic investigation of the perception of configuration in "autistic" children. This lacuna has appeared somewhat surprising in view of the extensive study of this aspect of perception in brain-injured children, who are similar to "autistic" children in certain other respects. Vernon (1962), for instance, has commented that the marble-board patterns of brain-injured children suggest that they may be unable to distinguish between figure and ground, being distracted by the structured background, overlapping lines, details and embedding. Similarly, Birch and Lefford (1964) reported that, although brain-injured Ss differed little from controls in simple discriminations and recognition of geometric forms, the former were significantly defective in perceptual analysis - finding isolated parts in a whole figure - and perceptual synthesis - selecting appropriate parts to construct a whole.

Certain forms of behaviour in ECA have, however, been interpreted as evidence of poor ability to separate figure from ground or of relatively slow development of this ability. The tendency to treat objects as a series of details, poorly organized as functional wholes (Norman, 1954), the tendency to walk into or through things or people as if they did not exist (Ornitz and Ritvo, 1968), failure to recognize the child's own house or parents when seen at a distance and fear of dogs, possible because they tend to materialize suddenly out of an undifferentiated background (Wing and Wing, 1968), have been interpreted as possibly related to inadequate perception of configuration.

On the other hand, other forms of behaviour have seemed to imply quite adequate perception of configuration. In particular, the anxiety shown at certain changes in spatial and temporal arrangement of the environment (Kanner, 1951) might be interpreted as indicating that configuration can be perceived. Moreover, evidence quoted earlier regarding shape, size and colour has implied that, at least under certain conditions, figure can be separated from ground.

In more formal investigations, however, schizophrenic children have been found to differ from normal controls in the ability to perceived wholes when fragmented stimuli were presented (Gottschalldt figures) (Goldfarb, 1961; 1964) and in visual form perception on the basis of closure of discontinuous line forms (Street figures) (Goldfarb, 1961). The manner in which the Gottschalldt and Street figures were presented and the response measures used might account in part

for the contradictory evidence from the more formal investigations as compared with certain observations. Nevertheless, insofar as the figures used were relatively complex and unfamiliar, it has seemed possible, in terms of the earlier discussion of perception of configuration in normal development, that the latter characteristics might well hamper perception of configuration in "autistic" children. In other areas also, "autistic" children have appeared relatively less proficient than normal children in processing information exhibiting relatively much uncertainty. This hypothesis has, however, required confirmation.

(5) Perception of object character.

The problem of how it is "that we know what objects are, that we assume that they will retain their identity unchanged and .... behave in a characteristic way" (Vernon, 1962, p. 12) has been discussed under many labels, including perception of identity (Vernon, ibid), objectification (Schachtel, 1959), and object perception (Elkind, 1967). The term, perception of object character, has been preferred here, since it has seemed to imply an essential aspect of the process, namely, that in addition to a certain unity and coherence of many attributes of stimulation, the distinctive character of the object is perceived. Thus, a plate is seen not merely as a coherent configuration, having a certain shape, size and colour, but as, amongst other things, an eating utensil.

The question has arisen, however, as to what extent a distinction can be made between perception of object character and conceptualization. Piaget (1955) has appeared to distinguish between the concept of object permanence and concepts regarding the character of objects and his definition of the former - perception of objects as substantial, permanent and of constant dimensions - has not seemed to encompass fully what has been defined above as essential to perception of object character. Forgas (1966) has also distinguished between perception, a primary process involving "the reception and meaningful interpretation of information received through the senses" (p. 289) and concept formation, defined as "the operation of generalizing a similar property or properties over stimulus dimensions and abstracting this property to form a class or category" (p.289-290). It might be argued, however, that "meaningful interpretation of information" involves to some extent the processes which Forgas has defined as concept formation - that, "to recognize that an object is a hat, is to assign it to a class" (Miller, 1962, p. 166). Indeed, Vernon (1962) has included as part of the perceptual process, classification and identification, usually (but not invariably) expressed in naming the object or describing it verbally.

It has thus appeared that a logical distinction between the processes of perception of object character and conceptualization is difficult to maintain and that the apparent distinction implied in the views quoted above has represented a convenient delimitation of the particular investigator's field of study. In the present context, however, it has seemed most fruitful to conceive of the perception of object character as continuous with both perception and conceptualization.

That is, it has been assumed that the perception of object character, while remaining closely related to the physical characteristics of the stimulus pattern, involves to some extent classification and identification (Vernon, 1962) or abstraction and generalization (Forgus, 1966) and hence, simple concept formation.

This assumption has been based, firstly, on the contention that, in the case of relatively simple concepts, the common attributes with which concept formation is concerned, are to a large extent directly contained in the physical stimulus pattern, as compared with more abstract concepts which depend on some logical definition. Formation of such simple concepts has appeared, therefore, to depend upon perception of common attributes and limitation of generalization by accurate discrimination (Forgus, 1966). For instance, the over-generalization of concepts by young children, such as the use of the label, "dog", to apply to other four-legged animals, as well as the opposite tendency, to restrict labels to familiar instances of a concept, both testify to the necessary contribution of perception to simple concept formation - a contribution recognized in the term, perception of object character.

Secondly, it has appeared that the familiar, functional use of objects exerts a primary influence on how they are conceptualized, despite the fact that later experiences may modify such concepts, so that at times they are subsumed under more inclusive abstractions. The privileged status of such concrete, functional concepts has appeared attributable to the fact that the necessary information is more readily apprehended, being present in or closely tied to the stimulus pattern. The term, object character, has seemed particularly applicable to such concepts.

To the new-born infant, the universe is undifferentiated (Maier, 1965), formed of patterns of stimulation which have no substantial permanence or spatial organization (Piaget, 1955) and in which the individual and the environment represent a syncretic whole (Maier, 1965; Schachtel, 1959). Developing perception of the unity and coherence in certain patterns of stimulation associated with objects - a prerequisite for perception of the character of those objects - has appeared to depend on some degree of development in other aspects of perception, referred to in previous sections of this chapter. It has not, however, appeared that perception of patterns of stimulation associated with objects necessitates prior ability to respond to cues, such as size and colour, as independent features of stimulation; probably no more than discrimination or the ability to respond to size or colour as part of a cue complex, is involved (Jeffrey, 1969). Movement of the head in scanning has appeared important in supplying unity and coherence, in that it permits clearer delineation of the group of invariants making up the object, particularly when the object is viewed under conditions of high background variability (Jeffrey, ibid).

Early recognition of recurring patterns of stimulation has appeared to occur in terms of positive or negative affect associated with them (Schachtel, 1959) and object character is, therefore, initially affective rather than cognitive (Elkind, 1967). Although the affective aspect of object character declines in relative importance with increasing age (Schachtel, 1959), "objects do vary considerably in their emotional importance to the individual, and .... each one of us

establishes .... his own personal hierarchy of objects ...." (Anthony, 1956, p. 24) which continues to influence perception of object character.

Although Piaget's (1955) concept of object permanence has not appeared identical with object character, the former has nevertheless appeared an important aspect of the latter. For Piaget, the infant does not have a true concept of object permanence until he can represent it as evidenced by pursuit of the object in its absence (Elkind, 1967). Development of the latter capacity has been conceived in six stages (Piaget, 1955). Initially, during the first two substages, "there are only fleeting images not dissociated from the infant's activity and feeling" (Anthony, 1956, p.24). In the third substage, the beginning of permanence is conferred on things, by prolongation of movements of accommodation, such as grasping, but there is no systematic search for absent objects. At the fourth substage, between 8 to 10 or 12 months, the child begins to search for objects, but only at the point of first disappearance and without regard for successive displacements. Next, between 12 and 18 months, the object is constituted to the extent that it is a permanent, individual substance, which can be found at various points of displacement, provided they are within the perceptual range. Finally, about 18 months, objects can be found outside the perceptual field, indicating that the child has an image of absent objects and their displacements (Anthony, 1956; Piaget, 1955). It is now possible for the child to be aware of objects as independent from himself, enduring through time, beyond his intention or action (Maier, 1965).

Once the permanence of objects beyond their perceptual presence is established - although this is obviously not an all-or-none process - the child is increasingly capable of using objects for their own qualities and differentially (Maier, 1965). The functional character of objects thus assumes increasing importance, being implicit in the second and third year, although not usually verbalized till later (Elkind, 1967).

Nevertheless, arising from the fact that he no longer sees all actions as emanating from himself, the child of two years and older tends to bestow power upon objects (Maier, 1965), which are seen as alive. Initially, all things tend to be seen as having life and consciousness, but, with increasing age, life becomes limited, first, to things that move, next, to things that move spontaneously, then, to animals and plants and finally, to things having anthropomorphic traits (Anthony, 1956).

With the development of language, the conceptual sphere expands with the discovery that everything has a name (Elkind, 1967). As mentioned earlier, language has important effects on perception and its accommodative, assimilative and analytical role obviously affects the perception of object character. That its effect is not invariably facilitative, however, has been deduced from the fact that the use of a discriminative label is insufficient evidence of appropriate perception of object character in young children (Forgus, 1966). The examples of over-generalization and restriction of labels mentioned above have suggested insufficient differentiation of percepts (Elkind, 1967; Forgus, 1966),

related to failure to distinguish between individual and class designations of words (Elkind, 1967).

Discovery of another form of representation, namely pictures, has also seemed important in the development of perception of object character, insofar as the child is required to extend his perception of object character to two-dimensional representations of objects, at the same time remaining aware of the distinction between pictures and objects. The capacity to comprehend pictures is acquired gradually, but "quite early in life [the child is able] to recognize and identify from pictures objects with which he is familiar .... Thus by the age of two or three years he can identify and name correctly pictures of single objects; and pick out and name correctly three objects from the fairly complicated pictures used in the Terman-Merrill test of intelligence" (Vernon, 1962, p.102). There has appeared to be some evidence that different attributes tend to be used as bases for simple concept formation in pictures as compared with those reported for objects; or, at least, that bases of association amongst pictures tend to be relatively more stimulus-bound. Thus, Olver and Hornsby (1966) reported that children of five to eight years of age tended more frequently to group pictorial stimuli on the basis of physical stimulus characteristics than in terms of functional characteristics, although, with increasing age, the difference between the two bases decreased. Pictorial stimuli were also found to encourage the use of nominal grouping - that is, grouping in terms of a name already existing in their vocabulary.

Finally, in the process of emergence of the world of objects, a mode of relatedness with the world, termed by Schachtel (1959) secondary autocentricity, has seemed likely to develop. Secondary autocentricity, developing in the shift from primarily autocentric to primarily allocentric perception, is characterized by a focus on the relation of objects to the needs and purposes of the perceiver and by avoidance and even fear of full encounter with objects which threaten the perceiver's embeddedness in a closed pattern or routine. Secondary autocentricity may aid efficient processing of routine information, thereby reducing the burden on limited perceptual capacity; hence, it is in some sense necessary to life. But, if secondary autocentricity is the primary mode of perception, it is likely to lead to mere recognition and labelling, with the function of orientation and maintenance of security and with no appreciation of the full complexity of objects.

One of the features of the behaviour of "autistic" children noted in Kanner's (1943) paper was fascination with objects as compared with people. Pronovost (1961), amongst others, confirmed that "autistic" children showed a good relation with objects as compared with their peers or adults. Other writers have, however, considered that, although "autistic" children may show a greater amount of activity directed towards objects than people, the nature of that activity is, in fact, suggestive of an abnormal relation with objects. Thus Creak *et al* (1961) considered that "pathological preoccupation with particular objects or certain characteristics of them, without regard to their accepted functions" (p.502) is an important diagnostic criterion

permanence in "autistic" children was found to follow the normal sequence, it was severely retarded. "Autistic" children have been found unable to conceive of objects as substantial and permanent (Anthony, 1958). Objects have appeared to be recognized only in a certain context. "To the autistic child, objects exist for him only when he sees them or they are readily available in their customary place; they cease to exist for him when they move beyond his familiar orbit" (Bettelheim, 1967, p.446). Objects have appeared not to be divorced from a context of personal action, such as a sequence of touching or naming. Insistence on adherence to routines or arrangements of the environment might, therefore, reflect an attempt to maintain some degree of permanence (Bettelheim, ibid).

Possibly related to failure to develop object permanence, are observations of close scrutiny of detail, to the neglect of attention to the total object (Norman, 1954; Ornitz and Ritvo, 1968; Stroh and Buick, 1964). Norman's description of the behaviour in question cannot be bettered:

"They behave as though their objects were a series of details, a collection of perceptual properties rather than functional wholes .... Even with the most usual objects they seem to be at pains to explore or reinstate for themselves each particular property of the object, even to the extent of seeing it from varying distances and at varying angles .... the capacity for one part to serve for the rest seems to be reduced .... the child often seems to fail to achieve objects as such, and is left with .... a number of details poorly organized as a whole". (Norman, 1954, pp. 130 - 131).

It has thus appeared that "autistic" children may have difficulty in attaining the degree of unity and coherence necessary for perception of objects and, furthermore, may be handicapped in the processes of abstraction and generalization necessary for the simple concept formation involved in perception of object character.

