

# Psychological Differentiation and Cognitive Style

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## Psychological Differentiation and Cognitive Style

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## Abstract

This thesis is concerned with the concept of psychological differentiation, and with its applications in the field of cognitive style, particularly in relation to individual differences in field-dependence-independence. The thesis addresses itself specifically to the 'differentiation hypothesis', which suggests that tests of perceptual field-dependence measure an individual's overall level of differentiation, and that this level will manifest itself consistently across many areas of psychological functioning, including cognition, personality, and social behaviour.

An examination of the concept of differentiation, and of research carried out on field-dependence-independence, revealed inconsistencies in the existing evidence and in the relationship between this evidence and the interpretation of the concept. Attention was focused on three questions about the links between field-dependence and differentiation, and some empirical work is reported bearing on each.

The first question was whether individual differences in field-dependence owed more to specific kinds of visual experience than to underlying, enduring personality characteristics. A cross-cultural study is outlined



which concerns this issue. This involved the administration of a battery of perceptual tests to groups of schoolchildren (n=54) and university students (n=34) in Hong Kong. Results did not favour the alternative view of field-dependence scores; however field-dependence tests showed strong associations with general intelligence.

A second study investigated more closely the relationship between field-dependence, intelligence, and other cognitive 'styles' (capacity for divergent thinking, and reflection-impulsivity). A number of cognitive style measures were administered to groups of school pupils in Edinburgh (n=110). Results suggested that while the other cognitive style tests are separate from each other and from intelligence, field-dependence tests measure little that can be distinguished from more general ability factors. However the possibility remained that field-dependent and field-independent individuals differ in their orientation towards or away from the interpersonal environment.

Accordingly, a third study explored the possibility that field-dependent persons, judged as 'less differentiated' on the basis of perceptual tests, in fact functioned at a higher level of differentiation in other domains - the verbal and the interpersonal. A study conducted with adolescents in Sheffield (n=91) failed to find support for this suggestion. While field-dependent and field-independent persons did differ in their orientation towards others, it could not be shown that field-dependent individuals were more 'differentiated' in their perceptions of them.

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# 1

## Introduction



## Chapter 1

### Introduction

The last quarter of a century has seen a substantial growth in the number of studies specifically designed to bridge gaps between separate strands of psychological inquiry. While inevitably many workers have continued to pursue their interests without reference to other - even closely related - areas of investigation, an increasing number have sought to restore the unity of the human organism and look at the inter-relations of its parts. Various 'schools' of psychology too have involved themselves in a refreshing rapport, putting aside many of their differences and fostering theory and research aimed at integrating their efforts and results.

Cognitive style psychology is one example of this trend. It is founded on an attempt to discover consistencies, and map out relationships, between cognition, personality, and social behaviour. Though its roots are to be found in the work of major figures whose ideas have been in currency since the earlier decades of the century, the empirical work and theory construction to which these ideas gave rise did not start to flourish until after 1950. Since then, however, work has continued apace;



producing an abundance of research studies and a proliferation of concepts intended to further understanding of how one aspect of an individual's psychological make-up influences another.

This thesis is concerned with just one of the ideas that have nurtured the study of cognitive styles - that of 'psychological differentiation'; and with the body of theory and research most closely identified with it - that on 'field-dependence-independence'. It aims to explore the use of the differentiation concept by those who propounded it and those who have built upon it in practice; to describe some research focusing on unanswered questions about the links between the concept and the work it has generated; and to offer some supplementary suggestions that might increase the concept's utility for contemporary work on personality and cognition.

Not unnaturally, the notion of 'styles' in thinking and perceiving has been subject to a variety of interpretations. In parallel with this has been a corresponding diversity in the subject-matter, strategy, and overall scale of the many pieces of research usually characterised as work on 'cognitive style'.

Some studies, for example, have aimed to explore the extent and nature of individual differences in the manner of dealing with a particular task or range of tasks. Individuals may, for instance, be given a list of objects or a batch of photographs, and asked to sort them into groups that belong together; afterwards giving reasons for the groupings they have imposed. This kind of research brings out differences in the use of categories - consistent across various types of item - and has been employed by R. W. Gardner and his co-workers in their study of 'cognitive controls' (e.g. Gardner and Schoen, 1962).

More elaborate schemes of research have aimed instead to systematically

chart the relationships between selected personality traits or dispositions and various kinds of cognitive performance. Having discovered individual differences in the tendency to reflect or to respond impulsively on a specially designed test, for example, we might then look at the possible impact of these differences on inductive reasoning or reading ability, as did Jerome Kagan (1965; Kagan et al., 1966a). This has led in turn to a wider search for other potential correlates of 'reflection-impulsivity' (which has recently been surveyed by Messer (1976)).

In yet other instances, however, work on a specific cognitive style has guided and initiated research in apparently quite disparate directions, and has stimulated attempts to assemble results from all of them into a meaningful and coherent whole. This has been the case with work on 'field-dependence-independence', primarily the concern of Herman Witkin and his associates (1954, 1962/1974). Spanning over thirty years, research work on it or allied to it has cut across the traditional compartments of perception, intelligence, memory, problem-solving, child-rearing, personality, social interaction, psychophysiology, psychopathology, psychotherapy, education, occupational choice, and cross-cultural studies. This work began, like that of Gardner, with the observation of some individual differences; continued, like that of Kagan, with a search for their correlates; and has proceeded, with theoretical refinements, to test the limits of its applicability in many areas. Central to this enterprise have been some basic concepts, each of them derived from the fundamental idea of 'psychological differentiation'.

The subject of this thesis is the relationship between this idea, on the one hand, and its use in interpreting evidence about 'field-dependence', on the other. Based on the work that has been done, the thesis formulates



some questions about this relationship, and tries to answer them in terms of some empirical work. Its starting-point, however, must be the concept of differentiation itself, and the varied meanings ascribed to it by those who have used it in their work.

### The concept of differentiation

It has been suggested (for example by Hesse, 1970) that the sciences make progress by a process of borrowing analogies from each other and from elsewhere; psychology seems to be no exception in this respect. The differentiation concept is in origin a biological one, used to describe a number of changes in living organisms, but particularly that of cell growth. Taking one definition, it is '...the process in the development of living cells by which a cell acquires the special characteristics and functions of a particular tissue or organ' (Wingate, 1972, P.130).

Associated with this are ideas about cell division, separation, and specialisation; all of it presumably under the control of some essential organising principles.

It is not difficult to see how such an idea could prove useful, and even indispensable, for an understanding of psychological growth and development. The concept of differentiation is ubiquitous amongst theories of development, though not always fully acknowledged. In psychoanalytic theory the ego could be said to differentiate from the id in order to regulate the latter's impulses and keep them attuned with reality. Even in social learning theory, some forms of differentiation are taken as given in the business of observing and imitating suitable models and acting appropriately on the strength of what is learned. Used in this loose sense, some process akin to differentiation must be invoked in almost any valid explanation of the differences between adult and child.

But it is to help build a picture of cognitive development that the idea of differentiation has been most frequently used. The most influential theory in this field, that of Piaget, leans heavily on the notion of differentiation at many points, both as a general developmental postulate and as a means of representing many specific changes during growth. The process of 'decentering' for example, '...whereby the child eventually comes to regard himself as an object among others' (Piaget & Inhelder, 1969, P.13), is but one manifestation of the deployment of the concept in his thinking. The pervasiveness of the idea, though it remains implicit in much of Piaget's theorising, derives of course from his conception of the 'biological' nature of intelligence.

The most explicit and thorough-going use of the differentiation concept, however, occurs in the work of Kurt Lewin and of Heinz Werner - whose refinements of the concept provided the impetus for its adoption in the sphere of cognitive style. Both of these men were strongly influenced by Gestalt psychology; Lewin is noted more than anyone for the introduction of 'field' concepts to psychology from physics, while Werner based much of his thinking on 'organismic' concepts, and on models drawn from embryology. A paramount concern of both authors, therefore, is with the 'wholeness' of the developing organism, with the interplay between the organism and its environment, and with the interaction amongst its parts. Each has offered views on how development can show continual increases in complexity, yet maintain an internal coherence throughout.

What does the idea of differentiation mean when applied to psychological development? For Lewin (1952), the changes that take place during growth can be summarised under five main headings as follows:

1. An increase in variety. During development, the individual shows an ever greater number and diversity of behaviour patterns,



emotions, needs, pieces of knowledge, and social interactions.

2. Changes in organisation. This increase in variety does not however lead to chaos. Behaviour is organised with increasing complexity: some acts or goals may be subsumed to others, and ordered together in still more complicated fashion.
3. Extension of the area of activities and interests. The spatial and temporal dimensions of the individual's world expand with increasing age.
4. Changes in interdependence. Although an increasing number of 'parts' of a person come to function relatively independently as age advances, at the same time these parts exhibit increasing hierarchical organisation. The nature of the relationships between them may also show complex variations; one result being that the individual's overall degree of unity is unrelated to age.
5. Finally, degree of realism. Development produces a decrease in subjectivity and an increasing tendency to be realistic, to come to terms with the world outside the self.

Differentiation as a developmental process underlies all of these transformations and can be understood in two main senses. The first of these is in terms of the number of parts of a whole; the larger the number, the greater the degree of differentiation. The second refers instead to the degree of independence between these parts; the more pronounced their level of independence, the greater the differentiation.

The first of these definitions clearly applies to innumerable changes that can be observed during development, including those in some of the categories mentioned above. For example the number of skills an individual can execute evidently multiplies during development; he becomes capable of experiencing a wider range of emotions; becomes aware of more and more

divisions of space and time; and can make an increasing number of discriminations concerning almost any aspect of his experience or of the world about him. This in a way is the simple 'complexity' aspect of differentiation, referring to '...relations of similarity and dissimilarity; it means "specialisation" or "individualisation"' (Lewin, 1952, P.104), and '...refers to the number of relatively separated or distinguishable parts contained in a definite whole' (ibid., P.116). Thus '...the degree of differentiation of a whole can be defined as the number of its cells' (ibid., P.119).

The second facet of differentiation is slightly more subtle. It refers to '...relations of dependence and independence between parts of a dynamic whole. In this case increasing differentiation means that the number of parts of the person which can function relatively independently increases' (Lewin, 1952, P.104). For example, the bodily movement of the infant is whole and uncoordinated; it lacks the feature of independence of function which characterises the movement of the adult. 'Needs too become less mutually dependent with age: the older an individual, the less likely it is that satisfaction of one need will also bring about satisfaction of another. In a more general sense, the individual as an entity becomes more independent of the surrounding environment as age progresses. However, an important distinction must be made in relation to the nature of all these changes in 'independence'. Lewin recognises at least two types of interdependence: 'simple dependence' and 'organisational interdependence'. The former describes states of dependence between parts of a whole in which each is dependent on the other in the same manner, and in which a change of state in one will spread to others and bring about an equivalent change of state in them. In the latter, by contrast, the dependency relationship between parts of a whole is more involved; the



onset of a change in one will act selectively upon others, not necessarily producing in them a change of state equivalent to that in the first. This is the interdependency of super-ordinate and subordinate, '...similar to that between leader and led, or between someone using a tool and the tool' (Lewin, 1952, P.117).

Differentiation, in the Lewinian sense, refers to the former but not the latter of these two kinds of change in interdependence. The latter refers instead to the developmental process which acts as a complement to increasing differentiation: that of hierarchic integration. An individual's degree of hierarchic integration is conceived by Lewin as increasing in stepwise fashion throughout development. One consequence of the (roughly) side-by-side increase of both differentiation and hierarchic integration is that the individual's degree of organisational unity will vary over the life cycle; children may in some cases show greater unity than adults.

Lewin's exposition of these concepts has had a substantial impact on the study of cognitive style. Among the studies which have at their root the idea of differentiation in Lewin's first sense - an increasing number of parts of a whole - are Bieri's investigations of cognitive complexity (e.g. Bieri et al., 1966); Gardner's work on cognitive differentiation and cognitive controls (e.g. Gardner & Schoen, 1962); and the writings of Harvey and others on 'conceptual systems' (e.g. Harvey et al., 1961). A list of the variables examined in these and related studies would be fairly lengthy, but would include for example: number of constructs used in interpersonal perception, number of categories used in sorting a stimulus array, number of categories of adjectives used in self-description, number of different methods used in problem-solving, or numbers of different dimensions used in making perceptual judgments.

Similarly, Lewin's delineation of a second form of differentiation - as an

increasing independence of parts during development - has also had an extensive influence on cognitive style research. It is upon this usage of the concept that the work of Witkin and his associates, on field-dependence, is based; as Kagan and Kogan point out, '...undoubtedly the most massive and thorough empirical examination of a particular cognitive structure in the psychological literature' (1970, P.1279). For Witkin et al. (1962/1974), development as a whole can be conceptualised as a progression from a relatively 'undifferentiated' state towards one which is increasingly 'differentiated'. Thus a dominant concern of this group of workers has been to show how 'parts' of the 'whole' individual become more independent during development: how for example his experience of himself and of the world becomes more finely analysed, or his separateness from others and from his environment as a whole become more marked. But in addition, these researchers also take the view that this progress towards independence will manifest itself consistently across widely scattered areas of an individual's functioning, producing a similar level of differentiation in each. Accordingly, measurements of differentiation taken from such areas as perception, body experience, self-awareness, and use of defence-mechanisms should show clear intra-individual consistency. This last proposition has been dubbed the 'differentiation hypothesis', and it is in turn derived from a more fundamental principle enunciated in the work of Heinz Werner.

#### The orthogenetic principle

This is Werner's 'orthogenetic principle', and the areas last mentioned are those in which Witkin and his associates initially sought evidence of its working. The orthogenetic principle is for Werner an 'heuristic definition' regarding development, which states that

'...wherever development occurs it proceeds from a state of



relative globality and lack of differentiation to a state of increasing differentiation, articulation, and hierarchic integration' (Werner, 1957, P.126).

To illustrate this and related ideas as they apply to development, Werner (1948) quotes a considerable body of material. The differentiation of abilities during growth, for example, is exemplified by the steady decrease in correlations amongst ability tests as children increase in age. This is due to the fragmentation of general intellectual ability, as special skills relating to verbal, numerical, and spatial factors crystallise out. Emotions also show increasing differentiation with age. The work of Bridges (1932) has shown how the 'primitive excitement' of the very young infant differentiates later into excitement, delight, and distress, each of these in turn yielding further variants as the child's age advances. Again, on the conceptual level, the child shows slowly increasing differentiation in the capacity to use concepts of space, time, and other categories; Piaget's (1951) work on the child's developing notions of 'left' and 'right' can be cited as an example of this.

The orthogenetic principle affords Werner a convenient means of summarising a number of different types of change which he detects during development.

These include changes from:

1. 'syncretic' to 'discrete'. In the 'undifferentiated' state, an individual's experiences and mental operations exhibit 'syncretism' - for example several experiences may be merged into one. During development they separate and become distinct.
2. 'global' or 'diffuse' to 'articulated'. Development also brings about structural changes in that the number of distinguishable, yet coordinated, parts which constitute the organism increases.
3. 'rigid' to 'flexible'. The more differentiated an individual in

relation to the foregoing factors, the greater will be his ability to adapt to changed circumstances; the more 'plastic' will be his behaviour.

4. 'labile' to 'stable'. Finally, the more flexible the developing individual, the greater his capacity for maintaining an internal equilibrium despite changes in the surrounding environment.

The first of these categories refers to the content of experience - to specific perceptions, images, or thoughts; the second denotes structural features of cognition; while the last two refer to dynamic qualities of the developing individual and his capacity to cope with change. For present purposes, the significant distinction is that between the first two, which are in essence two variant forms of differentiation. The former describes the substance of cognitions and actions and their existence in a 'fused' or 'separated' state. Such a notion has furnished part of the background to such studies as those of Bruner and his associates on cognitive growth, on '...the gradual loosening of the world of perception and imagery from the world of action' (Bruner et al., 1966, p.21), and those of Wallach and Kogan (1965) on physiognomic perception. The parallel with Lewin's description of development, however, lies chiefly in the latter characteristic of differentiation - its structural aspect; and it is with this kind of change also that Witkin and his associates have been concerned in their studies of 'field-dependence-independence'.

Coupled with his formulation of the orthogenetic principle in development, Werner also offers another notion which at first seems at odds with this general view of the process. Though the 'orthogenetic law' is an expression of unilinearity in development - and differentiation is uni-directional in nature - nevertheless this cannot deny '...the multiplicity of actual developmental forms' (Werner, 1957, p.138). In other words, individuals can



be capable of operating on several levels of differentiation at once - as for example in the physiognomic perception involved in artistic creativity - or can show varying degrees of differentiation in different spheres of their lives. As Kagan and Kogan put it, individuals '...cannot be so easily assigned to the same developmental stage in regard to all aspects of cognitive functioning' (1970, P.1283). A similar submission can be found in the writings of Lewin: 'Together with differences in degree of differentiation, there certainly exist between different individuals important differences in the type of differentiation' (1935, P.206). Although by and large both theorists are principally concerned with levels of differentiation within individuals considered as wholes, both nevertheless imply that separate parts of the whole individual may be differentiated to different degrees.

The concept of differentiation, then, has its antecedents primarily in the work of Werner and Lewin. From their theoretical analyses have come key distinctions between different forms or aspects of the concept, particularly as it has been used in research on cognitive style. In the work of the Witkin group the concept refers to the independence component of differentiation as understood by Lewin; and focuses especially on the global-articulated dimension of differentiation as understood by Werner. For Witkin and his associates, subsequent elaboration of the concept has gone hand in hand with empirical work designed to test hypotheses derived from it.

#### Psychological differentiation and field-dependence

In further analysing the concept of differentiation and applying it to their programme of research, Witkin and his co-workers have extended it in a number of ways, particularly as related to the 'differentiation hypo-

thesis' mentioned above.

First, consideration of the course of development led these researchers to suggest the existence of a parallel increase in differentiation in both 'internal' and 'external' aspects of experience: '...greater inner differentiation is associated with greater articulation of experience of the world' (Witkin et al., 1962, P.16). The growing child learns progressively to distinguish between himself and the world, between experiences rooted in bodily sensation and those 'emanating from within', between himself and others, and later between various aspects of his sense of self. But being only part of the totality of his experience, this gradual 'segregation of self' is accompanied by an increasing ability to analyse and structure the perceptual environment. The visual field, for example, becomes slowly more articulated; the individual becomes slowly more capable of imposing his own structure upon it.

Second, these researchers operationalised the concept of differentiation by selecting a number of areas in which they reasoned that greater or lesser differentiation should manifest itself, and devising or adapting methods for appraising level of differentiation in each. The areas chosen were that of visual perception - for evidence of analysis of experience; body awareness and use of defence mechanisms, for evidence of inner 'segregation of self'; and sense of separate identity, as an index of the distance between the self and the outside world. Though other areas than these have of course been examined, the aforementioned areas have formed the kernel of this work on psychological differentiation.

Third, the bulk of this research has been carried out on the basis of a further expectation: that individuals should exhibit a consistent level of differentiation throughout all of these areas of psychological functioning. Taking the fields of experience listed above as 'indicators' of underlying



differentiation, it was hypothesised that

'...greater or lesser progress toward developed differentiation in a given child is likely to be apparent in each of the indicators considered. We do not suppose that these indicators are products of development in "separate channels". We regard them rather as different expressions of an underlying process of development toward greater psychological complexity. On this basis we would expect measures of these indicators for any group of children to be significantly inter-related' (1962, P.16).

Finally, in conducting a search for this consistency, these workers have concentrated on one specific area, that of perceptual field-dependence-independence, as a 'reference standard' (1962, P.26) for the rest of their work. This is the cognitive-style dimension of psychological differentiation, which has been the nexus between the many kinds of research undertaken on differentiation, which were adumbrated earlier in this chapter. Dependence on the visual field in making certain perceptual judgments is taken as evidence of relative lack of differentiation, while ability to make judgments independently of the field is assumed to be a product of relatively greater differentiation.

The present thesis takes issue with the notion of individual consistency as predicated by Witkin and his group. Although some of the evidence presented by these workers in support of their conceptualisation is very impressive, there nevertheless remain sizeable doubts as to the extent of support it really provides. At the core of the present objections is a simple reluctance to accept that the development of differentiation should necessarily take place at the same rate in all 'sub-parts' of the whole individual. The possibility, developed particularly in the work of Werner (1957), that individuals show disparate levels of differentiation in diff-

erent areas of functioning, seems a much more plausible description of psychological growth than that encapsulated in the 'consistency' hypothesis. The emphasis of this thesis, therefore, is on the broad issue of whether the form of differentiation researched by Witkin and his co-workers has as many ramifications throughout an individual's personality as these researchers claim. Related points have been made in the past by Zigler (1963), Kagan and Kogan (1970), Wachtel (1972), and Kogan (1976). Inspection of the literature cited in support of the consistency hypothesis - in conjunction with other evidence - in fact points to a number of contradictions. It is upon these that the empirical work of the present thesis is focused.

A first question in this respect is whether the instruments used by the Witkin group for the assessment of differentiation - tests of articulation in perception - can in fact be taken as indices of a general aspect of an individual's psychological functioning. To what extent, in other words, are tests of field-dependence-independence a measure of central structural features of personality, rather than peripheral indicators reflecting differences in experience? Chapters 3, 4, and 5 describe some cross-cultural work bearing on this issue.

Secondly, a number of research findings have highlighted strong links between performance on field-dependence tests and general intelligence; others have in addition suggested a confusing network of relations between field-independence and performance on other tests involving the control of attention. Chapters 6 and 7 discuss these findings and outline an inter-correlational study which attempts to map out these relationships with greater clarity.

Thirdly, if development is assumed to be multi-directional in nature, and the consistency hypothesis thereby called into question, it might be poss-



ible to show that individuals characterised as less differentiated in terms of the field-dependence dimension exhibit high levels of differentiation in other areas. In other words, is the tendency towards greater 'psychological differentiation' during development unidirectional in nature, or are there other kinds of differentiation associated with differences in experience? The rationale, procedure, and results of a study centred on this question are reported in chapters 8 and 9.

Before developing this orientation towards work on field-dependence and differentiation more fully, however, it is necessary to describe in greater depth some of the empirical work carried out in concurrence with the differentiation hypothesis. Both of these tasks are attempted in chapter 2.



## 2

Research on field-dependence-independence

## Chapter 2

### Research on field-dependence-independence

If all the subjects who have taken part in studies of field-dependence were laid end to end, they would reach....Field-dependence-independence is the most thoroughly researched of cognitive styles. While review and research work on the topic are greatly facilitated by the availability of indexed bibliographies from the Educational Testing Service,<sup>1</sup> these documents also make clear the sheer scope and volume of the work that has been undertaken. The most recent, published in 1978, brings the total number of books, papers, and theses either pertaining to some aspect of this style, or using its criterion measures for some other purpose, to over 3,100. This work must place field-dependence amongst the most frequently investigated dimensions of individual differences.

No attempt will be made, in the present thesis, to survey these writings in detail. Instead, a general account will be given of the progress of field-dependence research, highlighting the principal findings and the major issues discussed. A first objective of the present chapter is to provide

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1 The first of these was published in October, 1973; since then three supplements have appeared, in August 1974; October 1976; and August 1978.

this account, beginning with work on space perception on which the initial formulations were based; continuing with research on the correlates of field-dependence and their placement in the context of differentiation theory; describing work on socialisation and cross-cultural comparisons; considering some of the potential applications of field-dependence research; and finally looking at some revisions of the approach recently advocated by Witkin and his associates. A second objective of the chapter is to pinpoint those difficulties with the relationship between field-dependence and differentiation with which the present thesis is mainly concerned.

# 1. The background

## (a) Individual differences in perception

The field-dependence-independence cognitive style was initially propounded as a description of patterns of individual differences in perception on the Rod-and-frame, Embedded Figures, and Body-adjustment tests.

The first of these was devised in a series of experiments by Asch and Witkin (1948a, b; Witkin and Asch, 1948a, b) in which an attempt was made to determine the relative importance of visual and postural factors in the perception of the upright. In the most advanced of these experiments, the researchers developed a technique designed to eliminate the normal visual field entirely, by conducting the experiments in a dark room, using a luminous rod and frame as stimuli. The subject's task was to adjust the rod to a position he perceived as vertical, under conditions in which the frame (which surrounded the rod) was tilted in various positions to the left and right of true vertical. Such a tilt in the frame, as expected, caused a shift in the perceived upright towards the direction of the frame; but the range of degrees of accuracy amongst the different Ss tested was remarkably wide. 'There were Ss who, despite the tilt of the frame,



brought the rod close to the vertical; at the other extreme Ss perceived the tilted frame as upright, and aligned the rod with it' (Witkin & Asch, 1948b, P.782).

By contrast, the Embedded Figures Test involves the visual system only, being based on a series of geometrical figures originally used by Gottschaldt (1926) and adapted with a number of modifications by Witkin (1950). Here the S is presented first with a simple figure, which is exposed for a few seconds only, and next asked to detect this simple figure in a larger, more complex whole in which it has been hidden or embedded. The time taken by S to find the simple shape in the more complex one then becomes his score on the test. Again, a wide range of scores is found: from very rapid, almost immediate identification of the embedded figure, to a search lasting many minutes.

In the Body-adjustment Test, rather than having to locate a rod or a geometric figure in a surrounding visual field, the S has to locate himself. Seated in a tilted chair in an experimental tilted room, his task is - by giving appropriate instructions to the experimenter - to re-adjust his chair to vertical while the room remains tilted. As in the Rod-and-frame Test, his relative accuracy in doing so constitutes his score; and once again, a substantial variation is found in individuals' scores. Involving as it does rather cumbersome apparatus, this test has been used much less frequently than the other two in research on field-independence.<sup>1</sup>

The ability underlying performance on these apparently quite different kinds of test was given the label 'field-dependence-independence' by Witkin

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1 The Body-adjustment Test was originally a partner of another perceptual test in which S's task was to re-adjust the surrounding room to the vertical: the Room-adjustment Test (RAT). However, this proved to be a poorer measure of the 'field-dependence' dimension than the other tests described here and it has been little used in subsequent research.

and his associates (Witkin, Lewis, Hertzman, Machover, Meissner, Wapner, 1954; Witkin, Dyk, Faterson, Goodenough, Karp, 1962/1974). A relatively 'field-dependent' performance is one in which S's judgment is powerfully influenced by stimuli from the surrounding field: that is, he adjusts the rod (or his body) to 'vertical' in terms of the frame (or tilted room), or he has great difficulty in detecting the simple figure hidden in the complex one. On the other hand, a relatively 'field-independent' performance is one in which S can resist the influence of the field, make judgments of the 'vertical' in terms of postural stimuli, and find simple figures embedded in complex ones with relative ease.

Crucial to the positing of a common dimension in all of these tests, of course, is the fact that individuals tend to show a similar level of field-dependence or -independence in their manner of performing on each. Correlations amongst the scores on all three tests are reported as being generally positive and significant. Those presented by Witkin et al. (1962), though ranging from .12 to .64, '...are for the most part significant, giving a picture of substantial consistency in individual functioning in these situations' (op. cit., P.44) - though it should be noted that they are almost always lower amongst females. Others reported by Witkin, Goodenough, and Karp (1967), with age groups ranging from 8-year-olds to adults, are generally higher, between .26 and .76 with the majority in the .40s and .50s. Broadly speaking therefore - though some reservations will be expressed about these results later - a pattern of consistency in degree of dependence on the field emerges from the use of these tests.

Not only do individuals show a consistency across these three tests, it is claimed, but also their performances show a marked consistency over time. Supporting this contention are test-retest correlations for the tests themselves, and data derived from developmental studies of field-dependence.



For example, three-year test-retest correlations for the Rod-and frame (RFT), Body-adjustment (BAT), and Embedded Figures (EFT) tests, from the work of Bauman (1951), are quoted by Witkin et al. (1962) as in Table 1.

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Table 1: 'Field-dependence': test-retest reliabilities

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	MEN	WOMEN
RFT	0.84	0.66
BAT	0.77	0.74
EFT	0.89	0.89

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Further evidence in support of this claim comes from Adevai and McGough (1968), who obtained a four-year test-retest correlation for the RFT of .86, an even stronger result than those of Bauman. But it is with the EFT that the most consistent and reliable results have been found. Dana and Goocher (1959) obtained a one-week test-retest correlation with this test of .92; Jackson (1956), in presenting a short, 12-item form of the EFT (half its full size), found its correlation with the full test to be .95 and remarked that the use of almost any twelve items from the test would yield a similarly high degree of internal reliability. Split-half correlations, say Witkin et al. (1962), are even higher.

Furthermore, longitudinal study of performance on the various tests of field-dependence has provided considerable support for the Witkin group's claim that the ability tapped by the EFT, RFT and BAT shows considerable stability over long periods of time (Witkin, Goodenough, & Karp, 1967). Though in general there was a trend towards increasing field-independence



during the course of development amongst the various groups tested, individual self-consistency in performance across the tests was in evidence at all stages. Of 44 correlations reported between tests of field-dependence at different age-levels, 42 are in the expected direction and 33 are significant. Test-retest correlations for the RFT for 10- to 24-year-olds, male and female, are all significant, and range in value from .62 to .92, leading these authors to the conclusion that '...each individual tends to maintain his relative position among his peers in the distribution of measures ...from age to age' (Witkin et al., 1967, P.297). This suggests a 'high degree of continuity during an individual's development in relative level' of field-dependence.

An additional finding reported in the majority of studies of field-dependence which have involved Ss of both sexes, is that there are fairly consistent differences between the sexes in scores on the EFT and RFT (which are not however usually found with the BAT). At most stages of development after the age of eight, and particularly in the mid-adolescent years, females seem more susceptible to the influence of the visual field than males (Witkin et al., 1962; Witkin, Goodenough, & Karp, 1967; Maccoby & Jacklin, 1974). These differences lie not only in level of performance, however; it has been shown repeatedly that male performance on the tests is more consistent than that of females. This, together with a number of studies in which no sex differences have been found, raises the possibility that performance on these tests amongst males and females may be a function of different determinants.

#### (b) Correlates in other areas

The individual-difference dimension of field-dependence-independence, though originally a product of research in space perception, has been

considerably extended and enriched by further work investigating its relationships to other psychological variables. In their own research along these lines, Witkin et al. (1962/1974) combined individuals' scores on the three standard tests - EFT, RFT, and BAT - into a 'perceptual index' which was then used as a criterion measure in relation to other areas. In many other pieces of research however, by the Witkin group and by others, only one of the tests - most commonly the EFT, but quite often the RFT or a portable form of it (e.g. Oltman's, 1968) - has been used. There are also versions of the EFT for use with children (Goodenough & Eagle, 1963; Karp & Konstadt, 1963), and a group form (all of them described in one manual; Witkin, Oltman, Raskin, & Karp, 1971).

A substantial quantity of the research work carried out by Witkin and his associates (1962/1974; Goodenough & Karp, 1961; Karp, 1963; Witkin, 1965) has been designed to consolidate their findings on the nature of individual differences in field-dependence, on the one hand; and to establish its links with other alleged manifestations of 'psychological differentiation' on the other. Factor-analytic studies have been undertaken to investigate the relationship between field-dependence and performance on other tests, particularly of intelligence. For example in one study, Goodenough and Karp (1961) administered a large test battery to groups of 10- and 12-year-olds. The battery included the field-dependence measures; the Wechsler Intelligence Scale for Children; and a number of other tasks designed to assess, for example, recognition-efficiency (speed in recognising pictures shown out of focus) and memory for incidental stimuli (S is shown a list of words printed in different colours; asked to name the colours; and later asked to recall the words). Of the three factors typically identified in such studies of intellectual function - 'verbal comprehension'; 'attention-concentration'; and 'spatial-perceptual' - the field-dependence tests were



all most highly loaded on the third, alongside such 'performance' tests as Block Designs, Object Assembly and Picture Completion. Similar findings of a close relationship between field-dependence tests and those assumed to measure 'spatial ability', 'closure', 'visualisation' - or whichever factor these are commonly thought to denote - have been reported by other researchers also (e.g., Messick & French, 1975; Vernon, 1969). However the issue of the relationship between field-dependence and intellectual functioning remains a fairly controversial one, and will be discussed at greater length below.

In another factor-analytic study, Karp (1963) probed the hypothesis that effective performance on such tests as the EFT, RFT, and BAT derived from a general ability to resist distraction, rather than from an ability to extract a target stimulus from a field in which it is encased. Working on the assumption that field-independence involves the ability to 'overcome embeddedness', Karp administered the standard field-dependence tests, the Wechsler Adult Intelligence Scale, and a number of 'distractibility' measures to a sample of 150 male college students. The distractibility tests included a group of tasks similar to the EFT, but with figures hidden in 'distracting' rather than 'embedding' contexts (e.g., interspersed amongst other similar figures, or having coloured designs superimposed upon them); an arithmetic test with its items printed on a page alongside irrelevant pictures and jokes; and more familiar tests such as an extended Digit Symbol task of the kind found in the Wechsler scale. Factor analysis, whether with four or eight factors (the latter proving more satisfactory), produced a similar result in relation to the hypothesis being tested: there was '...a complete absence of overlap of significant loadings of tests involving different kinds of contexts in either four or eight factor solutions' (Karp, 1963, P.298). Such results have demonstrated, for Witkin



and his co-workers, that the ability underlying performance on field-dependence tests is that of 'overcoming embedding contexts'. This in turn is held to be one feature of ability in 'articulation', which derives from the 'segregation of self' from the outside world. All of these are assumed to have at their root the fundamental process of 'psychological differentiation'.

Witkin et al. (1962/1974) also report research, by themselves and others, on those other areas of individual development which are held to be 'indicators of differentiation'. These are:

1. Degree of articulation of body-concept. This is assessed chiefly by the method of asking Ss to draw a person (first of their own, and then of the opposite sex), and rating the sophistication of the drawings produced. Correlations between sophistication of drawings (rated on a 5-point scale) and 'perceptual index' scores, amongst groups of 10-year-old boys and college males, ranged from .51 to .71.
2. Sense of separate identity. An individual's degree of developed 'sense of self' was assessed by means of a range of techniques, including: responses to the Thematic Apperception Test; performance on a series of tasks in which Ss could if they wished rely on 'the guidance of an authority figure'; self- and other-ratings of dependence; degree of conformity to group pressure (studied by Linton, 1955); and suggestibility. Results from most (but not all) of the measures used tended to support the conclusion that field-independent Ss are also more independent socially; are regarded by others as more independent; are less suggestible; and less conforming, than field-dependent Ss. These findings are taken by Witkin et al. as indicating that field-independent Ss' '...attitudes, feelings, and needs are developed and discrete and do not easily become fused with the

matrix of attitudes, feelings, and needs of others' (1962, P.156).

3. Patterns in use of 'defence mechanisms'. These patterns were ascertained by means of projective techniques such as the TAT, Rorschach Inkblots, and human figure drawing tests (data on frequency of dream recall are also quoted but these are difficult to interpret). This work was based on the hypothesis that field-dependent Ss (being less 'differentiated') would use less 'specialised' defences such as repression and denial; field-independent Ss would use the more 'specialised' defence of intellectualisation. The findings, though considerably weaker than those on body-awareness and sense of identity, show a trend in favour of the hypothesis.

The patterns of individual consistency which emerged from these studies, coupled with those on articulation in perception, are impressive in themselves given the wide range of test material involved. That this consistency be shown, is essential to the 'differentiation hypothesis' as expressed by Witkin and his associates. Whether or not the hypothesis is thereby strengthened is however another matter, discussed more fully below.

A great variety of other variables have been linked to field-dependence and field-independence in perception. In the cognitive domain, for example, a number of other differences have been observed between individuals differing in 'mode of field approach'. Not surprisingly given some of the evidence quoted earlier, field-independent Ss typically do better than field-dependent Ss on most spatial tests, even those not involving a specific 'dis-embedding' factor (Vernon, 1969, 1972). Other results reported include differences in 'insight' problem-solving ability (Harris, quoted in Witkin et al., 1962); differences in strategies of concept-attainment (Nebelkopf & Dreyer, 1973), and in effectiveness of concept-attainment (e.g. Dickstein, 1968; see Goodenough (1976) for a review); and differences



in selective attention to, and memory for, stimuli of a social or non-social nature (e.g., Fitzgibbons et al., 1965; Ruble and Nakamura, 1972; a point to be enlarged upon below). Although not all of these results have been secured with equal regularity, it seems to be generally accepted that field-independence carries with it advantages for performance on most cognitive tasks.

In the domain of personality, as traditionally assessed using self-report scales and schedules, attempts to identify correlates of field-dependent and field-independent cognitive styles have yielded generally inconsistent results. The expectations of theory on this point have been made clear by Witkin et al. (1954) who state that the field-dependent person is characterised by passive submission to the environment, whereas the field-independent person exhibits tendencies towards the use of active coping processes. Marlowe (1958) attempted to find the personality correlates of the dimension by administering the EFT and the Edwards Personal Preference Schedule to 69 undergraduates. He hypothesised that field-independence would be positively correlated with needs Achievement, Autonomy, Dominance, and Intraception; and negatively correlated with n Succourance. All correlations were in fact low and only two, Intraception (positively related) and Succourance (negatively related), proved statistically significant. This is in contrast with the findings of Wertheim and Mednick (1958) who, using a technique of a more 'projective' kind, found EFT performance to be positively related to the need for Achievement (i.e., the higher his need for Achievement, the more field-independent the individual). Different again were the results of Dana and Goocher (1959), who found only Edwards need for Order to be significantly related to EFT scores, leading these authors to suggest that their findings '...do not augur well for the EFT as a personality measure' (1959, P.101). A similarly confusing mixture of results has emerged from studies of the relationships between



the field-dependence dimension and introversion-extraversion. Whereas Franks (1956) found no evidence of any such relationship, Evans (1967) has reported a significant correlation between I-E scores on the Maudslsey Personality Inventory, and field-dependence scores as assessed by the EFT and Draw-a-person tests (field-dependent Ss being more extraverted). In neither case was field-dependence related to neuroticism.

In reviewing some of the above and more recent studies, Karp (1977) has concluded that '...further proliferation of studies of this type promises little clarification of the issues involved' (P.164). Karp sampled twenty-eight studies which had examined relationships between field-dependence and self-report scales of social dependence/independence. Of the 48 correlation coefficients reported therein, '...31 were not significant, 12 were significant in associating field-dependence with dependence, and 5 were significant in the opposite direction, associating field-independence with dependence' (Karp, 1977, P.161).

Some potential psychometric support for the initial suggestion of Witkin et al. (1954) has appeared more recently, however, in what Witkin and Good-enough (1977a) see as a 'convergence' between their work and that of Cattell (1969). This is based upon an apparently significant overlap between the field-dependence-independence style and Cattell's 'U.I.19' personality factor, which has been labelled 'Promethean Will' or more mundanely, 'Independence versus Subduedness'. The existence of such an overlap relates closely, of course, to the findings of Witkin et al. (1962/1974) on 'sense of separate identity'.

#### (c) Social behaviour and task-versus-social orientation

But stronger support for the idea of a relationship between field-approach and degree of separate identity has come from studies using observational

and experimental, rather than psychometric, data. Indeed the impact of findings from studies of this kind has been such as to initiate some revision of the concepts underpinning the field-dependence dimension.

These studies have focused predominantly on the social behaviour of field-dependent and field-independent Ss, and on what seem to be general differences in preference for activities of either an interpersonal, or an impersonal, nature. Much of this work has recently been surveyed by the Witkin group (Karp, 1977; Witkin & Goodenough, 1977b).

A number of studies have reported differences between field-dependent and field-independent Ss in their tendency to follow the suggestions of others. In one of the earliest studies of the social correlates of a cognitive style, Linton (1955) examined the relationships between field-dependence in perception, and 'dependence on external influence' amongst 53 male college students. Field-dependence was assessed by means of the Tilting-room-tilting-chair Test (the combination of the BAT and the RAT) and the EFT. Ss' tendency to conform to the suggestions of others was assessed by means of three tests; suggestibility in the autokinetic situation used by Sherif (1935); a syllogisms test designed to monitor the degree to which an S's judgment of logic was influenced by his attitudes; and an 'attitude change test' in which Ss' agreement or disagreement with a stated position was assessed both before and after reading authoritative articles on the point in question. For both the first and last of these tasks, there was a significant relationship between field-dependence and the tendency to conform to the suggestions of others. For the syllogisms task, however, no such relationship appeared; attributed by Linton to the fact that on this task '....the source of influence is not external' (1955, P.506). In another study by Mednick and Schaffer (cited in Witkin et al., 1962), also using the autokinetic situation, field-dependent Ss reported seeing signif-



icantly more words following the suggestion that the light would move 'so as to write messages' (1962, P.151).

Paradoxically given these results, attempts to find relationships between field-dependence and conformity or suggestibility using self-report or self-rating methods have proved as fruitless as those on social dependence noted above (Karp, 1977).<sup>1</sup> Similarly, the search for differences between field-dependent and field-independent individuals in experimental 'conformity' situations of the Asch or Crutchfield type has proved equally disappointing (Busch and DeRidder, 1973; Rosner, 1957). Once again however, some support for the hypotheses of Witkin et al. has come from studies using 'real life' criteria of conformity.

For example, Larsen and White (1974) have reported a study in which they selected two groups of male undergraduates (at Idaho State University) who differed in what, in that particular setting, seemed an index of relative conformity or deviance: wearing hair below shoulder length. Thirty Ss whose hair fell into this category were significantly more field-independent than 30 Ss whose hair complied more closely with the norm.<sup>2</sup>

Approaching this issue from a similar direction - selecting groups of Ss expected to differ in conformity and predicting their degree of field-independence - the Witkin group themselves have undertaken a major cross-cultural study designed to map out relationships between conformity and 'psychological differentiation'. Witkin, Price-Williams, Bertini, Christiansen, Oltman, Ramirez, and van Meel (1973) carried out a study in which

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- 1 Equally surprising is the finding that field-independent Ss are more susceptible to hypnosis than field-dependents (Morgan, 1972).
  - 2 It has also been claimed that juvenile delinquents are more field-independent than their non-delinquent peers (Offer et al., 1979). However, the evidence put forward by these authors to support their suggestion is very weak: amongst males, differences between delinquent and non-delinquent groups in RFT scores were significant only at the .10 level; amongst females there were no detectable differences.



groups of children from two villages in each of three countries (Holland, Italy, and Mexico) were given a battery of field-dependence tests. The two villages in each case were chosen, on the basis of substantial quantities of background information, so as to differ in relative emphasis on 'social conformity' - in terms of observance of family, religious, and political rules. Within each village, 25 boys and 25 girls, at each of two age-levels (10 and 13), were chosen so as to be as representative as possible of the groups from which they were drawn. In all then, 600 children took the tests. The specific measures used were: the portable RFT; the EFT (or children's version, CEFT, where appropriate); Block Designs (from the Wechsler scales); the Draw-a-person Test; and the vocabulary subtest from the Wechsler Intelligence Scale for Children (WISC). The results were in general agreement with the authors' hypotheses: children from 'less conformity' (LC) villages proved more field-independent on all tests than children from villages marked by 'more conformity' (MC); and also produced more articulated figure drawings. Other expectations regarding age differences, and the general coherence of the field-dependence tests, were also confirmed. It certainly seems clear from this study that 'conformity', however impressionistically judged, is strongly associated with field-dependence. However, given that the villages in each country also differed in economic circumstances and that vocabulary scores, where given, showed the same pattern of significant differences as the perceptual tests, some caution must be exercised in interpreting the results. Some reservations concerning this study will be discussed later in this chapter.

What are the possible sources of this apparent relationship between field-dependence and conformity? A number of studies have suggested that field-dependent individuals may be more attentive to the social environment, may make more use of other people or may be more generally responsive to them. Whether this implies a greater degree of interpersonal 'dependence' remains

unclear. By and large, attempts to find significant differences between field-dependent and field-independent individuals in behaviours associated with social 'dependency' have, like studies using self-report scales, met with little success (Crandall & Sinkeldam, 1964; Pedersen & Wender, 1968). In some respects, however, field-dependent Ss do seem to be more sensitive to signals from the social environment.

Konstadt and Forman (1965), for example, carried out an experiment in which field-dependent and field-independent boys and girls were given a simple task (cancelling out the letters a, c, and t in a printed passage), by either an 'approving' or a 'disapproving' experimenter. The Ss' performance on the task was monitored over two sessions, with either the 'approving' experimenter followed by the 'disapproving' one or vice versa. Normally, most Ss show improved performance on this task, due to practice, from one session to the next; which was the case here under all conditions except that in which field-dependent Ss had the 'disapproving' experimenter last. Their performance in fact worsened under this condition. This effect was taken as an indication of their greater dependence on guiding or encouraging cues from others - of their greater 'external directedness' towards their social surroundings at least.

Using a completely different task, Mausner and Graham (1970) obtained findings which run a close parallel to those of Konstadt and Forman. Ss, working in pairs, were asked to make several series of judgments about the rate of alternation of a flickering light. In an initial set of trials in which Ss made their own independent judgments, they were given false information as to their own and their partner's performance - within each pair one tended to be 'correct' more often than the other. Ss were then asked to make another series of judgments in 'interaction' conditions, i.e. in which they were fed information (actually manipulated by the experimenter) about



their partner's judgment prior to making their own. It was found that, whereas the judgments of field-independent Ss during the second set of trials were little affected by their partner's (apparent) judgments - whether they themselves had previously tended to be right or wrong - the responses of field-dependent Ss were markedly different. If they had previously (during the first set of trials) been led to believe they were accurate, their judgments were almost completely unaffected by those of their 'partner'. If on the other hand they believed they had often been 'wrong' on the first set of trials, their judgments during the 'interaction' trials shifted dramatically to be in line with those of their 'partner'. Thus field-dependent Ss did not simply conform to the judgments of another; they did so only when they thought the other was right and they were wrong. Field-independent Ss, by contrast, carried on making their own estimates regardless of prior reinforcement or of the supposed accuracy of their partners.

Results in a broadly similar vein have been obtained in a study by Gates (described by Goodenough, 1978), on the verbal conditioning of conversations during interviews. The word output of field-dependent and field-independent Ss was measured during conversations with silent interviewers, on the one hand, and with those who made standard following responses ('mm-hmm', 'yeah', etc.) on the other. The word output of the field-dependent Ss was much more affected by the behaviour of the interviewer than was that of field-independent Ss, suggesting (as was confirmed during post-experimental interviews) that the field-dependent S looked to the interviewer for guidance far more than her field-independent colleague.

Complementary to all of these findings is a result reported by Sousa-Poza et al. (1973) in which two groups of Ss from opposite extremes of the field-dependence-independence continuum were given a Self-disclosure Scale developed by Jourard (1971). Field-dependents were significantly more



'disclosing' than their peers in the comparison group; a finding which dovetails with that of Evans (1967) on extraversion, cited above. An attempt to produce a similar finding cross-culturally, with groups differing in field-dependence and expected to differ in self-disclosure, has however proved inconclusive (Berry & Annis, 1974).

A number of other studies have explored the relative attentiveness of field-dependent and field-independent individuals to other people and to aspects of the non-social environment respectively. For example, Coates, Lord, and Jakabovics (1975), in a study of the play preferences of 4- and 5-year-old children, found field-dependent children to be '...more socially oriented in their play while field-independent children tend to prefer solitary activities' (1975, P.199) - though part of the reason for these play preferences was attributed by the authors to differences in 'perceptual-motor experience'. Ruble and Nakamura (1972), working with children between 7 and 10 years old, constructed a situation in which Ss, asked to perform a number of game-like tasks (of object-assembly and concept-formation), were given opportunities to take advantage of 'task' and 'social' cues which would help them on their way. On the first task, Ss had to assemble two objects. While they assembled the first, E quickly assembled the second, noting the number of times Ss glanced at it, at the experimenter, or at both. Overall, field-dependent Ss glanced away from their tasks significantly more often than field-independents. However, field-independent Ss tended to glance more often at the second object, and performed better at assembling both objects than did field-dependent Ss. In the concept-formation game, by contrast, field-dependent Ss performed better (though not significantly) than independents on a block of trials on which E gave a non-verbal cue as to the correct answer; the reverse being the case on a block in which no cue was given. These results support the view that '...glancing by the field-independents was primarily a task-oriented, information-seeking behaviour rather than a

socially oriented responding' (Ruble & Nakamura, 1972, P.479). Similarly, in an observational study of the free play of children aged between 6 and 12, Crandall and Sinkeldam (1964) found field-independence to be significantly correlated with higher achievement orientation, more task persistence, and a greater concern with the mastery of fine motor skills. Analogous results have been obtained from studies using an incidental-learning paradigm, in which field-dependent Ss' recall of 'social' words was superior to that of field-independent Ss - no differences being found with 'neutral' words (Fitzgibbons, Goldberger, & Eagle, 1965; Fitzgibbons & Goldberger, 1971). However other studies have found no differences in this respect (Eagle, Fitzgibbons, & Goldberger, 1966).

Directly related to these findings is the suggestion, borne out by some empirical results, that field-dependent individuals should show better incidental recall of human faces. Messick and Damarin (1964) asked a group of college students to judge the age of individuals portrayed in a series of 79 photographs. Two hours later, they were asked to estimate the ages of a further 40 - which included 20 from the original series - and to identify the latter without knowing how many of them there were. A significant, but somewhat low correlation was found between field-dependence and better recall (corroborating the findings of Crutchfield, Woodworth, and Albrecht, cited by Witkin et al., 1962).<sup>1</sup> Evidence giving indirect support to these findings has also come from a study by Witryol and Kaess (1957) who found women to be superior to men in recalling both names and faces. Again however, not all of these findings have been reproduced in other studies (Goodenough, 1976).

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1 It may be worth noting that, in the Messick and Damarin (1964) paper, the correlation between number of faces recalled and category width (Pettigrew, 1958) was higher than that for field-dependence - narrow categorisers having better recall.



The general trend of all these findings then, favours the hypothesis that there are differences between field-dependent and field-independent persons in their orientation towards others. The field-independent individual appears as a self-determining, non-conforming, slightly withdrawn being, intent with getting on with the job in hand. Field-dependent individuals, on the other hand, are more inclined to take their bearings from others. Numerous findings, say Witkin and Goodenough (1977b), also suggest that these individuals are seen in this way by their peers; are attributed the characteristics which, on 'differentiation' theory, go hand-in-hand with being closer to, or more separate from, others.

Given some of the results discussed in this section, it should come as no surprise to find that when making decisions or resolving conflicts, groups of field-dependent individuals seem to reach agreement more readily than groups with field-independent membership. Oltman, Goodenough, Witkin, Freedman, and Friedman (1975) studied just this situation. Individuals whose responses were initially different on a 'moral dilemma' task (e.g., selecting which of two people in need should be given access to a renal dialysis machine) were grouped in pairs and asked to try to resolve their conflicting views. When both Ss were field-dependent, only 5% of the discussions remained unresolved. With two field-independent Ss, this proportion was 35%. With Ss differing in cognitive style, agreements were reached in all but 18% of the sessions - and more often reflected the field-independent S's point of view.<sup>1</sup> This last point, that in a decision-making

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1 Under other circumstances and with other kinds of task, Simon, Langmeyer, and Boyer (1974) found that groups of field-independent Ss reached decisions more quickly and efficiently than groups of field-dependent Ss. This may not be an unexpected finding given that the task in this instance was a perceptual-cognitive one (assembling squares from constituent parts); however the authors observed that the field-dependent groups tended to be less efficient in sharing information and ideas than did the field-independent groups.



group the views of field-independent Ss will prevail, also emerged from a study by Solar, Davenport, and Bruehl (1969) using the RFT. Field-dependent and field-independent Ss first took the test separately and were then formed into pairs, each of one field-dependent and one field-independent S, to take it again. The pairs were asked to arrive at a joint decision on the alignment of the rod. While the scores of these dyads were field-independent in every case, a post-test showed that field-dependent Ss subsequently reverted to a typically field-dependent performance. The scores of the dyads, in other words, were largely due to the influence of the field-independent Ss. Finally, combining what has been established concerning differences between field-dependent and field-independent individuals in various cognitive characteristics such as spatial ability - touched upon earlier - with the suggestions of the present section on 'personal versus impersonal' orientation, it is once again not surprising to find that these individuals also tend to make different choices of career. They differ in the kinds of jobs they prefer, and also in their predilections for working with others or alone. Findings on this point will be sketched out below in relation to 'potential applications' of field-dependence research (Pp.49 ff.). In the next section, hypotheses and evidence regarding the origins of individual differences in this cognitive style are briefly surveyed.

#### (d) The 'socialisation hypothesis' and cross-cultural studies

Having formulated some principles for giving an account of development, and having discovered individual differences in relation to some aspect of these, a logical next step for any programme of research would be to investigate the conditions governing the emergence of these differences. This has been the case with work on 'psychological differentiation'. In relative terms, the quantity of research devoted to the developmental

origins of differences in field-dependence-independence has been very small compared with that on its correlates in later years. Nevertheless a certain amount of work has been concerned with this issue; bolstered recently by a substantially larger volume of work carried out in other cultures.

A number of different hypotheses have been entertained as regards the possible origins of variations in degree of differentiation. Some attention has been paid to the possible role of genetic, or of hormonal factors - or their possible joint action, with the former being mediated by the latter.<sup>1</sup> The focal point of research, however, has been the process of socialisation: the interaction between parent and child, and between both and the culture in which they live. The location of such environmental influences does not of course exclude the possibility that these may interact with biological factors, in some as yet unspecified way.

The bulk of the pertinent research carried out by Witkin and his associates in this arena has favoured an explanation of individual differences in terms of the social experiences that influence growth - specifically, influences within the family which encourage or inhibit the development of separate, autonomous functioning (Bing, 1963; Dyk, 1969; Dyk and Witkin, 1965; Witkin et al., 1962/1974; Seder, 1957). In effect this has resulted in a concentration on child-rearing practices; particularly, in a study of relationships between infant and mother.

In work to date, certain aspects of mother-infant relationships have been

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1 Goodenough and Witkin (1977) have recently reviewed behaviour-genetics research which suggests that '...spatial-visualisation and disembedding abilities are influenced by an X-linked recessive gene' (op. cit., P.17); at present, however, little can be said with confidence regarding this possibility. Concerning hormonal factors, a number of mechanisms have been proposed whereby these might influence levels of field-independence (e.g. Broverman et al., 1968; Buffery & Gray, 1972). Many of these formulations, however, contradict each other and much of the evidence is conflicting. Some of these points are discussed more fully in chapter 8.



thought to be more important than others, and research has focused on three main areas or aspects of interaction: first, processes influencing the degree of separateness which develops between mother and child (for example, the amount of physical contact in infancy, or the degree of dependence of the child on the mother); second, the degree of control exercised over a child's aggressive or exploratory behaviour; and third, the nature of the mother as a person - and in particular, her own level of 'psychological differentiation'.

The rationale underlying an emphasis on processes such as these derives directly from the 'differentiation hypothesis'. The development of differentiation is held by Witkin et al. (1962) to entail, in the first instance, the child's growing awareness of his own existence as an entity apart from the rest of the world. Other planes of differentiation - for example within the individual self or in the individual's experience of the world - develop in conjunction with a growing independence of the self as a whole. Thus

'...child-rearing practices which encourage separate autonomous functioning foster the development of differentiation in general, and more particularly of a field-independent cognitive style.

In contrast, child-rearing practices which encourage continued reliance on parental authority are likely to make for less differentiation and a more field-dependent cognitive style'

(Goodenough & Witkin, 1977, Pp.26-27).

The specific characteristics of an upbringing likely to produce a field-dependent individual for example, have been investigated by Seder (1957) and by Witkin et al. (1962) in interviews with mothers of field-dependent and field-independent boys. On the basis of their research, Witkin and his colleagues concluded that the maternal attitudes likely to 'inhibit differentiation' in a child are as follows:



1. A possessive attitude of the mother towards the child (intense emotional involvement);
2. An attitude of anxiety or solicitousness;
3. A cold, unsympathetic, hostile attitude;
4. An inconsistent approach, alternating between over-indulgence and hostility.

Hand in hand with such attitudes, it was found, were the methods used by mothers of field-dependent children for the control of their child's aggressive or assertive behaviour. These tended to be either indulgent and submissive; severe and coercive; some combination of these; or were based upon the use of irrational threats. In general, the inclinations of the child towards self-assertiveness or independent mastery of the environment were inhibited or suppressed. Mothers of field-independent boys and girls, by contrast, allowed their progeny much more freedom. Their child-rearing attitudes were characterised by warmth and acceptance; they encouraged the growth of curiosity in their children; and they were more likely to permit the child to assume various kinds of responsibility associated with becoming an adult (Dyk and Witkin, 1965; Witkin et al., 1962/1974).

Congruent with these findings are a number of others pertaining to various aspects of the child-rearing process. Dyk (1969), in a longitudinal study using observational methods, found differences between mothers of field-dependent and field-independent children in their use of methods of comforting the child in distress. Mothers of more field-dependent children tended to be more repetitive and less specific in their manner of comforting - that is, their response did not vary in accordance with the needs of the infant, thus failing to promote 'differentiation' amongst its inner emotional states. Barclay and Cusumano (1967) found that children from families whose fathers had been absent during parts of the crucial child-rearing years

were more field-dependent than children from families which had remained intact. Claeys and DeBoeck (1976) reported, on the basis of interview data with mothers of adopted children, that the mothers' tendency to reinforce competitiveness, self-reliance, and achievement was significantly correlated with high (field-independent) CEFT scores for both boys and girls. (The overall trend of these authors' findings was however less supportive of the hypotheses of the Witkin group).

But perhaps the strongest evidence in favour of the 'socialisation hypothesis' has emerged from the considerable quantity of cross-cultural work that has been undertaken in recent years. This is based partly upon observed relationships between Ss' field-dependence test scores and their self-reports of their own experiences of upbringing; and partly upon comparative test performances of Ss from cultures assumed, on the basis of anthropological data, to differ in the extent to which they 'foster' or 'inhibit' 'differentiation'. The initial impetus towards work of this kind came from the research of Dawson (1963; 1967a, b), and much of what has been done since then has recently been examined by Witkin and Berry (1975).

The line of reasoning by which field-dependence-independence has come to be studied in a cross-cultural context runs roughly as follows. Different societies live in different physical and biological milieux. The characteristics of the environment in which a society lives, by determining the manner in which that society obtains its food, also have strong implications for the mode of social organisation which emerges. This in turn is responsible for the specific methods which the society will adopt for the training or rearing of its members, and for the 'typical' features of personality which are cultivated. Amongst these will be the 'level of differentiation' in personality and perceptual processes. It should therefore be possible to demonstrate that societies with different patterns of food-gathering and



(ergo) child training will manifest differing levels of 'psychological differentiation' in tests of perceptual field-dependence.

