ACHIEVEMENT, COGNITIVE STYLE
AND
ETHNIC GROUP MEMBERSHIP

A thesis presented in partial fulfilment of
the requirements for the degree of
Doctor of Philosophy in Education
at Massey University.

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1976.

Abstract

Relationships between Ethnicity, environmental variables, Cognitive Style and achievement are examined with a sample of 679 Standard Three children. No relationship is found between Ethnicity (Maori-Pakeha) and Cognitive Style, although the correlations between Cognitive Style and Achievement are different for Maori and Pakeha children, and are sustained when the comparisons are controlled for SES, Family Size, Rural-Urban location, Sex and Age.

Using two criteria of achievement (PAT Tests and Ravens Progressive Matrices), Pakeha children score higher than Maori children, differences which are reduced but not eliminated when control (in a Multiple Regression Analysis) for the five environmental variables mentioned above is undertaken. Using a third achievement criterion (Teacher Ratings), the initial correlation with ethnicity (similar to the other two criteria) is reduced to near zero in a Multiple Regression Analysis.

Acknowledgements

I should like to record my thanks and appreciation to a number of people.

To Professor R.S. Adams and Dr. D. McAlpine for their encouragement and guidance as supervisors.

To the Interdepartmental Committee for Polynesian Research (Department of Maori Affairs) who financed the data collection phase of this research.

To the large number of senior and post-graduate students who assisted with the individual testing of nearly 700 subjects.

To the Wanganui and Wellington Education Boards for their cooperation and assistance with the data collection programme.

To Mrs. K. Morgan for typing the final copy.

Last, but very far from least, to my wife Helen for typing numerous early drafts and for her forebearance in sharing our lives with a dissertation.

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INTRODUCTION

The education of Maori children has been a topic of considerable interest and debate amongst New Zealand educationalists for many years. The lengthy time span of this debate, and the considerable differences of opinion which still exist within the educational community are due, at least in part, to a dearth of empirical data of sufficient authority to allow the testing of the various causal models that have been generated by the debate. Insufficient in the sense that either the samples were too small, or not enough data were collected to adequately control for environmental differences. In its attempt to remedy this situation, the present study is concerned with three broad issues:

(i) to determine the amount of achievement variance which may be accounted for by selected environmental variables;

(ii) to examine the way in which the environmental variables interact with a Maori-Pakeha[1] dichotomy, which will allow an evaluation of two theoretical models seeking to explain the under-achievement of Maori pupils - namely an 'environmental deprivation' model and a 'cultural difference' model; and

(iii) to evaluate the influence of qualitative cognitive difference or 'cognitive style', as a mediator between environmental circumstances (including ethnicity) and achievement measures.

The predicating of a mediating role for cognitive style, presupposes that the schools operate within the bounds of one particular or dominant 'style', and children do more or less well within the cognitive environment of the school depending upon the extent to which the cognitive 'style' into which they have been socialised is congruent with the 'style' fostered by the school.

These concerns derive from two distinct sources: first, New Zealand writing on the 'educationally disadvantaged' and Maori education - two issues often treated as synonymous in the literature; and second, the literature, deriving mainly from American studies, which suggests that one of the main effects of different environmental circumstances is on the cognitive 'style' into which the children are socialised as a means of comprehending the world around them.

Both of these sources will be explored in more detail, in order to

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1. Pakeha, a Maori word in common usage to denote New Zealanders of European origin.

derive a number of hypotheses which can be tested with data gathered on New Zealand primary school children, both Maori and Pakeha. The findings from such a procedure should allow a number of relevant conclusions to be drawn. To this end, Chapter 1 examines the literature on the sources of differences in Maori and Pakeha school achievement and develops a number of hypotheses which are subsequently tested and discussed in Chapter 4. Chapter 2 is concerned with the concept of cognitive 'style' and its applicability in New Zealand, and generates further hypotheses that in turn are tested and discussed in Chapter 5. Chapter 3 describes the data gathering and sampling procedures.

Chapter 1

Maori Children and School Achievement

This chapter is concerned with the first two issues outlined in the Introduction (p. 1). Namely an elaboration of the relationships between environmental variables, ethnicity and achievement in the New Zealand context.

The literature seeking to explain school achievement differences between Maori and Pakeha children is extremely diverse. It is also characterised by a marked dearth of empirical research data.[2] The main point of contention seems to be whether differences in school achievement between Maori and Pakeha pupils are to be explained in socio-economic or cultural terms. Opinions vary. For example, Gregory (1974: 100-101), writing of children from the larger urban areas, suggests that the greatest differences are to be found between children from middle-class homes (Maori or Pakeha) and children from the lower socio-economic strata and concludes that differences between Maori and Pakeha children from low socio-economic homes are becoming blurred. To Gregory, the socio-economic variable is more potent as a determiner of school achievement than is ethnicity.[3] Thus Gregory implies, at least for urban areas, that Maori-Pakeha differences in school achievement are more apparent than real. The apparent differences in Maori-Pakeha achievement are to be explained by the over-representation of the Maori population in the lowest socio-economic categories.

This confounding of socio-economic influences with those of ethnic cultural differences is also pointed out by Hermansson (1974: 141), Mitchell (1970: 182) and Adams (1973: 65), the latter two finding support for their view in Lovegrove (1964, 1966), whose data will be examined in more detail at the end of this section.[4]

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2. This literature has been fully surveyed elsewhere - see Harker (1971, 1973).

3. Used in Devos' s sense "An ethnic group is some self-perceived group of people that share a past. They share some commonly held traditions separating them self-consciously from the others with whom they are in contact." (Devos, 1972: 437).

4. Lovegrove's findings are important in this debate as his study is the most comprehensive survey of Maori-Pakeha achievement differences and is frequently cited as providing support for the position that holds Maori-Pakeha differences to be due to deprived social and environmental circumstances.

Garrett (1973: 32-34) takes the argument further by suggesting that there is a large overlap, particularly in the minds of Pakehas, between phenomena perceived as characteristic of Maoris, and phenomena characteristic (on a world wide basis) of members of other low socio-economic status groups. However, she points out that in the case of Maoris the overlap is often not complete, emphasising that many Maoris, particularly of the middle class, are bi-cultural. With all that this implies it may therefore be erroneous to assume that the environmental variables known to be related to school achievement within European cultures, will bear the same relationships within Maori culture.[5] To assume that all observable achievement differences between Maori and Pakeha children are due to differential distribution on the socio-economic continuum and simply compare Maori and Pakeha children matched in terms of socio-economic criteria, is to beg the question which is "Do socio-economic differences relate to school achievement measures in the same way for Maoris as for Europeans?"

The view that Maori educational problems are due only to socio-economic factors, ignores or at least plays down the role of culture as a determinant of school achievement. It also leaves out the possibility that the more mono-cultural a school system is, the greater would be the relevance of cultural difference as an independent explanatory variable for school achievement.

Support for this particular viewpoint is to be found in the literature on Maori education, where a number of authors[6] explicitly or implicitly reject the purely socio-economic explanation of Maori-Pakeha achievement differentials. They would claim that differences exist over and above any socio-economic inequalities, and that they can be attributed to an inflexible school system that has made few if any meaningful concessions to Maori culture. The view of this group of writers are perhaps best summarised by Walker (1973: 112) as follows:[7]

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5. McDonald (1975) points out some possible fallacies in such an assumption.

6. Most Maori writers fall into this group, in contrast to the group advocating purely socio-economic causal factors which consists largely of Pakehas.

7. Some or all of these views find support in Dewes (1968: 1), Bray (1973: 104), Schwimmer (1973: 84-91) and Walsh (1973: 26).

"1. Teachers are predominantly Pakeha and monocultural, consequently teachers are generally ignorant of the other (Maori) culture and not sensitized to react to biculturalism and minority group needs.

2. Education is geared to a single cultural frame of reference. Education purveys and perpetuates a cultural tradition of West European origin that is ethnocentric and middle class oriented.

3. Maori children see little of relevance to them in the education system.

4. Maoris have an ambivalent attitude to education. The Maori desires education as a means to improve his life chances, yet at the same time he fears education for its alienating effect on the individual. In short Maoris are afraid of their children becoming monocultural and of loosing them to the Pakeha world."

The literature on Maori education, insofar as it touches upon causation, shows some evidence then, of polarisation around the central issue of the relative importance of socio-economic or cultural factors in accounting for school achievement variance. On the one hand is what will be called the 'environmental deprivation' model which explains Maori under-achievement in terms of low occupational status, large families, and rural residence, while on the other hand is the 'cultural difference' model which explains differences between Maori and Pakeha achievement levels as a result of culture conflict between home and school, between a minority culture and that of the predominant mainstream. Hence there are two potentially competing explanatory models, and the empirical problem is to decide between them if they prove to be mutually exclusive, or to give weight to one or the other (depending on the amount of school achievement variance each can account for) if they both prove to have some explanatory power. The environmental deprivation model would indicate that any correlation between ethnicity and school achievement is spurious and that if adequate controls for other environmental variables were made, the correlation would be non-significant. This suggests a way of empirically testing these two competing models. First a correlation between ethnicity and school achievement must be established, and then the extent to which this correlation is reduced, through controlling for the effects of other environmental variables, will lend support to one or other of the models: to the environmental deprivation model if the correlation reduces to near zero (or to a point where it is no longer statistically significant); and to the cultural difference model if the correlation is unaffected or increases.

The only major study to date to explore this particular problem was

that undertaken by Lovegrove (1964, 1966). Since his study is frequently quoted, particularly by the authors who favour a socio-economic explanation, it would seem appropriate to examine it in some detail at this stage.

Lovegrove's two objectives were to determine:

"1. Whether or not there are significant differences between Maori and European school children on tests of scholastic achievement and certain selected determiners, i.e. intelligence, home background, attitude to school, speed of performance, and listening comprehension.

2. The relative importance of intelligence, home background, attitude to school, speed of performance, and listening comprehension in determining the scholastic achievement of Maori and European children." (1966: 19)

With regard to the first objective, attention will be confined to Lovegrove's data on school achievement measures, and the two levels of analysis which he utilized - namely between group comparisons and within group comparisons.[8] In the between group comparisons, Lovegrove found, with a measure of control for home background, that "... Maori and European children...performed similarly on tests of scholastic achievement." (Op.cit: 31).

Lovegrove's analysis of the between group data highlights the importance of the meaning attached to the word 'significant' in the first objective stated above. Differences between means such as those reported by Lovegrove (1966: Table 1, p. 24) and reproduced here in Table 1.1, may be considered significant or not, in two senses: first, in the sense of statistical significance, which indicates the probability of mean differences as great as those reported, occurring by chance, giving due weight to sample size; and second, differences may be considered significant or not in the sense of theoretical significance, in which the differences are evaluated in terms of theoretical implications. This may often occur independently of any statistical notions of significance (within limits of course), which may well be providing information only on sample size in relation to the observed difference.

In Table 1.1. it can be seen that the mean difference found by Lovegrove, between Maori and Pakeha children on scholastic achievement is

8. The data relating to Lovegrove's second objective is not directly relevant to this study and is not included in this analysis - see Harker (1976: 6-12) for a fuller critique.

Table 1.1.

Table 1 from Lovegrove (1966: 24)

Means, Standard Deviations and t tests for total European and Maori groups

Test	European total (n=238)		Maori total (n=238)			
	Mean	S.D.	Mean	S.D.	t	stat. sig.
Scholastic Achievement	174.94	77.70	162.00	71.38	1.89	-
Intelligence	122.11	43.71	107.26	39.38	3.89	1%
Listening	22.08	7.20	18.60	6.47	5.55	1%
Speed	172.98	50.24	186.97	53.95	2.92	1%
Attitude	4.31	1.37	4.39	1.19	0.67	-

12.94, with a t statistic of 1.89, which with a two tailed criterion falls just outside the 5% level of statistical significance. In the discussion of the data, Lovegrove confounds these meanings, of statistical and theoretical significance, leaving himself in the position that the difference reported only has theoretical import if it falls within the arbitrary limit of statistical significance. Statements such as:

> "Significant differences between Maori and European children on tests of scholastic achievement were not obtained" (1966: 24)

are presumably referring to a lack of statistical significance in the data presented. But in the final discussion this is transformed into:

> "The fact that the Maori and European children from almost comparable home backgrounds performed similarly on tests of scholastic achievement is a finding of some significance." (Op. cit: 31) (emphasis added)

This second statement clearly equates similarity with a lack of statistically significant difference, and as well imputes some theoretical significance to this similarity. However, similarity cannot be assumed from any lack of statistically significant difference between the two groups concerned. Statistically, one may be able to make a distinction between failing to reject the null hypothesis at the .05 level, and being able to reject it at the .06 level. However, it would be difficult to

sustain an argument which suggested that this marginal failure to achieve statistical significance had any great theoretical import. It is also important to bear in mind that, if on the basis of previous research, Lovegrove had formulated an hypothesis which suggested that there would be an achievement difference in favour of Pakeha children even when some matching for home background had been carried out, then a one-tailed test of significance would have been appropriate. The t statistic of 1.89 reported by Lovegrove, using the one-tailed criterion would be statistically significant at the .03 level. Hence the lack of statistical significance in the main finding of Lovegrove's study is very marginal, and largely an artifact of his methodology. In fact Lovegrove was left with a considerable difference between the means that remained to be accounted for.

For the within group comparisons Lovegrove chose to employ two dimensions: urban - rural and sex differences. The findings from the urban - rural comparison favoured urban pupils (both Maori and Pakeha) on all his selected determiners except attitudes to school which showed no difference. Sex differences displayed the same pattern for Maori as for Pakeha, i.e. non-significant sex differences on scholastic achievement, intelligence and listening comprehension, but girls significantly better than boys on speed of performance and attitude to school.

In assessing the significance of his findings for the within group comparisons, Lovegrove switched to one-tailed tests of significance, which implies that he had hypothesised both that differences would be found, and the differences would favour specified groups. It seems inconsistent to use one-tailed tests for within groups analysis and not for the between groups analysis also, particularly when an acceptable level of statistical significance is achieved when the one-tailed criterion is applied to the between group difference in school achievement. Conversely, if the more rigorous two-tailed crieterion had been used throughout the within group comparisons, the number of statistically significant differences found would be the same, although in some cases the level would degrade from .01 to .05. This same inconsistency is to be found in the formulation of the hypotheses (Lovegrove, 1964: 111-113). Some hypotheses[9] are stated in the null form, while others[10] predict both a difference and a direction.

9. Hypotheses a, c, d, f, g, i, j, k, m, n and p.

10. Hypotheses b, e, h, l and o.

The appropriate significance criteria for these forms of hypothesis are two-tailed and one-tailed respectively, which Lovegrove does not follow in his analysis of the data.

From this analysis of Lovegrove's study, he does not appear to offer any satisfactory support for either of the two different explanatory models mentioned earlier due to insufficient control over environmental variables in his 'home background' index. In addition, the multiple regression analyses that Lovegrove carried out were done separately for Maori and Pakeha children and hence give no information of the possible interaction effects of ethnicity with his measure of home background.

At this point, an important caveat needs to be considered. McDonald (1975) contends that some environmental measures, particularly socio-economic status defined in occupational terms, and rural or urban residence, have been found to be useful predictors as a result of their extensive use in research based on populations who share cultures based on Western European roots. When these variables are to be used in comparative research with one of the groups concerned deriving from other cultural traditions, the researcher must first establish that the variables to be used in explanation of some criterion performance operate in the same way within each of the groups being compared. For example, if socio-economic status is found to be positively correlated with school achievement for Pakeha children, but to have a non-significant correlation for Maori pupils, then no meaningful explanation of Maori-Pakeha differences in school achievement based on the differential socio-economic distribution of the two populations could be sustained, since socio-economic status would have no predictive (or explanatory) power within the Maori population.

From such a consideration it seems clear that variables to be used in evaluating the explanatory models of Maori-Pakeha school achievement differences must be subjected to considerable scrutiny. Jensen (1973: 233) explicates the kind of scrutiny environmental variables need to be subjected to when more than one sub-population group is involved in comparative research. He regards as fallacious the procedure whereby environmental differences that exist between two sub-population groups which differ on some other criterion are merely assumed to be the cause of that criterion difference. He continues:

"At least three critical questions need to be answered about every hypothesized environmental factor before one can even begin to consider whether it is a causal factor:

1) Does it correlate with the trait in question within the two groups being compared?

2) How much do the groups differ on the environmental factors?

3) Does the factor make any significant contribution to within-groups or between-groups variance in the trait independently of other hypothesized factors?"

These important questions raised by Jensen can be reformulated into a series of testable hypotheses related to the specific groups being used in this study, and to the two explanatory models being evaluated. The first step is to check that the environmental variables being used in this study (socio-economic status, rural-urban residence, family size, sex, age) together with ethnicity are related to measures of school achievement. In other words, a theoretical generalization derivable from the 'environmental deprivation' model is that environmental variation is related to school achievement variation. This can be tested by:

Hypothesis 1

Variation in the environmental variables and ethnicity will have no significant effects on measures of achievement.

The second step is to determine whether or not the environmental variables are related to measures of school achievement within each of the sub-populations (Maori and Pakeha) being used in this study, which will provide an answer to the first of Jensen's three critical questions.

Hypothesis 2

The direction and magnitude of any differences found under Hypothesis 1 will be the same for both ethnic groups.

A third step is to provide an answer to Jensen's second critical question and determine by how much the Maori and Pakeha groups differ on the environmental variables.

Hypothesis 3

There will be no difference between the Maori and Pakeha sub-samples on environmental variables.

The fourth step is the most crucial from the point of evaluating the two explanatory models described earlier, and provides an answer to Jensen's third question - i.e., does ethnicity make a significant contribution to explaining variance in achievement, independently of the environmental variables used in this study?

Hypothesis 4

When entered last in a multiple regression procedure, ethnicity will make no significant contribution to criterion variance.

Hypothesis 4 is stated with a particular statistical procedure in mind. By entering ethnicity last, the indirect influence it has on achievement through its co-influences on socio-economic status, family size and so on, are semi-partialled out of the calculation, and any contribution which ethnicity then makes to explaining achievement variance is independent of these environmental influences. If the contribution to explained variance is high when ethnicity is entered last, then this would indicate a strong independent influence of ethnicity on achievement. If, on the other hand, the contribution is insignificant, then ethnicity's greatest effect would be indirect through its association with the environmental variables, rather than having any direct influence on achievement. From this it follows that Hypothesis 4 is stated in conformity with what has been termed the environmental deprivation model.

Rejection of the hypothesis would not constitute 'proof' for the cultural difference model, as the two explanatory models presented here do not exhaust the possible universe of explanations. However, rejection would suggest that the cultural difference model warrants further investigation.

Consideration of these first four hypotheses will be taken up again in Chapter 4, after (i) attention has been given to the concept of 'cognitive style' as an explanatory variable in comparative studies of achievement;

(ii) further hypotheses relating cognitive style to Maori-Pakeha differences in achievement have been generated (Chapter 2); and (iii) an outline of the sampling, data gathering and data processing procedures has been given (Chapter 3).

Chapter 2

Cognitive Style

In this chapter, the concept of Cognitive Style will be examined, particularly as it relates to school achievement differences between different sub-population groups. The relevance of the concept for explaining Maori-Pakeha differences will also be considered as a theoretical proposition, and a number of hypotheses will be generated to test the explanatory power of a measure of Cognitive Style.

Nathan Kogan (1971: 244) has defined cognitive style as:

> "... individual variation in modes (sic) of perceiving, remembering, and thinking, or as distinctive ways of apprehending, storing, transforming, and utilizing information. It may be noted that abilities (sic) also involve the foregoing properties, but a difference in emphasis should be noted: Abilities concern level of skill - the more and less of performance - whereas cognitive styles give greater weight to the manner and form (sic) of cognition."

He thus makes the important distinction between the quantitative measures of cognition (which Hertzig (1971: 149) calls cognitive competence), and the qualitative nature of the cognitive processes involved. Educational practice has been very much concerned with the quantitative aspects of cognition in children, and teaching methods together with remedial measures have been based on the proposition that the school's function is to increase the level and efficiency of a child's cognitive abilities. Kogan suggests (1971: 243) that it is only in the last decade or so that there has been any attempt to articulate educational research and practice with the findings of psychological research on the qualitative aspects of cognition. Furthermore, the cognitive style variable is an important source of individual differences in school achievement which overlays the obvious demographic variables such as race, sex, ethnic background and socio-economic status. The literature which discusses the relationship between these 'demographic variables' and cognition will be taken up again after the concept of cognitive style itself has been examined further.

Definitive statements on the development of the concept of cognitive style within the general psychological literature are to be found, inter alia, in Kagan and Kogan (1970) and Vernon (1973). From these sources it is apparent that the study of cognition, until the last

decade or so, has been the almost exclusive preserve of experimental and theoretical psychology. Kogan (1971: 244) outlines three major developments which have served to bring the field of cognitive studies generally, to the attention of educationists: first, many psychologists have taken up the study of cognitive processes in ways that can contribute to the understanding of educational issues and problems; secondly, the increasing interest in developmental studies of cognitive processes (stemming largely from the work of Piaget), which has obvious educational implications since they force consideration of the extent of the match between developmental stages and the content and method of instruction for children in the various stages of development; and thirdly, an increasing interest in the interaction between individual cognitive and non-cognitive characteristics and task and instructional variables.

It is the third development which is relevant to the purpose of this study, since the study will be concerned with the relationships between a non-cognitive characteristic such as ethnicity, cognitive style, and task performance on selected achievement measures. In this context, Bruner, Goodnow & Austin (1956) tie cognition much more explicitly to cultural variables when they state:

> "... all cognitive activity depends upon a prior placing of events in terms of their category membership... A category is, simply, a range of discriminably different events that are treated 'as if' equivalent... category learning is one of the principal means by which a growing member of a society is socialized, for the categories that one is taught and comes to use habitually reflect the demands of the culture in which they arise."
>
> (Bruner et. al, 1956: 231-232)

Hence Bruner, Goodnow & Austin place strong emphasis on categorizing behaviour as the fundamental building block of cognitive activity. Qualitative differences in cognitive behaviour, for these authors would involve different modes of categorisation, whereas quantiative differences would involve greater or less competence and complexity within one mode. Other ways of defining qualitative differences in cognition may also be found in the literature. Kogan, drawing on the work of Messick (1970), has summarised the various phenomena that are generally subsumable under the heading of qualitative aspects of cognition, and which are termed in the literature 'styles', 'controls', 'strategies', and 'information

processing habits':

"1. Field independence vs. field dependence: an analytical, in contrast to a global, way of perceiving (which) entails a tendency to experience items as discrete from their backgrounds and reflects ability to overcome the influence of an embedding context.

2. Scanning: a dimension of individual differences in the extensiveness and intensity of attention deployment, leading to individual variations in the vividness of experience and the span of awareness.

3. Breadth of categorizing: consistent preferences for broad inclusiveness, as opposed to narrow exclusiveness, in establishing the acceptable range for specified categories.

4. Conceptualizing styles: individual differences in the tendency to categorize perceived similarities and differences among stimuli in terms of many differentiated concepts, which is a dimension called conceptual differentiation, as well as consistencies in the utilization of particular conceptualizing approaches as bases for forming concepts (such as the routine use in concept formation of thematic or functional relations among stimuli as opposed to the analysis of descriptive attributes or the inference of class membership).

5. Cognitive complexity vs. simplicity: individual differences in the tendency to construe the world, and particularly the world of social behavior, in a multi-dimensional and discriminating way.

6. Reflectiveness vs. impulsivity: individual consistencies in the speed with which hypotheses are selected and information processed, with impulsive subjects tending to offer the first answer that occurs to them, even though it is frequently incorrect, and reflective subjects tending to ponder various possibilities before deciding.

7. Leveling vs. sharpening: reliable individual variations in assimilation in memory. Subjects at the leveling extreme tend to blur similar memories and to merge perceived objects or events with similar but not identical events recalled from previous experience. Sharpeners, at the other extreme, are less prone to confuse similar objects and, by contrast, may even judge the present to be less similar to the past than is actually the case.

8. Constricted vs. flexible control: individual differences in susceptibility to distraction and cognitive interference.

9. Tolerance for incongruous or unrealistic experiences: a dimension of differential willingness to accept perceptions at variance with conventional experience.

(Kogan, 1971: 244)

In addition to the nine styles mentioned by Messick, Kogan would add 'risk-taking vs. cautiousness' which has both cognitive and

motivational aspects.

The behaviours listed here as 'styles' are different on a number of counts, the main one of which would be their theoretical antecedents. They also vary in the extent to which they have been tested and refined, and in the extent to which their linkages to education have been explicated theoretically or empirically. The two most thoroughly researched areas are those listed above as 1. and 4. The field independence vs. field dependence area has been the concern of Witkin and his associates (Witkin et al, 1962) for over two decades and is perhaps more concerned with perceptual skills than with cognition per se. The area listed as 4. by Kogan has arisen from the work of Kagan, Moss & Sigel (1960, 1963), and has been directed more specifically to exploring relationships between their conceptualising styles, school achievement and intelligence. It is also the area most directly concerned with Bruner, Goodnow & Austin's placing of categorising behaviour to the forefront when considering cognitive activity (Bruner et al, 1956). Lenneberg (1967) and Nelson (1973) echo Bruner et al, and lend further strong support to the primacy of categorization in cognitive development. "Concepts... are not so much the product of man's cognition, but conceptualization is the cognitive process itself." (Lenneberg, 1967: 332-333). Kagan et al (1963) noted parallels between their conceptual style model and the field dependence - field independence model of Witkin et al (1962), however Witkin himself is very cautious about the comparability of the two models, despite some apparent similarities (Witkin, 1963). Messick & Fritzky (1963) attempted to investigate empirically the relationship between the Kagan and Witkin models and showed only marginal correlations. A more comprehensive study by Wachtel (1968) found that having a field independent score on Witkin's Embedded Figures Test reflects primarily an analytic capacity, whereas the production of analytic groupings on a sorting task (such as Kagan et al Conceptual Style Test) reflected primarily a stylistic preference. This stylistic preference relates back to the habitual use of culturally induced modes of categorization mentioned by Bruner, Goodnow & Austin (1956: 232). The implication is that stylistic preference in categorization is much more likely to vary across cultural boundaries than the ability to form conceptual categories per se.

For these reasons attention will be focussed on the Kagan et al

(1963) notion of Conceptualizing styles, for the purposes of this cross-cultural study, and when the term 'cognitive style' is used subsequently, it can be taken to mean conceptual style in the sense that Kagan et al define it. In working up their notion of cognitive style, two different assessment procedures were used: first, a sorting task using a variety of human figures, the assessment being based upon the criteria used in the sorting; secondly, specifically designed for children, a task in which pictorial stimuli are presented in triads, requiring the selection of two out of the three stimuli deemed to be most similar, the criterion used for selection being noted. On the basis of these assessment procedures, Kagan, Moss & Sigel proposed a threefold distinction for conceptual classifications as follows:

1. Descriptive (later analytic-descriptive, and later still simply analytic).

> "This category includes concepts that are based on similarity in objective elements, within a stimulus complex, that were part of the total stimulus. The S. selects an element of objective similarity shared by two or more figures that is a differentiated part of the total stimulus. Moreover, the conceptual label adopted by the S. contains a reference to the objective attribute shared by the grouped stimuli." (Kagan, Moss & Sigel, 1963: 76)

For example, with item 1 of the Cognitive Style Test used in this study (see Appendix 1) where the child is presented with line drawing of a man, a wrist-watch and a ruler, and is asked to nominate which two belong together, the response would be defined as analytic when the child says that the watch and the ruler go together because they both have numbers on them.

2. Inferential-categorical

> "This category includes concepts that are not directly based on a partial objective attribute of the stimuli, but involve an inference about the stimuli grouped together. Moreover, in an inferential concept, as in a descriptive one, any stimulus in the group is an independent instance of the conceptual label." (Ibid.)

Using the same stimulus item as above, an inferential-categorical response would be recorded when the child responded that the watch and the ruler belonged together because they both measure things, or they both are instruments.

3. Relational

> "This category includes concepts that are based on a functional relationship between or among the stimuli grouped together. This functional relationship can involve temporal or spatial contiguity between objects or interobject relationships among the stimulus members. In this category no stimulus is an independent instance of the concept, and each stimulus depends for its membership on its relationship to the other stimuli in the group. (Ibid.)

Again using the same stimulus item, a response would be coded relational if the child responded that the man and the watch went together because the man wears the watch, or the watch goes on the man's arm.

Kagan and his associates conducted a series of studies exploring the relationship between these conceptual categories and a variety of other behavioural phenomena, the most germane for cognitive development being the findings related to intelligence. Table 2.1 is taken from Table 2 of Kagan, Moss & Sigel (1963: 86), and shows the correlations between frequency of responses in the various conceptual classifications and measures of intelligence from the California Test of Mental Maturity.

> "The correlations between conceptual approach and scores on the California Test of Mental Maturity support the notion that an analytic attitude is more closely related to performance on items requiring percpetual differentiation than to facility on questions assessing language skills. There was no relation for boys between an analytic attitude on the conceptual style test and mental status on the verbal half of the California test ($r = +.07$). The items making up this score include vocabulary, verbal arithmetic problems, verbal reasoning, and memory for story elements. However, the non-language score was moderately correlated with analytic concepts in boys ($r = +.42$; $p < .05$). This score is based on tests of comprehension of spatial relationships, mazes, and reasoning tests that involve visually presented materials rather than language. A nonanalytic approach was associated with poor performance on the non-language scale ($r = -.51$; $p < .05$). Only inferential concepts showed a high, positive correlation with the language score ($r = +.57$; $p. < .01$), supporting the popular opinion that verbal items on standard I.Q. tests assess, in large measure, the degree to which the child has acquired the conventional abstract labels of his language." (Ibid.)

A more recent study by Gray & Knief (1975) specifically explored the relationships between cognitive style (measured on a modified version of the Kagan, Moss & Sigel instrument, together with some items from a subsequent modification by Sigel (1967)), and school achievement amongst fifth graders in an American south-western city school district. Fifth

Table 2.1

Data from Table 2 of Kagan, Moss and Sigel (1963:86)

Correlations Between Scores in Each of the Conceptual Categories and the Sub-Test and Total Scores from the California Test of Mental Maturity.

	Analytic		Categorical		Relational	
CTMM	boys	girls	boys	girls	boys	girls
Verbal IQ	.07	.20	.57**	.31	-.30	-.36*
Non-V. IQ	.42**	.26	.47**	.25	-.51**	-.26
Total IQ	.24	.14	.72**	.42**	-.48**	-.35*

(* Sig. at .05 level; ** Sig. at .01 level)

Table 2.2

Data from Table 2, Gray and Knief (1975:69)

Intercorrelations of Variables Used in the Gray and Knief Study.

Variable	2	3	4	5	6	7	8
1 Categorical	-.55*	-.01	-.04	.04	.00	-.03	.02
2 Descriptive		-.37*	.18*	.14*	.17*	.13*	.13*
3 Relational			-.10	-.17*	-.15*	-.09	-.11
4 Verbal IQ				.71*	.92*	.85*	.72*
5 Non-Verbal IQ					.93*	.60*	.70*
6 Full Scale IQ						.77*	.77*
7 Reading							.74*
8 Mathematics							

(* Sig. at .05 level)

graders in the American system are in the same age range as Standard three pupils in New Zealand schools, the group used in the present study. Gray & Knief found rather weaker relationships between their cognitive style measures and their I.Q. measures (from the Lorge-Thorndike Intelligence Test). These were in line with the weak to non-existent relationships between cognitive style and school achievement measures as shown in Table 2.2. In their findings, however, the analytic (descriptive in their Table) mode does seem to have a consistent -though weak - positive correlation with both intelligence and school achievement, while the relational style has a consistently weak negative association. From the Gray & Knief data it is also clear that the analytic style is bipolar with respect to both relational and categorical modes, with no relationship between the relational and categorical modes, (p. 68). These data, then provide a basis against which data from New Zealand children of the same age may be compared as some indication of the universality and stability of the cognitive style concept as used in this study.