A number of writers (Anthony, 1956; Bosch, 1962; Creak et al, 1961; Norman, 1954; Stroh and Buick, 1964), have commented on the extent to which the functional character of objects appears to be ignored by "autistic" children. Objects are incorporated in repetitive 'play' without regard for their conventional function; other objects differing in function, but similar in certain aspects of appearance, may be substituted without any change in the mode of activity; attention to part-characteristics of the object replaces more normal attention to function; and objects which do not fit in with the child's pre-established pattern of activity are discarded. A key aspect of object character has thus appeared to play a relatively minor role in the perceptual-motor behaviour of "autistic" children.

In contrast, in one of the few more controlled and systematic investigations relevant to the perception of object character, Tubbs (1966) found no significant difference between "autistic" Ss and normal and subnormal controls (matched for MA) on the visual decoding and visual-motor association sub-tests of the ITPA, both of which might be said to require, to a considerable extent, perception of object character. (In the visual decoding test, the S is required to find amongst four others, the picture which matches conceptually, rather than in terms of stimulus characteristics,

another picture previously shown, for example, a kitchen chair to match an arm-chair; in the visual-motor association test, objects or pictures must be associated either on a transitional basis, for example, a sock with a shoe, or a substitutional basis, for example, boy with girl since both are people. In another experiment (Hermelin and O'Connor, 1970), involving arrangement of pictures in sequence, "autistic" children used meaningful order as an aid to memory in a way similar to normal controls, even though making significantly more mistakes than the latter. It has thus appeared that object character, at least of fairly familiar objects, can be perceived by "autistic" children at a level comparable with their mental, but considerably below their chronological age. The observations regarding behaviour in relation to the functional character of objects have therefore been considered as probably more relevant to the unusual quality of the "autistic" child's affective relation with objects which apparently permits him to ignore conventional associations in favour of private ones and possibly to poorly developed object permanence and neglect of the whole. Thus, it has appeared that, although the "autistic" child can perceive object character at a level appropriate to his mental age, he does not always do so.

Animistic comprehension of objects has appeared to persist in "autistic" children beyond the stage when it is normally given up (Anthony, 1956; Bosch, 1962; Norman, 1954). Lack of clear differentiation in this respect between people and objects is most apparent in speaking "autistic" children (Anthony, 1956), but has also been deduced from the behaviour of non-speaking, "autistic" children (Norman, 1954).

Finally, it has appeared that many "autistic" children lag behind normal children in their appreciation of pictures. Difficulty is often encountered in getting "autistic" children to look at pictures (Elgar, 1966) and, when they do look at pictures, attention to detail without regard for the whole, similar to that seen in inspection of objects, has been observed (Norman, 1954). Fruit and food illustrations may be treated as real (Anthony, 1956). Only particular objects may be recognized. On the other hand, in the ITPA study (Tubbs, 1966) referred to above, recognition of pictures was at least at the level of the mental age of the "autistic" Ss. Behaviour in regard to pictures has thus been suggestive of similar problems to those encountered in the perception of the character of concrete objects.

The apparent disturbances in perception of object character by "autistic" children outlined above have appeared particularly likely, in view of their probable association with factors affecting perceptual development in ECA discussed earlier. For example, disturbances in language have appeared likely to limit the extent to which "autistic" children can benefit from the assimilative and accommodative potential of language in conveying the culturally accepted, functional character of objects. The restricted nature of motor activity in the "autistic" child must severely delay the development of object permanence insofar as a variety of interactions with an object are necessary for awareness that an object remains unchanged despite changes in context and action with respect to it (Bettelheim, 1967; Bosch, 1962). Moreover, the character and purpose of many objects depends on inter-

-action with other people (Bosch, ibid). The limited extent of such interaction in "autistic" children - and its egocentric nature (Anthony, 1958) - have appeared likely to hamper perception of the character of such objects. Avoidance of novelty, seen, for example, in failure to experiment with objects and explore their complexity, has also seemed likely to interfere with full perception of object character (Bosch, 1962). In this regard, even where there is a limited degree of recognition of objects, the perception of "autistic" children has seemed to be characterized by secondary autocentricity, preventing full encounter with objects.

In conclusion, it has appeared probable that "autistic" children are to some extent handicapped in their perception of object character, tending to operate at the level of the very young child. The evidence regarding most aspects of the perception of object character in ECA has, however, been observational and has, therefore, appeared to require further systematic investigation.

CHAPTER 1X

The Study : Original Research Design.

Every study has a history, involving changes in conceptions, approaches and aims in the face of new information and obstacles. The present study was no exception. Serious difficulties were encountered in the execution of the original design and subsequent modifications were constrained by the direction already adopted, in particular with regard to the nature of the perceptual measures. An understanding of the study as eventually executed thus seemed to demand an account of its background, which included two pilot studies (PS I and PS II)<sup>1</sup> in which preliminary assessment of various perceptual measures was undertaken.

A. Hypotheses.

It was intended to investigate hypotheses regarding certain aspects of perception in "autistic" children. The hypotheses referred to perception of shape, size, colour, two aspects of configuration and object character and have been expressed in general terms in a previous chapter (Vlll).

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1. The normal §s of the pilot studies, whose age range approximated that of the "autistic" §s studied later, have been described in greater detail in Appendix A.

B. Subjects.

In order to achieve a clearer understanding of the processes underlying perception in "autistic" children, it was necessary to show not only whether perception in "autistic" children differed from that of normal children, but also if and how it differed from or resembled perception in children representing various other points on a developmental continuum. In Hermelin and O'Connor's (1970) phrase, it was necessary to indicate whether any difference in perception between "autistic" and normal children indicated arrested development or a developmental anomaly.

With the latter aim in mind, Ss representing various levels of intellectual development and without serious behavioural or emotional problems were to be studied in addition to "autistic" Ss. The difficulty of testing the intelligence of "autistic" children and the resultant doubt regarding the reliability of the obtained IQ, however, presented problems as regards the basis of matching. As a more objective and reliable basis, it was decided that CA be used as a criterion in selecting Ss representing major control categories. The remaining control Ss would be selected by matching, on the basis of MA, with the major control categories.

The categories of control Ss to be studied and the rationale for their inclusion were as follows:-

- (1) Comparison with Ss of normal intelligence (labelled N/CA), with no serious behavioural or emotional problems, matched on the basis of CA with "autistic" Ss, would indicate whether perception in the "autistic" Ss was defective.

- (2) Comparison with Ss of subnormal intelligence, (labelled S/CA), assessed as non-psychotic, matched on the basis of CA with the "autistic" Ss and similar in MA, would indicate whether defective perception in "autistic" children could be attributed to low functional intelligence or whether other factors in addition to or independently of low functional intelligence were implicated. Thus, to the extent that both subnormal and "autistic" Ss differed from normal Ss, low functional intelligence would account for poorer perception in "autistic" children, although greater difficulties on the part of "autistic" as compared with subnormal Ss would indicate that factors in addition to low functional intelligence were involved in the case of "autistic" Ss. Lack of difference between subnormal and normal Ss in comparison with "autistic" Ss would imply a minimal role of low functional intelligence in the perceptual difficulties of the latter.
- (3) Comparison with Ss of normal intelligence, (labelled N/MA), with no serious behavioural or emotional problems and matched on the basis of MA with subnormal Ss (S/CA) would indicate whether "autistic" Ss, despite differing from normal and subnormal Ss of the same CA, nevertheless followed a similar but retarded developmental sequence as regards perception. This control was necessary in order to take account of the possibility (Allen et al, 1965) that the perceptual functions under study were linked to CA rather than MA, in which case deviations in perception from intellectually normal and subnormal Ss at the same CA, in the direction of perception

in younger children, would nevertheless indicate retarded perceptual development rather than developmental anomaly.

- (4) The final category of control Ss was to be composed of older, intellectually subnormal, but non-psychotic Ss, (labelled S/OLD), matched on the basis of MA with normal Ss (N/CA). Comparison with other control categories would further clarify whether the perceptual functions under study were CA - or MA-linked and thus whether deviations from control Ss by "autistic" Ss represented developmental lag or a qualitative departure from the normal developmental sequence. Conclusions regarding developmental sequences on the basis of selected groups would, however, be tentative in view of the fact that age trends in perceptual development are frequently non-continuous, non-linear or even U-shaped (Wohlwill, 1960).

A second consideration in deciding upon the basis for selecting Ss was representativeness. In the case of "autistic" Ss, the relative rarity of the condition and the problems of diagnosis outlined earlier meant that a limited number of Ss was available for the study. In view of the confusion in the literature, arising from failure sufficiently to specify selection criteria and from the use of heterogeneous groups, it appeared, however, that considerations of size should be secondary to an attempt to obtain a sample of Ss whose diagnostic status was relatively clear. In this regard the age range of the "autistic" Ss was a further factor

limiting the size of the sample, in that the older a child, the less certainty there has appeared to be regarding the applicability of the label, "autistic". It thus seemed desirable to obtain Ss as young and within as limited an age range as was compatible with certainty regarding diagnostic status. Homogeneity, as regards severity of the condition, in "autistic" Ss was also considered desirable, though less essential, in view of the aim of the study, namely, to investigate perception in children diagnosed "autistic", rather than in children exhibiting a particular degree of severity of the syndrome.

In view of the probably small number of "autistic" Ss, the question of the number of Ss in control categories arose. It seemed desirable to obtain a somewhat larger number of normal Ss at least, in order to provide a reference point against which the significance of any deviation by "autistic" Ss could be evaluated. However, practical considerations of the time available for selection and the necessity of co-ordinating testing with schools prevented random sampling from the populations in question. It was, therefore, decided to adopt a matched pairs procedure, drawing a small but carefully specified sample of control Ss from those available, on the basis of performance on an intelligence test appropriate to the age of the S (WISC, WPPSI or Merrill-Palmer) and a teacher's report indicating no serious behavioural or emotional problems. The level of intelligence of subnormal children to be selected

in this manner was derived from research (Mittler, 1968; Rutter and Lockyer, 1967; Wing, L., 1969) on the distribution of intelligence and its association with disturbances of speech in "autistic" children, permitting rough equation with the intellectual level of "autistic" Ss. Intellectually normal children were defined by IQ as indicated on the appropriate intelligence scale. Mental age was calculated where necessary, using the formula,  $MA = IQ/100 \times CA$ .

Certain other factors were also considered in relation to control. Firstly, the limited age range already specified for "autistic" Ss was relevant to control samples also in that it reduced the possibility of differences in what was being measured at different ages (Ernhart, Graham, Eichman, Marshall and Thurston, 1963). Secondly, since sex differences in perceptual ability have been reported (e.g. Rosenblith, 1965; Sherman, 1967), it was necessary, as far as possible, to ensure matching of sex across Ss. Thirdly, it was necessary to consider whether, since disturbances of language and low intelligence are not perfectly correlated in ECA, disturbances in language rather than perception might result in poorer performance by "autistic" as compared with subnormal Ss. The possible effects of the linguistic handicaps of "autistic" children affecting their perception has been discussed earlier (Chap.VII). More direct effects of linguistic disturbance on performance of perceptual tasks in the present

study could, however, be controlled, it seemed, through the use of demonstration rather than verbal instructions (Bijou and Baer, 1960) and simultaneous rather than successive presentation to lessen the burden on memory (Bryant, 1967).

The design with regard to Ss has been summarized in Table 1 below.

Table 1 : Summary of Criteria for Selection of Ss

Category	Subject Label	CA (Yrs)	MA	IQ
"autistic"	AUT	5 - 8 *	-	-
normal	N/CA	5 - 8 *	5 - 8	90 - 110
subnormal	S/CA	5 - 8 *	3 - 5	55 - 75
normal	N/MA	3 - 5	3 - 5 *	90 - 110
subnormal	S/OLD	9 - 12	5 - 8 *	55 - 75

\* Indicates matching criterion as CA or MA.

C. Measurement of perception.

(1) Standardized tests or experimental method.

The question arose how the aspects of perception on which this study focussed could best be studied in "autistic" children. Standardized developmental tests of perception such as the Frostig test (Maslow et al, 1964) did not appear suitable because the perceptual functions measured are relatively complex, other functions besides perception, such as fine-motor co-ordination, are involved and verbal instructions or complex gestures are essential features of the administration. Furthermore, even although psychometric evaluation of "autistic" children has been found possible with measurements at an appropriately low developmental level (Alpern, 1967), interpretation of the nature of the function in a child chronologically older than the standardization sample remains problematic (Ernhart et al, 1963). Finally, global tests tend not to provide much insight into the nature of the processes underlying performance (Mittler, 1968).

An alternative was the use of experimental method which has been used to advantage in demonstrating subtle defects in children whom many would regard as "untestable" on formal instruments (Mittler, ibid). Other methods such as naturalistic observation and prospective longitudinal study, have been advocated, particularly as providing a source of significant problems (Cartwright, 1959; Chess, Thomas, Rutter and Birch, 1963; Sears, 1957). The advantages of experimental method in the context of an attempt to clarify the existence of perceptual defects in ECA

were, however, its characteristic careful analysis of hypotheses and detailed listing and control of variables (Hermelin and O'Connor, 1970). The fruitfulness of such an approach to clearly defined problems has been amply demonstrated, for example, by the work of Hermelin and O'Connor (ibid) with "autistic" children and by House and Zeaman (1963) with retarded children.

(2.) Discrimination learning versus discrimination.