The anthropological data supporting the initial stages of this argument have come from the work of Barry, Child, and Bacon (1959). In an extensive survey of 104 non-literate societies from all parts of the world, these authors attempted to demonstrate the existence of a relationship between the level of food accumulation in a society and certain personality characteristics of the society's members: that is, societies differing in the nature of their 'subsistence economy' were compared in their methods and emphases in child training. Subsistence economies were first of all classified, as being either 'predominantly pastoral'; 'agricultural with animal husbandry'; 'cultivating grain'; 'cultivating root crops'; 'predominantly hunting'; or 'predominantly fishing'. These categories were then rated according to the relative amount of food accumulation thought to be typical of each - agricultural and pastoral economies high, grain and root-crop economies intermediate, and hunting/fishing economies low. Next, several ratings of child training practices were extracted from analyses of ethnographic documents conducted by two independent judges. It was predicted that, in each society, the emphasis in child training would be towards the development of the kinds of behaviour that would be useful in the adult economy. Specifically, in societies with low levels of accumulation of food, adults should tend to be individualistic, assertive, and venturesome; whereas in societies with high levels of food accumulation, adults should tend to be conscientious, compliant, and conservative.

Results drawn from a detailed analysis of 79 societies supported this hypothesis. The authors suggested that their results could be explained in terms of a general underlying variable which they chose to call 'pressure towards compliance versus assertion'. 'Societies with high accumulations

of food resources almost always had predominant pressure towards compliance; whereas societies with low accumulation of food almost always had predominant pressure towards assertion' (Barry et al., 1959, P.59).

The psychological ramifications of these results were investigated by Dawson (1967a, b) by comparing the perceptual abilities of two cultural groups which differ considerably in the degree of 'pressure towards compliance' typical of their child-rearing methods. Such pressure should, if the 'socialisation hypothesis' is correct, inhibit the development of differentiation, so producing a more field-dependent cognitive style; Ss from a society encouraging assertiveness should be relatively more field-independent by comparison.

These predictions were borne out in a study with the Temne and Mende, two Sierra Leone tribes known to differ in their relative emphasis on the inculcation of compliance or assertiveness during child training. Dawson predicted that the Temne, whose values are more aggressive, and whose child-rearing methods emphasise strict discipline, maternal dominance, and greater pressure towards uniformity, would be more field-dependent than the Mende, amongst whom child-rearing is less strict, mothers are less dominating, and individual initiative is encouraged. In two samples matched in age, occupation, sex, intelligence, and education, with extraneous factors controlled, Temne Ss proved to be significantly more field-dependent (on the EFT) than their Mende counterparts. In addition, there was found to be a significant relationship between the degree of strictness of maternal discipline, as estimated by Ss' own ratings, and observed scores on tests such as the EFT and Kohs Blocks. These findings have been taken as giving substantial support to the 'socialisation hypothesis' (Witkin, 1967).

Further support for this hypothesis has also been provided by a study in which an explicit comparison was made between a hunting society whose child-



rearing procedures emphasise assertiveness (the Canadian Eskimo), and an agricultural society whose child-rearing instils compliance (the Temne) (Berry, 1966). Predictions regarding field-dependence test scores amongst samples from these two societies were again confirmed: the performance of the Eskimo on four tests of spatial ability (Kohs Blocks, EFT, Morrisby Shapes, and Raven's Matrices) was consistently superior to that of the Temne, and closely approximated that of a Scottish sample included for comparative purposes. Additionally, comparisons were made - within each culture - between two sub-groups of Ss: a more traditional, un-Westernised group, and a 'transitional' sample having a history of contact with Europeans. Both Eskimo and Temne 'transitional' groups were more field-independent than their 'traditional' counterparts.

Findings in general accord with these have been obtained from a number of other studies in non Western settings. For example in Jamaica, Vernon (1965, 1969) found a spatial-perceptual factor - on which Gottschaldt Figures and Kohs Blocks were loaded - to be correlated with the extent to which his Ss (10- and 11-year-old boys) were judged as exhibiting 'male dominance' or 'identification with father'. In Hong Kong, Dawson, Young, and Choi (1974) obtained significant correlations between self-ratings of the severity of socialisation and scores on the EFT, RFT, and Block Designs - all in the direction predicted by the 'socialisation hypothesis'. The comparison of groups which have assimilated Western culture to varying degrees - the traditional/transitional distinction utilised by Berry - has proven particularly fruitful in relation to this hypothesis. Differences between cultural and sub-cultural groups in field-dependence test scores have been observed in a variety of contexts, including: American Jews from traditional backgrounds, or given a more 'Americanised' upbringing (Derishowitz, 1971); groups of Mexican-Americans living at different distances from

Los Angeles (Ramirez, Castaneda, & Herold, 1974); between groups of Nigerians reared in rural or in urban environments (Okonji, 1969); amongst Trinidadians of different ethnic origin and with varying degrees of attachment to traditional values (Nedd & Gruenfeld, 1976); and between Canadian Indian groups with different levels of food accumulation, and degrees of contact with Western education (Berry & Annis, 1974). The work of Witkin and his associates on 'social conformity and psychological differentiation', described above, could also be cited in this respect (Witkin, Price-Williams, et al., 1973).<sup>1</sup>

One other set of findings which has in the past been taken as supportive of the 'differentiation hypothesis' viewed cross-culturally, is that on the varied patterns of sex differences in field-dependence which have emerged from research in societies other than our own. Whereas in this culture such sex differences are commonly found, studies amongst other groups such as the Eskimo (Berry, 1966; MacArthur, 1967) and Arunta aborigines of Australia (Berry, 1971) - amongst whom sex roles are less clearly defined - found no differences. More recent research, however, has added only confusion to what at one stage seemed a fairly clear-cut picture. At present, beyond the suggestion that '...in migratory hunting and gathering samples sex differences in field-dependence-independence are relatively uncommon compared to sedentary groups' (Witkin and Berry, 1975, P.33), it is difficult to detect a consistent pattern in the findings that have appeared. Sex differences on field-dependence tests seem to be a function of a large number of factors; in any case, as Kogan (1973) has suggested, current trends towards the reduction of sex-role typing may in the long run show that even

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1 All of the Ss in this study, and some in the other studies cited here, were of course part of 'Western' society. The words 'Western' and 'Westernise' are used here to refer particularly to contemporary, urban, Anglo-American society with its associated beliefs and values.



the differences reported in American research are merely a 'generational cohort-specific phenomenon' (Kogan, 1973, P.167).<sup>1</sup>

The fecundity of field-dependence-independence in stimulating cross-cultural research has led to its being incorporated into a number of more comprehensive models of the nature of psychological differences between societies. For example Vernon (1969) has outlined a scheme for classifying broad ability differences between cultural groups from different kinds of environment and with different kinds of 'dominant ethic'. Field-dependence is depicted as an important dimension in this scheme. Berry (1974a, b) has put forward a still more panoramic frame of reference coordinating ecology and cultural factors with individual development. In essence, however, this consists of only one basic dimension - degree of food accumulation - with other observed data (socialisation practices, family structure, social structure, cognitive style, affective style, etc.) as its correlates. A problem with any model such as this is that all of the independent variables are conflated with each other; all are expected to act in a similar direction, and it is therefore difficult, given a specific result, to identify its antecedents with any confidence. Such a difficulty is particularly apparent in cross-cultural work on 'psychological differentiation', and will be scrutinised more carefully in the second part of this chapter.

What conclusions are warranted by the pattern of results described in the

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1 The efficiency with which existing sex-role stereotypes are transmitted to the young is exemplified in a study by Iscoe and Carden (1961) on field-dependence-independence. Amongst a group of 11-year-old children, field-dependence (as measured by the EFT) was positively related to sociometric status amongst girls (+ .57) but negatively related to sociometric status for boys (- .51). 'The girl who is an active initiator and organiser is not likely to enjoy high social status with her peers. In contrast, the relatively field-independent boy is most likely to gain wider acceptance with his classmates' (op. cit., P.184). Pressures towards sex-role differentiation show great variations across cultures, as illustrated in a survey of 110 cultural groups by Barry, Bacon, and Child (1957).

present section? First, though the evidence is weak in some places and inconsistent in others, there does seem to be a link between aspects of child-rearing and individuals' later performance on tests of perceptual field-dependence-independence. Second, these tests can be used meaningfully in non-Western societies, and comparisons made between the scores of different groups in relation to a number of background cultural variables. Third, the closer a group of people - in a cultural sense - to Western modes of social organisation and child training, the more likely it is that its members will perform in a field-independent manner on the tests. But once again, whether these patterns reflect underlying differences in extent of 'psychological differentiation' is open to debate. Prior to an evaluation of this latter claim, the next section of this chapter glances briefly at some possible future applications of the results of field-dependence research.

#### (e) Potential applications

Although it is at present too early to estimate the potential usefulness of work on cognitive styles for the fields of applied psychology, in the case of field-dependence-independence it may be possible to anticipate some of the directions in which work may be channeled. Like the correlates of this cognitive style, these are dispersed across a number of different areas.

Given the strong connection between field-dependence scores and measures of ability - a point to be enlarged upon below - it is not surprising to find a concentration of studies on the implications of levels of field-dependence for education (which is in any case a focal area for the study of cognitive styles as a whole). It is now widely accepted that even at comparable levels of ability, individuals learn different kinds of subject-matter at



different rates and in some cases by markedly dissimilar means. Hence work on field-dependence-independence has import both for individuals' educational capacities and for their preferred subjects and modes of learning.

One initial spin-off in the ability domain, which Kagan and Kogan (1970) have pointed out, is that Witkin and his associates have drawn general attention towards the perhaps under-researched and under-valued area of spatial abilities. This took concrete form in one study by Witkin, Fatter-son, Goodenough, and Birnbaum (1966), on the ability structure of two groups of slightly mentally handicapped boys. These boys, classified as 'retarded' on the basis, presumably, of school performance, were administered a battery of tests of field-dependence and of intelligence; and it was found that, fairly consistently, their performance on field-dependence tests and on intelligence subtests involving 'analytical' capacity was better than their performance on tests loading a dominant verbal-comprehension factor. The authors suggested that '...children who show a deficit in the verbal area, whatever other cognitive strengths they may have, are more likely to be recognised as suffering a deficit than children with other kinds of cognitive deficits who are functioning at the same overall level' (op. cit., P. 312). The bias of the educational system towards verbal-comprehension skills may thus damage children's prospects in two ways: by labelling as handicapped those who perform poorly on verbal tests (but have adequate analytical skills), and by failing to give help to those who, though performing well enough on verbal skills, in fact have deficits in the spatial domain - which may have unfortunate consequences in their later working lives. Educational assessment should, therefore, take fuller cognizance of individual differences in cognitive patterning - a recommendation with many implications for curricula, teaching methods, and even the goals of schooling overall.

But field-dependence-independence research might also prove serviceable in a number of more specific ways in education. These have recently been reported and reviewed by Witkin and his associates (Witkin, 1972; Witkin, Moore, Goodenough, and Cox, 1977). Amongst the findings indicated therein, which will not be considered in detail here, are that (1) whereas field-independent Ss show a preference for, and greater ability in, such subjects as the physical and biological sciences, mathematics, and engineering, field-dependent Ss prefer social sciences and humanities, and activities such as counselling or salesmanship. Even within one discipline - psychology - those favouring clinical psychology are more field-dependent than those drawn to the experimental side of the subject. (2) Field-dependent individuals seem - on the basis of some evidence at least - to take longer than field-independents to decide on their chosen field of study or career, and to more often make 'wrong' choices resulting in a later change of course or direction. (3) While the field-dependent teacher feels most at home with discussion or discovery methods of teaching - which involve interaction with learners - his field-independent colleague prefers lecturing, which is at once more distant and more directive than participatory methods; conversely, field-dependent pupils seem to benefit more from discovery-based modes of instruction. Not surprisingly therefore (4) teachers and students matched in cognitive style describe each other more positively than groups mismatched on cognitive style - which may have implications in turn for the effectiveness of teaching, which must depend at least in part on the atmosphere in which it takes place. Overall, such findings as these open up numerous avenues for the applications of cognitive-style research in education - at the very least for further action-research. Witkin (1972), asserting that cognitive-style research promises 'more comprehensive coverage' of abilities than intelligence testing, even envisages that systematic assessment of cognitive styles may in the future replace intell-



actually-based tests as we currently know them.

An area of particular interest for the application of field-dependence research, given its extension into other cultures, is that of education and training of individuals from third-world countries in the 'scientific' modes of thinking dominant in Western culture. For example, Gruenfeld and MacEachron (1975) have illustrated how performance on field-dependence tests can almost be used as an index of degree of Westernisation. In a study of cognitive style amongst 329 managers and technicians from 22 non-Western countries, field-independence was found to correlate positively ( $p < .001$ ) with a composite index of 'modernisation' or economic development based on a country's per capita GNP and per capita energy consumption. Given that some kinds of training can enhance performance on field-dependence tests (a fact which raises problems for the hypotheses of Witkin et al., and which will be considered more fully in the second half of this chapter), and given the active pursuit, by many non-Western states, of Western forms of education and employment, there may be a future role for work on this cognitive style in assessment and training in the technical field.

In a quite different domain, field-dependence has been found to be a useful predictor of certain kinds of effects and outcomes in the process of psychotherapy. For example, some evidence has suggested that field-dependent Ss are more commonly assigned by therapists to highly structured and supportive forms of therapy, and more commonly dealt with in a directive manner by their therapist (Karp, Kissin, & Hustmyer, 1970; Witkin, Lewis, and Weil, 1968). Field-independents on the other hand were judged more suitable for 'modification' types of therapy, and generally given less direction by therapists. Therapeutic interactions between patients and therapists differing in cognitive style have also followed patterns predicted by Witkin and his associates. While some of these findings require further clarification

and support, the possibility certainly exists that use might be made of them in the allocation of individuals differing in cognitive styles to different forms of psychotherapy.

Taken together, the foregoing results offer the prospect that research on the field-dependence-independence cognitive style will have practical applications in the fields of education, occupational selection, counselling, and psychotherapy. All of this is of course in addition to its theoretical interest in psychology, in the fields of cognition, perception, personality, and social behaviour. The next section returns to these issues and to some recent formulations proposed by Witkin and his group.

#### (f) Recent revisions

In order to keep track of the burgeoning literature on field-dependence-independence, and to help others do the same, Witkin and his associates have (as mentioned above) published a series of bibliographies itemising research studies on this cognitive style.<sup>1</sup> More recently, these authors have themselves been involved in an effort to consolidate the findings so far, and have also re-cast and extended some of the notions underlying their work (Goodenough, 1976, 1978; Goodenough & Witkin, 1977; Karp, 1977; Witkin & Goodenough, 1977a, b; Witkin, Goodenough, & Oltman, 1977). The present section looks briefly at the new directions taken in this work.

The principal aims of these papers, apart from that of reviewing past research, have been first, to embrace some new kinds of evidence bearing on field-dependence-independence, particularly from neurophysiology; and second, partly in response to adverse commentaries, to offer a re-concept-

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<sup>1</sup> See the following: Witkin, Oltman, Cox, Ehrlichman, Hamm, and Ringler, 1973; Witkin, Cox, Friedman, Hrishikeshan, and Siegel, 1974; Witkin, Cox, and Friedman, 1976; Cox and Witkin, 1978.



ualisation of the nature of the field-dependence-independence cognitive style.

With regard to the first of these, Witkin, Goodenough, and Oltman (1977) have sought to extend the concept of 'differentiation' as it has been understood in their previous work, to the process of cerebral lateralisation - in particular, to the degree to which the cerebral hemispheres become specialised for the performance of different functions. They suggest that '...field-independent people, compared to field-dependent ones, will give evidence of greater lateral specialisation of the hemispheres; this will show itself in greater specialisation of the left hemisphere for verbal and motor control processing and greater specialisation of the right hemisphere for configurational-gestalt processing' (op. cit., P.20). Evidence lending tentative support to this suggestion is outlined; much of it is, however, difficult to evaluate given the complexities of existing evidence on cerebral lateralisation more generally. For example the finding that, when speaking, field-independent Ss gesture primarily with their right hands, whereas field-dependent Ss are inclined to use both hands, can be interpreted in a number of ways. For Witkin, Goodenough, and Oltman this is a sign of greater hemispheric specialisation - greater differentiation - amongst the field-independent Ss. It could equally, however, be a sign of greater differentiation by the field-dependent Ss amongst different things they are saying.

The second aim of these recent writings by the Witkin group has been to re-define the meaning of the field-dependence-independence dimension. This seems to have been undertaken for two main reasons; first, to accommodate evidence such as that presented in section (c) above on the 'social' orientation of field-dependent individuals; and second, simultaneously to counter the criticism that the field-dependence-independence distinction is

value-laden. As has been pointed out by a number of authors, the pattern of findings which has emerged from research almost always seems to endow field-independent Ss with superior attributes. Indeed, given the substantial benefits that accrue to the field-independent person, many of them qualities highly valued in our culture, at least for males (intelligence, perceptual skill, independence, aloofness, flexibility) - who would want to be field-dependent? The accumulating evidence on differences between field-dependents and independents in level of interest in the human or non-human environment has afforded the Witkin group a way out of this problem.

Thus Witkin and Goodenough (1977a) have remodelled the field-dependence-independence dimension such that it now refers to '...tendencies to function with greater or less autonomy of external referents, manifested in both the cognitive and social domains' (op. cit., P.1). Field-independent persons exhibit greater all-round levels of autonomy, and so develop greater capacities in the 'cognitive restructuring' domain. Field-dependent persons have less autonomy and therefore must rely more on others; however this leads to their developing greater competence in the interpersonal domain. 'The interpersonal competencies in getting along with others found among field-dependent people, we are suggesting, are the sequelae of the tendency to rely on external referents' (ibid., P.26).

In this new model, therefore, field-dependence-independence (now designated in terms of 'degree of autonomy of external referents') becomes a super-ordinate construct; 'cognitive restructuring skill' and 'interpersonal competence' become secondary constructs, subsidiary to it. Field-independence is no longer construed as capacity for 'disembedding'; the latter becomes merely one specific cognitive skill with which field-independence is associated. Further, the 'global-articulated' dimension of cognitive functioning is broken down into two components: the tendency to rely on



vestibular or visual cues on the one hand, and relative skill in cognitive restructuring on the other. Accurate performance on a test like the RFT, for example, could be a product of reliance on vestibular feedback rather than of the possession of a particular cognitive ability. Witkin and Goodenough adduce a small quantity of evidence giving support to this suggestion. The net effect of all of these conceptual changes is to re-define the Rod-and-frame as a 'style' rather than an 'ability' test. In this manner the whole field-dependence-independence dimension, while still recognised as having strong connections with some kinds of cognitive ability, is effectively reconstructed as a true cognitive 'style'.<sup>1</sup>

Lest it be thought that these amendments involve any departure from the concept of differentiation, it should be emphasised that this is certainly not the case. The 'differentiation hypothesis' as formulated by Witkin and his colleagues at the outset of their work remains intact as a cornerstone of this approach to cognitive style. Witkin, Goodenough, and Oltman (1977) in a recent assessment of the status of the concept have re-affirmed their view that '...an individual's tendency to function in more differentiated or less differentiated fashion is likely to be evident throughout his psychological and neurophysiological activities...modes of functioning and behaviours identified as manifestations of greater differentiation in diverse domains are likely to cluster together; and so with modes of functioning and behaviours that are indicators of less differentiation' (op. cit., P.23). A model of the hierarchic relations between each of the concepts used by these authors appears roughly as follows: 'differentiation' is placed at the apex, with 'self-nonsel self segregation', 'segregation of psy-

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1 These ideas are also supplemented by another, that of 'mobility-fixity'. This suggests that while some individuals appear 'fixed' in terms of a field-dependent or field-independent cognitive style, others '...have access to the characteristics associated with both styles' (Witkin & Goodenough, 1977a, P.34). The implications of this for theory are not, however, made clear.

chological functions', and 'segregation of neurophysiological functions' on the next level below. In turn, beneath the concept 'self-nonsel self segregation' - which is equivalent to field-dependence-independence - are the constructs 'cognitive restructuring skills' and 'interpersonal competence'. Beneath the concept 'neurophysiological segregation' is the construct 'lateralisation of cerebral functions'. Thus measures taken from perception and personality, neurophysiology and social behaviour should all show patterns which are, ultimately, consequences of varying levels of differentiation. Although it is allowed that the various components of differentiation are 'multi-determined' and that causal pathways criss-cross each other in a complex way (e.g., socialisation practices may influence cerebral lateralisation), all of these elements are expected to knit together in a way predicted by differentiation theory. That is, individuals will show consistent levels of differentiation throughout all of the above-mentioned areas of psychological and neurological activity.

A number of points may be made concerning the refinements that have been outlined. First, the new model certainly accords much better than the old with the notion of field-dependence-independence as a cognitive 'style'. But second, the attribution to field-dependent Ss of superior skills in the interpersonal domain appears slightly like giving compensation to the deprived; and, as we shall see in chapter 8, is not necessarily supported by the available evidence. Third, the evidence in general which exists at present points to little that would enable us to choose between the new formulations and the old; indeed there seems to be no evidence giving unequivocal support either way.

Finally, in any case, the re-definition of concepts associated with the field-dependence cognitive style still rests solidly on the 'differentiation hypothesis'. It is with this link that the present thesis takes issue, and it is to the reasons for these disagreements, which were summarised briefly



in chapter 1, that the next section directs attention.

## 2. The problems

There can be no doubt that Witkin and his associates, together with those others whose work they have inspired, have erected an impressive edifice of theory and research on the base of field-dependence-independence and the 'differentiation hypothesis'. This work has been outstanding in its sheer fruitfulness and breadth of compass. It has generated specific hypotheses in relation to an enormous width of subject-matter, has had many of its predictions borne out, and has stimulated a great deal of discussion. However, this work continues to present a number of problems which, its considerable empirical success notwithstanding, seem to point to fundamental errors in the conceptions underlying it. In the first chapter of this thesis, some reservations were expressed about the notion of individual consistency in level of differentiation (Pp. 15-17), and a number of difficulties were outlined concerning the relationship between field-dependence and the concept of differentiation as enunciated in the work of Lewin and Werner. The aim of the second section of this chapter is to set out these problems in more detail, and to formulate some objections which the remainder of the thesis seeks to explore. Briefly, the problems to be described derive from (a) the methodology of assessing field-dependence, (b) effects of learning and training on field-dependence test scores, (c) the permeation of ability factors through field-dependence test performance, and (d) limitations on the range of applicability of the 'differentiation' dimension.

### (a) Assessment of field-dependence-independence

If the results of field-dependence research are thought to be generally acc-

acceptable, then, as Kagan and Kogan (1970) point out, to describe an individual as 'field-dependent' or 'field-independent' is to supply a very large amount of information about him or her. It is all the more important then that the methods used to assess someone's standing on the field-dependence dimension should be as sound and accurate as possible.

Suggestions that the standard field-dependence measures are neither as sound nor as accurate as initially supposed have come from a number of studies. Although in some cases, the reported findings give general support to the claims of Witkin et al. (1962) regarding these measures (e.g. Adeval & McGough, 1968; Irving & Henderson, 1971; Vaught, 1971), in a great many cases factors other than field approach have been shown to influence performance on field-dependence tests. Even within data initially cited by Witkin and his associates (1962), there are considerable variations in inter-correlations between tests of the field-dependence cluster. Mischel (1968) has drawn attention to the range of correlations between the EFT and various versions of the Tilting-room-tilting-chair Test which use different starting positions; these range for example in Linton's (1955) study from  $-.07$  to  $+.39$ . The measures, suggests Mischel, '...are far from equivalent. Even slight angle changes radically reduced the correlations' (1968, P.18). The influence of factors such as this on scores on the RFT have been examined by Lester (1968), who drew the conclusion that considerable improvements were required in the test before reliable statements could be made concerning perception-personality relationships. The traditional or stationary form of the RFT was shown by Lester to involve problems in administration, arising from (a) the lack of control of head position; (b) errors due to 'starting position' effects; (c) the need for control or base-line readings, which many researchers fail to take; and (d) the effects of instructions, particularly those ('demand characteristics') implicit in the



presentation of test materials. Such problems may be at the root of the doubts concerning the stability of RFT performance expressed by a number of authors (Cohen & Tepas, 1958; Goldstein & Chotlos, 1966; Oltman, 1964; Jacobsen, 1966; Wolf, 1965).

Associated with such problems are a number of others concerning the frame of mind with which Ss approach the test, and their basic grasp of the test's requirements. For example Lester (1971) administered the Oltman portable RFT to a group of 50 Ss and subsequently gave them a short questionnaire about the test. Uncertainty about the test's nature and purpose was commensurate with high error scores. The more elaborate S's concept of the test's purpose, the higher his error score tended to be. Such a result of course looms ominously over the use of this test in cross-cultural research, for which the test was partly designed. Even amongst Western, educated, samples speaking the same language as the test administrator, the word 'vertical' presented semantic difficulties.

It is no surprise therefore to find that an individual's manner of approach to the test - his 'cognitive set' - can have a considerable effect upon his final error scores. Silverman and King (1970) found a relationship between RFT performance and 'extensiveness of scanning' - as measured by a size-estimation task - amongst groups of normals and schizophrenics. Their results led them to suggest that a low-error (field-independent) performance on the RFT could be a product of 'minimal scanning'; deriving, in other words, not from inhibited attention to the embedding stimulus field, but simply from limited perceptual sampling of it. This these authors called 'pseudo perceptual differentiation'.

More recently Reinking (1977) demonstrated that a 'field-independent' RFT performance could be obtained by Ss given instructions designed to produce a specific 'cognitive set'. Working with alcoholics - a group usually con-

sidered to be much more field-dependent than the general population (Witkin, 1965) - Reinking hypothesised that first, special instructions would differentially affect RFT performance, and that second, instructions orienting Ss towards 'internal' stimuli (from within the body) would produce more field-independent performance than instructions directing their attention towards 'external' stimuli (aspects of the physical environment). Both of these hypotheses were supported ( $p < .01$ ) by the pattern of scores which emerged. Reinking, suggesting that his results leave Witkin's theory 'embroiled in conflict' concluded that RFT performance was a product of both field-dependence and a number of situational factors; and that, even when the mean scores of two groups were equivalent, it was impossible to conclude that the same factors were at work in both.

In a similar manner, studies have also shown that RFT performance can be modified by reinforcement (McAllister, 1970; Small, 1973). Small (1973) pretested a group of 30 college students on the RFT and then assigned them to one of three conditions: a group given positive reinforcements (their performance described as 'very good') after each successive trial on which they improved; a group given similar reinforcements after each trial on which their error score increased; and a control group given no additional feedback. The performance of the three groups, which had shown no differences on the pretest trials, showed predicted changes during the second set of trials. While performance for the first group significantly improved, that for the second group significantly worsened; scores for the control group showed little change. These differences were maintained on a follow-up testing given one month later. Such results open up the possibility that '...these aspects of individual functioning are more a reflection of similar kinds of life experiences and histories than of internal factors comprising personality structure' (McAllister, 1970, P.129).



A number of other factors have been shown to have a substantial impact on field-dependence test performance. Vaught (1965, 1969) has suggested on the basis of a study relating sex-role identification and ego-strength to RFT performance, that the latter is influenced by both. A field-independent score was obtained by Ss with a more masculine role identity, which of course supports the suggestions of Witkin et al.; but also by Ss with high ego-strength, regardless of biological sex or sex-role identity. Morf, Kavanaugh, and McConville (1971) investigated the relationship between scores on two blocks of RFT trials and scores on the Jackson Personality Inventory. Their findings were complex, suggesting that RFT performance amongst men and women has different determinants; that different factors may influence separate blocks of trials; and that, amongst men at least, anxiety disrupts performance.<sup>1</sup> Anxiety has also been shown to affect scores on the EFT, but typically in a more positive direction (Ruebush, 1960); however this result was mediated by the effects of intelligence. While high-anxiety Ss performed better than low-anxiety Ss amongst groups of average and below-average IQ, no such differences were found amongst Ss of above-average IQ.<sup>2</sup>

The majority of the findings rehearsed above concern only one of the field-dependence tests, the RFT; performance on others, and particularly on the EFT, has not been subject to the same searching scrutiny. A great deal of uncertainty seems to exist over what exactly is measured by the RFT. We are left with the conundrum of how a test on which performance is susceptible to such subject variables as scanning strategy, anxiety, and ego-strength; and to such situational variables as starting position, 'set' instructions, and

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1 Such findings run counter to those of Oltman (1964), who found that arousal produced by white noise led to more accurate performance on RFT.

2 The finding that anxiety can facilitate performance on such a test as the EFT is of course consistent with the hypotheses of Easterbrook (1959) on the effects of emotion on 'cue utilisation'. Callaway (1959) found that increased arousal due to drugs improved performance in 'dis-embedding'.

on-the-spot reinforcements, can possibly be a measure of some stable, fundamental, pervasive feature of an individual's psychological functioning. More troubling from the viewpoint of assessing field-dependence-independence is the fact that, contrary to the recommendations of the Witkin group, many researchers have used only the RFT as a criterion measure in their work. On the basis of the foregoing evidence this might call into question many of the results so obtained.<sup>1</sup>

(b) Effects of learning and training

An equally disturbing set of findings concerning tests of the field-dependence cognitive style, pertains to the effects of various kinds of learning and training on performance in these tests. If the level of field-dependence or independence exhibited by an individual represents a consistent feature of his perceptual functioning - and reflects an underlying structural characteristic of his personality as a whole - then we would hardly expect to find large changes in his level of performance over time due to the effects of exposure, practice, or coaching. Yet a number of studies have found just these effects.

The issue at stake here, of course, is that of relative stability of per-

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1 Similar doubts might be expressed concerning the validity of the interview and questionnaire methods used in another area of cognitive-style research, that on the origins of individual differences in field-dependence outlined above (Pp. 41-43). Interviews with mothers appear to have only modest reliability and validity as a source of information on child-rearing (Yarrow, Campbell, and Burton, 1964). Questionnaires seem equally untrustworthy. Zunich (1962) explored the validity of the widely used Parent Attitude Research Instrument (PARI). Of 272 comparisons made by means of correlation coefficients, between scores in 17 maternal behaviour categories and 16 attitude subscales, only 12 proved statistically significant - no more than might occur by chance. Nevertheless this instrument has provided significant findings in support of the Witkin et al. hypotheses on the effects of socialisation practices on the development of field-independence. A questionnaire of this sort, based on the work of Seder (1957), was used in part of the research described in chapter 4.



formance. Witkin, Goodenough, and Karp (1967) themselves point out (p. 294) that learning effects are to be observed on the EFT, and obviously are fully aware of the developmental trend from relatively lower to relatively higher 'field-independence' scores. The implications of these findings have not, however, been fully appreciated: they suggest that, above all else, the process of finding embedded figures is a skill that can be improved with practice.

The original experiments with embedded figures were carried out by Gottschaldt (1926; see Vernon, 1970), his primary purpose being to provide empirical support for the Gestalt theory of perception. Essentially this meant demonstrating that past experience was of little importance in the processes of finding, and learning to find, hidden figures. Gottschaldt's method for this was as follows. He presented S with simple figures (a-figures) projected on a screen for one second and repeated with varying frequency. Following exposure of these patterns, more complex patterns (b-patterns) containing a-figures were shown for two seconds each. S was asked to describe the b-patterns, mentioning anything noticeable about them. It was found that repeated presentations of the a-figures, even when carried to a total of 520 exposures, made no significant differences to an S's comments on the b-patterns: he still did not report perception of a-figures in them. This Gottschaldt took to show that frequent exposure of parts of a whole had little effect on perception of the whole itself. However, as Gibson (1969) has pointed out, this experiment does not produce any result that could either confirm or refute a hypothesis: S's spontaneous responses do not tell us whether or not he saw the simple figures in the complex ones. Hence Gottschaldt's experiment does not really support his claim. It may be that the use of hidden figures tests to assess stable features of personality is based on a mis-apprehension of these results; for a number of stud-

ies have demonstrated precisely the effect which Gottschaldt failed to obtain.

Djang (1937), in criticising Gottschaldt's method, decided to use figures in which many modes of organisation were more or less equally probable - which lacked the 'pragnanz' of Gottschaldt's shapes. Thus, his materials consisted of irregular dot patterns. The experiment he conducted showed that the hidden figures were seen as separate units in their respective complexes 20 times more often by an experimental group (previously exposed to the figures) than by a control group; and 77 times more often on the first trial. Experience certainly does make a difference to the way a form is organised, and to the process of finding a hidden form within it.

This does not in itself demonstrate that the skill of finding embedded figures improves with practice - merely that effects of practice or experience are present when the same simple figures are presented repeatedly. In designing the present form of the EFT, Witkin (1950) was fully aware of this kind of effect. Djang had noted that '...discovery of a simple figure in one complex setting seems to make more probable the discovery of the same figure in another setting' (1937, P.59). This is precisely the task to be done in parts of the EFT; and Witkin (1950) attempted to reduce the role of such practice effects by using fewer complex figures to correspond with each simple one.

To demonstrate that an individual's capacity for detecting embedded figures increases with practice, it is necessary to show that transfer effects can occur. Hanawalt (1942) found that not only was repetition of the same simple designs effective in aiding their detection, but also that there was positive transfer to new simple and complex designs. Thus Ss are not simply learning distinctive features of the same designs (as Gibson (1969) claims); they are developing a skill in dealing with the situation - overcoming the



effects of the embedding context. Individuals learn to attend to the features of any stimulus which will help them to perform a task. This bears out a suggestion made by Hanawalt (1942) that '...the Ss become adept in disregarding the figure in its entirety and analyse it in particular places' (op. cit., P.147). When Hanawalt retested one S after two three-year intervals of no practice, he found that the advantage gained in his experimental training sessions still persisted.

Other studies with various kinds of material (Brady, 1933; Frances, 1963; Henle, 1942; Munsinger and Gummerman, 1967) have found practice effects similar to those encountered by Djang (1937). In addition, Schwartz (quoted in Zusne, 1970) found that preliminary training enhanced the embedded-figures performance of groups of Ss, and that these effects were still detectable 48 hours later.

Possibly the clearest demonstration of the process of skill acquisition in locating embedded figures has come from the work of Kolers and Zink (quoted in Gibson, 1969). These authors used a forced-choice embedded figures task, based on patterns generated by a table of random numbers (a method employed by Attneave and Arnoult, 1956). Each test item consisted of four simple figures and three complex figures, one (and only one) of the former being included in all of the latter. The test items were presented to Ss tachistoscopically, on a card with the complex forms on the top row and the simple forms on the bottom row. S's task was simply to choose which of the four simple figures he thought was present in all three complex ones.

Each card was presented 25 times or more and S was asked to call out his choice figure each time; his choice was not corrected. Successful detection was said to have occurred after ten consecutive correct responses had been made beyond the 15th trial. S's score was the number of his first correct response in such a run of ten.

The outcome of this experiment - which could not be attributed to Ss' knowledge of their own performance - clearly showed the effects of two kinds of exposure learning. First, the probability of a correct response increased as trials on a given item progressed: this is a practice effect of the kind noted by Djang (1937) (and against which precautions were taken by Witkin (1950)). Second, there was transfer of learning from one item to another: correct detections were made sooner as the experiment continued - Ss' speed in 'dis-embedding' increased. Figure 1 illustrates these two kinds of effects over the six successive periods of the experiment (16 problems being given per period).<sup>1</sup>

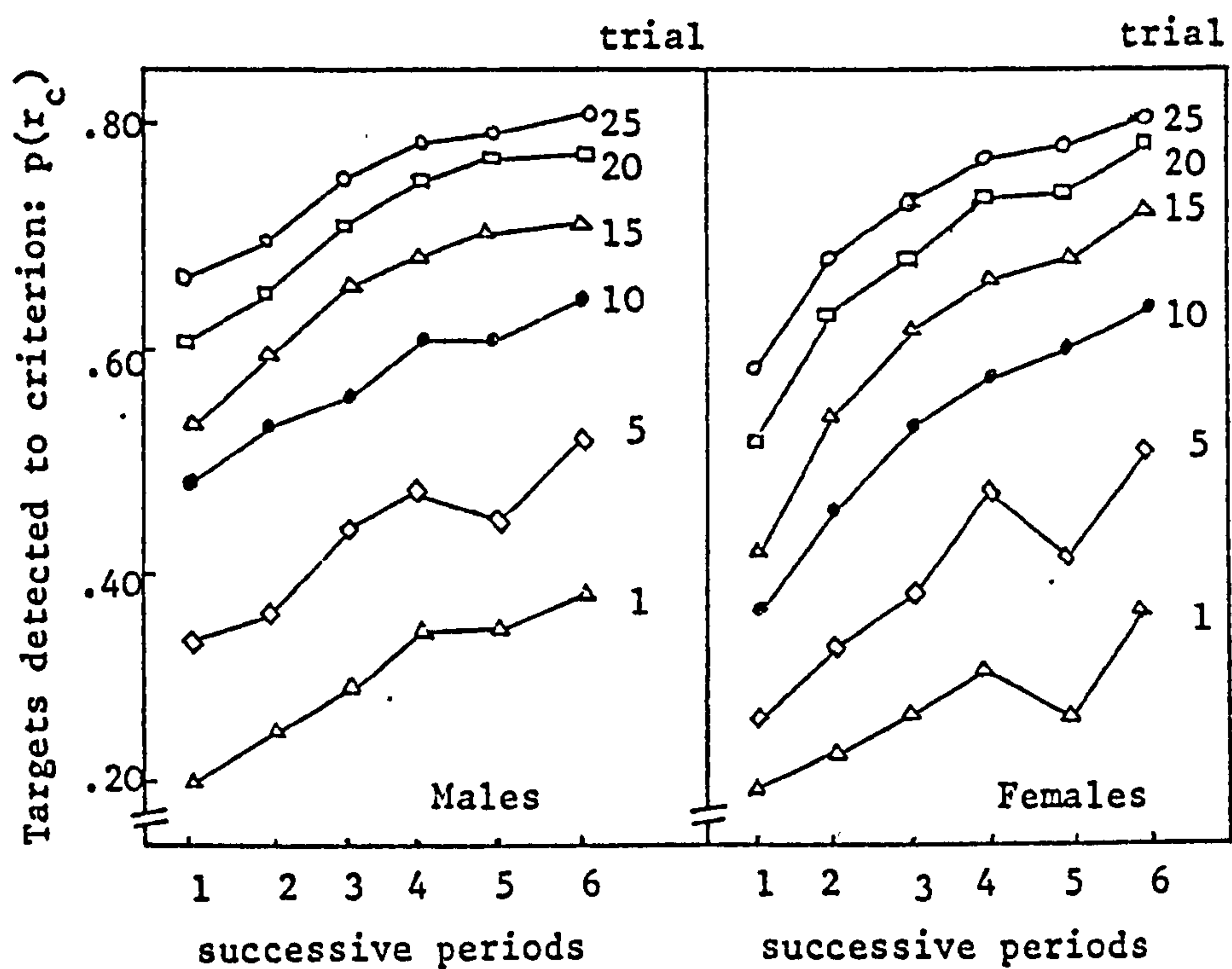


Figure 1: Exposure Learning and finding Embedded Figures.

As this figure shows, not only is there a rise in the probability of correct detections over successive trials (specific practice effect), but also, the

<sup>1</sup> Adapted from Gibson, 1969, P.173. The ordinate shows practice effects over trials on a given problem; the abscissa shows improvement effects over problems.



likelihood of correct detection on any given trial increases over successive periods of the experiment (transfer of practice).

These results indicate that practice effects are not confined to 'familiarity' effects alone: a skill is being acquired which enables S to improve his performance on the task. Both Hanawalt and Kolers and Zink indicated that Ss adopted, by degrees, a more analytical approach to the problem - involving active search, a focus on distinctive features, and the use of strategies of detection. Such results indicate that one of two alternatives must be the case. Either the performance and skills involved in tasks of the kind just described are substantially different from those employed by Witkin and his associates to measure field-dependence; or field-dependence as measured by the EFT is much less stable than these authors contend, and hardly a valid indicator of an organism's 'degree of differentiation'.

However another study using the EFT itself, given to groups of Ss held to differ in their extent of 'psychological differentiation', makes the second of these alternatives more likely. Goldstein and Chance (1965) found learning effects on the EFT and other embedded figures which suggest that the sex differences found in many other studies may be in part a product of the test situation. As these authors point out, Witkin's (1950) own EFT score data show clear within-session reductions in discovery-time scores, for both males and females - yielding significant differences between the means of the first 12 and last 12 items, which are not discussed by Witkin. In an investigation of these practice effects, Goldstein and Chance (1965) administered a series of 68 embedded figures (including the 24 of the EFT) to 13 male and 13 female Ss. Two main results emerged: first, between the first and last blocks of trials, mean discovery times for women decreased by 74%, and for men decreased by 65%, a substantial learning effect. Second, the sex-related difference, significant in block 1 (the first 10 trials,

$p < .05$ ), failed to be statistically significant in block 8 (the last 10 trials). Figure 2 illustrates the authors' conclusion that '...discovery times...are inversely related to the number of EFT items' (Goldstein and Chance, 1965, P.362).<sup>1</sup>

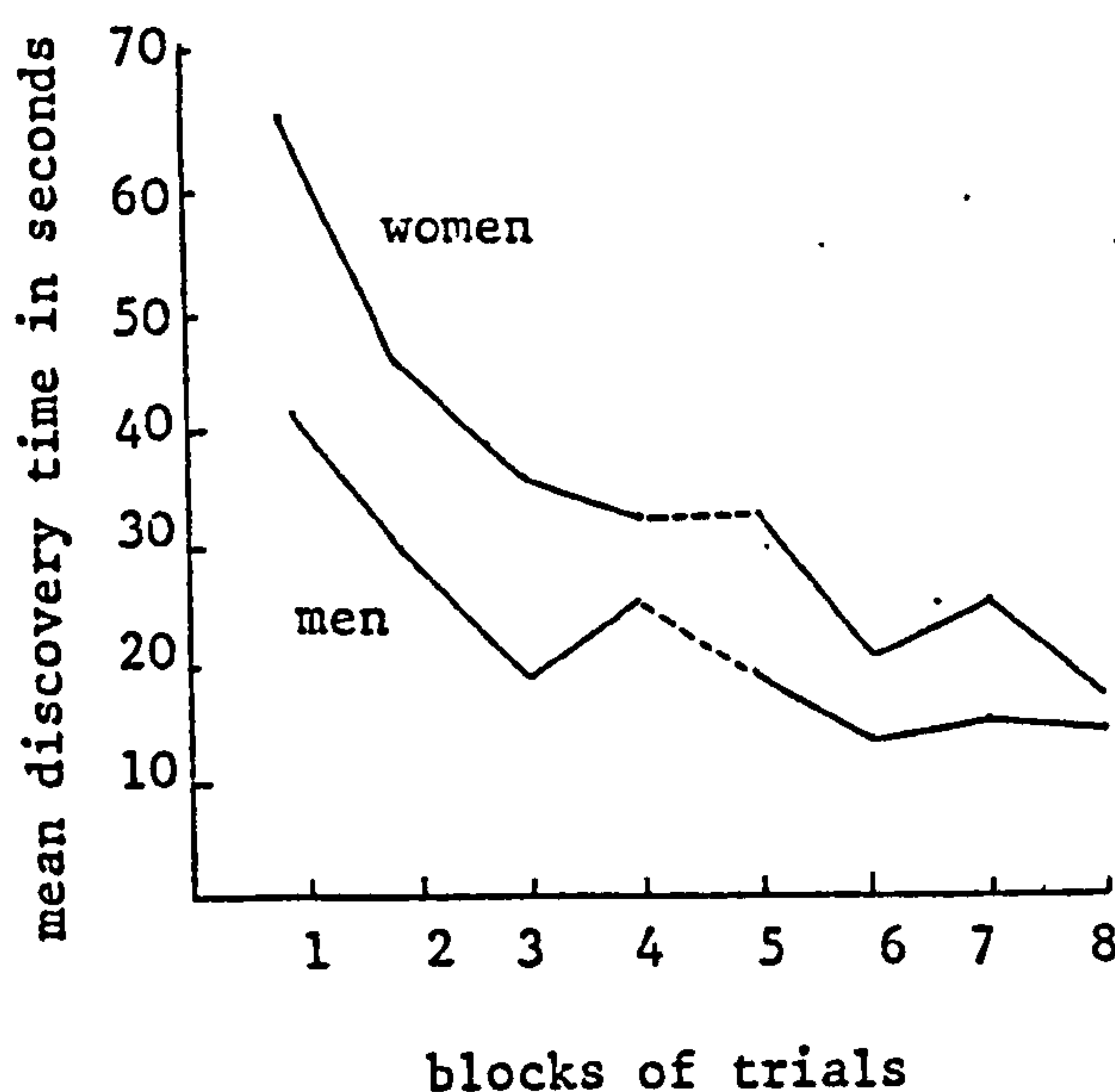


Figure 2: Sex-related differences on  
Embedded Figures over time.  
(From Goldstein and Chance, 1965).

Results such as these create a dilemma for the theorising of Witkin and his associates. Witkin's theory '...does not explain why practice in taking his test or similar tests reduces sex differences to non-significance' (Wolf, 1971, P.85). Sex differences are predicted by the 'differentiation' and 'socialisation' hypotheses; have been frequently found in research; yet on closer examination appear to be only superficial and ephemeral, vanishing completely if the test situation is extended. These findings suggest that, rather than being an index of 'psychological differentiation', EFT perform-

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1 A result comparable to this can be seen in the data of Kolers and Zink, set out in Figure 1 above. In period 1 of their experiment, the initial probabilities of correct detection are generally lower for females than for males; by contrast, in period 6 these differences are negligible.



ance is at least in part a product of peripheral skills or initial response tendencies.

Significant effects of practice - for both sexes - have also been found on the RFT, for example by Kato (1965) who developed a portable RFT for use in Japan, and by Sherman (1974), but not by Vaught (1971) with female Ss and a female E.

The effects of practice on field-dependence test performance documented in the preceding paragraphs pose problems for the assessment of individuals in relation to this cognitive style. It is difficult, when administering these tests, to take account of Ss' past experience and of the amount of skill they may have had the opportunity to acquire on tasks akin to the RFT and EFT. Though obviously both these tests are quite removed from everyday life, experiences resembling them may influence Ss' performance; the conclusion that test scores in some way measure underlying degrees of 'differentiation' seems unwarranted. The findings of a number of studies imply that various kinds of prior experience and other background variables may differentially affect scores on field-dependence tests.

For example, Gill, Herdtner, and Lough (1968) examined the effects of instruction in body-orientation on performance on the RFT and on the Frostig Developmental Test of Visual Perception amongst groups of 4-year-old nursery school children. A comparison was made between two groups: an experimental group, who spent 15 - 20 minutes per day in the gym being given instructions in body-balance and space-orientation; and a control group, who spent the same time in the gym but were given no specific exercises. The experimental group performed significantly better than the control group on both the RFT and on the 'Figure-Ground' subtest of the Frostig scales. Similar effects, though falling just short of significance, were found between experimental and control groups in a study by Leithwood and Fowler using an early child-

hood version of the EFT (Leithwood & Fowler, 1971). Strangely enough this effect appeared in groups given gymnastic training and also in groups given musical training.

The cumulative effects of such experiences may be measurable in later life. Amongst adult Ss, those whose overall agility and motor co-ordination are above average also prove to be more field-independent on the EFT. Meek and Skubic (1971) compared the EFT performance of 30 female Ss rated by instructors as 'highly skilled' in a number of sports, with that of 30 Ss rated as 'poorly skilled'. The former were significantly more field-independent. The skills on which these Ss were rated were not those which would be expected to correlate with 'psychological differentiation'; they were however those which we would assume to contribute to skilled performance on a visual-motor task like the EFT.

The finding that a particular S (or group of Ss) is field-independent, then, may be a consequence of specialised skills possessed by that S, or of specific experiences in his life. It may not be permissible to draw the conclusion that he is more 'differentiated' than a field-dependent S. The results of Gill, Herdtner, and Lough (1968) and of Leithwood and Fowler (1971), showing an effect of gymnastic training on EFT performance and on figure-ground discrimination, are especially difficult to reconcile with the 'differentiation hypothesis'. While it is possible that the training may have influenced cognitive skills through some global effect on level of 'differentiation', the latter concept would have questionable value were we to assume that brief training exercises, of whatever kind, produced radical changes in personality structure. As Goodenough and Witkin (1977) have themselves granted, '...far-reaching implications for the theory of the development of differentiation, as well as for educational practice, would follow from a conclusion that athletic training transfers to a variety of



restructuring skills' (op. cit., P.25).

The overall significance of the findings surveyed in this section has never been properly recognised by Witkin and his associates. In general they seem to take the view that '...while these various training procedures affect test performance itself, it is doubtful that they alter the underlying perceptual functions of concern to us' (Goodenough & Witkin, 1977, P.21). One study indeed supports this claim; Elliott and McMichael (1963), who found RFT performance to improve significantly after lectures and feedback training, later found that this effect was lost after an interval of 4 to 7 weeks. However, many pieces of the evidence described above have never been discussed by the Witkin group. The bulk of this evidence suggests that performance on tests of the field-dependence battery is as likely to be a function of specific perceptual skills as of personality-wide 'levels of differentiation'. The roles of previous visual and motor experience, practice, and conditions of test administration would need to be more fully explored before we could conclude that some structural psychological variable is assessed by these tests. The possibility does nevertheless exist that the tests have ties with an important cognitive variable: that of general intelligence. Evidence pertaining to this suggestion is considered in the following section.

### (c) The role of intelligence

The study of field-dependence-independence began in the field of visual perception; expanded, through a number of different channels, into the domain of personality; and has more recently embraced a wide range of findings on miscellaneous aspects of social behaviour. Dogging its path in this steady progression has been the uncomfortable submission, made by a number of authors, that the standard tests of this cognitive style measure little

that can be distinguished from general intelligence. Although field-dependence-independence is conceived of first and foremost as a 'cognitive style', embodying aspects of both cognition and personality, its strongest associations have almost always proven to be with certain measures of ability.

Goodenough and Karp (1961), recognising that '...the evidence now available suggests that field dependent subjects tend to perform less effectively on standard tests of intelligence than field independent subjects' (op. cit., P.241; see Pp.25-26 above), set out to find the specific nature of the relationship involved. The general intelligence subtests most closely linked to field-dependence were those of Picture Completion, Block Designs, and Object Assembly. The source of this common variance, claim Witkin and his associates, lies in the need for 'capacity to overcome embeddedness' both in these subtests and in those of the field-dependence battery. This skill has been entitled, by other authors and at other points, 'flexibility of closure', 'convergent production of figural transformations', 'spatial visualisation', and 'cognitive restructuring'; and is suggested by the Witkin group to be one of the components of spatial ability (or 'k') considered as a generic group of skills. Thus field-dependence is not necessarily expected to correlate with other tests of spatial skills which do not require dis-embedding or restructuring, such as those of pictorial depth perception, illusion susceptibility, mazes, reproducing designs, or matrices (Witkin and Berry, 1975).<sup>1</sup>

The fact is, however, that field-dependence scores all too often correlate significantly with a wide variety of 'spatial' tests, not only those alleged to involve 'dis-embedding'. Associations have been found between

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<sup>1</sup> More recently it has been suggested that field-dependence is also linked to dis-embedding in the verbal domain (Witkin & Goodenough, 1977a) (see chapter 8, Pp.230-234).



field-dependence-independence and: experience of discomfort in a driving simulator (Barrett & Thornton, 1968); performance in spatial orientation and space positioning tests (Bergman & Engelbrektson, 1973); visual discrimination skill (Berry, 1966); scores on Morrisby Shapes (Berry, 1966); effectiveness of learning three-dimensional pictorial perception (Dawson, 1967a); scores on mazes and picture recognition tests (Vernon, 1969), and on figure copying and formboard tasks (Vernon, 1972). In addition, field-independent individuals are frequently found amongst engineers (Barrett & Thornton, 1967) and architects (Peterson & Sweitzer, 1973), both of which occupations presumably involve spatial abilities of several different kinds. MacFarlane-Smith (1964), reviewing studies of spatial ability, saw a strong link between field-dependence-independence and the 'k' factor as understood by British psychologists; tallying with the suggestion of Sherman (1967) that differences between the sexes in field-dependence scores are a product of differences in spatial ability.

Links between field-independence and ability are not, however, confined to the spatial-perceptual domain. 'A serious weakness of Witkin's findings' writes Vernon, 'is that many of them could have derived from the g rather than the k component of his tests' (1969, P.61). For example, in Vernon's own cross-cultural research, using the EFT and Kohs Block Designs, a substantial 'g' and only a lesser 'k' factor emerged on these tests. Among his Eskimo samples, for example, respective loadings of 'g' and 'k' on the Gottschaldt EFT were .72 and .36; on Kohs blocks, .68 and .53. Similarly, in a study specifically designed to assess the 'unique contributions' of field-dependence-independence as a variable, Vernon (1972) obtained results in the same vein. Factor loadings of 'g' and 'S' on the three tests, Kohs blocks, EFT, and RFT, were respectively .52 and .33; .61 and .55; and .37 and .38. Correlations between the EFT and a verbal battery were almost as

high as those between the EFT and the RFT (.38 and .40). In a study by Siann (1972), the correlation between the EFT and a verbal test was significantly higher than that between the EFT and the RFT. Again, Dubois and Cohen (1970) found correlations between the EFT and a number of verbal aptitude and achievement tests to be as high as .56. Other indications of close relationships between field-dependence-independence and general intelligence include: significant correlations of up to .70 between matrices and EFT scores (Berry, 1966); a significant relation between RFT scores and those on a test of reading ability (Gill, Herdtner, and Lough, 1968); similarly significant relationships between EFT scores and performance on the Otis Mental Abilities Test (Spotts & Mackler, 1967); and the findings of greater language abilities and of higher vocabulary scores amongst field-independent as compared with field-dependent Ss (DeFazio, 1973; Wachtel, 1968).

Thus, although in the research conducted by Witkin and his associates only 'performance' tests are related to field-dependence-independence, research carried out by other authors connects the dimension with a more general intellectual capacity. 'The embarrassing truth of the matter is that various investigators have found significant relations between the Witkin indexes, on the one hand, and measures of verbal, mathematical, and spatial skills, on the other' (Kogan, 1973, P.166). The most worrying feature of this from the viewpoint of research is that many workers do not match the intelligence scores of groups they are comparing on field-dependence or some alleged correlate of it. The possibility that any differences found are due to intelligence, cannot then be excluded. In the work of Berry (1966) for example, the finding of differences between the Eskimo and Temne in EFT scores (cf. P.46 above) could well be a product of sample differences in intelligence; matrices distributions amongst his Temne and Eskimo groups show virtually no overlap (Berry, 1966, P.224).

Consideration of the above evidence must open up the question of whether or



not field-dependence-independence is a true cognitive 'style'. At a minimum, scores on the dimension correlate strongly with ability on spatial 'dis-embedding' tasks. More commonly however, the field-independent individual will show superior ability across a wide range of 'spatial' tests. And with corresponding frequency, he or she will tend to exhibit greater intellectual capacities all round. The possibility arises that the dimension reflects little more than the whole gamut of abilities normally subsumed under the concept of 'general intelligence'.

One reason for this may be in the basic logic behind the assessment of EFT or RFT scores. As Wachtel (1972) has pointed out, '...the instruments generally used to assess field-dependence do not really offer S a choice to see how he prefers to deal with a situation. Rather, they require the individual to perform in a particular way and assess how able he is to meet the task requirements' (op. cit., Pp.180-181; emphasis in original).<sup>1</sup> The assessment of some kind of ability therefore seems to be an ineluctable component of the field-dependence test situation.<sup>2,3</sup> Scores so derived will reveal personality attributes no more than the latter influence any 'test' situation. To conclude that EFT or RFT performance discloses underlying structures of personality may be to fall into error right from the outset.

- 1 While this manner of assessment is incompatible with the notion of 'style', it is not of course at odds with the assertion that Ss differing in degree of field-independence also differ in extent of 'psychological differentiation', or level of development. However, this would present the further possibility that 'differentiation' is an index of general intelligence or vice versa, which Witkin and his associates would presumably reject. An obvious conclusion is of course that field-dependence tests simply do not measure 'psychological differentiation'.
- 2 Kogan (1973, 1976) has put forward a threefold classification of cognitive styles. Type I is closest to the ability domain; performance can be set against some criterion of veridicality. Type II styles cannot be related to measures of veridicality, but one kind of performance is thought superior to another. Type III reflect purely stylistic preferences. Field-dependence-independence belongs to the first of these groups, for which the term 'style' may be a 'misnomer' (Kogan, 1973, P.161).
- 3 A similar point, though in the context of a quite different set of arguments, has been made by Kurtz (1969).



A set of findings which may reflect the combined influence of learning - discussed in the previous section - and of ability factors - discussed in the present - on field-dependence, is that suggesting the existence of a relationship between EFT/RFT scores and education. Much of this evidence has come from cross-cultural studies. A number of researchers have found significant associations between EFT performance and educational level as assessed by degree of literacy or number of years in school (e.g. Berry, 1966; Okonji, 1969; Wober, 1967). Others have reported significant correlations between EFT scores, RFT scores, and the educational level of fathers of Ss as well as their own. (Gruenfeld & MacEachron, 1975). Such results, coupled with those relating EFT scores to those on verbal tests mentioned above, are certainly '...more consonant with a general educational account of ability on the EFT than with a personality mediated account of a basic underlying analytic approach' (Siann, 1972, P.93). This account might also serve to explain some of the differences in field-dependence scores between groups differing in level of 'Westernisation', cited earlier (Pp.46-47). In sum, a great many of the findings considered in this section and the last point towards an explanation of individual differences in field-dependence in terms of a combination of two sets of factors: general intelligence and perceptual skill. That is, variance amongst scores on field-dependence tests for a given group of Ss will be in part a product of variations in 'g', and in part a product of variations in skills associated with the particular tests being used. Further, the relative contributions of these two sets of factors will depend on particular aspects of the sample of Ss being tested.<sup>1</sup> The case for an explanation of field-dependence scores in terms of 'psychological differentiation' is simply not proven.

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1 Such an explanation has been favoured by Serpell (1976) for cross-cultural differences in level of field-independence, though he specifies 'cognitive style' and 'perceptual skill' as the contributory factors.