Further studies related to school achievement by Kagan and his associates (Kagan et al, 1964), together with the work of other researchers (Sigel, Harman & Janesian, 1967; Cohen, 1968, 1969) suggest that the child who generates analytic concepts has an advantage in the classroom context over a child who generates relational ones, as is apprent in the Gray & Knief data. As an illustration of this important finding, the work of Cohen (1968, 1969) is germane.

Cohen explored the conceptual features of American schools by undertaking a content analysis of the most commonly used standardised tests of intelligence and achievement. This procedure yielded three major factors underlying successful performance.

"They were:

1. breadth and depth of informational content,
2. the ability to abstract analytically, and
3. the ability to extract salient information from its embedding contexts (field articulation)"

(Cohen, 1968: 202; 1969: 828-829)

As noted above, there are three cognitive styles which individuals may use in a given stimulus situation when selecting information salient to them. But, according to Cohen, schools require one specific approach to cognitive organisation - analytic - so that ability (or preference) in

using this mode becomes increasingly critical the higher up the educational ladder one moves.[11] This raises the question of causation. Why do some children prefer relational responses to analytic ones? Some children do not have the ability to make analytic responses, but according to Wachtel (1968) as noted above, this conclusion may not be drawn from a test such as that which Kagan et al utilize. Here we are dealing with a preference for a particular mode of response, rather than a skill which a child has or has not got available to him. Hence in trying to find reasons for one kind of response rather than another, unless the condition is genetic, which seems unlikely, it would appear to be necessary to look for extra-individual circumstances which predispose toward particular kinds of responses. It should be borne in mind that qualitative differences are being examined here, rather than the more usual quantitative ones which seek to measure the extent to which a child has mastered a particular ability. Sigel (1968: 509), echoing Bruner, Goodnow & Austin (1956), notes that a focus on experiential factors implies a conviction that sources of variation in performance reside in extra-individual variables. Thus if the nature of these extra-individual variables is known, obtained differences amongst groups of children can be accounted for. Interwoven with the extra-individual variables is the personality structure of the individual. It is interwoven, because personality is to a considerable extent determined by experience, and also plays an influential role in determining how the child will interact with the environment. However, irrespective of his personality, the specifics of the environment, as determined by culture and the availability of resources, contribute to the quality of the child's contact and the content of his experiences (Sigel, 1968: 510). The content and range of these experiences bear a fairly straightforward relationship to the availability of resources which the environment provides. In this regard, Sigel (Ibid) compares rural and urban areas as offering quite different arrays of experiences as a function of the different kinds of resources available within the particular environments classified as rural

11. Cohen abandoned the categorical response mode in her study, in favour of a straight analytic-relational dichotomy. Responses which originally would have been coded as categorical were assigned to either analytic or relational modes depending on whether the response was 'stimulus centred' (analytic), or 'self-centred' (relational).

(Cohen, 1969: 829-830 and Appendix C)

or urban. Similarly, he suggests, the nature of the economy in which the child's family participates (whether it be a highly industrialised, technological community, or a technologically underdeveloped, largely agrarian community), will affect the availability of resources and the arrays of experiences to which the child is exposed. In New Zealand, a rural-urban dichotomy would also reflect some economic differences, with the rural child being exposed to a wider, more integrated and whole economy, where the various features of the man-made landscape can be related to the occupational activities of the community, such as farming or timber-milling. The urban child, on the other hand, would not experience such integration, the various aspects of the urban landscape being perceived in a much more fragmentary way not readily cognizable as integrated. Hence, support for the relevance of Sigel's contention to New Zealand school children would necessitate finding significant differences in preferred mode of response on the cognitive style test, between those attending rural schools and those attending urban ones (see Hypotheses 8, 9 and 10).

As noted above, Sigel suggests that any direct relationship between environmental opportunities and preferred cognitive modes will be mediated by personality factors. He states that:

> "... the personality structure interacting with the environmental opportunities contributes considerably to the quality and pattern of children's thought."

Two major aspects or determinants of personality which are of significance for the present study are the influence of culture on the personality structure,[12] and the influence of sex-role expectations, both between cultural groups and within cultural groups. These two considerations would suggest (if valid) that any rural-urban differences found on the cognitive style test would need to be looked at <u>within</u> each of the cultural groups concerned, and for boys and girls separately for the sample as a whole, and within each cultural group.

Over and above rural-urban differences, and the availability of resources, it is necessary to consider other ways in which <u>culture</u> determines "... the specifics of the invironment" (Sigel, 1968: 510), and which of

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12. Personality is likely to have a much greater influence on stylistic <u>preference</u> than on the <u>ability</u> to make analytic judgements, hence needs to be borne in mind as a possible explanation if ethnic differences in stylistic preference persist after controlling for environmental factors, on the Kagan et al Cognitive Style Test.

these specifics are significant for cognitive development. Herskovits (1955: 305) has defined culture as "... the man-made part of the human environment". Such an ecompassing definition subsumes not only the material aspects of the man-made environment but also its conceptual and symbolic features such as the values, norms, beliefs, myths, religions, laws and epistemological system which are held by a group of people. It is these latter, non-material features of culture which are most likely to affect people's behaviour and the kind of cognitive mode in which they prefer to operate. If these features vary from group to group, the cumulative effect on the environment (particularly the cognitive environment) in which children are reared is likely to be widespread, affecting the attitudes, beliefs and values which the children come to acquire through socialisation.

Such variables are of little consequence for children who are going to live out their lives in the same environmental circumstances as the adults who socialise them. However, in a multi-cultural society undergoing rapid economic and social change, these variables can be seen to be crucial in determining life-chances in the wider national society, more particularly so if that society has a single-track education system, geared to facilitate social and economic change to which minority cultural groups are not orientated. Such school systems develop their own cultures which have their own set of values, beliefs and so on. Hence the idea of culture conflict can readily be invoked, not only to describe misunderstandings between societies, but also within a society to describe the difficulties met with in schools by children from different cultural or sub-cultural groups (Cohen, 1969).

The culture that schools develop will have its own particular features, which in turn will have their part to play with regard to cognitive development. The relationship between the culture of the school and cognitive style is explicated by Cohen, and manifests itself in a number of contexts:

> "... not only test criteria but also the overall ideology and learning environment of the school embody requirements for many social and psychological correlates of the analytic style. This emphasis can be found, for example, in its cool, impersonal, outer centred approach to reality organisation. Analytic correlates can also be found in the requirements that the pupil learn to sit increasingly long periods of time, to concentrate

> alone on impoersonal learning stimuli, and to observe and value organised time-allotment schedules." (Cohen, 1969: 830)

This claim of Cohen's, for an analytic orientation of the school has important consequences for the pupil whose preferred mode of cognitive organisation is other than analytic. Such a child

> "... is unlikely to be rewarded in the school setting either socially or by grades, regardless of his native abilities and even if his information repertoire and background of experience are adequate." (Ibid)

Cohen also found that the analytic cognitive style was not normally distributed among pupils. Few pupils from low-income environments used the analytic mode, while this mode was dominant among middle-class pupils.

> "The absence of normal distributions of these characteristics suggests that such systematic variations may have arisen as a result of different social environments that stimulate, reinforce and make functional the development of one style of conceptual organisation and constrain and inhibit others." (Ibid)

In following this proposition through, Cohen found that the organisational style of family and friendship groups in the low income areas she studies, were different from typical middle-class methods of primary group organisation, and strongly related to the cognitive styles of their members. In such low income groups, regardless of ethnic differences, critical functions such as leadership, child care and the discretionary use of group funds are not assigned to status roles within the group. Instead, such functions are periodically performed or widely shared by all members of the group. Where a child was socialised in such a 'shared-function' environment, it was found to be highly unlikely that he would develop any facility with the analytic cognitive style, and moreover, would not be able to participate effectively in any aspect of the formal school environment. Cohen, then, has isolated a social organisational variable that appears to have some potential significance for the development of cognitive style, and which in her data, is independent of ethnic group membership.

To apply these findings to New Zealand, amd more spcifically, to estimate their significance in explaining Maori-Pakeha achievement differences, would require significant relationships to be found between frequency of responses in the three modes of response on the cognitive

style test, and socio-economic status. If Cohen's findings are to be fully supported, these relationships would need to be the same within both the Maori and Pakeha groups.

While the work of Cohen would seem to give primacy to socio-economic status, and an insignificant (or at least secondary) role to ethnicity as determiners of preferred mode of cognitive response, other researchers, working in the field of patterns of achievement, present a different ordering of these two variables. Lesser and his associates (Lesser, Fifer & Clark (1965); Stodolsky & Lesser (1967)) compared the patterns of achievement in children from different class and ethnic backgrounds in New York, and found that, although lower class children tend to perform at a lower level than middle class children on all tasks, the hierarchical organisation of verbal, arithmetic, and reasoning skills, as well as the ability to conceptualise spacial relations, appeared to depend on ethnicity, and remained the same for children of the same ethnic background independent of their social class. In this case the culturally determined pattern of cognitive abilities was associated within each ethnic group with different achievement levels, which derived from the social class background. Their findings suggest that some qualitative aspects of cognition are culturally determined (through ethnic group membership), while quantitative aspects within any particular cognitive domain are determined by socio-economic circumstances.

Other studies have generally supported the findings of the Lesser group. For example, Marjoribanks (1972) examined the ability patterns of five ethnic groups residing in Canada, and demonstrated strikingly similar ability profiles to those of the Lesser, Fifer & Clark (1965) study, for those groups that were common to both studies. In addition, Marjoribanks found that by extending his environmental variables beyond the standard measures of socio-economic status, he was able to reduce the ability profile differences between the ethnic groups he used. In the domain of cognitive development, Feldman (1969), who studied 270 Black, Chinese and White subjects at various grade levels and matched for socio-economic status, found evidence to support the proposition that each of the ethnic groups had a unique rate and sequence of cognitive development.

A study which examined the relationship between ethnic group membership and Witkin's field-dependent-independent dimension of cognitive style

(which, it has been noted above, may reflect an analytic ability rather than a preference for the analytic mode) was undertaken by Dershowitz (1966). The results from his sample of 50 Jewish and 30 White boys, confirmed his major hypothesis that:

> "The patterns involved in the field-dependence-independence continuum are affected by specific cultural determinants, and differ from group to group in accord with selective cultural pressures." (Dershowitz, 1966: 92)

He concluded that the differences observed in his data were not limited to content, but extended to the way in which the environment was perceived, and that this difference diminished as the strength of ethnic identity diminished.

Some support for certain aspects of the Lesser et al findings in the New Zealand setting is to be found in a study by Brooks (1973). His research on four-year old Maori and Pakeha children shows that different cultures produce different patterns of sex differences in abilities, but overall concluded "...that differences in test performance are greater between SES groups than between cultural groups (Maori and Pakeha)", particularly for non-verbal tests. Further evidence is to be found in the study of New Zealand youths by Chapman (1973). He showed no significant difference between Maori and Pakeha adolescent males on the Witkin field-dependence-independence dimension, despite an expectation of greather field dependence amongst the Maori youths based on the greater degree of dependence which, according to J. & J. Ritchie (1968), characterises Maori personality patterns, together with an orientation to others. As Chapman points out (p. 43), it may be true that orientation to others reflects a lack of independence, but it might, on the other hand, simply reflect a different set of goals and values.

> "So the Maori, though less concerned with individualism, may be as analytic in thought and perception as the Pakeha, but his thought is directed more toward interpersonal rather than occupational or academic goals." (Chapman, 1973: 43)

As noted above (see also Wachtel, 1968), the Witkin field-dependence-independence dimension is more a test to measure the extent of an analytic ability, whereas the Kagan et al test is a measure of preference for the analytic mode. While it may be, as Chapman shows, that the social and persoanlity characteristics of Maori culture (as compared to those of

Pakeha culture) do not result in any significant differences in the ability to utilise an analytic mode where it is called upon by the requirements of a situation or test, it may be possible that these same characteristics will lend to a preference for a particular cognitive mode.

These studies, while not always concerning themselves with the same sets of variables, show that a number of different aspects of cognition, including cognitive style, are related to environmental factors, including both socio-economic status and ethnic group membership. However, the environmental variables used are global and descriptive, and do not of themselves explain behavioural phenomena. Hence some mechanism, or set of mechanisms, is needed to explain the correlations between aspects of cognitive competence (including stylistic preferences) and the environmental variables. Several researchers have suggested that this mechanism is to be found in the quantitative and qualitative nature of mother-child interaction patterns, For example, Shaffer & Emerson (1964) were able to discern from their research, three characteristic maternal patterns of responding to a child's demands:

1. an approach to the infant involving a great deal of physical contact;
2. an approach which relies on voice and expression for stimulation;
3. an approach whereby the mother uses directive objects, toys, or food impersonally to divert attention from herself.

While these modes of interaction had no differential effect upon attachment behaviour (in which Shaffer & Emerson were primarily interested), they felt that they may be precursors of habitual interaction patterns that affect later cognitive functioning. An attempt to explore such a contention, with specific reference to cognitive style is reported in Hess & Shipman (1965). Using the Kagan, Moss & Sigel (1963) tests of classificatory behaviour, they found consistent relationships between socio-economic status and cognitive style, both for four year old Negro children and their mothers. Middle class mothers were higher on analytic-descriptive and categorical responses, while low status mothers were higher on relational responses. With regard to interaction patterns, for the lower class mothers, a relational conceptual style and restricted speech pattern co-occur, and they create:

> "... a cognitive environment in which behavior is controlled by status rules rather than by attention to the individual characteristics of a specific situation and one in which behavior is not mediated by verbal cues or by teaching that relates events to one another and the present to the future. This environment produces a child who relates to authority rather than to rationale, who, although often compliant, is not reflective in his behavior, and for whom the consequences of an act are largely considered in terms of immediate punishment or reward rather than future effects and long range goals." (Hess & Shipman, 1965: 885)

The effects on the children were striking. Children from all SES groups used all categories, but there were substantial associations between high SES, and use of the analytic category, and conversely, low SES and the use of relational and non-verbal responses. The analytic response "... correlated with favorable prognostic signs for educability (such as attentiveness, control and learning ability)..." (Hess & Shipman, 1965: 880) was almost totally absent from all but the upper-middle class group.

Hess & Shipman's description of the cognitive environment provided by lower class mothers can be seen as dysfunctional to the two 'cognitive dispositions' described by Kagan et al (1963) as being fundamental to the production of analytic responses, namely: a tendency to reflect over alternative solutions that are simultaneously available; and the tendency to analyse a visual stimulus into component parts. These 'dispositions' then could be seen as providing an explanation for the dearth of analytic responses found in lower class children by both Hess & Shipman and Cohen. Also, it should be noted, these 'dispositions' have been described as 'cognitive styles' in their own right (Kogan, 1971: 244).

To summarise, the production of the qualitatively different response modes on the Kagan, Moss & Sigel Cognitive Style Test, would appear to be related to:

1. child rearing patterns (Shaffer & Emerson, 1964);
2. the nature of mother-child interactions (Hess & Shipman, 1965; and
3. the social pattern into which the child is socialised (Cohen's 'shared function' environments, 1969).

It is now necessary to turn to the New Zealand literature in order to assess whether or not any of the above factors would be relevant as a source for hypothesising about Maori-Pakeha differences in cognitive style, and which in turn may serve as explanations of Maori-Pakeha differences in

achievement.

Child Rearing Practices

There is a voluminous literature on cross-cultural studies of socialisation, which has been extended to New Zealand through a series of studies under the direction of James Ritchie. In their work (Ritchie & Ritchie, 1970) a comparison is made between Maori and Pakeha patterns of child rearing. Their description of the Maori pattern of child care in early infancy places particular emphasis upon the importance of physical touch:

> "The Maori child is held and carried, goes to sleep in parental arms, is not clock fed or calendar trained. He enjoys the warmth of the lap, is passed from receptive hand to receptive hand... When the Maori child is carried, cuddled, straddled on the hip, hoisted on the back in a blanket, held in a comfortable balance in physical contact with another he is already learning to enjoy physical sensations and to trust physical responses, to relate to others in more than intellectual terms."
>
> (Ritchie & Ritchie, 1970: 132-33)

For Shaffer & Emerson (1964) this would appear to be a classic example of the first pattern they describe. By contrast, the Pakeha pattern described by the Ritchies, does not place the same emphasis on the importance of physical touch. Pakeha patterns would then, tend to fall into the second of Shaffer & Emerson's patterns, with some falling into the third.

The different pattern of child rearing practices observed for Maori children (supported by research findings for other Polynesian groups - e.g. Hawaii, Tahiti - see Ritchie & Ritchie, 1970) would seem to be a likely contributing factor in later cognitive functioning, and of potential explanatory power in accounting for cognitive differences between Maori and Pakeha children. More so when different child rearing practices are paralleled by differences in children's play behaviour (see for example Ritchie & Ritchie, 1970: 66-68, 129-145), differences in language usage (Benton, 1964), and personality differences (Ritchie, 1963: part III).

The Nature of Mother-Child Interactions

There is some overlap here, whereby material in the previous section is also relevant under this heading. Ritchie in his Rakau studies emphasises the role of older children in the socialisation of young Maori children,

(Ritchie, 1963: 157). Adults and parents are seen as interfering and distant reference figures in the self-contained world of the children. Control techniques tend to be authoritarian and arbitrary (Ibid). That this pattern has been transferred into urban areas is documented in Ritchie & Ritchie (1970: 143-145). If this is the case, urban-rural differences in preferred mode of cognitive style would not be as great for the Maori population as for the Pakeha group. The pattern of child rearing described for the Maoris of Rakau would appear to be similar to the kind of situation described by Hess & Shipman (1965) as dysfunctional for the production of analytic responses. If such differences between Maori and Pakeha in child rearing practices (as described by Ritchie & Ritchie) are related to differences in cognitive style, then it is to be expected that differences would be found between Maori and Pakeha children on the cognitive style test.

Social Pattern

Some parallels are to be found between what Cohen (1969) has described as a 'shared function' environment and the Ritchie's descriptions of social environmental factors in the Maori grups they studied. They report a belief "... in the rightness of unguided growth..." (Ritchie & Ritchie, 1970: 131), and the separation of the children's world from that of adults. In addition, the parent role is viewed in broader terms than is true of Pakeha groups, extending beyond the biological parents, to include uncles, aunts and grandparents, whose homes often become like second homes to children (Ibid). Hence there are a number of "... parent-like adults" (p. 132), who give added security to the growing child. They also suggest that the competitive framework of the school puts pressure onto Polynesian children (in Hawaii as well as New Zealand) which their socialisation does not fit them to meet, as relationships to peers are all important (pp. 135-136).

In terms related to cognitive processes Ritchie states:

> "There is no tradition of objectivity - indeed such an approach is negatively sanctioned as 'cold', as unfeeling... In style, cognitive processes are rich in affective significance.
> (Ritchie, 1963: 150-151)

He goes on to argue that analytic problem solving was so rarely a feature of the thinking of people in Rakau that the rather formal academic

approach which may be adopted in schools was certain to promote difficulties for pupils. Thus it would seem that there is a considerable amount of commonality between the child rearing environment of Maori families in New Zealand, and groups which in overseas research have a child rearing environment which is not conducive to the production of analytic responses.

The rather diverse body of literature surveyed here will now be treated as a collection of theoretical generalizations in order to derive empirical hypotheses for this study, the findings from which can then be matched against the generalizations from the literature. From a theoretical viewpoint, the literature on cognitive style surveyed in this chapter will be taken as providing justification for the basic premise that there is a relationships between certain aspects of the environments in which children are reared, and the frequency of responses in the various modes of the Kagan et al (1964) Cognitive Style Test, which such children generate. The boundary conditions for the three hypotheses to follow, are set by the parallels between the Maori pattern of socialisation (ss reported by Ritchie, 1963; and Ritchie & Ritchie, 1970) and those patterns reported from groups elsewhere as being dysfunctional for the production of analytic modes of categorization (Shaffer & Emerson, 1964; Hess & Shipman, 1965; Cohen, 1969). Another boundary condition would be that Maori patterns of socialisation are different from those of the Pakeha population, as suggested in Ritchie & Ritchie,(1970).

With these conditions in mind, a theoretical generalisation can be made in the following terms - the more empirical, objective and verbal are the socialisation processes and patterns in a group the greater is the likelihood that children so socialised will prefer an analytic cognitive style. From observations made of Maori socialisation patterns and processes, a more specific theoretical generalisation can be made, such that - Maori children will display a lesser preference for an analytic cognitive style than will Pakeha children, and conversely a greater preference for a relational style. From these theoretical generalisations a number of specific, derived hypotheses would seem to be logically entailed. These are as follows:[13]

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13. These hypotheses follow on in sequence from the four stated at the end of Chapter 1.

Hypothesis 5

Maori children will give more relational responses than Pakeha children.

Hypothesis 6

Pakeha children will give more analytic responses than will Maori children.

Hypothesis 7

Pakeha children will give more categorical responses than will Maori children.

A further boundary condition can be taken from Sigel (1968: 510) who singled out rural-urban locations as offering quite different arrays of experience and available resources. Another boundary condition is set by the emphasis on the socio-economic variable in Hess & Shipman (1965) and in Cohen (1969), together with the Ritchies' suggestion that environmental variables of a socio-economic nature may be implicated, at least in part, in the patterns they describe for the Maori (1970: 129). Hence it would seem necessary to investigate the intervening effects of rural or urban residence, and socio-economic status, as follows:

Hypothesis 8

Rural children will give more relational responses than will urban children.

Hypothesis 9

Urban children will give more analytic responses than will rural children

Hypothesis 10

Urban children will give more categorical responses than will rural children.

Hypothesis 11

Children from low SES families will give more relational responses than will children from high SES families.

Hypothesis 12

Children from high SES families will give more analytic responses than will children from low SES families.

Hypothesis 13

Children from high SES families will give more categorical responses than will children from low SES families.

If, as suggested by Hess & Shipman (1965) and Shaffer & Emerson (1964), the quantity of cognitive style response is affected by the nature of parent-child interactions, then it would seem not unreasonable to suggest, as a further boundary condition, that family size, which must have some affect on the quantity of parent-child interactions (if not on the quality), may affect cognitive style preferences. This may be particularly relevant for Maori-Pakeha comparisons in that Maori families are on average twice the size of Pakeha ones - see Harker (1971(b)), and Table 4.8. Also note must be taken of the warning in Ritchie & Ritchie (1970: 129) that other environmental variables (including family size) may be implicated in the child rearing practices they describe for Maori families. The following three hypotheses are included as a check on possible effects of family size on preferred cognitive mode.

Hypothesis 14

Children from large families will give more relational responses than will children from small families.

Hypothesis 15

Children from small families will give more analytic responses than will children from large families.

Hypothesis 16

Children from small families will give more categorical responses than will children from large families.

A further boundary condition, related to patterns of socialization is the fact that sex differences in cognitive style are reported consistently in the literature (Kagan et al, 1963; Sigel et al, 1967). In a longitudinal

sense, it was found that the number of categorical and analytic responses increases with age at the expense of relational responses. Both sexes show equal decreases in relational responses, while the number of analytic responses increases more rapidly for boys than for girls, and the number of categorical responses increases more rapidly for girls than for boys (Sigel et al, 1967: 3). In a cross-sectional study using Form I pupils at one New Zealand Intermediate school, Archer (1970: 137-138) found the boys gave significantly more analytic responses than girls, while girls gave significantly more relational responses than boys. For categorical responses, no significant difference was found, although the trend was in favour of boys (Archer, 1970: Table VI, p. 114).

With these findings as boundary conditions, and the basic premise that sex role expectations are largely determined by cultural factors which vary socialization experiences depending on the sex of the child, a theoretical generalization can be stated such that sex differences could be important determiners of preferred mode of cognitive categorisation. Indeed, the Kagan et al (1963) data shown in Table 2.1 indicates considerable discrepancies between the results for boys and those for girls. The hypotheses that suggest themselves from this are:

Hypothesis 17

Girls will give more relational responses than will boys.

Hypothesis 18

Boys will give more analytic responses than will girls.

Hypothesis 19

There will be no difference between boys and girls in categorical responses.

Hypotheses 5 to 19 as set out above provide basic descriptive material from which some theoretical generalizations can be evaluated. However, since the main objective is to explore ethnic differences in cognitive style preference, the possibility that findings associated with other environmental hypotheses (8 - 19), may well affect the interpretation of findings associated with ethnic group membership (hypotheses 5 - 7) must be considered.

Hence a check for interaction effects is necessary. First:

Hypothesis 20

> The magnitude and direction of the effects of the environmental variables on response frequency of the different cognitive modes will be the same for both Maori and Pakeha.

and second:

Hypothesis 21

> The findings associated with hypotheses 5, 6 and 7 will be modified in the hypothesized directions when control is entered for the environmental variables which are themselves significantly related to cognitive style response.

The hypotheses above are all dealing with frequency distributions. However, to be of use as an explanatory concept with regard to achievement, some sort of systematic relationship between achievement and responses on the Cognitive Style Test must be established. The work of Kagan, Moss & Sigel (1963: supra) and of Gray & Knief (1975: supra) will be utilised to set the expected magnitude and direction of correlations between the cognitive style modes and measures of intelligence and school achievement for the sample used in this study. Gray and Knief (1975) found negative correlations between relational responses and both intelligence and school achievement, positive correlations between analytic responses and both intelligence and school achievement, and no correlations between categorical responses and both intelligence and school achievement. Thus:

Hypothesis 22

> School achievement measures and Raven's Progressive Matrices scores will be:
>
> i. negatively correlated with the number of relational responses;
>
> ii. positively correlated with the number of analytic responses; and
>
> iii. not correlated with the number of categorical responses.

Hypothesis 23

The pattern of correlations revealed by hypothesis 22 will be the same for the Maori sub-sample as for the Pakeha sub-sample.

Hypothesis 24.

If differences are found in the pattern of correlations for the two ethnic groups under hypothesis 23, then a reconvergence will occur when the effects of other environmental variables (rural-urban location, age, sex, SES and family size) are partialled out.

The hypotheses presented in this chapter will be evaluated against the collected data in Chapter 5. Attention is now turned to the sampling and data collection procedures, together with the techniques used in the analysis.

Chapter 3

Sample, Data Collection and Data Analysis

This chapter will describe the nature of the sample used in the study reported here, the data that were collected from the sample and the analyses to which the data were subjected.

The data for this study were gathered during the winter term of 1974. A total of 679 children were tested from Standard 3 classes drawn from 17 schools in the Wanganui and Wellington Education Board areas. In order to obtain data from a sufficient number of Maori pupils, and to cause a minimum of inconvenience to schools, whole classes were tested from schools having a minimum of 20% Maori enrolments. This means that a significant sector of the school population were not included in the sample - i.e. those children attending schools where Maori children form less than 20% of the enrolment. However, since the main purpose of this study was to compare Maori and Pakeha children from similar environmental circumstances, no great loss is sustained, except that the results will not be generalizable to the total New Zealand population. An advantage is that by adopting this procedure, some matching (at a macro level) of the environments of Maori and Pakeha children is entailed.

The schools themselves range from a large school serving part of a metropolitan state housing suburb, through schools serving suburban and industrial areas in two regional centres, schools in rural towns, to small two to five teacher schools serving scattered rural areas. Some more detailed figures can be seen in Table 3.1.

The 20% Maori enrolment criterion, when applied to the metropolitan and regional centres resulted in some socio-economic bias in the sample used in this study, i.e. the schools in those centres with a 20% Maori enrolment were in areas of state rental housing largely occupied by those whose employment places them in the bottom categories of the socio-economic scale (q.v.). Hence the sample cannot be regarded as representative of the New Zealand school population (see Table 3.2), but it may be pointed out again that the sampling procedure provides crude matching of school and community environments, which is likely to lead to underestimates of Maori-Pakeha differences on various achievement criteria.

Table 3.1

Roll Numbers and Pupils Tested for Schools used in Sample.

School X AREA	1973 Roll	Number of Pupils Tested, 1974			
		Pakeha	Maori	Other	Total
Metropolitan	400	20	17	23	60
Regional Centre 1	593	86	26	3	115
Regional Centre 2, sch.1	422	46	10	6	62
sch.2	211	16	18	2	36
sch.3	196	17	15	1	33
Small Town 1	587	31	21	2	54
Small Town 2	390	21	21	-	42
Small Town 3	361	27	16	-	43
Small Town 4	305	28	13	-	41
Small Town 5	296	20	10	1	31
Small Town 6	288	21	21	3	45
Small Town 7	247	20	17	-	37
Military Camp School	196	19	7	-	26
Rural Area, School 1	196	9	11	1	21
School 2	106	10	6	-	16
School 3	98	6	4	1	11
School 4	57	2	4	-	6
TOTALS 17		399	237	32	679

Table 3.2

Comparison of sample distributions with 1966 census figures in each of the Elley-Irving (1972) socio-economic categories (Percentages)

SES Category	Maori sub-sample (N=212)	Pakeha sub-sample (N=370)	Total sample (N=582)	1966 census distribution*
1	0.9	3.8	2.7	5.8
2	4.2	18.9	13.6	19.3
3	6.1	13.2	10.6	13.3
4	9.0	27.8	21.0	28.2
5	41.0	19.5	27.3	21.3
6	38.7	16.8	24.7	12.1
Total	99.9	100.0	99.9	100.0

* These data from Elley and Irving (1972: 163)

Information was obtained from three sources:

1. School Records:

   sex;

   age;

   ethnicity;

   father's occupation;

   teacher ratings from the previous year, by subject area; and

   teacher ratings from the previous year on personality dimensions.

2. Headmasters and Teachers:

   Progress Achievement Test scores; and

   a check on information missing from the school record card or out of date.

3. Pupils:

   number of siblings;

   Ravens Progressive Matrices raw scores; and

   scores on the three dimensions of the Kagan, Moss & Sigel Cognitive Style Test.

The gathering of the data was in two phases. In phase 1, senior and post-graduate student assistants were utilized to administer the Cognitive Style Test and the Verbal Response Test on an individual basis to all the children in the sample. Phase 2 involved the gathering of data from school records, checking this with school staff, and administering the Ravens Progressive Matrices Test. The complete data set was brought together and coded for computer analysis, as follows:

Name: It was necessary to keep a record of names in order to collate data obtained from different sources at different times. Subjects were assigned a three digit code number for permanent recording on IBM cards.

School: Standard 3 children at 17 schools were included in the sample. Record of the school attended was kept for each subject to facilitate later grouping into a rural-urban variable - see Appendix 2, Tables A2.1 and A2.29.

Sex: An important variable for control purposes due to sex differences found on the Cognitive Style Test (Kagan et al, 1963; Archer, 1970), and in school achievement studies in New Zealand (see for example Lovegrove, 1966: 26-28, 30) - see Appendix 2, Tables A2.2 and A2.30.

Age: Date of birth was recorded from school record cards and transformed into the number of completed months at the midpoint of the testing programme (June 1st, 1974) - see Appendix 2, Tables A2.3 and A2.31.

Ethnicity: A complex definitional problem exists with such a variable (Pools, 1963). However, since the major hypotheses of this study are derived from theories which suggest socialisation patterns as determinants of some cognitive phenomena, then any strict genetic definition of Maori as distinct from European was unnecessary. In addition, ethnicity is a controversial and sensitive area and hence could not be raised with the children themselves. Consequently, as a first approximation, this datum was taken from school records where an entry was made by the headmaster who first enrolled the child. Many of the record cards were incomplete in this respect, and in all cases (whether complete or incomplete) final recording was carried out in consultation with school staff, the major criteria being the life style of the family concerned and the extent to which the child was regarded as Maori by others. In cases where these criteria were unknown, but some Maori ancestry was known, the subject was coded as Maori. All European children (whether born in New Zealand or not) were coded as Pakeha.

Other codings were for children of Chinese, Indian, and Pacific Island descent, however numbers were small in these categories (see Table 3.1) and they have not been included in the analyses to follow. The effect of the multiple criteria for coding a subject as Maori would, if anything, underestimate Maori-Pakeha differences as some children from highly acculturated (in terms of life style) homes are included in the Maori sample - see Appendix 2, Table A2.4.