A fundamental operation in any experiment on perception is to demonstrate discrimination between patterns of stimulation (Garner, Hake and Eriksen, 1956). A procedure commonly used to attain this objective is discrimination learning, with trials to criterion as a measure of perception. In the present study, however, this procedure had certain disadvantages. As discussed in a previous chapter (VII), "autistic" children exhibit severe difficulties in learning, apparently requiring frequent repetition or conditions of high emotional impact in order to learn. Any perceptual disturbance would thus be confounded with learning disabilities in a discrimination learning procedure.

An alternative means of investigating discrimination, in which learning could be distinguished from perception, was, therefore, sought. A procedure similar to that used by House and Zeaman (1963), but with the emphasis on discrimination rather than learning, appeared to be a suitable alternative.

This procedure was characterized by a division into two stages. In the first stage, the S learned behaviour - whereby discrimination of a given form of stimulation was appropriately indicated. In the second stage, the already learned response was required in relation to novel instances of the same form of stimulation. Thus, assuming adequate learning in the first stage, performance in the second stage could be considered as indicating discriminative ability in relation to the form of stimulation presented.

(3) Measures of discrimination.

In order to make inferences about discriminative ability, overt performance on some task is required. The question was what form of task and what form of instrumental response would most effectively indicate the extent of discriminative ability in "autistic" children.

The form of task selected as a potentially fruitful and effective measure of discrimination was a matching one. Its advantages were, firstly, minimization of the role of memory, as a potentially confounding variable, through simultaneous presentation of standard and discriminative stimuli (Hermelin and O'Connor, 1970; Rosenblith, 1965). Secondly, matching allows testing of many more discriminative alternatives against standards (Fellows, 1968; Gibson and Olum, 1960). Thirdly, Fellows (1968) has suggested that matching permits fuller testing of the perceptual-cognitive capacities of children than does discrimination learning, since matching requires that the S respond to a stimulus relationship and not

merely to a specific stimulus. A similar view has been expressed by Vernon (1962) who has questioned whether discrimination between stimuli is equivalent to perception of a single stimulus. Whether or not matching involves a more complex perceptual process than does discrimination, a fourth advantage of the former is that it permits more detailed analysis of errors, providing a clearer indication of the constituent psychological operations (Fellows, 1968).

(4) The matching response.

In considering the form which the instrumental response indicating matching should take, a number of factors were considered. Such a response should be differential, capable of indicating recognition of differences in stimulation, and specific, preventing ambiguity (Gibson and Olum, 1960). Close association of the locus of stimulation and response has been found to enhance performance (Morin and Grant, 1955), as well as increasing the probability of contiguity between attending and choice behaviour (Bijou and Baer, 1960). Minimal motor involvement was necessary to prevent confounding of motor or perceptual-motor impairments with perceptual functioning (Rosenblith, 1965). Finally, the learning disabilities of "autistic" children already mentioned required that the instrumental response be simple, to facilitate training and invariant across different tasks, to facilitate transfer.

Initially, pressing one of a number of keys placed in front of and slightly below the discriminative stimuli was used as the instrumental response. It became evident, however, that even this slight degree of separation between stimulation and locus of response interfered with performance.

Normal Ss in PS I and PS II and one "autistic" S with whom this response was attempted, showed a tendency to attend to the keys, failing to associate stimulus and key, key-pressing was, therefore, discarded in favour of pointing, the S being required to point first to the standard and then to one of the discriminative alternatives representing his matching choice. An immediate improvement in performance was noted, attributable, no doubt, to the closer correspondence between stimulus and response and possibly also to the fact that pointing to the standard increased the likelihood that it, as well as the discriminative alternatives, were oriented.

(5) Training matching behaviour.

As mentioned earlier (p.131), in order to be able to distinguish learning from perception, it was necessary to devise a preliminary training procedure whereby the S was enabled to acquire the requisite matching behaviour, including not only the matching response itself, but also other behaviours relevant to discrimination. The acquisition of such matching behaviour was conceptualized in the present study as "discrimination set", a form of non-specific learning, in which the invariant features of otherwise dissimilar tasks are learnt, facilitating the solution of new tasks. Discrimination set develops when the S is given practice on a series of tasks similar, for example, in format or presentation, but differing in content, in that the stimuli used in different tasks differ along different dimensions (Reese, 1963). Discrimination set has appeared to include observing or orienting responses (Reese, ibid), increased attention to task relevant cues

(Bruner, Miller and Zimmerman, 1955; Reese, 1963) and suppression of specific transfer between tasks (Reese, ibid).

Discrimination set was operationalized in the present study as a set to choose from amongst five discriminative alternatives, that alternative (the match) matching a standard, all the stimuli being arranged on a T-shaped composite card and the matching choice being indicated by pointing from standard to match.<sup>2</sup> It was anticipated, in view of the limited extent of both generalization and non-specific learning in "autistic" children (cf. pp. 82-83), that difficulty would be encountered in establishing discrimination set. Accordingly, considerable attention was paid to devising a training procedure.

A prerequisite of more formal training appeared to be the establishment of rapport between S and E; particularly in the case of "autistic" Ss, such rapport has been considered essential to the success of any experimental procedure (Mook, B., personal communication). To this end, a number of preliminary sessions were planned to permit gradually increasing interaction between S and E and development of greater tolerance by the S of demands of an increasingly specific nature, leading, through shaping, to behaviour similar to that which would be required in perceptual tasks. Formal training would be initiated when the "autistic" S was able to remain alone with the E for a period of about 30 minutes, engaging in specific activities for some part of this time. Adverse reaction to initial attempts

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2. See Pp. 138 - 139 for further discussion of the number and arrangement of discriminative alternatives.

at more formal training would necessitate further attempts to extend rapport. In the case of control Ss, it appeared unlikely that more than one preliminary session, during which the intelligence test would be administered, would be necessary. Measures similar to those employed in conventional psychometric testing would be sufficient to ensure rapport in subsequent perceptual testing.

As regards more formal training, amongst the techniques considered were repeated demonstration of the required behaviour (Bijou and Baer, 1960; Hermelin and O'Connor, 1970), shaping the required behaviour, making use of already present behaviour (Lovaas, 1966) and free operant discrimination learning (Ferster, 1961; Ferster and DeMyer, 1961; 1962; Lovaas, 1966). The experience of previous researchers indicated that none of the above techniques alone was necessarily sufficient to induce desired behaviour in "autistic" children and it was, therefore, decided to attempt a combination of demonstration and shaping. Free operant learning was excluded, because of its heavy reliance on the reinforcing effects of various rewards, which are necessarily concrete in the case of "autistic" children (Lovaas, 1966) and thus subject to rapid satiation as well as being ineffective without rapport between S and E (Mook, B., personal communication).

A system of rewards was, however, retained, mainly as an inducement to continued co-operation (Hermelin and O'Connor, 1970). It was not assumed that reward would operate similarly for all Ss. That is, performance of different Ss might arise from different motivations, but this was not considered unduly significant, since it seemed likely that similar differences would be found outside the laboratory situation. Both

primary and secondary rewards were used (body play or sweets and small toy soldiers for boys and charms for girls). Secondary rewards were introduced on an increasing variable ratio schedule, while primary rewards were used increasingly sparingly, in order to maintain the rewarding effects of the former (where secondary rewards had little intrinsic appeal, as for "autistic" SS), while decreasing the rate of satiation of the latter.

Materials for training were drawn up, bearing in mind that, firstly, training has been found to be enhanced by initial presentation of marked inter-stimulus differences, which indicate the critical relationship unambiguously, followed by gradually decreasing inter-stimulus differences (Gibson and Olum, 1960). Secondly, initially only a few discriminative alternatives should be presented, proceeding gradually to presentation of more and new alternatives (Gibson and Olum, ibid). Six training items, arranged in pairs, showing decreasing inter-stimulus differences were designed for each of the perceptual tasks. Each item was composed of a number of steps, involving presentation of an increasing number of discriminative alternatives.<sup>3</sup> Each of the steps within a particular item was presented on a separate composite card, having the appearance of an inverted T, the standard being presented on the leg of the T and the discriminative alternatives along the elongated bar of the T, as in task items (see below p. 139).

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3. See Appendix B for further details regarding the composition of training items.

The procedure followed in inducing discrimination set with these materials in PS II was as follows:-

- (a) The first four steps of the first item were displayed, the E outlining or pointing to the standard and match in turn, in order to focus the S's attention on the display card.
- (b) The same four steps were re-displayed, the S being required to imitate the E's gestures on the previous presentation. If, at first, the S made no move to imitate the E, the S's arm was lifted in the direction of the apparatus and, if no further movement followed, his hand was moved from standard to match and the E then repeated the gesture of pointing from standard to match. The above procedure was repeated until the S spontaneously imitated the E's gestures. Choice of the match on any of the steps was rewarded, while failure to respond, or choice of a non-matching alternative, produced no reward and was followed by the E's again pointing to standard and match.
- (c) The remaining steps of the first item were then presented. Choice of the match on any item was rewarded and led to display of the next item, while choice of a non-matching alternative resulted in re-presentation of earlier items, until correct choice was established.
- (d) The steps of the second item were introduced as for the first item, although, where it appeared that discrimination set was established, later equivalent steps were not presented.
- (e) In the remaining items, if the S was successful on the first member of an equivalent pair, only an abbreviated version of the second - namely, the most difficult step - was presented. As on the second item, certain of the steps designed to induce discrimination set were omitted if S succeeded on an earlier, equivalent step. Conversely an incorrect choice later in a series would be followed by re-presentation of an earlier step, or even item.

The procedure and materials described above seemed to be effective in inducing the required discrimination set and in ensuring a smooth transition to the task which followed. In particular, in comparison with PS I,

where pointing by the E had not been incorporated, the use of gestures seemed to induce certain aspects of discrimination set far more efficiently and directly. Transfer of discrimination set to the materials of different tasks was generally good, with few repetitions of steps, as in training for the first task presented. It, therefore, appeared that the procedure would be effective in the present study.

(6) Control of task-related variables.

The advantages of matching as a measure of discrimination (cf. pp.131-132) are balanced by a corresponding increase in the number of variables to be controlled and taken into consideration. Decisions regarding control of variables common to all perceptual tasks were based upon recommendations in the literature and assessment in pilot studies.

(a) The number of discriminative alternatives per item.

Previous studies of discrimination in "autistic" children (e.g. Hermelin and O'Connor, 1970) have tended to present no more than two discriminative alternatives per item. It seemed desirable, therefore, in order to verify the generality of previous findings, that a greater number of alternatives be presented per item in the present study. Since the number of discriminative alternatives presented affects the ease of discrimination (Gibson and Olum, 1960), it seemed possible that the relative ease of discrimination by "autistic" as compared with control SS might be different with a greater number of alternatives. Presentation of more than two alternatives would also decrease the possibilities of choice of the matching alternative (the match) by chance.

The number of alternatives should not, however, be so great as to introduce the possible confounding effects of limited immediate memory or attention. Miller (1956) has suggested that the limit of the average individual's capacity for processing stimulation is about seven alternatives, plus or minus two. Thus, in order to remain within these limits and given the fact that the Ss of the present study were younger than those on whom Miller's figures were based, it was decided that five alternatives would be presented per item during the second, assessment stage of the two-stage procedure outlined earlier.

In both pilot studies, it was found that, provided adequate understanding of the task had been indicated on training items, five alternatives was within the limit of the Ss' capacity for processing stimulation.

(b) Arrangement of alternatives in relation to the standard.

A number of arrangements of alternatives in relation to the standard was possible, for example, in a circle around the standard or in a row to the left and right of the standard. The arrangement chosen in the present study involved presentation of all the stimuli of a given item on a composite card in the shape of an inverted T. The discriminative alternatives were arranged along the elongated bar of the T, separated from each other by a minimum of one inch. The standard appeared on the shortened leg of the T, separated from the row of discriminative alternatives by approximately one inch. This arrangement had the advantage that the standard was clearly set apart from the alternatives, but the disadvantage that discriminative alternatives were not all equally distant from the standard, thus possibly tending to discourage adequate comparison with all alternatives.

Other possible arrangements were, however, not free of disadvantages and, since the experience of the pilot studies indicated that training was sufficient to induce in normal SS a set to consider all alternatives, it was decided to retain the above arrangement.

- (c) The extent of inter-alternative difference and the ordering of alternatives in a given item.

Both these variables could be considered only in relation to relatively simple forms of stimulation to which some means of measurement was applicable, namely, size and colour and to some extent, shape. The extent of inter-alternative difference was decreased in successive groups of items in each of these perceptual tasks, thereby introducing increasing levels of difficulty of discrimination. The extent of difference was determined on empirical and practical grounds. That is, differences which, in the pilot studies, proved to be very easily discriminated by all age groups, were excluded from the final version of a task as failing to show discriminative power. On the otherhand, the extent of the smallest inter-alternative differences in the various tasks was determined jointly by practical difficulties of production and by the assumption that smaller differences would be irrelevant to the question of perception under extra-experimental conditions.

The ordering of alternatives, where applicable, took account of the finding that young children tend to choose an alternative near the middle of a rank-ordered series (Wohlwill, 1960). Thus, in most items, alternatives were randomly ordered or only partially rank-ordered. Only in the occasional item were all

alternatives rank-ordered. The form of ordering was randomly chosen in successive items.

(d) The position of the match.