(d) Unity and range of applicability

One final batch of results has created difficulties for the 'differentiation hypothesis' as an explanation of individual differences in field-dependence-independence. These results suggest first, that the hypothesised personality dimension underlying scores on the EFT and the RFT may be prone to fragment; and second, that the extrapolation of this dimension, via the concept of 'differentiation', into other regions of personality, may be in several respects unjustified.

A number of studies have found that, under certain conditions or with certain groups, correlations between scores on the EFT and RFT may be low and non-significant. Gruen (1955) found that, amongst a group of professional dancers (30 men and 30 women), EFT-RFT correlations were much lower than amongst a control group of (52 male and 51 female) 'normals' - and failed to achieve statistical significance except in the 'body straight' condition of the stationary RFT. Gruen suggested that '...performance in these perceptual tests is mediated along dimensions extending beyond the single field dependency-independency dimension proposed by Witkin' (op. cit., p.14). Working in Nigeria, Wober (1967) obtained a similar result. Wober's hypothesis, that Ss from different cultures with different developmental emphases might acquire skills in different sensory domains - and that for African Ss proprioception was particularly important - was given tentative support by his results. With the RFT frame kept straight and the body tilted, Nigerians were significantly more field-independent than their American counterparts, and a non-significant correlation was obtained between this test and the EFT. Further, EFT (but not RFT) scores were significantly correlated with educational level. Wober concluded that for these Ss the EFT and the RFT were measuring different skills. The implication of both of these studies is that groups of individuals with different back-

ground experience might display quite disparate patterns of performance on the various field-dependence tests, belying the suggestion that the underlying dimension is unitary and '...is to be found in many cultures and is thus not narrowly Western' (Witkin, Price-Williams, et al., 1973, P.4).

Results in considerable conflict with the predictions of Witkin and his associates have been obtained in a number of studies. For example, Vardy and Greenstein (1972), working with a mixed group of psychiatric patients and their therapists, found that, while EFT-RFT correlations were significant amongst the patient sample, for the therapist group they were non-significant. Attempts to find support for the hypotheses of the Witkin group concerning levels of field-independence for different diagnostic categories were completely unsuccessful; the only significant finding was in a direction opposite to expectations. However, a close association was found between field-dependence test scores and the patients' educational level. Again, Elliott (1961) obtained an EFT-RFT correlation amongst 128 college students of .40, '...as in other replications...significantly lower than originally reported by Witkin' (op. cit., P.31). Elliott attempted to measure 'psychological differentiation' by means of a statistic derived from Ss' relative spread of responses on a series of 49 7-point self-rating scales; but could find no support for the expectation that '...field-dependence is associated with little differentiation in the self-concept' (ibid., P.33) as assayed by this statistic. Finally, results of some factor-analytic studies have contradicted the notion that EFT and RFT scores load on the same factor. Bergman and Engelbrektson (1973) analysed a large battery of spatial tests and found that the EFT and the RFT were quite distinct in factor structure. While the EFT, as would be predicted by Wit-



kin et al., loaded highly on 'convergent production of figural transformations', the RFT was defined by a factor almost exclusively its own. 'The results also support the opinion that field dependence, as assessed by RFT and EFT, is not a unitary trait but is determined by at least two factors: a factor specific for the RFT situation and a Gestalt psychological factor, figural transformations...moreover, RFT and EFT had quite different factor patterns and shared only 4 to 16% common variance, giving further support to Elliott's view (1961) that the two tests cannot be regarded as equivalent measures of field dependence' (op. cit., P.946).

From a number of sources, then, have come results questioning the unity and validity of the field-dependence dimension. These results present the possibility that the high EFT-RFT correlations that have been found may have derived from common links to general intelligence in the samples in which they were obtained. In other samples the EFT-RFT correlations, which define the field-dependence-independence dimension, may be liable to break down. This suggests that the purview of this dimension may be considerably narrower than that envisaged by Witkin and his associates. Evidence reinforcing this latter suggestion has come from studies seeking to extend the 'dis-embedding' concept beyond the realm of the EFT and RFT.

A study by the Witkin group themselves has indicated some of the possible limitations on the applicability of the field-dependence concept. Witkin, Oltman, Chase, and Friedman (1971) searched for self-consistency in field-dependence across sensory modalities in a study involving blind Ss. A group of 25 blind and 28 sighted Ss was given a series of tests including tactile embedded figures and block designs tests; matchsticks problems; and an auditory embedded figures test. While the tactile tests were all significantly correlated with each other, none of the correlations between tactile tests and the auditory EFT reached significance amongst blind Ss. In fact

the correlation between tactile and auditory EFTs for this group was  $-.30$ . Though performing more poorly than sighted Ss on all the tactile tasks, blind Ss performed significantly better on the auditory task. In addition, the only sex differences found, on tactile matchsticks problems, favoured girls. Witkin et al. attempt to account for the first of these findings in terms of the greater importance of an 'attention-concentration' factor in auditory EFT performance amongst blind Ss. In other words, a test measuring field-dependence amongst normal Ss seems to measure different abilities when used with another group. This would seem to suggest that the dimension may be inappropriate when applied outside a certain range; however Witkin et al. conclude just the opposite. Their conclusions nevertheless admit that the special experiences of the blind can produce '...marked unevenness in level of functioning from one cognitive area to another' (op. cit., P.30).

- . On the basis of this study with blind individuals, it seems possible that skill in 'dis-embedding' cannot necessarily be generalised across different sensory modalities. A similar conclusion seems to follow in the cognitive domain from a study carried out by Messick and French (1975). These authors investigated the degree of generality of the 'closure' factor across the realms of cognition and personality. A battery of 35 tests which appeared, on face inspection, to involve some 'closure' element, was administered to a group of 541 naval aviation cadets. Factor analysis of the intercorrelation matrix so produced, yielded 14 factors, which, following rotation, reduced to 4 second-order dimensions. These were first, a 'general reasoning' or 'analytic functioning' factor; and three factors of 'closure' involving different categories of material: symbolic, semantic, and figural. Skill in 'dis-embedding', in other words, would appear to be specific to the kinds of stimuli involved; the capacity to locate hidden figures in a geometric context might not be paralleled by similar skills with semantic or symbolic



task content. The dimension of 'figural closure' - which is measured for example by embedded figures tests - was identified by these authors as being similar to the 'field-articulation' factor as defined by the Witkin group. Skill on this dimension of 'closure' would seem to be distinct from skill on other 'closure' dimensions, and to be related to them primarily through the medium of a more general intellectual capacity. Once again we are left with the suggestion that performance on field-dependence tests reflects in part, differences in general intelligence; and in part, skills of 'dis-embedding' with visual/postural, 'spatial' tasks.

If restrictions like the above have to be placed on field-dependence-independence within the cognitive sphere, then it is hardly surprising that the tests cannot be taken as measures of 'differentiation' when applied outside it. The results of a cross-cultural study on 'psychological differentiation' forced Berry (1974a; Berry & Annis, 1974) to just such a conclusion. Berry and Annis (1974) worked with three Indian cultural groups from different parts of Canada. These Ss were administered a variety of tests including Kohs blocks, as an index of 'perceptual differentiation'; a modified Asch-type 'group pressure' task and a 'self-disclosure' questionnaire, as indices of 'social differentiation'; and a frustration-inducing maze task for assessing self-control, as an index of 'emotional differentiation'. Of 30 inter-correlations between these measures in the various samples involved, only 5 proved significant in the expected direction. 'On the basis of these data, the notion of differentiation appears to be less unitary than the "characteristic of the organism" approach would suggest. Development of perceptual, cognitive, social, and emotional characteristics may be independently nurtured in particular eco-cultural settings, and may not need to "hang together"' (Berry, 1974a, P.221). The findings and conclusions of this research run completely counter to the 'differentiation hypothesis' as form-

ulated by Witkin and his associates. They suggest instead that - contrary to the supposition that individuals will show consistency across different areas of functioning - development does indeed take place in 'separate channels'; a state of affairs which Witkin et al. (1962) specifically dismiss (see above, P.15).

#### (e) Implications

Given the evidence reviewed in the last four sections of this chapter, the idea that tests of perceptual field-dependence measure a core feature of an individual's personality seems much less plausible than it might have at the outset. This evidence has suggested that performance on some of the key tests of the dimension is unstable, and may be influenced by a variety of personality and situational factors other than 'mode of field approach'; that field-independent scores on tests like the EFT and RFT may be achieved in a number of ways, particularly by the acquisition of skills through sheer practice and familiarity; that a major proportion of the variance in field-dependence test scores may be explicable in terms of general intelligence and the skills that go with it; that under some conditions and with a variety of different groups, the tests of the field-dependence dimension appear to fragment and to measure different things; and that, despite the insistence of the Witkin group on the widespread ramifications of their cognitive style, the findings of research regarding this point remain sadly equivocal.

What of the wide array of evidence, reviewed earlier in this chapter, linking field-dependence-independence to other features of personality and behaviour? Close scrutiny of this evidence suggests that overall, the majority of the findings could be explained as adequately in terms of general intelligence levels as in terms of 'mode of field approach'. The



tests of field-dependence themselves show more consistent relations to spatial or general intellectual factors than to any other variable with which they have been combined.<sup>1</sup> It is scarcely unaccountable that field-dependent individuals might show a greater social orientation; the less faith individuals have in their own judgment, the more likely it is that they will tend to rely upon others. Differences between field-dependent and field-independent individuals in problem-solving ability, concept attainment, career choice, and many other respects, can all be assimilated to this conception. Supplementing it with the notion that most of the skills required on field-dependence tests are promoted by formal education, a further selection of findings can be explained, linking EFT and RFT scores to experience of schooling or verbal test performance; together with the most consistent finding to have emerged from cross-cultural research - differences in levels of field-independence between groups differing in their degree of 'Westernisation'.

Returning then to the criticisms of the 'differentiation hypothesis' voiced earlier (at the conclusion of chapter 1), a number of points seem to have emerged more clearly. First, the available evidence implies that field-dependence cannot, as Witkin and his associates claim, be an indicator of an individual's extent of 'differentiation'. Second, a strong case can be made for the suggestion that field-dependence tests measure some conjoint product of general abilities and specific perceptual skills, and that the specific underlying variables measured will depend on characteristics of the Ss being tested. Third, such conclusions open the possibility that other means can be found for assessing individuals' 'differentiation' in

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1 It is somewhat inconsistent in any case, as Goldstein and Blackman (1978) point out, for the Witkin group to argue that significant EFT-RFT correlations are evidence of a common underlying dimension, while at the same time they do not take significant EFT-intelligence test correlations (which are often higher) to be evidence of a similar kind.

quite separate areas of psychological functioning. Even if field-dependence tests are indicators of 'differentiation' in some respect - for example confined to visual perception - the degree of generality of the measures becomes a subject for empirical research.

In this thesis a number of empirical studies are reported which focus on these questions. The suggestion that field-dependence tests measure a perceptual skill rather than an underlying personality variable is tested in a cross-cultural study outlined in the next three chapters. This work is an attempt to disentangle some of the variables that have been confounded in other studies, by selecting a sample in which two sets of factors - socialisation and perceptual experience - are expected to be working in opposite directions; the individuals involved in this study were Hong Kong Chinese. An attempt to obtain a clearer picture of the relationships between field-dependence, intelligence, and other cognitive styles is described in the ensuing two chapters. Finally, a study is reported which assesses the possibility that field-dependence tests do measure some residual component of 'differentiation', and examines their relationships to measures of 'differentiation' in other areas.



# 3

Empirical work in Hong Kong:

the background

## Chapter 3

### Empirical work in Hong Kong: the background

Considering the difficulties posed by some of the evidence discussed in chapter 2, it is surprising that the views of Witkin and his associates on the relationship between field-dependence and 'psychological differentiation' have gained such wide acceptance. Yet many studies have been conducted on the assumption that the tests of the field-dependence dimension do measure levels of 'differentiation'. In my own view the formulations of the Witkin group have been accepted far too readily by most psychologists; and I would endorse Vernon's contention that '...a great deal more research is needed to map out a clearer taxonomy of field-dependence' (1969, P.61). The aim of this chapter is to provide a basis for the empirical work on this 'taxonomy' reported in chapters 4 and 5.

This work is addressed to the question of whether field-dependence tests are indices of basic psychological structures on the one hand, or measures of perceptual or cognitive skill on the other. The arguments of chapters 1 and 2 had their roots in an unwillingness to believe that individuals could be described as more or less 'differentiated' on the strength of their scores on such tests as the RFT and the EFT. The theorising of Witkin and



his associates - and of others - forwarded the view that a great many psychological consequences flowed from an individual's level of 'differentiation'; that this level manifested itself consistently across many areas of an individual's life; and that it could be ascertained by his or her degree of competence on the aforementioned tests. Such a view seems at odds, however, with the conceptual analyses of 'differentiation' undertaken by Lewin and Werner, which allowed for growth at different rates in different psychological spheres; with everyday experience which suggests that individuals show markedly varied levels of 'differentiation' in different areas of functioning; and, as we have seen in the preceding chapter, with a large quantity of the findings of psychological research itself.

Given these reservations, an alternative view of field-dependence test scores has been entertained. This holds that performance on the tests is a function of an individual's overall level of intellectual capacity and of specific skills which he or she has had the opportunity to acquire. A number of strategies can be used to test out this notion. For example, the relative strength of the links between field-dependence scores, intelligence measures, assessments of skill, and other measures of differentiation can be mapped out. Alternatively, individuals' capacities for acquiring the skills involved in EFT or RFT performance could be explored in a 'training' experiment. Or again, research could determine the field-dependence test scores of individuals expected, on the hypotheses of Witkin and his co-workers, to exhibit a particular level of field-dependence - but predicted on the basis of the 'skills' approach to exhibit a quite different level. This is the strategy used in the present research.

The work to be described in chapters 4 and 5 employs the cross-cultural method, taking advantage of what Margaret Mead (1963) has called the 'natural laboratory' presented in the great variety of ways in which human beings

have adapted to differing conditions in various parts of the globe. In psychology, for the most part, the use of other cultures as a comparative 'treatment' - particularly in the area of cognitive style - has followed a path sketched out by Jahoda (1970): researchers have '...started with an observed correlation within a Western culture, and then selected non-Western ones in which the presumed independent variable existed at one or other extreme of the range, predicting consequences in terms of the dependent variable' (op. cit., P.9). This course of action has been followed in such studies as those of Berry (1966, 1971; Berry & Annis, 1974), Dawson (1963, 1967a, b), MacArthur (1967), Nedd and Gruenfeld (1976), Okonji (1969), Siann (1972), Witkin, Price-Williams, et al. (1973), Wober (1967), and many others. In many of these studies, however, such 'independent' variables as socialisation practices, ecological pressures, and education, have all been at work in the same direction. For example, in Berry's (1966) study, it is impossible to tell whether socialisation practices (Witkin's view) or perceptual experience (the present view) produced the dramatic differences he found between the Temne and Eskimo, as both factors are operating together within each sample. In the present study, an attempt was made to balance these two sets of factors against each other.

# 1. The choice of a Hong Kong Chinese sample

## (a) Socialisation practices

To meet these requirements, use was made of an opportunity to carry out psychological testing in Hong Kong. A first reason for the use of a Chinese sample in the present research was the suggestion that child-rearing practices in Chinese society would closely approximate those identified by Witkin and his colleagues (1962/1974) as being likely to produce individuals with a field-dependent perceptual style. Much of the evidence on which this reasoning was based was of necessity indirect, but



when put together suggested strongly that socialisation in Hong Kong would be such as to 'inhibit the development of differentiation'.

The aspects of upbringing considered by the Witkin group to produce a 'less differentiated' individual have already been outlined (see above, Pp.40ff.). Seder (1957), for example, found a particular pattern of behaviours to be characteristic of the mothers of field-dependent children. The most important of her findings concerning the nature of the parent-child interaction were as follows: first, field-dependent Ss had been subjected to child-rearing procedures which placed great stress on conformity and authority; second, these Ss had been harshly trained in aggression-control; and third, their spontaneous tendencies towards independence and self-reliance had been restricted or contained.

Although direct empirical confirmation of the existence of these or of similar conditions in Chinese families is unavailable, several pieces of indirect evidence suggest that child-rearing practices in Hong Kong will manifest 'indicators inhibiting differentiation'. These are drawn from the work of social anthropologists and, more recently, from work by psychologists on cultural differences in socialisation practices.

The characteristics of the so-called traditional 'Confucian family', as these have been described by social anthropologists, show a remarkable resemblance to those which, according to Witkin and Seder, will tend to produce field-dependent children. The Chinese kinship system is extremely complex, with over 400 terms in the language which refer to features of familial relations. Its foremost emphasis, traditionally, was on mutual dependence; and the growing individual was conditioned to have allegiance first, to his parents, and second, towards a well-defined family group (Hsu, 1972). 'In the peasant family it was taken for granted that a child would and should grow up to be much like the parent of the same sex and to carry

on the same activities' (Winch, 1963, P.36). Furthermore, '...in the Chinese society, filial piety should be singled out as the most fundamental social value having determining influences on the functioning of the whole society, not just the family' (Wong, 1970, P.170). Such tendencies towards extreme conservatism, coupled with a system in which the child's marriage was arranged by his or her parents, necessarily involve the inhibition of any marked inclinations towards self-assertiveness. Also in the traditional family, punishment for transgressing the rules of normal family life were abominably severe, and included such measures as flogging, ostracism, and on rare occasions, even execution (Lee, 1953).

To expect that such conditions prevail in the families of urban Hong Kong today would of course be naive, for a number of reasons. First, in 1949, communist China undertook a radical programme of re-organisation in the family structure, which spread to Hong Kong in the 1950s. This programme however led to a crisis in China in 1956, with delinquency running at an unprecedentedly high level, and subsequent programmes for family reform became more moderate. Second, Hong Kong today is highly Westernised, and the younger members of the population are (superficially at least) rapidly adopting Western attitudes and ways of life: '...filial piety has gradually lost its significant influence over family living...parents are aware that traditional types of home discipline cannot be exercised effectively' (Wong, 1970, Pp.172, 174). Third, it may well be the case that in the first place, those who came to Hong Kong from mainland China were (by reason of doing so) drawn from the more field-independent membership of the Chinese population as a whole.

Against these arguments, however, can be placed several equally valid points which suggest that, although the 'Confucian family' concept is no longer applicable to social structure in Hong Kong, the parental attitudes and



child-rearing procedures associated with it may still exist to some extent today. First, such aspects of a culture as procedures associated with child training are by no means easily susceptible to rapid change. Even within communist China it seems possible that, despite social upheaval, '...the Chinese family has survived' (Freedman, 1961, P.333), and this may continue to be true even in the wake of the 'cultural revolution' which had a passing impact on Hong Kong. Second, samples of Ss at school or university in Hong Kong in the early 1970s - when the present research work was done - are the children of parents who were themselves probably reared in 'traditional' Chinese families (inside China in the 1930s or 1940s), and who will have been likely to exercise child training methods similar to those they themselves experienced. Third, although as Wong (1970) points out, family life is becoming more Westernised in Hong Kong, and more children are sent to English-speaking than to Cantonese-speaking schools (in the ratio 4:1), there still remains a substantial number of Hong Kong children who speak no English, and who as far as can be judged come from more 'traditional' homes. Finally, some research work by Caudill and Weinstein (1969), carried out in Japan - which bears close similarity to Hong Kong in respect of its transition from a traditional to a Westernised culture - suggests that marked differences remain between child-rearing in the Orient and in the West.

The nature of these differences has been explored superficially by Scofield and Sun (1960) in a study conducted in the United States. A group of 40 Chinese students were asked to write about their knowledge of child-rearing practices in the families in which they had grown up. Thirty-six of these Ss had been born in mainland China, and the majority had been resident in the USA for less than two years. Their descriptions of child-rearing were compared with existing knowledge about American, middle-class child socialisation practices; and the processes involved were classified (independently

by three judges) as being more or less severe than those involved in typical American middle-class upbringing. In all respects except the age of weaning and manner of toilet training, Chinese practices were more severe than American ones. Of particular note in the present context, procedures liable to 'inhibit differentiation' - as defined by Witkin and his group - were much more evident during Chinese socialisation. The latter was more protective, more punitive, and more restricting than American practice; and seemed designed to inculcate respect for adults, obedience, dependence, and self-effacement.

A more searching analysis of the differences between the East and West in child-rearing habits has been undertaken by Caudill and Weinstein (1969). This investigation focused on the 'fine grain' of similarities and differences in maternal care and infant behaviour between Japan and the United States. Two groups of 30 infants each, one Japanese, the other American, were matched as far as possible in social-class origin, occupation of father, etc., in order that 'culture' would as far as possible remain the sole independent variable. The behaviour of each infant, and the mother-infant (or caretaker-infant) interaction, were observed, using a thorough time-sampling procedure, over a total period of five hours for each infant. Behaviour was observed according to a pre-arranged system of 40 categories, including such points of information as the location of the infant in relation to the mother, the infant's activity, vocalisations, feeding behaviour, caretaker behaviour, and so on. (In 90% of all cases, the caretaker was the mother.) Finally, the results on 12 'infant' and 15 'caretaker' variables were analysed for cultural similarities and differences.

It was found, first, that the types of behaviour in which there were no cultural differences were those which were clearly concerned with satisfying



biological needs, for example, food intake, amount of time asleep, and so on. 'Beyond this, however, the differences lie in the styles in which infants and mothers behave in the two cultures' (Caudill & Weinstein, 1969, P.29). Thus for example, while the American baby is physically active and happily vocal, the Japanese baby seems much more subdued in all respects. The American mother has a more lively, stimulating approach than that of the Japanese, for whom playing with the child is closely associated with 'soothing behaviour'. These and a number of other differences between the cultures support the authors' hypotheses that '...in Japan, the infant is seen as a separate biological organism who from the beginning, in order to develop, needs to be drawn into increasingly interdependent relations with others. In America, the infant is seen as a dependent biological organism who, in order to develop, needs to be made increasingly independent of others' (op. cit., P.15).

If it is a reasonable assumption, and it seems to me that it is, that the characteristics of infant care found in Japan will be similar to those obtaining in Hong Kong; and that both will differ substantially from those to be observed in the United States, then it is also reasonable to suppose that the characteristics of child-rearing amongst Hong Kong Chinese will be such as to make for the development of a more passive, dependent individual. If in addition Witkin et al.'s (1962) hypotheses concerning development are valid, then we should expect typical scores on spatial-perceptual tests in Hong Kong to lie towards the field-dependent end of the spectrum. That is, amongst Hong Kong subjects, typical child-rearing processes involve factors which Witkin and his associates would describe as tending to 'inhibit the development of differentiation'; so producing children and adults more field-dependent than their American counterparts.

(b) Perceptual experience

A second reason for focusing attention on a Hong Kong Chinese sample in the present study pertains to the nature of specific visual experiences to which Chinese individuals are exposed. These experiences derive, not from such ecological factors as 'degree of articulation of the environment', to which attention was directed by Berry (1966), but rather from familiarity with the written Chinese language.

Written Chinese is based on a system of 'characters' or ideograms not used by any language in the West. The average citizen will encounter 2,000 to 3,000 of these in the course of a day. They are thought to have their origins in some mode of pictorial representation of the environment, but the relationship of most modern characters to any original pictographic forms has been obscured by linguistic evolution. Chinese lexicography divides the characters into six main classes (Diringer, 1948; Kratochvil, 1968), but it is worth noting here that the majority of the characters in everyday use come from only one of the classes, the sixth. The classes are:

- (1) pictograms - simple characters based on a likeness of shape to objects;
- (2) indicative characters - in which abstract ideas are expressed by ideograms borrowed from other words similar to them in meaning;
- (3) suggestive compounds or 'assemblies of ideas';
- (4) modifications of existing ideograms to indicate subclasses of objects or acts;
- (5) 'borrow-help' characters, which are interchanges of characters similar to homophones; and
- (6) phonetic compounds ('Hsing sheng') - the most frequently used category, which consist of two parts, a phonetic and a denotative component.

From the point of view of perceptual experience, the sixth category of ideograms seems especially important. Apart from being the commonest type, these characters also seem to demand a particular kind of analysis during reading. Of the two parts of these characters - the phonetic and the denot-



ative - the former gives the rough pronunciation of the word, the latter determines the meaning (Diringer, 1948). This second element may be placed '...above or below, inside or around, to the right or left, of the other element' (op. cit., P.115). It is plausible to suppose that the regular reading of such characters must involve processes slightly different from those entailed in the reading of alphabetic scripts. For example, a higher level of visual discrimination skill would seem to be required, coupled with the ability (developing during the process of language acquisition) to sort the characters into their respective parts.

In addition however, a further type of 'stimulus-sorting' seems to be required in the reading of Chinese. Kvan (1969) has argued that the meaning of a Chinese character is much more dependent on other characters in a sentence, and on its context as a whole, than is the case with the word-units of an alphabetic script.<sup>1</sup> The Chinese written word, he points out, '...is best described as the centre in a cluster of meanings and only the total situation, which stretches far beyond the single sentence in many or most cases, will tell us the meaning the author had in mind when he wrote it' (op. cit., P.341). If this is the case, then the process of reading Chinese is radically different from that of reading English.

The Chinese language is the normal everyday language of 98% of the population of Hong Kong (Podmore, 1971); and the process of learning to read and write the characters just described begins in kindergarten at the age of three. Hong Kong's literacy rate has risen considerably during the last two decades, and the process of education, being highly competitive, is begun as early as possible in a child's life. Kindergarten schools are,

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1 An interesting finding possibly related to this was obtained by Chiu (1972). Groups of Chinese and American children were compared in their responses to the Kagan, Moss, and Sigel (1963) Conceptual Styles Test. While American Ss produced more 'analytic' and 'inferential' categorisations, Chinese Ss made more frequent use of 'relational-contextual' groupings.

therefore, widespread.

Thus, by the time Chinese children take the 'entrance examination' for primary school, the majority of them can read, write, and take dictation in between 100 and 160 characters. Some of these are very complex, requiring 20 or more individual strokes of the pen. Figure 3 shows a sample of the characters which must be formed by 5-year-olds (Kvan, 1969); the right- and left-hand columns are good and bad attempts to reproduce the central 'model'.

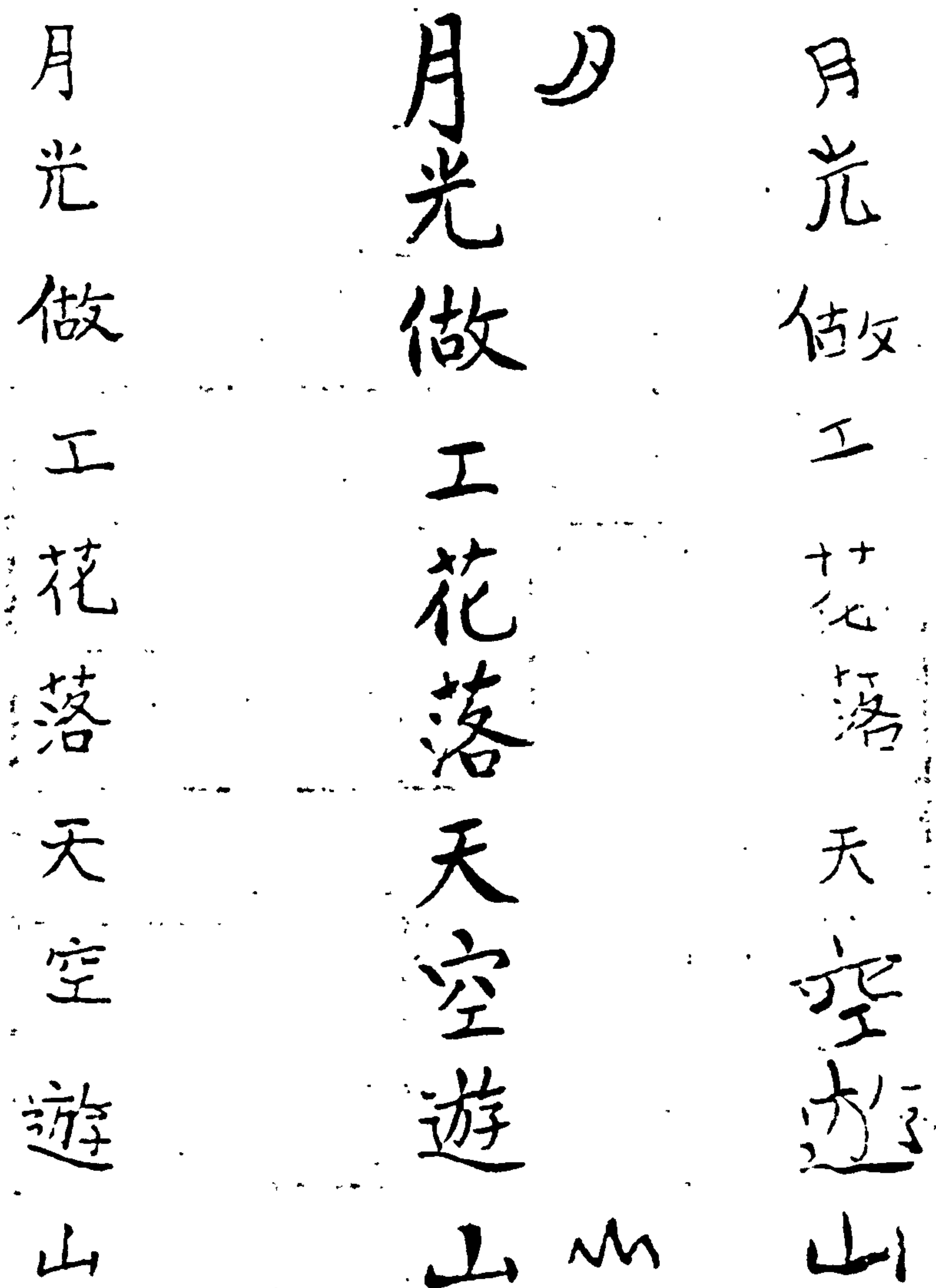


Figure 3. Characters formed by 5-year-olds.  
(Reproduced from Kvan, 1969)

Kvan (1969) draws a comparison between the above as a 'developmental task' and a corresponding developmental task used by child psychologists in the



West: 5-year-olds are asked to copy a figure, e.g. a circle, and the result is deemed satisfactory if the two ends of the drawing meet. Clearly the expectations of these two societies in terms of a child's perceptual capacities are considerably different.

A hypothesis of the present research, therefore, based on the facts just outlined, was that the processes of learning to recognise and reproduce such complex visual stimuli as Chinese ideograms would foster the development of perceptual skills, in a way that might be reflected in perceptual test performance. In particular, the experience of dealing with written Chinese might yield practice effects in the skill of 'overcoming embeddedness' which is at the centre of the 'articulated field approach' defined as field-independence. On the assumption that the latter is a perceptual skill, then, we should expect Hong Kong Chinese to be more field-independent than their American counterparts.

Although no direct evidence is available demonstrating a relationship between 'rich' form-experience and skill in 'dis-embedding', the proposition that such a relationship might obtain is supported by indirect evidence of various kinds. For example, the fact that simple exposure to visual patterns provides an advantage in discriminating these patterns during later testing, can be demonstrated even in the laboratory rat. Gibson and Walk (1956), in accordance with a large number of other studies, found that two groups of experimental animals, one reared in cages with simple visual forms present on the walls, the other in cages without such forms, differed significantly in the speed with which they solved a discrimination problem during adulthood. The results clearly demonstrated the effects of transfer of learning from the visual experience with the forms to the discrimination of the test stimuli, even '...without the complications introduced by the specific application of reinforcement' (op. cit., P.242). Results with

children have indicated that similarly, a process of transfer seems to take place between a child's experience of the world, and the stimuli presented there, and his ability to discriminate visual forms of a more abstract nature. Gibson, Gibson, Pick, and Osser (1962) suggest that, in development, children learn to distinguish outstanding features of objects, and in performing perceptual discrimination tasks (of which 'overcoming embeddedness' is one form), they do not start 'cold' because of their already established ability to discriminate amongst other items in their environment. The work of House and Zeaman (1960) supports this notion even amongst handicapped children; their ability to discriminate between objects clearly transferred to the process of discriminating patterns.

Working in a cross-cultural context, Serpell (1969) has furnished similar evidence suggesting that the processes of education involve the '...promotion of a certain kind of perceptual experience' (op. cit., P.193).

Education, Serpell found, tended to be associated with more 'form-dominant' responses, amongst Zambian Ss, on form-colour preference tasks; and it seems likely that learning to read, and the activities of visual sorting involved therein, also has a marked effect on the child's development of the ability to discriminate forms.

In view of the foregoing evidence, and although no research has been done linking form-discrimination directly to 'dis-embedding', it seems not unreasonable to predict that, amongst normally intelligent children, the experience of several years' exposure to 'discrimination' tasks with forms possessing features akin to 'embeddedness', with additional accompanying task- and social-reinforcements, might well enhance performance on field-dependence tests.

The predictions made in this research are therefore: that the administration of an embedded figures test to a sample of Chinese Ss will reveal enhanced



performance over what would be expected on the basis of the 'socialisation' hypothesis. Such a sample will be relatively more field-independent on the EFT than comparable samples from cultures without access to the Chinese language; this effect should, if the 'perceptual skill' hypothesis is correct, override the effects of 'indicators inhibiting differentiation' in child-rearing. Further, if the process of learning Chinese had such effects on EFT performance, but Ss did not, due to their cultural orientation, have equivalent kinds of experiences in the proprioceptive domain, then the close relationships between the EFT and the RFT found in Western samples should break down.

For these reasons, a Chinese sample seems well suited to a critical test of the 'socialisation' ('differentiation') versus the 'perceptual skill' accounts of performance on field-dependence tests. While its child-rearing conditions make for a field-dependent performance, its visual environment - or aspects of it - make for a field-independent performance. Ideally, this testing should have been undertaken inside communist China or in Taiwan; from necessity, however, it had to be done in Hong Kong.

### (c) Intelligence and education

The theorising and research of Witkin and his associates (1962/1974) takes as its guiding principle the idea that differences between individuals in scores on field-dependence tests can be accounted for by and large in terms of socialisation experiences in childhood. In chapter 2 (Pp.72-77) we saw, on the other hand, how a close relationship seems to exist between scores on these tests and individuals' levels of intelligence and education. However, the pattern of inter-relationships of these variables seems to show variations from sample to sample. For example while Busch and deRidder (1971) found IQ and RFT scores to be almost orthogonal amongst 4 to 6 year

old children, the evidence surveyed above has suggested that in other groups field-dependence scores and IQ may be very closely related. Some of the conflicts in the evidence concerning the factorial structure of field-dependence may have derived from sampling differences of this kind. Such a suggestion is complicated further by the fact that in the main, the American research which is supportive of the contentions of Witkin and his co-workers was based predominantly on younger samples of Ss, the majority aged under 17, and in the case of Witkin et al.'s 1962 book, concentrated in the age range 10 - 12. Most cross-cultural studies, on the other hand, such as those of Berry, Dawson, Okonji, and Wober, have used older Ss, of 15 years and above, and frequently adults. The possibility is real, therefore, that amongst different age-groups and in different cultures, the EFT and the RFT measure different attributes or skills. As Serpell (1976) has suggested, the relative contributions of different factors to the variance in field-dependence scores might vary with different sample characteristics. To attempt to 'map out a clearer taxonomy' of field-dependence in Hong Kong, a second piece of empirical work was undertaken, to inquire whether first, amongst older Ss the EFT would function primarily as a test of intelligence; and second, the pattern of inter-correlations of field-dependence tests would vary between two groups of Ss assumed to differ in their modes of intellectual functioning: students of the sciences and students of the arts. Once again, however, it was anticipated that both of these groups would be relatively field-independent when compared with American groups. This second investigation is the subject of chapter 5.

## 2. Design

The next two chapters describe research work undertaken in Hong Kong. In



the first, a sample of 9-year-old schoolchildren were administered a battery of field-dependence tests. The background variables of culture, socialisation, and visual experience functioned, as it were, like independent variables in this research; a central question being asked was concerned with the relative strength of the second two. The factors of visual acuity and colour vision, which may influence performance on perceptual tests, were controlled. In addition, both male and female Ss were tested in this research, and these two groups were matched on age, intelligence, social class, and number of years of education. The dependent variables then were scores on a number of tests linked to field-dependence-independence: the Children's Embedded Figures Test (Karp & Konstadt, 1963); the Witkin EFT (Witkin, 1950); the Oltman (1968) Portable Rod-and-Frame Test; and the Kohs Block Designs Test taken from the Wechsler Adult Intelligence Scale.

The second sample consisted of Hong Kong University students. Once again, culture and socialisation were presumed to be independent variables, since a comparison was being made here too between this sample and samples in the West. In addition, a further independent variable, subject of specialisation, was introduced, on the basis that the differential learning experiences of Ss from the physical sciences and from the arts would have predicted effects on the dependent variables. These samples were matched in age and consisted entirely of males. It proved impossible, however, to match the samples in intelligence. This sample too was controlled against colour blindness, and the dependent variables were scores on the Witkin EFT and portable Rod-and-Frame test.

The general hypothetical position on which these studies were founded has been outlined in the previous and present chapters. Specific predictions regarding each of the dependent variables are made in chapters 4 and 5.

# 4

Empirical work in Hong Kong:

9-year-old children



## Chapter 4

### Empirical work in Hong Kong: 9-year-old children

This chapter describes an attempt to test some of the ideas developed in chapter 2 and set out more fully in chapter 3. It focuses first, on the subjects in the sample; next on the tests given them; and finally, on the results obtained and their possible implications. As a preliminary, however, some features of society and education in Hong Kong will be outlined, in order to illuminate the background against which the research was carried out.

#### 1. Description of the sample

##### (a) Society and education in Hong Kong

Hong Kong is one of the world's few remaining colonies; and is a state marked by very large social and economic inequalities. Unfortunately, detailed information on the extent of these - for example on the proportion of the population in various income groups - is not readily available. For general purposes, however, it is possible to draw on accounts by Agassi (1969) and Podmore (1971) who have sketched broad outlines of the social and educational structure of the community.

The interpretation of existing evidence is open to hazard, however, as the population structure of Hong Kong has for some time been undergoing very rapid quantitative and qualitative change. Of paramount importance is of course the fact that its citizenry consists in the main of refugees who came to the colony from communist China during the nineteen-forties, fifties, and sixties - and of the families they have reared in Hong Kong since then. Thus in 1970-71 it was estimated that more than 50% of the population was under 20 years of age (in 1966, 40% of the population was aged 14 years or younger); and as these young people have taken up employment, the economic and social structure of the community has been - and will continue to be - subject to unpredictable mutations.

Two facts of considerable importance for psychological research emerge at once from this very rough picture. First, since there has been little work carried out on the psychological effects of processes of rapid (and accelerating) social change, firm statements concerning attitudes, child-rearing practices, the degree to which Hong Kong Chinese have become 'Westernised', and so on, simply cannot be made. The impact of such transformations on the young, caught between Chinese and Western worlds, between the traditional and the 'modern', is particularly difficult to assess.

Secondly, the pressures exerted by the process of social development on the educational system of Hong Kong, and on those who pass through it, is enormous. The greatest factor in social mobility is the literacy rate, which has been steadily rising over the past few decades. In 1931 only 51% of the population over the age of ten could read (74% of the males and 19% of the females); whereas by 1966, 78% of the population were literate (92% of the males and 64% of the females) (Podmore, 1971). This proportion will have risen still further since the advent of compulsory primary schooling.

One result of such pressures is that the motivation to succeed in education



is extremely high. The business of schooling in Hong Kong is an extraordinarily competitive one; there is a many-staged 'pecking order' amongst the colony's schools, and children are ever under pressure to excel and move on to a relatively better school. This competitive stress is at its most intense at the point of entry into Hong Kong University.

The problems of sampling in such a community are considerable. If the detailed structure of a society cannot be described, it is hardly possible to draw a sample that is truly representative of it. I decided in the present study firstly to sample children from the same educational environment, as it would be almost impossible to obtain a sample in Hong Kong schools which could be properly controlled for social class, family background, and so forth. The criteria by which a factor like social class is judged by a researcher are not necessarily ones which would be shared by his subjects. In Hong Kong, writes Agassi (1969), '...occupations are pretty well ranked according to the income they bring' (op. cit., P.73). But with a population as socially mobile as that of Hong Kong, it is unlikely that income differences will be correlated with those aspects of social class which are generally held to have psychological significance: child-rearing practices, the inculcation of 'internal' versus 'external' controls, degree and kind of stimulation in infancy, and the like.

The most straightforward way of choosing a sample, then, seemed to be to test Ss from the same school or from two schools in the same neighbourhood, thus controlling to some extent the factor of educational environment. The characteristics of those Ss tested in the first study are summarised in the section which follows.

#### (b) Subjects

The Ss tested in this first sample were 54 9-year-old schoolchildren from

two adjoining schools in the Sai Ying Poon district of Hong Kong (Victoria). Both schools were run by members of a Catholic religious order long established in Hong Kong. There were 33 boys and 21 girls.<sup>1</sup> Given that these Ss are from a non-Western background, some data were collected about the families from which they came. These are presented in Table 2.

Table 2. Characteristics of Ss in eventual school sample

	<u>Boys, n = 32<sup>2</sup></u>	<u>Girls, n = 21</u>
Mean age (years and months)	9:4.8	9:4.76
Mean no. of years of schooling	5.65	5.69
Mean no. of siblings	3.48	3.57
<u>Father's occupation group<sup>3</sup></u>		
Unskilled manual	5	2
Semiskilled manual	5	4
Skilled manual	7	8
Lower clerical	4	2
Lower professional	6	5
Upper professional	5	-

- 1 The larger number of boys is not at present disturbing since, in Witkin's research, the majority of Ss are male. In practical terms, the discrepancy reflects the fact that there are more boys than girls in Hong Kong schools. Agassi (1969) notes that, while middle-class parents send equal numbers of boys and girls to school, the lower classes send a greater proportion of boys. This derives from the Chinese tradition that, if a choice for privilege must be made, it inevitably falls on the male.
- 2 One S was unable to describe his father's occupation.
- 3 The six categories were used roughly as follows: 'unskilled' manual included labourers and watchmen; 'semiskilled' manual, waiters, cashiers, etc.; 'skilled' manual, taxi-drivers, skilled factory workers, craftsmen; 'lower clerical', clerks and shopkeepers; 'lower professional', teachers and accountants; 'upper professional', doctors and managers of firms or factories. This represents a broad spectrum of occupations in Hong Kong.



From the table it can be seen that the male and female groups are almost perfectly matched in age, number of years in school, size of family of origin, and also - with the exception of the 'upper professional' category - in respect of their father's occupational group. Only those Ss who had spent all their years of primary schooling in the same school (i.e. that in which the testing took place) were included in the final sample. That the figure for total number of years of schooling approaches 6 may seem curious to a Western observer: it is due to the fact that in Hong Kong, education begins in kindergarten at the age of 3, as described in the preceding chapter.

In both the schools in which testing was carried out, as in the majority of Hong Kong primary schools, the medium of instruction is Cantonese; and all Ss whose test scores were included in the sample (in fact, all the children in the school) spoke Cantonese only. While this was essential for the purposes of the research, it necessitated the use of an interpreter.

The Ss in this sample came almost exclusively from the third form of their respective schools. In obtaining them, the following method was adopted. The headmasters of schools were first contacted by letter, and later an appointment was made by telephone. A rough outline of the nature of the research was given them, and permission to test the children was sought. In both cases the headmasters proved very friendly and cooperative. They supplied class lists from which the names and dates of birth of children were obtained. In one school, almost all of the third form was tested, with the exception of (a) a small number of children used to familiarise the interpreter with test procedures; (b) a considerably larger number whose visual acuity was very weak, or who proved to be colour-blind; and (c) a few children who reacted adversely to the test situation and were wholly unresponsive. In the second school, an additional number of boys was

selected randomly from the class register.

## 2. The test battery: administration

### (a) Tests used

The tests administered to the Ss just described were the following:

- (1) The Landolt rings test, as a check on visual acuity;
- (2) The Ishihara test, for detecting colour blindness;
- (3) A Cantonese version of the Wechsler Intelligence Scale for Children (Verbal scale only);
- (4) Raven's (1956) Progressive Matrices;
- (5) The Witkin (1950) Embedded Figures Test;
- (6) The Children's Embedded Figures Test (Karp & Konstadt, 1963);
- (7) The Portable Rod-and-Frame Test (Oltman, 1968);
- (8) The Kohs Block Designs Test from the Wechsler Adult Intelligence Scale.

In addition, scores were obtained for each S on a Chinese Language test (these scores were supplied by the Hong Kong Government Education Authority); and a questionnaire was sent to the parents of each child, seeking information on child-rearing practices.

### (b) The interpreter and test sessions

The above tests were administered by a Cantonese interpreter in association with E. The interpreter, fluent in both English and Cantonese, was first of all trained in the methods of test administration. This involved a number of sessions in which the interpreter administered the tests to trial Ss under close supervision. An emphasis was placed on the adoption of a standard approach with all Ss; and where necessary, test instructions were translated into Cantonese and retained in written form by the interpreter. Scoring of the verbal (WISC) tests was carried out by the interpreter, and



of the non-verbal tests by the experimenter.

In all test sessions, the (female) interpreter sat beside E facing S across a small table in the school library. Prior to testing, Ss were put as far as possible at ease by the asking of simple questions (e.g. on whether they liked school) in a casual manner - though obviously a certain level of anxiety was unavoidable. Inquiries were made concerning the child's father's occupation, number of brothers and sisters, position in family, and number of years in school. The test sessions were designed as far as possible to be stimulating, with the tests juxtaposed in a sequence which introduced variety in the tasks to be performed. The order of administration thought to be best was therefore: Landolt Rings test - Ishihara test - Raven's Matrices - Kohs Blocks - Children's Embedded Figures - Adult EFT - Rod-and-Frame test (conducted in another part of the room) - and Wechsler Verbal scales. At the end of the session, children were given sweets. The whole testing period usually lasted about two hours, with short intervals between tests, but did not seem to fatigue any of the Ss. Where possible, two Ss were tested in a day, one each in the morning and afternoon.

### (c) Test procedures

In this section, the reasons behind the use of each test; its manner of administration; and other relevant background information, will all be outlined, taking the tests in their order of presentation to the subjects of the sample.

#### The Landolt Rings Test

Many residents of Hong Kong suffer from poor visual acuity, yet a large proportion of these wear no spectacles due to the expense involved. It was thought necessary in the present research to exclude the possibility that a

poor performance on any of the perceptual tests was caused by bad eyesight. The Landolt Rings were used for the purpose of 'screening' Ss for visual acuity and ensuring that all those tested were capable of accurate vision up to a certain pre-arranged level.

The Landolt Rings Test is a non-verbal analogue of the standard visual acuity chart used by opticians. Rather than having letters in rows of decreasing size, it presents the S with rows of circles - each having a gap somewhere on its circumference. S is asked to indicate, using his arms as in semaphore, the point on each ring where the gap is located. The test contains twelve rows of such rings. Ss who could not perform accurately on at least the first six rows were excluded from further testing. This was the case with 5 Ss.

#### The Ishihara Test

This test was used to screen Ss for colour-vision deficits. It was used particularly with EFT performance in mind. It may be possible that, given the use of colour on some items of the latter, scores of colour-blind Ss can be artificially lowered - or for that matter enhanced.

The Ishihara test consists of a booklet of coloured plates designed so as to detect the major forms of colour-blindness. Some of the plates contain patterns which can be seen by colour-normal Ss but not by those with particular forms of colour deficit. Only one S failed to find all the patterns, and was eliminated from further testing.

Altogether then, 6 Ss had to be excluded from the sample during the 'screening' process. A further 2 Ss had to be counted out later when they failed to grasp the task of finding embedded figures. Apart from these, all other Ss tested performed adequately on all the tests and were included in the final sample from which the results were taken.



### Raven's Progressive Matrices

The Progressive Matrices Test was used in this study to help match and control the male and female samples for intelligence. The value of this test in this respect lies in the fact that it is, factorially, relatively 'pure'; it is non-verbal in content; taps abstract intellectual abilities, while remaining almost free of the 'k:m' (spatial) factor present in other tests of the battery. Thus it can also provide some index of the extent to which 'g', rather than 'k', influences field-dependence test scores.

MacFarlane-Smith (1964) has noted that the Matrices test is '...generally regarded as a good g-test' (op. cit., P.205), and quotes factor-loadings of 'g' as high as .87 for the B and D series of the test, with loadings of the 'k' factor virtually negligible. Vernon (1969), while expressing doubts about the value of Matrices in cross-cultural research, lists the test as one of the most highly loaded 'g' tests, with a small spatial loading.

There is, however, a slight loading of 'k' occasionally found on series A, C, and E of the test (e.g. .17 by MacFarlane-Smith, 1964). This MacFarlane-Smith accounts for in terms of the need for '...attention to the figure as a whole' on items of these series. Furthermore, it has been observed that while amongst males, the test's spatial loading is negligible, amongst females it is consistently higher. The loading of 'g' on this test is sufficiently high when used with both sexes, however, to warrant the use of the Matrices for the purpose of matching of groups in the present investigation.

The form of the test used in the present study was the 1956 one, with 5 series (A - E) of 12 items each. This test is administered untimed, the score being the number of items correctly solved (maximum possible score then being 60). In normal usage the score is compared with norms for an S's age-group and his performance is represented, sensibly, in a grade form;

but since correlations with other tests are to be computed here, the raw scores are retained as the primary data.

The value of Raven's Matrices as a research tool in Hong Kong is augmented by the fact that local data exist for performance on the test. These data raise a number of points. The Matrices test has been one of the most widely and frequently used ability tests in the colony; and Goodnow (1962) has claimed that '...matrices scores appear to be a more-than-fair index of general intelligence' (op. cit., P.8). This Goodnow supports with the finding of a correlation of .77 between Matrices and Wechsler-Bellevue scores amongst Chinese adults. Further, Godman (1964), having administered the Matrices to a sample of 1007 primary school pupils in the colony, obtained a correlation of .44 with school attainment. Thus the Matrices seems to work tolerably well as a test of general intelligence in Hong Kong. On the other hand, Fung (1966), in a study of the relationships between Matrices performance and that in four academic areas, found that while there was a correlation of .31 ( $p < .01$ ) between Matrices scores and performance in physics and mathematics, the corresponding correlation with arts subjects (English and Chinese) was .10. This supports MacFarlane-Smith's (1964) view of the minor role played by a spatial factor in the test; and Fung urged that a verbal test be developed and used in conjunction with Matrices in Hong Kong. Hence the employment, in the present research, of a Chinese version of the WISC, to be described below.

Overall, though, the Matrices has good credentials as a general ability test. Its correlation with a verbal test in Hong Kong was found by Li (1964) to be .46 ( $p < .01$ ) and that writer concluded that it '...samples an important aspect of the ability to do well at school' (op. cit., P.190). Correlations between the Matrices and the WISC (Verbal) in the present study are described in section 4(b) below.



One final cautionary note arises, however, from the study by Li (1964). With samples of Ss of above average ability - in this case University Diploma in Education students, and two groups of students from post-secondary colleges - the test was found not to discriminate properly at higher levels of scoring. Towards the top end of the distribution, the curves for all three groups merged into one. It was not envisaged at the outset of the present study that the problems of a low test ceiling would be met with.

#### Kohs Block Designs Test (WAIS)

This test has been widely used in cross-cultural research (e.g., Berry, 1966; Berry & Annis, 1974; Dawson, 1967a, b; Jahoda, 1956; McConnell, 1954; Vernon, 1969; Witkin et al., 1973; Wober, 1970) and incorporates features of both general intelligence and field-dependence tests. Its loading of 'g' may be as high as .68 (Vernon, 1969); nevertheless it is most frequently regarded as a test of spatial ability (MacFarlane-Smith, 1964). It is included here essentially for purposes of comparison with the work of Dawson (1967a, b) and Berry (1966), and also to help delineate further the specific relation of field-dependence tests to possible 'g' and 'k' factors in a Chinese population.

The test used here is that taken from the Wechsler Adult Intelligence Scale. Preliminary testing with some Ss not included in the final sample revealed that the WISC block designs were too simple, and would not yield a fair score distribution; and that the full-scale Block Designs Test itself was too difficult. The WAIS version was therefore used as a compromise.

The test was administered as directed in the WAIS manual (Wechsler, 1958); one minor modification was, however, introduced. Prior to presenting card 7, the additional 5 blocks were given to S and it was pointed out that for the ensuing trials he (or she) would need to use a 3 x 3 design. This extra

instruction was given to slightly facilitate performance since the Ss were so young. Scores were calculated by reference to the times given in the manual; the maximum possible score is 48.

#### Children's Embedded Figures Test

This test (Karp & Konstadt, 1963; Witkin et al., 1971) was originally designed to provide an embedded figures test which could be used with Ss below the age of 9 to 10 years. Though it was expected here that the adult EFT would prove too difficult for children below this age limit, in fact the reverse turned out to be the case. The CEFT was too easy for most Ss: out of a maximum possible score of 25, 80% of the present sample obtained a score of 19 or more, and approximately 70% of the scores fell in the range 19 - 23. Thus the test did not prove to be a very meaningful indicator of field-dependence; in the present study it served more as an introduction to the EFT than as a valid measure in its own right.

The CEFT is identical in principle to the adult version of the test described below, but the items are of course much less difficult, and the 'embedding contexts' consist of drawings of houses, toys, ships, etc., to help retain the interest of younger Ss. There are also only two simple shapes to be 'dis-embedded' (one a red triangle, the other a blue polygon shaped like a house). In addition the test includes some practice items which illustrate the principle of 'embedding': a simple item is shown first by itself, then shown as part of a larger item, then the latter in turn shown as constituting part of a whole drawing. S's score is the number of simple items he finds at the first attempt. This test took only a few minutes to complete and Ss seemed to enjoy it thoroughly; it also probably had the effect of increasing motivation on, and facilitating the understanding of, the adult EFT which was given next.



### The Embedded Figures Test

The principle on which the Embedded Figures Test is based is a very straightforward one: as in the older Bender-Gestalt tests, the subject's task is merely to find a simple figure which is hidden in a complex one. The materials for the test used here consisted of 14 out of the 24 figures devised by Witkin (1950; Witkin, Oltman, Raskin, & Karp, 1971), based on the principles of Gottschaldt (1926), presented on thin 5" x 3" cards.

The simple figures, labelled A to H, are geometric line drawings, left uncoloured; the complex figures are (with one exception) coloured in order to increase the difficulty of the search. Task difficulty is also ensured by limiting the number of complex figures that contain any one simple figure, and by never presenting these consecutively (to avoid any 'massed' practice effect). Figure 4 illustrates the test's demonstration item and the single uncoloured item in the test.

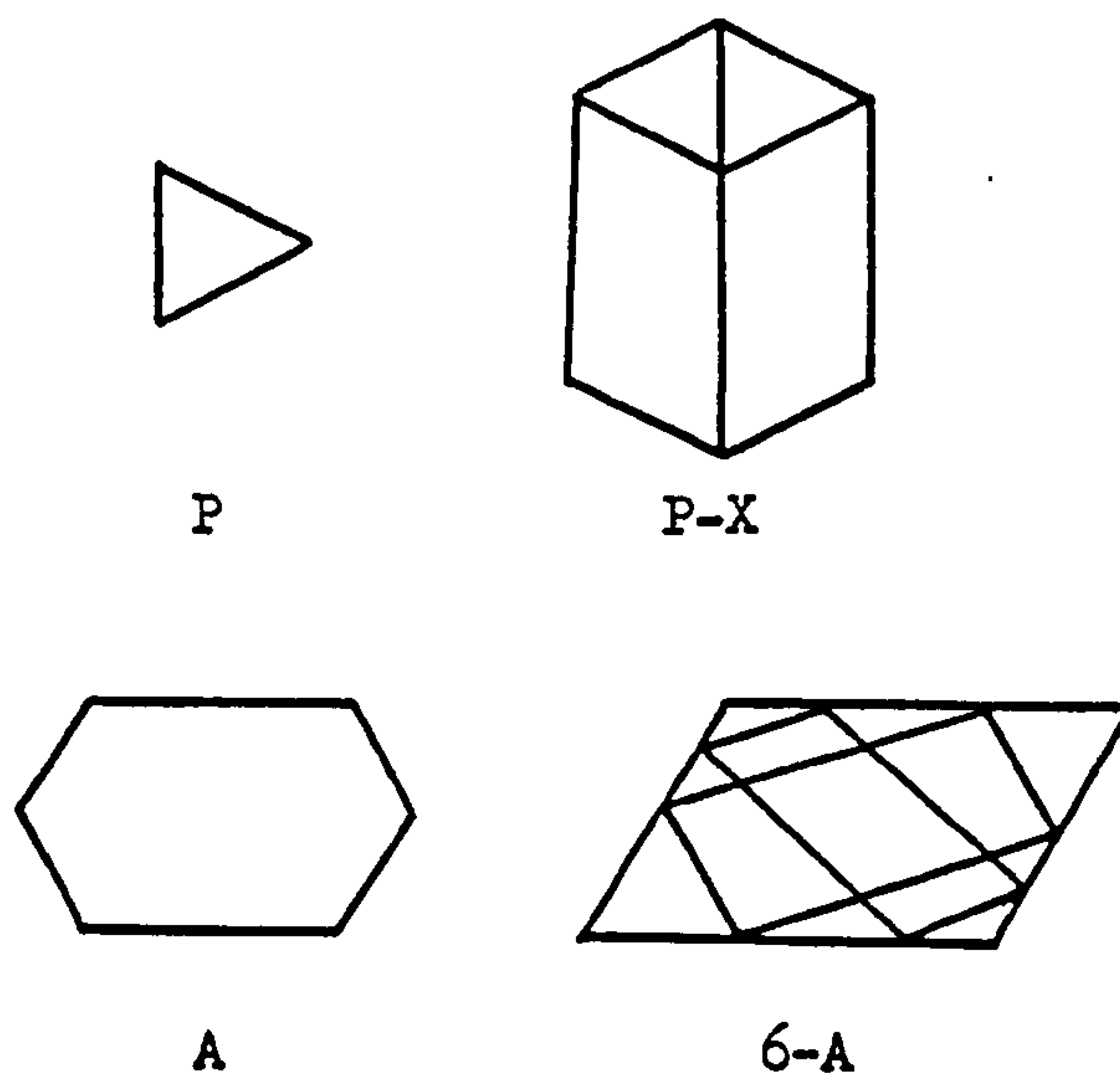


Figure 4. Practice item and item 6-A  
from the Witkin Embedded Figures Test

In test administration, the nature of the task is first of all explained to the subject, using the practice item shown above. The following instructions were given (these have been translated into Cantonese and then back

into English by different interpreters):

'What we are going to do is to show you some shapes like this (presenting P-X) and ask you to look at them for a little while; then we will give you a card with a different shape on it, like this (presenting P); you must look at it and try to remember what it is like. When we take this card (P) away, we want you to look at the first card and try to find the shape of the other one inside it; if you find it, tell us, and show us where it is by drawing round its edge with this brush (presenting fine paint-brush). Each time we want you to do this as fast as you can.'