Father's Occupation: This variable was derived from school record cards and in all cases checked with school staff to ensure accuracy and contemporaneity. The occupations were then classified according to the Elley-Irving scale (1972) to provide a six point socio-economic status index (SES) with 1 indicating the highest SES group and 6 the lowest - see Appendix 2, Tables A2.5 and A2.32.

Number of Siblings: At the time the Ravens Test was administered the subjects were asked to note on their answer sheets the numbers of brothers and sisters they had. These data were used to denote family size - see Appendix 2, Tables A2.6 and A2.33.

Ravens Progressive Matrices (1938): The Progressive Matrices (1938), prepared by J.C. Raven were used as a performance criterion in this study. Raven described the Matrices as:

> "... a test of a person's capacity at the time of the test to apprehend meaningless figures presented for his observation, see the relations between them, conceive the nature of the figure completing each system of relations presented, and by so doing, develop a systematic method of reasoning.
> (Raven, 1960: 1)

The abstract figure completion aspect of the test would seem to tap some of those areas of cognition which are also tapped by the analytic cognitive style as described by Kagan, Moss & Sigel (1963) (see Chapter 2). Hence the Progressive Matrices (1938) Test was used as a performance test for the children in the sample in an open ended way, ignoring the standardized time limits and using only the raw scores. I.Q. scores were not generated as there are no norms for New Zealand nine year olds, and the age range of children in this study is not great. This test then, was used as a measure of analytic reasoning ability of a non-verbal nature (irrespectively of how quickly the subject reasoned) to be used as an achievement criterion along with Progressive Achievement Test scores and

Teacher Ratings - see Appendix 2, Tables A2.7 and A2.34.

Cognitive Style Test: This is a 25 item test developed from the children's version of the Conceptual Style Test reported in Kagan, Moss & Sigel (1963) - see Appendix 1, where the test is reproduced, together with the instructions used. Archer (1970) used this test on New Zealand school children, and found that some items produced only one particular response mode from all children in his sample and were thus deleted from his analysis. The 25 items used in the study reported here are the ones Archer left in his analysis in order to facilitate direct comparison with the results he found for the older age group in his study - see Appendix 2, Tables A2.8, A2.9, A2.10, A2.35, A2.36 and A2.37.

Progressive Achievement Tests (PAT): Three of these tests, developed by the New Zealand Council for Educational Research for use in New Zealand schools, were currently in use at the time of data collection. They are given to all children early in each year by school staff. The results, for the children in this study, of the Reading Comprehension test, Reading Vocabulary test and the Listening Comprehension Test were collected from school records. During subsequent analysis, the raw scores for the three tests were added together to produce a composite PAT index, for use as a criterion measure of school achievement - see Appendix 2, Tables A2.11, A2.12, A2.13, A2.38, A2.39 and A2.40.

Teacher Ratings: At the end of each year, teachers are required to rate children on a five point scale in a number of subject areas, for inclusion on school record cards. At the Standard 3 level, only the first six subject areas are required to be considered, although some teachers rate the other subject areas as well - see Appendix 2, Tables A2.14 to A2.24 for a list of the subject areas. The five point scale is as follows:

1. excellent;
2. above average;
3. average;
4. below average; and
5. unsatisfactory

As with the PAT scores, a composite Teacher Rating index was used in analysis, devised by adding together the ratings given by teachers in the previous year for the six major subject areas - oral language, written language, reading, spelling, writing, and arithmetic. This index was also

used as a criterion measure of school achievement, although it should be noted that the index has a negative direction, i.e. the lower the index score, the higher the achievement level - see Appendix 2, Tables A2.14 to A2.24 and A2.41 to A2.51.

Behavioural Ratings: Data were also obtained from the school record cards on the five point ratings given by teachers on four personality/ behavioural characteristics for each pupil. These four characteristics are - stability, cooperation, independence and perseverence, with the five points in the rating scale having the same meanings as for the subject area ratings - Appendix 2, Tables A2.25 to A2.28 and A2.52 to A2.55.

These data items were coded and conveyed on to IBM computer cards. The analysis of the data was undertaken using SPSS routines (Statistical Package for the Social Sciences) on the Burroughts B6700 installation at Massey University. SPSS is a statistical package in which a data deck is described and labelled, and in which specific statistical routines are available to be called in for use with the data deck. A full description of this facility is to be found in Massey University Computer Unit (no date) and in Nie et al (1975). Specific statistical procedures used in this study were as follows:

CODEBOOK; for basic frequency distributions and descriptive statistics where appropriate. This routine was used for the sample as a whole and separately for Maori and Pakeha sub-samples

CROSSTABS; produces contingency tables for nominal or ordinal data, together with appropriate statistics such as chi-square.

BREAKDOWN; this routine was used to break down scores on interval data variables by selected nominal or ordinal categories such as ethnicity or SES. It produces means and standard deviations of the continuous variable for each of the nominal or ordinal categories.

T-TEST; to test the significance of differences found with BREAKDOWN.

NONPAR CORR; non-parametric correlation coefficient for the relationships between cognitive style and school achievement measures - Chapter 5.

REGRESSION; stepwise option to determine the relative contribution of various environmental variables to school achievement variance - Chapter 4.

This section has described the sample, the data and the analytic techniques used. The next two chapters are devoted to reporting the results of the analyses undertaken.

Chapter 4

Achievement and Ethnicity - Findings

This chapter has two purposes. The first is to examine the findings relevant to Hypotheses 1 to 4, which are concerned with the relationship between ethnicity, environmental variables and achievement. The second is to evaluate the two different models purporting to explain Maori-Pakeha achievement differences that were proposed in Chapter 1 - namely the Environmental deprivation model, and the Cultural difference model.

Hypotheses 1 to 4

Hypothesis 1

> Variation in the environmental variables and ethnicity will have no significant effects on measures of achievement (two-tailed criterion).

Hypothesis 1 was formulated as an initial check on the direction and extent of the relationship between the environmental variables used in this study and ethnicity, and measures of achievement. To test this hypothesis, the data on the independent variables have been reduced to dichotomous categories.[14] Six variables were involved, they are: sex, ethnicity, rural-urban residence, SES, family size and age.

The data on sex was a true dichotomy when collected. For ethnicity the data were dichotomised into Maori or Pakeha on the basis of the criteria set out in Chapter 3. In the case of rural-urban residence, the metropolitan school and schools in the two regional centres were classified as urban, with the remainder classed as rural. For socio-economic status, father occupations were classified into the six categories of the Elley-Irving scale (1972). To give groups of comparable size, categories 1 to 4 have been classified as high, and categories 5 and 6 classified as low. Family size based on number of siblings forms an interval scale from which those subjects with 3 or less siblings are regarded as coming from small families, while those with 4 or more siblings are classified as coming from large families - the cut off point being again chosen to give two even sized groups, for analysis.

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14. See Appendix 2 for basic descriptive statistics on the sample used in this study.

Table 4.1

Scores on the Composite PAT Index, the Composite Teacher Rating Index and Raven's Raw Scores, by Selected Determiners, (2-tailed Criterion).

Variable	Composite P.A.T. N	Mean	S.D.	Composite Teacher Rating N	Mean	S.D.	Raven's Raw Scores N	Mean	S.D.
Pakeha	344	59.93	22.08	387	17.96	3.91	370	30.91	9.05
Maori	151	47.66	19.67	225	19.35	4.03	211	25.52	9.89
t		5.88**			-4.21**			6.67**	
Urban	245	53.85	22.02	261	18.32	4.09	246	29.27	9.13
Rural	250	58.48	21.97	351	18.58	3.94	335	28.72	10.13
t		-2.34**			-0.80			0.68	
High SES	238	62.15	22.62	267	17.65	3.87	261	31.15	9.24
Low SES	218	50.37	19.16	297	19.08	3.86	273	27.19	9.83
t		6.01(+)**			-4.37**			4.79**	
Small family	287	59.38	21.70	338	17.81	3.89	344	30.37	9.36
Large family	170	51.58	22.02	232	19.12	3.93	237	26.90	9.86
t		3.69**			-3.94**			4.30**	
Male	238	53.24	22.09	289	19.60	3.94	278	28.26	9.79
Female	256	58.93	21.82	322	17.46	3.80	302	29.54	9.60
t		-2.88**			6.83**			-1.59	
Youngest	256	59.85	22.68	307	17.52	3.98	299	29.85	9.48
Oldest	231	52.25	20.49	305	19.42	3.81	280	28.00	9.87
t		3.86**			-6.02**			2.30*	

(+) Separate variance estimate, otherwise pooled variance estimate.
* p less than 0.05
** p less than 0.01

The continuous variable of age has been dichotomised at the median age. The achievement measures have been left as continuous measures, and the means and standard deviations of the achievement measures on each dichotomised category within each of the environmental variables in turn, and for ethnicity, have been calculated and subjected to a t-test. The results of this procedure are shown in Table 4.1.

The data in Table 4.1 show that for all the independent measures used in this study, a significant relationship is demonstrated with some or all of the achievement measures. Ethnicity, SES, family size and age difference can be seen to have quite strong differentiating effects on all three achievement measures. They favour Pakehas over Maoris, pupils from high SES homes over pupils from low SES homes, pupils from small families over pupils from large families, and the younger pupils over the older pupils. Sex difference favouring girls shows up as a strong differentiator for the two school achievement measures, but not for the Ravens test. Rather surprisingly, the effect of rural-urban location as a differentiator is confined to the PAT index, and favours rural pupils. In the other two achievement measures, the rural-urban dichotomy produces no significant difference. However, as noted in Chapter 3, the urban sample in this study was drawn from schools serving areas of low SES, hence it is possible that an interaction effect exists between rural-urban location and SES. If this is the case, a more meaningful picture of location effects will emerge if rural is compared to urban <u>within</u> each of the SES dichotomies. The first part of Table 4.2 (ALL) makes such a comparison and the figures are illustrated graphically in Figure 4.1. Figure 4.1 and the data in Table 4.2 show that for the PAT index an ordinal interaction occurs, in that significant difference between rural and urban pupils on this measure is confined to high SES children. For both the Teacher Rating index and the Ravens scores, disordinal interaction is occurring - i.e. for hish SES children those in rural schools tend to score better (as on the PAT index), while for low SES children those in urban schools tend to score slightly better, although it should be noted that only for low SES children on the Ravens test is the rural-urban difference statistically significant.[15]

15. Table 4.2 utilizes a one-tailed criterion, the directionality being set by the rural-urban differences reported in Table 4.1.

Table 4.2

Scores on Criterion Variables, by Location and SES, (1-tailed Criterion).

	Composite P.A.T.						Composite Teacher Rating						Raven's Raw Scores					
	High SES			Low SES			High SES			Low SES			High SES			Low SES		
	N	M	S.D.	N	M	S.D.	N	M	S.D.	N	M	S.D.	N	M	S.D.	N	M	S.D.
Total Sample																		
Urban	103	59.06	23.78	112	48.78	17.37	107	17.98	4.25	126	18.78	3.75	105	30.34	9.23	112	28.60	9.02
Rural	135	64.50	21.48	106	52.06	20.84	160	17.43	3.60	171	19.30	3.93	156	31.69	9.23	161	26.22	10.27
t		1.85*			1.26			<0			1.15			<0			1.97*	
Pakeha sub-Sample																		
Urban	91	59.65	23.60	61	52.88	17.94	91	17.94	4.35	65	18.37	3.65	89	31.63	8.46	56	29.95	8.32
Rural	118	66.25	20.68	48	56.50	21.86	135	17.15	3.44	69	19.13	3.79	132	32.67	8.55	67	28.03	10.48
t		2.15*			0.95			<0(+)			1.18			<0			1.11	
Maori sub-Sample																		
Urban	12	54.58	25.77	51	43.86	15.43	16	18.19	3.73	61	19.21	3.83	16	23.19	10.28	56	27.23	9.55
Rural	17	52.41	23.64	58	48.38	19.38	25	18.96	4.12	102	19.41	4.04	24	26.29	11.09	94	24.92	9.96
t		<0			1.33			0.61			0.31			<0			1.39	

(+) Separate variance estimate, otherwise pooled variance estimate used.

* p less than 0.05

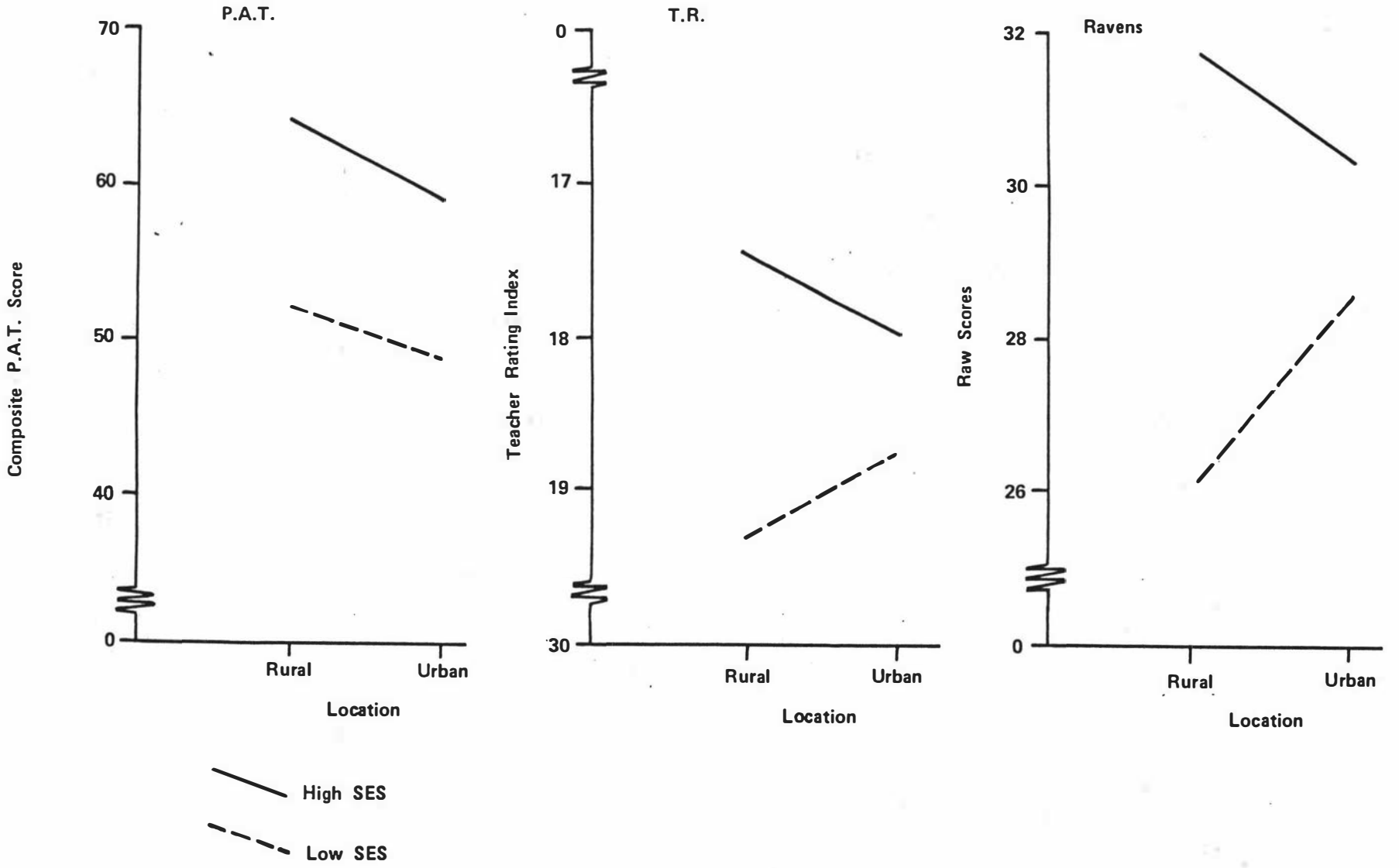


Figure 4.1: Graph Illustrating Interaction Effects Between Rural-Urban Location and SES as They Affect Criterion Performance

The data presented in Tables 4.1 and 4.2 lend a strong measure of support to a confident rejection of Hypothesis 1, and allow the conclusion that the environmental measures used in this study together with ethnicity act as significant discriminators on achievement measures. The data also suggest that the effects of envrionmental variables on achievement measures must take into account interaction effects amongst the environmental variables themselves.

The question of interactions, of course, is crucial in the environmental deprivation versus cultural difference explanations of the underachievement of Maori pupils in New Zealand schools. The former implies that apparent Maori-Pakeha differences in achievement are due to the interaction of ethnicity with SES, family size, rural-urban location and so on. The cultural difference model, on the other hand, implies no interaction effect. However, before looking at this question of interactions the effect of the environmental variables within each of the ethnic groups must be evaluated in order to check for conformity to the first of Jensen's (1973: 233) three criteria which must be met before such environmental variables can be evoked as explanations of inter-group performance differences (see Chapter 1).

Hypothesis 2

> The direction and magnitude of any differences found under Hypothesis 1, will be the same for both ethnic groups (one-tailed criterion).

To test this hypothesis the data as presented in Table 4.1 have been reanalysed for Maori and Pakeha separately, and the findings are presented in Tables 4.3, 4.4 and 4.5 for the PAT index, Teacher Rating index and Ravens raw scores respectively.[16]

With the PAT index as criterion (Table 4.3) the data show that the rural-urban location, SES and age variables, which were significant discriminators for the total sample, remain significant in the within group analysis only for the Pakeha group. For these three variables then, an ordinal interaction exists with ethnicity - i.e. the effect of rural-urban location, SES and age on PAT index performance is dependent on ethnic group membership - for Maori pupils, these three environmental variables do not

16. See also Appendix 2, Tables A2.29 to A2.55 for cross-tabulations of all variables used, against Ethnicity.

Table 4.3

Scores on the Composite PAT Index, by Ethnic Group and Selected Determiners, (1-tailed Criterion).

Variable	Pakeha N	Pakeha Mean	Pakeha S.D.	Maori N	Maori Mean	Maori S.D.	t
Urban	176	56.73	22.31	69	46.49	19.55	3.34**
Rural	168	63.29	21.40	82	48.95	19.83	5.20**
t		2.78**			0.67		
High SES	209	63.37	22.19	29	53.31	24.11	2.26*
Low SES	109	54.48	19.75	109	46.27	17.71	3.23**
t		3.52**			1.47(+)		
Small family	235	60.94	21.71	52	52.31	20.37	2.62**
Large family	86	57.14	23.11	84	45.89	19.37	3.44**
t		1.37			1.84*		
Male	163	57.32	22.70	75	44.37	17.85	4.76(+)**
Female	181	62.29	21.31	75	50.84	21.05	3.93**
t		2.09*			2.03*		
Youngest	193	62.84	22.55	63	50.71	20.68	3.78**
Oldest	148	55.83	20.47	83	45.88	19.03	3.63**
t		2.96**			1.46		

(+) Separate variance estimate, othewise pooled variance estimate.
* p less than 0.05
** p less than 0.01

Table 4.4

Scores on the Composite Teacher Rating Index, by Ethnic Group and Selected Determiners, (1-tailed Criterion).

Variable	Pakeha N	Pakeha Mean	Pakeha S.D.	Maori N	Maori Mean	Maori S.D.	t
Urban	180	18.08	4.17	81	18.84	3.88	1.34
Rural	207	17.84	3.66	144	19.64	4.10	4.31**
t		<0			1.43		
High SES	226	17.47	3.84	41	18.66	3.94	1.82*
Low SES	134	18.76	3.73	163	19.34	3.95	1.29
t		3.12**			0.98		
Small family	268	17.62	3.82	70	18.53	4.11	1.75*
Large family	97	18.60	4.16	135	19.50	3.72	1.73*
t		2.11*			1.70*		
Male	184	19.07	3.92	105	20.53	3.82	3.07**
Female	203	16.95	3.62	119	18.34	3.94	3.22**
t		5.54**			4.21**		
Youngest	214	17.28	3.96	93	18.09	4.00	1.64
Oldest	173	18.79	3.69	132	20.24	3.82	3.35**
t		3.85**			4.09**		

* p less than 0.05

** p less than 0.01

Table 4.5

Raven's Raw Scores by Ethnic Group and Selected Determiners, (1-tailed Criterion).

Variable	Pakeha N	Pakeha Mean	Pakeha S.D.	Maori N	Maori Mean	Maori S.D.	t
Urban	168	30.62	8.59	78	26.36	9.62	3.48**
Rural	202	31.15	9.44	133	25.03	10.05	5.66**
t		<0			0.94		
High SES	221	32.25	8.51	40	25.05	10.75	4.01(+)**
Low SES	123	28.90	9.57	150	25.79	9.84	2.63**
t		3.34**			<0		
Small family	272	31.26	8.74	72	26.99	10.81	3.09(+)**
Large family	98	29.93	9.84	139	24.76	9.33	4.11**
t		1.25			1.55		
Male	176	30.30	9.24	102	24.74	9.75	4.74**
Female	194	31.46	8.87	108	26.09	9.93	4.83**
t		1.23			0.99		
Youngest	209	31.34	8.81	90	26.40	10.10	4.25**
Oldest	161	30.35	9.36	119	24.81	9.69	4.82**
t		1.04			1.15		

(+) Separate variance estimate, otherwise pooled variance estimate.

* p less than 0.05
** p less than 0.01

act as significant discriminators of PAT test performance. A similar interaction effect is shown with family size, this variable demonstrating a significant discriminatory effect only for the Maori pupils in the sample. Within group sex differences are in the same direction and of the same magnitude for both groups.

With the Teacher Rating index as criterion (Table 4.4), the data show that family size, sex and age are equally effective as discriminators for both Maori and Pakeha pupils, SES is a significant discriminator only for the Pakeha pupils, as was the case with the PAT index as criterion. The location variable does not act as a discriminator for teacher ratings, and gives some slight indication of a disordinal interaction effect with ethnicity.

With Ravens raw scores as criterion (Table 4.5) the data show that of the environmental variables, only SES has a significant effect, and this only within the Pakeha sub-sample. Family size, sex and age are similar in their non-significance as discriminators for either group, while SES and location give indications of disordinal interactions with ethnicity.

The possibility of interaction effects between location and SES can be checked through further reference to Table 4.2 which shows that such an interaction is significant only for Pakehas on the PAT index, where high SES children show a significant rural-urban difference while low SES children do not. It should be noted from Table 4.2 that control for rural-urban location has in some instances increased the difference in achievement scores between high and low SES Maori pupils over and above the SES differences reported for Maori pupils in Tables 4.3, 4.4 and 4.5 where no control for location was used. Table 4.6 shows the t-test statistics obtained from a comparison of high SES pupils with low SES pupils, for Maori and Pakeha separately and controlling for rural-urban location. The data used to generate the t statistic are from the relevant rows of Table 4.2.

From Table 4.6 it can be seen that in no instance does control for rural-urban location produce a significant difference in achievement scores between high SES and low SES Maori children, hence increasing the confidence with which SES can be discounted as a significant discriminator of achievement scores for Maori pupils. It can also be pointed out that while SES is a significant discriminator for Pakeha pupils on the PAT index in both rural and urban schools, it is significant only in rural schools for Pakehas on the Teacher Rating index and on the Ravens test.

Table 4.6

T-Tests on Criterion Performance Between High and Low SES Groups, Controlling for Ethnicity and Rural-Urban Location

(one-tailed criterion)

(The t-statistic generated from data reported in Table 4.2)

		PAT t	T.R. t	Ravens t
Urban	Pakeha	2.01(+)*	0.65	1.17
	Maori	1.38(+)	0.95	1.47
Rural	Pakeha	2.69**	3.76**	3.34**
	Maori	0.72	0.50	0.59

(+) separate variance estimated used, otherwise poopled variance estimate.

* $p < 0.05$

** $p < 0.01$

Comparison of the results for the Teacher Rating index (Table 4.4) with the results for the other two criteria (PAT index (Table 4.3), and Ravens score (Table 4.5)) would appear to show that teachers give more favourable ratings to younger children and to girls, biases which are not supported by the PAT index or Ravens scores. This point will be taken up again in a later section.

Table 4.7

Frequency of significant differences made by environmental variables, on three criterion variables, for two ethnic groups

(summarised from Tables 4.3, 4.4 and 4.5)

variable	Pakeha	Maori
Rural-urban location	1	0
SES	3	0
Family size	1	2
Sex	2	2
Age	2	1

The data presented above are to some extent equivocal with regard to Hypothesis 2. Table 4.7 summarizes significant effects of the environmental variables on the three criterion measures for each ethnic group.

From the table it would appear that great caution needs to be exercised in any attempt to 'write-off' Maori-Pakeha achivement differences as being due solely to unfavourable environmental conditions. This is particularly noticeable for SES which is perhaps the most popular 'explanation' of Maori-Pakeha achievement differences (see Harker, 1973: 57). Table 4.7 shows that for all three criteria SES is a significant discriminator only for the Pakeha group. For the Maori group no significant differences are found between SES and any of the criterion variables, and in the case of the Raven's scores, some slight indiction of a disordinal interaction is to be found - see Table 4.5. Hence it appears that the assertion which explains Maori-Pakeha achievement differences in terms of differential distribution on the SES hierarchy is untenable, as SES makes little or no difference within the Maori group, i.e. high SES Maori children do not score significantly better than low SES Maori children on any of the criterion measures used in this study. Thus the fact that there is a disproportionate number of Maoris in low SES categories when compared to Pakehas is of little significance as an explanation of lower Maori achievement. Certainly, SES does not meet the requirements specified by Jensen (supra) as being necessary before a variable can be invoked as an explanation of between group achievement differences.

Similarly, another popular explanation of Maori underachievement (Harker, 1973: 57), the preponderance of Maoris in rural localities, is not supported by the data presented here. Only on the PAT index and only for Pakehas (Table 4.3) does rural-urban location act as a significant performance discriminator. On none of the criteria does it act as a discriminator of the performance of Maori children. Of the other variables, only sex differences acts as a discriminator of performance in the same direction for both ethnic groups on the two specifically school achievement oriented criteria. On the Ravens criterion sex does not act as a discriminator for either ethnic group. The rest of the environmental variables (family size and age) show inconsistent effects across the three criteria. For the PAT index, family size is a discriminator only for the Maori group, while age is a discriminator only for Pakehas. On the Teacher Rating index both the variables are significant discriminators for both ethnic groups, while

for the Ravens criterion the two variables do not discriminate within either ethnic group.

From the data presented here, Hypothesis 2 cannot be accepted as a general statement of the position. Only sex differences operate to affect criterion performance in the same way for both Maori and Pakeha pupils. Furthermore, sex is the only variable which gives any indication of satisfying the criterion implicit in Jensen's first question (see Chapter 1). Family size and age differences give a similar indication for the Teacher Rating and Ravens criteria, but give rise to some doubts on the PAT index due to indications of an interaction affect with ethnicity. Rural-urban location and SES are the least satisfactory with regard to Jensen's criterion, as on none of the achievement criteria can they be shown to affect performance significantly within the Maori group, and they also show interaction effects (both ordinal and disordinal) with ethnicity.

While the rejection of Hypothesis 2 throws some doubt on the utility of using most of the environmental variables included here as explanations of Maori-Pakeha performance differences, the possibility remains that the environmental variables will cumulatively account for the differences between Maori and Pakeha children. This possibility can best be checked through multiple regression analysis. Before proceeding with such an analysis it is necessary to provide an answer to the second of Jensen's questions, namely that differences do exist between Maori and Pakeha children on the environmental variables as well asthe criterion variables. Hypothesis 3 was formulated to act as such a check.

Hypothesis 3

There will be no difference between the Maori and Pakeha sub-samples on environmental variables.

For the measures of achievement, the top row of Table 4.1 (see also Appendix 2, Tables A2.34, A2.38 to A2.51) shows highly significant differences between Maori and Pakeha children on each of the variables - t = 5.88 for the PAT index, -4.21 for the Teacher Rating index and 6.67 for the Ravens scores. It should also be noted from the t-tests in the right hand columns of Tables 4.3, 4.4 and 4.5 that control for each environmental variables in turn does not reduce Maori-Pakeha differences to a non-significant level.

Table 4.8
Ethnic Differences on Environmental Varibales[1]

Variable	Value	Maori N	Maori %	Pakeha N	Pakeha %	Row total	chi[2]
Sex	Male	112	47.7	191	47.9	303	
	Female	123	52.3	207	52.0	330	0.00
	Total	235		398		633	
Age	Youngest	94	40.7	220	55.7	314	
	Oldest	137	59.3	175	44.2	312	16.25**
	Total	231		395		626	
Family Size	Small	72	34.1	272	73.5	344	
	Large	139	65.9	97	26.3	236	121.73**
	Total	211		369		580	
SES	High	43	20.3	235	63.7	278	
	Low	169	79.7	134	36.2	303	103.24**
	Total	212		369		581	
Location	Urban	86	36.3	184	46.2	270	
	Rural	151	63.7	214	53.8	365	5.61*
	Total	237		398		635	

* $p < 0.05$

** $p < 0.01$

1. These data from Appendix 2, Tables A2.29 to A2.33.

For the environmental variables, Table 4.8 shows that for age, family size, rural-urban location and SES, significant differences exist between Maori and Pakeha sub-groupings of the sample. Sex differences are equally distributed in the two groups, and any differences in achievement found between boys and girls are likely to be the same for Maori and Pakeha unless some aspects of appropriate sex role behaviour are different within Maori cultural patterns from those found amongst Europeans. Reference to Tables 4.3, 4.4 and 4.5 shows that if there are differences in appropriate sex role behaviour between Maori and Pakeha they are not relevant to the

achivement pheonomenon . This does not mean however, that the sex variable will be of no use as an explanation of achievement differences, as the impact of the different sex role behaviours may be quite different for a Maori child than for a Pakeha child. For the other four environmental variables, age, family size, rural-urban location and SES, Hypothesis 3 can be firmly rejected, as considerable ethnic differences are shown by Table 4.8.

Having established significant ethnic differences on the three achievement criteria and a majority of the environmental variables (Hypothesis 3), and notwithstanding the rather weak explanatory powers of some of the environmental variables within the Maori group (Hypothesis 2), it remains necessary to try to estimate the effect that controlling for all the environmental variables at once, will have on Maori-Pakeha achievement differences. At this point the statistical method used so far (comparison of means through the use of Student's T-Test), becomes inappropriate as the N of each cell becomes unbalanced and unacceptably small when control is entered for three or more of the environmental variables, simultaneously. The most appropriate method to cope with such circumstances is that of multiple regression, and Hypothesis 4 has been formulated with this method in mind.

Hypothesis 4

> When entered last in a multiple regression procedure, ethnicity will make no significant contribution to criterion variance.

Tables 4.3, 4.4.and 4.5 show that controlling for environmental variables one at a time does not reduce Maori-Pakeha achievement differences below a statistically significant level, but the tables do indicate that the variables have some influence on the absolute magnitude of the Maori-Pakeha difference. Inherent in the environmental deprivation model is the idea that controlling for all the environmental variables simultaneously should reduce Maori-Pakeha differences to zero, or at least to below a level of statistically significant difference. Hence, if Hypothesis 4 cannot be rejected, the environmental deprivation model gains support from this study. If, on the other hand, Hypothesis 4 can be rejected, then the cultural difference model would be strengthened as a possible alternative

explanation.

To test the hypothesis, the three criterion variables used throughout this chapter have been regressed separately against six independent variables - rural-urban location, SES, family size, age, sex and ethnicity. In order to preserve continuity with the previous analyses based on t-tests, the independent variables have all been entered into the multiple regression in dochotomised form (as in Table 4.1 for example). By adopting this procedure, some information is lost, particularly where interval scales (such as age and family size) are so reduced, and consequently the coefficient and multiple regression produced from such an analysis will be on the conservative side. However, the information loss will be the same as in the t-test procedures used earlier in the chapter, thus preserving some equivalence at the data management level. Also, the magnitude of the coefficient of multiple regression is of no consequence to the testing of the hypothesis (over and above its reaching a statistically significant level).