Control of the position of the match has been shown to be necessary in simultaneous matching, as young children are extremely susceptible to positional behaviour (Fellows, 1967; 1968; Gibson and Olum, 1960). Fellows (1967) has stated that it is necessary to choose a sequence which will combat a better or worse than chance performance occurring because of the operation of a positional strategy of choice, the most common being position perseveration and position alternation. The increased number of alternatives in the present study, in contrast to the more usual use of a two-alternative task, tended to reduce the likelihood that positional choices would be confounded with discrimination. In addition however, the position of the match was randomized in successive items and in such a manner that, over the whole series of items of a given perceptual task, the match appeared in each position approximately the same number of times.

(e) Exposure time.

The question arose whether an item should be exposed for a limited period of time, or whether unlimited viewing time should be permitted. Immediacy has, of course, often been proposed as a criterion of perception, distinguishing it from other cognitive processes such as judgement. Epstein (1967) has, however, pointed out the ambiguity of immediacy as a criterion of perception, referring as it may either to an overt

response initiated by perception, or to a covert experience; and the difficulty of applying the criterion experimentally. Epstein's criticisms, together with the view adopted in the present study (cf.Ch.VI) - that perception is not sharply demarcated from other psychological processes - seemed to indicate that a limited viewing period was not justified.

It remained to consider whether, given unlimited viewing time, the time taken by the S to make an instrumental response should be used as a measure of discriminative ability. A factor of some importance in this regard was the likely differences in non-perceptual aspects of task-oriented behaviour between the various Ss, particularly between "autistic" and control Ss, for example, the extent of distractibility or the degree of impulsiveness or caution in making a choice. The contribution of non-perceptual factors would not have been indicated by a simple measure of response latency. Similar criticisms could, of course, be made of the use of a single instrumental response as a measure of perception. It did seem, however, that the latter measure, in its very simplicity (even, its crudeness) implied reservations about its adequacy and the necessity of referring to qualitative data for amplification. Such reservations might be obscured in the case of response latency by the apparently greater sensitivity of the measure. It was thus decided that response latency would not be used as a measure of discriminative ability.

(f) Number of assessment items per task.

Two factors were considered in deciding on the number of assessment items per task. Firstly, it was necessary that at each level of difficulty in a given task, a sufficient number of items be available to permit reliable assessment of discriminative ability. Secondly, a task should not be too long in order to prevent a decline in Ss' interest and attention. In PS I, the number of items presented in different tasks varied from 20 to 36. It appeared that about 20 items was the optimal assessment task length, an impression confirmed in PS II, where attention and interest were better maintained on tasks which had been reduced in length.

(g) Practice effects.

Epstein (1967) has defined practice as any controlled activity of the S which involves repeated perception of that stimuli, or ones closely similar to them. Epstein has concluded, from a review of experiments dealing with the effect of practice on visual space and form perception, that, although the evidence is not conclusive, practice probably has only a limited facilitative effect on subsequent perception. It nevertheless seemed necessary to consider three possible ways in which practice might operate to affect differentially the performance of the various groups in the present study.

Firstly, experience with earlier items of a task might contribute to the ease with which later

items were discriminated. The question arose whether all groups of Ss would benefit equally from such experience. Two factors appeared likely to reduce, if not eliminate, the possibly confounding effects of this form of practice. These were the preliminary training of all Ss in the behaviour appropriate to discrimination and the reduced number of items and hence reduced opportunities for practice on the assessment task itself.

Secondly, experience on earlier presented tasks might affect performance on later tasks differentially for different groups. The small number of Ss available did not permit a counter-balanced administration of tasks. The possible differential effects of task-order were, however, partially controlled by ensuring that successive tasks presented were dissimilar and that some time - one day - elapsed between successive administrations. The latter two measures were considered likely to reduce both practice and interference effects for all groups. In PS II, none of the Ss in fact appeared to experience serious difficulties attributable to interference effects from previous tasks and all Ss appeared to derive similar benefit from practice on earlier tasks, judged in terms of the ease of transferring discrimination to the training items of subsequent tasks.

Thirdly, experience on one version of a task, having two- and three-dimensional versions, might differentially affect performance on the other version. The effects of this form of practice might be partially controlled by presenting the tasks in question in a counter-balanced order. Furthermore, administrations

of the two versions of each task would be separated by other tasks and a considerable length of time.

(h) Testing environment.

For a number of reasons, it seemed most advantageous to conduct testing at places most accessible to Ss in the various groups, rather than at one central testing point, provided suitable testing conditions - adequate lighting, a relatively simply furnished room and freedom from disturbance - were available. Firstly, a strange environment might adversely affect performance even in normal Ss, for example, through excitement or anxiety at visiting a new place. Although testing in a relatively familiar environment would not eliminate the effect of such factors as the experience of being singled out for testing by a strange adult, it did seem likely to decrease the effect of other factors mentioned above. A similar argument seemed applicable to subnormal Ss.

In the case of "autistic" children, bearing in mind their commonly noted adverse reaction to strangeness, every attempt to reduce the number of strange events seemed advisable. Even without the stress of a strange environment, "autistic" Ss would still have to cope with the demands of meeting a strange adult and engaging in unfamiliar activities.

Secondly, renewed interest in individual differences in interpretation of events has pointed up the fact that a physically identical environment cannot be

assumed to generate equivalent perceptions of the environment. For example, as mentioned above, anxiety or excitement both seemed likely reactions to a strange environment. Hence, since a physically identical environment could not be assumed to ensure a "controlled" environment, it seemed preferable to seek control in terms of familiarity.

Thirdly, on practical grounds, testing Ss at a place accessible to school or home would reduce objections to their participation in the study, such as extended periods away from school or the risk of accidents in transporting Ss to another centre.

D. Selection of stimulus materials.

(1) General considerations.

Most researchers are aware of the importance of specifying the population from which subjects are drawn and to which generalization may validly be made. Recently, however, attention has been drawn to the frequent disregard of the limits of generalization to populations of stimuli (Alluisi, 1960; Attneave, 1954; Attneave and Arnoult, 1956; Brown and Owen, 1967; Hammond, 1954). Selection of stimuli has tended to be somewhat arbitrary and restricted to a small number of stimuli. Generalizations regarding form perception in general, for example, have frequently been based on a small number of simple geometric or nonsense shapes, chosen apparently randomly.

If, however, generalization is to be extended beyond the particular objects or forms of stimulation employed in an experiment, some attempt must be made to specify the population of stimuli to which results may be generalized. Ideally, generalization should be to natural stimuli, based on some estimate of the psychologically important parameters of natural stimuli. Unfortunately, measurement is not always easy to undertake, since in many cases sophisticated techniques are required and, in others, measures have yet to be devised. Moreover, as Attneave and Arnoult (1956) have pointed out, there is not yet available a means of determining which of many possible measurements are psychologically relevant. That is, although rules have been devised for generating certain classes of stimuli, there is as yet, no methodology which can be utilized to generate synthetic stimuli possessing the statistical characteristics of natural stimuli to which generalization is intended.

Certain psychologically relevant aspects of naturally occurring stimulation have, however, appeared capable of incorporation into experimental stimulus materials. Firstly, the variable of two versus three dimensions was considered. In studies of perception, this variable has frequently been neglected and findings based on two-dimensional materials have been generalized to perception of three-dimensional stimulation. That such generalization may be invalid has been shown by such findings as that, in early development particularly, three-dimensional stimuli are more easily discriminated than are two-dimensional stimuli and that three-dimensionality of stimulation is importantly related to the degree of benefit derived from early exposure to stimuli (Gibson & Olum, 1960; Jeffrey, 1969).

A second reason for incorporating the variable of two-versus three-dimensionality was the reported tendency of "autistic" children to make use of the proximal senses in preference to the distal senses. Insofar, as two-versus three-dimensional stimuli seemed likely to vary in their relevance to particular modalities - three-dimensionality being relevant to both vision and touch, two-dimensionality only to vision - it was expected that differences might be found in the ease with which two- versus three-dimensional stimuli could be discriminated by "autistic" children. Findings in this regard might be expected to clarify the question of modality relations in ECA.

Initially, it was intended that both two- and three-dimensional versions of all perceptual tasks should be constructed. Largely for reasons of practicability, however, it was later decided that two- and three-dimensional versions should be constructed only for assessment of form and size perception, on the assumption that differences in dimensionality were most relevant to these forms of stimulation.

Accordingly, two-dimensional versions of the tasks in question were prepared by drafting stimuli directly onto the T-shaped cards referred to earlier (pp.139-140). The three-dimensional versions were prepared by cutting the stimuli from  $\frac{1}{4}$ -inch thick polystyrene and coating the cut-out shapes with black paint in order to maintain the necessary contrast with the background, T-shaped, cards, onto which the shapes were then stuck with a special adhesive. Cards for both versions were arranged in an ordered series in boxes for easy accessibility in administration.

A second feature of naturally occurring stimulation has appeared to be differences in degree of complexity. In many cases, however, it has proved easier to conceptualize the variable of complexity, than to define it operationally or measure it. A promising approach to the problem of stimulus complexity has, however, been offered by information theory which has provided a means of conceptualizing stimulus complexity, as well as, in some cases, a means of operationalizing the concept, without necessarily implying an informational view of perception (Alluisi, 1960). Empirical definitions of complexity as, for example, in terms of the relative difficulty of discriminating amongst series of stimuli, have thus appeared explicable in terms of the relative redundancy or uncertainty characteristic of the stimuli of each series. An alternative approach, applicable to some forms of stimulation, has been suggested by Alluisi (1960) and involved definition of the informational characteristics of a population of stimuli, followed by random selection of particular stimuli. Use of this approach permits definition of stimulus uncertainty or complexity in terms of the total number of possible figures in a given population. Both approaches to definition of complexity were used in the present study (as described below with regard to selection of stimuli in particular areas).

The incorporation of the above-mentioned variables, while reducing the arbitrariness of stimulus selection, has not, of course, eliminated the problem of defining the population of stimuli to which results may be generalized.

It remained necessary, therefore, to specify the population of stimuli from which task stimuli were drawn, or, where stimuli were arbitrarily selected, to recognize the limitations on generalization. In fulfilling the latter minimum requirements of stimulus specification, informational concepts were found useful for gathering and systematizing data regarding stimuli.

(2) Task 1 : Shape.

Shape has been defined earlier (p. 84 ) as a multidimensional quality of an object which remains invariant under certain changes in other variables, for example, size and colour. In studying form perception, therefore, changes in the latter variables must be controlled, either by holding the variables constant or systematically varying them.

In most cases, it is possible to hold constant the values of potentially confounding variables. In the case of the variable of familiarity, however, the problem of how to assess familiarity makes the use of relatively unfamiliar stimuli - shapes with which Ss are unlikely to have had experience - desirable. The use of non-meaningful or non-representational stimuli has been suggested as a control for relative familiarity (Arnoult, 1954).

Other selection criteria which require consideration in view of the need to specify the population of shapes to which generalizations may be made, have been suggested (Arnoult, ibid). Thus,

- (i) stimuli should be representative of a limited population, having a certain determinate homogeneity;
- (ii) stimuli should be judged to have a high degree of similarity to each other;
- (iii) it should be possible to give determinate orientation to the stimuli;
- (iv) stimuli should be difficult to discriminate with brief exposure time.

Alluisi (1960) has suggested that there are two approaches to selection of defined populations of stimuli. The first and more usual approach has been to design certain stimuli and then attempt to assess the extent to which the stimuli meet certain criteria such as the above. However, such assessment has seldom been satisfactory. How, for example, is the relative similarity of a triangle, a circle and a square assessed? How is the orientation of such figures determined? Such difficulties were clearly evident in PS I in which relatively familiar, geometric shapes were used as stimuli. Moreover, given unlimited exposure time, such stimuli were easily discriminable by young children.

An alternative approach, (which also permits definition of stimulus complexity), as mentioned above (p.149), involves informational definition of populations of stimuli, permitting experimental control of the amount of information and the range of possible stimuli. One such population of shapes, referred to as metric shapes and having the appearance of solid bar-graphs, has been devised, such that production of the shapes incorporates rules whereby various forms and

degrees of redundancy may be introduced.<sup>4</sup> It is thus possible to compute the uncertainty of any shape by calculating the total number of shapes possible in terms of a given rule, although it is usually sufficient to know that shapes generated by the same rules of production have equal uncertainty (Alluisi, ibid).

Since metric shapes appeared to satisfy the criteria outlined above, it was decided to make use of this approach in the present study. In particular, the problem of familiarity seemed to be effectively resolved by the non-representational nature of the shapes, while, in contrast to geometric shapes, the fact that the generation of metric shapes incorporates a fixed axis, permits determinate orientation of the shapes. The extent of homogeneity and similarity of shapes could be determined in advance, in terms of the rules used to generate the shapes. Finally, the criterion of difficulty of discrimination with brief exposure time has been shown to be capable of fulfillment (Alluisi, 1960), although subject factors in the present study necessitated unlimited exposure (cf.p.142).

The use of metric shapes is open to the criticism that such shapes may not possess the statistical characteristics of natural shapes. In the absence of a methodology to evaluate psychological relevance, however, and in view of the relative effectiveness of

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4. For further discussion regarding the production of metric shapes, see Appendix B.

this approach in solving other problems of selection, metric shapes did seem the most satisfactory stimuli available, provided their possible limitations were borne in mind in making generalizations from the resultant data.