These were the basic instructions; in practice some additions had to be made, depending on the testee. There can be few tests on which the myth of standardised presentation must be modified so rapidly.

In parallel with these instructions, the procedure on each trial was as follows: S was first shown the complex figure, whichever it happened to be, and allowed to examine it for 15 seconds; the corresponding simple figure was then placed on top (obscuring the complex one), and left there for 10 seconds; on its removal, a stopwatch was started. The score was simply the time taken by S to locate and outline the simple figure. If S's response was incorrect, the stopwatch was kept running. The time limit was 3 minutes. If S failed an item the correct solution was shown him. In addition, Ss were allowed to see the simple figure again if they wished, but only for 10 seconds at a time (which was not included in their solution time). If this procedure is not adopted, the test may tax memory factors too much and lose validity.

The most important modification introduced into testing with this sample, was an alteration in the order of presentation of the cards, such that easier ones would appear at the beginning. This probably helped Ss to grasp



the nature of the task, and increased their motivation by bringing earlier success.<sup>1</sup> Thus the actual order of presentation of the items was: 11-A, 15-D, 10-G, 1-A, 20-C, 5-E, 7-F, 4-D, 6-A, 8-E, 3-C, 2-B, 9-C, and 12-H. In no case did complex figures containing the same simple figure follow each other directly.

All Ss whose scores were eventually included in the data analysis showed an apparently clear understanding of the demands of the test. Only two testees' performances showed a lack of comprehension; their scores were not taken, and the test was discontinued. For other Ss, scores were obtained by summing discovery times over all trials; these final scores are given in Appendix I (a). Total time on the test was normally less than 20 minutes but in one case took almost 45 minutes.

#### The Rod-and-Frame Test

The portable Rod-and-Frame apparatus used in the present study was one of the kind designed by Oltman (1968). This apparatus rests on a 24" x 36" plywood base, whose plane can be adjusted to ensure that it is level (a spirit level is provided). The 'frame' is a rectangular box-like enclosure made of translucent plastic, with circular discs, 22" in diameter, mounted at each end. These discs rest on rollers which permit the smooth tilting of the box to the left or right. At one (open) end of the box enclosure is a headrest positioned so as to restrict an S's visual field to the inside of the box during testing. An adjustable curtain is provided for occluding the interior between trials. At the opposite end of the box,

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1 In the combined Embedded Figures Test manual, Witkin, Oltman, Raskin, and Karp (1971) specifically allow that the order of presentation of the cards may be varied with younger Ss, and add that '...at these younger ages, the procedure may be presented more informally when deemed necessary to sustain the child's interest and motivation' (op. cit., P.13).

pivoted so that it can be tilted independently, is a separate disc, also 22" in diameter, painted white on the side facing the interior of the box. The rod, a strip of black plastic 11" long, is mounted on this. The frame is formed on the inside of the box, at the end opposite the headrest, by the positioning of black plastic strips on the inside edges of the box. S's view of the interior of the box is thus as depicted in Figure 5.

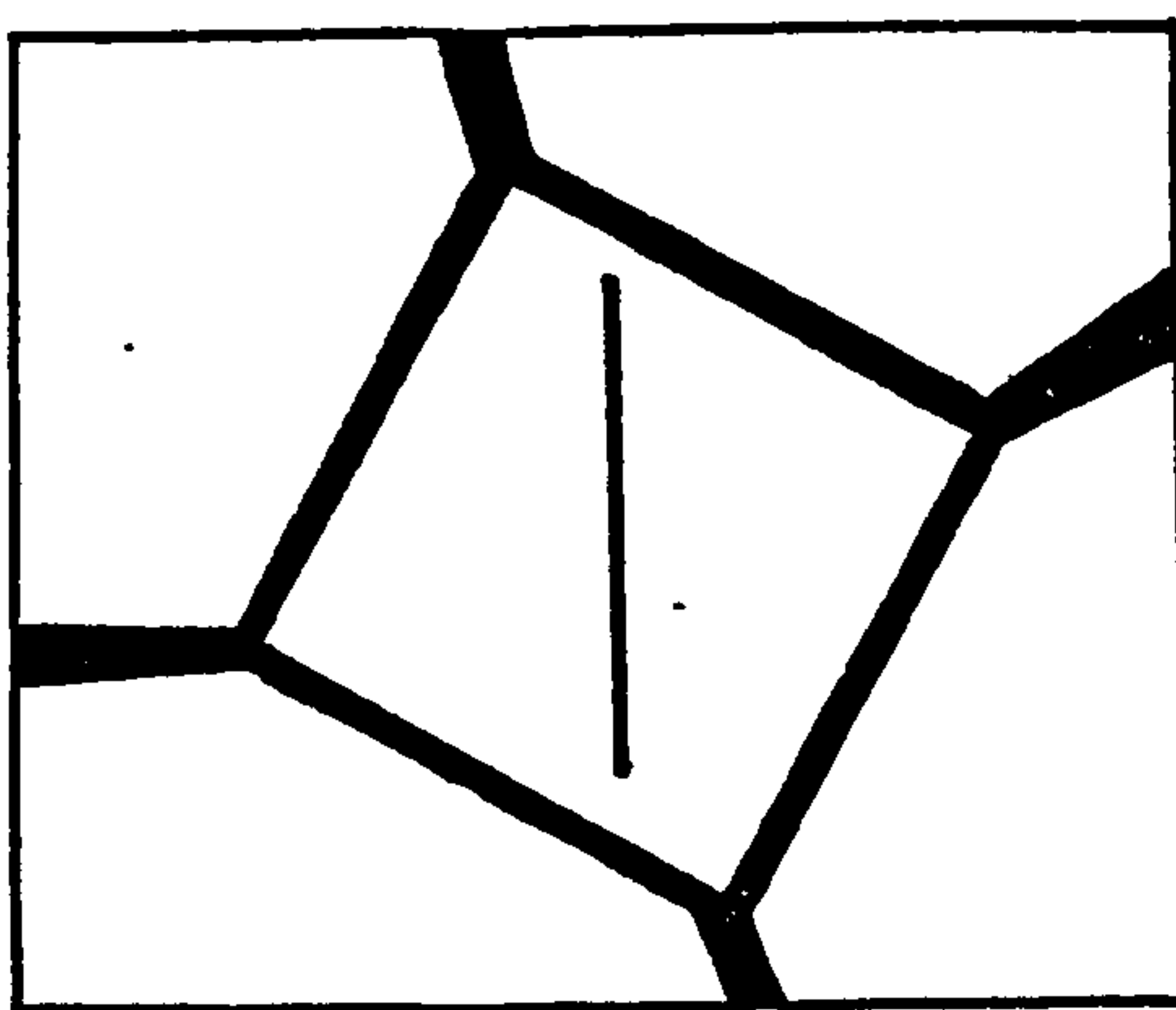


Figure 5. Interior view of the  
Portable Rod-and-Frame Test  
(Adapted from Oltman, 1968)

Thus when S rests his head in position and looks into the box, his only stimuli are the black rod and black 'frame', which rotate on the same horizontal axis; and the surrounding whiteness of the enclosing box walls. These are designed so as to diffuse light uniformly throughout the inside of the apparatus, thus eliminating depth gradient cues. With the exception of the walls and the inner surface of the disc bearing the rod, all other parts of the apparatus are painted in a matt black finish.

Finally, on the back of the disc bearing the rod is a photographically magnified protractor scale, with readings of up to  $30^{\circ}$  to the left and right of the true vertical position of the rod.



Before test administration the apparatus is first of all adjusted to the horizontal plane; and the movement of the rod and 'box' are demonstrated to S. Next, the concept of the vertical is explained with reference to the walls of the building, the corners of the room, and the position of the body when standing up straight - in order to be as sure as possible that Ss will simply not align the rod with the orientation of the frame. This caused a little difficulty amongst Chinese Ss, largely because of their polite willingness to affirm that they understood when in fact they did not. The school being a Roman Catholic one, a metaphor which some Ss found helpful was the idea of the direction of heaven straight above in the sky. All Ss whose scores were eventually used showed an adequate understanding of the test; only two Ss had to be eliminated owing to scores so erratic as to indicate failure to grasp the concept involved.

Once Ss had grasped the concept of the 'true' vertical, it was explained that the rod and frame were to be tilted, and that S's job would be to help E adjust the rod back to it, while the frame remained tilted. He would have to do this a number of times, and before each try his gaze would be occluded by a small curtain. This was adjusted by the interpreter. When the curtain was removed, S would be asked whether he thought the rod was in a vertical position, and if not, whether it had to be moved in a clockwise or anti-clockwise direction to return to vertical. When S had indicated the direction, E moved the rod in small steps, asking after each whether the rod was now vertical or needed to be moved further. This was done simply by using the words for 'enough' or 'move'.

When the rod was nearly vertical, a finer adjustment was brought into play and S was asked whether the rod required moving clockwise or anti-clockwise. Thus, S's judgment was assessed as accurately as possible.

For the first trial, both rod and frame were initially tilted  $28^{\circ}$  to S's

left. Eight trials in all were conducted, with the sequence of positions for the frame LLRRLRR, and for the rod LRRLRL. S's error score was noted after each trial and the sum of errors over all 8 trials became his score on the test. The whole test never took more than 15 minutes to administer and was usually completed in less than 12. Total error scores showed a remarkably wide range from  $10^{\circ}$  to  $187^{\circ}$ .

Additional precautions consisted of asking S at the outset if he could see anything other than the inside of the box when his head was in the test position, and ensuring that he could not; and of asking S to keep his head in the rest throughout testing.

#### The Wechsler Intelligence Scale for Children (Verbal Scale)

For the purposes of the present research it would have been preferable if there had been in Hong Kong a standardised verbal intelligence scale of local origin. No such instrument, however, existed. The only tests available were Cantonese translations of five subtests from the Verbal Scale of the WISC. Although no local norms or other statistical data were available for these either, they might still have some validity in Hong Kong, since most of the local schooling proceeds on Western lines.

In any case, it can be argued that for the purposes of matching groups in research, data which relate performance of test samples to their population as a whole are not absolutely necessary. Within the context of a single piece of research, unstandardised tests can still have some value in (a) enabling one to reject Ss who fall outside a certain range of scores, and (b) making possible the rough matching of two groups of Ss in their test scores. Since schools in Hong Kong emphasise achievement in similar areas to those prized in the West, there is also a fair chance that a Western test will, with some modifications, succeed in tapping the same kinds



of abilities which are assessed when testing a Western sample.

It was with these considerations in mind that the WISC subtests were employed in the present research. Five subtests were available in Cantonese, with appropriate modifications made. These were Information, Comprehension, Similarities, Digit Span, and Arithmetic. No Vocabulary test was however available, this being almost impossible to translate - vocabulary tests, perhaps more than any other kind, are almost wholly 'culture-bound'.

The list of modifications involved in the Information, Comprehension, and Similarities subtests (which were made by the test's Chinese translator), are listed in Appendix III (a). No changes were introduced on the Digit Span or Arithmetic subtests. Apart from these minor modifications, the tests were administered as directed in the WISC manual. Following completion of the RFT, and after a short pause, the interpreter simply said 'Well now I'd like to ask you some simple questions' and proceeded with item 4 of the Information subtest. Since all the responses to the test were of course in Cantonese, the interpreter scored the test (the items having been discussed with her beforehand). If the interpreter was uncertain as to how any response should be scored, she wrote it down and it was later scored by E. On Arithmetic, E operated the stopwatch and noted the times taken while the interpreter noted the responses themselves. In obtaining final scores, the UK norms were used. The scaled scores obtained for the 5 subtests were added together, and the result constituted S's score for the purposes of data analysis.

#### Chinese Language Test

The WISC was the last test given to Ss during the test sessions. However, other test scores were obtained for 42 of the Ss in the sample, for the

purpose of testing hypotheses concerning the relationship between EFT scores and ability in written Chinese. If experience with the complex stimuli of the Chinese language does enhance skill in 'dis-embedding', then it is feasible that, the more competent an individual in skills related to language, the greater will be his capacity for finding embedded figures.

Scores on a Chinese Language Test were not obtained directly by E, but were made available by the Research, Testing, and Guidance Centre of the Department of Education in the Government of Hong Kong. These tests were devised by the Education Department with the aim of assisting teachers in the assessment of pupils' progress in Cantonese during the third and fourth forms of primary school. In Hong Kong, these tests are now administered annually to children between the ages of 9 years 4 months and 11 years 3 months, in any school which asks that such an assessment be made. (Parallel tests are also available in English and Arithmetic.)

The actual administration of these tests to Ss in the present sample had taken place six months prior to their participation in the research. It was assumed that this interval would not adversely affect the validity of the scores for present purposes.

The instrument from which these scores are derived is a group test, with a total of 55 items and a time limit of 25 minutes. It is divided into four parts: Part I, Sentence Completion items (1-30); Part II, Sentence Completion with Synonyms (31-47); Part III, Sentence Completion with Antonyms (48-51); and Part IV, Comprehension (52-55). Thus the test focuses on vocabulary and language comprehension, and on the ability to distinguish characters which are closely similar in meaning. All the items use a forced-choice response technique.

The Kuder-Richardson reliability coefficient for this test, computed from



test results in a representative sample of 800 Hong Kong schoolchildren, would be the envy of many a Western psychometrician, at .926. Thus as an indicator of a child's ability to comprehend written Chinese, it is by any standards a very reliable instrument.

Scores were recorded for 21 boys and 21 girls of the present sample. These and all other scores on the tests just described are presented in Appendix I (a).

### Parents' Questionnaire

In order to carry out a test of the 'socialisation hypothesis' of Witkin and his associates (1962; Goodenough & Witkin, 1977), outlined above (Pp. 39ff.) it was necessary to obtain information concerning parents' attitudes to child-rearing, the methods they employed, and the extent to which these could be regarded as fostering or inhibiting the development of 'psychological differentiation'. For this reason, a short questionnaire was compiled, and sent to the parents of all the children in the sample.

Although, as already noted, (on P.63 above), the use of questionnaire methods to collect information about child-rearing practices is open to some criticism, it is difficult to see how any information could have been collected at all in Hong Kong without resort to this method. The problems of gaining access to Chinese homes to undertake a full-scale observational study (which must be the best method but itself has difficulties, e.g. of influencing the family's behaviour), may well be insurmountable. In any case, the use of a questionnaire in the present research does allow some comparisons to be made between the present results and those of other studies.

Initially, I had decided to ask each S to rate the strictness of his or her family home on a three-point scale in a manner similar to Berry (1966), but

in the end this did not seem searching enough. A three-point scale seemed somewhat artificial and over-simplified; and in two societies used in Berry's work, 'permissiveness' and 'strictness' might well have had very different connotations. Interviews with parents were also contemplated, but there are considerable cultural barriers involved in entering Chinese homes and asking questions - and financial barriers in paying interpreters. It seemed more likely that a questionnaire carrying the name of the child's school would receive the cooperation of Hong Kong parents.

The 20 items used were based on the questions of the Home Interview Schedule of the Harvard Laboratory for Research in Instruction, which was employed by Seder (1957) in her research on individual differences in field-dependence-independence. The items chosen were those which seemed to probe most directly into the various factors in child-rearing held by Witkin et al. (1962) to be responsible for individual differences in extent of 'differentiation'. Of particular interest in this respect were (a) the relative frequency of punishment as a measure of parental strictness or harshness; (b) the degree to which the child was allowed to show manifestations of independence; (c) the relative amount of pressure on the child to succeed in work and tests;<sup>1</sup> and (d) the extent to which the 'differentiation' of the child's body-concept was allowed to develop in infancy. The questionnaire was translated into Cantonese by the interpreter and back into English by a staff member of the Hong Kong University Psychology Department. The end-product may be inspected in Appendix III(a).

Evidence concerning socialisation has had a curious fate in cross-cultural research on field-dependence. Although evidence supporting Witkin's 'soc-

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1 Ho (1975) has pointed out that the considerable pressure exerted upon Hong Kong Chinese children to do well in school is not simply a product of Westernisation. Traditional Chinese views emphasise the 'proper development of character' through a good education.



ialisation' hypothesis is less clear-cut than that linking field-dependence scores to other factors, e.g. educational level, many reviewers have regarded the former as crucial, and have almost disregarded everything else. Reactions to Berry's (1966) research are illustrative of this. Berry conducted a number of statistical tests of relationships between field-dependence and a variety of other factors. Of 8 t-tests comparing traditional and transitional samples in test scores (cf. Pp.45-46 above), 8 are significant. Of 22 correlations between years of education and test scores, 18 are significant. But of 20 t-tests comparing the test scores of groups differing in 'severity of socialisation', only 7 are significant. Yet Witkin (1967) reported that '...the impressive differences in child-rearing emphases between the Temne and Eskimo were reflected in differences in perception by members of the two societies' (op. cit., P.240). Similarly Jahoda (1970), reviewing Berry's work, described the logic thus: 'The Temne bring up their children harshly, with a strong emphasis on obedience and conformity; the Eskimo, on the other hand, are highly permissive and seldom use punishment. Accordingly Berry predicted...' - later adding that '...the story has further complications regarding ecology, into which it is not possible to enter' (op. cit., P.9). But the results regarding the influence of socialisation on field-dependence were the weakest part of Berry's findings, and could hardly explain the intercultural differences between Temne and Eskimo. His findings have nevertheless been interpreted as support for the 'differentiation' theory.

To test this theory in Hong Kong, then, the questionnaire described above was sent to the parents of the 9-year-old children, via the children themselves. All were returned promptly within one week as requested.

This questionnaire, and the various intellectual and perceptual tests described earlier, were the methods by which data were gathered concerning

the hypotheses of the present study. The specific hypotheses themselves are described in the next section.

### 3. Specific hypotheses

The principal aim of this piece of research is to pit two hypotheses concerning individual differences in field-dependence against one another: the 'socialisation' hypothesis of Witkin and his collaborators, based on their notions of 'psychological differentiation', and the 'perceptual skill' hypothesis. The reasoning behind this study has been set out in chapter 3. The ideas involved led to the formulation of several specific research hypotheses; these are the following:

- (1) that Ss would perform in a relatively more field-independent manner than comparable American samples on the EFT and RFT. This would be because the effects of intelligence, education, and exposure to the Chinese language would combine to override the effects of socialisation, so boosting scores on field-dependence tests.
- (2) that the high EFT-RFT correlations found in Western studies would not appear in the present sample. Ss would be relatively better at 'overcoming embeddedness' in the visual channel alone, owing to experience with written Chinese; but have no comparable advantage in proprioceptive tasks. Thus while enhanced 'dis-embedding' skills would have diffuse effects on the level of RFT performance, this might not occur to the same degree for each S; skill in one medium would not correlate with skill in another.
- (3) that EFT scores would correlate significantly with Chinese language scores. If the skill assessed by the former is similar to that



assessed by the latter, then the two should be inter-related.

- (4) that the correlation between the EFT and the Matrices test would be significantly higher than the former's correlation with the RFT. Results of cross-cultural research (cf. P.77) have linked scores on the EFT to educational level, with which matrices scores are also associated. The RFT however, tests a different kind of skill. When Ss have a particular kind of experience related to one of the field-dependence tests, the relationship between the latter may break down (cf. P.78 et seq., above). This is predicted in the present study.
- (5) that there will be a significant difference between the sexes in RFT but not in EFT scores. While the commonly-found sex difference in RFT performance might be expected to appear in this sample (for whatever reasons it appears in most others), EFT performance, being influenced by other factors affecting both sexes equally (e.g. learning Chinese in school), will not distinguish between the sexes.
- (6) finally, in addition to the indirect testing of the Witkin 'socialisation' hypothesis underlying all of these hypotheses, the suggestion that there should be a relationship between child-rearing practices and field-dependence is also to be tested more directly by comparing parents' questionnaire responses with children's test scores. While the prediction of Witkin et al. is that those reared more strictly should be more field-dependent than those given more freedom, etc., the expectation of the present study is that no such differences will be found.

The 'fate' of these hypotheses is outlined below.

4. Results

The raw data from all the tests given to the 9-year-old sample are presented in Appendix I (a). All correlations reported below are Spearman rank-order coefficients; differences between means were tested by t-test. Results are presented and discussed as they relate to each of the hypotheses in turn.

Means and standard deviations on the principal tests of the battery are set out in Table 3. The differences between the means of the male and female groups on intelligence measures were not significant; thus in addition to being matched in age, amount and kind of schooling, linguistic and cultural background, these two groups are also matched in intelligence. Results pertaining to this conclusion are presented in Table 4.

Table 3. Means and standard deviations for 9-year-olds

	<u>Boys, n=33:</u>		<u>Girls, n=21:</u>			<u>Boys, n=33:</u>		<u>Girls, n=21:</u>	
	<u><math>\bar{x}</math></u>	<u>S.D.</u>	<u><math>\bar{x}</math></u>	<u>S.D.</u>		<u><math>\bar{x}</math></u>	<u>S.D.</u>	<u><math>\bar{x}</math></u>	<u>S.D.</u>
<u>WISC</u> (Scaled)	58.39	9.5	54.14	10.12	<u>RFT: mean</u> <u>sec/item</u>	73.6	28.06	81.2	32.7
<u>Matrices</u>	36.5	9.11	38.0	8.01	<u>CEFT</u>	20.27	2.29	21.33	2.71
<u>RFT: mean</u> <u>deg error</u>	6.9	5.6	9.3	6.7	<u>Kohs</u>	28.4	6.7	26.7	8.9

Table 4. Matrices and WISC scores for boys and girls

	<u>Boys, n = 33</u>		<u>Girls, n = 21</u>		<u>t</u>	<u>p</u>
	<u><math>\bar{x}</math></u>	<u>S.D.</u>	<u><math>\bar{x}</math></u>	<u>S.D.</u>		
WISC	58.39	9.5	54.14	10.12	0.25	<0.45
Matrices	36.5	9.11	38.0	8.01	-	ns



(a) Cross-cultural comparisons

The first hypothesis of the present research was that 9-year-old Chinese schoolchildren would perform in a more field-independent manner than comparable American groups on the principal tests of the field-dependence dimension. In Table 5, RFT and EFT scores of the Hong Kong sample are compared with those of two Western samples, tested respectively by Witkin, Goodenough, and Karp (1967) and by Witkin et al. (1962; quoted in Witkin, Oltman, Raskin, & Karp, 1971). The comparisons are between American 8- and 10-year-olds and the present 9-year-olds.

Table 5. Comparisons with American scores:  
Schoolchildren

	<u>RFT</u> <sup>1</sup>				<u>EFT</u> <sup>2</sup>			
	M		F		M		F	
	<u><math>\bar{x}</math></u>	<u>N</u>	<u><math>\bar{x}</math></u>	<u>N</u>	<u><math>\bar{x}</math></u>	<u>N</u>	<u><math>\bar{x}</math></u>	<u>N</u>
US 8-year-old <sup>3</sup>	17.1	26	21.5	27				
US 10-year-old <sup>3</sup>	14.8	54	17.7	54	137.0	54	156.0	54
US 10-year-old <sup>4</sup>					117.9	51	126.9	52
HK 9-year-old	6.9	33	9.3	21	73.6	33	81.2	21

In one instance, in which values for standard deviations are available, it is possible to make a statistical comparison of the results. This is between the Witkin et al. (1962) group and the Chinese Ss on the EFT. The

1 Mean degrees of error per trial made by the Ss in the sample.

2 Mean number of seconds to solution per figure.

3 From Witkin, Goodenough, and Karp, 1967.

4 From Witkin et al. (1962). S.Ds. quoted in Witkin et al. (1971).

outcome, in Table 6, gives solid confirmation of what is obvious on inspection: that the 9-year-old Chinese Ss are substantially more field-independent than their American peers.

Table 6. Statistical comparison with US 10-year-olds on EFT.

	$\bar{x}$	S.D.	t	p
Males: US 10-year	117.9	32.9	6.38	$\leftarrow .005$
HK 9-year	73.6	28.06		
Females: US 10-year	126.9	30.1	5.73	$\leftarrow .005$
HK 9-year	81.2	32.7		

It is not easy, in terms of Witkin et al.'s theory, to explain why these Ss, though coming from a culture which would be expected to be more field-dependent (cf. Pp.43ff. above), have performed so effectively on the two perceptual tests. A number of possible explanations can almost certainly be rejected. Clearly, the slight modifications of procedure introduced on the EFT cannot be the cause of the sample differences, for comparable changes were not introduced on the RFT, yet the scores are similarly discrepant. Unfortunately, it seems equally unlikely that experience with Chinese language is the explanation; one would expect then that only EFT performance would be enhanced. Finally, it is probably unsound to argue that the samples differ in intelligence (though it is of course possible): while this might account for differences in EFT scores it would tailor less well with RFT results (since these have been less often linked to intelligence test performance); and in addition the social class backgrounds of the samples are fairly evenly matched (see Witkin et al., 1962, P.32). There can be little doubt that the differences are 'real'.



A possible explanation of the findings of Tables 5 and 6 might be in terms of motivation. Coming from a society in which such a strong accent is placed upon education - a combination of pressures both Chinese and Western - and in which particular importance is attached to doing well on tests, it may be that the motivational level of these Ss was even higher than that of Americans, who are commonly assumed to have a marked 'need for achievement'. Whatever the case, an explanation in terms of the 'differentiation' or 'socialisation' hypotheses would prove inadequate for these findings. The data suggest that some motivational and/or cognitive factors have overridden the possible effective aspects of socialisation, and point to the idea that performance on field-dependence tests cannot be fully explained within the framework proposed by Witkin and his associates.

#### (b) Test intercorrelations

Hypothesis (2) of the present study was that the high EFT-RFT correlations typically found in Western and some other cultures would not be found with the present sample. For the purpose of evaluating this and the next two hypotheses, the intercorrelations of all the tests in the battery are presented in Table 7, P.133.

The second hypothesis is disconfirmed by these results. The findings of other studies have been reproduced with this Chinese sample; indeed some of the figures, such as the EFT-RFT and EFT-Kohs correlations for males (.66 and .65,  $p < .001$ ) and the EFT-RFT, EFT-Kohs, and EFT-CEFT correlations for females (respectively .62, .76 and .74; in each case  $p < .001$ ) are among the highest reported in the literature.

These results offer strong support for the notion of a unitary field-dependence-independence dimension amongst Hong Kong Chinese. As argued by Witkin and his associates, correlations amongst field-dependence tests, and

Table 7. Test intercorrelations: 9-year-olds<sup>1</sup>

	n	RFT	Chinese <sup>2</sup>	WISC	Matrices	Kohs	CEFT
EFT	m 33	.66***	.35	.39*	.43**	.65***	.38*
	f 21	.62***	.14	.35	.53**	.76***	.74***
CEFT	m 33	.42**	.43*	.26	.54***	.53***	
	f 21	.54**	.05	.19	.47**	.60**	
Kohs	m 33	.54***	.12	.24	.47**		
	f 21	.48**	.06	.38*	.46**		
Matrices	m 33	.26	.56**	.47**			
	f 21	.59**	.52**	.37*			
WISC	m 33	.13	.46*				
	f 21	.52**	.49*				
Chinese	m 21	-.22					
	f 19	.56**					

between these and spatial tests, are much higher than correlations between field-dependence and verbal tests. The suggestion that the EFT would break away from the RFT and attach itself to intelligence and Chinese language tests receives little support in these findings.

The pattern of intercorrelations is not, on the other hand, exactly what would be predicted by Witkin and his co-workers. Although the highest correlations are amongst tests of the field-dependence battery (EFT, RFT, CEFT), the influence of some general intellectual factor still seems considerable. All three of these tests are significantly correlated with Matrices performance (with the exception of the RFT for the boys) - and though this test has an acknowledged spatial component, its loading of 'g' is much

1 \*  $p < .05$ ; \*\*  $p < .01$ ; \*\*\*  $p < .001$

2 Correlations with Chinese scores for boys have  $n = 21$  only, for girls  $n = 19$  only.



higher, particularly with younger Ss: '...among children it seems to be mainly a test of general intelligence or deduction, with only a small perceptual-spatial loading' (Vernon, 1969, P.143). The pattern of inter-correlations for the girls is especially puzzling; the RFT is closely associated with WISC and Matrices scores, and, unexpectedly in terms of the present hypothesis, strongly correlated with Chinese language scores. Both Witkin's and the present view would have difficulty explaining this unforeseen and paradoxical finding.

(c) The 'Chinese language hypothesis'

Turning to hypothesis (3), that EFT scores would be significantly related to scores on the Chinese language test, again no clear support is provided by the results of Table 7 for the notion of transfer of practice in 'dis-embedding'. Language scores are, predictably, correlated significantly with WISC and Matrices performance for both sexes. That Chinese scores are tied to RFT scores for girls is difficult to explain in terms of 'transfer' in the absence of a similar correlation for the EFT.

Two possibilities may be considered in relation to the 'transfer' hypothesis. First, Chinese language scores may simply not be true indicators of an S's capacity for reading Chinese. Although the latter ability must be a component of the test, the abilities actually tapped by it may be of a conceptual rather than a perceptual nature. In this case a more rigorous test of the hypothesis might have been conducted by using a mere reading test.

Second however, it may be that skills in 'overcoming embeddedness' are not really developed by reading Chinese, and that the expectation that they might be was unrealistic. Conversations with Chinese individuals have suggested that ideograms are likely to be learned by rote methods in school, and that automatic everyday reading rests upon the perception of ideograms

as 'wholes'. While this may be the case and reading may for the most part contain little that is analogous to 'visual search' or 'stimulus sorting', it is still difficult to see how such characters can be learnt without some analysis and attention to 'parts', fostering analytic perceptual skills. The suggestion, however, receives no support in the present findings. A channel through which language may be more likely to influence skills of analysis in space perception, is that of greater codability amongst space-localising terms, which as Berry (1966) has described is a feature of the Eskimo tongue. In this respect - on the conceptual level - Chinese may be more liable to promote 'synthesis' than 'analysis', given the emphasis in Chinese language and thought on the 'inter-relatedness' of ideas (Chang, 1952).

#### (d) Field-dependence and intelligence scores

Hypothesis (4), following on the two preceding hypotheses, predicted that the correlation between the EFT and the Matrices test would be significantly higher than that between the EFT and the RFT. This was based on the assumption that the EFT would act as a measure of intelligence and of specific visual experiences within the present sample, and that the RFT, being a measure of quite different skills, would be uncorrelated with it. Strictly speaking this hypothesis must be rejected like the previous two, the main reason being the highly significant correlation between the EFT and the RFT. On the other hand, correlations between the EFT and Matrices are significant both for boys and girls (.43 and .53,  $p < .01$ ); and in the case of the girls this correlation is not very far below that between the EFT and the RFT. As indicated above, with a sample of this age the Matrices test may be regarded first and foremost as a test of 'g'. The whole pattern of relationships between the field-dependence tests and the tests of general



and verbal ability is not quite what would be expected on the basis of Witkin et al.'s hypotheses. The only 'uncontaminated' findings are in the low, non-significant correlations between the RFT, WISC, and Matrices for boys. In most other places, the existence of a strong relationship between intellectual abilities and the field-dependence dimension seems readily apparent.

(e) Factor analyses

In an attempt to disentangle this web of overlapping test intercorrelations, and to obtain a clearer picture of the relationships between the various test scores, two further sets of statistical analyses were carried out. First, the intercorrelations depicted in Table 7 were subjected to factor analysis; and second, the correlations between the principal field-dependence tests were calculated with the effects of other variables 'partialled out'. Test correlations were factor-analysed separately for boys and for girls.<sup>1</sup> A principal components analysis of correlations amongst the boys' test scores yielded two factors with eigenvalues greater than 1, after only 4 iterations; the factor matrix so produced is shown in Table 8.

Table 8. Principal components factor  
matrix for Hong Kong boys

	Factor 1	Factor 2	Communality
WISC	-0.51601	-0.26250	0.33517
Matrices	-0.72541	-0.17187	0.55576
RFT	-0.60080	0.63474	0.76385
EFT	-0.74200	0.17466	0.58107
CEFT	-0.68004	0.01283	0.46262
Kohs	-0.67693	0.33016	0.56724
Chinese	-0.64503	-0.74888	0.97688

<sup>1</sup> This analysis and others reported below were carried out using the Statistical Package for the Social Sciences (Nie, Bent, & Hull, 1970).

Factor 1, which in the final principal components solution accounted for 71.7% of the variance, is a common factor with sizeable loadings on all of the tests in the battery. Its highest loadings appear (in descending order of size) on the EFT, Matrices, CEFT, and Kohs, with the lowest loading on the WISC. This appears to be a 'g' or a spatial factor - more probably the former since despite showing consistently higher loadings on the spatial tests than on the WISC, it still loads substantially on the Chinese test and on Matrices. Factor 2 is more difficult to label. Using the Burt-Banks formula (described by Child, 1970) to assess the significance of loadings, only those on the RFT and on the Chinese test emerge as significant, both at the .01 level.<sup>1</sup> However, whereas the loading on the RFT is positive, that on the language test is negative; it is not easy to conceive of a bipolar factor which will neatly encapsulate the differences between these two tests. In an effort to resolve this problem, a Varimax rotation was undertaken, with the results shown in Table 9.

Table 9. Varimax rotated factor matrix  
for Hong Kong boys

	Factor 1	Factor 2
WISC	0.19361	0.54561
Matrices	0.40789	0.62401
RFT	0.87273	-0.04686
EFT	0.65846	0.38406
CEFT	0.50212	0.45880
Kohs	0.71830	0.22648
Chinese	-0.04760	0.98722

The pattern of loadings to have emerged following rotation is slightly

<sup>1</sup> The loadings necessary to achieve significance on factor 2 calculated in this way were: at the 5% level, 0.46669; at the 1% level, 0.35850.



easier to comprehend than was the case with the principal-factor solution. Factor 1 now appears as a 'spatial ability' or 'k' factor - perhaps even 'field-dependence-independence' might be appropriate as a label, since the distinction between the latter and spatial test performance has never been made absolutely clear. Factor 2, with substantial loadings on Chinese, Matrices and the WISC, is presumably some kind of reasoning factor though the juxtaposition of superficially 'verbal' and 'spatial' tests on this factor once again makes it difficult to label. Overall, with a small sample and a small number of variables, it is difficult to draw any firm conclusions from these analyses. The only really safe assertion seems to be that most of the tests share a great deal of common variance, with only the Chinese language test consistently defining a factor distinct from the rest.

Factor analysis of the test intercorrelations for the girls shewed a very similar pattern. The principal components and Varimax solutions are shown in Tables 10 and 11 respectively. The principal components solution in this case required 18 iterations, again producing two factors the first of which,

Table 10. Principal components factor  
matrix for Hong Kong girls

	Factor 1	Factor 2	Communality
WISC	0.45362	0.28206	0.28533
Matrices	0.71155	0.09947	0.51620
RFT	0.78254	0.18594	0.64695
EFT	0.84267	-0.35019	0.83272
CEFT	0.72929	-0.29914	0.62136
Kohs	0.76972	-0.33503	0.70471
Chinese	0.49313	0.86570	0.99261

with an eigenvalue of 3.40205, accounted for 74.0% of the variance. Once again every test in the battery has a significant loading on this factor,

and once again the EFT, CEFT and Kohs blocks are amongst those with the highest loadings. Only the Chinese language test has a significant loading on factor 2. After Varimax rotation, the results are roughly parallel to those obtained for boys, with the field-dependence/spatial tests emerging strongly on the first factor, and the Chinese test emerging extremely strongly on the second. There are differences, however, in that amongst

Table 11. Varimax rotated factor  
matrix, Hong Kong girls

	Factor 1	Factor 2
WISC	0.22897	0.48260
Matrices	0.54468	0.46853
RFT	0.55762	0.57966
EFT	0.89818	0.16125
CEFT	0.77521	0.14286
Kohs	0.82862	0.13454
Chinese	-0.05347	0.99486

girls the RFT has a much more pronounced loading on the second factor (with the same algebraic sign as the loading of this factor on the Chinese test). This reflects the positive and highly significant correlation between RFT and Chinese scores for girls ( $r = .56$ ,  $p < .01$ ), which does not square well with either the hypotheses of the Witkin group or those of the present thesis. The nature of the second factor is difficult to pin down given the somewhat odd assortment of tests which have loadings on it, even taking into account the fact that a broadly similar picture has emerged from the analyses with both male and female groups.

Factor analysis of the test intercorrelations for the sample as a whole tended, not unexpectedly, to yield very similar results to those obtained with boys and girls separately. In addition, when further factor analyses



were undertaken with Chinese test scores excluded (for boys, girls, and the sample as a whole), the result in each case was a single-factor solution. Tables pertaining to these analyses are presented in Appendix II (a).

(f) Partial correlations amongst field-dependence tests

The foregoing analyses have certainly confirmed the strength of the relationships amongst the tests of the field-dependence battery (although scores on the RFT seem less predictable than scores on the other tests). The analyses have not however made it possible to draw any firm conclusions about the extent to which the high intercorrelations of these tests may be a product of a common relationship between each of them and measured intelligence. As a further probe into this issue, the correlations amongst the tests used by Witkin and his associates were computed with the effects of a number of other variables successively 'partialled out'.

Tables 12 and 13 report, for boys and girls respectively, the partial correlation coefficients between each pair of the Witkin et al. tests (EFT, RFT, CEFT) controlling for the other tests of the battery (excluding Chinese) singly and in each possible combination in turn - i.e., producing first-,

Table 12. Partial correlation coefficients: 9-year-old boys

	<u>EFT x RFT</u>			<u>EFT x CEFT</u>			<u>RFT x CEFT</u>		
	r	df	p	r	df	p	r	df	p
Controlling for:									
WISC	.57	30	<.001	.27	30	ns	.49	30	<.01
Matrices	.53	30	<.001	.18	30	ns	.44	30	<.01
Kohs	.37	30	<.05	.11	30	ns	.36	30	<.05
WISC + Mat	.53	29	<.001	.14	29	ns	.44	29	<.01
WISC + Kohs	.37	29	<.05	.01	29	ns	.36	29	<.05
Mat + Kohs	.37	29	<.05	.05	29	ns	.38	29	<.05
WISC, Mat, Kohs	.37	28	<.05	-.00	28	ns	.37	28	<.05

Table 13. Partial correlation coefficients: 9-year-old girls

	<u>EFT x RFT</u>			<u>EFT x CEFT</u>			<u>RFT x CEFT</u>		
	r	df	p	r	df	p	r	df	p
Controlling for:									
WISC	.58	18	$\leq .01$	.72	18	$\leq .001$	.49	18	$\leq .05$
Matrices	.45	18	$\leq .05$	.62	18	$\leq .001$	.30	18	ns
Kohs	.38	18	$\leq .05$	.50	18	$\leq .05$	.27	18	ns
WISC + Mat	.45	17	$\leq .05$	.62	17	$\leq .01$	.32	17	ns
WISC + Kohs	.42	17	$\leq .05$	.50	17	$\leq .05$	.31	17	ns
Mat + Kohs	.32	17	ns	.46	17	$\leq .05$	.17	17	ns
WISC, Mat, Kohs	.36	16	ns	.45	16	$\leq .05$	.21	16	ns

second-, and third-order partial correlations.

The results of Tables 12 and 13 provide a rough indication of the degree to which the tests of field-dependence have an association with each other that is independent of their links with other tests used in the present study. As might be expected, the partial correlations in each case gradually decrease as new control variables are added. Correlations involving the CEFT show a markedly different pattern amongst boys and girls, a result which must certainly devalue the validity of this test for field-dependence research.

The key relationship, given the wide usage of the tests and the part they have played in the work of the Witkin group, is that between the EFT and the RFT.<sup>1</sup> Amongst boys, this correlation remains significant throughout, though the substantial drop in correlations when the Kohs test is controlled for suggests that a proportion of the common variance of these tests can be accounted for in terms of spatial ability. Amongst girls, the EFT-RFT correlation becomes non-significant once the effects of spatial tests are partialled out. Overall, the relationship between the EFT and the RFT seems a

1 For the sample as a whole, this was the only correlation which remained significant after the effects of the WISC, Matrices and Kohs had been partialled out (partial  $r = .34$ ,  $df = 49$ ,  $p \leq .01$ ). Other whole-sample partials are presented in Appendix II (b).



fairly robust one, though considerably less so amongst girls than amongst boys. These results mean that, after all the standard ability tests have been allowed to explain as much as they can of the variance in test scores, there still remains a significant correlation between the two field-dependence tests. Such a finding lends support to the view that the tests measure some ability that is independent of their relation to other ability tests.

(g) Sex differences

The fifth hypothesis of this study predicted that sex differences would appear on the EFT but not on the RFT. The RFT, being a spatial perceptual test demanding certain skills in body-orientation, would ordinarily be found easier by boys than by girls; this was expected with these Ss. But the EFT, being much more subject to the influence of 'g' and of specific visual experiences, would not discriminate between the sexes. The results relevant to this suggestion are contained in Table 14.

<u>Table 14. Sex differences<sup>1</sup></u>					
	n	$\bar{x}$	$\sigma$	t	p
EFT (')	m 33	17.18	6.55	0.90	.15 < p < .20
	f 21	18.94	7.64		
RFT (°)	m 33	55.56	45.1	1.42	.05 < p < .10
	f 21	74.8	54.18		
Kohs	m 33	28.4	6.68	0.80	.20 < p < .25
	f 21	26.7	8.9		

Once again, in statistical terms the hypothesis fails to be confirmed. How-

1 Data for the EFT in this table are presented as the mean total discovery time for all Ss in the sample; data for the RFT, as the average total degrees of error over the whole sample. Kohs blocks data are raw scores.

ever, there is a trend in the expected direction. While scores for the male and female Ss on the EFT and Kohs blocks are fairly close to each other, there is almost a 20-degree difference in scores on the RFT. Sex differences on the first two tests fall far below significance; on the other hand those on the RFT are almost significant at the .05 level. This discrepancy gives some partial support to the hypothesis.

#### (h) Field-dependence and parents' questionnaire responses

The final experimental hypothesis formulated in relation to these results, is the 'socialisation hypothesis' of Witkin and his associates (1962). This holds that field-dependence test scores are determined by an individual's level of 'differentiation', which is in turn a product of factors experienced in child-rearing; in particular the amount of self-assertion and independence allowed a child. If this hypothesis has predictive value, then it should be possible on the basis of what is known about child training, to sort individuals into field-dependent and field-independent groups.

The method by which Witkin et al. established a relationship between child-rearing procedures and test scores, was to administer a battery of perceptual tests to a sample of children, and relate the test results to various indicators of socialisation practices established in interviews with mothers. These indicators were classified as 'Fostering Differentiation' if they were related to a field-independent perceptual performance, a high degree of articulation of the body concept, and an active, analytical approach to the world. By contrast they were classified as 'Inhibiting Differentiation' if they were related to a field-dependent perceptual style, low articulation of body concept, and a global, passive approach to the world.



The parents' questionnaire described on Pp.124-125 above, and reproduced in Appendix IV (a), was intended to assess some of these aspects of socialisation. Two methods of examining its relationship to scores on field-dependence tests were adopted.<sup>1</sup>

First, Ss were categorised according to their parents' responses to Question (3) of the questionnaire, concerning the frequency and severity of punishment. This was taken as the simplest possible measure of the 'permissive-severe' dimension of socialisation. Next, the two most extreme groups on this dimension were selected for analysis of test scores. Means on field-dependence tests were computed and assessed for the significance of any differences.

Second, the whole questionnaire response was carefully read, and Ss were sorted into one of three categories: those whose parents' responses showed a consistent pattern of 'indicators fostering differentiation'; those whose parents' responses showed a consistent pattern of 'indicators inhibiting differentiation'; and those whose parents' responses failed to show any consistent pattern of this kind. This procedure was carried out several months after the testing and was for all practical purposes totally 'blind' - i.e. with no possible awareness of Ss' test scores. The first two groups were then separated out, and their EFT and RFT means compared as in the preceding exercise.

Looking first at the former of these two methods, the analysis of responses to Question (3) of the parents' questionnaire yielded a distribution as presented in Table 15 overleaf. Parents' replies for two of the girls and three of the boys could not be categorised since they gave no direct indic-

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1 Questionnaire responses had of course to be translated into English. This was carried out by another interpreter in Hong Kong University.

ations of the frequency of punishment, using instead such phrases as 'only when he deserves punishment'. Also, as can be observed, there were no Ss whose parents reported using punishment very often.

Table 15. Responses in different 'punishment' categories

	very often	often	some- times	seldom	never
Girls n=19	-	3	10	3	3
Boys n=30	-	3	8	8	11

As a test of the theories of Witkin et al., the 6 Ss (3 boys and 3 girls) in the category 'often' were compared in their test performance with the 14 Ss (11 boys and 3 girls) in the 'very seldom' category. The means of these two groups on the EFT and RFT were then compared by t-test. Results are presented in Table 16.

Table 16. Punishment and 'field-dependence'

		$\bar{x}$	S.D.	t	p
EFT (')	'often'	14.72	10.8	0.73	.20 < p < .25
	'very seldom'	17.55	6.46		
RFT (°)	'often'	67.33	61.2	0.09	ns
	'very seldom'	64.85	53.5		

Neither of these two differences approaches statistical significance; there is no detectable relationship, in these data at least, between the degree of severity of a child's upbringing, as attested by his or her parents, and later performance on the two principal tests of field-dependence. Indeed



in the case of EFT scores, the difference between the means is in the opposite direction to that which would be predicted by the 'socialisation hypothesis': those thought to be punished relatively more often have shorter mean discovery times.

The second test of this hypothesis involved the use of the whole questionnaire. In practice, the majority of the replies proved to be inconsistent in their apparent degree of 'fostering' or of 'inhibiting' the development of differentiation. To some questions, parents responded in a manner suggesting that they encouraged the child's becoming more independent, and nurtured his growth of a separate identity; while to other questions they responded in a manner suggesting the opposite. Most tended to be inconclusive; and all but those from which a clear pattern emerged were discarded for the purposes of this test. Of the 54 questionnaires, 42 were in this category. A total of 7 exhibited a pattern of consistently 'fostering differentiation', and a total of 5 showed a pattern of consistently 'inhibiting differentiation'.

The means on EFT and RFT of the two groups of Ss whose parents replied in this way were then compared as in the previous exercise. The results are shown in Table 17.

Table 17. Questionnaire responses and test scores

		$\bar{x}$	S.D.	t	p
EFT (')	'fostering'	15.86	5.30	1.59	.05 < p < .10
	'inhibiting'	22.18	8.55		
RFT (°)	'fostering'	49.64	51.53	0.97	.15 < p < .20
	'inhibiting'	81.5	62.47		

Once again, neither of the differences between these two sets of means has proved to be significant, giving little backing to the 'socialisation hypothesis'. This is surprising given that the differences between the two groups were quite sharply defined; they represent quite different patterns of upbringing, yet their effects cannot be distinguished in test scores. The group means show, however, that there is a trend in favour of the hypothesis - both differences are in the expected direction and that for the EFT borders on significance.

This apparent support for the hypothesis might however have other explanations than those which would be endorsed by the Witkin group. As Table 18 shows, the two sub-groups under comparison also differ slightly in WISC and Matrices scores - in a manner analogous to that depicted in

Table 18. Questionnaire responses and intelligence

		$\bar{x}$	S.D.	t	p
Matrices	'fostering'	38.25	5.43	1.55	.05 < p < .10
	'inhibiting'	30.8	11.17		
WISC	'fostering'	62.0	2.63	0.71	.20 < p < .25
	'inhibiting'	58.6	2.45		

Table 17. To the extent that these groups differ in field-dependence, they also seem to differ in ability overall. There could of course be a variety of reasons for this; it might reflect minor differences in reactions to the test-taking situation for example, which if partly a function of anxiety level, could well be a product of differences in child training.

A more likely explanation though is in terms of general differences in home background which foster or inhibit the growth of intelligence considered as



a whole. In their work on socialisation, Witkin and his associates have highlighted mother-child interactions - and particularly differences between mothers in restrictiveness, consistency, and warmth - as origins of the later differences between Ss in field-dependence. It is probable, on the other hand, that these contrasts are only part of wider differences between homes in many factors which are linked to general intellectual growth. Such a suggestion is supported by a large body of evidence on the links between cognitive abilities and home environments (e.g. Jencks et al., 1972; Rutter & Madge, 1976; Vernon, 1969). The marginal differences in field-dependence found here, therefore, and possibly the larger differences found in other studies which have been attributed to 'socialisation', most likely reflect the influences of social environment on general intellectual capacity.

The results of this chapter have been rather mixed in their overall implications for the argument between 'differentiation' and 'perceptual skill' accounts of differences in field-dependence scores. To recap, hypothesis (1), on differences between this sample and comparable American groups, gained substantial support, but this could not be assigned causes in specific visual experiences as had been hoped. Hypotheses (2), (3) and (4) were not verified; the field-dependence tests behaved approximately in accordance with the suggestions of Witkin et al.; and while amongst boys there was tentative evidence that field-dependence tests measured something distinct from the general ability domain, the effects of 'g' on field-dependence scores could not be clearly sorted out. The fifth hypothesis, regarding sex differences, went unconfirmed, although there was a trend in the predicted direction. Finally, the Witkin 'socialisation' hypothesis though also not confirmed, received some minimal support in the trends of the data, which could also however be interpreted in terms of intelligence factors. The next chapter describes a further attempt to clarify the nature of the relationship between field-dependence and the factor of 'g'.

# 5

Empirical work in Hong Kong:

University students



## Chapter 5

### Empirical work in Hong Kong: University students

While the inter-correlations of the field-dependence tests reported in chapter 4 are all high and significant, each of the tests showed links of some kind with other instruments which are assumed to be measures of 'g'. A recurring criticism of research work on field-dependence-independence is that the relationships between this allegedly distinct dimension of cognitive functioning, and a variety of other ability factors, have never really been made clear. This is particularly important in view of the claim made by Witkin and his colleagues to the effect that field-dependence tests measure a structural factor of 'psychological differentiation' which is believed to have ramifications throughout personality and cognition. The present thesis contests this claim, and asserts instead that field-dependence tests work principally as measures of general intelligence; and are also indicators of the extent to which individuals have had experience and have acquired skills in particular perceptual-cognitive areas. In this chapter, these suggestions are carried further in an investigation of the specific links of field-dependence amongst groups who differ in experience and skill of kinds associated with perform-

ance on perceptual tests.

A secondary aim of this study was to make a further testing of the Witkin 'socialisation hypothesis', using a method normally employed in cross-cultural research, that of asking Ss themselves to provide background information about their upbringing.

# 1. Description of the sample

## (a) Education in Hong Kong University

The subjects chosen as testees in the second sample were male second year students in the University of Hong Kong, in two groups, one each from the faculties of Science and Arts. There were 20 Ss from the second-year Mathematics and Physics class, and 14 from the second-year class in Chinese Literature.

The testing of University students brought with it a number of advantages, which is presumably why this group is so widely used in research. In the present case, the most important advantage was that all Ss spoke and understood English - the testing medium was English and all tests were administered directly by E. In addition, University students come from the same educational environment and are familiar with the process of taking tests.

Hong Kong has two Universities, Chinese and English; the latter, in which the testing took place, is essentially a British-style institution with classes, curricula, and departments organised along British lines. The medium of instruction is English and many of the staff are British or American expatriates. Competition for entry into the University is very intense; the entrance examinations are generally acknowledged to be at a standard above that of the G.C.E. in England; yet the University, in a colony of approximately four million inhabitants, has under four thousand



students. Only a limited number of government financial awards are made each year. The level of competitiveness in examinations can thus well be imagined, and it seems probable that this is transferred to the testing situation.

The principal disadvantage of testing students from another culture who have been subjected to a rigorous Western-type education, is that the test results might well reflect the effects of education rather than any features of the Ss' culture of origin. Test results emerge, as it were, much as Ss have been taught to produce them. Factor analyses of African ability, for example (as discussed by Vernon, 1969), inevitably yield similar results to those found in the UK, most likely because Ss have been taught in British schools, and given British tests. Statements about relationships between test scores and 'basic' cultural variables should be made with regard to the context of the educational system (in this case, Western) which acts as an intermediary between them.

#### (b) Selection of subjects

In selecting the Ss of the second sample, an attempt was made to assess the impact of different kinds of educational experience on performance in the tests of the battery. The two groups of Ss chosen were intended to represent two 'extremes' of the academic spectrum. Thus a number of effects could be examined together: the respective roles of verbal and perceptual-spatial intelligence; the impact of familiarity with Chinese characters; while the effects of socialisation, if any, could be examined across both groups.

The general ideas behind the choice of these Ss were similar to those involved in the work with the 9-year-old sample. It was expected that the effects of general intelligence would appear as crucial in the determination

of scores on the EFT; that for all Ss, this effect would be so strong that the test would 'detach' itself from the RFT; and that, despite their anticipated inferiority in spatial tests, the Chinese Literature students would perform up to the level of the Mathematicians and Physicists on the EFT. I expected that, where the science students would have spent more time reading English, the literature students would have excessive familiarity with the task of reading Chinese - a form of extended 'practice' which might transfer to 'dis-embedding' skill as suggested in chapter 3. Specific hypotheses relating to these ideas, and to the 'socialisation effects' predicted by Witkin et al., are detailed in section 3 below.

#### (c) Characteristics of Ss tested

The 34 students in the sample (20 Maths & Physics BSc students, 14 Chinese Literature & History BA students) were contacted through the University's Science Society and Chinese Society. The secretaries of these societies were first asked if they would be willing to provide a list of names of potential Ss; and on the basis of these lists, Ss were contacted, asked if they were willing to be tested, and a testing time arranged if they were. None of the Ss were known to E and there was no reason to assume that by adopting the method of telephoning randomly selected individuals from a list of these societies' members, that this would produced any kind of bias in the sample (though it is marginally possible that field-dependent Ss might be more obliging or cooperative). No S had ever taken a course in psychology and all were totally naive as to the purposes and methods of the testing.

The mean age, years of schooling, and number of siblings for Ss in the two groups are presented in Table 19 overleaf, together with the numbers of Ss in each parental occupation group, classified as in the previous sample



(see footnote 3 on page 107). The father of one S was deceased. A check was also made on the length of time for which Ss had been resident in Hong

Table 19. Characteristics of Ss in University group

	<u>Maths/Physics</u> n = 20	<u>Chinese Lit.</u> n = 14
Mean age: years and months	21:7	22:3
Mean No. of years of schooling	14.9	14.07
Mean No. of siblings	3.75	4.0
<u>Father's occupation group</u>		
Unskilled manual	1	1
Semiskilled manual	3	1
Skilled manual	4	2
Lower clerical	4	6
Lower professional	3	3
Upper professional	4	1

Kong. Of the Science sample (which will be referred to as the SCI sample), 18 had always lived in Hong Kong, the other two had been resident for 12 and 17 years respectively. Of the Chinese Literature sample (hereafter to be called the ARTS sample), 11 Ss were lifelong residents of Hong Kong, the remaining three having lived there for 14, 15, and 17 years respectively. No S had spent any lengthy period abroad, with the foregoing exceptions who had of course come from China. Thus it was considered that the cultural environment for these Ss was as uniform as could be expected.

Additional information was also gathered, as will be described below, concerning the level of education of Ss' parents, with the aim of assessing

the role, if any, of parental education as related to field-dependence.

These two groups were therefore roughly matched in age, length of schooling, numbers of siblings, length of stay in Hong Kong, experience of University, and were sampled in similar proportions from the various occupational-class backgrounds.

## 2. The test battery: administration

### (a) Tests used

The tests administered to the Ss just described were the following:

- (1) The Ishihara test;
- (2) Raven's (1956) Progressive Matrices;
- (3) The Witkin (1950) Embedded Figures Test;
- (4) The Portable Rod-and-Frame Test (Oltman, 1968);
- (5) The Wechsler Adult Intelligence Scale (WAIS)(Wechsler, 1958).

In addition, each S was asked to complete a questionnaire concerning his family background; this was administered verbally during the test sessions.

### (b) Test sessions

Testing was arranged by E for a time suitable to S, and was conducted in a large room in the Department of Psychology. E and S faced each other across a table with the test material in between; the RFT was on a separate table. The language medium was English, which all Ss understood well; nevertheless considerable care was taken in explaining the test items and in ensuring that S's response was the one he intended to give. The reliability and validity of tests must fall under such circumstances, a condition which cross-cultural testing cannot unfortunately avoid even when Ss accept the principle of taking tests in the first place. The order of presentation of the tests was as they are listed above, the priority being to retain S's



interest. The Wechsler scale, though time-consuming, contains a considerable variety of items which are found stimulating by most Ss.

### (c) Test procedures

#### The Wechsler Adult Intelligence Scale

The Ishihara, Progressive Matrices, Embedded Figures, and Rod-and-Frame tests were all administered exactly as described in chapter 4 (though of course E's manner was slightly different). The CEFT was not included for obvious reasons; Landolt Rings were also excluded as unnecessary since most Ss knew the strength of their eyesight and all those tested could see the test material clearly. Kohs Block Designs are of course part of the Wechsler test.

The latter test is a standardised IQ test, with two scales, Verbal and Performance, and a total of 11 separate subtests. These are described in Appendix III (b). Apart from the Information subtest, on which minor modifications were introduced (cf. Appendix III (b)), the test was administered as directed in the manual (Wechsler, 1958). Raw scores on the subtests are converted to scaled scores, which are summed to produce 'Verbal', 'Performance', and 'Full Scale' IQs (the latter having a population mean of 100 and S.D of 15). The latter were the data on which results were calculated.

For the most part Ss did not seem to perform adversely owing to their being tested in a foreign language. Their scores would probably have been higher had the test been conducted in Cantonese (which the Digit Span subtest was using my limited knowledge of Cantonese), better still had there been a locally modified and standardised version of the test. However, use of the test in the present research served the purpose of ranking Ss only, and seemed justifiable on those grounds. Comparing the two sub-samples, it may

on the other hand be possible that the Arts group, being perhaps slightly less at home in the English language, were at a greater disadvantage than the Science group. This is taken into account later in assessing the results.