The data produced from the multiple regression analyses are reported in Tables 4.9 (correlation matrix), 4.10 (PAT criterion), 4.11 (Teacher Rating criterion), and 4.12 (Ravens criterion). These data show that for all three criteria, a significant but rather small coefficient of multiple regression is obtained (0.39 on the PAT criterion, 0.41 on the Teacher Rating criterion, and 0.29 on the Ravens criterion). The data of interest in evaluating Hypothesis 4 are to be found in the 3rd and 4th columns of Tables 4.10, 4.11 and 4.12. Column 3 of each table shows the squared zero order correlation coefficient which gives the proportion of the variance in the criterion variable which each independent variable makes without considering any commonalities or interactions with any of the other independent variables. Column 4 shows the amount of variance accounted for by the variable after commonalities with the other independent variables have been semi-partialed out of the regression. In other words, column 4 shows the unique contribution made by each of the variables independently of any indirect effect through covariance with others of the independent variables. To lend support to Hypothesis 4, the variable 'ethnicity' would need to show a zero or non-significant contribution to criterion variance in colulmn 4, despite a significant zero order contribution shown in column 3 of each of Tables 4.10, 4.11 and 4.12.

Table 4.9

Zero Order Correlation Coefficients (r) and Variance Estimates(r^2) for Variables Used in the Multiple Regression Analysis (r above diagonal, r^2 below).

	PAT	TR	Raven	Ethn	Locn	SES	family size	Sex	Age
PAT		.69**	.53**	.24**	.14**	.26**	.18**	.14**	.18**
TR	.471		.47**	.12*	.00	.20**	.14**	.29**	.21**
Raven	.278	.222		.22**	.05	.22**	.13**	.08	.11*
Ethnicity	.060	.013	.047		.00	.40**	.33**	.00	.09
Location	.019	.000	.002	.000		.06	.09	.01	.03
SES	.068	.042	.048	.162	.004		.21**	.03	.12*
Family size	.032	.019	.018	.110	.008	.046		.01	.14**
Sex	.020	.085	.006	.000	.000	.001	.000		.02
Age	.032	.044	.012	.008	.001	.014	.020	.000	

* p less than 0.05

** p less than 0.01

Table 4.10

Multiple Regression Analysis - P.A.T.

Criterion - Composite P.A.T. Index

Multiple correlation coefficient (R) = 0.39**

R^2 = 0.15

F Ratio = 12.18**

Variable	Beta	F to delete	zero order[1] variance accounted for	Variance[2] accounted for when entered last
Ethnicity	-0.15	8.141	.060**	.017**
Location	0.13	7.941	.019**	.017**
SES	-0.16	9.827	.068**	.021**
Family size	-0.06	1.566	.032**	.003
Sex	0.14	9.576	.020**	.020**
Age	-0.14	9.748	.032**	.021**

** p less than 0.01

(1) From Table 4.9

(2) Variance accounted for when variable X is entered last can be calculated from the sum of squares of the variable when entered last (SS_{Xi}), divided by the total sum of squares (SS_y). SS_{Xi} can be calculated by multiplying F to delete (F_{del}) from the last step in a stepwise analysis, by the mean square of the residual (σ^2). Hence:

$$\text{variance accounted for when entered last} = \frac{F_{del} \cdot \sigma^2}{SS_y}$$

This is equivalent to R^2 with X entered last, minus R^2 without X, from the previous step (Kerlinger and Pedhazur 1973: 290-295).

Table 4.11

Multiple Regression Analysis - T.R.

Criterion - Composite Teacher Rating Index

$R = 0.41^{**}$

$R^2 = 0.17$

$F = 16.23^{**}$

Variable[+]	Beta	F to delete	Zero order[(1)] variance accounted for	Variance[(2)] accounted for when entered last
Ethnicity	-0.01	0.066	.013*	.000
SES	0.15	9.463	.042**	.019**
Family size	0.07	2.212	.019**	.004
Sex	-0.29	40.909	.085**	.084**
Age	0.18	16.197	.044**	.033**

+ Location not included due to nil relationship with T.R. Index - see Table 4.9.

* p less than 0.05

** p less than 0.01

(1) From Table 4.9.

(2) See note (2) of Table 4.10.

Table 4.12

Multiple Regression Analysis - Raven.

Criterion - Raven's Progressive Matrices, Raw Scores.

$R = 0.29^{**}$

$R^2 = 0.08$

$F = 6.13^{**}$

Variable	Beta	F to delete	Zero order[1] variance accounted for	Variance[2] accounted for when entered last
Ethnicity	-0.14	6.586	.047**	.015*
Location	0.04	0.588	.002	.001
SES	-0.14	7.349	.048**	.017**
Family size	-0.04	0.696	.018**	.002
Sex	0.07	2.436	.006	.005
Age	-0.08	2.557	.012*	.006

* p less than 0.05

** p less than 0.01

(1) From Table 4.9.

(2) See note (2) of Table 4.10.

With the Teacher Rating index as criterion (Table 4.11), the hypothesis is supported strongly. Hence the small but significant zero order correlation between ethnicity and the Teacher Rating index (0.115, Table 4.9 - the mean difference between Maori and Pakeha on this index is shown in Table 4.1), is seen to be spurious when account is taken of intervening environmental variables in the multiple regression, which have the effect of reducing the amount of variance accounted for directly by ethnicity, to zero. With the objective tests as criteria (PAT index and Ravens scores - Tables 4.10 and 4.12) the hypothesis is rejected, as ethnicity still makes a significant contribution to variance when entered last - i.e. when the effects of the environmental variables are semi-partialed out. For these two achievement criteria then, ethnicity still makes a significant direct contribution to criterion variance over and above its indirect effects through covariance with the environmental variables. Hence rejecting or failing to reject the hypothesis will depend upon which of the criterion variables is regarded as the most appropriate measure of achievement - the results of once only tests, or the considered grading of pupils by teachers on a wider set of criteria which may include test performance. Certainly at higher levels of the educational system, performance is assessed largely through test situations (School Certificate, University Bursaries and so on), and because tests tend to be validated by reference to other tests, it could be further argued that there would be a greater agreement between test scores (PAT and Ravens) taken at age nine and, for example, School Certificate marks at age 15 or 16 than would be true for teachers' ratings of pupils at age nine.[17]

Earlier in this chapter, mention was made of the tendency for the teachers' ratings to favour females and younger pupils. This is borne out by the data in Table 4.11 where it is shown that both of these variables (age and sex) are little affected by commonalities with the other independent variables, hence retaining their contribution to criterion variance after semi-partialing for the other variables. As in the previous data, the teachers' ratings for females and the relatively young are not supported at all by the regression data using Ravens scores as criterion (Table 4.12) nor to the same degree by the regression of the PAT results (Table 4.10).

17. Such an argument would require empirical validation, which is not possible from the data in this study, and hence is purely speculative.

It may be that the teachers are influenced in their ability ratings of pupils by other characteristics such as personality and classroom behaviour. Relevant to this conjecture, data were also collected from the pupils' record cards on four dimensions of behaviour - stability, cooperation, independence and perseverence (see Chapter 3). If the Teacher Rating index is regressed against these four behavioural dimensions, together with the PAT index and the Ravens scores, some indication will be given of the criteria inherent in the Teacher Rating index. The data from such an analysis are shown in Table 4.13, from which it can be seen that 62% of the variance on the Teacher Rating index can be accounted for by the six independent variables, indicating a considerable degree of commonality in terms of their effect on the criterion index. However, the analysis isolates two variables which make contributuions over and above this commonality - namely PAT score and the behaviourable variable labelled 'independence'. This indicates that in their ratings of children teachers are giving considerable weight to abilities, which are also tapped by the PAT index, and in addition, they are also giving consideration to behavioural phenomena, particularly to that labelled 'independence'. Such behavioural characteristics are, of course, not directly tapped by the PAT or Ravens tests, and the data presented in Table 4.13 lend support to the contention that teachers are in fact influenced in their ability rating of children by some behavioural and personality characteristics which the children exhibit.

Before returning to further consideration of the environmental deprivation versus the cultural difference models as explanations of Maori-Pakeha achievement differences, the relationships between ethnicity, the environmental variables and the three criterion variables, will be explicated further through the use of path analysis. Path analysis is an extension of multiple regression which allows the testing of causal theoretical models (provided these models have been pre-specified) to find which model the data support best (see Kerlinger & Pedhazur, 1973: 305-331, for a full account). In addition to testing causal models, path analysis also serves to explicate the causal paths through which various variables affect the criterion. Figures 4.2, 4.3 and 4.4 present path analysis diagrams for each of the criterion variables in turn. The top diagram of each figure (a) shows a diagram of the environmental deprivation model with the zero order correlation coefficients shown. The environmental deprivation causal

Table 4.13

Multiple Regression Analysis - T.R. Against Other Achievement Criteria and Behavioural Ratings.

Criterion - Composite Teacher Rating Index.

$R = 0.786^{**}$

$R^2 = 0.618$

$F = 100.215^{**}$

Variable	Beta	F to delete	Zero order[1] variance accounted for	Variance[2] accounted for when entered last
Composite PAT	-0.42	102.880	0.46**	0.11**
Raven	-0.05	1.792	0.23**	0.00
Stability	0.09	3.129	0.30**	0.00
Cooperation	0.04	0.841	0.20**	0.00
Independence	0.25	21.828	0.44**	0.02**
Perseverence	0.12	4.652	0.36**	0.00*

* p less than 0.05

** p less than 0.01

(1) Obtained by squaring the zero order correlation of each variable with the criterion. The zero order correlation matrix is:

	T.R.	PAT	Raven	Stab.	Coop.	Ind.	Pers.
T.R.		0.68	0.48	0.55	0.45	0.66	0.60
PAT			0.55	0.40	0.31	0.52	0.44
Ravens				0.35	0.21	0.44	0.38
Stability					0.69	0.63	0.69
Cooperation						0.54	0.63
Independence							0.75
Perseverence							

(2) See note (2) of Table 4.10.

Figure 4.2: Path Analysis Diagrams for the relationship of Ethnicity to the Composite PAT index.

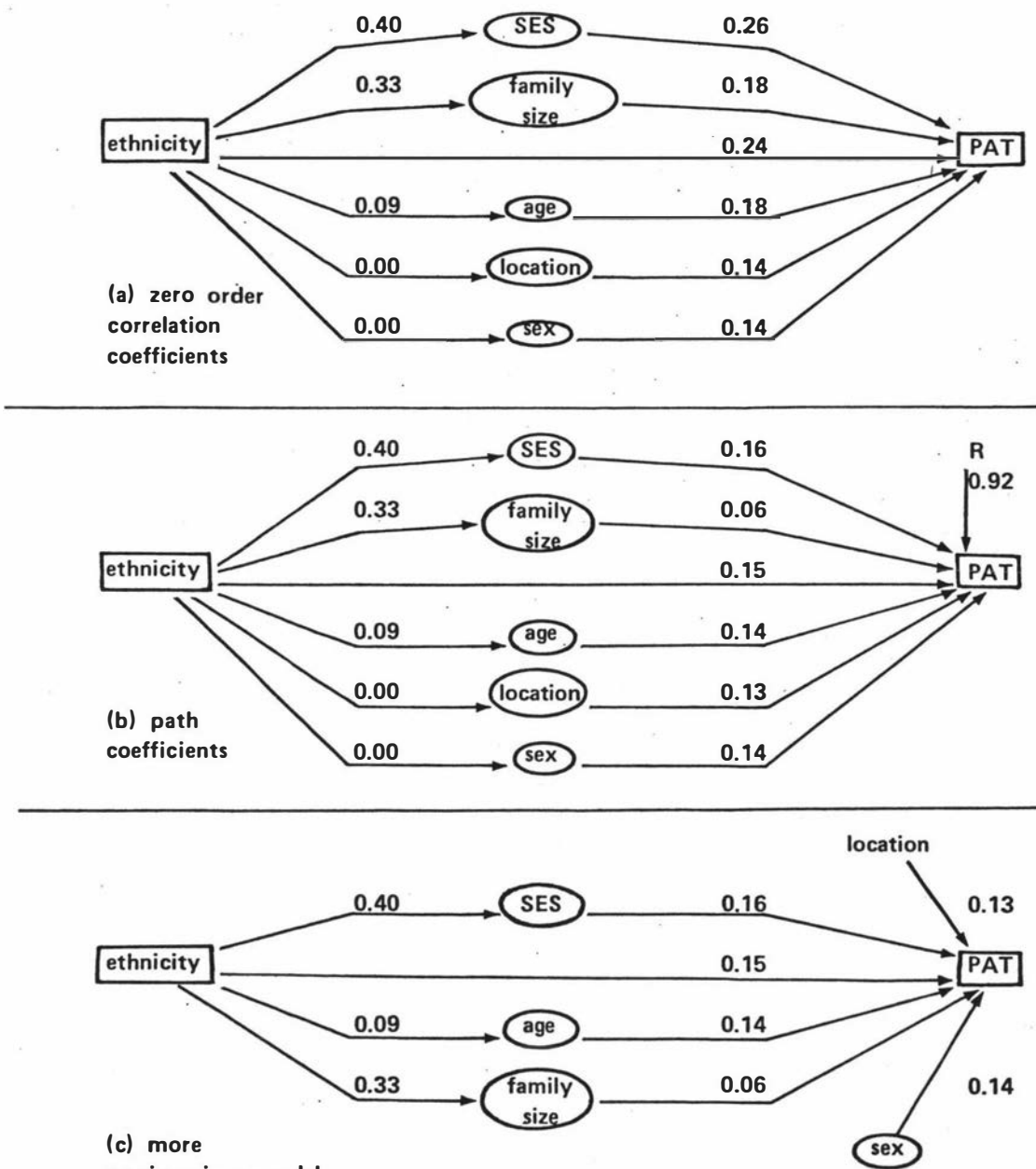
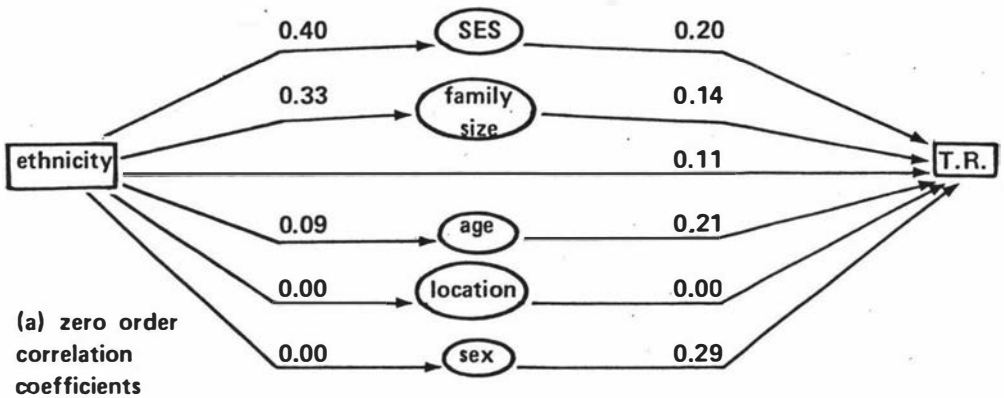
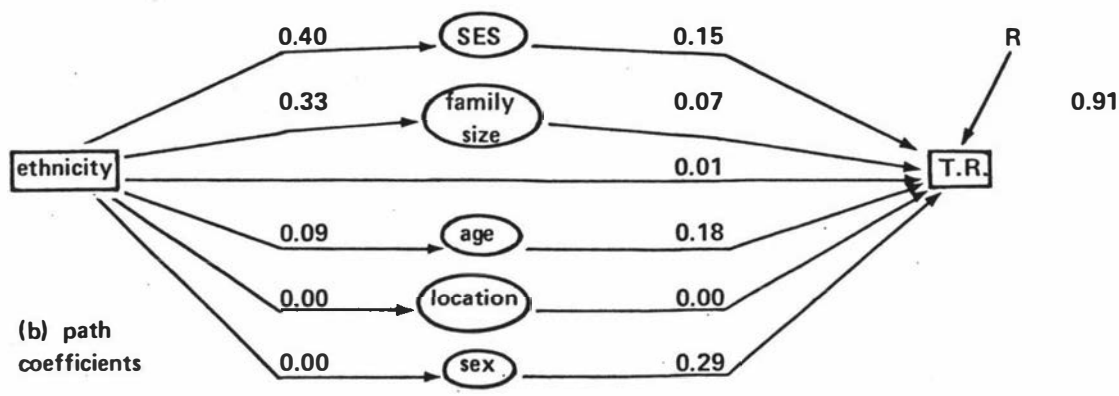


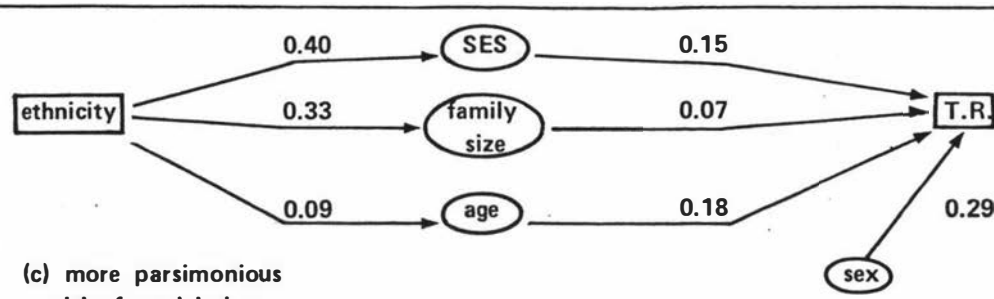
Figure 4.3: Path Analysis Diagrams for the relationship of Ethnicity to the Composite Teacher Rating Index



(a) zero order correlation coefficients

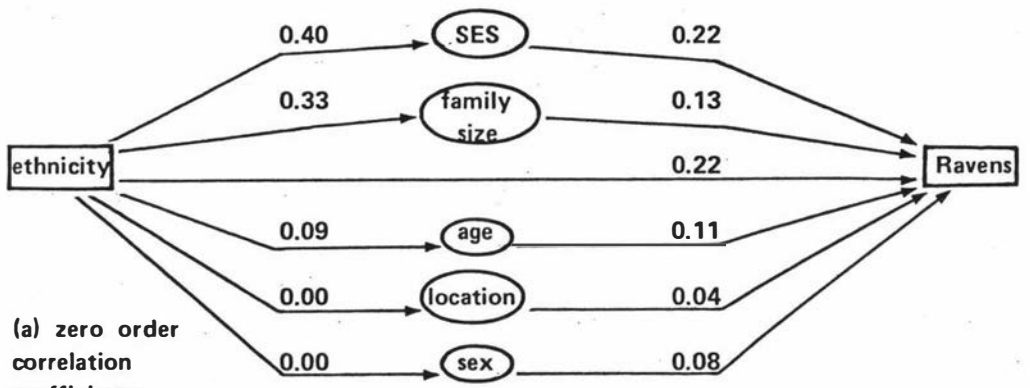


(b) path coefficients

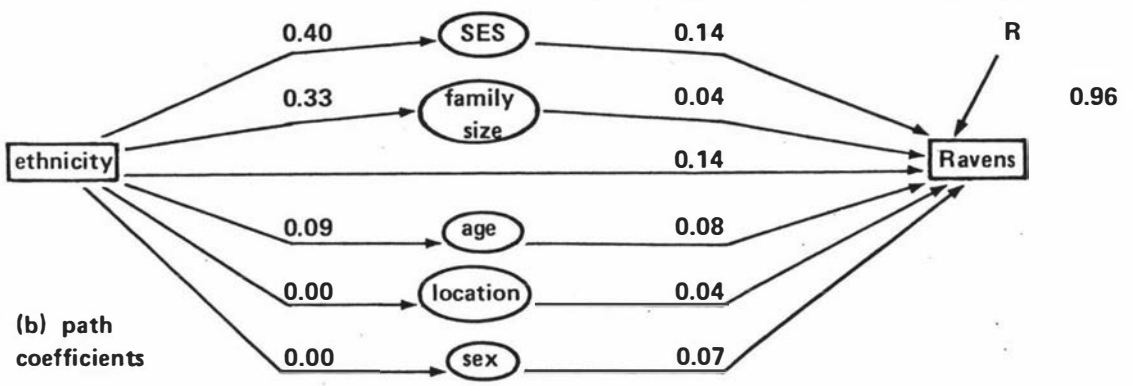


(c) more parsimonious model after deletion of non-substantial path coefficients.

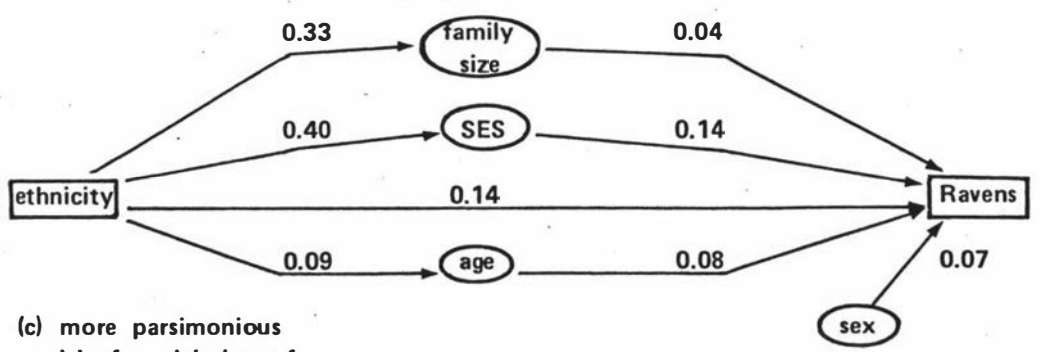
Figure 4.4: Path Analysis Diagrams for the relationship of Ethnicity to Ravens raw scores.



(a) zero order correlation coefficients



(b) path coefficients



(c) more parsimonious model after deletion of non-substantial path coefficients.

hypothesis would claim the direct relationship between ethnicity and criterion performance to be spurious, and the 'real' causal path to be an indirect one via the environmental variables, so that when proper account is taken of these other variables, the direct causal path will become insignificant.

The second diagram of each Figure substitutes the path coefficients for the zero order correlation coefficients. These path coefficients are the standardised semi-partial correlation coefficients (Beta weights) obtained from a multiple regression analysis with the variables at the causal arrow heads as criteria. Where there is only one causal arrow leading to a variable, the path coefficient is simply the zero order correlation coefficient. The path coefficients indicate the direct effect of a variable taken as a cause of some other variable which is taken as an effect (Kerlinger & Pedhazur, 1973: 309-310). The third diagram of each figure shows a more parsimonious causal model after the removal of non-significant path links.

The data from these figures are summarised in Table 4.14, which clearly shows the basic difference between the Teacher Rating criterion on the one hand, and the PAT and Ravens criteria on the other. For the Teacher Rating criterion, 91% of the zero order effect of ethnicity is indirect through its covariance with SES (54.5%), family size (18%) and age (18%). It should be noted from Figure 4.3 that the effect of sex is entirely exogenous to the causal model involving ethnicity, while location is not involved as a causal factor at all.

However, for the PAT and Ravens criteria a considerable degree of similarity exists. For both, the direct effect of ethnicity (63%) outweighs the indirect effects. Of the indirect effects, as with the Teacher Rating criterion, SES is the major covariate, with some small effects through family size and age. Again, sex differences are entirely exogenous to the causal model, as is location which only affects the PAT criterion.

The path analyses yield then, the same set of conclusions as the multiple regressions, and in addition, clarify the relative strengths of the various causal paths. Only on the Teacher Rating criterion can the direct link between ethnicity and criterion variance be eliminated as non-significant. For the other two test criteria ethnicity must remain as a significant contributor to variance, given the set of independent variables

Table 4.14

Direct and Indirect Effects of Ethnicity on Achievement Criteria, Summarised from Figures 4.2, 4.3 and 4.4.

	PAT	T.R.	Ravens
Zero order r with Ethnicity	0.24	0.11	0.22
Direct effect of Ethnicity	0.15 (62.5%)	0.01 (9.1%)	0.14 (63.6%)
Total indirect effects[1]	0.09 (37.5%)	0.10 (90.9%)	0.08 (36.4%)
Indirect effect through:			
SES[2]	0.06 (25.0%)	0.06 (54.5%)	0.06 (27.3%)
Family size	0.02 (8.3%)	0.02 (18.2%)	0.01 (4.5%)
Age	0.01 (4.2%)	0.02 (18.2%)	0.01 (4.5%)

(1) Zero order correlation minus the direct path coefficient.

(2) The product of the path coefficients linking the intervening variable to ethnicity and to the criterion. The individual indirect effects should sum to the total indirect effect, which with the direct effect should in turn sum to the zero order correlation coefficient.

used in this study. The notion of specification error of course, would allow further hypothesizing, such that the addition of more independent variables[18] would further reduce the direct path coefficient, perhaps to a non-significant level, with Pat and Ravens as criteria.

Summary

The major purpose of this chapter has been to provide an empirical basis which would allow an evaluation of two separate explanatory models which are implicit in much of the literature on the underachievement of Maori pupils. The analysis which used teachers ratings as the criterion of school achievement was fully consistent with the environmental deprivation model, described in Chapter 1. This model holds that the apparent correlation between ethnicity and achievement is merely an artifact of the covariation of ethnicity with environmental variables such as SES, family size, rural-urban location and so on. The Teacher Rating criterion displays precisely this pattern of interaction with the independent variables used in this study. From this it may be concluded that the teachers of the children used in this study are quite unbiased, with regard to ethnicity, in ability ratings of their pupils. This lack of an ethnic bias is not demonstrated when standardised test performances (PAT and Ravens scores) are used as criteria. With these two criteria the data are not fully consistent with the environmental deprivation model, although the model goes some way as an explanation of Maori-Pakeha differences. The covariation of ethnicity with the environmental variables does account for some part of the effect of ethnicity on PAT and Ravens scores (37.5% and 36.4% respectively - see Table 4.14), but the major part of ethnicity's effect is independent of the environmental variables (over 60% - see Table 4.14). Thus, after the environmental deprivation effects are removed there still remains a significant amount of variance in both the PAT and Ravens tests attributable to some dimension of human behaviour which has been captured by the Maori-Pakeha dichotomy used in this study. It may in fact be the cultural differences that exist between Maoris and Europeans in New Zealand, or more specifically some dimensions of behaviour which vary across the ethnic boundary such as attitude to school, achievement orientation and motivation. Equally it could be hypothesized that the ethnic dichotomy used in this study implies some

18. Particularly from the areas of personality, behaviour and motivation.

genetic differences between the two groups which are relevant to test performance differences. However, the data in this study are mute on such a distinction, merely indicating that the environmental deprivation model does not account for all of the performance variance between Maori and Pakeha children on the PAT index or on the Ravens test.

A further point to note is that with the exception of sex differences which show a consistent pattern of interaction with achievement criteria within both ethnic groups, none of the other environmental variables satisfy Jensen's criterion of having an equal effect (in terms of both direction and magnitude) within both the Maori and the Pakeha sub-samples. This is particularly true of SES and of rural-urban location, which quite clearly do not have the same effect on criterion performance for Maoris as for Pakehas. These findings lend strong support to McDonald's contention (1975: 80-81) that rural-urban location and socio-economic status indices are unsatisfactory if used across ethnic group boundaries, and therefore that they are inappropriate for use in the establishing of matched samples of Maori and Pakeha children for comparative purposes.

A final point of interest from the data presented in this chapter is the rather small amount of the total variance on each criterion variable that the independent variables together account for - 15% of PAT index variance, 17% of Teacher Rating variance and 8% of Ravens variance - see Tables 4.10, 4.11 and 4.12. The relative effects of the various independent variables selected are only operative within these small proportions of total variance. Hence, although the path analysis indicates that the independent effect of ethnicity on PAT performance is 63% of the total effect of ethnicity, it must be remembered that ethnicity's total effect is only 6% of total PAT variance - see Table 4.10, column 3. Thus, despite the fact that a great deal of the discussion and debate on the so-called Maori educational problem centres around the various environmental disadvantages of Maoris such as predominantly rural residence, low socio-economic status, large families, later starting and slower progress through school, such variables taken together, explain very little of the variance to be found amongst Standard 3 children on three different achievement measures. It would appear that the differences between individuals in both ethnic groups far outweigh any differences to be found between the two groups of individuals classified as Maori or Pakeha. The predominant and

continued interest in explaining performance differences in terms of environmental factors, may perhaps be diverting teachers and researchers from the much more fruitful 'causes' of such differences, those that lie within the individual children as individuals, rather than as children from this ethnic group or that SES category.

Chapter 5

Cognitive Style and Ethnicity - Findings

In this chapter the hypotheses derived from the literature surveyed in Chapter 2 will be tested against the data collected for this study, and the theoretical significance of the findings considered.

In the light of the overseas findings on cognitive style and cultural differences, it seems reasonable to propose that cognitive style could also be an important variable in further reducing the direct effect of ethnicity on the PAT index and Ravens raw scores. In other words, if in the previous chapter, a cognitive style variable had been entered into the multiple regression as an additional independent variable, then ethnicity's unique contribution to PAT and Ravens variance might have no longer been significant. However, such a procedure is pointless until it has been first established that Maori and Pakeha children differ in their responses on the cognitive style test. Hence Hypotheses 5, 6 and 7 as outlined in Chapter 2 have two purposes: first, to test the theoretical generalization that cognitive style is a function of cultural difference; and, second to see whether or not it is worthwhile to include cognitive style as an independent variable in a multi-variate explanation of Maori/ Pakeha achievement differences.

The relevant hypotheses are:

Hypothesis 5

> Maori children will give more relational responses than will Pakeha children.

Hypothesis 6

> Pakeha children will give more analytic responses than will Maori children.

Hypothesis 7

> Pakeha children will give more categorical responses than will Maori children.

The data presented in Table 5.1 do not sustain any of the three hypotheses. The small differences that are observable in the data are in the hypothesised direction, but are quite insufficient to reject the

Table 5.1

Number of Relational, Analytic and Categorical responses on the Cognitive Style Test, by ethnic group, (one-tailed criterion)

	Pakeha (N = 368)		Maori (N = 207)		
	Mean	S.D.	Mean	S.D.	t
Number of relational responses	11.793	5.686	12.130	5.486	0.69
Number of analytic responses	5.427	3.922	5.314	4.102	0.33
Number of categorical responses	7.769	4.223	7.498	3.540	0.82(+)

(+) separate variance estimate, otherwise the pooled variance estimate used.

null alternative. Thus the theoretical generalisation that cognitive style is a function of cultural difference is not sustained by this study of nine year old Maori and Pakeha children. Furthermore, the degree of similarity of the response frequencies on the cognitive style test within both groups being studied, indicates that stylistic preference would make little or no further reduction in ethnicity's unique contribution to PAT or Ravens variance.

A further theoretical genearlization derived from the literature surveyed in Chapter 2 was that cognitive style is a function of environmental variables which have an effect on life style, such as rural or urban residence, SES and family size. The effects of each of these environmental variables on response frequency for the Cognitive Style Test will be examined in turn. The hypotheses for rural/urban location were as follows:

Hypothesis 8

Rural children will give more relational responses than will urban children.

Hypothesis 9

Urban children will give more analytic responses than will rural children.

Hypothesis 10

Urban children will give more categorical responses than will rural children.

Table 5.2

Number of Relational, Analytic and Categorical responses on the Cognitive Style Test, by location, (one-tailed criterion)

	Urban (N = 245)		Rural (N = 330)		
	Mean	S.D.	Mean	S.D.	t
Number of relational responses	11.029	5.612	12.573	5.530	3.29**
Number of analytic responses	5.943	4.186	4.973	3.782	2.91**
Number of categorical responses	8.004	4.135	7.424	3.867	1.73*

Pooled variance estimates used.

* $p < 0.05$
** $p < 0.01$

All three of the hypotheses relating rural/urban location differences with the frequency of responses on each cognitive mode, are supported by the data presented in Table 5.2. Hence the null alternative of no difference can be confidently rejected in each case. Rural/urban differences are most strongly reflected in the number of relational responses, followed by analytic responses, with categorical responses least differentiated, though still at a statistically significant level.