Categories of metric shapes were, therefore, devised according to certain rules, such that complexity or uncertainty and homogeneity or similarity were varied in different items in a manner assumed to affect ease of discrimination. A third variable, orientation, was incorporated, on the assumption that orientation changes might increase or decrease redundancy and thereby relative discriminability of different items, as well as function to lessen practice effects over the items of a task.<sup>5</sup>

Any single item was thus composed of metric shapes drawn from one category and reproduced as solid, black shapes on a white display card. No shape from a particular category served as a standard on more than one item and discriminative alternatives on any item were randomly selected from the remaining shapes in the particular category and randomly positioned on the display card. Different forms of orientation were randomly alternated in successive items. Where the form of orientation was other than perpendicular to the base of the card, the particular orientation of any of the discriminative alternatives

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5. For details regarding the procedures followed in devising metric shapes for the present study and the forms of orientation used, see Appendix B.

of a given item was randomly determined. Each of the categories of shapes was represented by approximately the same number of items.

The items of the two-dimensional version produced in this manner were administered to normal Ss in PS II. Mean error scores indicated little difference in difficulty with age, and, although the range of inter-individual differences in terms of total errors was quite considerable, mean and median error scores indicated that the majority of Ss experienced little difficulty in discriminating the metric shapes used. Differences between categories of shapes generated by different rules, in terms of mean number of errors per item, were slight, nor was there any consistent increase in mean number of errors per item as predicted in terms of these categories.<sup>6</sup>

Since, however, the expected increases in difficulty were based upon findings under conditions of brief exposure time, it was perhaps not surprising that data obtained under conditions of unlimited viewing time, did not reflect the same trend. A further factor affecting ease of discrimination was variations in orientation, since where standard and match were similarly oriented, mean error was considerably lower than where standard and match were differently oriented. Interactional effects amongst the variables, complexity, homogeneity and orientation also seemed likely to have affected ease of discrimination.

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6. The quantitative data arising from administration of this and other tasks in PSII has been set out in greater detail in Appendix B.

In view of the low ceiling of the task, it appeared desirable to eliminate variables contributing to ease of discrimination. Thus, despite the fact that it might be of interest to investigate whether orientation cues are similarly utilized by "autistic" and control Ss, it was decided to eliminate such cues from the task, in order to permit clearer delineation of any differences in form perception per se between "autistic" and control Ss in the present study.

The final version of the task thus consisted of 20 assessment items, representing seven categories of metric shapes. Two forms of orientation, which in PS II had elicited similar mean numbers of errors, were retained to reduce to some extent the effects of practice in successive items. That is, either all shapes composing an item were presented with their vertical axes perpendicular to the base of the card; or the orientation of discriminative alternatives was randomly varied and standard and match were differently oriented. Items were arranged within the task such that five series of items were presented, the first composed of two items from each category randomly alternating the two forms of orientation, and the second consisting of one item from each category, all in the second form of orientation.

Six items were devised for use in training, two consisting of simple geometric shapes and the remaining four consisting of metric shapes exhibiting a low degree of complexity and homogeneity and thus relatively easily discriminable. These items were found satisfactory for establishing

discrimination set in PS II and were retained unchanged for use in the present study.

A three-dimensional version of the task - shape (3D) - was prepared. Additional shapes were generated where necessary to avoid use of the same shapes as standards in the two versions and hence to minimize transfer of experience from one version to another.

(3) Task 2 : Size

Definition of size presented far fewer difficulties than was the case as regards shape, but since even pre-school children are capable of accurate discrimination of the sizes of geometric figures (Rosenblith, 1965), similar problems were encountered in providing sufficiently difficult discriminations at the upper end of the task. Such problems arose because extremely small differences in size did not appear relevant to everyday perception, to which the findings regarding size perception in "autistic" children were to be generalized.

The limit to the fineness of size differences thus imposed, necessitated attempts to devise other means of raising the level of difficulty of the task. The first form of the task (used in PS I) was made up of items in which discriminative alternatives differed from each other by different amounts, thus

increasing the amount of information carried by some of the alternatives, since the S could easily eliminate some of the alternatives and confine his attention to the remaining alternatives of the item. In a second form of the task, equal-sized differences between discriminative alternatives were used in all items, thus reducing the range of size values represented in each item and increasing the difficulty of discrimination.

A second means of increasing difficulty was to alternate items composed of differently sized circles or squares, thus serving to lessen practice effects. This device also served to increase somewhat the representativeness of the sample of stimuli, providing an indication of the effect of different shapes on the ability to discriminate size.

Categories of items were produced, incorporating the variables mentioned above and based on the size difference between discriminative alternatives. Size differences ranged from  $1/4$  inch to  $1/16$  inch, while the absolute size of alternatives (measured by diameter in the case of circles and length in the case of squares) ranged from  $1/2$  inch to  $2\ 1/16$  inch. None of the absolute sizes within any category served as a standard on more than one item and standards were drawn from each category in such a manner that the full range of sizes was sampled. Discriminative alternatives were chosen from sizes closest in size to the standard, randomly alternating items with the standard near the upper

or lower end of the range of sizes of alternatives, or intermediate. Within an item, discriminative alternatives were ordered as described above (p.140). Any single item was thus composed of circles or squares differing in size from each other by a constant amount and reproduced as solid black shapes on a white display card.

The items devised in this manner were administered to normal Ss in PS II. There appeared to be only a slight and partial improvement in discrimination with age, as indicated by comparison of mean error scores of the three groups. Moreover, the range of inter-individual differences in errors was quite considerable, indicating considerable variability within groups. For the majority of Ss, however, only moderate difficulty was experienced in discriminating sizes presented as described above. Mean errors per category of size differences increased in a consistent manner according to the fineness of discrimination required, but mean errors by shape differed very little over the whole task. An unexpected finding was that the last three items in the category requiring the finest discrimination elicited markedly fewer errors than previous items in the same category, suggesting that experience gained during the course of the task as a whole or on previous items of the same category had enhanced their discriminability.

In view of the low ceiling of the task and the apparent contribution of practice effects to ease of discrimination, it appeared desirable to discard

items on which few errors were made, thereby reducing opportunities for practice. The relatively low mean error per item of the category with the largest size differences between alternatives suggested that this category might be discarded.

The final version of the task thus consisted of 20 assessment items, representing three categories of size difference (namely  $3/16$ ,  $1/8$  and  $1/16$  inch). These items were the same as those used in PS II.

Six items were devised for use in training. Four items showed  $1/2$  inch differences between discriminative alternatives (as in PS II). The remaining two items were drawn from the discarded task items and showed  $1/4$  inch differences between alternatives, thus facilitating transfer to the first task items, which showed  $3/16$  inch differences between alternatives.

A three-dimensional version of the task - Size (3D) - was prepared according to the format adopted for the two-dimensional version, as described above. Where possible, values of the standard were different from those of equivalent items on the two-dimensional version or were presented as circles rather than squares or vice versa.

(4) Task 3 : Colour.

The term, colour, has been employed here in the fairly general sense of the hues of chromatic colours, as well as the greys, but excluding white and black. Discrimination of such colours independently of an association with particular objects, is, however, a somewhat artificial task. Thus, it has been shown that although great accuracy is possible in discrimination between colours of only slightly different wave-lengths, perception and identification of colour in objects depends on factors other than the wave-length of light actually reflected by the object (Vernon, 1962). Generalization of the results of colour discrimination to perception of differently coloured objects must, therefore, be extremely tentative, if indeed it is warranted at all.

Further difficulties are presented by the fact that colours may vary in saturation and brightness and that the latter variables interact in determining accuracy of discrimination. Thus, it has been shown that matching colours, varying in both saturation and brightness, develops earlier than matching for brightness or saturation alone (Gibson and Olum, 1960).

In the present study, the above-mentioned difficulties, together with practical problems, hindered the construction of a colour discrimination

task. A number of media were investigated (for example, water colours, enamel paints, felt pens), but in each case were found unsuitable because of difficulties in producing even surfaces of colour, duplicating colours, controlling saturation and brightness and producing a sufficiently wide range of colours. A compromise solution was to use colour chips from charts used for advertising purposes, which overcame the first two difficulties mentioned above. In addition, the range of colours available was greatly extended. The main drawbacks of the method were that saturation and brightness could not be exactly controlled and that selection of colours was limited to those available on the charts, thus constituting a limitation on the representativeness of the sample of colours.

Practical considerations nevertheless dictated the use of the above-mentioned medium, the following criteria being used in selecting colour ranges for the items of the task:

- (i) Only colours represented on the colour charts by five or more shades, (necessary to make up an item), were used in the task. Seven colour categories were thus available.
- (ii) Discriminative alternatives for each item were selected from one colour category and from more similar shades within the category.
- (iii) The gradation of shades within each item was as even as possible, extremely marked differences between shades being avoided.

- (iv) Matt and glossy finishes were not used in the same item, but as far as possible, items composed of colours having either finish were alternated in successive items.
- (v) Items composed of similar colours (for example, blue, turquoise, grey) were interspersed amongst other, different colours.

Colour chips selected in terms of the above criteria for each item were affixed to white display cards, providing a uniform background. The number of items per colour category was approximately equal, except in the case of turquoise and yellow, where the number of shades available was sufficient for only two items each.

The items were administered to normal Ss in PS II. Comparison of mean error scores revealed little difference in difficulty with age and there was considerable variability in performance within each group as indicated by range of errors. For the majority of Ss, however, only moderate difficulty was experienced in discriminating colours. An analysis of mean errors per category and colour finish was not attempted, since it appeared from inspection that difficulty was a function of the particular composition of shades in given items, a finding which was explicable in terms of the fact that items varied in the degree to which gradations of colour were even and hence in discriminability.

In view of the relatively low ceiling of the task and the considerable intra-group variability

in errors, it appeared desirable to discard more easily discriminable items which did not contribute to the difficulty of the task and provided additional opportunities for practice in discriminating colours. Certain items on which few errors were made were, therefore, eliminated.

The final version of the task thus consisted of 20 assessment items, representing seven colour categories (blue, pink, turquoise, cream, grey, yellow and green). The task was drawn up such that successive items were drawn from different colour categories and as far as possible randomly alternating matt and glossy finishes.

Finally, as regards the training items of the task, it was found in PS II that Ss experienced difficulty in the initial transition from training to task items. The difficulty appeared due to the fact that training items were composed of different shades of the same colour as in task items. It was, therefore, decided to use five of the items eliminated from the task as the final training items, retaining also the existing training items. It was acknowledged that this alteration might have the effect of decreasing the difficulty of the task, but was considered necessary in the interests of a smooth transition to the task, which has appeared particularly desirable in maintaining task-oriented behaviour in "autistic" children (Lovaas, 1966). Eight items were thus available for use in training, four composed of very different colours, two of more similar colours and two of different shades of the same colours. Glossy and matt finishes were alternated as in the task.

(5) Task 4 : Configuration (synthesis).

This task was conceived as covering those aspects of perception which the Gestaltists related to the tendency towards "good figure" and to "closure" and which have been conceived in information theory terms as having to do with the degree of internal redundancy characterizing figures (Attneave, 1954; Forgas, 1966). Thus the Gestalt principles of organization, such as contiguity, similarity and continuation, have been seen as reducing the uncertainty of a configuration by providing certain redundant information, hence facilitating perception of such figures.

Forgas (*ibid*) has remarked that the work of Attneave "seems very promising for the task of quantifying the Gestalt laws of organization", (p.121). As discussed elsewhere (p.147), however, the problem of the psychological relevance of such types of measurement has not been satisfactorily resolved. Thus, although it seems clear that the Gestalt principles pertain to distributions of information characterized by a high degree of internal redundancy, a method of quantifying such information has yet to be devised. Without a means of quantification, no a priori criteria of difficulty could be stated and it was necessary to adopt an empirical approach with regard to devising items of varying difficulty.

The items designed for this task differed from those in previous tasks in that standard and match were not identical. Instead, the standard was an

incomplete figure, incorporating one or more Gestalt principles of organization, while the match was a figure which seemed a priori to be a perceptually "good" arrangement or synthesis of the standard configuration. The principles incorporated in the standard configurations were any one or any combination of the following: proximity, closure, similarity and good continuation. The principles were used together only when, as far as could be judged, they supported one another rather than conflicted. Additional discriminative alternatives were unique to each item and were designed (as far as could be judged) to appear inappropriate to the Gestalt principle incorporated in the standard. Such additional figures might be complete or incomplete, but at least one was similar to the match in respect of completeness, to control for choices based on the assumption that the match would always have a unique character in relation to the other discriminative alternatives. Furthermore, figures were designed such that, as far as could be judged, similarity between discriminative alternatives, and match or standard increased in successive items. Figures composing an item were reproduced as black-on-white line drawings on the standard white card.

Items devised in this manner were administered to normal Ss in PS II. Scoring of protocols was based on prior analysis of choices to check whether the a priori designation of the match on each item was empirically valid, designation of the match being altered where the majority of Ss chose figures other than the a priori designated figure.

Comparison of mean and median error scores revealed negligible differences between groups and relatively slight difficulty in matching figures over the whole sample. There was, however, quite considerable intra-group variability. Item analysis revealed that the majority of items elicited very few errors and that the ceiling of the task was rather low.