The scores of all the tests in the battery for this sample of Ss are presented in Appendix I (a).

#### Family background questionnaire

As with the questionnaire sent to the parents of the children in the first sample, the aim of this assessment was to obtain information concerning the degree to which an S's relationship with his parents in childhood could be said to have been one which 'fostered or inhibited differentiation'. The general lines along which this inquiry was conducted were again those described in the work of Witkin et al. (1962).

The questionnaire consisted, apart from data questions on age, years of schooling, etc., of a series of 27 questions relating to aspects of socialisation and family background. These were selected with reference to (a) The Harvard Home Interview Schedule, as with the questions asked of parents earlier, drawn from the work of Seder (1957); and (b) some items used by Vernon (1969) in his cross-cultural research on intelligence, in an attempt to explore aspects of home background and how they related to performance on his cognitive tests.

In format, in addition to open-ended and multiple-choice questionnaire items like those used with parents, a number of 7-point rating scales were introduced, on which S was asked to rate himself, his home, or his parents on a variety of adjective dimensions. These were (1) a 'parental aspirations' scale; (2) a scale for rating level of stimulation in the home; (3) parental 'protectiveness versus encouragement'; (4) parental 'permissiveness versus



severity'; (5) a self-rating of 'dependence-independence'; (6) self-rating on the scale 'easy-going - worried'; (7) degree of strictness of father; (8) degree of strictness of mother; and (9) rating self on a scale of 'independence of mind'.

The scales were not presented en bloc, but were scattered amidst the other items of the questionnaire, as can be seen in Appendix IV (b).

Three items of the questionnaire were as mentioned above based on ideas in the work of Vernon (1969). The first two of these concerned the highest level of education achieved by S's mother and father respectively, and the third was the rating scale 'would you say that your home is a very stimulating one?'. It was considered that a relationship might appear between the level of education of Ss' parents and Ss' performance on field-dependence tests. Such a relationship would not, of course, contradict Witkin et al.'s theories; parents who are themselves 'more differentiated' should tend to rear 'more differentiated' children. But if such a relationship was found in the absence of any evidence that it operated through the medium of child-rearing practices, then an alternative explanation might be offered in terms of the presence of a greater variety of rewarding stimuli in the homes of parents who had been more highly educated.

The questionnaire was administered in the testing session following completion of the Ishihara test, prior to Matrices. Ss did not seem to encounter any difficulty with the rating scales; it was thought that the idea of self-ratings might seem very alien to them, but there was no suggestion of this in their responses.

The foregoing are the methods by which data were collected from this sample of students. In the next section, specific test hypotheses are pinned down.

### 3. Specific hypotheses

This piece of research is essentially an extension of that reported in chapter 4, and has a similar overall aim of contrasting 'differentiation' and 'perceptual skill' accounts of field-dependence test performance. The experimental hypotheses are:

- (1) that Ss in this sample will perform in a relatively more field-independent manner than their American counterparts on the EFT and RFT. Following the parallel hypothesis in the preceding chapter, this reflects the view that the principal determinants of field-dependence scores are intelligence level, education, motivation, and specific perceptual experiences.
- (2) that the high EFT-RFT correlations found in other samples would not be found in Hong Kong; since these Ss would perform better at 'dis-embedding' tasks in a purely visual medium than at those involving a proprioceptive medium, and the EFT would be more closely related to intelligence test scores than would the RFT.
- (3) that correlations between the EFT and the WAIS, and between the EFT and Raven's Matrices, would be significantly higher than those between the EFT and the RFT; EFT scores would be more closely related to the intelligence measures of the battery.
- (4) that while differences between the SCI and ARTS groups would be significant on the RFT, the ARTS group having larger error scores, no such differences would be found on the EFT - reflecting the idea that Chinese language experience would tend to bring EFT scores to a more uniform level, while RFT scores, being more closely related to a spatial factor, would be more accurate in the SCI group.
- (5) the fifth hypothesis is again the Witkin 'socialisation hypothesis'



- that there should be a relationship between Ss' family experiences and their field-dependence test scores. In the present context, this was tested by sorting Ss, on the basis of their self-ratings, into groups whose upbringing would be expected to 'foster or inhibit the development of differentiation', and testing the significance of any differences in field-dependence.
- (6) that there would be a relationship between levels of education of Ss' parents and Ss' EFT scores, those with parents who had higher levels of education (in terms of years of schooling) being more field-independent. This is an attempt to find support for the suggestion that 'stimulation in the home' (which might be related to parental education level) would be correlated with perceptual skills amongst Ss in the sample.

Results pertaining to these hypotheses are discussed in the order in which the hypotheses have been presented above.

#### 4. Results

Raw data for the sample are presented in Appendix I (a). All correlation coefficients are Spearman rs. For making comparisons between means, t-tests and Mann-Whitney U tests were used. Table 20 presents sample means and SDs.

Table 20. Means and standard deviations, University sample

	<u>SCI Ss, n=20</u>		<u>ARTS Ss, n=14</u>	
	<u><math>\bar{x}</math></u>	<u>S.D.</u>	<u><math>\bar{x}</math></u>	<u>S.D.</u>
WAIS	122.4	7.37	115.9	4.44
Matrices	51.85	6.6	43.5	8.04
EFT (sec/trial)	20.23	15.03	37.63	24.46
RFT ( $^{\circ}$ error/trial)	2.48	2.06	4.47	4.7

No attempt was made, in the end, to match these two groups in intelligence. It may be that there are systematic differences between students of the sciences and of the arts in performance on tests of 'convergent thinking' (Hudson, 1966). In any case the primary focus of this study is on patterns of scoring within groups.

(a) Comparisons with American scores

The first experimental hypothesis stated that these Ss, like the 9-year-old children of the first sample, would perform in a more field-independent manner on perceptual tests than comparable American samples. Data relevant to this hypothesis are presented in Table 21. The American scores are those presented by Okonji (1969), who made a similar comparison between his Nigerian Ss and New York males.

<u>Table 21. Comparisons with US scores, University sample</u>					
	n	$\bar{x}$	S.D.	t	p
<u>RFT</u>					
College males (New York)	34	5.61	3.72		
HKU: SCI	20	2.48	2.06	3.8	$\leq .005$
HKU: ARTS	14	4.47	4.7	0.83	$.20 \leq p \leq .25$
<u>EFT</u>					
College males (New York)	34	47.99	23.88		
HKU: SCI	20	20.23	15.03	4.67	$\leq .005$
HKU: ARTS	14	37.63	24.46	1.36	$.05 \leq p \leq .10$

The New York sample also consisted of undergraduates. EFT data in the table are mean discovery times per figure over all Ss in the sample; RFT



scores are expressed as mean degrees of error per trial over all Ss. The  $t$  and  $p$  values alongside the Hong Kong groups are the results of statistical comparisons between the groups and the New York group. Once again the differences are striking. They are highly significant in the case of the Hong Kong science students, and are in the anticipated direction (though falling just short of significance) for the arts students. As was the case with the earlier sample, these differences are difficult to account for in terms of a 'socialisation' hypothesis regarding individual differences in field-dependence. In the absence of further information concerning the American sample, it cannot of course be concluded that these results are not the product of differences in intelligence; but it is likely that the two groups are of a similar level of ability. Whatever the case, the high degree of field-independence of the Hong Kong Ss is not easy to explain against a background of child-rearing practices which on the assumptions of Witkin et al. would be likely to produce more field-dependent individuals.

#### (b) Test intercorrelations

Hypotheses (2) and (3) of the present study suggested that the normally high EFT-RFT correlations found in Western cultural groups would break down in the present sample; and that the EFT would be more closely associated with the intelligence measures in the battery. Intercorrelations amongst the various tests of the battery are given in Table 22 overleaf.

Hypothesis (2) is partly supported by the evidence of Table 22. Although amongst the ARTS sample the EFT-RFT correlation is .63 ( $p < .01$ ), and the 'standard' relationship obtains, for the SCI group the two tests are uncorrelated ( $r = .09$ ). In fact, amongst the Ss of this sample, it is difficult to identify what the RFT is measuring, as its correlations with all the other tests are uniformly low and non-significant. These results

are in marked contrast to those found with 9-year-olds, in which the EFT-RFT relationship held up; and bear a much closer resemblance to those of Bergman and Engelbrektson (1973; cf. Pp.79-80 above) whose factor-analytic study found the RFT to load a factor distinct from all the other tests in their battery. With this sample also, the unity of the field-dependence-independence dimension is called into question. Further, while

Table 22. Test intercorrelations: University Ss<sup>1</sup>

	n	RFT	Matrices	WAIS Perf.	WAIS Verbal	WAIS <sup>2</sup> Full scale
EFT	SCI 20	.09	.32	.37	.56**	.63***
	ARTS 14	.63**	.47*	.29	.58*	.87***
WAIS Full Scale	SCI 20	-.01	.44*	.81***	.68***	
	ARTS 14	.66**	.59**	.37	.74**	
WAIS Verbal	SCI 20	-.06	.23	.20		
	ARTS 14	.17	.38	-.29		
WAIS Perf.	SCI 20	-.10	.43*			
	ARTS 14	.41	.33			
Matrices	SCI 20	.10				
	ARTS 14	.53*				

it may be objected that correlations between the EFT and RFT are high and significant amongst the ARTS Ss, in this sample EFT-WAIS (Full scale) correlations are even higher at .87 ( $p < .001$ ). This pattern in fact occurs in both of these groups, as forecast by hypothesis (3).

1 \*  $p < .05$ ; \*\*  $p < .01$ ; \*\*\*  $p < .001$ .

2 Unfortunately WAIS data are available for 12 ARTS Ss only.



This, the corollary of hypothesis (2), suggested that correlations between the EFT and the WAIS and Matrices tests would be significantly higher than those between the EFT and the RFT. Though the evidence is not wholly supportive, in three comparisons out of four the differences are in the expected direction, and in one of these, EFT-WAIS as against EFT-RFT correlations for the science students, the difference is significant ( $z = 2.093$ , one-tailed,  $p < .02$ ).

Amongst Ss in this sample then, there is a tendency for the EFT to have closer relationships on the whole with intelligence measures than with its expected correlate, the RFT. Furthermore, for both groups such relationships are consistently higher with the Verbal than with the Performance scale of the WAIS. This raises a point often dealt with rather gingerly by Witkin and his associates. Though they maintain that their 'perceptual index' - derived from the field-dependence tests - is more closely related to spatial ('intellectual') than to verbal tests, occasionally the reverse is to be found: witness their own reported correlation of .56 ( $p < .05$ ) between field-dependence and Stanford-Binet Vocabulary scores with 24 Ss (Witkin et al., 1962, P.190), or any of the similar findings obtained by other authors, discussed earlier (Pp.74 ff. above).

These results constitute a cogent criticism of the 'differentiation' hypothesis put forward by Witkin and his colleagues, and suggest that the determination of scores on a test such as the EFT is a complex process involving many variables, which cannot be subsumed under a theory taking socialisation as its main independent variable, and relegating other factors to a secondary place.

### (c) Further analyses of test intercorrelations

To investigate more fully the nature of the relationships between test scores

amongst the University Ss, the intercorrelation matrix shown in Table 22 (page 163) was factor-analysed. Tables 23 to 26 report the results of this analysis separately for the arts and science groups.

Taking the science group first, the principal factor matrix is shown in Table 23. This result emerged following 23 iterations; factor 1, with an

Table 23. Principal components factor matrix  
for University science sample

	Factor 1	Factor 2	Communality
WAIS Verbal	-0.46543	0.16850	0.24502
WAIS Perf.	-0.76590	-0.33551	0.69918
RFT	-0.18869	-0.15430	0.05941
EFT	-0.91717	0.38617	0.99033
Matrices	-0.37181	-0.39410	0.29355

eigenvalue of 1.81828, accounted for 79.5% of the variance; factor 2, with an eigenvalue of 0.46921, accounted for only 20.5%. None of the individual loadings on factor 2 is significant. Factor 1 is fairly readily identifiable as a spatial factor, with high loadings on WAIS Performance and on the EFT. Factor 2 on the other hand is something of a puzzle, and cannot be labelled very clearly. The rotated factor matrix is shown in Table 24, but rather

Table 24. Varimax rotated factor matrix,  
University science sample

	Factor 1	Factor 2
WAIS Verbal	0.47669	0.13336
WAIS Perf.	0.42830	0.71815
RFT	0.06388	0.23522
EFT	0.97081	0.21875
Matrices	0.07354	0.53679



than making the pattern of loadings easier to interpret it makes it less so. The EFT and WAIS tests still have the highest loadings on factor 1, but factor 2 is defined more strongly with significant loadings on WAIS Performance and Matrices. Given the combinations of tests loading on each of these factors - the EFT with WAIS Verbal scales on factor 1, and WAIS Performance with Matrices (a 'g' or reasoning test) on factor 2 - it is difficult to assess exactly what the factors are. The position of the RFT is particularly difficult to understand; its communality is extremely low and it has little variance in common with the other tests. Seldom can two tests allegedly measuring the same dimension have emerged from an analysis with so little common ground as have the EFT and the RFT with this sample of Ss.

Tables 25 and 26 present the principal factor and rotated factor matrices

Table 25. Principal components factor matrix  
for University arts sample

	Factor 1	Factor 2	Communality
WAIS Verbal	-0.39292	0.88827	0.94341
WAIS Perf.	-0.81000	-0.35813	0.78435
RFT	-0.79135	-0.20920	0.67001
EFT	-0.92393	0.12344	0.86889
Matrices	-0.77868	-0.00954	0.60644

Table 26. Varimax rotated factor matrix,  
University arts sample

	Factor 1	Factor 2
WAIS Verbal	0.08938	0.96717
WAIS Perf.	0.88189	-0.08134
RFT	0.81667	0.05388
EFT	0.83643	0.41143
Matrices	0.74113	0.23910

for the arts student group. Results here present a more familiar and more easily interpreted pattern than was evident amongst the science Ss. Again the first factor, with an eigenvalue of 2.89673, accounted for a very large share of the variance - 74.8%, while factor 2 (eigenvalue = 0.97637) accounted for 25.2%. In both principal factor and rotated solutions, the EFT, RFT, WAIS Performance tests and Matrices have high loadings on the first factor, and WAIS Verbal tests have high loadings on the second. These seem to be the normal 'spatial' and 'verbal' factors which customarily appear in factor analyses of ability tests; and as would be predicted by Witkin and his associates, both the field-dependence tests behave in a similar manner in having very high loadings on the first factor and low-to-negligible loadings on the second.

The relationship between the EFT and the RFT seems as compact amongst the arts group of students as it was fragmentary amongst the science group. As a further check on this, partial correlation coefficients between the EFT and RFT amongst the arts group were computed, with the various other tests of the battery controlled in each of the several combinations possible. The partial correlations so obtained are set out in Table 27. These results

Table 27. Partial correlations between EFT and RFT  
amongst University arts students

Controlling for:	r	df	p
WAIS Verbal	.91	9	<.001
WAIS Performance	.70	9	<.01
Matrices	.77	9	<.01
WAIS Verbal + Performance	.82	8	<.01
WAIS Verbal + Matrices	.87	8	<.001
WAIS Performance + Matrices	.70	8	<.05
WAIS Verbal, Perf., Matrices	.82	7	<.01

once again attest to the cohesiveness of the field-dependence tests and give



additional weight to the proposition that the relationship between them is not simply a product of their separate associations with measures of intelligence.

This finding raises a general point about the interpretation of the results that have been reported so far. Putting together the various pieces of statistical evidence that have just been outlined - test intercorrelations, factor analyses, and partial correlations between the EFT and RFT - it is still difficult to arrive at any firm statements concerning the extent to which field-dependence-independence can be said to be a dimension separate from those of general or spatial ability. The available results are contradictory at a number of crucial points. First, while amongst one of the sub-samples described here the frequently-found relationship between the two principal field-dependence tests emerged yet again, in the other it failed to appear: the EFT was significantly correlated with intelligence (and in particular, with verbal IQ), and RFT scores were more or less orthogonal to those on every other test in the battery. Second, in each of the factor analyses reported here (and in the previous chapter), the EFT (and usually the RFT also) has exhibited high loadings on the same factor as that on which most tests of 'g' or 'k' have been loaded. In no instance have the field-dependence tests yielded a separate factor of their own. Yet third, in the majority of cases EFT-RFT correlations have remained significant after the effects of other ability variables have been partialled out, indicating that some of the variance in scores on these tests cannot be attributed to variations that would be assessed by ability tests. If field-dependence-independence is a distinct dimension of cognitive functioning, then it is certainly one that is exceedingly difficult to detect.

#### (d) Inter-group differences

Concerning differences between the two groups of Ss - students of science

and students of literature - in terms of levels of test performance, hypothesis (4) predicted that while differences between the two groups would be significant on the RFT, EFT differences if any would be non-significant. This hypothesis was a further derivative of the proposition that 'dis-embedding' skills, particularly in the visual medium, would be enhanced by the reading of Chinese. However as Table 28 shows the results afforded no support for this suggestion, and were in fact almost the reverse of it.

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Table 28. Group differences in EFT and RFT scores

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	n	$\bar{x}$	S.D.	t	p
EFT <sup>1</sup>	SCI 20	20.23	15.03	2.57	<.01
	ARTS 14	37.63	24.46		
RFT <sup>2</sup>	SCI 20	2.48	2.06	1.69	<.05
	ARTS 14	4.47	4.7		

---

The most likely explanation of these differences is in terms of general intelligence, or some other broad-based skill or test-taking ability. The WAIS and Matrices means are both higher for the SCI sample, and as has been suggested by the results both of this and a great deal of other research, field-dependence test performance is strongly related to all-round intellectual ability.

The above results, whatever their cause, certainly do not favour the notion of 'transfer' between the deciphering of Chinese characters and the conquering of 'embeddedness' in perception. It may of course be that the assumpt-

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1 Mean time (in seconds) per figure for the group as a whole.

2 Mean no. of degrees of error per trial for the group as a whole.



ion that students of Chinese literature would spend more time reading Chinese than would students of Western sciences, and would thus acquire the associated analytic skills, is ill-founded. More likely, however, is the suggestion that the reading of Chinese does not, as first envisaged, involve the extraction of perceptual elements from their embedding contexts in a manner akin to the EFT. A factor similar to 'embeddedness' may be a feature of Chinese ideograms; and the early learning of the language may necessitate a high level of discrimination skill; however the normal reading of Chinese proceeds much as the reading of any other language, in the automatic perception of easily recognised units. Thus the present results have failed to show any effects of the perceptual skill of reading Chinese on other tests of perceptual skill.

(e) Self-ratings of socialisation and field-dependence

The fifth hypothesis of this study was concerned with relationships between family background and Ss' levels of field-dependence-independence. This was a further test of the Witkin et al. (1962) 'socialisation hypothesis', specifically in relation to Ss' own reports on the frequency with which they were punished by their parents when young, and in terms of their home background described on a number of rating scales.

The method used to test the first part of this hypothesis was identical to that employed in the analysis of parents' questionnaires for the first group of Ss (cf. P.143 et seq., above). However in this case the judgments of frequency of punishment were supplied by Ss themselves. Ss were asked how often, in infancy, their parents had been likely to punish them; and were requested to record this on a scale of frequencies, 'very often - often - sometimes - seldom - very seldom'. Responses were then sorted into 'punishment' categories and examined in relation to Ss' field-dependence test

scores. However, in this sample, Ss confined themselves for the most part to the categories 'sometimes' and 'very seldom'. (It had been hoped that Ss would spread themselves out much more, so providing 'extreme' groups.) A significance test was carried out between the test means of these two groups, those who had 'sometimes' and those who had 'very seldom' received punishment. The largely negative results of this can be seen in Table 29.

Table 29. Frequency of punishment and field-dependence: University sample

	<u>EFT</u> (')				<u>RFT</u> (°)			
	$\bar{x}$	S.D.	$t^1$	p	$\bar{x}$	S.D.	$t^1$	p
<u>SCI</u>								
'sometimes' (n=8)	5.89	4.7	1.3	<.15	21.87	16.82	0.81	<.25
'very seldom' (n=4)	2.72	0.91			14.62	6.6	-	
<u>ARTS</u>								
'sometimes' (n=6)	8.8	6.15	0.4	<.35	33.25	27.66	0.3	<.40
'very seldom' (n=6)	7.58	4.05			41.73	17.21		

The procedure, given the spread of the groups and the small numbers, does not unfortunately permit a very satisfactory testing of Witkin's hypothesis. Given that there is no large 'rearing' gap between the groups it is not surprising that no differences have emerged. Similar difficulties were encountered by Berry (1966) who asked his Ss to rate the strictness of their upbringing on a three-point scale, 'very strict, fairly strict, not so strict'. Distributions of responses amongst his samples were very uneven, but nevertheless some of the differences between 'strictness' groups in

1 From the table it can be seen that the SDs of groups being compared are in some cases quite disparate. This was unavoidable given the spread of responses and occurs in a number of the significance tests to follow. Edwards (1967) has pointed out that the t-test is fairly 'robust', i.e. relatively insensitive to even very marked violations of its assumptions.



EFT and RFT scores proved significant. Looked at in this way the above test of the 'socialisation hypothesis' is as fair as Berry's, yet no differences have appeared between the groups. It is difficult to avoid the conclusion that the efficacy of the hypothesis in predicting differences between individuals in their levels of field-dependence is somewhat open to doubt.

The second part of this hypothesis was concerned with the possible effects of a number of home background variables, including socialisation, on field-dependence scores. This involved the use of a number of 7-point rating scales, which have been described above (Pp.157-158). Each of these scales was first of all recast as a scale from +3 to -3, in which the positive signs were indicative of factors associated with field-independence, e.g. a more permissive and stimulating upbringing, and the negative signs represented factors associated with field-dependence, e.g. a more strict or more protective upbringing. The numbers of Ss placing themselves at the different points of these scales were then summed and tabulated; the resultant distributions are depicted in Table 30 overleaf.

In order to test hypothesis (5), a series of comparisons were made - on EFT and RFT scores - between those groups of Ss at the opposite ends of each scale. Any effects of home background variables would then be reflected in differences between the means of the two groups in each comparison. The expectations of the hypotheses of Witkin and his associates are that those rating themselves as having stricter fathers and mothers, as having been more protected and dealt with more severely in childhood, and as being more dependent on others in general, would be more field-dependent on the EFT and the RFT. The expectations of the present thesis were that those rating their homes as more stimulating, and their parents' aspirations for them as high, would be more field-independent.

Table 30. Self-ratings on home background variables

		+3	+2	+1	0	-1	-2	-3
Parent aspirations	SCI	3	8	2	4	1	1	-
	ARTS	1	5	4	1	-	-	2
Home stimulation	SCI	2	5	-	5	1	5	2
	ARTS	2	2	4	2	1	1	2
Protective-encouraging	SCI	1	4	2	6	1	6	-
	ARTS	1	2	1	5	2	2	1
Permissive-severe	SCI	3	4	2	5	6	-	-
	ARTS	2	6	-	5	1	1	-
Independence rating	SCI	2	6	3	3	4	2	-
	ARTS	2	5	3	1	1	2	-
Father strictness	SCI	2	6	2	1	2	3	1
	ARTS	3	6	-	2	1	2	-
Mother strictness	SCI	3	5	5	3	3	-	1
	ARTS	3	3	3	3	-	2	-

A major difficulty which emerged in this analysis, however, was that once again the Ss were unevenly distributed on many of the scales; in a number of cases the categories at the ends of the scales were either empty or contained only very small numbers, making 'extreme-group' comparisons difficult or impossible. Accordingly, each scale was treated independently and a comparison simply made between those towards opposite ends of it, regardless of the distance separating them. Thus individuals in adjacent categories were combined for the purpose of making criterion groups, and tests of significance carried out on the EFT and RFT means of these groups. Table 31 (overleaf) presents the results of this analysis. One comparison (that for the ARTS Ss on 'Parent aspirations') could not be made owing to the



distribution of the responses. Of 26 comparisons shown in the table, only two are significant in the direction which would be predicted by the Witkin et al. hypotheses. Of the remainder, approximately half are in the expected direction but are non-significant; the other half are in the opposite direction.

Table 31. Self-ratings in relation to field-dependence scores<sup>1</sup>

	<u>EFT</u>		<u>RFT</u>	
	t or U <sup>2</sup>	p	t or U	p
<u>SCI</u>				
Parent aspirations	1.64+	.05 < p < .10	2.63+	p < .01
Home stimulation	1.00+	.15 < p < .20	0.23-	.40 < p < .45
Protective-encouraging	0.27+	.35 < p < .40	0.13-	.40 < p < .45
Permissive-severe	0.75+	.20 < p < .25	0.59-	.25 < p < .30
Independence rating	0.63-	.25 < p < .30	0.47+	.25 < p < .30
Father strictness	0.30-	.35 < p < .40	3.15+	p < .01
Mother strictness	0.50-	.30 < p < .35	1.21-	.10 < p < .15
<u>ARTS</u>				
Home stimulation*	7-	.44	6-	.34
Protective-encouraging*	7-	.27	.5-	.14
Permissive-severe	0.03-	ns	0.09+	ns
Independence rating	1.08+	.15 < p < .20	0.63+	.25 < p < .30
Father strictness*	17+	ns	18-	ns
Mother strictness	0.12+	ns	0.11+	ns

On the whole therefore, the evidence does not give a great deal of support

1 In this table, a + sign beside a statistic indicates that the observed difference is in the direction which would be predicted by Witkin et al.; a - sign indicates that the difference is in the opposite direction.

2 Where possible, t-tests were used. However in a number of cases (those marked \*) in which the numbers were very small and the variances somewhat heterogeneous, Mann-Whitney U-tests were carried out instead. Probability values were obtained from tables in Siegel (1956).

to the 'socialisation' hypothesis. In fact only one of the significant findings - of a relationship between 'father strictness' and RFT scores amongst Ss of the SCI sample - is properly speaking a prediction of the kind that would be made by Witkin et al.; though the finding on 'parent aspirations' for this group could also, by a chain of reasoning, be linked to their theoretical approach (parents with higher aspirations for their children give them more encouragement, and allow them more freedom for self-expression, etc.). That children of parents who have higher aspirations for their offspring do better on mental tests would however be predicted by almost any theory of child development, and cannot really be taken as a finding specifically supportive of the Witkin group. In the present context this finding relates more closely to the suggestions of Vernon (1969) on aspects of the social environment which help to promote cognitive growth. In addition, the finding of a relationship between 'father strictness' and field-dependence scores is somewhat puzzling in the absence of any relationships between test scores and 'mother strictness'. It is the latter variable which has been held responsible by Witkin et al. for individual differences in field-dependence. While adventurous anthropological theorising might suggest that in the Chinese family the father's role will be more important in this respect, the fact remains that the burden of child care still rests with the mother. Hypothesis (5) then, receives only the most minimal degree of support from this result on 'father strictness'.

(f) Parents' education level and field-dependence

The last hypothesis under test in the present study was that Ss whose parents had had higher levels of education (in terms of years of schooling) would be more field-independent on the EFT and RFT than Ss whose parents had had fewer years of schooling. In order to test this hypothesis, the



information provided by Ss concerning their parents' schooling was used to sort parents into two groups differing in their experience of education. In both groups, as was inevitable given the privileged status of the male in Chinese society, fathers had had longer periods of schooling than mothers. Thus two groups of Ss were obtained according to the following pattern:

(a) those whose fathers' had had three or more years of secondary schooling, and whose mothers had been to primary school - designated the 'high' group; and (b) those whose fathers had had some primary schooling, and whose mothers had not been to school at all - designated the 'low' group. These two groups were then compared in EFT and RFT scores, separately for both SCI and ARTS samples. The results are presented in Table 32.

Table 32. Parental education level and test scores

		<u>EFT</u> <sup>1</sup>				<u>RFT</u> <sup>2</sup>			
		x	S.D.	t	p	x	S.D.	t	p
<u>SCI</u>									
'High' group	n=6	4.33	1.39	1.87	<.05	12.33	5.72	1.28	<.15
'Low' group	n=6	7.14	3.38			24.75	23.03		
<u>ARTS</u>									
'High' group	n=5	5.13	2.01	1.07	<.20	18.87	12.64	0.65	<.30
'Low' group	n=4	9.21	7.25			35.4	48.73		

These findings are in general accord with the hypothesis: Ss whose parents have had higher levels of schooling are more field-independent on both the EFT and RFT amongst both sub-samples, though only the EFT result for the SCI

1 Mean total discovery time (') for the group.

2 Mean total error (°) for the group.

group reaches significance.

This last finding cannot be attributed solely to intellectual factors: a comparison between the WAIS means of the 'high' and 'low' SCI groups was non-significant ( $t = 0.80$ ,  $p < .25$ ). Nor, it seems to me, can it be attributed to differences in the extent to which their parents have 'fostered differentiation' in these Ss: that a few years of schooling will alter mother-infant interactions of the kind described by the Witkin group seems unlikely. The most plausible account of these trends would probably be in terms of the suggestion that the home environment is different for the two groups of Ss: in the amounts and kinds of stimulation available, in activity level, and in the degree of motivation to succeed which is inculcated in the child. However, only research on a much larger scale would make possible a choice between these alternative explanations.

The results described in the present chapter have presented a somewhat different pattern to those outlined in chapter 4, and have cast some doubt on the validity of the propositions of the Witkin group. In the following closing section of this chapter, the potential implications of the results overall for the approach of the Witkin group are drawn out.

##### 5. A review of findings in Hong Kong

The general intentions of the 'cross-cultural' studies described in this and in the preceding chapter were to test the view that field-dependence test scores reflected an individual's general intellectual capacities, and his possession of particular perceptual skills, rather than his level of 'psychological differentiation' conceived as an organismic property having ramifications throughout cognition and personality. This was done by selecting a subject sample in which the main predictors of 'differentiation level' from the Witkin standpoint - socialisation processes - were thought to have



a specific set of implications for field-dependence scores; and in which other kinds of experience thought to be relevant to field-dependence test performance - in this case the visual experience of reading Chinese - were expected to have a contrary set of implications.

Test results with the school sample, reported in chapter 4, were in broad concordance with the results of many studies using the EFT, RFT, and related tests, giving support to the Witkin et al. position. Some of the inter-correlations reported in the present chapter also favoured this approach. Little support was found, with the Ss of either the school or the university group, for the suggestion of a link between field-dependence (EFT) performance and familiarity or skill with Chinese; some reservations were however expressed about the manner in which this hypothesis had to be tested. Thus in some respects the findings of the foregoing two studies add more weight to the standard view of field-dependence-independence than to any alternative view founded in a 'skills' approach.

In other respects however, the findings that have been recited here are damaging to, rather than supportive of, the view that field-dependence tests measure 'differentiation'. The levels of field-independence manifested in the two samples studied were very much higher than would be expected on the grounds of a 'socialisation' hypothesis. Also at variance with this hypothesis was the absence of significant sex differences in field-dependence test scores amongst the 9-year-olds. Little evidence could be unearthed of any effects of socialisation on individual differences in field-dependence. Finally, in some instances it seemed to be the case that field-dependence-independence is much more closely related to intelligence test performance than Witkin and his associates will admit.

The curious outcome of these studies, taken together, therefore seems to be that, although the findings are generally unsupportive of the 'perceptual

skills' approach to field-dependence test performance, they are equally at odds with the notion that the EFT and the RFT measure a central, independent feature of an individual's functioning which cuts across both personality and intellectual processes. The results suggest instead that the main difference between individuals who differ in their abilities on the EFT and RFT is one of general intellectual capacity; and that socialisation has little effect on these differences other than through those channels by which it influences intellectual development as a whole. Overall therefore, while the specific 'alternative' hypotheses entertained by these two chapters have gone unconfirmed, the underlying propositions made in this thesis - concerning the relationships between field-dependence and differentiation - have been strengthened by these results. In the next two chapters the relationships between field-dependence and intellectual functioning are investigated again, in the context of a study of the links between field-dependence and other cognitive styles.



# 6

Field-dependence-independence and  
other cognitive styles: the background

## Chapter 6

### Field-dependence-independence and other cognitive styles:

#### the background

The disquiet that has been expressed by a number of authors (e.g. Kogan, 1973; Wachtel, 1972; Vernon, 1969, 1972) about the frequently-reported close links between field-dependence scores and measures of general ability, could only be intensified by some of the results of chapters 4 and 5. The field-dependence-independence dimension has been recognised, amongst all cognitive styles, as the one with the strongest ties to the ability domain. The question of how much variance in their test scores would remain after the partialling out of intelligence factors, is one that should be far more perturbing to Witkin and his associates than their most recent writings would testify. From the point of view of examining the relationship between field-dependence and the differentiation process of which it is presumed to be an index, it is essential to clarify the nature of the associations between field-dependence tests, intelligence tests, and other cognitive style measures having apparent overlaps with 'mode of field approach'.

In this chapter and the next, some work is considered which focuses on this question; the present chapter surveying some existing results, and the ensuing one outlining an empirical study designed to locate the field-depen-



dence dimension in the network of other cognitive styles. The other dimensions of cognition on which this work is focused are intellectual ability; the cognitive style of reflection-impulsivity; and the capacity for divergent thinking, which is held to be a major component of creativity.

The inclusion of an intelligence test in the study to be reported in the next chapter reflects the expectation that there will be a close association between performance on such a test, and field-dependence as measured by the EFT. The other two dimensions are included chiefly in the light of their apparent overlap with the field-dependence-independence dimension. Evidence from a number of sources suggests that similar kinds of attentional control processes may be involved in effective performance on the prime measures of each of these dimensions (i.e. of field-dependence, reflection-impulsivity, and divergent thinking).

A second factor linking these different cognitive styles is that each has been shown to have links of some kind to achievement in school or thereafter. Evidence suggesting that individuals who differ in level of field-dependence, also perform differentially in various academic fields has been reviewed by Witkin (1972, 1977; see chapter 2, Pp.51-52, above).

Obviously, similar findings could be recited regarding intelligence - indeed observed differences in performance and preference between field-dependent and field-independent Ss may be a product of these. Divergent thinking too has been shown to correlate with preference for certain academic subjects (Hudson, 1966, 1968) and to be linked to attainment at school in such subjects as English (Bennett, 1973). Finally, the tendency to be reflective rather than impulsive has clear advantages in educational attainment, a suggestion borne out by the findings of research (e.g. Kagan, 1965; Barratt, 1977). A clearer picture of the inter-relations of these variables might therefore be of use in the field of education.

The basic strategy of the research to be reported in the next chapter was intercorrelational: a battery of tests, including representatives of each of the dimensions of interest, was given to a sample of 17-year-olds, and the relationships between the tests examined using correlation and factor analysis. The present chapter briefly sketches the background to research on the other cognitive 'styles' on which the study is focused, before outlining the results of some previous research on their inter-relationships.

# 1. Cognitive style and 'attention deployment'

## (a) Creativity and divergent thinking

Given the quantity of research that has been undertaken into creativity and creative thinking, a review of the work done to date, even in moderate depth, would be beyond the scope of this thesis. However, some of the main features of work on divergent thinking can be identified. Kogan (1973) has drawn a rough picture of the progress of research on creativity, and has characterised it as dividing into three broad areas or approaches. The first of these he describes as 'product-centred', that is, focused on the output of creative individuals; Lehman's (1953) studies of the peak ages of achievement in different academic disciplines is an illustration of this. The second approach is 'personality-centred', concentrating as it does on the personal attributes, abilities, and motives of individuals acknowledged by others to be creative; MacKinnon's (1962a, b) studies of creative architects would serve as an example of this. The third approach focuses on the creative process itself, on the kinds of thinking involved in it, and on their relationships with other kinds of thinking; this species of work has been inspired by the ideas of Guilford (1956) on cognitive structure, and it is in this area that the kind of thinking known as 'divergent' can be



found.

Divergent thinking is the kind of thinking involved in the generation of ideas. A test of the capacity for it focuses, not on the production of single, correct ideas such as are required by the questions of intelligence tests, but on the production of ideas in quantity. Examples of such tests are Similarities - in which Ss are asked to list as many ways as possible in which two objects are alike; Uses - in which Ss are asked to suggest as many uses as possible for familiar objects; or Consequences - in which Ss are asked to describe as many possible effects as they can of a given event or state of affairs. Such tests are, on the surface at least, dramatically different from those used in the normal assessment of intelligence or 'convergent thinking' in which only one answer can possibly be correct.

However, the question of whether these tests actually measure an ability that can be distinguished from that tapped by conventional intelligence tests has been a controversial one. The basic point at issue is whether divergent thinking tests correlate more highly with each other than they do with measures of intelligence. While some authors have found that they do not (Getzels & Jackson, 1962; Hasan & Butcher, 1966), others have found that they do (Cropley, 1966; Haddon & Lytton, 1968; Hudson, 1968; Wallach & Kogan, 1965). Factor analytic studies have tended to support the notion of a distinction between the abilities tapped by convergent and divergent tests (Bennett, 1973; Hargreaves & Bolton, 1972; Vernon, 1971). An attempt to explain the different degrees of correlation between convergent and divergent tests in different samples, has also been made, in the form of a 'threshold' hypothesis (MacKinnon, 1962; Yamamoto, 1965). This proposes that intelligence and divergent thinking tests are closely correlated in groups of average IQ; but that, above a certain level (roughly an IQ of 115) the correlations between the tests will be lower. This has been

reinforced by some results (Haddon & Lytton, 1968; Hargreaves & Bolton, 1972) but not by others (Bennett, 1973).

In strict terms, fluent performance on divergent thinking tests - that is, performance characterised by the production of many ideas - may not be a 'style' but a 'capacity', just as is performance on tests of the field-dependence dimension (cf. chapter 2, Pp.75-76). However, it is a performance which seems easily modified by situational and other factors. Much of the argument over the distinctiveness of divergent from convergent thinking has centred on the atmosphere in which tests of the former were administered; and as Wallach and Kogan (1965) have amply demonstrated, it is important that these tests be given in a manner somewhat more relaxed than that of the typical 'test' situation. Enhanced or suppressed divergent thinking scores through training or instructions have been found in a number of studies (Hargreaves, 1974; Harrington, 1975; Piers & Morgan, 1973; Vernon, 1971); and such devices as imaginary roleplay have also been shown to induce marked fluctuations in the numbers and kinds of responses made by Ss on 'uses' and 'circles' tests (Hargreaves, 1977; Hudson, 1968).<sup>1</sup>

Although not, properly speaking, a 'style' dimension in itself, relative fluency on divergent thinking tests may be an indicator of a genuine 'style' dimension when used in conjunction with scores on intelligence tests. Hudson (1966, 1968) found that the combination of the two measures enabled him to predict an S's choice of arts or science subjects at school and university, and that a convergence-divergence 'bias'<sup>2</sup> score could be used as an index of a number of individual differences in personality and social behaviour, including attitudes to authority and numerous aspects of self-perception. The devising of scores such as this opens up the possibility

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1 An exposition of methods that can be used to stimulate creativity has been provided by Stein (1974, 1975).

2 The method of calculating these scores is outlined below, P.215.



of securing real 'cognitive style' variables, in which neither end of a distribution is necessarily preferable to the other, and gaps between individuals derive not from differences in ability but from genuine contrasts in disposition.

What of the stability of an individual's capacity for generating ideas over time? Given the amount of interest shown in creativity, it seems surprising that little research has been carried out on changing patterns in 'divergence' during development. In a five-year follow-up study (with Ss aging from 10 to 15 years) Kogan and Pankove (1972) obtained tentative evidence of a reasonable degree of stability in creativity as appraised by divergent thinking tests. This finding held, however, only for boys, and only for those who were administered the tests in a group setting. Given the variations in test scores that may emerge during a single session it hardly seems possible that any stability should be shown over such a lengthy period.

A more urgent question is whether or not performance on divergent tests bears any detectable relation to real-life criteria of creativity. The results of Vernon (1971) and of Wallach and Wing (1969) are encouraging in this respect. Obviously, creativity tests can rarely be administered to famous scientists, novelists, or other individuals whose creative endeavours have earned them a widespread reputation; research has to be content with more modest estimates of creativity. Vernon (1971), working with 400 Canadian adolescents, found significant correlations between divergent thinking scores and various indices of creativity including marks for a written autobiography; teachers' ratings of pupils' curiosity levels; sociometric ratings as 'creative'; participation in artistic spare-time interests; and performance in a number of school subjects. Wallach and Wing (1969) found test scores to be related to the taking of innovative

and leadership roles amongst a group of American senior school pupils.

Though in itself only one aspect of creativity, fluent performance on divergent thinking tests does seem to have some validity when set against more 'objective' measures of creative potential.

Finally, what are thought to be the origins of differences between individuals in their capacities to 'diverge'? A number of theoretical formulations exist concerning the roots of creativity (cf. for example Vernon, 1970); for present purposes however, the key concept, suggesting a link between divergent thinking capacity and field-dependence, is that of 'deployment of attention'. Performance on such tests as the EFT and RFT, and on tests in which the kernel task is to cast a net over a wide range of stimuli, would seem to involve some common elements. Wallach (1970) has explored the possibility that individuals who score highly on creativity tests do so at least partly because of their greater width of attention deployment. Such individuals, it is held, scan their environment widely in perception, and so are more able than others to produce a large number of responses on tests calling for the 'generation of alternatives'. Higher levels of creativity seem to involve '...a disposition to deploy one's attention from the centre to the periphery of a task content - a greater readiness to utilise incidental cues' (Wallach, 1970, P.1250).<sup>1</sup> While such findings may make it diff-

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1 An experiment by Mendelsohn and Griswold (1964) provides support for the view that creativity involves a disposition towards incidental learning. Individuals differing in their performance on the Remote Associates Test (RAT) (Mednick, 1962) - a measure of creativity - were compared in their capacity for recall of incidental stimuli. Ss were asked to memorise a ('focal') list of 25 printed words while another ('peripheral') list of 25 words was played on a tape-recorder. Prior to a recall test for the 'focal' word list, Ss were asked to solve a series of anagrams. Amongst these were some words from both the 'focal' and 'peripheral' lists, plus other words not on either list. High scorers on the RAT (more creative Ss) solved more items that were anagrams of words on the original lists (whether 'focal' or 'peripheral'), than did low RAT scorers. However, no differences were found between high and low RAT scorers in their recall of words from the original lists that had not been solutions to anagrams. Thus width of attention (regardless of memory capacity) seemed to underlie the differences between Ss in their RAT performance.



icult to venture specific predictions about the relationship between field-dependence-independence and creativity, it seems plausible to suggest that the two dimensions are interlinked in some way through an attentional scanning mechanism. The study to be reported in the following chapter had as one of its aims the furnishing of some evidence on the direction of this link.

#### (b) Reflection-impulsivity

Another cognitive style dimension which would appear to be related to field-dependence-independence in terms of some attentional process is that of reflection-impulsivity. Although research on this cognitive style has been conducted on a much more limited scale than that on either field-dependence or creativity, there nevertheless exists a sizeable, and expanding, quantity of work on the style and its correlates.

Research on reflection-impulsivity was initiated by studies of Kagan and his associates (Kagan, Rosman, Day, Albert, & Phillips, 1964) on the tendencies of children to act hesitantly, or rapidly, on tasks involving some degree of response uncertainty. 'Reflective' children were those who took their time and weighed up the alternatives more carefully; 'impulsive' children on the other hand responded very quickly and were much more likely to make errors on a task as a result. To assess these proclivities, Kagan and his co-authors used a specially constructed test, the Matching Familiar Figures Test (MFF). This presents Ss with a situation in which several different responses can be made to perform a task, but only one of them is correct. Briefly, the test consists of a series of simple drawings or pictures of familiar items (such as a flower, animal, or toy), and, corresponding to each, an array of drawings of the same object, one (and only one) of which is identical to the original or 'standard'. The task is to find the item which looks exactly like the standard. Two kinds of score can be taken

from this test. The first is S's latency or response time; that is, the amount of time which lapses before he or she makes any choice from amongst the available alternatives (which vary in number on different versions of the test). The second is the number of error choices made before S finds the correct solution. These two scores - response time and number of errors - are negatively correlated: Messer (1976), reviewing studies on the use of the MFF test, found a median correlation coefficient of  $-.48$ . Clearly, for the solving of most problems, the longer an individual takes to consider the alternatives (up to a point at least), the more likely it is that the choice eventually made will be correct. An impulsive approach to the test then is one characterised by a short response time and a large number of errors; a reflective approach, one signalled by longer response times and lower error scores.<sup>1</sup>

The bulk of the available evidence suggests that the MFF test is a reasonably reliable one. Again quoting Messer (1976), test-retest and internal reliabilities obtained in various studies range from  $.58$  to  $.96$  for response times; those for error scores are however generally lower, and the results obtained vary somewhat depending on the age-group of the Ss. Amongst very young children, for example, error scores show greater stability than do response times. For older children though, the test scores are both fairly reliable and show a consistent negative correlation with each other. An illustration of this is provided in a study by Yando (quoted in Kagan, 1967). Groups of 9-year-old children classified as reflective and impulsive were tested weekly for ten weeks. Each week, the number of alternative figures from which S had to choose was increased. While reflective children showed steady increases in response time yet maintained a constant number of

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1 Further details on this test, and an illustrative item, are set out below (Pp.208-211).



errors as task complexity increased, impulsive children did just the opposite - showing fairly constant response times but an increasing number of errors.

Concerning the levels of scores, as age progresses there is a tendency for all Ss to become more reflective on the test; degree of caution, in other words, seems to slowly increase with age. This is confirmed by the results of many studies (cf. for example Kagan, 1966, and also Messer (1976) who presents age norms collated from a number of studies). In addition, the negative correlation between response time and errors increases in magnitude with age (Messer, 1976), presumably because Ss become more aware of the advantages of delaying response, and more capable of response inhibition.

Tendencies towards reflectiveness or impulsivity on the MFF test have correlates in a great many areas. The simple measure of relative delay in making a response has been shown to be a general feature of an individual's manner of behaving in many situations. For example, impulsive children respond sooner than reflective children on a task such as describing incongruous drawings presented in a tachistoscope, or in reply to questions asked during an interview about their hobbies or school interests (Kagan & Kogan, 1970). There is '...some generalised tendency for a child to show long or short decision times across various kinds of problem situations that contain response uncertainty' (op. cit., Pp.1310-1311).

More widely, scores on the MFF test seem to be a useful index of an individual's level of self-control and habits of response, having potentially far-reaching implications for problem-solving capacity and overall progress in school. Reflective individuals perform better than impulsives on most cognitive tests, including mazes, short-term memory, and concept-attainment tasks (Messer, 1976), and measures of intelligence, though the latter relationship is not especially strong. Impulsive children are more likely

to make errors on reading tests (Kagan, 1965); hyperactive children have been found to be significantly more impulsive than normals (Campbell, Douglas, & Morgenstern, 1971); and children classified as reflective at the age of nine were found to perform better than impulsives in every subsequent year of schooling (Barratt, 1977). For many kinds of performance linked to educational attainment, then, impulsivity seems to place an individual in a distinctly disadvantaged position.

This disadvantage also extends into other areas associated with overall self-control and self-regulation. Toner, Holstein, and Hetherington (1977) examined the relationship between reflection-impulsivity and responses on a variety of 'self-control' tasks amongst a group of pre-school children. The tasks included an assessment of the capacity to regulate response by asking Ss to draw a line as slowly as possible; a test of ability to 'delay gratification' (e.g. sweets appeared on a moving conveyor belt, which stopped as soon as S took one); and a test of 'resistance to temptation' in which Ss were left alone in a room with a candy bar which they were told belonged to someone else. In all three of these situations, impulsive children showed poorer capacity for self-control.

Fortunately, given the educational difficulties related to impulsiveness, an individual's standing on the reflection-impulsivity dimension seems, like scores on field-dependence and divergent thinking tests, to be modifiable. Campbell, Douglas, and Morgenstern (1971) for example found that the MFF performance of hyperactive children became significantly less impulsive following administration of the drug methylphenidate which has been used in the treatment of hyperactivity. Kagan, Rosman, Day, Albert, and Phillips (1964) found that impulsive children, who typically produce more 'relational' responses on the (Kagan, Moss, & Sigel, 1963) Conceptual Styles Test, produced more 'analytic' responses when simply instructed to



respond more slowly. Kagan, Pearson, and Welch (1966b) found response times could be lengthened merely by asking Ss to check their responses. Meichenbaum and Goodman (1971; Meichenbaum, 1977) have shown that Ss' response times can be raised, and their error scores lowered, by the teaching of scanning strategies accompanied by verbal self-instruction (i.e., Ss directing themselves to look at different parts of the stimulus array, and so forth). Significant shifts towards more reflective MFF test scores were still in evidence one month later using this procedure.

In summary then, reflection-impulsivity, as measured by the MFF test, shows a fair degree of stability over time; with a tendency for all Ss to become steadily more reflective with age while maintaining their rank-order places relative to each other. Proneness towards reflection or impulsivity appears to affect scores on a wide variety of tasks, including many that have import for performance in school. However, impulsivity, which carries with it disadvantages in this respect, can be reduced by special kinds of training. These, roughly, are the main findings of research on this cognitive style. What are thought to be the antecedents of individual differences in leanings towards reflection or impulsivity? The possibility exists that individuals who show extreme degrees of impulsiveness may do so as a result of minimal brain damage sustained during birth (Kagan, 1966, 1967). Within normal ranges of performance on the MFF test, a variety of factors have been entertained as precursors of reflection-impulsivity, including constitutional factors, intelligence,<sup>1</sup> and levels of anxiety in relation to competence or fear of failure (Kagan, 1966; Kagan & Kogan, 1970; Messer, 1976). In connection with the present research however, the most salient suggestion is once again that linking individual differences in MFF test scores to differences in the 'deployment of attention'; since the latter appear to

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1 As with divergent thinking, there has been some debate concerning the relationship between MFF test scores and intelligence (Block, Block, & Harrington, 1974, 1975; Kagan & Messer, 1975).

have common links to the field-dependence and creativity dimensions.

A number of studies have found that the scanning activity of Ss found to be reflective and impulsive is different in a number of respects. Kagan, Pearson, and Welch (1966a) for example found that Ss with longer response times simply looked at the test stimuli more often and more thoroughly than those responding quickly. Siegelman (1969) constructed a situation in which Ss had to make 'observing responses' - i.e. press a button - in order to view the test materials clearly; reflective Ss made more such responses and attended to the test figures longer than did impulsives. Paradoxically in the light of these findings, Ault, Crawford, and Jeffrey (1972) found that a sample of Ss both fast and accurate on the MFF (cf. P.210 below) looked less often than reflective individuals at the test figures; these Ss seemed more willing than reflective Ss to risk making a wrong choice by responding before all the alternatives had been eliminated. Finally, Drake (1970) examined the eye movements of reflective and impulsive adults and found that the former examined the figures more thoroughly than the latter, made more sets of comparisons between elements of different figures, and looked at each figure more often. The tendency to be reflective, then, is marked by a more extensive scanning of stimuli, a more comprehensive search and exploration of all the possibilities, than that typical of the impulsive response.<sup>1</sup> Reflective and impulsive Ss differ in their willingness to suspend judgment and consider a wider range of possibilities - a difference similar to that noted by Wallach (1970) as possibly being at the root of individual differences in creativity.

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1 In addition, Zelniker, Jeffrey, Ault, and Parsons (1972) found that, on reaction-time tests involving longer preparatory intervals (i.e. periods between the 'ready' light and the stimulus light), impulsive Ss had significantly longer reaction-times than reflective Ss; a result which the authors saw as a further illustration of '...the inability of impulsive Ss to sustain attention' (op. cit., P.334).



## 2. Interrelationships of cognitive styles

The foregoing outlines of research work on creativity and reflection-impulsivity have aimed, not only to introduce these cognitive styles into the context of the present thesis, but also to suggest that an orderly and predictable set of relationships should exist between them, given their similarities when construed as modes of attention deployment. The precise nature of these relationships is however less easy to forecast; equally valid reasons could be adduced, for example, for quite opposite states of affairs. A small number of studies has looked specifically at the interrelations of these styles.

Findings so produced have lent some support to the view that field-independent Ss are more 'creative' than their field-dependent counterparts. Spotts and Mackler (1967) administered a battery of intelligence and creativity tests, plus the EFT and a hidden-figures test, to a sample of 114 male undergraduates. Over the whole of this sample, there were significant correlations between IQ and field-dependence-independence; accordingly, three subsamples, roughly matched in intelligence but differing in level of field-dependence, were selected out; giving field-independent, field-central, and field-dependent groups. The results were by no means clear-cut: none of the differences between the groups in creativity test scores was significant. However, a Kendall coefficient of concordance carried out on the pattern of the 14 test scores suggested that field-independents tended to be most creative, field-central Ss least creative, with field-dependent Ss in between. A similar procedure repeated with the score patterns of the whole sample, divided into field-independent, field-central, and field-dependent portions, again found no significant differences between the group means on any test; but again detected a significant pattern through the use of Kendall's W, this time in the expected direction overall (field-

independent most creative, field-dependent least, field-central in between). Results reported by McWhinnie (1967) were more straightforward. Giving a battery of perceptual and creativity tests (including the EFT) to a group of 136 11-year-old schoolchildren, McWhinnie found that the only significant correlations were between the EFT and originality and elaboration scores on creativity tests, field-independent Ss being more creative. Using a quite different method to assess creativity - the Obscure Figures Test (OFT) which measures an individual's 'innovativeness in imposing organisation on ambiguous stimuli' - Moore, Gleser, and Warm (1970) also found a significant correlation between this test and performance on the EFT; and once again, field-independent Ss were more creative than field-dependents, in terms of this particular measure.

A study by Bloomberg (1971) on the other hand found no links between field-independence and creativity, despite a strong anticipation that the former must be a prerequisite of the latter. Using the EFT and four different creativity tests (with a college sample), Bloomberg found equal numbers of field-dependent and field-independent Ss scoring highly on creativity tests; leading him to the conclusion that '...creativity is not contingent upon field-dependence' (op. cit., P.7). Similarly, Busse (1968) administered a large battery of tests to 61 10-year-old boys and factor-analysed the resulting correlations. The battery included the EFT and an 'unusual uses' test. Scores on these two tests were virtually orthogonal; and while in the factor analysis the EFT had its highest loadings on a factor labelled by Busse as 'flexible thinking', the unusual uses test had its only high loading on another factor labelled 'general speed'.

Existing studies therefore, while somewhat equivocal, slightly favour the suggestion that field-independent Ss will score more highly on divergent thinking tests than will field-dependent Ss. Available results on the



relationship between field-dependence-independence and reflection-impulsivity show a similar pattern: most studies indicating the existence of some sort of link between field-independence and reflectiveness, with others finding orthogonality. Kagan and his associates (Kagan, Rosman, Day, Albert, & Phillips, 1964) themselves found no links between response times on the MFF and solution times on the EFT; however impulsive children suggested more incorrect solutions on their way to finding the embedded figure. Massari and Massari (1973), in contrast, found almost the converse of this with early childhood versions of both the MFF and the EFT: response times on both tests were significantly correlated (in a sample in the 3 to 5 age range), but MFF response times were not significantly correlated with EFT scores (which in the early childhood EFT, as in the CEFT, are numbers of items correct). More clear-cut were the results of Massari (1975) who found significant differences in CEFT scores between reflective and impulsive children at both 6 and 8 years of age, reflective children being more field-independent. Thomas (1971) found a significant relationship between field-independence and reflectiveness amongst  $6\frac{1}{2}$ - and  $7\frac{1}{2}$ -year-old, but not amongst  $5\frac{1}{2}$ - and  $8\frac{1}{2}$ -year-old children; whereas Campbell and Douglas (1972) found a similar relationship amongst 8- and 10-year-olds, but not amongst 6-year-olds. In both of these studies, field-dependence test performance was more commonly related to MFF error scores than to MFF response times. But again Busse (1968), in the study cited above, found a low and non-significant correlation between EFT scores and 'impulsivity' as defined by another measure from the same test - the time elapsed before S's first attempt to find the embedded figure.

A number of other studies have found low, but significant correlations between field-independence and the tendency to be reflective on the MFF (e.g. Keogh & Donlon, 1972; Numbauer & Miller, 1970). While this has been attributed by Messer (1976) to similarities in the demands of the tests

(EFT, RFT, MFF), all of which involve response uncertainty, Kogan (1976) has suggested that it is merely due to 'uncontrolled age and IQ effects' (1976, P.118). Ss in most of the studies covered a wide age range; test inter-correlations might then reflect little more than parallel age trends towards greater field-independence and greater reflectiveness - though the studies of Campbell and Douglas (1972) and of Thomas (1971) would escape this criticism.

Results to date, therefore, on the relationships between field-dependence-independence, creativity, and reflection-impulsivity, do not permit the drawing of very firm conclusions. It may be tentatively suggested that the field-independent individual is more likely to be more creative on divergent thinking tests, and more reflective on the MFF. The first of these findings may however be partly a product of intelligence; the second a result of developmental trends in the samples on which it is based, or of common reactions to the test situation. The study to be reported in the next chapter looks at these relationships within a restricted age range, focusing also on the links between each of these variables and a measure of general intelligence.

What of the relationship between reflection-impulsivity and creativity? Once again results are inconclusive. While Ward (1968) found no meaningful links between MFF performance and creativity as assessed by tests from the Wallach and Kogan (1965) battery, and Busse (1968) found his measure of impulsivity (latency of first attempt on the EFT) unrelated to scores on the unusual uses test, Fuqua, Bartsch, and Phye (1975) found reflective Ss to be much more creative than impulsive Ss ( $p < .005$ ) on one of the Torrance (1962) tests, amongst a sample of 70 pre-school children. While available evidence, overall, points to the possible existence of some general link between reflective, creative, and field-independent performances, it may



equally well be the case that no such relationships exist and that all of these measures are independent of each other. Given the face validity of the notion that they are all features of an individual's 'attention deployment', the next chapter investigates relationships between them in a single sample of Ss. The principal focus, however, is on the field-dependence dimension and its degree of distinctiveness from the other 'cognitive styles'.