The hypotheses for SES and its effects on cognitive style were:

Hypothesis 11

Children from low SES families will give more relational responses than will children from high SES families.

Hypothesis 12

Children from high SES families will give more analytic responses than will children from low SES families.

Hypothesis 13

Children from high SES families will give more categorical responses than will children from low SES families.

Table 5.3

Number of Relational, Analytic and Categorical responses on the Cognitive Style Test, by socio-economic status (SES), (one-tailed criterion)

	High SES groups 1 - 4* (N = 253)		Low SES groups 5 - 6 (N = 272)		
	Mean	S.D.	Mean	S.D.	t
Number of relational responses	11.779	5.919	12.088	5.426	0.63
Number of analytic responses	5.257	4.026	5.484	4.082	<0
Number of categorical responses	7.956	4.375	7.390	3.710	$1.60^{(+)}$

(+) separate variance estimate, otherwise the pooled variance estimate used.

* groupings made from the Elley and Irving (1972) scale.

The data in Table 5.3 do not lend support to any of the SES hypotheses. The number of categorical responses shows the greatest reaction to SES differences, and the number of analytic responses is in a direction opposite to that hypothesised. However, the reported differences are insufficient to reject the null alternative, and lend

no support to the generalisation that SES affects cognitive style.

The hypotheses for family size differences, and their effects on cognitive style were:

Hypothesis 14

Children from large families will give more relational responses than will children from small families.

Hypothesis 15

Children from small families will give more analytic responses than will children from large families.

Hypothesis 16

Children from small families will give more categorical responses than will children from large families.

Table 5.4

Number of Relational, Analytic and Categorical responses on the Cognitive Style Test, by family size, (one-tailed criterion)

	Less than 4 siblings (N = 320)		4 or more siblings (N = 215)		
	Mean	S.D.	Mean	S.D.	t
Number of relational responses	11.737	5.527	12.061	5.671	0.66
Number of analytic responses	5.281	3.817	5.516	4.131	<0
Number of categorical responses	7.950	4.152	7.386	3.728	1.60

Pooled variance estimates used

The data in Table 5.4 do not lend support to any of the three hypotheses, although, as for SES, the categorical responses are more pronounced than for the other two modes of response. Again, as for SES,

the number of analytic responses show a slight tendency in the direction opposite to that hypothesised. However, it can be concluded that the data in this study do not support the generalisation that family size affects cognitive style responses.

Of the three environmental variables tested in this study, only rural/urban location covaries with cognitive style response frequencies. Neither SES nor family size covary in this way, thus necessitating a revision of the original theoretical generalisation (cognitive style is a function of environmental variables), to a much more modest statement such that cognitive style covaries with one environmental variable (rural/urban location) but not with others (SES and family size). More empirical generalisations of this type would need to be established before the theoretical generalisation could be comprehensively evaluated, and also a great deal of further work is called for to establish whether covariation between a variable such as rural/urban location and cognitive style necessarily implies a functional (causal) relationship.

A third theoretical generalisation noted in Chapter 2 was that cognitive style would be a function of sex role socialisation. The hypotheses derived from this generalisation were:

Hypothesis 17

Girls will give more relational responses than will boys.

Hypothesis 18

Boys will give more analytic responses than will girls.

Hypothesis 19

There will be no difference between boys and girls in number of categorical responses.

Tables 5.5 shows insufficient difference in the number of relational responses to enable a rejection of the alternative hypothesis of no difference. The number of categorical responses show no significant difference, thus supporting Hypothesis 19. For the analytic mode however, a difference in favour of boys is of sufficient magnitude to confidently support Hypothesis 18. This finding is in agreement with that of Archer

Table 5.5
Number of Relational, Categorical and Analytic responses on the Cognitive Style Test, by sex group, (one-tailed criterion)

	Male (N = 269)		Female (N = 304)		
	Mean	S.D.	Mean	S.D.	t
Number of relational responses	11.729	5.672	12.128	5.544	0.85
Number of analytic responses	5.838	4.191	4.967	3.741	2.61**
Number of categorical responses (++)	7.446	3.834	7.845	4.119	1.20

Pooled variance estimates used.

(++) two-tailed criterion for categorical responses

** $p < 0.01$

(1970: 114), who, in addition, found a significant difference in favour of girls on the number of relational responses. A slight trend in this direction is noticeable in Table 5.5, but nothing like the strong trend shown in Archer's data. It must be remembered however, that Archer's sample compared Form I pupils who were two years ahead of the children used in the present study. Sigel et al (1967: 3) may be relevant here. They indicate that the number of relational responses decreases with age for both sexes. Comparison of Table 5.5 with Archer's Table VI indicates that in the New Zealand context the decrease is much more rapid for boys than for girls, although it must be remembered that the samples involved were drawn from different areas and on different bases. However, the trend in the number of analytic responses between the data in Table 5.5 and that presented by Archer are in close agreement with the findings of Sigel et al (1967), which suggests that the departure of the New Zealand data from the American norms with regard to the relational responses may be of some consequence.

In Chapter 4 it was found that some of the environmental variables

that were related to achievement measures for the total sample, were of significance only for the Pakeha group when each ethnic group was analysed separately. The hypothesis to be considered next was formulated to test whether the same pattern occurs with cognitive style responses as the criterion.

Hypothesis 20

> The magnitude and direction of the effects of the environmental variables on response frequency of the different cognitive modes will be the same for both Maori and Pakeha.

Inspection of the within groups t-statistics presented in Table 5.6 shows that the two variables which showed significant associations with cognitive style responses for the whole sample (rural/urban for all three cognitive modes and sex for analytic mode), confine their significant association entirely to the Pakeha group when a within group analysis is made. The equivalent groups in the Maori sub-sample show similar trends (close to statistical significance in three of the four cases) but of lesser relative magnitude. As with achievement then, cognitive style is little affected by environmental variables when looked at within the Maori sub-sample. In addition, the environmental variables which had no effect on cognitive style responses for the sample as a whole, are equally ineffective within each ethnic group, thus Hypothesis 20 can be rejected against the alternative for those environmental variables which have significant overall effects.

Similarly it could be argued that controlling for the environmental variables may substantially affect the magnitude of the ethnic differences on the cognitive style test - (which were in fact non-significant, see Table 5.1).

Hypothesis 21

> The findings associated with Hypotheses 5, 6 and 7 (see Table 5.1) will be modified in the hypothesised directions when control is entered for the environmental variables which are themselves significantly related to cognitive style response.

Inspection of the between groups t-tests in Table 5.6 shows that controlling separately for the environmental variables (as main effects),

Table 5.6

Within and Between Group Differences in Number of Relational, Analytic and Categorical Responses on the Cognitive Style Test, by Location, Family Size, SES and Ethnicity, (1-tailed Criterion).

Variable	Pakeha N	Pakeha Mean	Pakeha S.D.	Maori N	Maori Mean	Maori S.D.	Between group t
Relational Responses							
Urban	167	10.868	5.512	78	11.372	5.842	0.65
Rural	201	12.562	5.728	129	12.589	5.229	0.04
Within group t		2.869**			1.551		
Small family	254	11.673	5.657	66	11.985	5.031	0.41
Large family	93	11.742	5.722	122	12.303	5.644	0.72
Within group t		0.100			0.382		
High SES	215	11.800	5.948	38	11.658	5.832	<0
Low SES	126	12.048	5.335	146	12.123	5.522	0.11
Within group t		0.386			0.457		
Male	172	11.599	5.775	97	11.959	5.506	0.50
Female	196	11.964	5.616	108	12.426	5.424	0.69
Within group t		0.614			0.611		
Analytic Responses							
Urban	167	5.946	3.918	78	5.936	4.735	0.02(+)
Rural	201	4.995	3.881	129	4.938	3.635	0.13
Within group t		2.327**			1.599(+)		
Small family	254	5.287	3.791	66	5.258	3.947	0.05
Large family	93	6.000	4.399	122	5.148	3.893	1.50
Within group t		1.386(+)			<0		
High SES	215	5.265	4.001	38	5.211	4.218	0.08
Low SES	126	5.556	3.935	146	5.425	4.218	0.26
Within group t		0.652			0.279		
Male	172	5.878	4.193	97	5.753	4.208	0.23
Female	196	5.031	3.632	108	4.852	3.945	0.40
Within group t		2.057(+)*			1.581		

/cont./

Table 5.6 (Cont.)

Categorical Responses							
Urban	167	8.192	4.298	78	7.603	3.757	1.04
Rural	201	7.418	4.138	129	7.434	3.416	<0(+)
Within group t		1.795*			0.332		
Small family	254	8.016	4.340	66	7.697	3.347	0.65(+)
Large family	93	7.258	3.856	122	7.484	3.641	<0
Within group t		1.483			0.393		
High SES	215	7.926	4.394	38	8.132	4.319	0.27
Low SES	126	7.397	4.066	146	7.384	3.388	0.03(+)
Within group t		1.102			0.991(+)		
Male	172	7.547	4.059	97	7.268	3.411	0.60(+)
Female	196	7.964	4.363	108	7.630	3.644	0.71(+)
Within group t		0.946			0.731		

(+) Separate variance estimate, otherwise pooled variance estimate

* p less than 0.05

** p less than 0.01

produces no significant ethnic difference on any of the cognitive modes. However, the possibility of interaction effects between the environmental variables (together with ethnicity) and their effects on cognitive style must not be discounted. In order to check this possibility, the data have been reanalysed, controlling for each environmental variable in turn, as set out in Table 5.7, parts (i), (ii) and (iii). SES has not been included in this analysis as it makes the least contribution to explaining between group variance on the cognitive style test (see Table 5.6), and to include it in Table 5.7 would reduce cell sizes to unworkable levels.

Table 5.7 attempts to identify within the sample being studied, the precise location of any ethnic difference in cognitive style response modes, and for which of the ethnic groups these locations are most significant. Overall, the three parts of Table 5.7 are almost precisely evenly divided with 11 of the 24 between group comparisons in favour of the Maori group and 13 in favour of the Pakeha group. However, four of the comparisons show a statistically significant difference. For relational responses (part (i) of Table 5.7) females from large families living in urban areas show a trend in favour of Maori pupils. Conversely, this same group show a significant trend in favour of Pakeha pupils on the number of analytic responses. Closer inspection of the data indicates that it is the Pakeha girls concerened who are the exceptional group. They are quite noticeably polarized between relational and analytic responses, having the lowest relational score of any group (9.519, Table 5.7 (i)), and the highest analytic score (7.407, Table 5.7 (ii)). This extreme response set of the Pakeha group concerned accounts for two of the four significant ethnic differences, as the scores of the equivalent Maori group do not show this extreme reaction and are not noticeably different from the other Maori sub-groups. Two other significant ethnic differences are to be found. Analytic responses favour Pakeha males from large families in rural areas (Table 5.7 (ii)), and categorical responses for males from small urban families (Table 5.7 (iii)). Neither of these two differences would stand up to the two-tailed criterion, and on balance, with only four significant differences out of 24 comparisons and with the remaining non-significant differences being equivocal with regard to directionality, it would be unwarranted to modify the findings reported for Hypotheses 5, 6 and 7 which suggest no systematic relationship between ethnicity and preferred

Table 5.7(i)

Number of Relational Responses on the Cognitive Style Test, by Location, Family Size, Sex and Ethnic Group, (1-tailed Criterion).

Loc.	No. of siblings	Sex	N	Pakeha Mean	S.D.	N	Maori Mean	S.D.	Between grp. t
Urban	≤ 3	Male	50	10.300	5.482	11	12.000	5.235	0.938
		Female	62	11.210	5.806	11	9.636	5.697	< 0
		Within group t		0.845			< 0		
	> 3	Male	17	10.647	5.384	24	10.625	5.962	< 0
		Female	27	9.519	4.154	27	12.259	6.199	$1.908^{(+)}$*
		Within group t		< 0			0.957		
Rural	≤ 3	Male	68	11.897	5.718	18	11.944	4.952	0.032
		Female	74	12.784	5.458	26	13.000	4.656	0.180
		Within group t		0.946			0.721		
	> 3	Male	26	13.000	6.536	36	12.861	5.642	< 0
		Female	23	13.739	5.817	34	13.235	4.632	< 0
		Within group t		0.416			0.302		

(+) Separate variance estimate, otherwise pooled variance estimate.

Table 5.7(ii)

Number of Analytic Responses by Location, Family Size, Sex and Ethnic Group, (1-tailed Criterion).

Loc.	No. of siblings	Sex	Pakeha N	Pakeha Mean	Pakeha S.D.	Maori N	Maori Mean	Maori S.D.	Between group t
Urban	≤ 3	Male	50	6.100	3.950	11	6.636	5.372	< 0
		Female	62	5.258	3.585	11	5.000	4.025	0.216
		Within group t		1.181			0.808		
	> 3	Male	17	6.882	4.999	24	7.333	5.113	< 0
		Female	27	7.407	3.885	27	4.852	4.435	2.252*
		Within group t		< 0			1.856*		
Rural	≤ 3	Male	68	5.794	4.098	18	5.111	2.541	0.878(+)
		Female	74	4.297	3.391	26	4.885	4.131	< 0
		Within group t		2.379**			0.224(+)		
	> 3	Male	26	5.462	4.950	36	4.694	3.060	1.720(+)*
		Female	23	4.304	3.267	34	4.088	2.261	0.295
		Within group t		0.953			0.938		

(+) Separate variance estimate used, otherwise pooled variance estimate.

* p less than 0.05
** p less than 0.01

Table 5.7(iii)

Number of Categorical Responses, by Location, Family Size, Sex and Ethnic Group, (1-tailed Criterion).

Loc.	No. of siblings	Sex	Pakeha N	Pakeha Mean	Pakeha S.D.	Maori N	Maori Mean	Maori S.D.	Between group t
Urban	≤3	Male	50	8.600	3.912	11	6.364	3.295	1.759*
		Female	62	8.500	4.821	11	10.273	3.438	<0
		Within group t(++)		-0.118			2.722**		
	>3	Male	17	7.471	4.079	24	7.000	2.554	0.421(+)
		Female	27	8.074	3.615	27	7.704	4.539	0.331
		Within group t		0.513			0.692(+)		
Rural	≤3	Male	68	7.324	4.116	18	7.944	3.334	<0
		Female	74	7.851	4.375	26	7.000	2.871	1.122(+)
		Within group t		0.738			-1.004		
	>3	Male	26	6.538	4.042	36	7.417	4.003	<0
		Female	23	6.957	3.808	34	7.647	3.228	<0
		Within group t		0.372			0.264		

(+) Separate variance estimate, otherwise pooled variance estimate.

(++) 2-tailed criterion for within group t's on Sex - see Hypothesis 19.

* p less than 0.05

** p less than 0.01

mode of cognitive style.

Hypotheses 5 to 21 have been concerned with exploring and elaborating a theoretical relationship between environmental variations (together with ethnicity) and cognitive style. No consideration has been given to achievement and its role as a criterion variable. It is possible that despite no relationship between ethnicity and cognitive style, the relationship between cognitive style and achievement may vary within each of the ethnic groups used in this study. Hypotheses 22 and 23 were formulated to test this possibility, using the findings of the Gray & Knief study (1975, supra) as empirical generalisations to set the directionality of Hypothesis 22.

Hypothesis 22

School achievement measures and Ravens Progressive Matrices scores will be:

(i) negatively correlated with the number of relational responses;

(ii) positively correlated with the number of analytic responses; and

(iii) not correlated with the number of categorical responses.

Table 5.8 shows that for all the sub-scales of the Teacher Rating Index (together with those subject areas rated by teachers but not included in the Index), for the sub-scales of the PAT Index and for Ravens raw scores, the correlations with the three cognitive modes are in accord with Hypothesis 22. While the correlations are not large they are consistent and show a tendency to polarize on a relational-analytic dimension, with categorical responses falling between the two extremes. The findings are generally in line with those of Gray & Knief as outlined in Chapter 2, for fifth grade American children. Hypothesis 23 was formulated to test the stability of the findings for hypothesis 22 within each ethnic sub-sample.

Hypothesis 23

The pattern of correlations revealed by Hypothesis 22 will be the same for the Maori sub-sample as for the Pakeha sub-sample.

Table 5.9 contains the same data items as Table 5.8 broken down for

Table 5.8

Correlations of Achievement Criteria by Responses on the Cognitive Style Test - Kendall's T for Subjects Rated by Teachers, Spearman's r for PAT and Raven's Scores (1-tailed criterion for Relational and Analytic Responses, 2-tailed for Categorical).(1)

Criterion	N	Relational responses	Categorical responses	Analytic responses
Subjects Rated by Teachers				
Oral language	560	-0.04	-0.01	0.05*
Written language	561	-0.03	0.02	0.03
Reading	561	-0.06*	0.06*	0.05*
Spelling	560	-0.04	0.05	0.03
Writing	561	-0.02	0.00	0.01
Arithmetic	561	-0.04	0.01	0.07**
Social studies	254	-0.06	0.05	0.09*
Nature Study	249	-0.03	0.04	0.01
Art and Craft	219	-0.09*	0.02	0.15**
Music	211	-0.08*	0.07	0.04
P.Ed.	212	-0.01	0.05	0.07
PAT Raw Scores				
Reading Comprehension	474	-0.06	0.07	0.02
Reading Vocabulary	487	-0.08*	0.08	0.08*
Listening Comprehension	471	-0.08*	0.04	0.09*
Raven's Raw Scores				
	534	-0.07*	0.03	0.11**

* p less than 0.05

** p less than 0.01

(1) Significance computed using: $z = \frac{T}{\sqrt{\frac{2(2N + 5)}{9N(N-1)}}}$ for Kendall's T;

and $t = r_s \sqrt{\frac{N - 2}{1 - r_s^2}}$ for Spearman's r (Siegel 1956: 221 and 212).

Table 5.9

Correlations of Achievement Criteria by Responses on the Cognitive Style Test, by Ethnic Group - Kendall's T for Teacher Ratings, Spearman's r for others, (1-tailed for Relational and Analytic, 2-tailed for Categorical).(1)

Criterion	N P	N M	Relational P	Relational M	Categorical P	Categorical M	Analytic P	Analytic M
Subjects Rated by Teachers								
Oral language	360	200	-0.04	-0.01	0.00	-0.02	0.07*	0.01
Written lang.	361	200	-0.09**	0.08*	0.05	-0.05	0.08*	-0.06
Reading	361	200	-0.07*	0.00	0.07*	0.03	0.06	-0.01
Spelling	361	199	-0.07*	0.02	0.05	0.04	0.07*	-0.04
Writing	361	200	-0.04	0.02	0.02	-0.02	0.02	-0.03
Arithmetic	361	200	-0.10**	0.07	0.06	-0.07	0.11**	-0.01
Social studies	163	91	-0.08	0.02	0.07	0.02	0.14**	-0.03
Nature study	162	87	-0.02	0.00	0.05	0.01	0.04	-0.07
Art and Craft	137	82	-0.10*	-0.08	0.08	-0.08	0.13*	0.19**
Music	135	76	-0.06	-0.13	0.10	0.02	0.03	0.07
Phys. Ed.	134	78	0.04	-0.09	0.06	-0.03	0.06	0.09
PAT Raw Scores								
Reading Comprehension	329	145	-0.09	0.00	0.10	0.01	0.05	-0.03
Reading Vocabulary	332	155	-0.15**	0.05	0.12*	0.01	0.15**	-0.02
Listening Comprehension	325	146	-0.14**	-0.01	0.09	-0.05	0.11*	0.06
Raven's Raw Scores								
	347	188	-0.10*	0.02	0.06	-0.05	0.11*	0.08

* p less than 0.05

** p less than 0.01

(1) See note (1) of Table 5.8.

each ethnic group separately. Inspection of Table 5.9 shows that the pattern of correlations found for the whole sample is maintained in the sub-sample analysis only for the Pakeha group. The Maori group shows no such consistency, with the correlations fluctuating around zero. Hence rejection of Hypothesis 23 seems reasonable, but must be regarded with some caution due to the rather weak associations inherent in the small correlations, as against the consistency of the directionality for the Pakeha sub-sample and the indeterminancy of the Maori sub-sample.

As with previous findings in this section, the possibility exists that the differences between Maori and Pakeha with respect to the correlations between cognitive style and achievement may be due to the intervention of other environmental variables for which the groups are not matched. Hence Hypothesis 24 seeks to replicate the findings from the test of Hypothesis 23 after statistically controlling for the effects of other environmental variables through partial correlation.

Hypothesis 24

> If differences are found in the pattern of correlations for the two ethnic groups under Hypothesis 23, then a reconvergence will occur when the effects of other environmental variables (age, sex, SES, family size and rural/urban) are partialled out.

To reduce the mass of data to more manageable dimensions, Table 5.10 reports the partial correlation data for the Teacher Rating Index, rather than separate analyses for each individual subject rated by the teachers. Similarly, Table 5.11 reports data for the PAT Index.

From Table 5.10 it can be seen that controlling for environmental variables through partialling tends to exacerbate the differences between the Maori and Pakeha sub-sample correlations between the Teacher Rating achievement criterion and cognitive style scores. Certainly no reconvergence takes place as the correlation coefficients are just as far apart after partialling as they were before - in fact slightly further apart. A similar trend is observable in Table 5.11 for the PAT Index where, again, partialling does not bring about any convergence of the correlation coefficients, and in Table 5.12 for Ravens scores. For all three achievement criteria Hypothesis 24 is rejected as no convergence of the correlation

Table 5.10

Correlations and partial correlations between the composite teacher rating index and scores on the Cognitive Style Test, by Ethnic Group, (one-tailed criterion)

Correlations	Relational		Categorical		Analytic	
	P (N = 272)	M (N = 107)	P	M	P	M
Zero order r	-0.16**(+)	0.07	0.10	-0.04	0.12*	-0.06
First order partial for age	-0.13*	0.10	0.07	-0.05	0.11*	-0.08
First order partial for sex	-0.19**	0.07	0.10	-0.08	0.16**	-0.03
First order partial for SES	-0.16**	0.08	0.08	-0.06	0.13*	-0.07
First order partial for family size	-0.15**	0.07	0.09	-0.04	0.12*	-0.06
First order partial for rural-urban	-0.17**	0.07	0.10	-0.04	0.12*	-0.06
Fifth order partial for all above	-0.17**(+)	0.11	0.06	-0.11	0.17**	-0.05

* p = 0.05

** p = 0.01

(+) Maori and Pakeha correlations are significantly different from each other. (Ferguson, 1971: 187-188)

coefficents occurs as a result of partialling. It should be noted that only for the Teacher Rating Index's correlation with the relational cognitive mode does the correlation coefficients for Maori and Pakeha differ at a statistically significant level, although the same Index with the analytical mode comes very close to producing a statistically significant difference as well (a z of 1.925 for a difference as large as that reported - 0.17 for Pakeha and -0.05 for Maori). The other two achievement criteria confirm the trends shown for the Teacher Rating Index but at a slightly lower level of intensity. Rejection of Hypothesis 24 indicates that the weak but consistent differences in the relationship between cognitive style and achievement that show up when Maori and Pakeha subjects are analysed separately are due to differences associated with the ethnic variable rather than to any of the environmental variables used in this analysis.

Table 5.11

Correlations and partial correlations between composite PAT index and scores on the Cognitive Style Test, by Ethnic Group, (one-tailed criterion)

Correlation	Relational		Categorical		Analytic	
	P	M	P	M	P	M
Zero order r	-0.12*	0.03	0.08	0.02	0.09	-0.04
First order partial for age	-0.10	0.05	0.06	0.01	0.07	-0.06
First order partial for sex	-0.13*	0.03	0.08	-0.001	0.10*	-0.02
First order partial for SES	-0.12*	0.05	0.07	-0.01	0.096	-0.05
First order partial for family size	-0.11*	0.03	0.07	0.02	0.09	-0.04
First order partial for rural-urban	-0.15**	0.01	0.10	0.02	0.11*	-0.03
Fifth order partial for all above	-0.14*	0.04	0.06	-0.03	0.12*	-0.02

* p = 0.05

** p = 0.01

This is not to say of course that the difference is necessarily of racial or cultural origin, as the addition of other environmental variables not considered for this study could well account for the differences found. On the other hand, the difference may be of racial or cultural origin, the point being that no location can be pin-pointed as a source for the small observed differences from the data in this study. All that can be said is that the most frequently cited environmental variables do not account for the ethnic differences observable in Table 5.9.

Table 5.12

Correlations and Partial Correlations between Ravens Raw Scores and Cognitive Style Test Scores, by Ethnic Group, (one-tailed criterion)

(Pakeha, N = 321. Maori, N = 166)

Correlations	Relational		Categorical		Analytic	
	P	M	P	M	P	M
Zero order r	-0.09*	0.03	0.03	-0.06	0.11*	0.02
First order partial for age	-0.09	0.05	0.02	-0.07	0.11*	0.00
First order partial for sex	-0.10*	0.03	0.02	-0.06	0.12*	0.02
First order partial for family size	-0.09	0.03	0.01	-0.06	0.12*	0.02
First order partial for SES	-0.09*	0.03	0.02	-0.06	0.12*	0.02
First order partial for rural-urban	-0.10*	0.04	0.03	-0.06	0.11*	0.01
Fifth order partial for all above	-0.09	0.05	0.01	-0.07	0.13**	-0.00

* p = 0.05

** p = 0.01

Summary and Discussion of Findings in Relation to Other Research

The main objectives of this Chapter have been to explore the ethnic group differences in cognitive style response modes, and their relationship to achievement. The most striking aspect of the data reported here is the the lack of any significant relationship between response frequency on the Cognitive Style Test and either ethnicity or the environmental variables SES and family size - see Tables 5.1, 5,3 and 5.4. These findings are generally contrary to the patterns outlined in the overseas research discussed in Chapter 2. The disagreement between the work of Cohen (1969) and the Lesser group (Lesser, Fifer & Clark (1965); Stodolsky & Lesser (1967); Marjoribanks (1972)) as to whether SES or Ethnicity is the prime determiner of cognitive acquisitions is of no moment for the data presented here. It appears that for these New Zealand children neither ethnic differences nor

SES differences in child rearing patterns, nor the actual size of the family or origin has any effect on preferred mode of cognitive style. The failure of the Cognitive Style Test as a differentiator between Maori and Pakeha subjects is in agreement with the New Zealand findings of Chapman (1973) who found no difference between Maori and Pakeha adolescent males on another dimension of cognitive style, the Witkin field dependence-independence dimension. Further, the discrepancies between the relationships of cognitive style and achievement in the Maori sub-sample as compared to the Pakeha sub-sample (Table 5.9) could be interpreted as lending support to Chapman's contention that the Maori

> "... may be as analytic in thought and perception as the Pakeha, but his thought is directed more toward interpersonal rather than occupational or academic goals."
> (Chapman, op.cit.: 43)

Certainly the data in Table 5.1 indicate that the Maori pupils are as capable of producing analytic responses in a test situation as are Pakeha pupils. Furthermore, while being unable to show that Maori thought is directed toward 'interpersonal goals', the data in Tables 5.9, 5.10, 5.11 and 5.12 show at least that cognitive style and achievement (academic goals in Chapman's terminology) are independent phenomena for the Maori group but interrelated for Pakehas, which suggests that some cognitive phenomena are utilised for different purposes by children in the two ethnic groups. On the other hand, of course, the ethnic difference in relationships between cognitive style and achievement could reflect bias on the part of teachers and differential treatment of Maori and Pakeha children by the schools such that the high analytic Maori children do not score well on measures of school achievement. However, the data presented in Chapter 4 (Table 4.11) would seem to indicate that teachers, at least in their reatings of children's achievement levels, are not influenced by ethnic considerations at all, yet it is with the Teacher Rating Index that cognitive style shows the largest discrepancies when correlated separately for Maori and Pakeha.

The failure of the cognitive style measure as a discriminator between SES categories brings into question the applicability to New Zealand of the findings of Cohen (1968, 1969; see also Chapter 2). This is not to invalidate Cohen's findings, but to suggest that the life style differences

between low and middle income groups in the United States are greater than in New Zealand where income differentials are not as great to start with. Thus her claim that the social pattern into which the child is socialised is a major determinant of cognitive style may still be perfectly valid, and the fact that it does not emerge from the data in this study may simply be a consequence of New Zealand's much flatter social topography. If, as Hess & Shipman (1965) claim, preferred mode of cognitive style is due to qualitative differences in the nature of mother-child interactions, or to general child rearing patterns (Shaffer & Emerson, 1964), then from the present sample it would appear that child rearing patterns and the quality of mother-child interactions do not differ between SES groups, or between Maori and Pakeha families in ways that significantly affect preferred mode of cognitive style. This does not mean that they do not differ, but that any differences are not reflected in responses to the Kagan et al (1963) Cognitive Style Test.

Much of the literature on Maori education in New Zealand has concentrated on the differences between Maori and Pakeha, not only in terms of school achievement, but also focussing on the large size of Maori families, their overrepresentation in the low occupational categories and their different patterns of child rearing (Ritchie & Ritchie, 1970). The data presented in this chapter suggest that at least for one aspect of cognition, stylistic preference, these kinds of differences are of no moment. In addition the data suggest that some attention should perhaps be devoted to similarities between groups as these would seem to far outweigh the differences.

The only environmental variable to have a significant impact on all three cognitive modes was rural/urban location (Table 5.2). This finding lends support to Sigel's contention (1968: 510 and Chapter 2) that the different arrays of experience offered by rural and urban areas affects the content and range of experience to which children are exposed, and also the preferred mode by which children organize stimuli of the type presented in the Kagan, Moss & Sigel Cognitive Style Test. However, when the rural/urban location dichotomy is examined for its effect on cognitive style response frequencies <u>within</u> each of the ethnic groups under study (see Tables 5.6 and 5.13), it can be seen that the statistically significant rural/urban variance is located within the Pakeha group. A similar trend

is observable for relational and analytic responses within the Maori group, and although it does not reach a statistically significant level, it should not, on that account, be regarded as non-existant. The other variable which accounted for some of the variation in cognitive style responses was sex, particularly for the analytic mode (Table 5.5). If sex is introduced into the rural/urban analysis, some more detailed conclusions can be drawn. In Table 5.13, rural/urban differences are analysed for each cognitive mode by ethnicity, then by sex and then by sex within ethnicity. This table shows that for relational responses rural or urban location is of no consequence for the Maori pupils, whether boy or girl, as all of the significant differences are confined to the Pakeha group. For analytic responses the effects of ethnicity and of sex are similar to the relational pattern, but a discrdinal interaction appears when the effect of sex is examined within ethnicity. Rural or urban location strongly affects the number of analytic responses for Maori boys (but not Maori girls), while for Pakeha the significant effect is for girls and not boys. For categorical responses rural/urban location has a significant effect only for Pakeha groups. In general, from the table it would appear that rural environments tend to favour the production of relational responses while urban environments favour both analytic and categorical responses, with the exception of Maori boys for whom an urban environment is particularly conducive to the production of analytic responses at the expense of categorical ones thus producing an anamalous trend for this group on categorical responses.

The data presented in this section would tend to support McDonald's warnings (1975: 75-83) about the blanket application of essentially European notions of differentiation such as rural/urban, socio-economic status and so on. These data would suggest that the effect of rural or urban residence has a different influence on Maori children than on Pakeha children in terms of their predisposition to respond in the various modes of the Cognitive Style Test. Similarly, the reasons for sex differences that are advanced in other literature cannot be applied to the Maori children in this study, as in some cases the direction of the differences are in opposite directions to those found for the Pakeha children. There would appear to be ground for suggesting that the socialisation of sex roles, at least those aspects of sex role that result in different cognitive

Table 5.13

T-Tests for Rural-Urban Differences, Controlling for Ethnicity, Sex and Sex Within Ethnicity, (1-tailed Criterion).