Despite certain reservations regarding the satisfactoriness of the task (as implied above), the difficulties of designing items, (illustrated by the necessity of altering the designations of matches), seemed to prohibit further attempts to extend the upper end of the task. Certain of the more easily discriminable items were, however, discarded, thus increasing the ratio of less to more easily discriminable items and reducing opportunities for practice. The final version of the task thus consisted of 20 assessment items, arranged in approximate order of difficulty as indicated by number of errors elicited in PS II.

Six training items were devised, representing relatively simple configurations with the Gestalt principle of organization as unambiguously incorporated as possible. These items proved satisfactory for training purposes in PS II and were retained unchanged in the present study.

(6) Task 5 : Configuration (analysis).

This task was conceived as related to the Gestalt "law of inclusiveness" - that is, the tendency of the Gestalt properties of a unified whole to change the identity of a subwhole included in it. Reference has been made elsewhere (p.103) to informational reconceptualizations of the law of inclusiveness which, together with empirical studies (Ghent, 1956; Gibson and Olum, 1960; Maccoby, 1969) and reference to other tests such as the Frostig test (Marlow et al, 1964), provided a basis for designing items for the present task. As in the previous configurational task, however, and for the same reasons, no means of quantifying information distributions was available and no a priori criteria of difficulty could, therefore, be stated. Difficulty was thus empirically defined.

Items were devised such that the standard was a complex figure in which a simpler figure was incorporated, in varying degrees of "embeddedness", ranging from simple overlapping of figures to increasingly complex sharing of contours. The additional figures, to varying degrees, depending on the projected difficulty of the item, shared attributes of the standard and/or match figures. The match was a duplicate of the simpler figure contained in the standard. Figures composing an item were reproduced as black-on-white line drawings on the standard white card.

Items devised in this manner were administered to normal Ss in PS II. Although there was considerable intra-group variability, there was very little difference between mean error scores of the groups, all of which were relatively high. Mean and median error scores indicated that on the average, Ss made errors on about half the items. Item analysis indicated that the task lacked items in the intermediate range of difficulty and that, in general, items were not sufficiently differentiated as regards discriminability. Hence, the task did not present a graded increase in difficulty of discrimination.

For practical reasons, however, it did not seem feasible to attempt a major revision of the task - for example, incorporating more items in which the standard involved overlapping, rather than embedded figures. Thus it was decided that certain items eliciting most errors be discarded. The final version of the task thus consisted of 20 assessment items arranged in approximate order of difficulty as indicated by number of errors elicited in PS II.

Training items illustrated both overlapping and simple embedding, that is, few contours shared by the larger whole and its simpler, internal figure. The first two training items were prepared with the embedded figure lightly shaded in grey pencil, as were all the discriminative alternatives, in order to emphasize the feature leading to correct choice. The remaining items were not shaded. The items proved satisfactory for training

in PS II, although it was found necessary to outline the internal figure with a finger on the first two items as an added indication of the discriminative feature in question on this task. The items and the gestural innovation were retained in the present study.

(7) Task 6 : Object character.

As discussed elsewhere in this study (pp.109-110 ), perception of object character has been conceived as continuous with both perception and conceptualization, in its emphasis on concrete, functional characteristics of objects. Hence, the perceptual task designed to assess perception of object character was focussed on the functional characteristics of familiar objects. Familiarity was stressed to avoid confounding of the limited experience of "autistic" children with any perceptual deficiencies.

Usually, the ability to name an object is taken as evidence of ability to identify objects. In a study of "autistic" children with defective language, however, it was necessary to devise some other means of establishing whether object character could be perceived. A procedure was adopted, therefore, whereby the S was required to match objects which are commonly functionally associated in some way, for example, table and chair, shoe and sock.

Items were devised, using coloured drawings of common objects. The standard and match for each item were selected on the basis of being commonly associated in terms of function. The remaining discriminative alternatives composing a given item were objects assumed to be relatively less commonly associated with the standard object as regards functional character. Over the whole series of items an attempt was made to introduce progressively more difficult discriminations by increasing the similarity of the functional relationship between standard and discriminative alternatives, on the one hand, and on the other, standard and match. For example, a relatively "easy" item might be composed of fork and knife together with pencil, wool, hat and trousers, as contrasted with a more "difficult" item, composed of knife and fork, together with garden fork, comb, saw and brush.

As far as possible, standard-match pairs were chosen so as not to be differentially more familiar to either sex, but where a sex difference in familiarity seemed possible, other items were included favouring the other sex. Thus, over the whole series of items, as far as could be judged, neither sex was favoured.

Choices of the appropriate match on a basis other than recognition of the functional relationship between standard and match was controlled by presenting standard and match in different orientations and using different colours in the drawings. In addition, all drawings were approximately the same size so that matching on the basis of relative size was controlled.

Items devised in this manner were administered to normal Ss in PS II. Scoring of protocols was based on prior analysis of choices to check whether the a priori designation of the match was empirically valid, designation of the match being altered where the majority of Ss chose objects other than the a priori designated object. Comparison of mean and median error scores indicated a slight tendency for errors to decrease with age, although all those groups appeared to encounter relatively little difficulty in matching objects having functional associations. Item analysis revealed that the majority of items elicited very few errors.

Thus, although the task appeared a fairly satisfactory means of evaluating perception of object character, the ceiling of the task was rather low. The difficulties of designing items for the task (illustrated by the necessity of altering the designations of matches), particularly when limited to familiar objects capable of clear pictorial representation, seemed, however, to prohibit further attempts in this direction in order to increase the difficulty of the task. Certain of the more easily discriminable items were, therefore, discarded, thus decreasing opportunities for practice in this type of matching. The final version of the task thus consisted of 20 assessment items, arranged in approximate order of difficulty as indicated by number of errors elicited in PS II.

Six training items were devised, such that the functional relationship between standard and match as compared with other discriminative alternatives was relatively unambiguous. These items proved satisfactory for training purposes in PS II and were retained unchanged in the present study.

University of Cape Town

CHAPTER X

The study : Revised research design.

As indicated in the introduction to Chapter IX, serious difficulties were encountered in attempts to implement the original research design. These difficulties arose from two major interacting sources, subject inhomogeneity and deficiencies in the training procedure.

Subject inhomogeneity might appear a surprising difficulty in view of the decision in the original design that considerations of size should be secondary to an attempt to obtain a sample of Ss whose diagnostic status was relatively clear. However, despite the fact that, of the sample of three Ss obtained, all had been at some time diagnosed as "autistic" and two at least were still considered to display characteristic signs of ECA, there was indeed great inhomogeneity amongst the three. Age and (possibly) intellectual differences might have accounted in part for the inhomogeneity, but the fact that all three Ss were regarded as having serious to severe prognoses might have been expected to reduce the contribution of such factors. Nevertheless, the Ss did differ amongst themselves, and in a manner which could by no means be related to a single or even a few dimensions. As a result, it would not have been meaningful to treat the Ss as a group, in the sense in which the latter term is usually used in experimental design.

The second major difficulty was that, following initial attempts at training, it became clear that in the case of certain Ss, no amount of repetition, as called for in the original training procedure, would be sufficient to induce discrimination set as operationalized in the original design. Moreover, continued repetition appeared to have adverse effects on rapport.

Further study of perception in the sample of "autistic" Ss available thus called for major modifications in the research design. At the same time, it seemed desirable that the apparently promising stimulus materials already devised (at the cost of a considerable amount of time and effort) should not be altogether discarded. What seemed indicated was a design taking account of inter-S variability at the training and task levels, while still permitting some comparison across Ss.

An approach conforming to these requirements was experimental study of single cases. Underlying this approach is the assumption that "the systematic objective investigation of ... a single case should lead to findings which are relevant to the general function of the individual concerned and which can be generalized to many other individuals" (Shapiro, 1955, p.344). This assumption runs contrary to the general belief that study of single cases must result in unique findings, incapable of generalization to other individuals. A number of writers have,

however, called in question the latter assumption, pointing out, firstly, the greater precision possible in specifying relevant parameters in individuals as compared with groups. In dealing with psychiatric populations, in particular, the characteristically vague definition of populations results in severe limitations, in terms of identifying many possibly relevant patient characteristics in a group setting (Chassan, 1960). Secondly, it has been argued that since biological processes take place only in individual organisms, investigations of populations of organisms are only likely to yield suggestive relationships. In order to understand "what makes the system hang together in any one person" (Taylor, 1958, p.110), studies of the operation of the system in individuals is required (Shapiro, 1964; Taylor, 1958). Only when it has been demonstrated that the process under investigation is similar in a number of individuals, is combination of the data from these individuals warranted (Shapiro, 1964) and then only the most obvious trends should be generalized (Nunnally, 1965).

Use of the single case approach does not, however, absolve the investigator of the need for rigour. Reliability of observations must be checked; alternative possible explanations must be tested; relevant control data must be collected; and findings related to those of other investigators (Shapiro, 1957).

In adopting the single case approach in the present study, therefore, an attempt was to be made to investigate certain aspects of perception in individual "autistic" Ss. Hypotheses regarding the handicaps of individual Ss would be tested by appropriate, systematic modification of the training and testing procedure. Subsequent comparison with individually matched control Ss, conforming to the categories originally selected, and with other individually studied "autistic" Ss might permit the discovery of trends across Ss. Such trends - or, indeed, their absence - would, in terms of the single case approach, permit inferences regarding processes in other "autistic" children, to the extent that they share characteristics with the Ss of the present study.

Some general framework was, however, necessary in order that such comparison be possible. In view of the inhomogeneity of Ss and the necessity of introducing different modifications for different Ss, such a framework needed to take account of qualitative rather than quantitative inter-S differences, with an emphasis on how a response was achieved, rather than on a single final response. There was, therefore, a necessity for a number of measures, focussing on several different aspects of a process. Unavoidably, such measures exhibited some degree of over-lap, but comprehensiveness seemed preferable in this instance to parsimony. Reference was thus made in each case study and across Ss to the following aspects of behaviour relevant to the achievement or non-achievement of discrimination.

(1) The establishment and maintenance of rapport.

In the context of this study, rapport has been conceived not only as a harmonious relationship between the E and the S, but also as a relationship such that the S is amenable to carrying out certain demands of the E. A description of the procedure adopted for establishing and maintaining rapport with the Ss and the degree of success of that procedure has been considered indispensable to an understanding of the findings of this study regarding perception.

Firstly, without such a description, the extent to which the degree of disturbance in non-perceptual functioning affected performance on the perceptual tasks, cannot be gauged. Whether, in any case, a realistic estimate of the interactional effects can be made, has been doubtful, but a description of the extent of rapport has permitted some assessment.

Secondly, such a description has provided an indication of the conditions under which the perceptual behaviour was observed and, more specifically, the measures employed to elicit the behaviour. Such measures have seldom been described in any detail by other investigators, leaving the reader in ignorance of whether those investigators were exceptionally astute in eliciting suitably task-oriented behaviour, or whether their Ss were not severely disturbed.

Hermelin and O'Connor (1970), for instance, reported that, in one experiment, "subjects were first shown the display box and the experimenter demonstrated how to look into it by putting his head through the opening. The child was then told to look into the box himself. When he had placed his head inside, the flap was raised, revealing the lit-up display cards .... Sweets were given for the children's continued co-operation. However, little difficulty was experienced in maintaining their involvement with the apparatus .... " (p.31). Such measures alone would have been quite inadequate to ensure the co-operation of two of the three "autistic" Ss in the present study, hence the necessity of adopting a single-case approach in lieu of the originally planned comparison amongst various experimental groups.

The description of the procedure with regard to rapport has been presented in two sections, the first dealing with the establishment of rapport prior to the introduction of the perceptual tasks, the second with maintenance of rapport during presentation of the perceptual tasks. Subsequently, the description has been used as a framework in terms of which the extent of rapport with each S and hence, the extent of possible interference, through lack of rapport, with task performance, has been evaluated.

The description has been phrased in terms of the procedure followed with "autistic" Ss, since these Ss presented the most severe problems with regard to rapport. In contrast, most of the control Ss required little more than the usual care paid to rapport in psychometric testing. The session spent in administering the intelligence test, together with the evident feeling of pride of most control Ss at being specially selected to participate in the series of sessions, was usually sufficient to ensure co-operation. Any further inducements to co-operation were the various rewards used. Participation and co-operation in the intelligence test provided an indication that such children would have little difficulty in participating in the perceptual tasks.

(a) Pre-task sessions:

A sequence of stages in the development of rapport has been described below, in which certain objectives and the criteria for their attainment have been stated. Pre-task sessions occurred within this framework, although the particular activities engaged in differed from S to S.

(i) The first objective was to establish some contact with the S through engaging in activities with him in familiar surroundings; to become acquainted with the S's behaviour, in particular with what events appeared to distress or annoy him and what activities he enjoyed; and to allow him to become familiar with the E, as far as possible, in a way which was pleasurable. Attainment of these goals was assessed largely in terms of the E's subjective

impressions, but also in terms of the establishment of eye-contact, some degree of control on the part of the E over the S's behaviour and some enjoyment by the S of mutual activities.

(ii) Limited demands were then made on the S, namely, that he stay in one place or room for increasing periods of time and that he engage in imitative behaviour during at least part of such periods. In return, the E continued to engage in activities enjoyed by the S, or provided him with rewards found to be desirable to the S in earlier sessions.