# 7

Field-dependence-independence and other 'styles':  
a study in Edinburgh



## Chapter 7

### Field-dependence-independence and other 'styles':

#### a study in Edinburgh

The preceding chapter traced in outline the network of evidence concerning the relationships between field-dependence-independence and other cognitive styles. Discussion was concentrated on those styles which, on the surface at least, seemed to signal the existence of differences between individuals in their 'deployment of attention'. In the present chapter, an empirical study is reported which attempts to delineate more clearly the inter-relationships amongst field-dependence, convergent and divergent thinking, and reflection-impulsivity. The chapter first of all describes the subjects of the sample used in the research; then gives details of the tests - some of them rather un-test-like - used to gather data; and finally reports the results so obtained. This study was inter-correlational in design and was not concerned with inter-group comparisons as were the studies in Hong Kong reported in chapters 4 and 5. Also, there were no specific hypothesis formulated as in those studies; given the uncertainties of existing research results, precise predictions regarding the relationships between various 'styles' are not easy to make. Beyond the general expectation of a close association between field-dependence and intelligence test scores, this work

was therefore conducted without a specific set of predictions in mind.

### 1. Subjects

The subjects of this study were 110 fifth- and sixth-formers from five secondary schools in or near the city of Edinburgh. These Ss were obtained through direct contact with their schools. Initially, a number of headmasters were contacted by telephone, to explore the possibility of carrying out research in their schools. If they expressed willingness, a meeting was arranged in order to explain the aims and nature of the research in more detail to them and (where possible) to form teachers. Subsequently, all the fifth- and sixth-formers in the five schools which gave permission for the undertaking of research, were assembled on pre-arranged dates and invited to take group intelligence and divergent thinking tests. At this stage, 132 Ss took the group tests, and were asked to take part in individual sessions in which other cognitive style tests were to be administered. A number of Ss declined to do so; several others who were willing to take part could not be tested in the end owing to the timetabling of sessions; and a few more had to be eliminated from the study due to test performances that were in some respect invalid. A final sample of 110 Ss who had completed all the tests were included in the data analysis. There were 51 boys and 59 girls; their distribution of origin from the five schools sampled is shown in Table 33.

Table 33. Distribution of Ss by sex and school of origin

<u>School:</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>Total</u>
Boys	12	5	13	4	17	51
Girls	16	5	14	13	11	59
Total	28	10	27	17	28	110



The mean age of the boys in the sample was 16 years 11 months; of the girls, 17 years 1 month; and of the sample as a whole, almost exactly 17 years.

While it might have been preferable, for the purposes of this research, to have obtained Ss from a single school or from a smaller number of schools, the limited sizes of upper school forms - coupled with the fact that the testing was undertaken late in the Educational year - meant that five different schools had to be used. (The advantage of schools testing in the summer term - that pupils are more likely to be made available - must be offset against the problem that many will have already left.) All of the schools involved in the study were comprehensives; each had a certain amount of 'streaming' in various years. Each school had a similar curriculum, centred around preparation for the ordinary and higher grades of the Scottish Certificate of Education.

## 2. Tests and test administration

### (a) Tests used

Each of the subjects who took part in this study completed the following cognitive tests:

- (1) The AH5 test of intelligence (Heim, 1968);
- (2) Divergent thinking tests: 'Uses of objects' (Hudson, 1966), and 'Pattern meanings' (Wallach and Kogan, 1965);
- (3) The Matching Familiar Figures Test of reflection-impulsivity (Kagan, 1966);
- (4) The Witkin Embedded Figures Test (Witkin, 1950). Figures 1-A to 12-H were used in sequence as directed in the manual (Witkin, Oltman, Raskin, & Karp, 1971). This test has been described above (Pp.116-118).

In addition, Ss were given a brief opening questionnaire for the purpose of

collecting basic information on age, the subjects they were taking at school, and their interests. This is contained in Appendix IV (c). A set of self-rating scales on various personality dimensions was also prepared, for use as a 'buffer' task following completion of the divergent thinking tests (cf. P.211 below), and to explore relationships between self-perception and cognitive styles. This was not however completed by all Ss.

(b) Testing sessions

In each of the schools in which data were gathered, testing began with a group session in which all interested fifth and sixth formers were invited to take part. The aims of the research were outlined, together with plans for individual test sessions; and Ss were asked to record on the questionnaire if and when they would be available for individual testing. It was emphasised that all testing was to be done on a voluntary basis, that the results were entirely confidential (they could use pseudonyms if they wished), and that they could find out their own test results later if they were interested. An accent was also placed on the fact that only one of the tests to be used - the AH5 - was a 'test' in the ordinary sense of the word. None of the Ss withdrew from the group sessions, though some later declined or failed to take the other tests.

During the group sessions in each school, the one-page questionnaire, the AH5 test, and a specially prepared booklet containing the two divergent thinking tasks were administered. A number of testers were present during the administration of the AH5, and a 20-minute break was taken after its completion. In the second session, if Ss had completed the divergent thinking tests, they were asked to complete the self-rating scales - a series of 5-point scales using such adjectives as 'hard - soft', 'active - passive' as dimensions for self-description. This was done chiefly to avoid



a situation in which some Ss had completed the divergent thinking tests while others had not - which given the nature of these tests is very likely - and the former took to distracting the latter.

Following the group sessions, a series of individual testing sessions were arranged in an empty classroom, and at times suitable to them, Ss were given the Matching Familiar Figures (MFF) and Embedded Figures tests. Prior to administration of the EFT, as a brief precautionary measure, each S was shown a few plates of the Ishihara test (cf. P.111 above) as a screen against possible colour-blindness. Help was obtained from a number of testers (all of them psychologists) in the administration of the EFT and the MFF; the administration of the tests was discussed beforehand by all testers to bring out any points of uncertainty about the tests. The duration of individual sessions obviously depended on the Ss themselves - both tests being time-based in their manner of scoring - and could range from ten minutes to just over an hour. Thus the number of Ss tested in one day could vary between 4 and 12 depending on the number of testers available and on the responses of Ss themselves.

### (c) Test procedures

#### The AH5

Given that the aim of this research was to explore the relationships between field-dependence-independence and other dimensions and styles of cognitive functioning, the basic strategy involved was simply to examine the inter-correlations between the Witkin EFT and a number of tests representing other 'strands' of mental activity. The AH5 test was used as a representative of intelligence or 'convergent thinking'.

This test was specifically designed to discriminate between individuals at

higher levels of ability (Heim, 1968), partly with senior school pupils in mind. It is a group test and is divided into two parts. Part 1 contains 36 items of a verbal-numerical nature, part 2 the same number of items of a diagrammatic kind. Each has a time limit of 20 minutes. The emphasis in both is on deductive reasoning; in other words, part 2, though ostensibly involving items with a 'spatial' appearance, functions less as a test of spatial-perceptual ability than as one of the capacity to use logic for solving problems. Example items are provided for use prior to administering each part of the test, and care has to be taken to ensure that all Ss have grasped the principles involved in their solution.

Altogether the test takes about an hour or slightly longer to administer. In ordinary usage, Ss' final scores are converted by the use of norms to one of five grades (A - E). In the present research however, raw scores (part 1, part 2, and total score) were retained for statistical analysis. In addition, the number of errors made by Ss (i.e. the number of items they answered wrongly) on each part of the test were recorded. It was thought that the tendency to make errors might be linked to impulsiveness on the MFF.

The AH5, though in itself a measure of intelligence, has been used in work on cognitive style by Hudson (1966, 1968), who combined it with tests of divergent thinking to produce a 'bias' score. This represented the extent to which an individual felt more at home with test items permitting only one possible solution, or with items in which many solutions or alternatives were equally valid. In the present study attention was paid to the relationships between field-dependence-independence and this 'bias' score in addition to those between actual test scores themselves.

Appendix I (b) presents scores for the Edinburgh Ss on the AH5 test (part 1, part 2, total scores and total error scores).



### Divergent thinking tests

As described in chapter 6, a principal aim of research work in creativity has been to identify features thought to be characteristic of the creative process or of the creative person. 'Divergent thinking' and the capacity for it have been found to be centrally important in this respect. The production of ideas in number, and the ability to generate associations to ideas in the course of problem-solving, are evidently basic requirements of any search for new and original ideas. Divergent thinking tests are used to help assess an individual's penchant for this kind of ideational fertility. Two tests were selected from the wide range available for the purpose of gauging this capacity amongst Ss of the present sample.

The first of these is the 'Uses of Objects' test. Ss are given the name of a familiar, everyday object, and asked to think of as many possible uses for it as they can. In the present study Ss were asked to do this for four objects: a tube of toothpaste; a pane of glass; a plastic comb; and a balloon. While some individuals will respond to this by merely citing the standard, accepted uses of the item in question, others will take it as an opportunity for the exercise of imagination, and will suggest a large number of uses quite removed from the obvious ones. Thus, for example, most Ss in the sample (90% +) suggested using a comb 'to comb your hair', and some confined themselves to this. Others, however, suggested a dozen or more possible uses; among the less common ideas were that it could be used as a ruler, letter-opener, plectrum, backscratcher, or shoe-horn, or to open tins of elastoplast, to take tyres off bikes, make furrows in a miniature farm-yard, stop the school bell from ringing, and propel an unmanned space probe to Mars.

The second test used was a 'Pattern Meanings' test, employing some of the designs of Wallach and Kogan (1965). In this test Ss are shown a simple

line figure, and asked to write down as many things as possible which they think the figure could represent. Four patterns were used; these are shown in Figure 6. On the whole this task, which has no obvious response for any item, probably taxes an individual's inventiveness more than the 'uses'

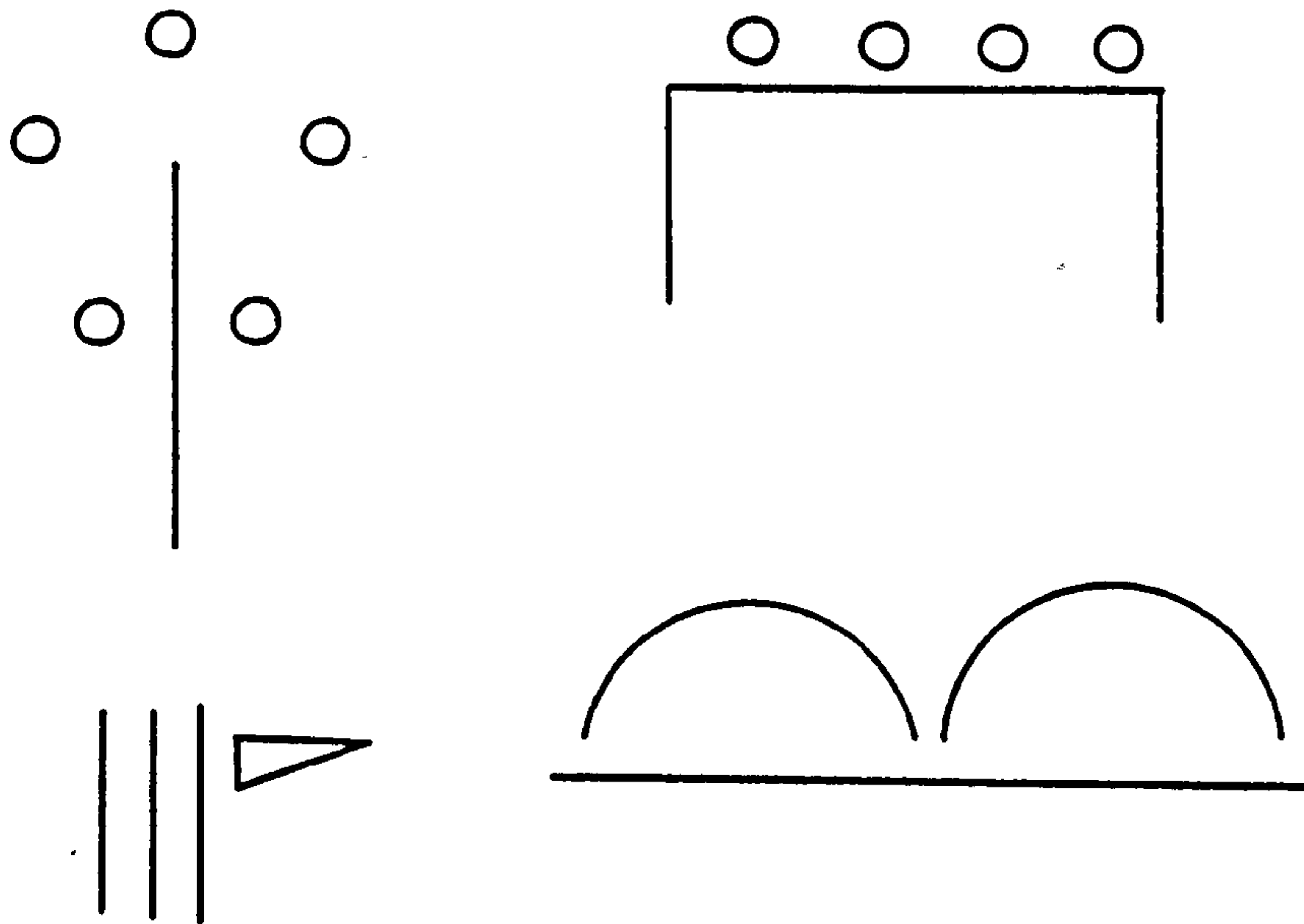


Figure 6. Patterns used in the 'Pattern Meanings' test

test described above. (The figure shown in the top left provoked in one boy the image of 'an old Polish watchmaker, suspended between the two Forth bridges, calmly blowing smoke rings into a calm, grey, September sky'.)

These two tests were presented together in A5 booklet form. Each object name or pattern was printed at the top of a separate page, with the rest of the page left blank for S's responses. Instructions at the beginning of the booklet read as follows:

'This booklet is divided into two parts.

In part 1, each page contains the name of a familiar, everyday object. All you have to do is to think of as many uses as you can for that object, and write them down in the space provided.

Part 2 is similar but involves patterns instead of objects. Here, we should like you to write down as many things as possible that



you think the pattern could represent. You can turn the pattern round in any way you like.'

These instructions were read aloud to Ss in a fairly relaxed manner; a strong emphasis being placed on the phrases 'as many uses as you can' and 'as many things as possible'. After 25 minutes had elapsed Ss were asked to turn to the set of self-rating scales.

A number of different scores can be taken from divergent thinking tests.

Fluency scores - a straightforward count of the numbers of 'uses' or 'meanings' suggested - are the most widely used. Other possible scores are Originality (the relative infrequency of responses) and Flexibility (number of different categories used); and in addition the content of responses can be analysed for references of a particular sort. For present purposes, fluency scores on the two tests served as the scores; results obtained by other authors have suggested that the amount of effort that has to be expended in calculating other kinds of scores is not really justified by the amount of information so produced (Hargreaves & Bolton, 1972).

#### The Matching Familiar Figures Test

The AH5 and divergent thinking tests were given in the group sessions, together with the rating scales which are described below. In the individual sessions, Ss were administered the EFT and Matching Familiar Figures Test (MFF) which is the principal measure of 'reflection-impulsivity'.

The MFF test exists, like the EFT, in a number of forms (Messer, 1976); the version used here was the adult one, which was obtained direct from Harvard University. The basic principle and method underlying the test have been described above (P.188 ff.). The 12 items in the test are so printed in a card booklet that when opened, the booklet shows the standard item on one page and the (6 or 8) alternative items, from amongst which S must find its

exact replica, on the other. The 12 items in the test are a dog, rose, soldier, graph, baby, lamp, dress, lion, glasses, aeroplane, leaf, and bed. Two practice items (boat and cowboy) are also included; one is shown in Figure 7 below. While on these the S must choose from amongst 6 alternatives, on the test items this number is increased to 8.

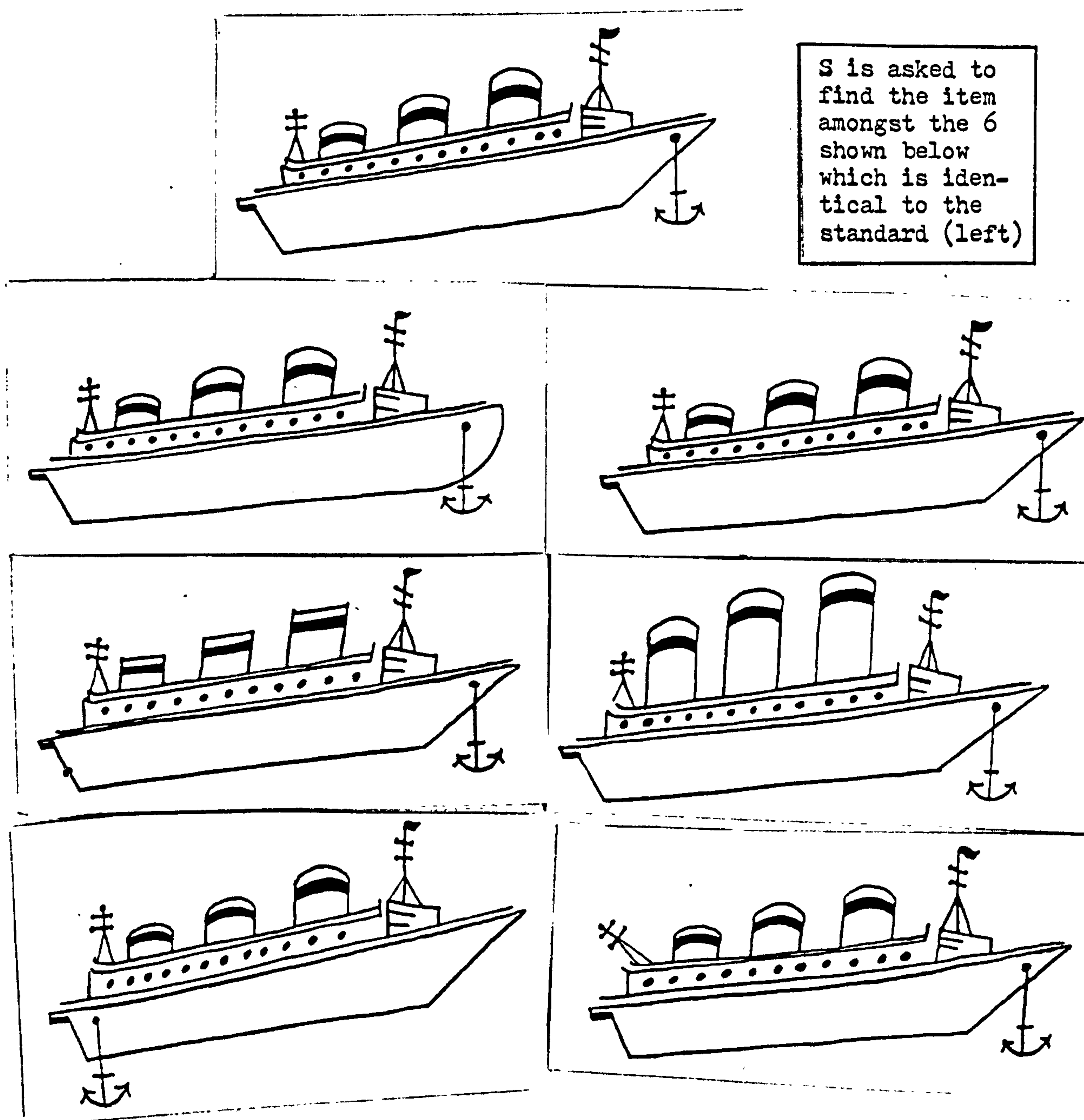


Figure 7. Practice item from the Matching Familiar Figures test



The instructions for this test, which are read to S, are as follows:

'I am going to show you a picture of a familiar item and then some pictures that look like it. You will have to point to the picture on this bottom page (pointing) that is just like the one on this top page. Let's do some for practice.'

The practice items are then attempted; when S has selected the correct item, the test items proper are introduced:

'Now we are going to do some that are a bit harder. You will see a picture on top and eight pictures on the bottom. Find the one that is just like the one on top and point to it.'

The time taken to S's first response - his 'response latency' - is recorded on a stopwatch. If S's response is wrong he is told this, and asked to find the one just like the standard. This continues until S has made a maximum of 8 errors or has selected the correct item (Ss do occasionally select the same wrong items more than once). If S fails to find the solution, it is pointed out to him before going on to the next item.

Two scores are thus taken from the test. S's response latencies are summed over 12 items, and the mean of these becomes his response time (MFFRT), recorded for each S in seconds in Appendix I (b). The numbers of errors made over 12 items are simply summed to give S's error score (MFFES).

For most Ss, the tendency to respond more quickly on this test is associated with a higher error score; such individuals are termed 'impulsives'; their opposite numbers who think carefully before selecting the correct item are called 'reflectives'. This contrasting pattern seems to hold for about two-thirds of the Ss in most samples. The remaining one-third are divided between 'fast-accurate' and 'slow-inaccurate' respondents, but Ss in both these groups have been passed over by research (Messer, 1976). In the present research, a 'bias' score was also computed for MFF scores, indicating S's tendency to be reflective or impulsive in terms of the relationship between his two scores on the test.

In the individual testing sessions, half of the Ss took the EFT first, the other half taking the MFF first. No differences were observed between the scores on either of the tests as a result of the order in which they were given.

### Self-rating scales

During the group sessions, as mentioned above, Ss were also asked to complete a series of self-description scales, using 5-point ratings. These were in five sets, each printed on a separate page, and each set containing the following items:

Active		Passive
Unimaginative		Imaginative
Impulsive		Cautious
Hard		Soft
Humourous		Serious
Rational		Irrational
Practical		Impractical
Interested in people		Interested in things
Logical		Intuitive
Tough		Tender
Emotional		Calm
Unconventional		Orthodox
Realistic		Idealistic

Ss were asked to make these ratings in five different ways, for five different 'selves' as it were, in a manner similar to that used by Hudson (1968). These were: 'as I see myself' (actual self); 'as I would really like to be' (ideal self); 'as I used to be' (past self); 'as others see me' (perceived



self); and 'as I am going to be' (future self). For scoring purposes, Ss' positionings on the various dimensions were converted to points on an ordinal scale from 1 to 5. As anticipated, some Ss did not complete the five different sets of 'selves'; however, a total of 99 Ss did finish all of them in the time allotted.

### Group questionnaire

The brief questionnaire given these Ss, for the purpose of collecting basic background information, and additional information on school subjects and interests - which it was thought might be correlated with the various cognitive styles - is reproduced in Appendix IV (c). Scores on the battery of cognitive style tests are tabulated in Appendix I (b). All of the data gathered in this study were transferred onto cards, via a pre-arranged coding sheet, and analysed by computer using the Statistical Package for the Social Sciences (Nie, Bent, and Hull, 1970). The next section outlines the results on the inter-relationships of the various cognitive style measures.

### 3. Results

Means and standard deviations on the various tests are presented in Table 34 overleaf, separately for boys, girls, and the sample as a whole. The mean AH5 score for the group as a whole is slightly below that given in the manual (Heim, 1968) for grammar-school pupils of an age comparable with the present Ss; this is not surprising given that the Ss in this sample are a less highly selected group. Although there are slight differences between the means for boys and girls on some of the tests, none of these gaps is significant (for the EFT,  $t = 0.42$ , ns; for MFF response time,  $t = 0.34$ , ns; for AH5 total error score,  $t = 0.99$ , ns). For the purposes of this research therefore, it seems both preferable and justifiable to treat the sample as

Table 34. Means and standard deviations for the Edinburgh sample

	<u>Boys, n = 51</u>		<u>Girls, n = 59</u>		<u>Whole sample, n = 110</u>	
	$\bar{x}$	S.D.	$\bar{x}$	S.D.	$\bar{x}$	S.D.
AH5 part 1	12.76	3.78	14.10	4.40	13.48	4.20
AH5 part 2	17.52	4.97	17.20	4.76	17.35	4.88
AH5 total score	30.29	7.42	31.30	7.86	30.81	7.73
AH5 errors	17.70	8.46	14.35	6.56	15.90	7.68
Uses	13.47	6.32	13.64	5.01	13.56	5.68
Patterns	13.72	6.67	12.44	5.72	13.03	6.24
DT total	27.39	11.09	25.91	9.20	26.55	10.38
MFF errors	8.68	5.22	8.62	4.56	8.65	4.88
MFF latency (")	45.83	19.63	41.45	14.34	43.48	17.14
EFT discovery time (")	39.63	20.74	43.35	21.24	41.59	21.09

a whole.

There is every reason to believe that the various tests used here have performed as their authors would have wished them to do. The pattern of scores on the AH5 is what would be expected; the correlation between part 1 and part 2 of this test was .45, a close approximation to the figures quoted in the manual. The average score on the divergent thinking tests, of just over 3 suggestions per item, is similar to that reported by other authors (e.g. Hudson, 1966), though lower than that quoted by Wallach and Kogan (1965). The internal consistency of the EFT and the MFF reached generally satisfactory levels (odd-even  $r$  for the EFT = .53; for the MFF, .91,  $p < .001$  in both cases).

The ensuing sections of this chapter describe test intercorrelations, factor analysis results, and findings on the relationships between field-dependence test scores and self-descriptive data.



(a) Intercorrelation matrix

The intercorrelations of the various tests in the battery are set out in Table 35. Correlations are also given separately for errors on parts 1 and 2 of the AH5, as well as for the whole test (AH5E 1, AH5E 2, and AH5E Tot., respectively). (All decimal points have been removed.) For all statistics,  $n = 110$ .

Table 35. Intercorrelations of cognitive style measures<sup>1</sup>

	EFT	MFF Lat.	MFF Errs.	DT Tot.	Patt erns	Uses	AH5E Tot.	AH5E 2	AH5E 1	AH5 Tot.	AH5 2
AH5 1	-35***	00	-10	09	12	-01	-34***	-27**	-34***	80***	45***
AH5 2	-48***	-19	-12	07	07	03	-28***	-32***	-20*	87***	
AH5 Tot.	-50***	-11	-13	10	11	02	-36***	-36***	-30***		
AH5E 1	20*	-12	10	-05	-03	00	83***	47***			
AH5E 2	32***	-04	18*	-09	-03	-13	87***				
AH5E Tot.	29***	-07	14	-11	-06	-09					
Uses	01	12	-11	82***	51***						
Patterns	01	-01	10	89***							
DT Tot.	00	06	02								
MFF Errs.	03	-53***									
MFF Lat.	26**										

As the results of Table 35 show, once again a highly significant relationship is in evidence between measures of field-dependence-independence and intelligence; the correlation between the EFT and AH5 total score is  $-.50$

<sup>1</sup> \*  $p < .05$ ; \*\*  $p < .01$ ; \*\*\*  $p < .001$ .

(negative since they were scored in opposite directions), which is significant beyond .001. This is higher than the correlation between the EFT and either part 1 or part 2 of the AH5, although both of these figures are significant also.

Other findings to emerge from this matrix include a separation between convergent and divergent thinking tests. While both parts of the AH5 are closely correlated with each other, and the Uses and Pattern Meanings tests are intercorrelated at a similar level, the relationship between the two sets of measures is a more or less orthogonal one: coefficients amongst the various measures involved range from  $-.01$  to  $+.12$ . This supports the view of a 'creativity - intelligence' distinction as found in work by other authors (e.g. Bennett, 1973; Hargreaves & Bolton, 1972; Hudson, 1966, 1968; Kogan & Pankove, 1972; Wallach & Kogan, 1965).

In addition, error and latency scores on the Kagan (1966) MFF test are, as would be expected, significantly negatively correlated ( $-.53$ ,  $p < .001$ ). However, apart from one significant relationship between MFF latency scores and EFT discovery times, the Kagan test appears unrelated to any of the other tests in the battery.

To further examine the relationship between convergent-divergent 'bias' and other test scores, a 'bias' score was devised for each S in the sample. This was done on the basis of the relationship between an individual's AH5 score and his total score on the divergent thinking tests. Distributions on the two tests were first divided into categories, in the proportions 10:20:40:20:10, and Ss in each of these categories assigned category scores (from  $-2$  to  $+2$ ), on both tests. A 'bias' score could then be obtained by subtracting one score from the other: resulting in a range of scores from  $-4$  (an extreme 'diverger') to  $+4$  (an extreme 'converger'). The only significant correlation between this bias measure and the other tests of the battery was



that with the EFT - 'convergers' being more likely to be field-independent ( $r = .34$ ,  $p < .001$ ). Relationships between the EFT and a similar 'bias' score computed for the MFF (a joint product of latency and error scores) were non-significant.

(b) Factor analysis with the Edinburgh group

In order to illuminate the nature of the relationships between the different cognitive style measures more clearly, a principal components factor analysis was carried out on the intercorrelation matrix of test variables, AH5 parts 1 and 2, AH5 errors parts 1 and 2, Uses, Pattern Meanings, MFF error and latency scores, and EFT scores. Three factors, with eigenvalues greater than 1, accounted for all the variance on this analysis (following more than 25 iterations). The resultant factor matrix is depicted in Table 36.

Table 36. Principal components factor matrix, Edinburgh

	Factor 1	Factor 2	Factor 3	Commun- ality
AH5 1	0.54703	0.08641	-0.03363	0.30784
AH5 2	0.66413	0.29261	0.02889	0.52753
AH5E 1	-0.50882	0.09918	0.09808	0.27836
AH5E 2	-0.60136	0.08863	0.14392	0.39020
Uses	0.20579	-0.25098	0.49495	0.35032
Patterns	0.20235	-0.13375	0.81611	0.72487
MFF errors	-0.34307	0.44525	0.25079	0.37884
MFF latency	0.08636	-0.87985	-0.13059	0.79865
EFT	-0.52142	-0.32529	0.06524	0.38195

These factors lend themselves to a fairly straightforward interpretation.

Factor 1 is clearly associated with the intelligence test; both scores and error scores on the AH5 have high loadings on this factor, as does the EFT.

Factor 2 seems to derive from the Kagan MFF test; most highly loaded on latency (response time) scores, with the EFT also having a small loading on this factor. The third factor defines the divergent thinking tests, in particular the Pattern Meanings test; both this and the Uses test are factorially distinct from the AH5 and EFT measures, supporting still more strongly the notion of a separation between 'creativity' and intelligence. As a check on the results of this analysis, a Varimax rotation was undertaken, yielding a rotated factor matrix as shown in Table 37.

Table 37. Varimax rotated factor matrix

	Factor 1	Factor 2	Factor 3
AH5 1	-0.54630	-0.07396	0.06270
AH5 2	-0.71314	0.10358	0.09067
AH5E 1	0.46041	0.25380	-0.04431
AH5E 2	0.55660	0.28296	-0.01835
Uses	-0.05315	-0.12227	0.57666
Patterns	-0.04622	0.08889	0.84548
MFF errors	0.21537	0.57514	0.04084
MFF latency	0.17727	-0.86553	0.13449
EFT	0.60081	-0.13997	0.03719

The pattern of loadings shown in Table 37 largely parallels that of Table 36; similar results are obtained with both rotated and unrotated factor solutions. Again factor 1 comprises the intelligence and field-dependence tests, factor 2 the MFF test (its two scores of course having opposite-sign loadings), and factor 3 the divergent thinking tests. Although there is some overlap amongst the tests - the EFT for example also having a small loading on the 'reflection-impulsivity' factor - the results of the foregoing analyses are fairly clear-cut. Their implication for the investig-



ation of field-dependence-independence is also clear. Little evidence can be found in the above results to suggest that this dimension can in any way be distinguished from intelligence amongst Ss of the present sample. Apart from correlations between different parts of the same test, or between tests purporting to measure the same dimension, the correlations between the EFT and the AH5 test were the highest to be found in the present study. This certainly casts a shadow over the validity of field-dependence as a separate cognitive style.

(c) Field-dependence-independence and self-description

In a search for potential correlates of EFT performance beyond the ability domain, an analysis of Ss' responses to the group questionnaire, and on the self-rating scales or 'selves' was carried out. This analysis suggested that there may be some residual differences between field-dependent and field-independent individuals which are not wholly accounted for in terms of differences in intelligence.

For the purpose of analysing the group questionnaire, the 15 most field-dependent and the 15 most field-independent Ss in the sample were selected out, and a number of comparisons made between them. The first of these aimed to test the suggestion that field-independent Ss would be more likely to concentrate on science subjects in the school curriculum. In preparing for the Scottish Certificate of Education, a certain amount of specialisation takes place within schools like those used in the present research. This may take a number of forms, e.g. a concentration on commercial or technical subjects, but for the Ss in this sample the clearest division was between those taking 'arts' and 'science' subjects: while the former took for example languages, history, or art, the latter focused on mathematics, physics, and chemistry. Thus the 30 Ss in the selected 'extreme groups'

were sorted into 'arts' and 'science' categories according to whether or not they were taking or had taken the maths - physics - chemistry triad. However the results, as Table 38 shows, though in the expected direction, fell just short of significance.

Table 38. Field-dependence-independence  
and subject of specialisation

	'Arts'	'Science'
Field-independent <sup>1</sup>	5	9
Field-dependent	13	2

Fisher exact probability test:  $p = .13$

A second set of comparisons were concerned with the interests of the Ss in the two groups from opposite ends of the field-dependence dimension. The number of interests listed by Ss in two areas - as having some connection with school, or as being unconnected with school - were summed and the means found for each group. While there was no difference between the groups for 'in school' interests (which of course excluded school subjects) - each group listing a mean of 1.66 items - field-dependent Ss had a slightly larger number of interests outside school (4.2 as against 3.4; a non-significant difference).

Differences did emerge, however, in the proportion of interests listed by the two groups which, on the surface at least, could be characterised as being of a 'social' or a 'non-social' nature. Interests were classified according to whether their pursuit seemed to involve some kind of social interaction; in practice, this meant simply that activities which have no immediate social reference (e.g. sewing, knitting, driving, reading, as

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1 Unfortunately one S in this group did not list his school subjects.



contrasted with participatory sports or membership of clubs, etc.) are defined as 'non-social'. While the majority of interests mentioned by most Ss were of a 'social' variety, this held more strongly for field-dependent than for field-independent Ss: 91% of the activities listed by the former fell into this category, as opposed to 76% for the latter. Differences between the two groups (pooling both 'in school' and 'out of school' activities together) are shown in Table 39; these are significant at the .05 level.

Table 39. Field-dependence-independence  
and Ss' interests

	'Social'	'Non-social'
Field-independent	58	18
Field-dependent	80	8

Chi-square = 6.463, d.f. = 2,  $p < .05$

This result is in accord with the suggestion that field-dependent and field-independent individuals differ in their degree of social orientation, on which evidence was reviewed in chapter 2 (Pp.30-39). Associated with the same proposition are some results from Ss' descriptions of themselves on rating scales.

Of the 65 correlations between the EFT and individuals' ratings on the 'selves' described above (P.211), 10 were significant at the .05 and 3 at the .005 level. These results are displayed in Table 40 overleaf. The strongest finding to emerge from this analysis - fairly striking given the 'soft' nature of the data involved - is that between field-dependence and an interest in people on the one hand, and field-independence and an interest in things on the other. This holds for both the 'as I see myself' and

Table 40. Field-independence and ratings on self-perception scales

<u>Scale</u>	Field-independent Ss rated as more...	n	r	p
<u>'as I see myself':</u>				
Active - passive	Passive	107	-.25	.004
Impulsive - cautious	Cautious	108	-.16	.047
Humourous - serious	Serious	107	-.16	.042
Interested in people/things	Interested in things	107	-.25	.004
<u>'as I used to be':</u>				
Impulsive - cautious	Cautious	105	-.17	.042
<u>'as others see me':</u>				
Active - passive	Passive	107	-.19	.022
Hard - soft	Hard	106	+.20	.017
Rational - irrational	Irrational	105	-.21	.014
Interested in people/things	Interested in things	106	-.27	.002
Logical - intuitive	Intuitive	105	-.21	.015
Realistic - idealistic	Idealistic	105	-.21	.013
<u>'as I am going to be':</u>				
Interested in people/things	Interested in things	102	-.16	.045
Realistic - idealistic	Idealistic	102	-.18	.034

'as others see me' sets of scales, and also - though at a lower level of significance - for 'me as I am going to be'. This finding and some of the others suggested by the table above - such as that field-independents are more serious and cautious than their field-dependent peers (the latter also reinforced by the correlation of .26 ( $p < .01$ ) between EFT scores and latency on the MFF) - give general support to the propositions of Witkin and his associates concerning social and personal differences between individuals who perform differently on the EFT. On the other hand, that field-independent Ss should rate themselves as more passive, irrational, and intuitive as



compared with field-dependents, runs somewhat counter to the suggestions of these authors. It is clearly inadvisable to build too much on such findings as these; but the recurrence of the finding that field-dependent Ss have a greater level of interest in the social environment adds force to the submission that individuals differing in levels of field-dependence, differ in more than just general or perceptual ability. The next two chapters look further into the question of whether the apparently stronger pull of the interpersonal sphere on the field-dependent manifests itself in greater 'differentiation', amongst these Ss, in their manner of approach to others.

#### (d) Cognitive style interrelationships

The aim of this chapter was to report the methods and outcome of an investigation into the relationships between field-dependence-independence, and intelligence, and two other cognitive 'styles' which were regarded as indices of different modes of attention towards the environment. The outcomes of this piece of research for the hypotheses of Witkin et al. have not been favourable. Rather than being a far-reaching, unifying construct with implications for many areas of personality, field-dependence - in a study with adolescents in a British school at least - hardly seemed to define a factor of its own distinct from that measured by an intelligence test. The hypothesis that field-dependence tests measure 'psychological differentiation' would be in a strong position if the latter was taken to be a component or correlate of general intellectual ability. While Witkin and his colleagues would agree that ability factors are involved in 'differentiation', the core of their argument is to suggest that the 'level of differentiation' construct embraces many facets of the differences between individuals regardless of levels of ability. This claim receives no support in the present results.

Nor is it possible, on the present results, to suggest that there is a link between field-independence and creativity (Spotts & Mackler, 1967); correlations between the EFT and divergent thinking measures were confined to the range .00 - .03. There was a slight tendency for field-independent individuals to be more reflective than field-dependents, confirming the results of previous studies (Messer, 1976). However this result was overshadowed by the EFT's links to intelligence.

Concerning the other findings of this study, support was found for the making of a distinction between 'creativity' and 'intelligence' as these are conventionally measured. Correlations within each of the domains were much higher than any between them. It seems unlikely that this is due simply to the creativity 'threshold' effect (MacKinnon, 1962a; Torrance, 1962). Many of the Ss in the present sample would probably be below the 'threshold' level in IQ. In any case the correlation between the AH5 and total divergent thinking scores for the bottom 13 AH5 scorers is actually nearer zero than that for the 14 top scorers (.09 as against -.27). It may be that convergent and divergent thinking are uncorrelated over a wider range of ability than has been accepted hitherto.

The reflection-impulsivity test, the MFF, also retained its independence in the correlations of the present study. Given its level of internal consistency and its factorial distinctiveness, this test does seem to be a valid measure of some trait or style not tapped by any other test, in the present battery at least. Unfortunately for the same reason the present research has thrown little new light on its correlates.

The findings on self-ratings and interests described in the last section of this chapter do provide some vindication of the claim that the EFT acts as a measure of personality in some respect. Field-dependent Ss were more likely to have socially-oriented spare-time activities and to rate them-



selves as interested in people rather than things. These findings are in agreement with some recent formulations concerning field-dependence put forward by Witkin and Goodenough (1977a). The question therefore remains, whether a residual element in field-dependence test scores (left behind after the removal of intelligence) is an index of an individual's personal-versus-impersonal orientation, or of some other channeling of the direction of interests. This in turn raises the further question of whether such channeling of interests might be accompanied by an increase in cognitive 'differentiation' in relation to the field of interest. Evidence that field-dependent Ss exhibited a higher level of 'differentiation' in the interpersonal sphere would cast real doubts on the Witkin et al. claim that their perceptual tests measure fundamental levels of 'psychological differentiation'. The next two chapters survey the literature and report a research study bearing on these and related questions.

# 8

Alternative forms of differentiation:

some possibilities



## Chapter 8

### Alternative forms of differentiation: some possibilities

In the first two chapters of this thesis, three questions were formulated concerning the relationship between field-dependence-independence and the concept of differentiation. The first of these concerned the antecedents of individual differences in performance on field-dependence tests. It was suggested that, rather than being measures of basic structural differences between individuals brought about by variations in child-rearing, the tests were indices partly of general ability and partly of the extent to which individuals had mastered particular perceptual skills. Some empirical work on one aspect of these skills, reported in chapters 4 and 5, could not show this to be the case, but identified a large degree of overlap between field-dependence and intelligence scores.

The second question focused specifically on the relationships of field-dependence to intelligence and other cognitive styles, giving rise to a study whose results were presented in chapter 7. Each of the cognitive style variables involved - field-dependence, divergent thinking, and reflection-impulsivity - has at some point been the subject of a dispute regarding its relationship to general intelligence. It seems almost ironic,

given the claims made about the relative scope of each of these dimensions, that field-dependence-independence should have shown the strongest ties to ability in the study described. More than any other cognitive style, field-dependence has been presented as indexing a fundamental feature of psychological functioning - 'level of differentiation' - with implications across the whole field of thought and personality. Yet in practice a principal measure of field-dependence appeared less distinct from general ability than did measures of other cognitive styles with more limited terms of reference.

The third question posed at the outset of this thesis is addressed in this chapter and the next. A central tenet of the 'differentiation' and 'consistency' hypotheses propounded by Witkin and his associates (1962/1974; see chapter 1 above, Pp.13-17), is that an individual's 'level of differentiation' as assessed by field-dependence tests will typify his mode of functioning across quite discrete psychological domains. Counter to this, it is suggested here that the process of differentiation, as conceived by Lewin and Werner, may take place at different rates and in different directions in different parts of the organism. In other words, even if performance on field-dependence tests like the EFT or RFT were an index of differentiation in the spatial-perceptual sphere, this would tell us little about an individual's 'level of differentiation' in other areas, such as the linguistic, aesthetic, or interpersonal parts of his life. To assess these, other instruments would have to be used.

The specific areas with which these two chapters are concerned, and in which evidence is sought of other kinds of differentiation than that allegedly gauged by perceptual tests, are in the verbal and interpersonal domains. Since the test materials used to ascertain levels of field-dependence are spatial and figural, it seems possible that individuals



performing poorly on these might manifest skills of a parallel kind with problems of a verbal nature. Similarly, if field-dependent and field-independent individuals differ in their orientation towards or away from the social environment, as some research suggests, then those performing poorly on field-dependence tests might again exhibit greater 'differentiation' in their perceptions of other people. In the research to be described in the next chapter therefore, tests of field-dependence; of verbal 'dis-embedding'; and of 'differentiation' in the interpersonal sphere, were administered to an adolescent sample and their inter-relations examined.

An additional question asked in this study in relation to the above ideas, was concerned with possible differences between the sexes in their scores on the aforementioned tests. Although there is substantial variation within both sexes in scores on field-dependence tests, the majority of studies undertaken in many societies have found a significant sex difference with women being more field-dependent than men (Witkin, 1967). Such differences are accounted for in terms of socialisation pressures, along the lines described in chapter 2 (though a possible role of biological factors, or some form of interaction, has not been excluded). An implication of the hypotheses of Witkin and his associates must therefore be that women are 'less differentiated' than men on average. The argument of the present thesis on the other hand is that those performing less well on the EFT or RFT cannot be described as 'less differentiated' for that reason; and that indices akin to field-dependence tests, but used in other areas, may suggest just the opposite. The frequently-found sex difference in EFT and RFT performance thus affords an opportunity for testing this notion, by sampling other areas in which, on the basis of research evidence, females might be 'more differentiated' than males.

A sizeable literature now exists on the nature and extent of psychological



differences between the sexes (e.g. Garai & Scheinfeld, 1968; Lloyd & Archer, 1976; Maccoby, 1967; Maccoby & Jacklin, 1974). Several findings of this research are relevant to the suggestion that females might show greater 'differentiation' than males in areas other than space or form perception. First, as regards space perception itself, most studies show a pattern of superior male test performance from early adolescence onwards. This result has prompted writers such as Sherman (1967) to suggest that the sex difference on field-dependence tests is primarily a function of differences in spatial ability.<sup>1</sup> Second, the reverse seems to hold for verbal abilities: from the age of 10 or 11 and throughout the teenage years, there is a sex difference in verbal test performance favouring girls (Maccoby & Jacklin, 1974). Third, some research has suggested - though this finding is by no means as clear-cut as the differences on spatial and verbal tests - that

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1 As noted in chapter 2 (P.40), a number of attempts have been made to give an account of individual differences in field-dependence in terms of hormonal factors. These attempts have taken the sex differences in EFT and RFT scores as primary data, and have tried to relate them to other observed differences between the sexes in cognitive ability and motor skills, emotionality and patterns of behaviour. However, a curious contradiction can be found in the theoretical writings on this point. The concept of 'inhibition' has been used as a cornerstone of theorising in this area; but in invoking it, two of the most widely-quoted approaches to cognitive sex differences couched in biological terms draw conclusions which are completely the opposite of each other. Broverman, Klaiber, Kobayashi, and Vogel (1968) reviewed evidence concerning psychological and physiological differences between the sexes. Hinging their explanations on differences between males and females in levels of 'inhibition' in the autonomic nervous system, these authors suggested that males are superior to females in performance on those tasks which involve '...inhibition or delay of initial response tendencies to obvious stimulus attributes' (op. cit., P.28). But reviewing the same field, Gray and Buffery (1971; Gray, 1971) reached just the opposite position: '...we would expect females...to be superior to males on delayed response tasks' (op. cit., P.101). Explanations of these (mutually contradictory) sets of differences are given by each group of authors in terms of 'inhibition' - for Broverman et al., higher amongst males; for Gray and Buffery, higher amongst females. That these authors see 'inhibition' as operating on different physiological 'levels' (for Broverman et al., in the endocrine system, for Gray and Buffery in the brain) does not resolve the differences between them. More disturbing, is the fact that both groups can adduce evidence, not quoted by the other party, in support of their own argument. Buffery and Gray (1972) even cite Broverman et al., seemingly unaware of these differences in terminology, in hypothesised cause and effect, and in selection of the available evidence.



there are differences between the sexes in their relative level of attention towards other people; females being more interested in, and sensitive to, events in the interpersonal environment. Complementing this and the oft-quoted finding of sex differences in field-dependence, is the contention of Witkin and his associates (Witkin & Goodenough, 1977a, b; and see chapter 2, Pp.30-39) that field-dependent individuals are more 'socially oriented' than their field-independent peers.

If field-dependence tests do measure some form of 'differentiation', and if males show greater differentiation in areas - like space perception - in which they have more interest or skill, then it seems plausible enough to speculate that females might manifest higher levels of differentiation in fields that are of interest to them. The aims of this chapter are to explore such fields, and possible means of measuring differentiation within them. Evidence bearing more closely on these proposals is sifted below.

### 1. 'Dis-embedding' in language

The skill which underlies performance on the tests of the field-dependence dimension has at various points in the past (Karp, 1963; Witkin et al., 1962/1974; Witkin & Goodenough, 1977a) been referred to as 'dis-embedding', 'de-contextualisation', or 'restructuring'. All of these terms imply a similar kind of process: the ability to extract parts of stimuli from their surrounding wholes, to separate them from a field - perceptual or conceptual - with which they are merged, and to deal with them flexibly to produce new combinations of stimuli. It is easy to see how the possession of such skills could - by a process of analogy - be taken as an index of differentiation; how the capacity to separate part from part could be understood as signalling the existence of a similar separateness within the person. A forceful argument for the existence of multiple kinds of differentiation, therefore, could be built on evidence that 'dis-embedding' skills with diff-

erent kinds of material do not correlate with each other.

Unfortunately, evidence on this point is somewhat conflicting. While some results suggest that there may be a range of 'restructuring' skills specific to different kinds of stimuli, others support the view that there may be a similar ability underlying all of them. A study by Messick and French (1975) favours the first of these suggestions. These authors administered a battery of 35 'closure' tests to a sample of 541 Naval Aviation cadets. The tests included a number of the standard Thurstone measures of speed and flexibility of closure, and a number of other related tests using geometric, verbal, or other symbolic material, such as hidden figures and anagrams tests. The intercorrelations of these were factor-analysed, yielding 14 first-order factors linked to different kinds of tests; of more interest, however, were the second-order factors produced by further analysis. These were four in number: a 'general analytical functioning' or 'general reasoning' factor, and three other factors associated with distinct kinds of test materials. First amongst the latter was a factor labelled 'symbolic closure', reflecting skill with words, letters or numbers. A second factor of 'semantic closure' could also be identified, on tests of higher-order linguistic abilities. The third factor was 'figural closure', described as the ability to impose form upon a figural array, or to analyse it into parts, and thought by these authors to be similar to 'articulation' as defined by Witkin and his associates.

On the basis of these results then it would seem that a distinction between 'dis-embedding' in the figural and verbal domains is wholly justified. The tasks with high loadings on the symbolic closure factor seemed to require '...the structuring or imposing of form upon relatively unstructured or incomplete arrays of symbols and/or the ability to analyse structured arrays of symbolic elements into discrete parts so as to facilitate dis-embedding or re-combination' (Messick & French, 1975, P.15). Such abilities are exact



analogues, in the verbal sphere, of the skills thought to be behind effective performance on tests of the field-dependence dimension.

Witkin and Goodenough (1977a), however, have contended that the tests used by Messick and French are not true measures of 'dis-embedding'; and point to a study by Lefever and Ehri (1976) which in their view employed a proper measure of 'verbal dis-embedding' and which supported the idea that field-independent individuals will also show greater competence in non-spatial 'restructuring'. Lefever and Ehri (1976) examined the relationship between field-dependence-independence and the capacity to dis-ambiguate sentences with more than one possible meaning. Four types of ambiguous sentence were utilised by these authors. The first contained 'lexical ambiguity', in which a single word had two different meanings (as in 'the soldiers took the port'); the second typified 'surface-structure' ambiguity - arising from the possibility that words could be combined in different ways (e.g. 'they are cooking apples'); and the third illustrated ambiguities in underlying structure (such as 'flying aeroplanes can be dangerous'). Sentences of each of these types permitted two possible interpretations. A fourth group of sentences contained combinations of the foregoing types and thus allowed at least four possible interpretations in each case. Ss were set the task of dis-ambiguating (i.e. recognising the alternative meanings of) 15 sentences in each of these four categories. Sixty-nine students were asked to complete this task, together with a variant form of the EFT; and field-independence was found to correlate positively with the number of sentences successfully dealt with in each separate category - a result which was significant over all categories. It may then be the case that 'dis-embedding' or 'restructuring' is a skill which manifests itself to a similar degree in the verbal and spatial domains.

Lefever and Ehri's results could, on the other hand, have been due to differences in intelligence within their sample of Ss; no information on this

can be gleaned from their study. Though their sample consisted of college students, there may still have been enough variation within the group to account for these results in terms of intelligence. An additional possibility is, of course, that field-independent individuals do possess greater skill (and are more 'differentiated') in the verbal domain also (as some of the evidence reviewed in chapter 2 might suggest) - indeed that they have an advantage in relation to any cognitive test; but are less skilled and less interested in areas outwith those usually assessed by these means.

However, there are some studies which suggest that groups which tend on average to be more field-dependent on the EFT and RFT may nevertheless perform more effectively on one 'verbal dis-embedding' task: that of solving anagrams. Stevenson, Klein, Hale, and Miller (1968) asked a sample of 258 boys and 271 girls in the age range 8 - 14 to make as many words as they could from the letters in the word 'generation'; 8 minutes were allotted to the task. At all age levels, performance of girls was superior to that of boys ( $p < .001$ ). Similar results (though less highly significant) were also obtained in other studies by these authors (Stevenson, Hale, Klein, & Miller, 1968; Stevenson, Friedrichs, & Simpson, 1970). But in other studies, in which S's task has been to 'solve' a fixed number of items in anagram form, no sex difference has been found (Feather, 1968, 1969; Lipton & Overton, 1971). Nevertheless, the superiority of males on tasks involving 'dis-embedding' is challenged by these results, which have emerged sufficiently often to identify anagrams as a test on which field-dependent Ss may show greater 'restructuring' capacities than they do on tests using spatial-perceptual materials.

The extracting and re-arranging of elements which must be undertaken if an anagram is to be correctly solved, seems to me to constitute a suitable verbal parallel to the 'de-contextualisation' thought to be required on the EFT. Anagrams were amongst the items used by Messick and French (1975) in



their study which suggested that figural and verbal forms of 'closure' are distinct; and Podell and Phillips (1959) also found anagrams and embedded figures tests to be factorially separate. Hence, an anagrams test was used in the study to be described in the next chapter as a means of assessing 'dis-embedding' in a non-spatial context.

## 2. Social orientation, person perception, and 'differentiation'

A second field in which the study to be reported in chapter 9 sought evidence of other forms of differentiation was that of interpersonal relations. The research reviewed in chapter 2 (P.30 et seq.); some of the results of chapter 7; and the recent formulations of the Witkin group (Witkin & Goodenough, 1977a, b), are all compatible with the notion that field-dependent and field-independent individuals differ in the extent to which they are attentive towards their social surroundings. If field-independent Ss are more aloof, more task-oriented, more separate from others, and this is accompanied by greater 'differentiation' which can be measured by performance on perceptual tests; then it seems equally likely that the more socially-attuned field-dependent S might be more 'differentiated' in his perceptions of other people. For Witkin and his colleagues of course, 'differentiation' is all of one kind and the statement just made is a misconception. The research to be outlined below was designed to compare these two views of 'differentiation'.

### (a) 'Social-personal orientation'

A first question in this respect of course, is whether field-dependents and field-independents do genuinely differ in their relative directions of interest. In this piece of research therefore, one of the measures used was designed to estimate an individual's relative 'personal versus social'

orientation directly. The use of this measure is based on the suggestion, referred to above (P.230), that there is a difference between males and females (who are generally found to differ in level of field-dependence) in the amount of attention they pay towards others.

While evidence bearing on this point is once again equivocal (Maccoby & Jacklin, 1974), a number of studies have reported significant differences between the sexes which conform to the pattern previously outlined, with females showing a greater level of interest in people. This difference seems to emerge very early in life. For example, in an ethological study of the behaviour of children aged between 2 and 5, Smith and Connolly (1972) found that, while there was no overall difference between boys and girls in the amount of vocalisation they made, the pattern of vocalisations was different for each sex. While girls were significantly more likely to talk to other children, boys were much more likely to make noise simply associated with play activities. Using a similar approach, McGrew (1972) noted the responses of boys and girls in nursery groups to the introduction of a new member. While boys remained aloof and indifferent, girls paid a great deal of attention to newcomers, talking to them, comforting them, and apparently helping them to 'settle in'. Even in infancy, then, there seems to be some kind of difference between the sexes in degree of social orientation.

That this kind of difference also manifests itself in adulthood, in a contrasting pattern of preference for people or objects as a focus of interest, has been shown in an experiment by McGuinness and Symonds (1977). These authors tested the preferences of males and females for persons or objects, in an experiment in which Ss were forced to choose between them. Pictures of human figures and of mechanical objects were paired and presented tachistoscopically in a specially constructed stereoscope. In this



situation, which produces 'binocular rivalry', Ss tend to report seeing whichever stimulus (of the two presented) is of greater interest to them. In McGuinness and Symonds' experiment, '...Males saw objects significantly more often than people...and they saw objects more than females. Females reported human stimuli more than objects...and more than males' (op. cit., P.693); leading these authors to the conclusion that '...when two stimuli rival each other for attention, objects are more meaningful or salient to the male, and social stimuli are more salient to the female' (loc. cit.).

In the present research, attention was focused not on the 'object-person' dimension, but simply on the extent to which female (and field-dependent) Ss could be said to be more concerned with aspects of interpersonal relations. The method used as a 'marker' of this was taken from the work of Carlson (1970; Carlson & Levy, 1968). Working in the field of sex differences in personality functioning, Carlson (1970) conceptualised a number of differences between males and females in terms of 'agency' versus 'communion', a distinction which in some respects mirrors that between field-dependence and field-independence. The concept of 'agency' refers to a concern with instrumental actions and manipulations beyond the self; to a tendency to see oneself as separate from others; and to an urge to gain control over one's environment. 'Communion' on the other hand reflects a concern with interpersonal relations, a tendency to merge with others, and a desire to communicate and cooperate. In a series of studies with groups of male and female Ss, using a variety of assessment methods (including an adjective checklist, and content analysis of self-descriptions and self-reports), some tentative support was obtained for the usefulness of this distinction in comprehending patterns of differences between the sexes.

The drawing of a contrast between 'social' and 'personal' orientations is one aspect of the 'agency-communion' schema outlined by Carlson. Put

briefly, this refers to '...a tendency to define one's self-concept either in terms of social relationships or in terms independent of social relationships' (Carlson & Levy, 1968, P.911). Using a specially prepared adjective checklist, Carlson and Levy found highly significant differences ( $p < .001$ ) between the responses of 88 male and 75 female adults ranging in age from 18 to 45, males being more 'personally' oriented - that is, more likely to describe themselves in terms independent of others.<sup>1</sup> There is a straightforward parallel here with the propositions forwarded by Witkin and Goodenough (1977a, b) concerning field-dependent and field-independent cognitive styles; Carlson and Levy's adjective checklist was therefore included in the present study to test whether or not field-dependent and field-independent Ss (or females and males) would respectively emerge as more 'socially' and more 'personally' oriented when asked to describe themselves in this way. The adjective checklist is described in more detail below (P.249) and is set out in full in Appendix IV (h).

(b) Sex differences, field-dependence, and person perception

Recalling the research outlined earlier (Pp.30-39) on links between field-dependence and a 'social' orientation, and in view of the results just described, it may be inferred that women, and those found to be more field-dependent, may have a stronger interest in others than men and more field-independent persons. The concern of the present thesis is whether this carries the further implication that women and field-dependent individuals will manifest greater 'differentiation' in the interpersonal domain. A number of other results have bearings on this issue, though their overall

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1 In other studies however; a confusing collection of results has been obtained. Some have found the difference described here (Carlson, 1965; Smart & Smart, 1970); others have found no differences (Carlson & Levy, 1970); and still others have found the direction of the difference to vary with age (Katz & Zigler, 1967).



tenor remains unclear. These concern differences between the sexes, and between field-dependent and field-independent individuals, in their manner of perceiving others.

Information about the way in which individuals see others is usually abstracted from Ss' descriptions of other persons specified by the experimenter. Of numerous methods that can be used to accomplish this process, two are relevant here. In the first, Ss are simply asked to freely describe a small number of people (say 4 or 8), and the resultant descriptions content-analysed. The latter may involve placing their responses into a set of pre-arranged categories, or searching through them for statements of a particular kind. In the second method, Ss are requested to compare two individuals with a third, and to identify some way in which the first two are like each other, but differ from the third. This method has been used in research on personal construct theory and can lead to a wide range of analyses derived from that approach.