Group	Urban N	Urban Mean	Urban S.D.	Rural N	Rural Mean	Rural S.D.	t
Relational Responses							
All	245	11.029	5.612	330	12.573	5.530	3.29**
Pakeha	167	10.868	5.512	201	12.562	5.728	2.87**
Maori	78	11.372	5.842	129	12.589	5.229	1.55
Male	102	10.618	5.499	148	12.331	5.730	2.36**
Female	127	10.937	5.601	157	13.057	5.180	3.31**
Pakeha Male	67	10.388	5.419	94	12.202	5.940	1.98*
Pakeha Female	89	10.697	5.392	97	13.010	5.529	2.88**
Maori Male	35	11.057	5.703	54	12.555	5.392	1.25
Maori Female	38	11.500	6.101	60	13.133	4.604	1.50
Analytic Responses							
All	245	5.943	4.186	330	4.973	3.782	2.91**
Pakeha	167	5.946	3.918	201	4.995	3.881	2.33*
Maori	78	5.936	4.735	129	4.938	3.635	1.60(+)
Male	102	6.578	4.539	148	5.385	3.973	2.23*
Female	127	5.606	3.949	157	4.350	3.281	2.93**
Pakeha Male	67	6.298	4.214	94	5.702	4.325	0.87
Pakeha Female	89	5.910	3.789	97	4.299	3.345	3.08**
Maori Male	35	7.114	5.126	54	4.833	2.880	2.40(+) **
Maori Female	38	4.895	4.267	60	4.433	3.201	0.61
Categorical Responses							
All	245	8.004	4.135	330	7.424	3.867	1.73*
Pakeha	167	8.192	4.298	201	7.418	4.138	1.795*
Maori	78	7.603	3.757	129	7.434	3.416	0.33
Male	102	7.794	3.651	148	7.284	3.970	1.03
Female	127	8.394	4.424	157	7.535	3.830	1.75*
Pakeha Male	67	8.313	3.955	94	7.107	4.089	1.87*
Pakeha Female	89	8.371	4.473	97	7.639	4.245	1.14
Maori Male	35	6.800	2.774	54	7.593	3.770	<0(+)
Maori Female	38	8.448	4.366	60	7.367	3.070	1.33(+)

(+) Separate variance estimate, otherwise pooled variance estimate.

* p less than 0.05

** p less than 0.01

stylistic preferences, are qualitatively different in Maori society from that found in Pakeha society.

To return to a theoretical point made at the beginning of this chapter, the findings presented here would not seem to offer much hope that cognitive style could act as an intervening variable to further reduce the direct effect of ethnicity on achievement, over and above the reduction shown to occur in Chapter 4, Tables 4.10 and 4.12. However, the stepwise regressions reported in Tables 4.10 and 4.12 were run again to include Relational and Analytic scores as independent variables in addition to those already in the regression.[19] These re-runs produced no modification of the direct effect of ethnicity on criterion performance. Thus the possibility that preferred mode of cognitive style would account for residual ethnic variance when other environmental variables had been taken into account was not sustained.

A final point concerns the relationships between the various modes of the Cognitive Style Test itself, where a considerable difference exists between the New Zealand data reported here and the findings of the Gray & Knief (1975) study described in Chapter 2. Gray & Knief found no correlation between the categorical and relational modes, and significant correlations between categorical and descriptive (analytic) modes on the one hand, and analytic and relational modes on the other - see Figure 5.1. They were able to conclude that:

> "Correlations among the cognitive style (sic.) indicate that descriptive (read analytic) style was a bi-polar factor with respect to both categorical and relational style, while categorical and relational styles were independent of each other." (Op.cit., p. 68)

As shown in Figure 5.1, there is a much reduced correlation between categorical and analytic styles for New Zealand school children (non-significant in the case of European pupils), together with strong correlations between categorical and relational on the one hand, and between analytic and relational on the other, for both Maori and European pupils. From these results one can conclude that relational style was bi-polar with respect

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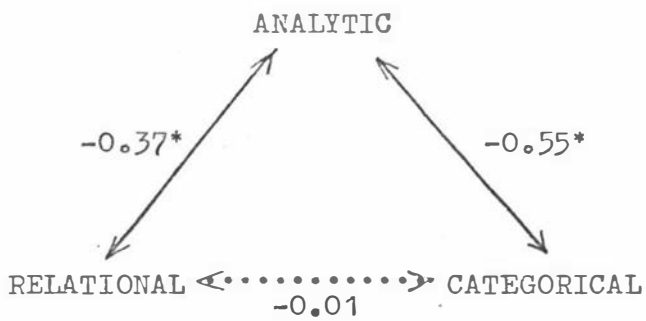
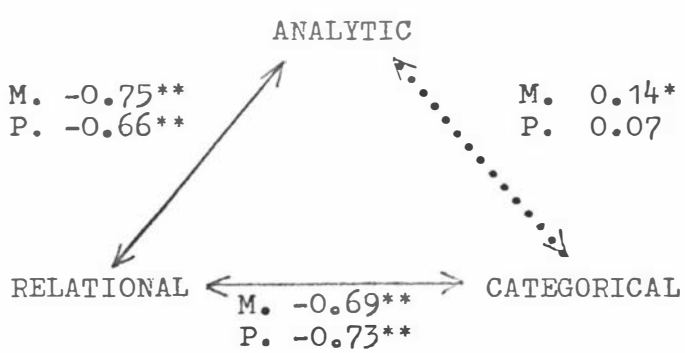
19. Categorical scores were not included as (a) the three scores (Relational, Analytic and Categorical) always sum to 25 with the resultant problems of an ipsative cluster of variables; and (b) Categorical scores were intermediate between Analytic and Relational in their effect on the achievement criteria - see Table 5.8.

Figure 5.1

Correlation Coefficients Between Cognitive Style Responses, Comparing Gray and Knief (1975) Findings with the present Sample.



(a) Gray and Knief (1975), Table 2, p.69.



(b) The New Zealand Sample used in this Study.

M. = Maori sub-sample,

P. = Pakeha sub-sample.

* p less than 0.05

** p less than 0.01

to both categorical and analytic styles, while categorical and analytic styles were independent of each other. The point here is that qualitative aspects of cognition - as measured by such instruments as the Kagan, Moss & Sigel Conceptual Style Test, which, according to Wachtel (1968), is a measure of stylistic preference rather than a measure of an ability to form conceptual classes - are likely to be strongly influenced by cultural differences. The basic differences observable amongst the cognitive style categories between children from the American south-west, and this New Zealand sample, indicates either basic differences in socialisation processes in the two countries, or rather different cognitive environments provided by the schools in the American south-western city compared with the schools involved in this study. If it is true that child rearing practices in New Zealand are rather different for the Maori population than for the Europeans, as claimed by Ritchie & Ritchie (1970), and since the two New Zealand samples are more similar to each other than either is to the American sample, in terms of the relationships among the cognitive styles, it would seem plausible to suggest that school environments have a strong influence on preferred modes of cognition, strong enough perhaps, to overcome any differences that may have arisen from differences in socialization due to ethnicity.

Chapter 6

Summary and Conclusions

The major purpose of this research has been to study the occurrence of cognitive style preferences (see Chapter 2) among children from various environmental circumstances and to examine the relationships between cognitive style and school achievement. The data gathered to this end also facilitated an examination of two competing explanatory models of the achievement differences between Maori and Pakeha children: namely, the Environmental Deprivation model which seeks to explain the under-achievement of Maori children in terms of low occupational status, large families, rural residence, later starting ages and so on; and the Cultural Difference model which seeks to explain the underachievement of Maori children in terms of a culture conflict between home and school - between a minority culture and the schools of a different 'mainstream' culture.

A number of hypotheses were set up in Chapter 1 to test these models and the results are reported in detail in Chapter 4. Three separate measures of achievement were used: a composite index made up from scores on three PAT tests (see Chapter 3, p. 42); a Teacher Rating index (pp. 42-43); and Ravens non-verbal I.Q. test (p. 41).

The first major point to note is that on none of the achievement criteria do the independent variables used in the study (SES, family size, age, sex, rural-urban, Maori-Pakeha) account for more than a small amount of the variance in performance amongst the individual children in the sample - 15% for the PAT Index, 17% for the Teacher Rating Index, and 8% for the Ravens Test (see Tables 4.10, 4.11 and 4.12).[20]

A second point to note is that when the independent variables mentioned above are controlled in a multiple regression analysis, the initial (or zero-order) correlation between ethnicity and achievement is reduced considerably, which lends a measure of support to the Environmental

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20. These variance estimates will be low due to the information loss sustained when the SES, family size and age variables were reduced to dichotomies - see p. 60. Re-running the regressions using the untransformed independent variables (with no interactions included) produces variance estimates of 21% for the PAT Index, 21.5% for the Teacher Rating Index, and 9% for the Ravens Test. The addition of all first order interactions results in variance estimates of 23%, 25% and 12% respectively.

Deprivation model.[21] In the case of the Teacher Rating Index, the correlation disappears altogether which indicates (within the confines of the sample used in this study) that teachers are not directly influenced by ethnic considerations in their assessments of children. With the PAT and Ravens as criteria, however, there still remains a statistically significant (though theoretically rather negligible) correlation between ethnicity and criterion perfoemance after controlling for the environmental variables. Additional post hoc analysis was undertaken to gain further insight into the criteria used by teachers in their ratings of children - see p. 66 and Table 4.13. This analysis showed that the main criterion of the teachers' ratings was performance level (as indicated by the high correlation with PAT test performance), with some additional contribution made by certain behavioural characteristics, particularly that labelled "Independence". Hence the zero-order correlation between ethnicity and teacher ratings (p. 12, Table 4.9) is largely an artifact of the relationship between ethnicity and PAT test performance (see Table 4.10), this latter variable influencing the teachers' ratings rather than ethnicity per se.

Overall then, the Environmental Deprivation model is supported when Teacher Rating constitutes the criterion of achievement, while with the two objective tests as criteria (PAT and Ravens), consideration must be given to both the Environmental Deprivation and the Cultural Difference models. However, the first point noted above must be kept in mind when considering these two explanatory models - i.e. we are only dealing here with a small part of the total achievement variance amongst the children in this sample. It is clear from the data reported here that three quarters of the variance amongst individual children remains unaccounted for. Such a finding is in line with many overseas findings relating environmental variables with achievement - see for example Jensen, 1973. A major debate concerned with accounting for this remaining variance has developed particularly since the publication of Jensen (1969). He states (1973: 355) that genetic factors appear to be about twice as important as environmental factors as the cause of "intelligence" differences among

21. The word "deprivation" is not used in any pejorative sense, but to describe a situation in which a particular group is over-represented in categories of environmental variables which prove disfunctional for high achievement.

individuals within a population, a statement which is not disputed by his critics (Hunt, 1969: 280-281; Crow, 1969: 305-306; Bereiter, 1969: 310; Cronback, 1969: 338-339). However, there is no such consensus over the extent to which genetic factors may be involved in racial achievement differences. The variable "Ethnicity" used in the study reported here was not based on any genetic criteria hence no comments can be made on such an involvement. Defined in non-genetic terms (see pp. 40-41), ethnicity has only a small contribution to make to the variance of the test criteria after controlling for five environmental variables. The addition of further environmental variables (such as parents' attitudes to education, motivational factors and so on) could well account for the remaining ethnic variance. This would still leave a large residual of the achievement variance in the total sample unaccounted for. Until environmentalists can produce further non-genetic variables that can account for such a residual (or some part of it), present opinion would seem to be that it is due to the normal genotypic variation to be found within any population for such poly-genetic phenomena as "intelligence" or "achievement". This makes the small amount of variance attributable to non-genetic sources of much greater theoretical significance than would normally be adduced from the statistical properties, since it is the only part of the variance between individuals that is accessible to intervention or manipulation.

A third point to note is that where environmental variables taken singly act as discriminators on achievement measures for the sample as a whole, in the case of both SES and rural-urban location they do not act as significant discriminators within the Maori sub-sample - see Tables 4.3, 4.4 and 4.5, pp. 51-53. This lends support to McDonald's contention (1975: 80-81) that rural-urban location and SES are unsatisfactory as matching criteria in comparative studies of Maori and Pakeha, as they act quite differently (in an explanatory or predictive sense) within the two populations. Further inspection of Tables 4.3, 4.4 and 4.5 shows that for the test criteria (PAT and Ravens) and in the case of every independent variable, the Maori group in the category which proved most favourable to achievement in the sample as a whole, score lower on the achievement measures than do the Pakeha children in the least favourable group. Thus matching Maori and Pakeha children on any of the independent variables will not effect any significant reduction in test performance differences. This pattern does not occur with the Teacher Rating Index as criterion

(Table 4.4). Controlling for all the independent variables simultaneously (through multiple regression, Tables 4.10 and 4.12, and the discussion above) does not eliminate test performance differences between Maori and Pakeha children either. The data in this study then, do not support Lovegrove's finding of no significant difference between Maori and Pakeha children from "..... almost comparable home backgrounds..." (1966: 31). For the reasons mentioned earlier, this does not apply to the Teacher Rating Criterion (Tables 4.4 and 4.11) used in this study (Lovegrove's scholastic achievement measures were all test based).

From the rather small multiple correlation coefficients reported in Chapter 4, it would appear that the differences between individuals in both ethnic groups far outweigh any differences to be found between the two groups of individuals classified as Maori or Pakeha. The predominant and continued interest in explaining performance differences in terms of the kind of environmental factors used in this study may be diverting teachers and researchers from the much more fruitful 'causes' of such differences. As Jensen (1973: 204) suggests, such environmental variables

> "... are 'crude' not in the sense that they do not account for a major proportion of the environmental variance in (achievement), but only in the sense that they are not analytical - they do not pinpoint the most potent specific sources of environmental variance encompassed within these broad or 'crude' measures."

It would seem clear that simply belonging to a particular ethnic or SES group does not 'cause' different levels of achievement directly. A much more complex explanation is called for - one which invokes intervening variables directly related to achievement and which may be differentially distributed amongst the various categories of the 'crude' environmental measures. Jensen himself would argue that one such intervening variable could be the genetic differences that exist between different racial, ethnic and even social groups. However, there are other possibilities within the realm of the cultural (i.e. non-genetic) differences that also exist between various racial, ethnic or social groups, such as different attitudes toward the value or 'worthwhileness' of 'doing well at school', different beliefs about the way children should be treated by adults both in terms of child rearing practices and in everyday life, different emphasis placed on educational qualifications in determining status and prestige within a group, and so on - see for example Harker, 1971b: 23-25.

One such 'intervening variable' that has proven fruitful in overseas studies is the behavioural dimension of Cognitive Style, which provided a major theoretical impetus for this study (see Chapter 2 for an explication of this concept). The overseas studies show significant cultural differences in cognitive categorization (or cognitive style), and that the various modes of classification are differentially correlated to school achievement. For example, the response mode classified as Relational (see p. 18) is negatively correlated to achievement and is found to be the preferred mode of classification for children from low SES homes (Cohen, 1969). From the survey of the literature (Chapter 2) cognitive style differences seem to derive from different child rearing practices, the nature of mother-child interactions and different social organisation patterns. The literature on Maori-Pakeha differences in such respects is also surveyed in Chapter 2, from which it was concluded that a number of environmental variables (in addition to ethnicity) should affect cognitive style responses. It would seem clear that if the 'causes' pinpointed in the overseas literature are to be extended to New Zealand, then SES, family size and rural-urban location could all affect child rearing practices, mother-child interactions and social patterns. Thus in Chapter 2, twenty hypotheses were set up to explore the relationships between ethnicity, environmental variables, cognitive style and achievement. The findings are reported in Chapter 5.

The main finding of Chapter 5 was the lack of any significant relationship between cognitive style and ethnicity, SES or family size - see Tables 5.1, 5.3 and 5.4. Rural-urban location was the only variable to be significantly related to all three modes of response on the Cognitive Style test. However, in examing this effect within each ethnic group separately, a statistically significant relationship is sustained only within the Pakeha group (see Tables 5.6 and 5.13). The findings from the sample in this study suggest a much more generalised effect of environment on cognitive style than was expected on the basis of overseas research evidence. It would appear that the total and generalised 'life style' fostered in either an urban or rural community affects the way in which a child responds on the Cognitive Style test - the content and range of experience to which they are exposed, irrespective of other specific influences such as ethnicity, SES or family size (see pp. 21-22 and 98-99 for further elaboration).

In examining the relationship between cognitive style and achievement, however, differences between Maori and Pakeha children do emerge, though at a rather weak statistical level. Overseas research reviewed in Chapter 2 (see pp. 18-20) suggests that the correlations between analytic responses and achievement should be positive; relational responses and achievement should be negative; and categorical responses and achievement should be positive. Such a pattern of correlations emerged for the total sample in this study - see Table 5.8. However, as for many of the other findings reported here, such a pattern is sustained only within the Pakeha sub-sample - see Tables 5.9, 5.10, 5.11 and 5.12. For the Maori sub-sample no significant correlations emerge from the data, although there is a consistent trend for the non-significant correlations to be in a direction opposite to those reported for the Pakeha sub-sample. These correlational differences, together with the fact that Maori children produce as many analytic responses as Pakeha children, lend support to Chapman's contention that the Maori:

> "may be as analytic in thought and perception as the Pakeha, but his thought is directed more toward interpersonal rather than occupational or academic goals." (1973: 43)

While being unable to show that Maori thought is directed toward 'interpersonal goals', the data in Tables 5.9, 5.10, 5.11 and 5.12 show at least that cognitive style and achievement (academic goals in Chapman's terminology) are independent phenomena for the Maori sub-sample but interrelated for the Pakeha sub-sample. This would seem to suggest that some cognitive phenomena are utilised for different purposes by children in the two ethnic groups, which could be a fruitful line for further investigation.

From this study as a whole, it appears that many of the usual environmental variables which relate to school achievement, I.Q. and cognitive style within Western European based cultures (in New Zealand as well as overseas) are not useful or relevant when considering Maori school children. In terms of environmental differences, the performance of Maori children in this study was far less affected by environmental variations (such as SES) than was so for the Pakeha children, while the range of individual performances was as great within both sub-samples. This suggests that there is a generalised (or generalising) factor affecting the performance of Maori children as a whole, producing similarity of performance despite the specific environmental differences in which

they live, and which have a relatively strong effect on Pakeha children.

This phenomena seems consistent with the Cultural Difference model as outlined in Chapter 1, and given specific application to education by Walker (1973: 112; supra, pp. 4-5). Cultural difference implies, amonst other things, different value systems, which include in turn, different definitions of 'worthwhile activities'. If a minority culture places less emphasis on achievement (in the educational institutions of the majority culture) as a worthwhile activity than does some other culture, and furthermore, if in that minority culture educational achievement does not automatically confer high social status or prestige on the achiever, then it is to be expected that children from such a minority culture will not perform so well at schools oriented to an achievement based set of values and status conferring criteria. This would seem to be the case in New Zealand with regard to Maori and Pakeha children.

In the face of strong pressures to equalise educational performance for Maori and Pakeha children, there would appear to be but two choices (or some combination of them): through parent education and intensive pre-school intervention attempt to restructure the value system of Maori children in order to bring it into line with the requirements for success in the school environment; or make adjustments to the school environment (such as curriculum reform) in order to provide greater continuity with the Maori value system. Both of these alternatives have inherent problems. The first alternative, if successful, would result in the disappearance of Maori culture as a distinctive life style - and the history of education in New Zealand has shown that over a century of effort along such lines has not been particularly fruitful, and has been perhaps counter-productive. The second alternative may go some way to achieving the desired objective, but as Glazer suggests;

> "... those groups that do well in one school system will very likely do well in another." (1969: 193)

What he is suggesting is that if the criteria for success in school are changed, those groups with high cultural motivation to succeed will adapt and continue to succeed under the new criteria. For Glazer the factors 'causing' ethnic differences in educational achievement lie in the different value systems of the cultures associated with various ethnic groups and the extent to which such value systems motivate children to succeed in a school environment. Hence achievement differences cannot be ameliorated by changes to the educational system - which rules out the

second alternative mentioned above.

But the first alternative is not tenable either in a democratic, pluralistic society such as New Zealand. As the Advisory Coundil on Educational Planning state:

> "In a society which permits a wide diversity of styles of life and beliefs, and which is vigorously pursuing with its main ethnic sub-group a policy of cultural coexistence, it is obvious that no consensus on detailed national aims of education is possible. In fact, such consensus would indicate a degree of cultural conformity which is the very opposite of the present aim of cultural diversification." (1972: 1-3)

Is there a solution to this dilemma? The beginnings of a solution are perhaps to be found in a questioning of the wisdom of insisting on equalising performance for all ethnic groups. If New Zealanders are genuine about their society as a multi-cultural one, in which all cultures are accorded equal status, then perhaps we have to learn to live with some measure of achievement differences between ethnic groups. If success in school is in some way related to achievement motivation which in turn has its roots in cultural value systems and life styles, and it is these value systems and life styles we wish to retain as viable alternatives in our society, then it would seem inevitable that we should expect there to be achievement differences between ethnic groups. Glazer makes some important points when he reflects that:

> "The question that troubles me most is what attitude we are to take to these differences. Are we to view them as the consequences of ill-will - that of teacher, administrator, the society in general? How elaborate are we to make the efforts to wipe them out, and how successful can we hope to be no matter how elaborate our efforts are? Are our measures to equalize to include the restriction of the opportunities of those groups that seem to find school achievement easy? Or are we to develop a set of values that accepts within some measure differences as desirable and expectable , and tries to mitigate the negative consequences that society imposes for them? These are hard questions, and they are questions to which we do not have answers. Nor are they questions for the United States alone. They are questions for every ethnically diverse society in which some groups show distinct patterns of educational achievement, whether in Malaya, Nigeria, Indonesia, or what have you, in which all these questions are real and live.
>
> They are questions that can destroy a society, and we are already halfway there. We need to press not only our research on these differences, their origins, their extent, their causes, the measures that reduce them, but also develop and strengthen a political and social philosophy that permits a society to accept them, to live with them, and be stronger because of them. (1969: 195)

Glazer's sentiments find an echo in the report of The Committee on Secondary Education (1976) who state that their recommendations:

> "... are an attempt to compensate for differences that put any group at a disadvantage, to remove discrimination, and to provide for the development of society beyond mere acceptance of cultural complexity... What we had to work towards was the step beyond recognition of difference, beyond respect for diversity, even beyond tolerance... It is our hope that the new generations of New Zealanders, as well as coming to understand the major cultures, will appreciate also our many cultures. They will accordingly respect them and, because they value the diversity that results, will identify with each and every culture and hold their opportunity to do so as something precious." (1976: 20-21)

From the perspective of the findings presented in this study, the point that then becomes problematic is trying to determine the area where achievement differences constitute real disadvantages for individuals in our society, over and above the differences that will inevitably arise between children from diverse backgrounds in a uniform national education system.

APPENDIX 1

Cognitive Style Test

INSTRUCTIONS: FOR INDIVIDUAL APPLICATION OF THE COGNITIVE STYLE TEST

Have the pictures ready for presentation, and fill in the top of the answer record as follows:-

1. Name
2. Age - add the date of birth above this
3. Class - room number
4. School
5. Put today's date in top left hand corner

THEN SAY:

* I am going to show you some pictures arranged in groups of three, which
* are pictures of many familiar things. For each set of three pictures I
* want you to pick out any two of the things which go together, belong
* together or are related in any way, and tell me which you have chosen.
* Then I want you to tell me why you chose those two.

At this point, using the first set of three, elicit a response from the subject and his reason for making the choice. Write the letters of the two objects in the boxes, and write in (clearly) the reason given for the choice.

THEN SAY:

* Do you understand what I want you to do?

* All you do is pick out the two things that you think go together and
* then tell me why you think they go together.

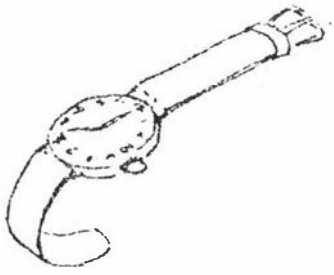
* Good, then let's continue.

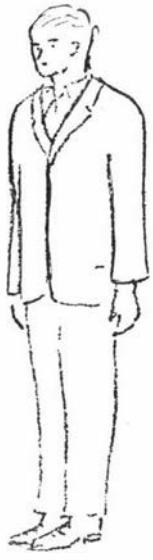
Proceed through all the pictures, checking to see that you are writing the subjects responses in the correct place i.e. that the number on the picture coincides with the appropriate number on the answer record.

N.B. Some children will give as a reason:

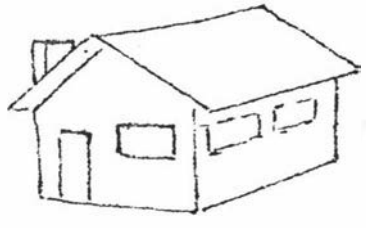
1. They go together; or
2. It goes with that;

In such cases probe further by asking "why?"





1. a. b. c.



2. d. e. f.

3. a. b. c.

4. d.

e.

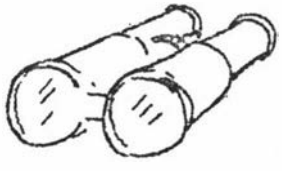
f.

5. a.

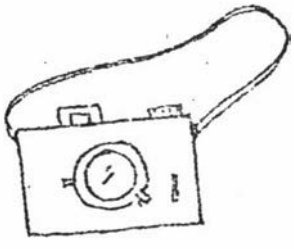
b.

c.

6. d.



e

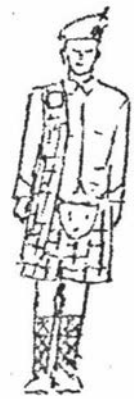


f

7.

a.

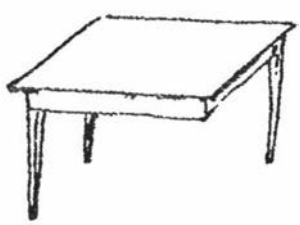
b.



c.

8.

d.

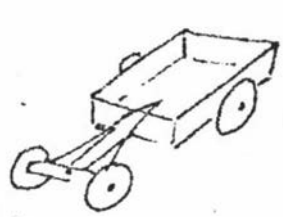


e.

f.

9.

a.

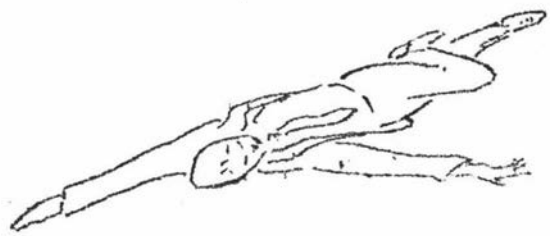


b.

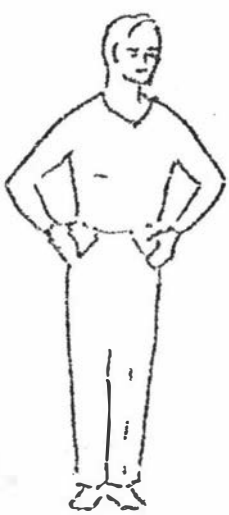
c.

10. d.

e.



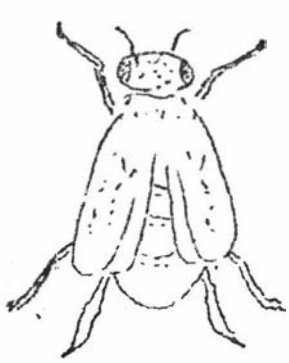
f.



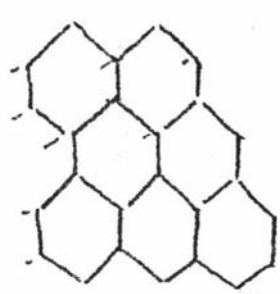
11. a.

b.

c.

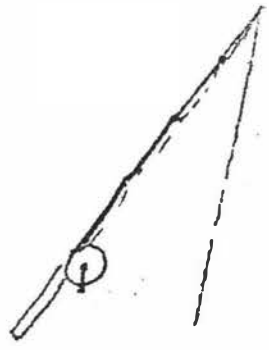


12. d.



e.

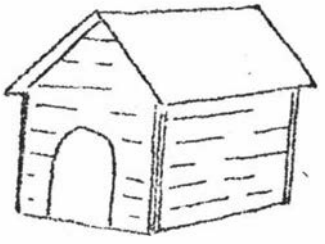
f.



13. a. b. c.

14. d. e. f.

15. a. b. c.



16. d. e. f.

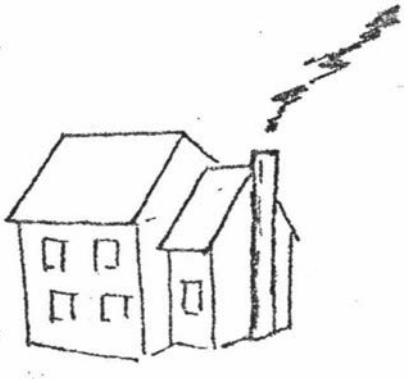
17. a. b. c.

18. d. e. f.

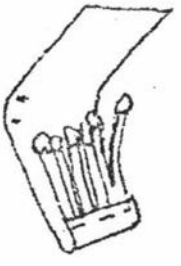
19. a.

b.

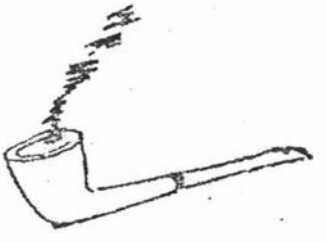
c.



20. d.



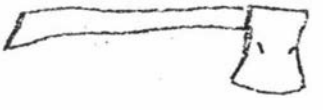
e.



f.

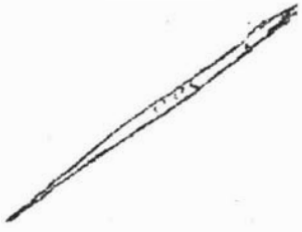
21 a.

b.



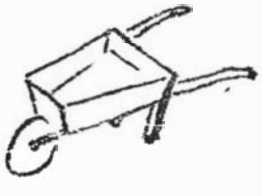
c.

22. d e. f.



23. a. b. c.

24. d. e. f.



25. a. b. c.

Answer Record

MASSEY UNIVERSITY

Department of Education

Name:- _____ Age __ yrs _ months

Class:- _____ School:- _____

Which two go together?

1. [ ] and [ ] ..... Because _____

_____

3.. [ ] and [ ] ..... Because _____

_____

4. [ ] and [ ] ..... Because _____

_____

5. [ ] and [ ] ..... Because _____

_____

6.. [ ] and [ ] ..... Because _____

_____

7. [ ] and [ ] ..... Because _____

_____

8.. [ ] and [ ] ..... Because _____

_____

12. [ ] and [ ] ..... Because _____

_____

13. [ ] and [ ] ..... Because _____

_____

14. [ ] and [ ] ..... Because _____

_____

16. [ ] and [ ] ..... Because _____

_____

18. [ ] and [ ] ..... Because _____

_____

19. [ ] and [ ] .... Because________________

20. [ ] and [ ] .... Because________________

21. [ ] and [ ] .... Because________________

22. [ ] and [ ] .... Because________________

23. [ ] and [ ] .... Because________________

25. [ ] and [ ] .... Because________________

26. [ ] and [ ] .... Because________________

27. [ ] and [ ] .... Because________________

29. [ ] and [ ] .... Because________________

31. [ ] and [ ] .... Because________________

32. [ ] and [ ] .... Because________________

33. [ ] and [ ] .... Because________________

35. [ ] and [ ] .... Because________________

Appendix 2

a) Frequency distributions of variables used in this study - Tables A2.1 to A2.28.

b) Crosstabulations with Ethnicity of variables used in this study - Tables A2.29 to A2.55.