(iii) An attempt was then made to shape the S's behaviour in a way which would facilitate his participation in the perceptual tasks, specifically, to look at visual material, such as magazine pictures or drawings; to look at specific parts of pictures and point to them in imitation of the E; to perform simple movements in imitation of E, such as drawing, any movement being accepted initially, but increasingly specific imitations being required; to engage in some activity - though not necessarily continuously in the same activity - with the E in one room for 30 minutes.

The pre-task sessions with the "autistic" Ss were initially conducted in the S's place of residence and later, in the case of Ss with whom rapport was not yet sufficiently well established, continued at the School,<sup>1</sup> where the remainder of the study (with "autistic" Ss) was conducted. Even in the case of Ss who had already been introduced to more demanding stages, however, it was considered necessary temporarily to reintroduce less demanding activities to assist in familiarization to the new surroundings of the School and to ensure as far as possible, a minimum of interference with task behaviour.

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1. The special school attended by the three "autistic" Ss for the first time during the course of this study; further reference in the text to "the School" has been to the same school, unless appropriately qualified.

Depending on the extent of disturbance of a given S, the sequence outlined above was followed in detail and slowly, or was telescoped. Thus, where rapport was established relatively easily and where the S engaged relatively well in specific activities at the direction of the E, the criteria implicit in the above sequence were considered to have been met and the next stage of the sequence was initiated. Where more difficulty was encountered in establishing rapport, no attempt was made to proceed to a more demanding stage of the sequence until the criteria of the earlier stage had been met. There was, however, in the more seriously disturbed Ss, much fluctuation in rapport from session to session, so that it was at times necessary to reintroduce a less demanding stage of the sequence. In such Ss indeed, it was never possible to assume stability in the level of rapport, although fluctuations did tend to become less frequent, less prolonged and less severe over time. Even after several months of daily interaction, however, rapport in a given session might be virtually non-existent. Such fluctuations, usually not confined to the sessions only, frequently appeared inexplicable, although diligent investigation might reveal some reason.

(b) Task sessions:

Once the S had displayed a fairly stable run of behaviour compatible with the criteria of the third stage of the pre-task sessions, the display apparatus was introduced and attempts to teach the

S the required task behaviour were made, followed by assessment of perceptual behaviour. The objectives with regard to rapport during training and assessment sessions were the maintenance of a sufficient level of co-operation to permit study of perceptual behaviour and the avoidance, as far as possible, of demands likely to disrupt the developing equilibrium of the S.

The measures adopted stemmed from the knowledge gained in pre-task sessions of the kinds of activities enjoyed by the S, the kinds of rewards found desirable and the extent of frustration which the S could tolerate without serious distress. As mentioned with regard to pre-task sessions, rapport fluctuated from session to session and it was sometimes necessary, during the task sessions, to reintroduce some of the less demanding activities of the pre-task sessions to cope with rather severe breakdowns of rapport. In addition to the measures employed during the sessions, the E spent time with the Ss outside the sessions, engaging in less demanding activities likely to enhance rapport and, as far as possible, maintain and develop the level of contact already achieved.

Notes regarding the behaviour of each S in pre-task and task sessions were made immediately after a session whenever possible. At the School, however, if the S left the session in a distressed state, the E usually remained with the S until a more even tone had been re-established; in such cases, notes were made as soon after the session as was possible. The delay in the latter circumstances

has appeared unlikely, however, to have affected the completeness of the notes, since the behaviour in such sessions was usually flamboyant enough to be recalled easily. Subsequently, the content of the notes was analyzed and tabulated in terms of categories appropriate to the particular S, permitting clearer assessment of trends in rapport over time.

The description presented for each S has, therefore, referred to phases, which, since they represent abstractions, unavoidably present a more coherent picture of the development of rapport than was actually the case. Statement of the fact of distortion has appeared the only alternative to presentation of the detailed notes, themselves abstractions, in the sense of being translations of selected aspects of an interactional process into a verbal description.

(2) Discrimination set.

As mentioned in discussion of the original design (cf. p. 133 ), a training procedure was evolved to induce in the Ss the appropriate task-oriented behaviour and responses - that is, a discrimination set (Reese, 1963). The essence of the procedure was a carefully graded increase in the number and complexity of discriminative alternatives, appropriate responses initially being demonstrated by the E and the S's behaviour shaped accordingly. Rewards were to be used in

the procedure less as a means of reinforcement, than as an inducement to continued co-operation.

Despite the incorporation in the training procedure of variables reported by other investigators as facilitating learning in "autistic" children, some "autistic" Ss in the present study nevertheless exhibited severe and characteristic difficulties in acquiring a discrimination set. Certain modifications had, therefore, to be introduced in the training procedure. The process of acquisition of discrimination set in the various Ss, therefore, appeared to constitute an important variable to be studied and reported in an attempt to understand other aspects of the perception of "autistic" children.

Training for all Ss was initiated according to the procedure outlined in the original design and any modifications considered necessary for a particular S were introduced within the framework of that procedure, permitting comparison across Ss. Such modifications were introduced systematically, that is, in terms of hypotheses regarding the source of interference with the acquisition of discrimination set.

Apart from the great deal of distractibility shown by some "autistic" Ss, which necessitated frequent re-presentation and demonstration of items, the major sources of interference appeared related to patterns of visual inspection and identification strategies employed by the Ss.

Since both the latter sources appeared to constitute perceptual factors, they have been discussed in greater detail elsewhere. Suffice it to say here that attempts were made to extend visual inspection and identification strategies to conform with the requirements of discrimination set. Such attempts involved masking to reduce the number of alternatives or to exclude alternatives encouraging other than matching strategies. Masking was also used to encourage scanning the full range of alternatives and comparison amongst alternatives, as was pointing to the standard and alternative rather than pressing a button associated with a particular alternative.

Recording of the various forms of behaviour and of modifications in presentation was accomplished in two ways. Firstly, during the session, after each presentation, an entry was made on a prepared record sheet, indicating, if masking of alternatives had been used, which alternatives were masked; whether a demonstration by the E had been given prior to the S's response; whether the S's choice was correct and, if not, which alternative had been selected. Secondly, during the session, if possible, brief comments were noted regarding salient features of behaviour, such as the extent of scanning or the manner in which movements were made. Thirdly, as soon after the session as possible (as in recording with regard to rapport), any comments noted during the session were expanded and a more detailed record of behaviour during the session made.

Subsequently, the notes and record sheets were analyzed and tabulated in terms of a number of categories of behaviour, incorporating, in some cases, more specific forms of behaviour. The categories, derived from the notes and record sheets and from error analysis, were the following:

- (a) General features of task orientation included
  - (i) sitting at the table in front of the apparatus;
  - (ii) not interfering with the apparatus (for example, not banging on the apparatus or throwing it on the floor);
  - (iii) waiting between presentations.
- (b) Gaze orientation; that is, looking at the display rather than elsewhere.
- (c) Instrumental response, including
  - (i) allowing the E to guide his hand towards the display;
  - (ii) moving his hand voluntarily, but vaguely, in imitation of the E;
  - (iii) moving his hand voluntarily and deliberately in imitation of the E;
  - (iv) touching the display in one or more places;
  - (v) pointing to a specific discriminative alternatives.
- (d) Identification strategies, namely,
  - (i) no discernible identification strategy, seen in random choices, that is, choices distributed evenly over available alternatives;
  - (ii) systematic choices, that is, choices distributed according to some criterion, such as position or matching;
  - (iii) choices made consistently in terms of a matching strategy.

- (e) Number and arrangement of alternatives amongst which choices were made.
- (f) Features of attention, namely,
  - (i) distractibility (for example, being distracted by features of the room or the E, engaging in repetitive mannerisms or un-directed gazing) from moment to moment during a session;
  - (ii) persistence, that is, regardless of distractibility, continued willingness to return to the task and continued directed effort in the task;
  - (iii) the effect of a novel task on attention.
- (g) Recall or transfer of features of discrimination set
  - (i) from less to more complex items of the training series;
  - (ii) from session to session, as observed at the beginning of the session;
  - (iii) from one task to another, that is, from one set of stimulus materials to another.

The development of discrimination set in any S was described and evaluated in terms of the above categories. A S who had successfully acquired discrimination set thus exhibited all the general features of task orientation, gaze orientation and pointed to a specific discriminative alternative; his choices reflected systematic matching rather than random selection and were made amongst five alternatives; little distractibility was evident, persistence was shown and both the latter features were enhanced by the presentation of novel materials; and recall or transfer was shown over varying periods of time.

(3) Perceptual factors.

The difficulties encountered in carrying out the original design were directly responsible for the decision to adopt a more qualitative approach to studying perception in the various "autistic" Ss. A more indirect determinant of the form of qualitative approach then adopted was Kanfer's (1956) distinction, referred to earlier, between identifying and instrumental responses and his suggestion that over-stress on the final instrumental responses has frequently resulted in neglect of other important aspects of the perceptual process.

Implicit in the earlier discussion of the development of rapport and the acquisition of discrimination set was an attempt to describe variables importantly affecting perception as observed in the present study. In reporting on more specifically perceptual factors, as well, it has seemed that only an analysis capable of conveying the distinctive character of the performances of various Ss would be adequate to account for any observed differences between "autistic" and other Ss. It would have been possible to report a score reflecting proportion of assessment items correct for each S, but such a score could not have conveyed - indeed, would have obscured - qualitative differences amongst Ss in obtaining those scores.

Alternative measures were therefore sought and found in recent attempts to extend Lashley's

observation that, contrary to ideas then current, the behaviour of normal animals in an operant situation is not random, but displays order and system. Such systematic behaviour is, however, only observable in situations which permit its occurrence - discriminative problems being one such class of situations (Fellows, 1968; Reese, 1963). Measures of the extent and nature of systematic behaviour which appeared relevant to the present study were, firstly, analysis of choice patterns of individual Ss, variously referred to as "error factors", "response dispositions" or "hypotheses" (Fellows, 1968; Levine, 1959; Reese, 1963); and secondly, assessment of patterns of visual inspection (Gardner, Holzman, Klein, Linton and Spence, 1959).

(a) Identification strategies.

Brief reference was made earlier (p.187 ) in discussion regarding the acquisition of discrimination set, to identification strategies, a term used to refer to systematic patterns of choice amongst alternatives. While the introduction of yet another term to designate such patterns has not seemed altogether desirable, the term used here has appeared to have certain advantages over the terms used by other researchers, particularly in the context of the perceptual model discussed earlier. Thus, the term, identification strategy, was consistent with the distinction between identifying and instrumental responses. This distinction was often seen clearly in the present study,

where, despite the existence of a stable pointing response (instrumental responses), choices, (reflecting identifying responses), were often inconsistent, at least when viewed from the standpoint of a matching criterion. Secondly, the term, identification strategy, again in the context of the model discussed earlier, carried clear connotations as to the process involved in arriving at the choice from which it was inferred. Earlier writers (Fellows, 1968; Reese, 1963) have usually been careful to disclaim any reification implied in the terms used, noting that naming a systematic sequence does not explain it. However, terms such as "hypothesis" or "disposition" do have other connotations which have appeared likely to prevent their neutral use in the context of systematic response sequences.

Both Reese (1963) and Fellows (1968) have in fact proposed models, not unlike the more general model of the present study, to account for the development and operation of strategies. Reese (1963) has stressed the importance of verbal mediators in older children, on the basis that, in such children, reward or non-reward is less important in determining strategies than is confirmation or non-confirmation of a strategy over a series of choices. He has suggested that, in younger children, there is a deficiency in verbal mediation and that their less efficient performance is accountable in terms of non-verbal mediation. Severely subnormal children may, however, because of their continuing deficiency as regards verbal mediation, continue to rely on limited, non-verbal

mediation and be more responsive to the effects of reward and non-reward. Fellows (1968), basing his model largely on work with younger children, has placed greater stress on the differential reinforcing effects of outcomes of choices, but has also considered that mediation deficiencies may largely account for the reliance of younger children on simple, positional strategies.

Assessment of identification strategies involves analysis of individual rather than group performance in terms of patterns of choices. Moreover, since any one choice or sequence of choices can represent more than one (if not all) of several possible strategies, it is desirable to evaluate the relative probability of various strategies (Levine, 1959).

In early work, the form of analysis used was frequently selected for the specific demonstration in hand, without reference to a comprehensive set of possible patterns to prevent confounding of measures or to show the proportion of choices under the control of any particular strategy (Levine, *ibid*). A more comprehensive set of possible strategies has, however, now been formulated and a fair amount of information has become available regarding factors affecting strategies with respect to two-alternative discriminative problems, including developmental changes in their relative probability (Fellows, 1968; Levine, 1959; Reese, 1963). Such a set of possible strategies on a matching-to-sample task has been summarized by Fellows (1968) who has

suggested that each choice in matching performance can be described in terms of three pairs of opposing strategies, namely,

- (i) choice of the matching alternative versus choice of a non-matching alternative, that is, matching versus oddity responding;
- (ii) choice of an alternative consonant with the outcome of the previous choice (that is, choice of the same position following a positive outcome or another position following a negative outcome) versus choice of an alternative inconsistent with the outcome of the previous choice, that is, a "winning" versus a "losing" strategy;
- (iii) choice of the same position as the previous choice (regardless of outcome) versus choice of another position, that is, position preference or perseveration versus position alternation.