Several research studies, based on these methods, have suggested that in appraising others, women and men attend to different attributes. In two studies separated by 14 years, Beach and Wertheimer (1960) and Korten (1974) obtained remarkably similar results. Using the first of the methods described above, these researchers discovered that significantly more often than females, males referred to abilities, knowledge, interests, and activities when describing other people. Significantly more often than males, females referred to aspects of interpersonal interaction, and to an individual's self-concept. In both of these studies, in which the Ss were American college students, the results conformed to this same pattern.

A number of studies have lent weight to the view that females are more conscious of an individual's personal qualities, and of what may be called 'psychological' attributes, than are males. In a large-scale study of the

social perceptions of children and adolescents, Livesley and Bromley (1973) analysed descriptions of other people supplied by 320 school pupils aged between 7 and 15. Of the many findings of this research, a few are of interest here. First, with the exception of those in the youngest age group, girls' descriptions contained more statements than boys'. Second, when statements were divided into 'central' and 'peripheral' groups - the former referring to 'inner, psychological qualities' and the latter to 'external qualities of a person and to his surroundings' - it was found that girls used more 'central' statements than boys, though these did not constitute a higher proportion of their total number of statements than was the case with boys. Third, girls had a larger 'trait vocabulary' than boys, and '...used significantly more and a higher proportion of traits per description than did boys' (op. cit., P.163), a difference which increased with age.<sup>1</sup> Fourth, when the kinds of statements made by Ss were analysed, it appeared that girls made significantly more references than did boys to the opinions of the person they were describing; referred more often to his attitudes towards himself; and made more evaluative comments. Girls '...tended to be a little more sensitive to the stimulus person's interpersonal qualities than were boys' (ibid., P.181). In general, the results indicated that '...girls appeared to be more interested in people than did boys, and more sensitive to the range of qualities people possess, thus highlighting an important psychosexual difference' (ibid., P.289).

Results from several other studies have been in agreement with those recited above. Supnick (described in Crockett, 1965), using content analysis of

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1 For the purpose of this analysis a trait was defined as 'a psychological concept which enables an observer to impose a meaningful and an economical construction on a person's behaviour, and, if it is a valid assessment, to predict or influence that person's actions' (Livesley & Bromley, 1973, P.157).

It should be noted that the boys and girls in this study were matched in overall verbal ability; thus 'girls may develop a somewhat specialised vocabulary in response to their concern with the interpersonal environment' (op. cit., P.167).



descriptions of 8 people in a manner akin to Livesley and Bromley, and working with students aged 17 - 55, found that female Ss used significantly more interpersonal constructs in their descriptions than did male Ss. Little (1968), whose Ss ranged in age from 11 to 18, also found that females used a larger proportion of psychological constructs (elicited by the personal construct method, cf. P.238) than did males. Finally, as a possible corollary of these findings, a large quantity of research on friendship patterns in adolescence (reviewed by Maccoby & Jacklin, 1974) suggests that these differ between the sexes - girls tending to form fewer, but more intimate, relationships with others.

Results on sex differences, then, generally support the view that females may perceive others in terms of more 'psychological' attributes. Results on field-dependence-independence, on the other hand, show less concurrence with the expectation that field-dependent individuals might also perceive others in this way.

A study undertaken by Westbrook (1974) gives tentative support to the view that field-dependent Ss may be more attentive than field-independents to emotional cues. Ss were asked to describe two series of stimuli, one consisting of slides which showed people interacting in small groups, the other of brief, two-person conversations recorded on tape. Their descriptions were then analysed for references to feelings or emotions. Field-dependence was significantly associated with attentiveness to emotion in the visual, but not the auditory, stimuli. (Surprisingly, no such finding emerged in relation to sex.)

However, evidence concerning the constructs used by field-dependent and field-independent individuals in perceiving others, runs counter to the proposal that the former will be more 'psychologically minded'. While Elliott (1961) found no differences between field-dependent and field-

independent Ss in this respect (and concluded that field-dependence did not signify 'little differentiation in the self-concept' (op. cit., P.33)), both Bieri, Bradburn, and Galinsky (1958) and Witkin et al. (1962) found that there was a tendency for field-independent Ss to produce more constructs of a 'psychological' nature. Bieri, Bradburn, and Galinsky (1958) elicited constructs from their Ss by means of the 'triad' method outlined above (comparing two individuals with a third). The constructs were then classified as either 'external' or 'internal', contrasting those '...which placed greatest emphasis on the more apparent, superficial, and surface qualities of human behaviour' with those '...which emphasised underlying motivation, emotional expression, and qualitative aspects of one's interpersonal relationship to another' (op. cit., P.3). The External Construct Score (ECS) so devised was significantly correlated with EFT score for women (but not for men), field-dependent Ss having more 'external' constructs. Witkin et al. (1962), analysing their Ss' descriptions of themselves, their teachers, fathers, and mothers, found a similar relationship amongst their sample of 10-year-old boys.

These results seem slightly at odds with some of those discussed earlier. If females, who tend on average towards field-dependence, also tend to use more 'psychologically' based constructs than males (Little, 1968; Livesley & Bromley, 1973), then it is surprising that within one sample of females and one of males (Bieri et al., 1958; Witkin et al., 1962), these constructs tend to be used more by field-independent Ss. In the study to be described below, an attempt was made to clarify these relationships by eliciting constructs from male and female Ss and examining both within-sex and between-sex relationships between these constructs and field-dependence.

### (c) 'Differentiation' in person perception

Whatever the pattern of relationships between sex, personality, and degree



of 'social orientation', one finding is clear from person-perception research. This is that attentiveness towards others is no guarantee of accuracy in making judgments about them. In the study by Westbrook (1974) cited above, measures of attentiveness to emotions and of accuracy in judging them were unrelated in the case of auditory stimuli, and negatively correlated in the case of visual stimuli. Reviews of the literature have emphasised the independence of attention and accuracy (Taft, 1955; Hoffman, 1977). And it has been shown that, though less attentive socially than their field-dependent peers, field-independent Ss make better judges of others (Westbrook, 1974; Wolitzky, 1973).

Similarly, attentiveness to a particular domain does not in itself ensure a higher level of 'differentiation' in relation to that domain. However, if males have a higher level of interest, and greater skills, in the area of spatial perception, and also manifest greater 'differentiation' in that area (accepting field-dependence tests for the moment as a measure of this); then it seems possible that females might exhibit greater 'differentiation' in an area that is of interest to them. The preceding sections have tried to show that interpersonal relationships constitute such an area; that females are more interested in this than are males, and more attentive towards the specifically 'psychological' parts of it. It could be argued that this last point is in itself an index of greater 'differentiation'; a concern with such issues generally emerges later in development than a concern with 'external' attributes (Livesley & Bromley, 1973), and is widely taken to be one indicator of developmental level or 'maturity'.

The aim of the study to be described in the next chapter is to test this hypothesis: that females (or field-dependent Ss) might show greater 'differentiation' than males (or field-independent Ss) in the interpersonal domain.

At present, no evidence is available on 'differentiation' in the interpersonal sphere which can throw any light on this hypothesis, with one tentative exception. Livesley and Bromley (1973) found that, as mentioned above, the girls in their sample tended to use more traits than boys in describing others. However, girls also tended to use each trait more often than did boys; that is, they applied each trait to a larger number of situations. Boys therefore appeared to use traits more differentially; however, Livesley and Bromley were unable to decide whether this indicated greater discrimination skill amongst the boys, since traits with the same names might nevertheless have had different meanings for the girls. A method is therefore required which helps to distinguish whether or not Ss are applying traits in the same way each time they use them.

In the study to be described here, repertory grids were used to explore the extent to which Ss used constructs differentially in describing other people. The constructs themselves were also examined in terms of the 'internal - external' distinction employed by Bieri and his associates (1958). Thus evidence could be gathered simultaneously on the issues of whether females (and field-dependents) were more 'psychologically oriented' and more 'differentiated' in their perceptions of others.

The aims of this chapter have been to suggest areas other than space perception in which individuals might manifest greater 'differentiation' than they do on the EFT and RFT; to explore evidence relating thereto; and to identify possible means of measuring 'differentiation' in the verbal and interpersonal fields. In the next chapter, empirical work is described on the relationships between these measures and field-dependence-independence.



# 9

Alternative forms of differentiation:

a study in Sheffield

## Chapter 9

### Alternative forms of differentiation:

#### a study in Sheffield

The aim of this chapter is to describe an empirical study which set out to test some of the ideas developed in chapter 8. In essence, this study was concerned with relationships between three sets of dependent variables: first, scores on a group version of the EFT, used as a measure of the field-dependence dimension; second, scores on two brief anagrams tests, used as indices of 'differentiation' in the verbal domain; and third, aspects of the personal constructs used by individuals in perceiving others, as indicators of 'differentiation' in the interpersonal domain. As a measure of ability, in the light of evidence obtained earlier, an intelligence test was also included; and individuals were asked in addition to complete an adjective checklist as an assessment of their 'social-personal' orientation, and a short questionnaire.

#### 1. Subjects

The subjects in this sample were 91 fourth- and lower sixth-formers from a large comprehensive school in Sheffield. These Ss were obtained by contacting the city's Education Department, which suggested the school as



a possible site for the research. Contact was then made with the headmaster and with one of the form teachers, and the purpose and requirements of the research outlined. Dates for carrying out group testing were arranged, and the teacher invited as many pupils as possible to be present. As with the research in Edinburgh, this work was carried out in the summer term and so the numbers were lower than they otherwise might have been. In addition, since the testing was carried out on two consecutive days with each form, the numbers fluctuated somewhat; some Ss took some tests but not others. It was decided that, for any given test, the scores of all those who had taken it would be included in the data analysis.

The numbers and mean ages (in years and months) of Ss in the various groups are shown in Table 41 (as some Ss were not present when information on age was collected, the age data for the fourth form are based on 29 boys and 21 girls only).

Table 41. Numbers and ages of Ss: Sheffield sample

	<u>Boys</u>		<u>Girls</u>		<u>Total</u>
	n	Age	n	Age	n
4th form	34	15:6	23	15:3	57
6th form	16	17:11	18	17:1	34
Total n	50		41		91

## 2. Tests and test administration

### (a) Measures used

The measures used to gather data in this study were as follows:

- (1) The AH5 group test of intelligence (Heim, 1968);
- (2) The group version of the Embedded Figures Test (Witkin, Oltman,

Raskin, & Karp, 1971);

- (3) The Carlson Adjective Checklist (Carlson & Levy, 1968);
- (4) Two anagrams tests: one of solving a series of anagrams (Feather, 1969), and the other of producing words from the letters of the word 'generation' (Stevenson, Klein, Hale, & Miller, 1968);
- (5) A specially prepared group form of the Role Construct Repertory Test (or 'Repertory Grid'), incorporating a 'rank-order' grid (Fransella & Bannister, 1977).

In addition, Ss were given a brief questionnaire for the purpose of gathering information about age, school subjects, and interests. This questionnaire and items (3), (4), and (5) above are reproduced in Appendix IV sections (d) to (h).

#### (b) Testing sessions

All of the above measures were administered in group form. For this purpose, a large classroom was made available by the school. Ss from each form were tested in two sessions on consecutive mornings. In the first session with the fourth form, Ss were given the brief questionnaire; the AH5 test; and the adjective checklist. In the second session, they were given the group EFT, the anagrams tests, and the repertory grid. A similar order was followed with sixth formers except that the anagrams were given in the first session and the adjective checklist in the second. Each session lasted for two 'periods' of the school timetable, or one hour and twenty minutes. Some Ss came to the first session but not the second and vice versa. To help maintain sample sizes, all the test scores were used, rather than only those for Ss who completed all tests. It was again emphasised to Ss that participation in the exercise was voluntary (at which point a few left) and that the research was concerned with the relations between their scores on the tests rather than their overall level.



### (c) Test procedures

#### The AH5

The AH5 test was included in this study for the general purpose of monitoring the relationship between ability and scores on the other test of the 'battery', notably the EFT. While for the younger Ss other tests would have been more appropriate, unfortunately the AH5 was the only test available. The test can however be used with 15-year-olds and was employed here for correlational rather than assessment purposes.

This test has been described above (P.204). For the purpose of the present study only the total score was used in data analysis. Administration of the test was undertaken as directed in the manual.

#### Group Embedded Figures Test (GEFT)

Since the assessment of field-dependence using the individual Witkin EFT can be a time-consuming process, a group version of the test was devised by Oltman, Raskin, and Witkin (Witkin, Oltman, Raskin, & Karp, 1971).

This consists of a booklet with the standard simple forms (8 of those used in the full individual test) printed on the back and the complex forms inside. Thus Ss cannot see both at once (the complex forms all being printed on odd-numbered pages). The test contains a total of 25 items, in three sections of increasing difficulty; instructions are presented at the front of the booklet. The test is timed; two minutes being allowed for the first section (of 7 items) and five minutes each allowed for sections 2 and 3 (which have 9 items each).

The test was administered as required by the manual. S is instructed to trace round a simple form whenever he thinks he has found it; his score on the test is then simply the total number of items he correctly locates in the time available. A scoring key is provided.

The internal reliability coefficient of this test quoted in the manual is .82 and its correlation with the individual EFT is given as  $-.82$  for men and  $-.63$  for women (the  $r$ s being negative since these tests are scored in opposite directions). The test thus seems satisfactory as a group measure of the field-dependence dimension.

#### The Carlson Adjective Checklist

The Carlson Adjective Checklist was used in this study as a base measure of 'social-personal' orientation, and to test the hypothesis that females and field-dependent Ss should be more 'socially oriented' than males and field-independent Ss. The checklist is reproduced in full in Appendix IV (h).

The checklist was administered to Ss in the form in which it is given in the Appendix; the instructions were read out and Ss asked if there was anything they did not understand or needed explaining further. A special accent was placed on the marking of exactly ten adjectives.

Specification of which adjectives are respectively indicative of a 'social' and a 'personal' orientation is contained in Carlson and Levy (1968). For scoring purposes, items which Ss have marked (+) (as best describing themselves) are scored 1; items which Ss have encircled (as 'most descriptive' of themselves) are scored 2. In addition in the present study, 'social' items were given a minus sign, and 'personal' items a positive sign.

Overall responses can then be scored in two ways: Ss can simply be described as 'socially' or 'personally' oriented in terms of the balance of their scores (above or below zero); or can be given an actual score according to the algebraic sum of their item scores. Both procedures were followed in the present research. (The latter gives a range of scores from  $-15$  to  $+15$ .)

One-month test-retest correlations for the Carlson checklist are given by



Carlson and Levy (1968) as .79 and .72 for two small college samples. The method thus seems a reasonably stable indicator of an individual's degree of 'social' orientation. Approximately ten minutes were allowed for its completion by Ss in the present samples.

### Anagrams

Anagrams tests were employed in this study as indices of 'dis-embedding' capacity in the verbal domain, in line with the reasoning set out in chapter 8 (Pp.230-234). To assess Ss' skill with anagrams, a 3-page test booklet was prepared, which is presented in Appendix IV (g).

This was assembled in a manner analogous to the group Embedded Figures Test, with three parts each timed separately. The first part contains ten 5-letter anagrams (some with more than one solution) which were included partly as an easy introduction to the test; five minutes were allowed for this part of the test. The second part contains ten 6-letter anagrams taken from the research of Feather (1969; Feather & Saville, 1967). These items have been established as being of about 50% difficulty (Feather & Saville, 1967); a further five minutes were allowed for these. The third part of the test, adopted from the work of Stevenson and his associates (Stevenson, Klein, Hale, & Miller, 1968), allows Ss eight minutes to produce as many words as they can from the letters of the word 'generation'.

In administering these tests, which need little introduction to most Ss, only brief instructions were given. When the time had elapsed on each part, Ss were asked to turn over the page to the next.

Two scores were taken from this test. The first was the sum of anagrams correctly solved by S on the first two parts of the test (the maximum thus being 20). The second was the number of words made by S from the letters of the word 'generation' in the third part of the test. (The latter ranged

from 7 to 44). When analysing the data the first of these scores was called 'Anagrams 1' and the second 'Anagrams 2'.

### Role Construct Repertory Test

The Role Construct Repertory Test was used in this study to provide two sorts of information: first, concerning the kinds of constructs used by Ss in perceiving other people; and second, as a measure of 'differentiation' in perception in the interpersonal domain.

This test is one of the principal measures used in research on Personal Construct Theory. It was devised originally by Kelly (1955) but has since then been developed and extended in a number of ways (Bannister & Fransella, 1971; Bannister & Mair, 1968; Fransella & Bannister, 1977). While its main area of application has been in clinical work, it has also been used in research on personality, particularly on cognitive complexity (Bieri, 1955; Crockett, 1965; Fransella & Bannister, 1977). Its aim is to produce an understanding of individuals in terms of the constructs they use to organise their experience. A construct is '...a way in which some things are interpreted as being alike and at the same time different from other things' (Bannister & Mair, 1968, P.13). The scope of this formulation and the range of methods derived from it are obviously too wide to be discussed at length here; for present purposes attention is focused on the methods used to elicit personal constructs and explore the relationships between them.

Constructs may be generated in a number of ways; the most common is by use of the 'triad' method mentioned above (P.238). Individuals are given a list of role-titles of important people in their lives - such as father, mother, teacher, spouse, or supervisor. Then, taking three of the individuals thus identified, they are asked to think of some way in which two of them are similar to each other but different from the third. The ideas



Ss were asked to write down. Finally, after entering their elements and constructs in a matrix Ss were asked to rank the ten elements on each of the constructs in turn. One construct, 'like me - not like me', was supplied. The end product of this process is a grid containing sets of ranks for each of the elements on each of the constructs.

In practice this task unfortunately proved too difficult for some Ss in the time available; of 79 Ss who were present when the grids were administered, 51 produced a full list of ten constructs, and 34 completed the matrix of ranks.

The contents of grids can be treated in a number of ways. A variety of methods have been developed for analysing the relationships between constructs and elements (Fransella & Bannister, 1977). In the present research, each grid was analysed with a view to producing an index of an individual's level of 'differentiation' in the interpersonal domain. For this purpose the measure chosen was the 'intensity score' (Bannister, 1960; Bannister & Fransella, 1966; Honess, 1976).

This score can be regarded as a measure of the amount of 'differentiation' in a grid; that is, of the degree to which the individual's constructs are separate from one another. By examining the rank-order correlations between the constructs, it is possible to ascertain whether or not each of the constructs is being used in a distinctive fashion. For example, if the rank orders of the elements on a number of constructs are very similar, there would seem to be a close link between the constructs in the way in which they are used - they have roughly the same meaning for the individual in question. If on the other hand the rank orders are all different, it seems much more likely that the individual is using constructs in a discriminating way; he has a larger number of constructs at his disposal and there is greater separation between them. A measure of this separation would seem

to be a reasonable index of 'differentiation' in the Lewinian sense.

Such a measure has been used as an index of 'cognitive differentiation' and must be distinguished from measures of 'cognitive complexity'. Though the former is an essential component of the latter, 'complexity' as understood by most psychologists also refers to the manner in which an individual's constructs are organised in relation to each other. This in turn has been assessed using measures of 'consistency' - the extent to which an individual's pattern of construct usage is repeated from one grid to another (Bannister, 1960; Bannister & Fransella, 1966); and of 'integration' or of 'hierarchic organisation' - the extent to which some of an individual's constructs are super-ordinate to others (Fransella & Bannister, 1977; Smith & Leach, 1972).<sup>1</sup>

Intensity scores have proven validity in distinguishing schizophrenics from other psychiatric populations and from normals (Bannister & Fransella, 1966) but their reliability is rather low (Bannister, 1962; Honess, 1976). In particular it has been observed that individuals tend to increase their intensity scores on completion of a second grid, that is, relationships between Ss' constructs seem to become more 'tight' (Bannister, Fransella, & Agnew, 1971). The value of intensity scores for the investigation of the internal structure of grids is therefore limited; however the scores are useful as a global index of the degree of inter-relatedness of constructs within an individual's 'construct system'.

Intensity scores are calculated as follows. First, for every pairing of

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1 One of the most frequently used measures of 'cognitive complexity', that of Bieri (1955), which involves a 'ratings grid', has been correctly described by Crockett (1965) as a measure of 'differentiation' rather than 'complexity'.

It is interesting that a debate on the generality of cognitive complexity - similar to that considered in this thesis in relation to field-dependence - has also occurred, with some authors in favour of greater generality (Allard & Carlson, 1963; Feffer & Gourevitch, 1960; Wolfe, 1963) and others against (Crockett, 1965; Vannoy, 1965).



constructs in a grid, the correlation between the rank-ordering of the elements is computed. For a grid with ten constructs, this involves 45 Spearman  $r_s$ . These coefficients are then squared and multiplied by 100 (eliminating negative signs) to produce 'relationship scores'. The intensity score for a given grid is simply the sum of all its relationship scores.

To facilitate these calculations, a special scoring sheet was used, which is shown in Appendix IV (f). Intensity scores for those Ss for whom they could be computed are shown in Appendix I (c). The lower an S's intensity score, the lower the general level of construct intercorrelations in that S's grid; and therefore the higher is the S's presumed level of 'differentiation'.

#### Group questionnaire

For the purpose of gathering information about age, school subjects, and interests, Ss in this sample were also given a short questionnaire, which is reproduced in Appendix IV (d).

The next section sets out the hypotheses formulated regarding the results of the present study. Results themselves are outlined in section 4.

### 3. Specific hypotheses

The overall aim of this research study was to explore the possibility that those regarded as relatively less 'differentiated' on the grounds of their field-dependence test scores might show relatively higher levels of 'differentiation' in other areas; specifically, in 'dis-embedding' in the verbal domain, and in their perceptions of other people. In view of the research evidence discussed in chapter 8 and elsewhere, the following hypotheses were entertained:

- (1) that amongst all the groups in the present study, there would be significant correlations between field-dependence (EFT) and intelligence (AH5) test scores.
- (2) that while boys would perform significantly better than girls on the group EFT, the reverse would hold for anagrams, girls obtaining significantly higher scores than boys.
- (3) that girls would be significantly more 'socially oriented' than boys on the Carlson Adjective Checklist; and that there would be a significant correlation between EFT scores and Adjective Checklist scores, field-dependent Ss being more 'socially oriented'.
- (4) that girls would use more 'internal' constructs than boys on the Repertory Grid test. In addition it was thought possible, despite the evidence of Bieri, Bradburn, and Galinsky (1958) to the contrary, that field-dependent Ss might also use more 'internal' constructs than their field-independent peers.
- (5) that girls would have significantly lower intensity scores than boys on the Repertory Grid test, betokening a higher level of 'differentiation' in person perception; and that there would be a significant correlation between EFT scores and intensity scores, field-dependent Ss having lower scores of this kind.

It was also anticipated, though this cannot strictly speaking be expressed as an experimental hypothesis, that scores on the group EFT and on anagrams tests would be unrelated - reflecting the expectation that the tests are measuring 'differentiation' in distinct areas of skill.

#### 4. Results

Raw data from all the tests administered to the present sample of Ss are presented in Appendix I (c). Means and standard deviations on the tests



yielding conventional scores are presented in Table 42. Data from other measures (the Carlson Adjective Checklist and Repertory Grid) will be considered below. The data in Table 42 are based on all Ss who completed

Table 42. Means and standard deviations for the Sheffield sample

	<u>Boys</u>			<u>Girls</u>		
	n	$\bar{x}$	S.D.	n	$\bar{x}$	S.D.
<u>4th Form</u>						
AH5 part 1	28	10.39	4.27	21	7.38	3.47
AH5 part 2	28	15.82	4.03	21	12.52	5.10
AH5 total	28	26.21	7.06	21	19.42	6.44
GEFT	29	12.20	4.57	20	9.05	4.54
Anagrams 1	29	9.68	3.05	20	10.20	2.94
Anagrams 2	29	24.65	8.47	20	21.75	8.22
<u>6th Form</u>						
AH5 part 1	16	15.00	3.80	18	10.72	3.84
AH5 part 2	16	19.31	3.91	18	18.22	3.69
AH5 total	16	34.31	5.94	18	28.94	6.19
GEFT	16	14.75	3.45	18	14.33	3.77
Anagrams 1	12	11.75	2.00	18	11.38	2.73
Anagrams 2	12	26.08	5.05	18	24.94	7.57

each of the tests, and the numbers doing so are specified in each case.

As can be seen from the table, there is a difference between the sexes, at both age-levels, in total AH5 score. Neither of the differences is however significant (for the 4th form,  $t = 0.95$ , ns; for the 6th form,  $t = 0.48$ , ns). Thus although from a statistical point of view the male and female groups are roughly matched, the poorer performance of the girls is very puzzling given that the Ss are in the same forms in the same school. While

the means for the boys approximate closely to the grammar-school norms given in the manual (the fourth form scoring slightly below, and the sixth form slightly above these), those for girls are on average somewhat lower. The correlations between parts 1 and 2 of the test were: for the fourth-form sample, .387 ( $df = 47$ ,  $p < .005$ ), for the sixth-form sample, .291 ( $df = 32$ ,  $p < .05$ ).

The remainder of this chapter outlines the results of this study as they pertain to each of the hypotheses presented above. Since it is concerned with findings - on differences between the sexes in GEFT and Anagrams scores - which have been set out in Table 42, the second hypothesis is dealt with first.

(a) Spatial and verbal 'dis-embedding'

Hypothesis (2) suggested that while the commonly-found sex difference in field-dependence, favouring males, would be found again in the present study, differences between the sexes in Anagrams test scores would be in the opposite direction, favouring females. However, as can be seen from Table 42, the hypothesis fails to find support. None of the differences between the sexes on any of the tests (GEFT, Anagrams 1 and 2) is significant. For the slight gap in GEFT scores between the 15-year-old groups, for example - where a maximal male advantage might be expected - a t-test revealed no significance ( $t = 0.90$ , ns).

The absence of any sex difference in this sample continues the pattern of Embedded Figures performance found in the preceding studies in Hong Kong and Edinburgh. While a majority of studies have found females to be more field-dependent than males (Witkin, 1967), the fact that so many - including those reported here - have not done so, calls into question some of the conclusions drawn from the finding of differences in some studies.



Given that, though non-significant, the gap between the sexes in AH5 scores is larger than that in Anagrams scores, it was thought that the uneven matching of males and females in intelligence might be concealing a real female advantage in solving anagrams. In other words, girls, though scoring more poorly than boys on the AH5, have performed just as well as them on Anagrams; and given equivalent intelligence scores might have performed better. To explore this possibility, at both age-levels, sub-samples of Ss were drawn which were more closely matched in AH5 performance. This was done by selecting those Ss whose AH5 scores were within one standard deviation of the overall age-group mean, and comparing the means of boys and girls on the GEFT and Anagrams tests.

The procedure however again failed to expose any differences. For the fourth-form group, the overall AH5 mean was 23.3 and the standard deviation 7.58. Sixteen boys and thirteen girls scoring within the specified range had respective scores on the other tests as follows: on the GEFT, 10.62 and 10.46; for Anagrams 1, 8.87 and 10.46; for Anagrams 2, 23.25 and 23.30. Amongst sixth-formers, the overall AH5 group mean was 31.47 and the standard deviation 6.64. Ten boys and twelve girls falling in the required range respectively scored: on the GEFT, 13.80 and 14.91; on Anagrams 1, 11.60 and 10.80; and on Anagrams 2, 25.70 and 24.08. None of these differences is statistically significant, and the present hypothesis must be rejected. It may be worth noting that the slight sex differences which have appeared on the Anagrams tests are confined to what may be called the 'open-ended' test of Stevenson, Klein, Hale, and Miller (1968) (producing words from the letters of the word 'generation') and are in the opposite direction to these authors' findings.

The present study, then, finds no evidence of greater female capacity for 'dis-embedding' in the verbal domain; likewise it finds no evidence for superior spatial 'dis-embedding' skill amongst males.

(b) Test intercorrelations

Hypotheses (1) and (3) of the present study were addressed to relationships between a number of the measures included in the test battery. Relevant to these hypotheses, intercorrelations amongst the AH5 (parts 1, 2, and total score), GEFT, Anagrams tests (1 and 2), and Carlson Adjective Checklist (CAC) are set out in Tables 43 to 48 for the various sub-groupings of this sample of Ss.

Tables 43 (below) and 44 (P.261) present results for the two age-groups (fourth- and sixth-form) separately; Tables 45 and 46 (P.262) present results separately for fourth-form boys and girls; and Tables 47 and 48 (P.263) present results separately for sixth-form boys and girls.<sup>1</sup>

Table 43. Test intercorrelations for the fourth-form group<sup>2</sup>

	GEFT	CAC	ANA 2	ANA 1	AH5 Tot.	AH5 2
AH5 1	.46***	.36**	.44**	.17	.77***	.39**
AH5 2	.70***	.05	.14	.08	.86***	
AH5 Tot.	.52***	.15	.39**	.23		
ANA 1	.23	.31*	.39**			
ANA 2	.31**	.08				
CAC	.26*					

Hypothesis (1), that in each of the subgroups of the present sample there would be significant correlations between the intelligence and field-depend-

1 In all tables on Pp.260-265: \*  $p < .05$ ; \*\*  $p < .01$ ; \*\*\*  $p < .001$

2 For each of the tables shown here, the correlation between any two tests was computed for as many Ss as had taken both. In Table 43, correlations are for  $n = 41$  except GEFT x Anagrams where  $n = 49$ , and CAC x Anagrams and CAC x GEFT where  $n = 42$ .



ence tests, receives substantial support from these findings. In nearly every case in Tables 43 to 48, AH5-GEFT correlations are significant, and in four cases out of six (setting aside the intercorrelations of AH5 subtests and total score) they are the highest correlations to emerge. Further, although correlations between the GEFT and the AH5 part 2 (spatial) test are consistently higher than those between the GEFT and AH5 part 1 (verbal-numerical), the latter are also nearly always significant. Once again, as has been found in many studies, the closest correlate of the field-dependence dimension is general intelligence.

A number of other points may be made concerning the results reported in

Table 44. Test intercorrelations for the sixth-form group<sup>1</sup>

	GEFT	CAC	ANA 2	ANA 1	AH5 Tot.	AH5 2
AH5 1	.27	.46**	.16	.12	.79***	.29
AH5 2	.60***	.00	.25	.43**	.80***	
AH5 Tot.	.54***	.30	.28	.34*		
ANA 1	.06	-.17	.41*			
ANA 2	-.08	-.18				
CAC	.22					

Tables 43 to 48. Most notably, there is a tendency for correlations between the various tests of the battery to be slightly higher amongst boys than amongst girls - with the exception, oddly enough, of that between the AH5 and the GEFT. While the two Anagrams scores are significantly related for boys of both age-levels, neither of these coefficients is significant amongst

<sup>1</sup> In Table 44, all statistics are for  $n = 30$  except AH5 x GEFT where  $n = 34$ .

girls. Only amongst fourth-form boys (Table 45) is the GEFT significantly correlated with any of the other tests (Anagrams), although the weak correlations between the CAC and the GEFT for fourth-form boys and girls becomes

Table 45. Test intercorrelations: fourth-form boys<sup>1</sup>

	GEFT	CAC	ANA 2	ANA 1	AH5 Tot.	AH5 2
AH5 1	.40*	.47**	.43*	.54**	.77***	.37*
AH5 2	.55**	-.17	.30	.17	.84***	
AH5 Tot.	.38*	.01	.51**	.32*		
ANA 1	.36*	.45*	.71***			
ANA 2	.44**	.10				
CAC	.10					

Table 46. Test intercorrelations: fourth-form girls<sup>2</sup>

	GEFT	CAC	ANA 2	ANA 1	AH5 Tot.	AH5 2
AH5 1	.43*	.06	.38	-.24	.75***	.34
AH5 2	.78***	.19	-.04	.13	.85***	
AH5 Tot.	.79***	.18	.26	.18		
ANA 1	.33	.14	-.00			
ANA 2	.14	-.13				
CAC	.13					

1 In Table 45, for Anagrams x GEFT and ANA 1 x ANA 2 correlations,  $n = 29$ ; for AH5 x CAC,  $n = 27$ ; for Anagrams x CAC,  $n = 24$ ; and for other correlations  $n = 23$ .

2 In Table 46,  $n = 18$  except for Anagrams x GEFT and ANA 1 x ANA 2 correlations where  $n = 20$ , and AH5 x CAC where  $n = 21$ .



Table 47. Test intercorrelations: sixth-form boys<sup>1</sup>

	GEFT	CAC	ANA 2	ANA 1	AH5 Tot.	AH5 2
AH5 1	.13	.05	.19	-.15	.58**	.16
AH5 2	.54*	-.09	.29	.59*	.88***	
AH5 Tot.	.46*	-.11	.42	.51*		
ANA 1	-.04	-.70**	.58*			
ANA 2	-.36	-.77**				
CAC	.40					

Table 48. Test intercorrelations: sixth-form girls<sup>2</sup>

	GEFT	CAC	ANA 2	ANA 1	AH5 Tot.	AH5 2
AH5 1	.42*	.43*	.11	.22	.86***	.39
AH5 2	.70***	-.10	.31	.28	.76***	
AH5 Tot.	.67***	.27	.24	.24		
ANA 1	.12	.12	.31			
ANA 2	.12	-.06				
CAC	.12					

just significant when the age group is considered as a whole. Correlations between Anagrams scores and intelligence also tend to be higher for the boys. Other relationships however, such as those between Anagrams scores and scores on the Carlson Checklist, show no consistent pattern across groups. Finally,

1 In Table 47, n = 12 except for the AH5 x GEFT correlations where n = 16.

2 For Table 48 n = 18 throughout.

apart from the case of the fourth-form boys just mentioned, correlations between the GEFT and Anagrams tests are, as anticipated, generally low and non-significant.

(c) Whole-sample and partial correlations

To provide a fuller picture of the relationships between the various tests of the battery, two further sets of correlation coefficients were computed. First, it was envisaged that trends not visible within the small sub-samples of the population might emerge more clearly if the sample were looked at as a whole. Test intercorrelations across the entire sample of Ss were therefore computed and are presented in Table 49.

Table 49. Test intercorrelations: whole sample<sup>1</sup>

	GEFT	CAC	ANA 2	ANA 1	AH5 2
AH5 1	.49***	.38***	.34**	.24*	.49***
AH5 2	.70***	.08	.15	.25*	
ANA 1	.25*	.11	.42***		
ANA 2	.22*	-.05			
CAC	.25*				

From the table it can be seen that, as might be expected, there are once again highly significant correlations between the GEFT and the AH5 parts 1 and 2. Also, encouragingly, the two Anagrams tests are closely correlated with one another - at a level not dissimilar to the association between

<sup>1</sup> The ns on which the correlations in Table 49 are based were: AH5 1 x AH5 2, n = 83; Anagrams 1 x 2 and Anagrams x GEFT, n = 79; AH5 x CAC, n = 78; AH5 x GEFT, n = 75; CAC x GEFT and Anagrams, n = 72; and AH5 x Anagrams, n = 71.



parts 1 and 2 of the AH5. In addition, a number of relationships - notably those between the GEFT and other tests - which were rarely significant amongst the separate sub-samples, achieve significance over a larger number of Ss.

To appraise whether this last set of significant correlations might be a product of the common relations of the variables involved to general intelligence, a second set of correlations was computed. These were partial correlations between GEFT, Anagrams, and the CAC, with the effects of the AH5 parts 1 and 2 'controlled for' singly and in combination.<sup>1</sup> Table 50 presents the second-order partials (controlling for both AH5 1 and 2); all coefficients have 45 degrees of freedom.

Table 50. Partial correlations between field-dependence and other variables

	GEFT	ANA 2	ANA 1
CAC	.24*	-.22	.06
ANA 1	.17	.33*	
ANA 2	.08		

A number of results emerge from this table. First, the correlation between the two Anagrams tests remains significant, supporting the view that these tests may indeed assess some capacity that is distinct from general or verbal ability. Second, as might have been expected given the zero-order correlations in Tables 43 to 48, correlations between the GEFT and Anagrams fall below significance once the effects of intelligence are partialled out. Finally, the relationship predicted by hypothesis (3) between field-dependence and a 'social orientation' on the CAC appears to be significant and indep-

<sup>1</sup> Partial correlations were also computed in this way for fourth- and sixth-forms separately, but only one correlation - between Anagrams 1 and 2 with AH5 part 2 controlled amongst fourth-formers - was significant.

endent of correlations between the CAC, GEFT and intelligence.

(d) 'Social-personal orientation'

Hypothesis (3) predicted that girls and field-dependent Ss would be more 'socially oriented' on the Carlson Adjective Checklist. Scores on this test, obtained in the manner described above (P.249), were rank-ordered from 'most personally oriented' to 'most socially oriented' in the computation of correlation coefficients. A positive correlation between the CAC and any other test in Tables 43 to 50 means, therefore, that those who score high on the other variable tend to be more 'personally oriented'.

Concerning the second part of this hypothesis, then, there is a slight trend in all of the sub-groups in the predicted direction (for field-dependent Ss to be more 'socially oriented'), but only amongst the fourth-form group (Table 43) does this achieve statistical significance with a correlation of .26 ( $p < .05$ ). Correlations for the boys and girls taken separately are not significant. Taking the sample as a whole, however (Table 49), the hypothesis does find broad support, with a significant correlation of .25 ( $n = 72$ ,  $p = .018$ ). As indicated above, this relationship also holds up after the effects of intelligence have been 'partialled out'. As a further check on the possibility that the significance of this correlation might be attributable to age differences in GEFT scores (which are significant at the .001 level), a partial correlation coefficient was computed between GEFT and CAC scores with age-level 'controlled'. The resulting  $r$  of .25 is also significant at the .05 level ( $F = 4.456$ ,  $d.f. = 69$ ).

The first part of the hypothesis, referring to sex differences, was tested in two ways. First, the Carlson Checklist was scored simply in terms of whether Ss were on balance 'socially oriented' or 'personally oriented'. The distribution of males and females in the two groups created in this way was as shown in Table 51 overleaf. This pattern, taking both age-groups toge-



ther, is non-significant, and remains so when separate analyses are undertaken for each age-group on its own.

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Table 51. Sex and 'social-personal orientation'

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	'social'	'personal'
Boys	17	23
Girls	22	17

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Chi-square = 1.525, d.f. = 1, ns.

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As a second test of this hypothesis which would take individual CAC scores into account, rank-order correlation coefficients were computed between sex and CAC scores both separately for each age-group and across the sample as a whole.<sup>1</sup> Within each age-level the resulting coefficients, though in the predicted direction, fell just short of significance (for the fourth form,  $r = -.21$ ,  $n = 49$ ,  $p = .069$ ; for the sixth form,  $r = -.27$ ,  $n = 30$ ,  $p = .075$ ). Over the whole sample, however, a significant result was obtained ( $r = -.21$ ,  $n = 79$ ,  $p = .029$ ). The 40 boys who completed the Carlson Checklist had a mean score of exactly +1, while the 39 girls who completed it had a mean score of -1.102. Thus although the trend may not be very strong, there is a tendency for girls to be more 'socially oriented' than boys and hypothesis (3) receives a certain measure of support.<sup>2</sup>

#### (e) Factor analysis results

To explore more thoroughly the pattern of test intercorrelations shown in

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1 For this purpose boys were given a rank of 1 and girls a rank of 2, in other words a negative correlation between sex and CAC scores suggests that boys are more 'personally oriented' than girls.

2 An analysis of Ss' 'social' and 'non-social' interests, akin to that described in chapter 7 (P.220), yielded results in the expected direction but non-significant (Chi-square = 2.24,  $p > .10$ ).

Tables 43 to 48, the correlation matrices in each case were factor-analysed. Factor analyses were carried out separately for fourth-form boys and girls, for sixth-form boys and girls, and for the fourth and sixth forms each taken as a whole. Since the analyses for the male and female groups occasionally proved slightly different from each other, and since the results for each form tended to reflect a combination of the results for boys and girls, only the factor matrices for the four separate subgroups are reported here. The fourth- and sixth-form analyses may be found in Appendix II (c). For each of the analyses to be reported here, a Varimax rotation was undertaken; a procedure which normally proved very helpful in the identification of factors.<sup>1</sup>

Tables 52 and 53 present the principal factor matrix and Varimax rotated factor matrix for fourth-form boys. The principal factors shown here emerged

Table 52. Principal components factor matrix  
for fourth-form boys

	Factor 1	Factor 2	Communality
AH5 1	-0.71990	0.07667	0.52413
AH5 2	-0.53506	-0.84095	0.99348
GEFT	-0.51927	-0.33649	0.38287
ANA 1	-0.80020	0.46233	0.85407
ANA 2	-0.61699	0.07687	0.38658
CAC	-0.37972	0.40059	0.30466

after 23 iterations; factor 1, with an eigenvalue of 2.23936, accounted for 65.0% of the variance, factor 2 (eigenvalue 1.20642) for 35.0%. Factor 1

1 In common with the factor analyses described elsewhere in this thesis, those reported here were carried out using the Statistical Package for the Social Sciences (Nie, Bent, & Hull, 1970).



Table 53. Varimax rotated factor matrix,  
fourth-form boys

	Factor 1	Factor 2
AH5 1	0.62364	0.36770
AH5 2	-0.07190	0.99414
GEFT	0.21623	0.57976
ANA 1	0.91806	0.10598
ANA 2	0.54114	0.30618
CAC	0.54369	-0.09517

which has moderate-to-high loadings on most of the tests might appear to be a common factor, though its concentration of high loadings on the AH5 part 1 and Anagrams tests suggests it may be some kind of verbal factor; whereas factor 2 shows a much more pronounced association with part 2 of the AH5. The rotated factor matrix certainly helps to clarify the picture: factors 1 and 2 now emerge much more clearly as 'verbal' and 'spatial' factors respectively. The GEFT, as might be expected, has a substantial loading on the same factor as the AH5 part 2. Given the differences between the AH5 part 1 and the Anagrams tests, it is perhaps surprising that they should appear loaded on the same factor, and it may be that performance on an Anagrams task is much more a function of general verbal ability than of any specific 'dis-embedding' skill.

Though the results of this factor analysis appear to conform approximately to a familiar 'verbal' versus 'spatial' pattern, it is difficult to draw any really firm conclusions about the factors which may be common to the various tests included in this battery. Results for fourth-form girls, set out in Tables 54 and 55 overleaf, show a similar pattern however; and it may be that the emergence of parallel sets of loadings from two comparable groups of Ss will make firmer conclusions possible concerning the factor structure

Table 54. Principal components factor matrix  
for fourth form girls

	Factor 1	Factor 2	Communality
AH5 1	0.73537	0.67254	0.99309
AH5 2	0.68767	-0.28797	0.55582
GEFT	0.95310	-0.29678	0.99647
ANA 1	0.07236	-0.45253	0.21002
ANA 2	0.15598	0.45939	0.23537
CAC	0.23009	-0.22857	0.10519

Table 55. Varimax rotated factor matrix,  
fourth-form girls

	Factor 1	Factor 2
AH5 1	0.37868	0.92179
AH5 2	0.74482	0.03252
GEFT	0.98870	0.13765
ANA 1	0.25829	-0.37855
ANA 2	-0.05465	0.48206
CAC	0.30556	-0.10874

of these tests.

The principal factor matrix shown in Table 54 required 17 iterations; factor 1, with an eigenvalue of 2.00857, accounted for 64.7% of the variance, factor 2, with an eigenvalue of 1.09739, accounted for 35.3%. Though the pattern of factor loadings is largely similar to that found amongst boys, there are differences too. Factor 1 appears much more confined in terms of loadings to the AH5 and Embedded Figures tests, and might at first glance seem to be 'g'; however following rotation it seems more likely that it is a 'k' or spatial ability factor. The second factor, with high loadings on AH5 part 1



and moderate loadings on the Anagrams tests, is presumably some factor akin to verbal ability once again. Thus while the distribution of loadings amongst the various tests inevitably shows some variations when boys are compared with girls, and the two factors have been extracted in a different order in each case, it looks nevertheless as if basically similar factors can be detected amongst the test correlations for both male and female Ss. Amongst the sixth-form groups on the other hand a somewhat different pattern was found. Tables 56 and 57 present the principal components and Varimax rotated factor matrices for sixth-form boys. Three factors were extracted

Table 56. Principal components factor matrix: sixth-form boys

	Factor 1	Factor 2	Factor 3	Communality
AH5 1	-0.20480	-0.10484	0.60206	0.41541
AH5 2	0.02069	0.99443	0.09137	0.99767
GEFT	0.58687	0.57877	0.14951	0.70175
ANA 1	-0.73594	0.57628	-0.21071	0.91810
ANA 2	-0.91623	-0.00872	0.33752	0.95347
CAC	0.80016	0.04299	0.23475	0.69721

Table 57. Varimax rotated factor matrix:  
sixth-form boys

	Factor 1	Factor 2	Factor 3
AH5 1	0.00366	-0.03299	0.64367
AH5 2	0.19840	0.97834	-0.03399
GEFT	-0.44608	0.70155	-0.10287
ANA 1	0.88283	0.37000	-0.04244
ANA 2	0.76086	-0.13025	0.59799
CAC	-0.79828	0.24355	-0.02536

in this analysis, following 15 iterations; factor 1 (eigenvalue = 2.41812), which accounted for 51.4% of the variance; factor 2 (eigenvalue = 1.66888), which accounted for 35.6%; and factor 3 (eigenvalue = 0.66661), which accounted for 13.0%.

The pattern of loadings on each of the tests is sufficiently similar in the principal factor and rotated solutions to allow us to identify at least two of the factors with a reasonable degree of confidence. Factor 2 appears to be a 'spatial' factor once again, with high loadings on the AH5 part 2 and on the GEFT; and factor 3 resembles the 'verbal' factor which was in evidence in the fourth-form groups, with high loadings on the AH5 part 1 and on at least one of the Anagrams tests. Factor 1, with loadings on the GEFT, Anagrams tests, and Carlson Checklist, is a bipolar factor, with the Anagrams tests loading at one pole and GEFT and CAC at the other. This factor is unfortunately not easy to label; were it not for the presence of the CAC it would be tempting to call it 'dis-embedding skill', but the diverse nature of the tasks involved in the tests which have loadings on this factor precludes any straightforward identification of it.

Turning to sixth-form girls, the principal factor and rotated matrices for this group are shown respectively in Tables 58 and 59. Once again three

Table 58. Principal components factor matrix: sixth-form girls

	Factor 1	Factor 2	Factor 3	Communality
AH5 1	0.57192	0.30956	0.02408	0.42350
AH5 2	0.84973	-0.47233	-0.18045	0.97770
GEFT	0.65452	-0.16753	-0.16697	0.48434
ANA 1	0.35246	-0.01896	0.18211	0.15775
ANA 2	0.32376	-0.12035	0.63628	0.52416
CAC	0.44659	0.85002	-0.04779	0.92426



Table 59. Varimax rotated factor matrix:  
sixth-form girls

	Factor 1	Factor 2	Factor 3
AH5 1	0.30746	0.54286	0.18512
AH5 2	0.96844	0.00134	0.19954
GEFT	0.66592	0.17480	0.10164
ANA 1	0.22324	0.14098	0.29672
ANA 2	0.07587	0.01222	0.71990
CAC	-0.01552	0.96126	0.00181

factors have been extracted (following more than 25 iterations): factor 1 with an eigenvalue of 1.90602 accounting for 54.6% of the variance; factor 2 with an eigenvalue of 1.08437 accounting for 31.1%; and factor 3 with an eigenvalue of 0.50132 accounting for 14.4%.

The first factor in the principal components solution appears initially to be a common factor, with moderate-to-high loadings on all of the tests, but on rotation it is highlighted more clearly as a 'spatial' factor with its most substantial loadings on the AH5 (part 2) and GEFT. This corresponds closely with the second factor which was found in the analysis of the boys' scores. The other two factors bear little resemblance to those which were found amongst boys. Part 1 of the AH5 is associated almost exclusively with the Carlson Checklist and both have high loadings on factor 2; whereas factor 3 appears to be a unique factor on which only part 2 of the Anagrams test has a significant loading in both principal factor and Varimax solutions. When the intercorrelation matrix for the sixth-form was factor-analysed (i.e. including both boys' and girls' scores) the factors which emerged were similar to these: a 'spatial' factor loaded on AH5 part 2 and GEFT; a factor related to the AH5 part 1 and CAC; and a factor associated most distinctively with Anagrams part 2. (results of this analysis are pres-

ented in Appendix II (c)).

Drawing together the results of the various factor analyses which have been described, what conclusions can be reached concerning the relationships between the different tests in the present battery? Interpretation of factor loadings is a very hazardous process, and is especially so when only a small number of variables is involved.

The most consistent finding of the foregoing analyses, which has emerged in almost every factor matrix presented, is of a 'spatial' factor on which the AH5 test part 2 and the GEFT have had high loadings. While occasionally other tests have appeared loaded on this factor too, the fact that the GEFT is so regularly and almost unshakably linked with spatial ability certainly calls into question the notion that the test measures anything other than this. As with the factor analyses reported in earlier chapters, there has been no case in which the GEFT has been identifiable with a factor of its own. The other factor which has emerged frequently in these analyses has been a 'verbal' one associated with AH5 part 1 and with Anagrams, on which the CAC has also occasionally had loadings. Finally, in one sample of Ss there emerged a unique factor, on which part 2 of the Anagrams test was loaded. The possibility exists that this might be a 'verbal dis-embedding' factor, but given the absence of any other criterion tests and the frequent links between Anagrams and the AH5 part 1, this conclusion cannot on the present evidence be drawn with a great deal of confidence.

#### (f) Field-dependence and types of constructs

Hypothesis (4) of the present study was concerned with relationships between field-dependence-independence and patterns of response on the Repertory Grid test; and predicted that girls and field-dependent Ss would use more 'internal' constructs to describe others than would boys or field-independent Ss. In order to test hypothesis (4), only those Ss who produced a full list of



ten usable constructs were included in the analysis. For various reasons a number of Ss failed to do this. Some simply produced fewer than ten constructs; others used exactly the same construct more than once, or stated that one or more of their constructs could not be applied to the individuals comprising their element list; and others used all-or-none constructs which made rank-ordering of the elements impossible. As a consequence, a total of 28 Ss (of the 79 who took the Grid test) had to be excluded from the analysis, leaving 51 individuals (22 boys and 29 girls) on whose responses the results were based.

In analysing these Ss' constructs and describing them as 'internal' or 'external', the method adopted was that used by Bieri, Bradburn, and Galinsky (1958) and by Witkin and his associates (1962). This involved the calculation of an 'External Construct Score' (ECS) for each S. The criteria used in allocating constructs to the 'external' category were as follows: if the construct referred to (a) physical characteristics or appearance; (b) relationships (e.g. relative social position); (c) interests; (d) superficial similarities (e.g. 'good at maths'); (e) activities engaged in by the persons being described; or (f) likes and dislikes of the persons being described. 'Internal' constructs by contrast were those which referred to '...underlying motivation, emotional expression, and qualitative aspects of one's interpersonal relationship with another' (Bieri, Bradburn, & Galinsky, 1958, P.3).

Using these definitions, an External Construct Score (out of 10) was calculated for each of the 51 Ss, thus requiring the classification of a total of 510 constructs. This was carried out by E and by another judge using the same criteria, with an agreement rate of 89.9%. The resultant scores as assigned by E (which given the fairly high rate of agreement were used in the subsequent analysis) are listed in Appendix I (c).

As a first test of hypothesis (4), the mean External Construct Scores of male and female, and of field-dependent and field-independent groups were compared. None of these analyses however produced results favouring the hypothesis. Over the sample as a whole, Ss tended to use more 'internal' than 'external' constructs. The mean External Construct Scores of the fourth-form boys and girls were identical at 3.78; the mean ECS for sixth-form boys was 4.75 and for sixth-form girls 4.13. The difference at the sixth-form level is in the predicted direction but is non-significant. To test for differences between field-dependent and field-independent Ss in ECS, extreme-group comparisons were used. Two sets of comparisons were undertaken: first, between the 8 most field-dependent Ss (with GEFT scores of 7 or below) and the 8 most field-independent Ss (each with the maximum GEFT score of 18), yielding respective ECS means of 3.25 and 4.5; and second, between the 16 most field-dependent Ss (GEFT score of 9 or below) and the 15 most field-independent Ss (with GEFT scores of 17 and 18), yielding corresponding ECS means of 3.31 and 4.73. Neither of these differences, though in the predicted direction (field-dependent Ss using 'internal' constructs more), was significant on a t-test.

A second test of this hypothesis however produced some positive results. It was thought that different relationships might obtain between field-dependence and the use of 'internal' constructs in males and females respectively - a possibility which might be concealed in the foregoing comparisons. Correlations between GEFT and External Construct scores were therefore computed separately for boys and girls at each age-level. (Both sets of scores were ranked from highest to lowest in each case.) For fourth- and sixth-year boys both correlations were non-significant at .04 and -.18 respectively. For girls, on the other hand, the correlation at fourth-form level approached significance, the  $r$  being .43 ( $p < .1$ ), and the correlation of .57 amongst sixth-form girls ( $n = 15$ ) was significant at the .025 level.



In addition, when the correlation between GEFT and External Construct scores was computed on a sample-wide basis, it emerged as significant ( $r = .30$ ,  $n = 51$ ,  $p = .015$ ). Closer inspection, however, suggests that the reasons for this significant relationship lie elsewhere. Although the GEFT-ECS correlation remains significant when the effects of sex are partialled out ( $r = .25$ ,  $d.f. = 46$ ,  $p = .046$ ), it fails to do so when the effects of age are similarly controlled ( $r = .22$ ,  $d.f. = 46$ ,  $p = .076$ ). Further, there is also a significant correlation between External Construct scores and performance on both parts of the AH5 (with AH5 part 1,  $r = .26$ , with AH5 part 2,  $r = .26$ , both  $p < .05$ ).<sup>1</sup> Consequently when the effects of intelligence are controlled for in the GEFT-ECS correlation its significance disappears completely (controlling for AH5 parts 1 and 2,  $r = .15$ ,  $d.f. = 45$ , ns).

Thus overall hypothesis (4) must be rejected; although amongst girls there is a slight trend in its favour - more field-dependent girls tending to use more 'internal' and fewer 'external' constructs - these results are probably due to differences in intelligence. The present findings may be compared with those of Bieri et al. (1958) and of Witkin et al. (1962) who found significant trends in the opposite direction amongst females and males respectively, and with the result of Bieri et al. who found a non-significant pattern similar to that found here amongst males. In view of these contradictions it is impossible to draw any conclusions with regard to a relationship between field-dependence and 'psychological' construing.

#### (g) Field-dependence and Intensity scores

The fifth hypothesis of the present study was concerned with the relationship between 'differentiation' in the perceptual domain - as purportedly measured

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1. That higher AH5 scores should be associated with a greater usage of external constructs is interesting in that it runs counter to the notion of higher intelligence being marked by a more 'analytical' disposition.

by the GEFT - and that in the interpersonal domain, as assessed here by Repertory Grid 'intensity' scores. The hypothesis suggested that females and field-dependent Ss would have lower intensity scores - an index of greater construct 'differentiation' - than would males and field-independent Ss.

The results of the study however ran completely counter to the hypothesis. A total of 34 Ss - 20 female and 14 male - succeeded in rank-ordering their ten elements in terms of the ten constructs they had produced; it seems certain that Ss needed more time for the exercise than could be allocated to it in the testing sessions. Intensity scores for the Ss were obtained in the manner described above (Pp.254-255). The relationship between these scores, field-dependence-independence, and sex was in each case in a direction opposite to that predicted by the hypothesis.

The mean grid intensity score for girls in the sample was 1504.75 with a standard deviation of 716.78; the mean grid intensity score for boys was 1105.73 with a standard deviation of 436.95. Thus boys have, on average, a lower intensity score than girls, though the differences between the two means is not significant ( $t = 1.42$ ). The mean intensity scores for fourth-form boys and girls were respectively 1120.88 and 1975.58; for sixth-form boys and girls, 1085.68 and 1215.85. These differences are also non-significant (for the former,  $t = 0.99$ ). However over the whole group the rank-order correlation between sex and grid score is significant ( $r = .33$ ,  $p = .029$ ), boys having lower intensity scores than girls. A coefficient computed in a similar way between grid score and form level, though in the expected direction (sixth-formers having lower intensity scores) was non-significant.

The suggestion that female Ss might show greater 'construct differentiation' than males therefore receives no support; findings are indeed the reverse of this. The related argument that field-dependent Ss should tend to have lower



intensity scores than their field-independent counterparts is also refuted by results. Table 60 below presents correlation coefficients between grid intensity scores and the other variables of the study, for the fourth form, sixth form, and whole group respectively.<sup>1</sup>

Table 60. Correlations between grid intensity scores and other variables

	<u>Fourth form</u>		<u>Sixth form</u>		<u>Whole group</u>	
	n	r	n	r	n	r
AH5 1	15	-.32	18	.03	33	-.06
AH5 2	15	-.30	18	-.17	33	-.29*
GEFT	16	-.33	18	-.09	34	-.26
ANA 1	16	.11	18	.07	34	.04
ANA 2	16	-.65**	18	-.06	34	-.35*
CAC	16	-.54**	18	.04	33	-.09
ECS	16	-.25	18	-.21	34	-.30*

In the computation of these correlations, intensity scores are ranked from highest to lowest; in other words a negative coefficient suggests that Ss with lower intensity scores (greater construct differentiation) have scored higher on the test. Thus lower intensity scores are associated with higher AH5 part 2 scores across the sample as a whole; are associated with superior Anagrams (part 2) performance amongst fourth-formers; and there is a tendency for those who manifest greater differentiation of constructs to be more 'personally oriented' on the CAC (within one subgroup) and to use more 'external' constructs in describing others. Finally, there is a tendency, though non-significant, for greater differentiation amongst constructs to be associated with field-independence, contrary to the current hypothesis, which must be rejected completely.

<sup>1</sup> In Table 60: \*  $p < .05$ ; \*\* $p < .01$ .