Table A2.1

RURB Rural - Urban Location

CATEGORY LABEL	CODE	ABSOLUTE FREQUENCY	RELATIVE FREQUENCY (PERCENT)	ADJUSTED FREQUENCY (PERCENT)	CUMULATIVE ADJ FREQ (PERCENT)
URBAN	1	270	42.5	42.5	42.5
RURAL	2	365	57.5	57.5	100.0
	TOTAL	635	100.0	100.0	

VALID CASES = 635
MISSING CASES = 0

Table A2.2

VAR02 SEX

CATEGORY LABEL	CODE	ABSOLUTE FREQUENCY	RELATIVE FREQUENCY (PERCENT)	ADJUSTED FREQUENCY (PERCENT)	CUMULATIVE ADJ FREQ (PERCENT)
MALE	1	303	47.7	47.9	47.9
FEMALE	2	330	52.0	52.1	100.0
	0	2	0.3	MISSING	100.0
	TOTAL	635	100.0	100.0	

VALID CASES = 633
MISSING CASES = 2

Table A2.3

VAR03 AGE IN MONTHS AT 1-6-74

CATEGORY LABEL	CODE	ABSOLUTE FREQUENCY	RELATIVE FREQUENCY (PERCENT)	ADJUSTED FREQUENCY (PERCENT)	CUMULATIVE ADJ FREQ (PERCENT)
	101	1	0.2	0.2	0.2
	103	1	0.2	0.2	0.3
	105	3	0.5	0.5	0.8
	106	6	0.9	1.0	1.8
	107	7	1.1	1.1	2.9
	108	8	1.3	1.3	4.2
	109	18	2.8	2.9	7.0
	110	32	5.0	5.1	12.1
	111	29	4.6	4.6	16.8
	112	28	4.4	4.5	21.2
	113	36	5.7	5.8	27.0
	114	50	7.9	8.0	35.0
	115	44	6.9	7.0	42.0
	116	51	8.0	8.1	50.2
	117	51	8.0	8.1	58.3
	118	41	6.5	6.5	64.9
	119	50	7.9	8.0	72.8
	120	37	5.8	5.9	78.8
	121	21	3.3	3.4	82.1
	122	37	5.8	5.9	88.0
	123	21	3.3	3.4	91.4
	124	11	1.7	1.8	93.1
	125	7	1.1	1.1	94.2
	126	9	1.4	1.4	95.7
	127	8	1.3	1.3	97.0
	128	13	2.0	2.1	99.0
	129	5	0.8	0.8	99.8
	132	1	0.2	0.2	100.0
	0	9	1.4	MISSING	100.0
	TOTAL	635	100.0	100.0	

MEAN	116.633	STD ERR	0.203	MEDIAN	116.480
MODE	116.000	STD DEV	5.090		

QUARTILES 113.000 116.000 120.000

VALID CASES = 626
MISSING CASES = 9

Table A2.4

VAR04 ETHNICITY

CATEGORY LABEL	CODE	ABSOLUTE FREQUENCY	RELATIVE FREQUENCY (PERCENT)	ADJUSTED FREQUENCY (PERCENT)	CUMULATIVE ADJ FREQ (PERCENT)
EUROPEAN	1	398	62.7	62.7	62.7
MAORI	2	237	37.3	37.3	100.0
	TOTAL	635	100.0	100.0	

VALID CASES = 635
MISSING CASES = 0

Table A2.5

VAR05 SES

CATEGORY LABEL	CODE	ABSOLUTE FREQUENCY	RELATIVE FREQUENCY (PERCENT)	ADJUSTED FREQUENCY (PERCENT)	CUMULATIVE ADJ FREQ (PERCENT)
	1	16	2.5	2.6	2.6
	2	79	12.4	12.8	15.4
	3	62	9.8	10.1	25.5
	4	121	19.1	19.6	45.1
	5	159	25.0	25.8	70.9
	6	144	22.7	23.4	94.3
SOLO PARENT	7	35	5.5	5.7	100.0
	0	19	3.0	MISSING	100.0
	TOTAL	635	100.0	100.0	

VALID CASES = 616
MISSING CASES = 19

Table A2.6

VAR06 NO. OF SIBLINGS

CATEGORY LABEL	CODE	ABSOLUTE FREQUENCY	RELATIVE FREQUENCY (PERCENT)	ADJUSTED FREQUENCY (PERCENT)	CUMULATIVE ADJ FREQ (PERCENT)
	0	8	1.3	1.4	1.4
	1	76	12.0	13.1	14.5
	2	127	20.0	21.9	36.4
	3	133	20.9	22.9	59.3
	4	80	12.6	13.8	73.1
	5	41	6.5	7.1	80.2
	6	31	4.9	5.3	85.5
	7	30	4.7	5.2	90.7
	8	10	1.6	1.7	92.4
	9	15	2.4	2.6	95.0
	10	12	1.9	2.1	97.1
	11	4	0.6	0.7	97.8
	12	3	0.5	0.5	98.3
	13	2	0.3	0.3	98.6
	14	3	0.5	0.5	99.1
	15	4	0.6	0.7	99.8
	23	1	0.2	0.2	100.0
	99	55	8.7	MISSING	100.0
	TOTAL	635	100.0	100.0	

MEAN	3.821	STD ERR	0.116	MEDIAN	3.094
MODE	3.000	STD DEV	2.795		
QUARTILES	2.000	3.000	5.000		

VALID CASES = 580
MISSING CASES = 55

Table A2.7

VAR07 RAVENS RAW SCORE

CATEGORY LABEL	CODE	ABSOLUTE FREQUENCY	RELATIVE FREQUENCY (PERCENT)	ADJUSTED FREQUENCY (PERCENT)	CUMULATIVE ADJ FREQ (PERCENT)
	6	1	0.2	0.2	0.2
	8	1	0.2	0.2	0.3
	9	3	0.5	0.5	0.9
	10	10	1.6	1.7	2.6
	11	8	1.3	1.4	4.0
	12	9	1.4	1.6	5.5
	13	14	2.2	2.4	7.9
	14	16	2.5	2.8	10.7
	15	17	2.7	2.9	13.6
	16	15	2.4	2.6	16.2
	17	10	1.6	1.7	17.9
	18	4	0.6	0.7	18.6
	19	9	1.4	1.6	20.2
	20	17	2.7	2.9	23.1
	21	9	1.4	1.6	24.7
	22	18	2.8	3.1	27.8
	23	18	2.8	3.1	30.9
	24	16	2.5	2.8	33.6
	25	10	1.6	1.7	35.3
	26	9	1.4	1.6	36.9
	27	12	1.9	2.1	39.0
	28	18	2.8	3.1	42.1
	29	24	3.8	4.1	46.2
	30	15	2.4	2.6	48.8
	31	21	3.3	3.6	52.4

/cont.

Table A2.7(cont.)

VAR07 RAVENS RAW SCORE

32	27	4.3	4.7	57.1
33	29	4.6	5.0	62.1
34	26	4.1	4.5	66.6
35	27	4.3	4.7	71.2
36	21	3.3	3.6	74.8
37	27	4.3	4.7	79.5
38	22	3.5	3.8	83.3
39	18	2.8	3.1	86.4
40	17	2.7	2.9	89.3
41	16	2.5	2.8	92.1
42	14	2.2	2.4	94.5
43	10	1.6	1.7	96.2
44	7	1.1	1.2	97.4
45	8	1.3	1.4	98.8
46	1	0.2	0.2	99.0
47	2	0.3	0.3	99.3
48	1	0.2	0.2	99.5
49	3	0.5	0.5	100.0
99	55	8.7	MISSING	100.0
TOTAL	635	100.0	100.0	

MEAN	28.936	STD ERR	0.403	MEDIAN	30.833
MODE	33.000	STD DEV	9.703		
QUARTILES	22.000	31.000	37.000		

VALID CASES = 580
MISSING CASES = 55

Table A2.8

VAR09 RELATIONAL SCORE ON CST

CATEGORY LABEL	CODE	ABSOLUTE FREQUENCY	RELATIVE FREQUENCY (PERCENT)	ADJUSTED FREQUENCY (PERCENT)	CUMULATIVE ADJ FREQ (PERCENT)
	0	12	1.9	2.1	2.1
	1	14	2.2	2.4	4.5
	2	14	2.2	2.4	7.0
	3	12	1.9	2.1	9.1
	4	11	1.7	1.9	11.0
	5	14	2.2	2.4	13.4
	6	21	3.3	3.7	17.1
	7	24	3.8	4.2	21.3
	8	37	5.8	6.4	27.7
	9	40	6.3	7.0	34.7
	10	36	5.7	6.3	40.9
	11	33	5.2	5.7	46.7
	12	34	5.4	5.9	52.6
	13	33	5.2	5.7	58.4
	14	37	5.8	6.4	64.8
	15	40	6.3	7.0	71.8
	16	35	5.5	6.1	77.9
	17	25	3.9	4.4	82.2
	18	27	4.3	4.7	86.9
	19	26	4.1	4.5	91.5
	20	15	2.4	2.6	94.1
	21	15	2.4	2.6	96.7
	22	11	1.7	1.9	98.6
	23	3	0.5	0.5	99.1
	24	3	0.5	0.5	99.7
	25	2	0.3	0.3	100.0
	99	61	9.6	MISSING	100.0
	TOTAL	635	100.0	100.0	

MEAN	11.904	STD ERR	0.234	MEDIAN	12.059
MODE	9.000	STD DEV	5.607		
QUARTILES	8.000	12.000	16.000		

VALID CASES = 574
MISSING CASES = 61

Table A2.9

VAR10 CATEGORICAL SCORE ON CST

CATEGORY LABEL	CODE	ABSOLUTE FREQUENCY	RELATIVE FREQUENCY (PERCENT)	ADJUSTED FREQUENCY (PERCENT)	CUMULATIVE ADJ FREQ (PERCENT)
	0	3	0.5	0.5	0.5
	1	12	1.9	2.1	2.6
	2	27	4.3	4.7	7.3
	3	47	7.4	8.2	15.5
	4	45	7.1	7.8	23.3
	5	47	7.4	8.2	31.5
	6	66	10.4	11.5	43.0
	7	57	9.0	9.9	53.0
	8	53	8.3	9.2	62.2
	9	47	7.4	8.2	70.4
	10	44	6.9	7.7	78.0
	11	28	4.4	4.9	82.9
	12	24	3.8	4.2	87.1
	13	27	4.3	4.7	91.8
	14	14	2.2	2.4	94.3
	15	10	1.6	1.7	96.0
	16	8	1.3	1.4	97.4
	17	4	0.6	0.7	98.1
	18	2	0.3	0.3	98.4
	19	6	0.9	1.0	99.5
	20	1	0.2	0.2	99.7
	21	1	0.2	0.2	99.8
	22	1	0.2	0.2	100.0
	99	61	9.6	MISSING	100.0
	TOTAL	635	100.0	100.0	

MEAN	7.676	STD ERR	0.166	MEDIAN	7.202
MODE	6.000	STD DEV	3.988		
QUARTILES	5.000	7.000	10.000		

VALID CASES = 574
MISSING CASES = 61

Table A2.10

VAR11 ANALYTIC SCORE ON CST

CATEGORY LABEL	CODE	ABSOLUTE FREQUENCY	RELATIVE FREQUENCY (PERCENT)	ADJUSTED FREQUENCY (PERCENT)	CUMULATIVE ADJ FREQ (PERCENT)
	0	33	5.2	5.7	5.7
	1	46	7.2	8.0	13.8
	2	56	8.8	9.8	23.5
	3	79	12.4	13.8	37.3
	4	70	11.0	12.2	49.5
	5	55	8.7	9.6	59.1
	6	57	9.0	9.9	69.0
	7	45	7.1	7.8	76.8
	8	34	5.4	5.9	82.8
	9	21	3.3	3.7	86.4
	10	17	2.7	3.0	89.4
	11	12	1.9	2.1	91.5
	12	12	1.9	2.1	93.6
	13	8	1.3	1.4	94.9
	14	6	0.9	1.0	96.0
	15	5	0.8	0.9	96.9
	16	2	0.3	0.3	97.2
	17	8	1.3	1.4	98.6
	18	5	0.8	0.9	99.5
	19	1	0.2	0.2	99.7
	20	1	0.2	0.2	99.8
	21	1	0.2	0.2	100.0
	99	61	9.6	MISSING	100.0
	TOTAL	635	100.0	100.0	

MEAN	5.392	STD ERR	0.166	MEDIAN	4.555
MODE	3.000	STD DEV	3.982		
QUARTILES	3.000	5.000	7.000		

VALID CASES = 574
MISSING CASES = 61

Table A2.11

VAR23 PAT READING COMP. RAW SCORES

CATEGORY LABEL	CODE	ABSOLUTE FREQUENCY	RELATIVE FREQUENCY (PERCENT)	ADJUSTED FREQUENCY (PERCENT)	CUMULATIVE ADJ FREQ (PERCENT)
	2	2	0.3	0.4	0.4
	3	4	0.6	0.8	1.2
	4	17	2.7	3.3	4.5
	5	17	2.7	3.3	7.8
	6	31	4.9	6.0	13.8
	7	41	6.5	8.0	21.7
	8	32	5.0	6.2	28.0
	9	29	4.6	5.6	33.6
	10	37	5.8	7.2	40.8
	11	34	5.4	6.6	47.4
	12	27	4.3	5.2	52.6
	13	20	3.1	3.9	56.5
	14	26	4.1	5.0	61.6
	15	18	2.8	3.5	65.0
	16	20	3.1	3.9	68.9
	17	14	2.2	2.7	71.7
	18	17	2.7	3.3	75.0
	19	12	1.9	2.3	77.3
	20	15	2.4	2.9	80.2
	21	15	2.4	2.9	83.1
	22	8	1.3	1.6	84.7
	23	12	1.9	2.3	87.0
	24	8	1.3	1.6	88.5
	25	11	1.7	2.1	90.7
	26	4	0.6	0.8	91.5

/cont.

Table A2.11 (cont.)

	27	8	1.3	1.6	93.0
	28	12	1.9	2.3	95.3
	29	3	0.5	0.6	95.9
	30	6	0.9	1.2	97.1
	31	2	0.3	0.4	97.5
	32	3	0.5	0.6	98.1
	33	4	0.6	0.8	98.8
	34	2	0.3	0.4	99.2
	35	1	0.2	0.2	99.4
	36	2	0.3	0.4	99.8
	37	1	0.2	0.2	100.0
	99	120	18.9	MISSING	100.0
	TOTAL	635	100.0	100.0	

MEAN	13.926	STD ERR	0.329	MEDIAN	12.000
MODE	7.000	STD DEV	7.459		
QUARTILES	8.000	12.000	19.000		

VALID CASES = 515
MISSING CASES = 120

Table A2.12

VAR25 PAT READING VOCAB. RAW SCORES

CATEGORY LABEL	CODE	ABSOLUTE FREQUENCY	RELATIVE FREQUENCY (PERCENT)	ADJUSTED FREQUENCY (PERCENT)	CUMULATIVE ADJ FREQ (PERCENT)
	3	1	0.2	0.2	0.2
	4	1	0.2	0.2	0.4
	5	5	0.8	0.9	1.3
	6	14	2.2	2.7	4.0
	7	23	3.6	4.4	8.3
	8	23	3.6	4.4	12.7
	9	22	3.5	4.2	16.9
	10	23	3.6	4.4	21.2
	11	21	3.3	4.0	25.2
	12	23	3.6	4.4	29.5
	13	20	3.1	3.8	33.3
	14	12	1.9	2.3	35.6
	15	25	3.9	4.7	40.3
	16	17	2.7	3.2	43.6
	17	24	3.8	4.5	48.1
	18	19	3.0	3.6	51.7
	19	12	1.9	2.3	54.0
	20	13	2.0	2.5	56.4
	21	18	2.8	3.4	59.8
	22	14	2.2	2.7	62.5
	23	11	1.7	2.1	64.6
	24	21	3.3	4.0	68.6
	25	15	2.4	2.8	71.4
	26	19	3.0	3.6	75.0
	27	9	1.4	1.7	76.7

/cont.

Table A2.12 (cont.)

28	13	2.0	2.5	79.1
29	9	1.4	1.7	80.9
30	16	2.5	3.0	83.9
31	5	0.8	0.9	84.8
32	10	1.6	1.9	86.7
33	11	1.7	2.1	88.8
34	7	1.1	1.3	90.2
35	4	0.6	0.8	90.9
36	9	1.4	1.7	92.6
37	6	0.9	1.1	93.8
38	4	0.6	0.8	94.5
39	6	0.9	1.1	95.6
41	5	0.8	0.9	96.6
42	6	0.9	1.1	97.7
43	3	0.5	0.6	98.3
44	3	0.5	0.6	98.9
45	2	0.3	0.4	99.2
46	3	0.5	0.6	99.8
48	1	0.2	0.2	100.0
99	107	16.9	MISSING	100.0
TOTAL	635	100.0	100.0	

MEAN	19.907	STD ERR	0.439	MEDIAN	18.026
MODE	15.000	STD DEV	10.084		
QUARTILES	11.000	18.000	26.500		

VALID CASES = 528
MISSING CASES = 107

Table A2.13

VAR27 PATLISTENING COMP. RAW SCORES

CATEGORY LABEL	CODE	ABSOLUTE FREQUENCY	RELATIVE FREQUENCY (PERCENT)	ADJUSTED FREQUENCY (PERCENT)	CUMULATIVE ADJ FREQ (PERCENT)
	1	1	0.2	0.2	0.2
	5	2	0.3	0.4	0.6
	7	2	0.3	0.4	1.0
	8	7	1.1	1.4	2.3
	9	9	1.4	1.8	4.1
	10	7	1.1	1.4	5.5
	11	11	1.7	2.1	7.6
	12	9	1.4	1.8	9.4
	13	14	2.2	2.7	12.1
	14	11	1.7	2.1	14.3
	15	27	4.3	5.3	19.5
	16	20	3.1	3.9	23.4
	17	24	3.8	4.7	28.1
	18	20	3.1	3.9	32.0
	19	26	4.1	5.1	37.1
	20	29	4.6	5.7	42.8
	21	27	4.3	5.3	48.0
	22	18	2.8	3.5	51.6
	23	24	3.8	4.7	56.3
	24	23	3.6	4.5	60.7
	25	23	3.6	4.5	65.2
	26	21	3.3	4.1	69.3
	27	22	3.5	4.3	73.6
	28	15	2.4	2.9	76.6
	29	25	3.9	4.9	81.4

/cont.

Table A2.13 (cont.)

	30	15	2.4	2.9	84.4
	31	21	3.3	4.1	88.5
	32	12	1.9	2.3	90.8
	33	10	1.6	2.0	92.8
	34	10	1.6	2.0	94.7
	35	8	1.3	1.6	96.3
	36	7	1.1	1.4	97.7
	37	6	0.9	1.2	98.8
	38	4	0.6	0.8	99.6
	39	1	0.2	0.2	99.8
	40	1	0.2	0.2	100.0
	99	123	19.4	MISSING	100.0
	TOTAL	635	100.0	100.0	

MEAN	22.326	STD ERR	0.326	MEDIAN	22.056
MODE	20.000	STD DEV	7.385		
QUARTILES	17.000	22.000	28.000		

VALID CASES = 512
MISSING CASES = 123

Table A2.14

VAR29 TEACHER RATING - ORAL LANGUAGE

CATEGORY LABEL	CODE	ABSOLUTE FREQUENCY	RELATIVE FREQUENCY (PERCENT)	ADJUSTED FREQUENCY (PERCENT)	CUMULATIVE ADJ FREQ (PERCENT)
SUPERIOR	1	15	2.4	2.5	2.5
ABOVE AVERAGE	2	108	17.0	17.6	20.1
AVERAGE	3	356	56.1	58.2	78.3
BELOW AVERAGE	4	122	19.2	19.9	98.2
INFERIOR	5	11	1.7	1.8	100.0
	0	23	3.6	MISSING	100.0
	TOTAL	635	100.0	100.0	

VALID CASES = 612
MISSING CASES = 23

Table A2.15

VAR30 TEACHER RATING - WRITTEN LANGUAGE

CATEGORY LABEL	CODE	ABSOLUTE FREQUENCY	RELATIVE FREQUENCY (PERCENT)	ADJUSTED FREQUENCY (PERCENT)	CUMULATIVE ADJ FREQ (PERCENT)
SUPERIOR	1	18	2.8	2.9	2.9
ABOVE AVERAGE	2	98	15.4	16.0	18.9
AVERAGE	3	318	50.1	51.9	70.8
BELOW AVERAGE	4	158	24.9	25.8	96.6
INFERIOR	5	21	3.3	3.4	100.0
	0	22	3.5	MISSING	100.0
	TOTAL	635	100.0	100.0	

VALID CASES = 613
MISSING CASES = 22

Table A2.16

VAR31 TEACHER RATING, READING

CATEGORY LABEL	CODE	ABSOLUTE FREQUENCY	RELATIVE FREQUENCY (PERCENT)	ADJUSTED FREQUENCY (PERCENT)	CUMULATIVE ADJ FREQ (PERCENT)
SUPERIOR	1	27	4.3	4.4	4.4
ABOVE AVERAGE	2	99	15.6	16.2	20.6
AVERAGE	3	310	48.8	50.6	71.1
BELOW AVERAGE	4	157	24.7	25.6	96.7
INFERIOR	5	20	3.1	3.3	100.0
	0	22	3.5	MISSING	100.0
	TOTAL	635	100.0	100.0	

VALID CASES = 613
MISSING CASES = 22

Table A2.17

VAR32 TEACHER RATING, SPELLING

CATEGORY LABEL	CODE	ABSOLUTE FREQUENCY	RELATIVE FREQUENCY (PERCENT)	ADJUSTED FREQUENCY (PERCENT)	CUMULATIVE ADJ FREQ (PERCENT)
SUPERIOR	1	21	3.3	3.4	3.4
ABOVE AVERAGE	2	89	14.0	14.5	18.0
AVERAGE	3	294	46.3	48.0	66.0
BELOW AVERAGE	4	180	28.3	29.4	95.4
INFERIOR	5	28	4.4	4.6	100.0
	0	23	3.6	MISSING	100.0
	TOTAL	635	100.0	100.0	

VALID CASES = 612
MISSING CASES = 23

Table A2.18

VAR33 TEACHER RATING, WRITING

CATEGORY LABEL	CODE	ABSOLUTE FREQUENCY	RELATIVE FREQUENCY (PERCENT)	ADJUSTED FREQUENCY (PERCENT)	CUMULATIVE ADJ FREQ (PERCENT)
SUPERIOR	1	18	2.8	2.9	2.9
ABOVE AVERAGE	2	114	18.0	18.6	21.5
AVERAGE	3	344	54.2	56.1	77.7
BELOW AVERAGE	4	120	18.9	19.6	97.2
INFERIOR	5	17	2.7	2.8	100.0
	0	22	3.5	MISSING	100.0
	TOTAL	635	100.0	100.0	

VALID CASES = 613
MISSING CASES = 22

Table A2.19

VAR34 TEACHER RATING, ARITHMETIC

CATEGORY LABEL	CODE	ABSOLUTE FREQUENCY	RELATIVE FREQUENCY (PERCENT)	ADJUSTED FREQUENCY (PERCENT)	CUMULATIVE ADJ FREQ (PERCENT)
SUPERIOR	1	21	3.3	3.4	3.4
ABOVE AVERAGE	2	103	16.2	16.8	20.2
AVERAGE	3	311	49.0	50.7	71.0
BELOW AVERAGE	4	147	23.1	24.0	94.9
INFERIOR	5	31	4.9	5.1	100.0
	0	22	3.5	MISSING	100.0
	TOTAL	635	100.0	100.0	

VALID CASES = 613
MISSING CASES = 22

Table A2.20

VAR35 TEACHER RATING, SOC. STUDIES

CATEGORY LABEL	CODE	ABSOLUTE FREQUENCY	RELATIVE FREQUENCY (PERCENT)	ADJUSTED FREQUENCY (PERCENT)	CUMULATIVE ADJ FREQ (PERCENT)
SUPERIOR	1	5	0.8	1.8	1.8
ABOVE AVERAGE	2	35	5.5	12.7	14.5
AVERAGE	3	178	28.0	64.7	79.3
BELOW AVERAGE	4	51	8.0	18.5	97.8
INFERIOR	5	6	0.9	2.2	100.0
	0	360	56.7	MISSING	100.0
	TOTAL	635	100.0	100.0	

VALID CASES = 275
MISSING CASES = 360

Table A2.21

VAR36 TEACHER RATING, NAT. STUDY

CATEGORY LABEL	CODE	ABSOLUTE FREQUENCY	RELATIVE FREQUENCY (PERCENT)	ADJUSTED FREQUENCY (PERCENT)	CUMULATIVE ADJ FREQ (PERCENT)
SUPERIOR	1	3	0.5	1.1	1.1
ABOVE AVERAGE	2	33	5.2	12.2	13.3
AVERAGE	3	190	29.9	70.4	83.7
BELOW AVERAGE	4	39	6.1	14.4	98.1
INFERIOR	5	5	0.8	1.9	100.0
	0	365	57.5	MISSING	100.0
	TOTAL	635	100.0	100.0	

VALID CASES = 270
MISSING CASES = 365

Table A2.22

VAR37 TEACHER RATING, ART & CRAFT

CATEGORY LABEL	CODE	ABSOLUTE FREQUENCY	RELATIVE FREQUENCY (PERCENT)	ADJUSTED FREQUENCY (PERCENT)	CUMULATIVE ADJ FREQ (PERCENT)
SUPERIOR	1	2	0.3	0.8	0.8
ABOVE AVERAGE	2	30	4.7	12.7	13.5
AVERAGE	3	183	28.8	77.2	90.7
BELOW AVERAGE	4	20	3.1	8.4	99.2
INFERIOR	5	2	0.3	0.8	100.0
	0	398	62.7	MISSING	100.0
	TOTAL	635	100.0	100.0	

VALID CASES = 237
MISSING CASES = 398

Table A2.23

VAR38 TEACHER RATING, MUSIC

CATEGORY LABEL	CODE	ABSOLUTE FREQUENCY	RELATIVE FREQUENCY (PERCENT)	ADJUSTED FREQUENCY (PERCENT)	CUMULATIVE ADJ FREQ (PERCENT)
SUPERIOR	1	2	0.3	0.9	0.9
ABOVE AVERAGE	2	27	4.3	11.7	12.6
AVERAGE	3	182	28.7	79.1	91.7
BELOW AVERAGE	4	18	2.8	7.8	99.6
INFERIOR	5	1	0.2	0.4	100.0
	0	405	63.8	MISSING	100.0
	TOTAL	635	100.0	100.0	

VALID CASES = 230
MISSING CASES = 405

Table A2.24

VAR39 TEACHER RATING, PHYS. ED

CATEGORY LABEL	CODE	ABSOLUTE FREQUENCY	RELATIVE FREQUENCY (PERCENT)	ADJUSTED FREQUENCY (PERCENT)	CUMULATIVE ADJ FREQ (PERCENT)
SUPERIOR	1	4	0.6	1.7	1.7
ABOVE AVERAGE	2	47	7.4	20.4	22.2
AVERAGE	3	158	24.9	68.7	90.9
BELOW AVERAGE	4	19	3.0	8.3	99.1
INFERIOR	5	2	0.3	0.9	100.0
	0	405	63.8	MISSING	100.0
	TOTAL	635	100.0	100.0	

VALID CASES = 230
MISSING CASES = 405

Table A2.25

VAR41 TEACHER RATING, STABILITY

CATEGORY LABEL	CODE	ABSOLUTE FREQUENCY	RELATIVE FREQUENCY (PERCENT)	ADJUSTED FREQUENCY (PERCENT)	CUMULATIVE ADJ FREQ (PERCENT)
SUPERIOR	1	30	4.7	5.6	5.6
ABOVE AVERAGE	2	167	26.3	31.2	36.8
AVERAGE	3	261	41.1	48.7	85.4
BELOW AVERAGE	4	71	11.2	13.2	98.7
INFERIOR	5	7	1.1	1.3	100.0
	0	99	15.6	MISSING	100.0
	TOTAL	635	100.0	100.0	

VALID CASES = 536
MISSING CASES = 99

Table A2.26

VAR42 TEACHER RATING, CO-OPERATION

CATEGORY LABEL	CODE	ABSOLUTE FREQUENCY	RELATIVE FREQUENCY (PERCENT)	ADJUSTED FREQUENCY (PERCENT)	CUMULATIVE ADJ FREQ (PERCENT)
SUPERIOR	1	39	6.1	7.3	7.3
ABOVE AVERAGE	2	218	34.3	40.7	47.9
AVERAGE	3	229	36.1	42.7	90.7
BELOW AVERAGE	4	48	7.6	9.0	99.6
INFERIOR	5	2	0.3	0.4	100.0
	0	99	15.6	MISSING	100.0
	TOTAL	635	100.0	100.0	

VALID CASES = 536
MISSING CASES = 99

Table A2.27

VAR43 TEACHER RATING, INDEPENDENCE

CATEGORY LABEL	CODE	ABSOLUTE FREQUENCY	RELATIVE FREQUENCY (PERCENT)	ADJUSTED FREQUENCY (PERCENT)	CUMULATIVE ADJ FREQ (PERCENT)
SUPERIOR	1	32	5.0	6.0	6.0
ABOVE AVERAGE	2	160	25.2	29.9	35.8
AVERAGE	3	252	39.7	47.0	82.8
BELOW AVERAGE	4	87	13.7	16.2	99.1
INFERIOR	5	5	0.8	0.9	100.0
	0	99	15.6	MISSING	100.0
	TOTAL	635	100.0	100.0	

VALID CASES = 536
MISSING CASES = 99

Table A2.28

VAR44 TEACHER RATING, PERSEVERENCE

CATEGORY LABEL	CODE	ABSOLUTE FREQUENCY	RELATIVE FREQUENCY (PERCENT)	ADJUSTED FREQUENCY (PERCENT)	CUMULATIVE ADJ FREQ (PERCENT)
SUPERIOR	1	22	3.5	4.1	4.1
ABOVE AVERAGE	2	150	23.6	28.0	32.1
AVERAGE	3	257	40.5	47.9	80.0
BELOW AVERAGE	4	95	15.0	17.7	97.8
INFERIOR	5	12	1.9	2.2	100.0
	0	99	15.6	MISSING	100.0
	TOTAL	635	100.0	100.0	

VALID CASES = 536
MISSING CASES = 99

FILE HARKER (CREATION DATE = 09/27/76)
SUBFILE EUROP MAORI

* C R O S S T A B U L A T I O N O F * * * * *
VAR04 ETHNICITY BY RURB
* *

	COUNT / ROW % / COL % / TOT %	RURB 1	RURB 2	ROW TOTAL
VAR04				
1 EUROPEAN		184	214	398
		46.2	53.8	62.7
		68.1	58.6	
		29.0	33.7	
2 MAORI		86	151	237
		36.3	63.7	37.3
		31.9	41.4	
		13.5	23.8	
COLUMN TOTAL		270	365	635
		42.5	57.5	100.0

CORRECTED CHI SQUARE = 5.61024 WITH 1 DEGREE OF FREEDOM. SIGNIFICANCE = 0.0179
KENDALL'S TAU B = 0.09729, SIGNIFICANCE = 0.0001
KENDALL'S TAU C = 0.09305, SIGNIFICANCE = 0.0002

FILE HARKER (CREATION DATE = 09/27/76)
SUBFILE EUROP MAORI

* CROSSTABULATION OF * * * *
VAR04 ETHNICITY BY VAR02 SEX
* *

VAR04	COUNT / ROW % / COL % / TOT %	VAR02 MALE (1)	VAR02 FEMALE (2)	ROW TOTAL
1 EUROPEAN		191	207	398
		48.0	52.0	62.9
		63.0	62.7	
		30.2	32.7	
2 MAORI		112	123	235
		47.7	52.3	37.1
		37.0	37.3	
		17.7	19.4	
COLUMN TOTAL		303	330	633
		47.9	52.1	100.0

CORRECTED CHI SQUARE = 0.00000 WITH 1 DEGREE OF FREEDOM. SIGNIFICANCE = 0.9984
KENDALL'S TAU B = 0.00320, SIGNIFICANCE = 0.4521
KENDALL'S TAU C = 0.00308, SIGNIFICANCE = 0.4538