Available evidence has suggested that positional strategies represent the most primitive method of identification in discrimination tasks, being characteristic of younger children as well as severely subnormal children and decreasing with increasing CA and MA (Fellows, 1968; House and Zeaman, 1963; Reese, 1963). The type of positional strategy employed has also appeared to change with increasing CA and MA, position perseveration being characteristic of very young children, giving way later to position alternation, followed by a strategy based on the outcome of choices of particular positions (Fellows, 1968; Reese, 1963). The greater distractibility of pre-school and severely subnormal children as compared respectively with older and normal children may provide an explanation of the relationship

between positional strategies and MA and CA (Reese, 1963), although mediation deficiencies are probably also important determinants (Fellows, 1968; Reese, 1963).

Oddity responding has appeared to constitute the next stage in a hierarchy of strategies. Since it requires only that the S perceive the odd part of a stimulus complex rather than check the entire area for homogeneity, oddity responding is easier than matching, the final stage of the hierarchy (Fellows, 1968).

Under stress or given a difficult discrimination, a more primitive strategy than is usually employed, may be used. For example, an older child, may, under such conditions, revert to the use of positional rather than matching strategies. Such regression has appeared to be accompanied by a sharp reduction in the latency of choice; that is, choices tend to be made more impulsively and with less careful attention to the task (Fellows, 1968).

Use was made in the present study of the set of strategies outlined by Fellows (*ibid*), together with the available information regarding such strategies, in evaluating each S's performance, chiefly on the assessment items. Discussion of the acquisition of discrimination set has indicated that use was made in training of the concept of identification strategy, to describe and evaluate progress. The fact, however, that the aim of training was, as far as possible to induce in the

S the maximum degree of matching possible, as well as to observe the conditions under which matching was maximized, necessitated frequent re-presentation of items. It was thus possible that choices on training items, after considerable practice on those items, reflected highly over-learned associations rather than identification strategies. Analysis of such choices would not permit evaluation of the latter hypothesis. Analysis of choices on subsequently presented assessment items would, however, provide a test of the kinds of strategies used, summarizing strategies evident earlier with similar stimuli, as well as reflecting the effect of factors such as increasing complexity of alternatives.

In using analysis of strategies in relation to choice in a non-learning situation - that is, where only one trial or at most two or three per item, usually separated in time, were permitted - some departure has been made from the more usual analysis of pre-solution behaviour. Instead, analysis of strategies has been used to assess quality of performance, under conditions designed to test the limits of current perceptual skill, rather than of ability to profit from training designed to develop perception. As well, the number of alternatives per item (decided on the basis of performance in training) was sometimes greater than two, in contrast to the more usual two-alternative item. In considering strategies, it was, therefore, necessary to take account of possible modifications arising out of the different number and arrangement of alternatives. The

strategy which appeared most affected in this regard was that involving simple positional choices (referred to by Fellows (1968) as position preference or perseveration) which appeared likely, from preliminary analysis, to occur in a number of forms, termed here "simple positional strategies" to distinguish them from position alternation.

A further departure from conventional procedure in analysis of strategies has been the omission from consideration of "winning" versus "losing" strategies. This omission occurred because certain ss were unresponsive to rewards or other indications of outcome, on which an outcome strategy must be based, and rewards (given between presentations) were, therefore, used only to encourage continued participation. It appeared in any case unlikely that outcome strategies could have been employed effectively on items composed of more than two alternatives.

Analysis of strategies on assessment items was based on the extent to which runs of a particular strategy were evident in patterns of choice. On each item, strategy was considered in terms of the following categories:

Simple positional strategies,

- (i) choice of the same position as the previous choice, if the position in question was not masked on the current item (that is, where position could be maintained, it was), termed "position perseveration", the maximum number of choices consistent with this strategy being variable, depending on arrangement of alternatives;

- (ii) choice on the same side of the display, relative to the centre position, as the previous choice, termed "position preference", the maximum number of choices consistent with such a strategy per series of items being one less than the total number of items, since choice on the first item served as a model for subsequent choices and could not itself be evaluated;
- (iii) choice consistent with a bias to one or other side of the display, relative to the centre position, over a given series of items, termed "lateral preference", the maximum number of choices consistent with this strategy per series of items being equal to the total number of items, since no model was required as a basis for analysis;
- (iv) choice of a position nearest the centre position, termed "central preference", the maximum number of choices consistent with this strategy per series of items being equal to the total number of items;
- (v) where five alternatives were presented, choice of a position near the centre (positions 2, 3 and 4) rather than an outer position, termed "central bias", (a less stringently defined strategy than central preference), the maximum number of choices consistent with this strategy being equal to the total number of items;

Position alternation,

choice of a position on the opposite side of the display, relative to the previous choice, the maximum number of choices consistent with this strategy per series of items being one less than the total number of items;

Discrimination strategies,

- (i) choice of the matching alternative, termed "matching", the maximum number of choices consistent with this strategy per series of items being equal to the total number of items;
- (ii) choice of a non-matching alternative, termed "oddy responding", the maximum number of choices consistent with this strategy per series of items being equal to the total number of items.

The decision to use the above hypothesized strategies and the formulation of operational definitions were made following preliminary analysis of patterns of choices, during which the above definitions were found to provide the most comprehensive summary of possible strategies. Position perseveration provided the clearest indication that the S was making use of positional strategies, but was not always useful as masking reduced the number of items on which it could occur, making it difficult to assess the significance of a small number of choices consistent with strategy. Where only a small number of choices was involved, assessment of position perseveration was, therefore, included only for the sake of completeness and because its occurrence together with other simple positional strategies added weight to an hypothesis of positional rather than discrimination strategy. Position preference, on

the other hand, in taking account of the possibility of runs of choices on one or other side of the centre position (the position most often masked), through making use of less stringent criteria, made allowance for the effects of masking. In this study, in contrast to earlier research, therefore, position preference rather than position perseveration (as defined here) was the logical opposite of position alternation. Lateral preference and central preference provided indications of general tendencies to choose particular positions or closely related positions, irrespective of minor fluctuations in consecutive choices, making it possible to gauge whether modified positional strategies replaced strict position perseveration, when masking prevented the latter, especially with respect to the central position. Assessment of position alternation was more ambiguous, especially where more than two alternatives were presented. The ambiguity arose because randomization of the position of the match over a series of items, meant that the match itself alternated; a high proportion of matching was therefore, invariably associated with a high proportion of alternation. The ambiguity was resolved by investigating the extent to which, where alternation could have occurred, it was subordinated to a matching strategy. Where alternation was low, associated with a high proportion of other positional strategies, it was assumed to be unlikely that any moderate proportion of matching could have occurred other than by chance association with some other strategy.

Matching was conservatively assessed - that is, only where matching was high and comparison amongst choices indicated that matching was more likely than an alternation strategy, was a matching strategy assumed to account for choices over all the items under consideration. Oddity responding was also conservatively assessed, usually in relation to positional strategies, as well as to the move obvious opposite, matching.

The chief means of analysis was examination of graphic representations of the pattern of choices of each  $S$  in each session, in conjunction with comparison of the proportion of choices consistent with various possible strategies. Where the number of items warranted it, proportions of choices were compared for the first half, second half, as well as total number of items of any given series presented during a session, in an attempt to investigate whether, as in training, performance deteriorated towards the end of a session.

The small number of events (that is, choices) per series, together with the difficulty of taking account of the effect of the changing number and arrangement of alternatives due to masking, precluded the use of statistical evaluation of the significance of differences between proportions. In some respects, the lack of a suitable technique seemed advantageous, as presentation of a figure representing some probability coefficient would have tended to obscure the degree to which choices were affected from moment to moment by other, unquantifiable factors, such as level of rapport and

degree of distractibility. Direct reference to the latter factors, as reported in the notes on each session, seemed preferable to the spurious statistical evaluation, as a means of qualifying or expending evidence from analysis of patterns of choices.

(b) Patterns of visual inspection.

In earlier discussion of intra-model differentiation in "autistic" children, it was mentioned that "autistic" Ss have been shown (O'Connor and Hermelin, 1967) to display relatively immature patterns of visual inspection, as regards switching gaze between stimuli, as well as deviant patterns of visual inspection as regards engaging in undirected gazing and briefer fixation of displays. Such findings were related to altered developmental relations amongst modalities in ECA, but have also appeared relevant to concepts of selective attention.

It has been suggested that, in dealing with the external world, individuals exhibit enduring response dispositions - termed cognitive control principles - which are relatively invariant over broad ranges of laboratory and environmental conditions and which apparently develop in early childhood (Silverman, 1964). Among the various cognitive control principles delineated by Gardner et al (1959) were two specifically related to what has been termed by McGhie (1969)

the attentive process, which has appeared essentially similar to the selective aspect of the perceptual model of the present study. One of the principles in question, termed scanning control, refers to the extensive aspects of selective perception or attention, that is, the degree to which stimuli are sampled from the environment and reflects S differences in the extensiveness with which stimuli are sampled in any perceptual field (McGhie, 1969; Silverman, 1964).

McKinnon and Singer (1969) have pointed out that extensive scanning would involve continually alternating fixations between stimuli, whereas minimal scanning would involve maintaining fixation with little eye-movement. Certain of the earlier studies did not, however, include any direct measures of scanning which was instead inferred from analysis of errors made in perceptual judgements (Silverman, 1964). When direct measures have been obtained, a relation between eye-movement measures and perception, in particular, size judgements, has not been demonstrated, even although the stability and generality of individual consistencies in patterns of eye-movement have been confirmed (McKinnon and Singer, 1969). The lack of relation "indicate s difficulties in inferring scanning differences from perceptual judgements alone and the need to specify objective criteria of scanning" (McKinnon and Singer, *ibid*, p.243).

A further difficulty has been that the number of operational definitions which have been used, may be unrelated or negatively related and, in a study of scanning in adult schizophrenics, McKinnon and Singer (ibid) did not obtain significant correlations amongst various measures of eye-movements.

Despite the cogent criticisms by McKinnon and Singer (ibid) regarding the concept and measurement of scanning, it nevertheless seemed worthwhile to attempt some assessment of scanning in the present study. Firstly, the findings of O'Connor and Hermelin (1967) regarding patterns of visual inspection in ECA might be further investigated, under conditions where a greater number of alternatives were presented. Not only would such information be useful in assessing the generality of their findings, but also, in view of McKinnon and Singer's (1969) criticisms, in testing the validity of explanations offered earlier of other aspects of perception in terms of patterns of visual inspection. In the latter connection, it must be recalled that McKinnon and Singer's (ibid) criticisms were based on studies using adult Ss, whose eye-movements, it has been suggested (Maccoby, 1969), tend to be deployed somewhat more economically and directedly than are those of children and, in the case of simple figures, may be implicit (Fellows, 1968). Any relationship between scanning and perceptual skill might, therefore, be more evident in children than in adults and might certainly be a different one. Secondly, as mentioned in discussion of the

training procedure, quite early in training with certain "autistic" Ss, it appeared that patterns of visual inspection might be hampering the acquisition of discrimination set. Attempts to compensate for such interfering effects through masking also provided an opportunity for observing patterns of eye-movements under various conditions which could subsequently be investigated as regards their relation to identification strategies.

Aspects of patterns of visual inspection or scanning investigated in the present study and the mode of their investigation were unfortunately determined largely by technical factors, rather than by criteria of experimental reliability. That is, since the decision to adopt a qualitative rather than a quantitative approach arose out of the difficulties of carrying out a prior experimental plan, certain features which would have been desirable, could not then be arranged. In particular, reliance had to be placed on the E's observations of eye-movements. A more accurate recording would have been dependent on a technique such as corneal photography which was not available. The findings regarding eye-movements have, therefore, been descriptive rather than exact and have been included chiefly because of suggestive relationships with identification strategies.

Observation and recording of patterns of visual inspection was carried out as follows: As a card was being placed on the display rack, the E observed

the direction of the S's gaze and noted eye-movements in relation to the discriminative alternatives. The latter could be observed with some accuracy, since head-movements were necessary in order for the S to observe alternatives in the outer positions, while comparison between two alternatives required larger eye excursion movements, as compared with the finer changes in fixation on a particular alternative which, although discernible, could not be reliably associated with particular segments of that alternative. Eye-movements were, of course, only considered to reflect scanning when there was evidence of the S directing his gaze at the display. Brief notes regarding patterns of visual inspection were included in the description of behaviour recorded after each session; more detailed notes did not seem warranted in view of the low probability of reliability of particular observations in relation to separate items.

Since scanning involves a systematic rather than random deployment of eye-movements, it was in terms of the degree of consistency evident that scanning was described and evaluated during each session. The categories below have summarised the kinds of observations recorded regarding patterns of visual inspection:

- (i) S looked at only one alternative or the standard (minimal scanning);

- (ii) S looked along the range of alternatives, including outer positions if alternatives were visible in these positions (scanning the range of alternatives);
- (iii) S glanced back and forth between the standard and one or more alternatives? (inter-alternative comparison).

Subsequently, the pattern of visual inspection in each session was considered in relation to the kinds of identification strategies which appeared from analysis of choices to have been employed in each session. An attempt was made to assess the extent and nature of any relationship between identification strategies and patterns of visual inspection.