One other possibility was however entertained about the relationship between field-dependence-independence and grid intensity scores: that it might be non-linear and might not therefore be depicted clearly in a rank-order correlation coefficient. To explore this, a scattergram of GEFT and Grid

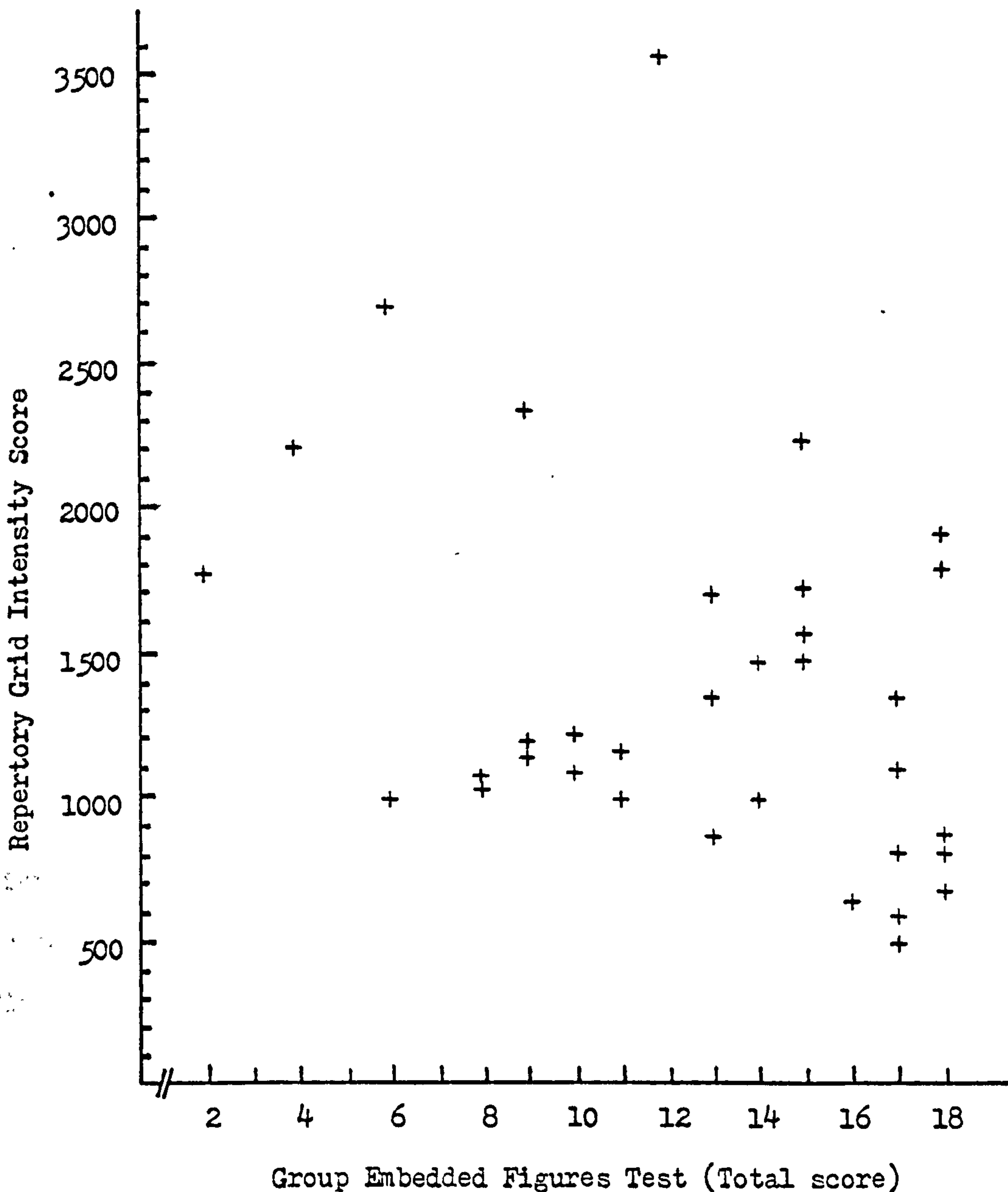


Figure 8. Scattergram of GEFT and Grid Intensity scores  
(n = 34)

intensity scores was plotted, which is shown in Figure 8. However, no overall pattern other than one of low, negative correlation can be detected in the distribution of these scores.



In summary, the hypotheses of the present study have not fared very well in attempting to predict the results just reported. As expected, the field-dependence dimension did prove to have closer ties with intelligence test scores than with any other variable; this was amply confirmed in both test intercorrelations and factor analysis results. Also on the positive side, hypothesis (3) received a fair degree of support, in that girls and field-dependent Ss tended to be more 'socially oriented' than boys and field-independent Ss; a result which held even after allowing for the possible effects of age and intelligence differences. The reverse was the case as far as hypothesis (4) was concerned: while there seemed to be a tendency for girls and field-dependent Ss to make use of more 'internal' constructs, this effect disappeared when differences in intelligence were taken into account. The key 'differentiation' hypotheses (2) and (5) of the study gained no support whatever from the results. It had been suggested that female and field-dependent Ss might show indications of greater 'differentiation' than their male or field-independent peers in the fields of verbal dis-embedding and interpersonal perception. Results in relation to the former were wholly inconclusive; those in relation to the latter ran in a direction opposite to the one predicted. It may be that, with a larger number of cases, a significant link between 'differentiation' in pattern perception and in person perception might have been forged, extending the generality of the Witkin 'differentiation hypothesis' with which this thesis has taken issue.

# 10

General discussion and conclusions



## Chapter 10

### General discussion and conclusions

The central aim of this thesis was to investigate the nature of the relationship between the concept of 'differentiation' in development - as enunciated in the writings of Werner and Lewin - and the field-dependence-independence cognitive style. Drawing together the results of the empirical work reported in chapters 4, 5, 7, and 9, the general conclusions may be fairly concisely expressed. First, with more consistency than any other finding, there has emerged a strong association between field-dependence-independence and general intelligence. Indeed as suggested in chapter 2, it is likely that a majority of the outcomes of research reported here and elsewhere could best be explained in terms of the basic tenet that field-dependence tests function, more than anything else, as measures of an individual's overall level of cognitive ability. Even the differences that have been identified between field-dependent and field-independent home backgrounds are those recognised more widely as fostering or inhibiting the growth of intelligence in general. Second however tests of the field-dependence dimension do act in some respect as indices of individual differences beyond the cognitive domain. Results of the present thesis have been in agreement with the suggestions of the Witkin group - and with congruent

findings from other sources - to the effect that field-dependent and field-independent individuals differ in their respective levels of interest in the human and non-human aspects of their environments. But third the apparently greater degree of interest taken by field-dependent individuals in their social surroundings does not seem to be accompanied by greater 'differentiation' amongst the constructs they use to dissect the social world. It has not been possible to show, in the present thesis, that a 'lack of differentiation' in one sphere could co-exist with a high level of 'differentiation' in another - and that therefore the concept of 'differentiation' should not be applied uniformly to diverse areas of an individual's functioning - particularly on the basis of tests with such a restricted range of task content as the EFT and the RFT.

Overall, the results of the present thesis can do little to detract from the apparent cohesiveness of the research findings and theorising associated with the 'differentiation hypothesis'. But by the same token, the constant effort to assimilate new variables to the same overburdened concepts can do little to further our understanding of individual differences. The addition of one correlate after another, each presumed to measure 'differentiation' in this context or in relation to that process, appears to consolidate the position of the Witkin group. But if each of the items produced in this way is itself correlated with intelligence - or at least with performance on various ability tests - what is the contribution of 'differentiation' to the individual differences so observed? Most studies which have found differences of any kind between field-dependent and field-independent groups have failed to match these groups in intelligence; the results of studies which have undertaken such matching are not uncommonly in conflict with each other. Given such a state of affairs, research on field-dependence would appear to be in something of a dilemma. Either 'differentiation' must be some component of gen-



eral intelligence itself; or the instruments currently used to assess an individual's level of 'differentiation' succeed in doing so only in a most marginal and tangential way.

On a number of more specific issues the results of the present thesis ran contrary to the suppositions of Witkin et al.. The breakdown of the relationship between the Embedded Figures and Rod-and-Frame tests amongst the students described in chapter 5 indicated that the field-dependence dimension itself may not be unitary; and that performance on each of its tests may be under the influence of separate sets of factors. The absence of significant sex differences in any of the samples in which both males and females were represented, could also be taken to imply that those sex differences which have been observed in other studies are less the product of early socialisation processes, than of differential opportunities to acquire particular skills relevant to success on particular field-dependence tests. Thus although this thesis could not demonstrate the importance of specific antecedents of successful test performance, these results may be more compatible with a 'perceptual skill' approach to field-dependence-independence, than with an approach which defines the dimension as a marker of some underlying personality trait.

My own view therefore remains, on balance, that tying the concept of differentiation down to one particular set of tests will greatly reduce its value for an understanding of psychological development. The research described here tried to argue this case by showing that field-dependence tests, which have the strongest claim to be measures of differentiation (as conceived by Lewin and Werner) (a) measure other attributes such as perceptual skills and (b) general intellectual capacities; or that (c) if these tests do measure differentiation they measure only one aspect of it. If this attempt has been only minimally successful, it will nevertheless, I hope, have raised

some doubts concerning the widespread identification of field-dependence-independence with the concept of differentiation.

### Using the differentiation concept

If this concept is to retain its usefulness in research on cognitive style, and on psychological growth in general, it might be necessary to make some further distinctions between types of differentiation thought to be involved in separate developmental processes. A study undertaken by Signell (1966) may illustrate this point. Signell investigated the development of complexity in children's perceptions of other people and of nations respectively. Using a variety of methods, she found that in perceiving persons, there was an increase in the complexity of single concepts which individuals used, rather than an increase in the complexity of their conceptual array. In perceiving nations, on the other hand, the child '...acquires more labels, more underlying dimensions, and more differentiated objects' (op. cit., P. 531). Thus differentiation may incorporate both an increase in the number of concepts used and in the manner in which each is applied; and the relation between these two processes may vary according to the kind of stimulus material involved. In the present thesis some degree of correlation was found between skill in the perception of embedded figures, and the use of distinctive constructs in person perception. It may then be that both of these tasks (if not correlated simply because of common links to intelligence) act as measures of one form of differentiation. To assert that this relationship proves the process of differentiation to be unilinear, however, is both unwarranted and restrictive to an understanding of developmental changes in other domains.

We might acquire greater flexibility for the differentiation concept by using it in conjunction with the idea of 'canalisation' as put forward by Waddington (1969). Addressing himself to the issue of interactions between



genes and the environment, Waddington suggested that these could be envisaged in terms of a ball, representing the developing organism, rolling down an inclined plane. The latter is not however the inclined plane of the physicist, but an intricately landscaped hillside which Waddington called an 'epigenetic surface'. At various choice-points in its downward path, the ball can roll into one of several different valleys; thus, although equipped with the potential for progressing along a large number of different routes, the ball can in practice choose only one. This process of 'canalisation' may also modify the shape of the ball - possibly limiting its choices further downhill. Applying this picture to the process of cognitive growth (which has been suggested for infant development by Bower, 1974), we may imagine that different individuals, and different cultures, develop in diverse directions and become more 'differentiated' in relation to issues, or stimuli, or activities that are of concern to them. Channeling along different developmental paths brings about increased differentiation of the objects met with along those paths. The job of cognitive style research is then to identify, for given individuals or cultures, those routes along which they have become differentiated; the links between choices made at different points in their development; and whether because of one choice another developmental route remains closed to them. (The word 'choice' as used here refers of course to a large number of decisions made with varying degrees of freedom.) This, it seems to me, would be a more fruitful direction for research to take than the application of a single yardstick of 'psychological differentiation' to a whole range of cognitive processes; particularly when the evidence drawing them together is in many respects inconclusive.

Used in this way the differentiation concept might also prove useful in reference to recent debates surrounding the 'interactionist' approach to personality (Endler and Magnusson, 1976). It seems unlikely that the behav-

four of individuals can be accounted for exclusively either in terms of personality traits on the one hand, or in terms of situational variables influencing them at a given time, on the other. The expectation that behaviour will be an outcome of an interaction between these two sets of factors provides a much more realistic and comprehensive understanding of research results (Bowers, 1973). The concept of differentiation could have substantial value for the exploration of these interactions for different individuals and different situations; and Witkin and Goodenough (1977a) have themselves recognised the importance of viewing individuals in terms of the degree to which they are 'fixed' or 'mobile' in their cognitive style. Thus while we might, for example, expect individuals to respond rigidly in situations regarding which they lack differentiation, in other situations their reactions might manifest greater flexibility, associated with a higher level of differentiation. An endorsement of a multilinear view of the development of differentiation - and an accompanying escape from rigid 'consistency hypotheses' - might extend this analysis still more fruitfully.

#### Further research

There may be much more to be gained, then, from the use of the differentiation concept in the manner described above, than as a theoretical construct held to underlie just one cognitive style. But what of research on field-dependence itself? Two general points ought to be made concerning the unabated flow of research studies with this dimension at their centre. First, the number of different variables which could be encompassed in correlational studies of the field-dependence cognitive style is exceedingly large. Even if these were not replete with contradictory findings at present, there would seem little purpose in accumulating further data in relation to an already overburdened conception of individual differences. But



second, having said this, no other major research exercise in relation to field-dependence presents itself. The dimension seems so closely related to general intelligence that to carry out research on the one is tantamount to undertaking research on the other. Further pursuit of differences between field-dependent and field-independent groups therefore in my view is a somewhat pointless exercise.

Research on the limitations of the style, and problems related thereto, might in the long run prove more valuable. The present thesis was an attempt to map out some boundaries of the field-dependence dimension, which in retrospect could have been improved in many ways. If the numbers in some of the samples had been larger; if more appropriate tests had been found for some of the skills being researched; or if groups could have been more closely matched and balanced in a number of ways; then perhaps firmer conclusions could have been drawn from the results obtained. The issues examined here could certainly be more thoroughly investigated in a larger-scale study of various potential forms of 'dis-embedding' and differentiation. Such a study might include for example some assessment of dis-embedding in the olfactory domain. Individuals might be asked, for example, to identify which of a series of different mixtures contains one initially sampled substance; to match, from two sets of mixtures, those which contain the same ingredients; or simply to identify all the ingredients of a given mixture of smells. Another task which might be used for assessing perceptual dis-embedding skills in the verbal field is the kind of popular word-puzzle in which words are hidden in an apparently random table of letters. These tasks and others, including standard embedded-figures, could be used together in attempts to estimate the degree of communality amongst dis-embedding skills. In a more practical vein, research on field-dependence, and indeed on any of the cognitive styles, should be addressing itself more fully to the educ-

ational issues which it has raised. In other words, having established that a certain cognitive style is associated with poor academic performance, or is a barrier to an individual's achievement of some educational goal, much work could be done to discover the means by which such performance could be improved, and such barriers removed. Strategies of teaching, learning, or problem-solving tailored to the needs of individuals with different cognitive styles would be invaluable educational tools. And, as happens surprisingly often with practically-oriented research, the products might advance theory more rapidly than were it left to progress on its own, aided only by research carried out in a vacuum.



## Appendices

## APPENDICES

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APPENDIX I. RAW TEST SCORES

The abbreviations used to denote the various tests, and the pages in the text where these are described, are as follows:

AH51	AH5 Test, part 1 (verbal-numerical)	Page 204
AH52	AH5 Test, part 2 (spatial)	204
AH5TOT	AH5 Test, total score	204
AH5 ERROR	AH5 Test, total error score	204
ANA1	Anagrams test (parts 1 & 2)	250
ANA2	Anagrams test (part 3)	250
CAC	Carlson Adjective Checklist	249
CEFT	Children's Embedded Figures Test	115
CHINESE	Chinese Language Test	122
EFT	(Witkin) Embedded Figures Test	116
GEFT	Group Embedded Figures Test	248
KOHS	Kohs Block Designs Test	114
MATRICES	Raven's Progressive Matrices A - E	112
MFFES	Matching Familiar Figures Test (errors)	208
MFFRT	Matching Familiar Figures Test (latency)	208
PATTERNS	Pattern Meanings Test	206
RFT	Portable (Oltman) Rod-and-Frame Test	118
USES	Uses of Objects Test	206
WAIS	Wechsler Adult Intelligence Scale	156
WISC	Wechsler Intelligence Scale for Children (Verbal Scale)	121

APPENDIX I (a) : TEST SCORES FOR THE HONG KONG SAMPLE :  
 9 YEAR OLD BOYS, n = 33.

SUBJECT NUMBER	WISC (SCALED)	MATRICES	RFT TOTAL ERROR (°)	EFT: TOTAL TIME (MIN)	CEFT	KOHS	CHINESE LANGUAGE
1	75	44	51	17.36	21	29	
2	74	44	15	9.05	24	29	
3	73	39	15	8.26	24	34	123
4	72	47	48	11.46	23	28	127
5	68	39	18	16.9	21	33	111
6	68	32	35	17.2	19	29	
7	66	29	187	19.63	19	24	130
8	65	44	48.5	18.61	22	25	
9	65	41	105	28.08	19	24	117
10	62	39	44.5	10.93	19	33	
11	62	43	14.5	11.35	21	29	129
12	60	53	74.5	16.13	20	35	134
13	59	36	11	7.08	18	41	107
14	58	44	102.5	22.87	21	24	116
15	58	40	21.5	13.8	19	24	
16	58	51	27.5	8.28	23	41	
17	57	29	106.5	22.31	18	25	
18	57	22	84.5	9.86	15	24	
19	57	34	71.5	24.26	21	24	
20	57	36	19.5	11.73	23	39	113
21	57	40	10.5	16.55	20	32	110
22	57	43	111	22.16	20	33	129
23	56	22	50	20.33	18	24	110
24	55	38	14.5	16.83	18	28	110
25	55	29	20.5	19.16	23	30	127
26	53	22	100.5	28.5	19	8	116
27	53	45	14.5	18.28	22	28	125
28	52	24	17	15.1	22	26	
29	50	45	25	4.68	23	35	129
30	50	28	160	23.33	16	20	
31	48	18	64.5	29.9	19	24	92
32	43	32	50	22.18	22	37	104
33	27	31	95	24.78	17	20	98



APPENDIX I (a) CONTINUED : HONG KONG TEST SCORES :  
 9 YEAR OLD GIRLS, n = 21.

SUBJECT NUMBER	WISC (SCALED)	MATRICES	RFT TOTAL ERROR (°)	EFT: TOTAL TIME (MIN)	CEFT	KOHS	CHINESE LANGUAGE
34	77	33	29	13.26	24	32	
35	66	45	14	8.53	25	42	125
36	64	47	21	22.83	22	30	129
37	64	50	17	14.16	21	25	131
38	62	41	11.5	13.65	24	30	123
39	61	46	19.5	10.55	23	44	127
40	59	41	61.5	9.0	22	29	121
41	59	36	77	23.88	18	20	123
42	59	25	176	33.93	16	12	117
43	57	44	165.5	22.4	20	20	
44	55	33	63	14.33	23	36	110
45	53	43	114	26.95	23	28	108
46	52	32	107.5	27.08	17	20	117
47	49	35	80.5	17.11	18	36	110
48	48	40	118	16.28	23	33	125
49	46	40	26	28.61	19	17	129
50	46	35	55.5	18.75	23	16	117
51	45	28	114	27.96	21	16	123
52	42	49	20	5.83	25	32	117
53	38	19	124	23.81	18	18	114
54	35	37	156	18.9	23	25	114

APPENDIX I (a) CONTINUED : TEST SCORES FOR THE HONG KONG UNIVERSITY  
SAMPLE : PHYSICS AND MATHS STUDENTS, n = 20.

SUBJECT NUMBER	WAIS:		FULL SCALE	RFT TOTAL ERROR (°)	EFT: TOTAL TIME (MIN)	MATRICES
	VERBAL	PERFORMANCE				
55	135	116	129	10	2.85	58
56	122	121	123	8	4.53	57
57	132	132	134	15	1.25	59
58	120	110	117	19	1.80	55
59	115	132	124	12	3.93	59
60	119	131	126	18.5	2.86	54
61	115	120	118	45	8.43	57
62	124	114	121	17.5	4.68	38
63	128	132	131	14	4.06	55
64	121	104	115	70.5	8.58	46
65	120	125	124	7	1.80	52
66	129	127	130	10	2.25	57
67	121	119	121	21	5.25	58
68	114	112	114	8.5	5.82	44
69	135	131	135	20	3.31	45
70	113	102	109	13.5	7.23	42
71	109	134	121	19.5	5.42	50
72	115	100	109	6	16.43	53
73	124	116	122	11.5	2.06	47
74	127	119	125	50.5	1.95	51



APPENDIX I (a) CONTINUED : TEST SCORES FOR HONG KONG UNIVERSITY  
SAMPLE: CHINESE LITERATURE STUDENTS, n = 14.

SUBJECT NUMBER	WAIS:		FULL SCALE	RFT TOTAL ERROR (°)	EFT TOTAL TIME (MIN)	MATRICES
	VERBAL	PERFORMANCE				
75	108	116	112	26	13.4	45
76	127	116	124	15	5.35	56
77	113	116	115	21	5.58	51
78	116	98	109	121.5	20.00	30
79	115	116	117	6	3.46	41
80	118	111	116	4.5	6.0	51
81	125	111	120	34.5	2.65	42
82	111	117	115	22	7.36	41
83	125	112	121	14.5	4.54	44
84	114	99	110	25	13.82	30
85	118	107	114	31.5	6.6	50
86	-	-	-	117	18.73	42
87	-	-	-	54.5	11.52	34
88	119	114	118	8.5	3.86	51

APPENDIX I (b) : EDINBURGH SAMPLE : BOYS, n = 51.

<u>SUBJECT NUMBER</u>	<u>AH51</u>	<u>AH52</u>	<u>AH5 TOT</u>	<u>AH5 ERROR</u>	<u>USES</u>	<u>PATTERNS</u>	<u>EFT MIN</u>	<u>MFF ES</u>	<u>MFF RT</u>
89	21	27	48	8	9	24	1.85	11	37.62
90	19	27	46	23	12	10	5.37	4	50.29
91	16	27	43	12	37	18	2.82	11	41.08
92	21	21	42	19	11	18	14.48	5	71.58
93	13	28	41	13	14	3	1.05	12	32.36
94	13	28	41	7	23	30	3.44	8	25.20
95	18	21	39	9	19	11	3.03	5	75.54
96	17	22	39	19	10	16	7.71	5	58.62
97	23	15	38	8	6	20	5.70	16	56.29
98	18	19	37	11	12	21	2.33	9	40.54
99	14	23	37	17	10	8	6.30	4	42.37
100	14	23	37	19	12	16	20.66	7	38.25
101	12	24	36	13	12	26	3.00	12	19.75
102	16	19	35	10	22	7	4.19	5	47.41
103	17	18	35	9	17	18	6.26	3	70.45
104	14	20	34	15	14	19	6.30	12	20.95
105	12	21	33	22	7	6	3.06	2	50.16
106	12	20	32	16	8	5	1.99	13	25.83
107	12	20	32	26	9	11	4.22	7	44.16
108	12	20	32	7	11	12	7.45	12	52.75
109	15	17	32	27	11	8	8.48	9	23.41
110	13	19	32	15	13	15	10.80	8	63.41
111	14	18	32	11	24	29	11.05	12	60.62
112	15	17	32	22	6	5	11.95	6	79.87
113	12	19	31	22	8	8	6.80	9	32.66
114	15	15	30	19	5	6	6.04	3	28.70
115	16	14	30	23	9	16	8.30	13	36.83
116	12	17	29	15	12	14	10.56	8	31.41
117	11	17	28	7	14	5	6.56	1	98.08
118	9	19	28	8	12	15	7.97	2	58.25
119	10	17	27	20	12	7	8.26	10	30.20
120	10	16	26	22	9	12	4.49	14	25.37
121	9	17	26	17	11	12	5.57	11	40.66
122	9	16	25	21	13	15	10.27	7	46.16
123	9	16	25	12	15	17	10.57	3	66.45
124	14	11	25	22	9	3	14.20	12	38.04
125	12	13	25	17	27	22	14.35	2	103.12



APPENDIX I (b) CONTINUED : EDINBURGH SAMPLE : BOYS, n = 51.

<u>SUBJECT NUMBER</u>	<u>AH51</u>	<u>AH52</u>	<u>AH5 TOT</u>	<u>AH5 ERROR</u>	<u>USES</u>	<u>PATTERNS</u>	<u>EFT MIN</u>	<u>MFF ES</u>	<u>MFF RT</u>
126	11	13	24	21	18	21	7.51	13	16.12
127	9	15	24	32	11	5	14.15	11	59.45
128	5	19	24	29	12	14	14.45	31	25.58
129	11	12	23	34	17	21	3.33	18	19.54
130	12	11	23	5	15	10	9.02	5	40.95
131	11	12	23	15	30	18	11.37	10	29.91
132	13	10	23	10	12	9	11.58	4	36.70
133	7	16	23	12	8	14	12.25	14	28.41
134	9	14	23	19	20	19	13.90	4	71.79
135	12	10	22	46	12	20	9.31	11	39.33
136	8	11	19	42	14	16	6.61	14	31.50
137	7	12	19	19	20	13	10.87	6	68.20
138	8	10	18	19	7	4	5.73	2	55.54
139	9	8	17	17	6	8	6.75	7	50.04

## APPENDIX I (b) CONTINUED. EDINBURGH SAMPLE: GIRLS, n = 59.

SUBJECT NUMBER	AH51	AH52	AH5 TOT	AH5 ERROR	USES	PATTERNS	EFTS	MFF ES	MFF RT
140	23	27	50	13	15	12	1.95	8	24.08
141	21	26	47	7	8	9	2.03	6	23.54
142	21	25	46	12	12	6	5.64	6	46.12
143	19	25	44	15	13	11	1.74	7	33.48
144	26	18	44	9	7	6	12.50	7	54.95
145	15	26	41	13	22	21	5.94	2	28.50
146	13	28	41	13	15	10	6.60	5	32.20
147	18	22	40	7	18	14	3.77	8	39.25
148	17	22	39	2	19	20	2.34	4	28.54
149	17	22	39	13	19	20	4.70	9	41.54
150	17	22	39	10	12	17	5.97	8	37.16
151	21	18	39	19	21	26	10.78	4	81.87
152	22	16	38	16	14	11	7.46	12	31.87
153	18	20	38	15	10	24	10.36	10	14.87
154	17	20	37	3	9	16	8.95	10	37.54
155	15	22	37	10	15	13	9.20	6	44.68
156	16	20	36	9	7	1	2.73	15	39.00
157	14	22	36	13	13	16	9.85	7	74.70
158	17	19	36	17	10	18	11.88	9	26.58
159	18	17	35	8	26	12	4.13	7	51.41
160	15	20	35	3	21	10	10.64	1	63.79
161	16	18	34	4	8	8	2.65	5	36.62
162	19	15	34	7	25	13	5.86	5	33.16
163	13	20	33	16	16	15	4.11	13	44.20
164	14	19	33	19	17	19	7.40	4	47.58
165	15	18	33	31	20	17	15.05	16	33.08
166	16	16	32	14	15	20	6.53	8	33.16
167	12	19	31	15	12	11	8.89	7	30.50
168	16	15	31	16	13	12	10.80	6	47.79
169	13	18	31	7	11	6	13.29	14	10.16
170	14	16	30	16	11	7	4.54	12	25.12
171	15	15	30	10	11	17	6.30	4	71.75
172	14	16	30	23	9	5	6.78	5	47.66
173	12	18	30	15	9	6	11.60	7	43.37
174	13	16	29	22	7	5	12.75	8	39.00
175	13	15	28	9	7	6	4.90	6	52.16



## APPENDIX I (b) CONTINUED. EDINBURGH SAMPLE: GIRLS, n = 59.

SUBJECT NUMBER	AH51	AH52	AH5 TOT	AH5 ERROR	USES	PATTERNS	EFTS	MFF ES	MFF RT
176	8	20	28	23	16	15	9.40	8	33.00
177	12	16	28	14	11	15	14.10	23	42.00
178	8	19	27	13	7	3	9.53	13	19.12
179	11	16	27	15	15	9	9.96	2	53.12
180	14	12	26	17	19	12	2.87	7	61.83
181	14	12	26	6	11	12	4.47	14	27.12
182	14	12	26	35	12	17	6.65	16	23.04
183	8	18	26	12	9	8	7.26	21	19.45
184	11	15	26	15	25	14	11.63	10	41.54
185	11	15	26	22	13	8	11.72	9	37.87
186	10	15	25	13	3	4	8.47	4	48.45
187	13	12	25	13	15	21	13.60	7	49.75
188	16	9	25	11	10	14	20.66	20	49.62
189	9	15	24	14	12	8	5.17	10	41.33
190	11	13	24	27	11	9	17.42	11	44.50
191	14	8	22	20	12	6	9.64	6	44.75
192	14	8	22	17	9	6	17.87	7	55.50
193	7	14	21	24	16	18	13.46	12	39.00
194	5	15	20	19	18	11	13.67	5	47.00
195	7	12	19	10	14	21	9.95	2	69.08
196	7	11	18	17	23	21	10.05	11	51.91
197	6	10	16	26	13	6	11.05	8	41.37
198	7	7	14	13	14	16	12.78	12	54.70

APP. I (c) SHEFFIELD SAMPLE. 4TH YEAR BOYS, n = 34.

<u>SUBJECT NUMBER</u>	<u>AH51</u>	<u>AH52</u>	<u>AH5TOT</u>	<u>GEFT</u>	<u>ANA1</u>	<u>ANA2</u>	<u>CAC</u>
199	21	23	44				
200	14	26	40	16	5	21	- 5
201	18	18	36	18	12	39	+ 1
202	19	16	35	15	15	28	+ 9
203	14	21	35	11	12	26	+ 7
204	13	21	34	17	12	29	+ 3
205	13	19	32	17	11	29	- 1
206	14	18	32	17	15	44	+ 1
207	15	14	29	11	11	25	+ 5
208	10	18	28	13	11	31	+ 1
209	10	17	27	14	5	24	+ 5
210	5	21	26	16	12	30	- 3
211	6	18	24	11	6	25	- 1
212	12	11	23	18	12	30	+ 5
213	8	15	23	14	7	13	- 5
214	9	14	23	6	11	44	- 3
215	7	16	23				- 5
216	9	13	22	10	8	22	- 1
217	11	11	22	4	14	31	+ 3
218	6	15	21	13	7	9	- 1
219	6	15	21				-11
220	6	15	21				- 7
221	9	11	20	9	8	11	+ 5
222	9	11	20	5	10	17	- 1
223	8	12	20	3	4	16	- 5
224	6	13	19	9	10	19	+ 5
225	8	10	18				+ 7
226	5	11	16	14	6	25	+ 1
227				18	10	25	
228				14	11	20	+ 9
229				15	14	28	
230				13	8	18	
231				11	7	21	
232				2	7	15	



APP. I (c) CONTINUED. SHEFFIELD SAMPLE. 4TH YEAR GIRLS, n = 23.

<u>SUBJECT NUMBER</u>	<u>AH51</u>	<u>AH52</u>	<u>AH5TOT</u>	<u>GEFT</u>	<u>ANA1</u>	<u>ANA2</u>	<u>CAC</u>
233	10	24	34	18	12	24	+ 7
234	9	19	28	15	9	17	- 1
235	5	23	28	13	11	11	- 3
236	9	17	26	12	14	32	- 9
237	10	14	24	8	12	22	+ 1
238	17	15	22	17	8	31	+ 1
239	9	13	22	9	12	16	+ 3
240	11	10	21	13	9	18	- 7
241	11	10	21	7	12	36	+ 1
242	7	13	20	8	7	25	- 3
243	9	11	20	2	4	21	- 5
244	6	13	19	10	14	35	- 1
245	7	11	18				+ 5
246	3	14	17	12	15	10	- 1
247	8	9	17	9	9	29	- 5
248	3	14	17				- 1
249	6	9	15	6	13	17	- 5
250	4	8	12	7	8	28	+ 1
251	3	8	11	3	9	26	- 5
252	6	3	9				- 5
253	2	5	7	5	13	7	+ 3
254				4	6	16	
255				3	7	14	

APP. I (c) CONTINUED. SHEFFIELD SAMPLE. 6TH YEAR BOYS, n = 16.

<u>SUBJECT NUMBER</u>	<u>AH51</u>	<u>AH52</u>	<u>AH5TOT</u>	<u>GEFT</u>	<u>ANA1</u>	<u>ANA2</u>	<u>CAC</u>
256	20	24	44	18			
257	22	22	44	16			
258	19	24	43	17	13	25	+ 5
259	21	22	43	17	12	31	+ 3
260	12	24	36	18	15	29	- 7
261	11	24	35	13	12	31	+ 3
262	14	20	34	18	10	22	+13
263	15	19	34	15	11	26	+ 3
264	11	21	32	15	14	25	- 5
265	13	19	32	8	14	28	- 1
266	14	16	30	17	8	17	+ 5
267	12	18	30	16	11	20	+ 7
268	15	15	30	13			
269	19	11	30	6	12	36	- 9
270	10	16	26	17			
271	12	14	26	12	9	23	+ 5



APP. I (c) CONTINUED. SHEFFIELD SAMPLE. 6TH YEAR GIRLS, n = 18.

<u>SUBJECT NUMBER</u>	<u>AH51</u>	<u>AH52</u>	<u>AH5TOT</u>	<u>GEFT</u>	<u>ANA1</u>	<u>ANA2</u>	<u>CAC</u>
272	15	24	39	18	11	39	+ 5
273	19	19	38	16	13	37	+ 7
274	17	20	37	17	8	16	+ 1
275	11	22	33	17	17	32	- 5
276	16	17	33	17	10	19	+ 3
277	11	22	33	16	11	20	- 5
278	12	20	32	18	16	24	+ 1
279	9	22	31	17	16	22	+ 1
280	10	20	30	15	12	34	- 3
281	8	20	28	18	8	20	- 7
282	9	19	28	10	11	19	- 3
283	10	17	27	13	13	31	- 3
284	13	14	27	5	11	15	+ 3
285	7	17	24	9	8	31	-11
286	8	15	23	16	8	25	- 1
287	5	18	23	13	9	22	+ 3
288	6	14	20	15	12	13	+ 1
289	7	8	15	8	11	30	- 1

APPENDIX I (c) CONTINUED. REPERTORY GRID 'EXTERNAL CONSTRUCT' SCORES  
SHEFFIELD SAMPLE.

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	<u>Boys, n = 22</u>		<u>Girls, n = 29</u>	
4TH YEAR	<u>Subject No.</u>	<u>'E' Score</u>	<u>Subject No.</u>	<u>'E' Score</u>
	201	3	233	3
	202	3	234	5
	203	3	236	10
	205	4	237	9
	207	3	239	0
	209	5	240	7
	211	5	241	7
	214	2	243	1
	218	8	244	2
	221	4	246	1
	223	5	247	3
	224	3	249	1
	226	0	251	2
	227	5	254	2
6TH YEAR	258	4	272	8
	259	6	274	4
	260	5	276	4
	261	3	277	3
	262	2	278	3
	264	6	279	3
	265	3	280	6
	271	9	281	7
			282	1
			283	2
			285	3
			286	8
			287	6
			288	2
			289	2



APPENDIX I (c) CONTINUED. REPERTORY GRID INTENSITY SCORES.  
SHEFFIELD SAMPLE.

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	<u>Boys, n = 14</u>		<u>Girls, n = 20</u>	
4TH YEAR	<u>Subject No.</u>	<u>Score</u>	<u>Subject No.</u>	<u>Score</u>
	203	966.1	233	815.0
	205	1318.0	234	1423.7
	207	1109.1	239	2284.5
	209	1415.8	243	1732.0
	214	953.9	244	1196.1
	221	1142.9	246	3523.7
	224	1113.7	249	2661.0
	226	947.6	254	2168.7
6TH YEAR	258	469.4	272	1742.6
	259	560.5	276	1036.1
	260	620.9	278	1867.6
	261	1673.3	279	799.8
	264	2196.8	280	1507.3
	265	993.2	281	774.1
			282	1065.8
			283	1321.0
			286	595.9
			287	826.9
			288	1693.5
			289	1059.7

APPENDIX II (a). Factor analysis of test intercorrelations amongst Hong Kong 9-year-olds: Whole sample results

<u>Principal components factor matrix</u>			
	Factor 1	Factor 2	Communality
WISC	0.47342	-0.19444	0.26193
Matrices	0.70619	-0.19340	0.53611
RFT	0.64092	0.28413	0.49150
EFT	0.79210	0.23010	0.68036
CEFT	0.64995	0.04728	0.42467
Kohs	0.75151	0.38137	0.71021
Chinese	0.54527	-0.83090	0.98771

Factor 1 (eigenvalue 3.04554) accounts for 74.4% of the variance after 14 iterations; Factor 2 (eigenvalue 1.04695) accounts for 25.6%.

<u>Varimax rotated factor matrix</u>		
	Factor 1	Factor 2
WISC	0.28739	0.42348
Matrices	0.48205	0.55112
RFT	0.69125	0.11692
EFT	0.78748	0.24543
CEFT	0.56803	0.31940
Kohs	0.83715	0.09690
Chinese	-0.00406	0.99383



APPENDIX II (a) Continued. Factor analysis of test intercorrelations  
amongst Hong Kong 9-year-olds excluding  
Chinese Language scores

Principal components factor matrix:

<u>(i) Boys</u>		<u>(ii) Girls</u>	
	<u>Factor 1</u>		<u>Factor 1</u>
WISC	-0.42658	WISC	-0.39241
Matrices	-0.64954	Matrices	-0.67993
RFT	-0.66092	RFT	-0.72431
EFT	-0.76213	EFT	-0.87552
CEFT	-0.65849	CEFT	-0.76573
Kohs	-0.75903	Kohs	-0.81477

(iii) Whole sample

	<u>Factor 1</u>
WISC	-0.41533
Matrices	-0.63268
RFT	-0.68679
EFT	-0.82226
CEFT	-0.65415
Kohs	-0.79612

APPENDIX II (b). Partial correlation coefficients of field-dependence tests: Hong Kong 9-year-olds (Whole sample)

	<u>EFT x RFT</u>			<u>EFT x CEFT</u>			<u>RFT x CEFT</u>		
	r	df	p	r	df	p	r	df	p
Controlling for:									
WISC	.56	51	<.001	.46	51	<.001	.41	51	<.001
Matrices	.53	51	<.001	.33	51	<.01	.33	51	<.01
Kohs	.38	51	<.01	.23	51	<.05	.25	51	<.05
WISC + Mat	.50	50	<.001	.33	50	<.01	.33	50	<.01
WISC + Kohs	.35	50	<.01	.21	50	ns	.24	50	<.05
Mat + Kohs	.36	50	<.01	.17	50	ns	.22	50	ns
WISC, Mat, Kohs	.34	49	<.01	.18	49	ns	.22	49	ns



APPENDIX II (c). Factor analysis of test intercorrelations: Sheffield  
Fourth-form sample

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<u>Principal components factor matrix</u>			
	Factor 1	Factor 2	Communality
AH5 1	-0.69973	-0.24637	0.55032
AH5 2	-0.71646	0.45068	0.71643
GEFT	-0.79193	0.23860	0.68409
ANA 1	-0.28311	-0.36063	0.21677
ANA 2	-0.41579	-0.35542	0.29920
CAC	-0.35337	-0.24630	0.18553

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Factor 1 (eigenvalue 2.00799) accounts for 75.7%  
of the variance following more than 25 iterations;  
Factor 2 (eigenvalue 0.66435) accounts for 24.3%

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<u>Varimax rotated factor matrix</u>		
	Factor 1	Factor 2
AH5 1	0.41533	0.61467
AH5 2	0.84394	0.06471
GEFT	0.77825	0.28003
ANA 1	0.00726	0.46553
ANA 2	0.12230	0.53314
CAC	0.13715	0.40831

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APPENDIX II (c) Continued. Factor analysis of test intercorrelations:  
Sheffield Sixth-form sample

<u>Principal components factor matrix</u>				
	Factor 1	Factor 2	Factor 3	Communality
AH5 1	0.45066	0.05229	0.60167	0.56784
AH5 2	0.87598	-0.13094	-0.29239	0.86998
GEFT	0.67818	0.28256	-0.24182	0.59824
ANA 1	0.34572	-0.41316	-0.01775	0.29054
ANA 2	0.21721	-0.60600	0.30676	0.50852
CAC	0.29478	0.59021	0.30014	0.52532

Factor 1 (eigenvalue 1.68396) accounts for 50.1% of the variance after more than 25 iterations; Factor 2 (eigenvalue 0.98501) accounts for 29.3% and Factor 3 (eigenvalue 0.69047) accounts for 20.5%.

<u>Varimax rotated factor matrix</u>			
	Factor 1	Factor 2	Factor 3
AH5 1	0.08393	0.28921	0.69076
AH5 2	0.87450	0.31721	0.06785
GEFT	0.73864	-0.10131	0.20588
ANA 1	0.24485	0.47750	-0.05085
ANA 2	-0.05643	0.70702	0.07388
CAC	0.18027	-0.33516	0.61684



APPENDIX III (a) : MODIFICATIONS TO THE WISC.

The items of the WISC were modified as follows:

In the INFORMATION subtest:

- Item 7 : How many cents are there in a Hong Kong Dollar?
- Item 16 : From which book is "(a well-known quotation from a famous Chinese novel)" taken?
- Item 17 : What is celebrated on October 1st, or on October 10th? (National Days of Communist and Nationalist China respectively; the mark was given if the child got either one correct.)
- Item 18 : What is a registered letter?
- Item 19 : What is the height of the average Chinese man?
- Item 24 : How far is it from Hong Kong to Shanghai?
- Item 25 : Which day of the year is labour day?

In the COMPREHENSION subtest:

- Item 9 : Why is it good to put money in the bank?

In the SIMILARITIES subtest:

No actual changes were made in any of the items; but extra care was taken to ensure that each child clearly understood the nature of the task, in view of its rather 'Western' flavour. As it turned out, however, none of the Ss seemed to experience any difficulty due to the 'strangeness' of the test.

APPENDIX III (b) : THE WECHSLER ADULT INTELLIGENCE SCALE.

The eleven subtests of the Intelligence Scale are as follows:

- ( 1) The Verbal Scale: Information: Like the Information subtest of the WISC, this is a series of 29 items concerning general knowledge, each scored 1 or 0 according to whether correct or incorrect as directed in the manual. This was the only subtest in which modifications were introduced, and these were minimal: Question 11 became "What is the height of the average Chinese?"; Question 17 "How far is it from Hong Kong to Shanghai?"; and Question 20 "What is the population of China?"
- ( 2) Comprehension: A test of the individual's understanding of the world around him, containing items such as "Why do we pay taxes?", 14 in all. Scored 2, 1, or 0 according to the level of understanding shown in the response.
- ( 3) Arithmetic: 14 items, each with a time limit, with bonus marks for rapid response..
- ( 4) Similarities: 13 items, designed to elicit information concerning S's understanding of the common properties of objects, and the degree of abstractness of his system of categories. Each item scored 2, 1, or 0.
- ( 5) Digit Span: Almost identical to that in the WISC.
- ( 6) Vocabulary: A 40-item test, each item scored 2, 1, or 0 according to the level of precision of the response.
- ( 7) Performance Scale: Digit Symbol: A perceptual-motor task in which S is asked to copy out into a series of boxes a number of symbols representing the digits 1-9. S's score is the number of boxes completed in 90".
- ( 8) Picture Completion: A series of 21 cards, each containing a line drawing in which some crucial part of an object is missing; S is asked to name it. Scored 1 or 0.



- ( 9) Block Designs: This is the Kohs Block Designs Test, described in Chapter 3 (Section 2 (c) ). Administered in this case, with the student, exactly as described in the manual.
- (10) Picture Arrangement: Here, S is presented with a series of cards, on each of which is a drawing representing part of a story; S is asked to order them in the appropriate way. There are 8 series in all; the test is timed, with speed bonuses on the last two series.
- (11) Object Assembly: In this test, S is presented with a series of flat wooden shapes, which when put together can be made into a familiar object. Scoring is based both on the total time taken to make the required and on the number of correctly juxtaposed parts.

APPENDIX IV (a) : PARENTS' QUESTIONNAIRE : HONG KONG SAMPLE.

This Questionnaire was sent to the parents of the children in the Hong Kong sample.

It was translated into Chinese and back again into English by two different interpreters to produce the version below.

Notice

The following is concerned with an investigation of education in Hong Kong:-

Your child has received some educational and psychological tests. In order to understand them more fully, it is desirable to obtain more information concerning his/her role in the family and his/her relationship with you. I would be very grateful if you could answer the following questions in the attached form, and send it back through your child to the school within a week. .

To the child's parents.

University of Hong Kong.

- ( 1) In the eyes of the parents, most children do some naughty things, therefore parents will often punish them. Do you use the same method, or different methods of punishment in all instances? Please state some of the methods you use, and the methods you would use under special conditions.
- ( 2) In your opinion, what is a harsh method of punishment?
- ( 3) When your child was still young, which of the above-mentioned methods did you adopt?

Did you use them:-

- (1) very often?
- (2) often?
- (3) sometimes?



- (4) seldom?
- (5) very seldom?

- ( 4) Have you ever adopted a method threat, without putting it into practice afterwards?
- ( 5) Does the child know that some behaviour will certainly lead to punishment? And will he still go on with it when you are in a good mood?
- ( 6) If both you and your wife are present, who would normally execute the punishment?
- ( 7) In preparing for a celebration, does the child work most of the time with you, or with your wife?
- ( 8) How does he (or she) get along with his (or her) brothers and sisters?
- ( 9) Most children will have fights and rows with their brothers and sisters, or with their peers. Some parents think they should try to investigate the matter and arbitrate; others will pay no attention and let the children solve the matter among themselves. What is the attitude you commonly adopt?
- (10) Some children like to do things by themselves and make their own decisions, others would like their parents to decide for them. To which type does this child belong?
- (11) Some children will get angry with their parents or other elders, and would even argue back. Has your child ever done this?  
(If YES) What do you do?  
(If NO) And unfortunately it happens, what would you feel?
- (12) What is it about your child that pleases you most?
- (13) What is it about him (or her) that makes you angry, or displeases you particularly?

- (14) How does your child behave if everything is arranged in perfect order?
- (15) Some children like to do things well, and if the result is not satisfactory, they will feel unhappy. Others are careless and would feel indifferent even if something went wrong. How does this child behave in this respect?
- (16) What is the thing you most expect your child to succeed in? (e.g. school work, dancing, physical education etc.)
- (17) In your opinion, in what grades should your child's results in school be classified? Would C grade or B grade be alright?
- (18) Is it necessary for you to remind your child from time to time about the things he is working on, and to encourage him to work hard?
- (19) When your child was young, did he (or she) sleep alone or with other people? If so, with whom? Did he sleep beside you? If so, for how long?
- (20) If his (or her) bed was kept in the same room as yours, how long did this last?

The questions were, of course so arranged as to leave room for written answers after each. The responses were translated back into English by another interpreter.



APPENDIX IV (b) : HONG KONG STUDENTS' QUESTIONNAIRE.<sup>1</sup>

Name	Date of Birth
University Course	A-levels and grades
Estimated ability in Chinese	

How long have you been in Hong Kong?

How many years of schooling have you had?

How many brothers and sisters have you?

When a child, were you cared for by your parents or by someone else?

What is the highest standard of education reached by your father?

What is the highest standard of education reached by your mother?

In which of the following categories would you place your father's occupation?

- (1) unskilled manual
- (2) semi-skilled manual
- (3) skilled manual
- (4) lower clerical
- (5) lower professional
- (6) upper professional

In which of the following categories does your family's income lie?

(H.K. \$ per month)

- (1) below 300
- (2) 300 - 600
- (3) 600 - 900
- (4) 900 - 1200
- (5) above 1200

The following questions consist of scales on which you are asked to rate yourself according to the degree to which something is true or untrue of you; the two ends of each scale represent opposite extremes with regard to the variable in question.

Do you think your parents have high or low aspirations for your future?

LOW .....HIGH

---

<sup>1</sup> The rating scales included in this questionnaire were 7-point scales, as described in chapter 5, P.157.

Would you say that your home is a very stimulating one (are there books, etc.)?

VERY DULL .....VERY STIMULATING

Some parents are very protective, and won't allow their children to make decisions for themselves; others are very encouraging and want their children to be as independent as possible. What do you think is more true of yours?

VERY PROTECTIVE.....VERY ENCOURAGING

Who makes most of the decisions in your family, your mother or your father.

When you were young, were you ever naughty?

When you were naughty, did your parents punish you?

Did they use a variety of methods or always the same method?

How often were they likely to punish you?

- (1) very often
- (2) often
- (3) sometimes
- (4) seldom
- (5) very seldom

Did they often make threats and then not follow through?

Would you say that their methods of treating you were very severe or very permissive?

PERMISSIVE.....SEVERE

Who was mainly responsible for punishing you, your mother or your father?

When doing things for pleasure, did you spent more time with your mother or with your father?

Most children will fight with their brothers and sisters or with other children. When you did so, did your parents usually stop you or allow you to continue?



Would you say that you are a more independent, or a less independent  
king of person?

MORE INDEPENDENT.....LESS INDEPENDENT

When you were young, did you ever talk back to your parents?

Do you tend to be an easy-going, carefree sort of person, or are you  
more inclined to worry and feel a sense of urgency about things?

EASY-GOING.....WORRIED

Are your parents eager for you to be successful?

Do you think they are satisfied with your progress?

Do they ever remind you that you should do well or better than you are  
doing?

- (1) very often
- (2) often
- (3) sometimes
- (4) seldom
- (5) very seldom

Would you say that your father is very strict or not at all strict?

VERY STRICT.....NOT AT ALL STRICT

Would you say that your mother is very strict or not at all strict?

VERY STRICT.....NOT AT ALL STRICT

Do you usually make up your mind for yourself about things?

ALWAYS.....NEVER"

APPENDIX IV (c). GROUP QUESTIONNAIRE. EDINBURGH SAMPLE

Name

School

Sex

Date of Birth

Please list the school subjects which you passed last year or have taken this year in the Scottish Certificate of Education:

Ordinary Grades:

Higher Grades:

Which subjects, if any, do you intend to take next year?

Ordinary Grades:

Higher Grades:

What are your main interests and activities other than school subjects?  
Please list separately -

(a) Interests or activities which have some connection with school:

(b) Interests or activities which have no connection with school:



APPENDIX IV (d). GROUP QUESTIONNAIRE. SHEFFIELD SAMPLE

For the purposes of this piece of research, like any other, I need some background information about you. If you feel worried by this you needn't use your real name on any of the sheets, so long as you remember to use the same name on all of them - otherwise I lose track of you completely.

Name \_\_\_\_\_ Date of Birth \_\_\_\_\_

Form \_\_\_\_\_ Sex (M or F) \_\_\_\_\_

Can you make a list here of the subjects you're taking at school this year?

Any O-levels or A-levels? If so list them here.

What do you think you will be doing after you leave school? If you have particular plans for jobs or further education, can you describe them briefly here?

Have you any hobbies or particular spare-time interests? If so can you list them here.

APPENDIX IV (e). REPERTORY GRID SHEET

The aim of this booklet is to look at some of the things you think about some of the people you know.

It consists of several parts.

First, you are asked to make out a short list of some people in your life (the next page will tell you the sort of people to pick). If you want to conceal who they are, just write their initials on the sheet.

Second, you are asked to pick three of these people, and say how the first two differ, in your eyes, from the third. Just think of any difference that you can, and write it down in the space provided. Some important kinds of differences will be suggested for you, for example 'like me / not like me'. You will be asked to do this several times and to write down what you think each time.

Thirdly, you are asked to make up a large box out of all this, called a MATRIX. Along the top of the matrix you write the initials of the people you thought of on page 1. Down the sides, you write down some of the differences you thought of on page 2. Then, you have to go through the matrix and think about how the differences apply to each person in turn.

It might sound a bit beyond you at first - but if you take your time, I think you might even enjoy it!

Now turn to page 1.



MAKING UP A LIST OF PEOPLE

On this page, I would like you to make a list of ten people, who fall into the categories named below. Some are obvious, like 'my father'; others might take a bit of thought. You don't necessarily have to know them personally to include them here. When you have thought of someone in a category, write their initials in the left-hand column, and carry on like this until you have done all ten.

The peopleInitials of the  
person you have  
in mind

- |   |       |
|---|-------|
| 1. Your father                          | _____ |
| 2. Your mother                          | _____ |
| 3. A good friend                        | _____ |
| 4. A teacher you like                   | _____ |
| 5. A teacher you don't like             | _____ |
| 6. Someone you admire                   | _____ |
| 7. Someone you'd like to get to know    | _____ |
| 8. Someone who annoys you a lot         | _____ |
| 9. Someone you'd like to be             | _____ |
| 10. Someone in your form whom you avoid | _____ |

The only other thing to remember is not to use the same person twice. Each of the ten people has to be somebody different.

THINKING ABOUT THE DIFFERENCES  
BETWEEN PEOPLE

On this page, I'd like you to write down some of the differences between some of these people, by thinking about them in a certain way. Each time you are asked to say in what way a particular pair of them is different from a third. The groups you have to take each time are listed below. Then, you write down the difference you have thought of on the line provided.

For example, one difference between people might be 'like me - not like me'. (In fact don't use this one, because it's being provided on the next page anyway). See what other differences you can think of.

1. In what way are your father and mother like each other, but unlike your good friend?

---

2. In what way is your father like someone you admire, but unlike a teacher you don't like?

---

3. In what way is your good friend like a teacher you like, but different from someone who annoys you a lot?

---

4. In what way is your friend like someone you'd like to get to know, but unlike someone you'd like to be?

---

5. In what way is someone in your form whom you avoid like someone who annoys you a lot, but unlike someone you admire?

---



6. In what way is your mother like your good friend, but unlike someone you'd like to be?

---

7. In what way is your friend like someone you'd like to be, but unlike a teacher you don't like?

---

8. In what way is your father like a teacher you don't like, but different from someone you'd like to be?

---

9. In what way is your father like someone you admire, but different from someone in your form whom you avoid?

---

10. Finally, in what way is your friend like someone who annoys you a lot, but unlike your father?

---

The last thing you have to do is to fill in the MATRIX shown here. Along the top, you write the initials of the people you thought of on page 2. Down the side, you put your list of the differences you wrote down on pages 3 and 4. (One kind of difference, 'like me - not like me', has been added.) What you have to do now is to take each difference one at a time, and put your ten people in rank order on that difference, from one end to the other. For example, if you think that your friend is the person most like you out of the ten, put a 1 in the box under your friend's name, opposite the line which says 'like me - not like me'. If you think someone you'd like to be is least like you, put a 10 in the box under their name. Then go on and do the rest of the ranks from 2 to 9. Finally, try this out for each of the differences in turn.

Write the list of  
**DIFFERENCES DOWN HERE**

write the set of initials HERE

Like me - not like me

[illegible]

THANK YOU

\*\*\*\*\*



APPENDIX IV (f). REPERTORY GRID SCORING SHEET

<u>Constructs</u>	<u>Spearman r</u>	<u>r<sup>2</sup> x 100</u>	<u>Constructs</u>	<u>Spearman r</u>	<u>r<sup>2</sup> x 100</u>
1 - 2	_____	_____	4 - 5	_____	_____
1 - 3	_____	_____	4 - 6	_____	_____
1 - 4	_____	_____	4 - 7	_____	_____
1 - 5	_____	_____	4 - 8	_____	_____
1 - 6	_____	_____	4 - 9	_____	_____
1 - 7	_____	_____	4 - 10	_____	_____
1 - 8	_____	_____	5 - 6	_____	_____
1 - 9	_____	_____	5 - 7	_____	_____
1 - 10	_____	_____	5 - 8	_____	_____
2 - 3	_____	_____	5 - 9	_____	_____
2 - 4	_____	_____	5 - 10	_____	_____
2 - 5	_____	_____	6 - 7	_____	_____
2 - 6	_____	_____	6 - 8	_____	_____
2 - 7	_____	_____	6 - 9	_____	_____
2 - 8	_____	_____	6 - 10	_____	_____
2 - 9	_____	_____	7 - 8	_____	_____
2 - 10	_____	_____	7 - 9	_____	_____
3 - 4	_____	_____	7 - 10	_____	_____
3 - 5	_____	_____	8 - 9	_____	_____
3 - 6	_____	_____	8 - 10	_____	_____
3 - 7	_____	_____	9 - 10	_____	_____
3 - 8	_____	_____			
3 - 9	_____	_____			
3 - 10	_____	_____			

INTENSITY SCORE (ignoring sign) =

APPENDIX IV (7). ANAGRAMS

Name \_\_\_\_\_

Form \_\_\_\_\_

The ten sets of scrambled letters below can each be arranged into a meaningful English word. If you think you know the word, can you write it in the space provided beside the set of letters.

ebalt \_\_\_\_\_

reppa \_\_\_\_\_

•huse \_\_\_\_\_

ehewl \_\_\_\_\_

thuno \_\_\_\_\_

peshe \_\_\_\_\_

neluc \_\_\_\_\_

etrah \_\_\_\_\_

vesne \_\_\_\_\_

gihtl \_\_\_\_\_

\*\*\*\*\*



ANAGRAMS

Name \_\_\_\_\_

Form \_\_\_\_\_

The ten sets of scrambled letters below can each be arranged into a meaningful English word. If you think you know the word, can you write it in the space provided beside the set of letters.

woelly \_\_\_\_\_

spruue \_\_\_\_\_

oneass \_\_\_\_\_

onersp \_\_\_\_\_

cnegah \_\_\_\_\_

oolruc \_\_\_\_\_

uftrue \_\_\_\_\_

mnegaa \_\_\_\_\_

meealf \_\_\_\_\_

bunmer \_\_\_\_\_

\*\*\*\*\*

ANAGRAMS

Name \_\_\_\_\_

In the space below, I would like you to write down as many words as you can that can be made out of the letters of the word GENERATION. The words can be of any length, but cannot contain letters more often than they occur in the key word -

G E N E R A T I O N



APPENDIX IV (h). ADJECTIVE CHECKLIST

Name \_\_\_\_\_

Form \_\_\_\_\_

Listed below are some adjectives which people might use to describe themselves. If possible, can you please check the 10 adjectives which you think best describe yourself by marking them with a +. When you have chosen the ten most descriptive words, please circle the 5 which you think are most descriptive of you: Make sure you choose 10 words altogether, and mark only 5 of them with a circle.

- |                  |                 |
|------------------|-----------------|
| 1. ambitious     | 16. imaginative |
| 2. attractive    | 17. independent |
| 3. confident     | 18. leader      |
| 4. compassionate | 19. likeable    |
| 5. considerate   | 20. optimistic  |
| 6. cooperative   | 21. persuasive  |
| 7. creative      | 22. practical   |
| 8. dependable    | 23. rational    |
| 9. efficient     | 24. reasonable  |
| 10. energetic    | 25. sincere     |
| 11. fair-minded  | 26. sympathetic |
| 12. frank        | 27. tactful     |
| 13. friendly     | 28. versatile   |
| 14. generous     | 29. warm        |
| 15. idealistic   | 30. wise        |

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