NUMBER OF MISSING OBSERVATIONS = 2

FILE HARKER (CREATION DATE = 09/27/76)
SUBFILE EUROP MAORI

* CROSSTABULATION OF * * * * * * * *
VAR04 ETHNICITY BY AGEGRP AGE GROUP - QUARTILES
* *

		AGEGRP				
	COUNT / ROW % / COL % / TOT %	YOUNGEST LT 9Y.5	9Y.6M TO 9Y.8M	9Y9M TO 9Y11M	10Y OR OLDER	ROW TOTAL
		1	2	3	4	
VAR04						
EUROPEAN	1	120	100	87	88	395
		30.4	25.3	22.0	22.3	63.1
		71.0	69.0	61.3	51.8	
		19.2	16.0	13.9	14.1	
MAORI	2	49	45	55	82	231
		21.2	19.5	23.8	35.5	36.9
		29.0	31.0	38.7	48.2	
		7.8	7.2	8.8	13.1	
	COLUMN TOTAL	169	145	142	170	626
		27.0	23.2	22.7	27.2	100.0

RAW CHI SQUARE = 16.26498 WITH 3 DEGREES OF FREEDOM. SIGNIFICANCE = 0.0010
KENDALL'S TAU B = 0.14252, SIGNIFICANCE = 0.0000
KENDALL'S TAU C = 0.16826, SIGNIFICANCE = 0.0000

NUMBER OF MISSING OBSERVATIONS = 9

FILE HARKER (CREATION DATE = 09/27/76)
SUBFILE EUROP MAORI

* CROSSTABULATION OF * * * * *
VAR04 ETHNICITY BY VAR05 SES
* *

VAR04	COUNT / ROW % / COL % / TOT %	VAR05 1	2	3	4	5	6	ROW TOTAL
1 EUROPEAN		14	70	49	102	72	62	369
		3.8	19.0	13.3	27.6	19.5	16.8	63.5
		87.5	88.6	79.0	84.3	45.3	43.1	
		2.4	12.0	8.4	17.6	12.4	10.7	
2 MAORI		2	9	13	19	87	82	212
		0.9	4.2	6.1	9.0	41.0	38.7	36.5
		12.5	11.4	21.0	15.7	54.7	56.9	
		0.3	1.5	2.2	3.3	15.0	14.1	
COLUMN TOTAL		16	79	62	121	159	144	581
		2.8	13.6	10.7	20.8	27.4	24.8	100.0

RAW CHI SQUARE = 103.24517 WITH 5 DEGREES OF FREEDOM. SIGNIFICANCE = 0.0000
KENDALL'S TAU B = 0.34356, SIGNIFICANCE = 0.0000
KENDALL'S TAU C = 0.41570, SIGNIFICANCE = 0.0000

NUMBER OF MISSING OBSERVATIONS = 54

FILE HARKER (CREATION DATE = 09/27/76)
SUBFILE EUROP MAORI

* C R O S S T A B U L A T I O N O F * * * * * * * * * * *
VAR04 ETHNICITY BY SIBGRP NO. OF SIBLINGS - QUARTILES
* *

		SIBGRP				
	COUNT / ROW % / COL % / TOT %	LESS THAN 3 (1)	THREE (2)	FOUR-FIVE (3)	SIX OR MORE (4)	ROW TOTAL
VAR04						
1 EUROPEAN	COUNT	176	96	70	27	369
	ROW %	47.7	26.0	19.0	7.3	63.6
	COL %	83.4	72.2	57.9	23.5	
	TOT %	30.3	16.6	12.1	4.7	
2 MAORI	COUNT	35	37	51	88	211
	ROW %	16.6	17.5	24.2	41.7	36.4
	COL %	16.6	27.8	42.1	76.5	
	TOT %	6.0	6.4	8.8	15.2	
COLUMN TOTAL		211	133	121	115	580
		36.4	22.9	20.9	19.8	100.0

RAW CHI SQUARE = 121.72761 WITH 3 DEGREES OF FREEDOM. SIGNIFICANCE = 0.0000
KENDALL'S TAU B = 0.39580, SIGNIFICANCE = 0.0000
KENDALL'S TAU C = 0.46087, SIGNIFICANCE = 0.0000

NUMBER OF MISSING OBSERVATIONS = 55

FILE HARKER (CREATION DATE = 09/27/76)
SUBFILE EUROP MAORI

* C R O S S T A B U L A T I O N O F *
VAR04 ETHNICITY BY RAVGRP RAVENS RAW SCORE GROUPS= QUARTILES
* *

	RAVGRP				
COUNT / ROW % / COL % / TOT %	1 37 OR MO RE	2 31-36	3 22-30	4 LESS THAN 22	ROW TOTAL
VAR04					
1 EUROPEAN	114 / 30.9 / 78.1 / 19.7	106 / 28.7 / 70.2 / 18.3	88 / 23.8 / 62.9 / 15.2	61 / 16.5 / 42.7 / 10.5	369 / 63.6
2 MAORI	32 / 15.2 / 21.9 / 5.5	45 / 21.3 / 29.8 / 7.8	52 / 24.6 / 37.1 / 9.0	82 / 38.9 / 57.3 / 14.1	211 / 36.4
COLUMN TOTAL	146 / 25.2	151 / 26.0	140 / 24.1	143 / 24.7	580 / 100.0

RAW CHI SQUARE = 43.20292 WITH 3 DEGREES OF FREEDOM. SIGNIFICANCE = 0.0000
KENDALL'S TAU B = 0.24007, SIGNIFICANCE = 0.0000
KENDALL'S TAU C = 0.28287, SIGNIFICANCE = 0.0000

NUMBER OF MISSING OBSERVATIONS = 55

Table A2.34

FILE HARKER (CREATION DATE = 09/27/76)
SUBFILE EUROP MAORI

* CROSSTABULATION OF *
VAR04 ETHNICITY BY RELGRP RELATIONAL GROUP SCORES - QUARTILES
* *

	RELGRP				
COUNT / ROW % / COL % / TOT %	17 OR MO RE	13-16	9-12	8 OR LES S	ROW TOTAL
VAR04	1	2	3	4	
1 EUROPEAN	83 22.6 65.4 14.5	86 23.4 59.3 15.0	91 24.8 63.6 15.9	107 29.2 67.3 18.6	367 63.9
2 MAORI	44 21.3 34.6 7.7	59 28.5 40.7 10.3	52 25.1 36.4 9.1	52 25.1 32.7 9.1	207 36.1
COLUMN TOTAL	127 22.1	145 25.3	143 24.9	159 27.7	574 100.0

RAW CHI SQUARE = 2.24025 WITH 3 DEGREES OF FREEDOM. SIGNIFICANCE = 0.5241
KENDALL'S TAU B = -0.02621, SIGNIFICANCE = 0.1738
KENDALL'S TAU C = -0.03080, SIGNIFICANCE = 0.1349

NUMBER OF MISSING OBSERVATIONS = 61

FILE HARKER (CREATION DATE = 09/27/76)
SUBFILE EUROP MAORI

* C R O S S T A B U L A T I O N O F *
VAR04 ETHNICITY BY CATGRP CATEGORICAL GROUP SCORES- QUARTILES
* *

	CATGRP				
COUNT / ROW % / COL % / TOT %	11 OR MO RE	8-10	5-7	4 OR LES S	ROW TOTAL
	1	2	3	4	
VAR04					
1 EUROPEAN	84 22.9 66.7 14.6	91 24.8 63.2 15.9	100 27.2 58.8 17.4	92 25.1 68.7 16.0	367 63.9
2 MAORI	42 20.3 33.3 7.3	53 25.6 36.8 9.2	70 33.8 41.2 12.2	42 20.3 31.3 7.3	207 36.1
COLUMN TOTAL	126 22.0	144 25.1	170 29.6	134 23.3	574 100.0

RAW CHI SQUARE = 3.66400 WITH 3 DEGREES OF FREEDOM. SIGNIFICANCE = 0.3001
KENDALL'S TAU B = -0.00259, SIGNIFICANCE = 0.4631
KENDALL'S TAU C = -0.00304, SIGNIFICANCE = 0.4567

NUMBER OF MISSING OBSERVATIONS = 61

Table A2.36

FILE HARKER (CREATION DATE = 09/27/76)
SUBFILE EUROP MAORI

* C R O S S T A B U L A T I O N O F *
VAR04 ETHNICITY BY ANGRP ANALYTIC GROUP SCORES 4 QUARTILES
* *

VAR04	ANGRP 1 (8 OR MOR)	2 (5-7)	3 (3-4)	4 (2 OR LES)	ROW TOTAL
1 EUROPEAN	86	104	89	88	367
	23.4	28.3	24.3	24.0	63.9
	64.7	66.2	59.7	65.2	
	15.0	18.1	15.5	15.3	
2 MAORI	47	53	60	47	207
	22.7	25.6	29.0	22.7	36.1
	35.3	33.8	40.3	34.8	
	8.2	9.2	10.5	8.2	
COLUMN TOTAL	133	157	149	135	574
	23.2	27.4	26.0	23.5	100.0

RAW CHI SQUARE = 1.62616 WITH 3 DEGREES OF FREEDOM. SIGNIFICANCE = 0.6535
KENDALL'S TAU B = 0.01243, SIGNIFICANCE = 0.3281
KENDALL'S TAU C = 0.01461, SIGNIFICANCE = 0.3004

NUMBER OF MISSING OBSERVATIONS = 61

FILE HARKER (CREATION DATE = 09/27/76)
SUBFILE EUROP MAORI

* * * * * * * * * * * * * * * * * * C R O S S T A B U L A T I O N O F * * * * * * * * * * * *
VAR04 ETHNICITY BY PATRCR PAT R.C.-RAW- QUARTILE GROUPS
* *

VAR04	COUNT / ROW % / COL % / TOT %	PATRCR: 19 OR MORE (1)	13-18 (2)	8-12 (3)	7 OR LESS (4)	ROW TOTAL
EUROPEAN	1	103	77	105	68	353
		29.2	21.8	29.7	19.3	68.5
		79.8	67.0	66.0	60.7	
		20.0	15.0	20.4	13.2	
MAORI	2	26	38	54	44	162
		16.0	23.5	33.3	27.2	31.5
		20.2	33.0	34.0	39.3	
		5.0	7.4	10.5	8.5	
COLUMN TOTAL		129	115	159	112	515
		25.0	22.3	30.9	21.7	100.0

RAW CHI SQUARE = 11.42298 WITH 3 DEGREES OF FREEDOM. SIGNIFICANCE = 0.0096
KENDALL'S TAU B = 0.12545, SIGNIFICANCE = 0.0000
KENDALL'S TAU C = 0.14219, SIGNIFICANCE = 0.0000

NUMBER OF MISSING OBSERVATIONS = 120

Table A2.38

FILE HARKER (CREATION DATE = 09/27/76)
SUBFILE EUROP MAORI

CROSSTABULATION OF VAR04 ETHNICITY BY PATRVR PAT R.V.-RAW-QUARTILE GROUPS

VAR04	PATRVR COUNT ROW % COL % TOT %	27 OR MORE 1	18-26 2	12-17 3	11 OR LESS 4	ROW TOTAL
EUROPEAN	1	113 31.8 85.6 21.4	97 27.3 68.3 18.4	66 18.6 54.5 12.5	79 22.3 59.4 15.0	355 67.2
MAORI	2	19 11.0 14.4 3.6	45 26.0 31.7 8.5	55 31.8 45.5 10.4	54 31.2 40.6 10.2	173 32.8
	COLUMN TOTAL	132 25.0	142 26.9	121 22.9	133 25.2	528 100.0

RAW CHI SQUARE = 32.84904 WITH 3 DEGREES OF FREEDOM. SIGNIFICANCE = 0.0000
KENDALL'S TAU B = 0.20067, SIGNIFICANCE = 0.0000
KENDALL'S TAU C = 0.23059, SIGNIFICANCE = 0.0000

NUMBER OF MISSING OBSERVATIONS = 107

Table A2.39

FILE HARKER (CREATION DATE = 09/27/76)
SUBFILE EUROP MAORI

* CROSSTABULATION OF *
VAR04 ETHNICITY BY PATLIR PAT LIST.-RAW-QUARTILE GROUPS
* *

	PATLIR				
COUNT / ROW % / COL % / TOT %	28 OR MO RE	22-27	17-21	16 OR LESS	ROW TOTAL
VAR04					
1 EUROPEAN	115 33.0 85.2 22.5	100 28.7 76.3 19.5	80 23.0 63.5 15.6	53 15.2 44.2 10.4	348 68.0
2 MAORI	20 12.2 14.8 3.9	31 18.9 23.7 6.1	46 28.0 36.5 9.0	67 40.9 55.8 13.1	164 32.0
COLUMN TOTAL	135 26.4	131 25.6	126 24.6	120 23.4	512 100.0

RAW CHI SQUARE = 54.97884 WITH 3 DEGREES OF FREEDOM. SIGNIFICANCE = 0.0000
KENDALL'S TAU B = 0.29380. SIGNIFICANCE = 0.0000
KENDALL'S TAU C = 0.33568. SIGNIFICANCE = 0.0000

NUMBER OF MISSING OBSERVATIONS = 123

FILE MARKER (CREATION DATE = 09/27/76)
SUBFILE EUROP MAORI

CROSSTABULATION OF VAR04 ETHNICITY BY VAR29 TEACHER RATING : ORAL LANGUAGE

	COUNT / ROW % / COL % / TOT %	VAR29 1 SUPERIOR	2 ABOVE AVERAGE	3 AV AVERAGE	4 BELOW AV AVERAGE	5 INFERIOR	ROW TOTAL
VAR04							
1 EUROPEAN		11	81	235	58	1	386
		2.8	21.0	60.9	15.0	0.3	63.1
		73.3	75.0	66.0	47.5	9.1	
		1.8	13.2	38.4	9.5	0.2	
2 MAORI		4	27	121	64	10	226
		1.8	11.9	53.5	28.3	4.4	36.9
		26.7	25.0	34.0	52.5	90.9	
		0.7	4.4	19.8	10.5	1.6	
COLUMN TOTAL		15	108	356	122	11	612
		2.5	17.6	58.2	19.9	1.8	100.0

RAW CHI SQUARE = 34.99268 WITH 4 DEGREES OF FREEDOM. SIGNIFICANCE = 0.0000
KENDALL'S TAU B = 0.19932, SIGNIFICANCE = 0.0000
KENDALL'S TAU C = 0.20896, SIGNIFICANCE = 0.0000

NUMBER OF MISSING OBSERVATIONS = 23

FILE HARKER (CREATION DATE = 09/27/76)
SUBFILE EUROP MAORI

* CROSSTABULATION OF *
VAR04 ETHNICITY BY VAR30 TEACHER RATING, WRITTEN LANGUAGE
* *

		VAR30					
	COUNT / ROW % / COL % / TOT %	1 SUPERIOR	2 ABOVE AVERAGE	3 AVERAGE	4 BELOW AVERAGE	5 INFERIOR	ROW TOTAL
VAR04							
1 EUROPEAN	COUNT	14	73	209	82	9	387
	ROW %	3.6	18.9	54.0	21.2	2.3	63.1
	COL %	77.8	74.5	65.7	51.9	42.9	
	TOT %	2.3	11.9	34.1	13.4	1.5	
2 MAORI	COUNT	4	25	109	76	12	226
	ROW %	1.8	11.1	48.2	33.6	5.3	36.9
	COL %	22.2	25.5	34.3	48.1	57.1	
	TOT %	0.7	4.1	17.8	12.4	2.0	
COLUMN TOTAL		18	98	318	158	21	613
		2.9	16.0	51.9	25.8	3.4	100.0

RAW CHI SQUARE = 20.28234 WITH 4 DEGREES OF FREEDOM. SIGNIFICANCE = 0.0004
KENDALL'S TAU B = 0.16882, SIGNIFICANCE = 0.0000
KENDALL'S TAU C = 0.18384, SIGNIFICANCE = 0.0000

NUMBER OF MISSING OBSERVATIONS = 22

FILE HARKER (CREATION DATE = 09/27/76)
SUBFILE EUROP MAORI

* C R O S S T A B U L A T I O N O F * * * * * * * * * * *
VAR04 ETHNICITY BY VAR31 TEACHER RATING, READING

		VAR31					
	COUNT / ROW % / COL % / TOT %	SUPERIOR 1	ABOVE AVERAGE 2	AVERAGE 3	BELOW AVERAGE 4	INFERIOR 5	ROW TOTAL
VAR04							
EUROPEAN	1	21	79	195	80	12	387
		5.4	20.4	50.4	20.7	3.1	63.1
		77.8	79.8	62.9	51.0	60.0	
		3.4	12.9	31.8	13.1	2.0	
MAORI	2	6	20	115	77	8	226
		2.7	8.8	50.9	34.1	3.5	36.9
		22.2	20.2	37.1	49.0	40.0	
		1.0	3.3	18.8	12.6	1.3	
	COLUMN TOTAL	27	99	310	157	20	613
		4.4	16.2	50.6	25.6	3.3	100.0

RAW CHI SQUARE = 24.39473 WITH 4 DEGREES OF FREEDOM, SIGNIFICANCE = 0.0001
KENDALL'S TAU B = 0.17611, SIGNIFICANCE = 0.0000
KENDALL'S TAU C = 0.19368, SIGNIFICANCE = 0.0000

NUMBER OF MISSING OBSERVATIONS = 22

FILE HARKER (CREATION DATE = 09/27/76)
SUBFILE EUROP MAORI

* C R O S S T A B U L A T I O N O F * * * * * * * * * *
VAR04 ETHNICITY BY VAR32 TEACHER RATING, SPELLING

		VAR32					
	COUNT / ROW % / COL % / TOT %	SUPERIOR 1	ABOVE AV AVERAGE 2	AVERAGE 3	BELOW AV AVERAGE 4	INFERIOR 5	ROW TOTAL
VAR04							
EUROPEAN	1	12	65	185	107	18	387
		3.1	16.8	47.8	27.6	4.7	63.2
		57.1	73.0	62.9	59.4	64.3	
		2.0	10.6	30.2	17.5	2.9	
MAORI	2	9	24	109	73	10	225
		4.0	10.7	48.4	32.4	4.4	36.8
		42.9	27.0	37.1	40.6	35.7	
		1.5	3.9	17.8	11.9	1.6	
	COLUMN TOTAL	21	89	294	180	28	612
		3.4	14.5	48.0	29.4	4.6	100.0

RAW CHI SQUARE = 5.14883 WITH 4 DEGREES OF FREEDOM, SIGNIFICANCE = 0.2724
KENDALL'S TAU B = 0.05543, SIGNIFICANCE = 0.0201
KENDALL'S TAU C = 0.06133, SIGNIFICANCE = 0.0116

NUMBER OF MISSING OBSERVATIONS = 23

FILE HARKER (CREATION DATE = 09/27/76)
SUBFILE EUROP MAORI

CROSSTABULATION OF VAR04 ETHNICITY BY VAR33 TEACHER RATING, WRITING

VAR04	COUNT / ROW % / COL % / TOT %	VAR33 1 SUPERIOR	2 ABOVE AV ERAGE	3 AVERAGE	4 BELOW AV ERAGE	5 INFERIOR	ROW TOTAL
1 EUROPEAN	COUNT	10	79	211	76	11	387
	ROW %	2.6	20.4	54.5	19.6	2.8	63.1
	COL %	55.6	69.3	61.3	63.3	64.7	
	TOT %	1.6	12.9	34.4	12.4	1.8	
2 MAORI	COUNT	8	35	133	44	6	226
	ROW %	3.5	15.5	58.8	19.5	2.7	36.9
	COL %	44.4	30.7	38.7	36.7	35.3	
	TOT %	1.3	5.7	21.7	7.2	1.0	
COLUMN TOTAL		18	114	344	120	17	613
		2.9	18.6	56.1	19.6	2.8	100.0

RAW CHI SQUARE = 2.80248 WITH 4 DEGREES OF FREEDOM, SIGNIFICANCE = 0.5914
KENDALL'S TAU B = 0.02138, SIGNIFICANCE = 0.2142
KENDALL'S TAU C = 0.02280, SIGNIFICANCE = 0.1992

NUMBER OF MISSING OBSERVATIONS = 22

FILE HARKER (CREATION DATE = 09/27/76)
SUBFILE EUROP MAORI

* C R O S S T A B U L A T I O N O F * * * * * * * * * * *
VAR04 ETHNICITY BY VAR34 TEACHER RATING, ARITHMETIC
* *

		VAR34					
	COUNT / ROW % / COL % / TOT %	SUPERIOR 1	ABOVE AV ERAGE 2	AVERAGE 3	BELOW AV ERAGE 4	INFERIOR 5	ROW TOTAL
VAR04							
EUROPEAN	1	16	78	207	72	14	387
		4.1	20.2	53.5	18.6	3.6	63.1
		76.2	75.7	66.6	49.0	45.2	
		2.6	12.7	33.8	11.7	2.3	
MAORI	2	5	25	104	75	17	226
		2.2	11.1	46.0	33.2	7.5	36.9
		23.8	24.3	33.4	51.0	54.8	
		0.8	4.1	17.0	12.2	2.8	
	COLUMN TOTAL	21	103	311	147	31	613
		3.4	16.8	50.7	24.0	5.1	100.0

RAW CHI SQUARE = 27.08039 WITH 4 DEGREES OF FREEDOM, SIGNIFICANCE = 0.0000
KENDALL'S TAU B = 0.19226, SIGNIFICANCE = 0.0000
KENDALL'S TAU C = 0.21202, SIGNIFICANCE = 0.0000

NUMBER OF MISSING OBSERVATIONS = 22

FILE HARKER (CREATION DATE = 09/27/76)
SUBFILE EUROP MAORI

* C R O S S T A B U L A T I O N O F *
VAR04 ETHNICITY BY VAR35 TEACHER RATING, SOC. STUDIES
* *

		VAR35					
	COUNT / ROW % / COL % / TOT %	1 SUPERIOR	2 ABOVE AVERAGE	3 AVERAGE	4 BELOW AVERAGE	5 INFERIOR	ROW TOTAL
VAR04							
1 EUROPEAN		3	26	120	19	3	171
		1.8	15.2	70.2	11.1	1.8	62.2
		60.0	74.3	67.4	37.3	50.0	
		1.1	9.5	43.6	6.9	1.1	
2 MAORI		2	9	58	32	3	104
		1.9	8.7	55.8	30.8	2.9	37.8
		40.0	25.7	32.6	62.7	50.0	
		0.7	3.3	21.1	11.6	1.1	
COLUMN TOTAL		5	35	178	51	6	275
		1.8	12.7	64.7	18.5	2.2	100.0

RAW CHI SQUARE = 18.11821 WITH 4 DEGREES OF FREEDOM, SIGNIFICANCE = 0.0012
KENDALL'S TAU B = 0.21169, SIGNIFICANCE = 0.0000
KENDALL'S TAU C = 0.21131, SIGNIFICANCE = 0.0000

NUMBER OF MISSING OBSERVATIONS = 360

FILE HARKER (CREATION DATE = 09/27/76)
SUBFILE EUROP MAORI

* C R O S S T A B U L A T I O N O F * * * * * * * * * * *
VAR04 ETHNICITY BY VAR36 TEACHER RATING, NAT. STUDY
* *

		VAR36					
	COUNT / ROW % / COL % / TOT %	1 SUPERIOR	2 ABOVE AVERAGE	3 AVERAGE	4 BELOW AVERAGE	5 INFERIOR	ROW TOTAL
VAR04							
1 EUROPEAN	COUNT	2	23	128	14	3	170
	ROW %	1.2	13.5	75.3	8.2	1.8	63.0
	COL %	66.7	69.7	67.4	35.9	60.0	
	TOT %	0.7	8.5	47.4	5.2	1.1	
2 MAORI	COUNT	1	10	62	25	2	100
	ROW %	1.0	10.0	62.0	25.0	2.0	37.0
	COL %	33.3	30.3	32.6	64.1	40.0	
	TOT %	0.4	3.7	23.0	9.3	0.7	
COLUMN TOTAL		3	33	190	39	5	270
		1.1	12.2	70.4	14.4	1.9	100.0

RAW CHI SQUARE = 14.51061 WITH 4 DEGREES OF FREEDOM. SIGNIFICANCE = 0.0058
KENDALL'S TAU B = 0.17501, SIGNIFICANCE = 0.0000
KENDALL'S TAU C = 0.16362, SIGNIFICANCE = 0.0000

NUMBER OF MISSING OBSERVATIONS = 365

Table A2.48

FILE HARKER (CREATION DATE = 09/27/76)
SUBFILE EUROP MAORI

CROSSTABULATION OF VAR04 ETHNICITY BY VAR37 TEACHER RATING, ART & CRAFT

VAR04	COUNT / ROW % / COL % / TOT %	VAR37 1 SUPERIOR	2 ABOVE AVERAGE	3 AVERAGE	4 BELOW AVERAGE	5 INFERIOR	ROW TOTAL
1 EUROPEAN	COUNT	1	13	116	12	1	143
	ROW %	0.7	9.1	81.1	8.4	0.7	60.3
	COL %	50.0	43.3	63.4	60.0	50.0	
	TOT %	0.4	5.5	48.9	5.1	0.4	
2 MAORI	COUNT	1	17	67	8	1	94
	ROW %	1.1	18.1	71.3	8.5	1.1	39.7
	COL %	50.0	56.7	36.6	40.0	50.0	
	TOT %	0.4	7.2	28.3	3.4	0.4	
COLUMN TOTAL		2	30	183	20	2	237
		0.8	12.7	77.2	8.4	0.8	100.0

RAW CHI SQUARE = 4.51578 WITH 4 DEGREES OF FREEDOM, SIGNIFICANCE = 0.3407
KENDALL'S TAU B = -0.08986, SIGNIFICANCE = 0.0197
KENDALL'S TAU C = -0.07670, SIGNIFICANCE = 0.0394

NUMBER OF MISSING OBSERVATIONS = 396

FILE HARKER (CREATION DATE = 09/27/76)
SUBFILE EUROP MAORI

* C R O S S T A B U L A T I O N O F * * * * * * * *
VAR04 ETHNICITY BY VAR38 TEACHER RATING, MUSIC
* *

		VAR38					
	COUNT / ROW % / COL % / TOT %	SUPERIOR 1	ABOVE AV ERAGE 2	AVERAGE 3	BELOW AV ERAGE 4	INFERIOR 5	ROW TOTAL
VAR04							
EUROPEAN	1	2	13	115	11	1	142
		1.4	9.2	81.0	7.7	0.7	61.7
		100.0	48.1	63.2	61.1	100.0	
		0.9	5.7	50.0	4.8	0.4	
MAORI	2	0	14	67	7	0	88
		0.0	15.9	76.1	8.0	0.0	38.3
		0.0	51.9	36.8	38.9	0.0	
		0.0	6.1	29.1	3.0	0.0	
	COLUMN TOTAL	2	27	182	18	1	230
		0.9	11.7	79.1	7.8	0.4	100.0

RAW CHI SQUARE = 4.13494 WITH 4 DEGREES OF FREEDOM. SIGNIFICANCE = 0.3881
KENDALL'S TAU B = -0.05974, SIGNIFICANCE = 0.0887
KENDALL'S TAU C = -0.04885, SIGNIFICANCE = 0.1351

NUMBER OF MISSING OBSERVATIONS = 405

FILE HARKER (CREATION DATE = 09/27/76)
SUBFILE EUROP MAORI

* C R O S S T A B U L A T I O N O F * * * * * * * * * * *
VAR04 ETHNICITY BY VAR39 TEACHER RATING, PHYS. ED
* *

	VAR39					
COUNT / ROW % / COL % / TOT %	1 SUPERIOR	2 ABOVE AVERAGE	3 AVERAGE	4 BELOW AVERAGE	5 INFERIOR	ROW TOTAL
VAR04						
1 EUROPEAN	0 0.0 0.0 0.0	33 23.6 70.2 14.3	94 67.1 59.5 40.9	12 8.6 63.2 5.2	1 0.7 50.0 0.4	140 60.9
2 MAORI	4 4.4 100.0 1.7	14 15.6 29.8 6.1	64 71.1 40.5 27.8	7 7.8 36.8 3.0	1 1.1 50.0 0.4	90 39.1
COLUMN TOTAL	4 1.7	47 20.4	158 68.7	19 8.3	2 0.9	230 100.0

RAW CHI SQUARE = 8.21134 WITH 4 DEGREES OF FREEDOM, SIGNIFICANCE = 0.0841
KENDALL'S TAU B = 0.01923, SIGNIFICANCE = 0.3321
KENDALL'S TAU C = 0.01837, SIGNIFICANCE = 0.3391

NUMBER OF MISSING OBSERVATIONS = 405

FILE HARKER (CREATION DATE = 09/27/76)
SUBFILE EUROP MAORI

* C R O S S T A B U L A T I O N O F *
VAR04 ETHNICITY BY VAR41 TEACHER RATING, STABILITY
* *

	COUNT / ROW % / COL % / TOT %	VAR41 1 SUPERIOR	2 ABOVE AVERAGE	3 AVERAGE	4 BELOW AVERAGE	5 INFERIOR	ROW TOTAL
VAR04							
1 EUROPEAN		22	114	147	42	4	329
		6.7	34.7	44.7	12.8	1.2	61.4
		73.3	68.3	56.3	59.2	57.1	
		4.1	21.3	27.4	7.8	0.7	
2 MAORI		8	53	114	29	3	207
		3.9	25.6	55.1	14.0	1.4	38.6
		26.7	31.7	43.7	40.8	42.9	
		1.5	9.9	21.3	5.4	0.6	
COLUMN TOTAL		30	167	261	71	7	536
		5.6	31.2	48.7	13.2	1.3	100.0

RAW CHI SQUARE = 8.16465 WITH 4 DEGREES OF FREEDOM, SIGNIFICANCE = 0.0857
KENDALL'S TAU B = 0.09828, SIGNIFICANCE = 0.0003
KENDALL'S TAU C = 0.10870, SIGNIFICANCE = 0.0001

NUMBER OF MISSING OBSERVATIONS = 99

Table A2.52

FILE HARKER (CREATION DATE = 09/27/76)
SUBFILE EUROP MAORI

* CROSSTABULATION OF *
VAR04 ETHNICITY BY VAR42 TEACHER RATING, CO-OPERATION

VAR04	COUNT / ROW % / COL % / TOT %	VAR42 1 SUPERIOR	2 ABOVE AVERAGE	3 AVERAGE	4 BELOW AVERAGE	5 INFERIOR	ROW TOTAL
1 EUROPEAN		27	139	139	23	1	329
		8.2	42.2	42.2	7.0	0.3	61.4
		69.2	63.8	60.7	47.9	50.0	
		5.0	25.9	25.9	4.3	0.2	
2 MAORI		12	79	90	25	1	207
		5.8	38.2	43.5	12.1	0.5	38.6
		30.8	36.2	39.3	52.1	50.0	
		2.2	14.7	16.8	4.7	0.2	
COLUMN TOTAL		39	218	229	48	2	536
		7.3	40.7	42.7	9.0	0.4	100.0

RAW CHI SQUARE = 5.36008 WITH 4 DEGREES OF FREEDOM. SIGNIFICANCE = 0.2523
KENDALL'S TAU B = 0.08020, SIGNIFICANCE = 0.0027
KENDALL'S TAU C = 0.08827, SIGNIFICANCE = 0.0011

NUMBER OF MISSING OBSERVATIONS = 99

FILE HARKER (CREATION DATE = 09/27/76)
SUBFILE EUROP MAORI

* C R O S S T A B U L A T I O N O F *
VAR04 ETHNICITY BY VAR43 TEACHER RATING, INDEPENDENCE
* *

		VAR43					
	COUNT / ROW % / COL % / TOT %	SUPERIOR 1	ABOVE AV AVERAGE 2	AVERAGE 3	BELOW AV AVERAGE 4	INFERIOR 5	ROW TOTAL
VAR04							
EUROPEAN	1	21	108	147	50	3	329
		6.4	32.8	44.7	15.2	0.9	61.4
		65.6	67.5	58.3	57.5	60.0	
		3.9	20.1	27.4	9.3	0.6	
MAORI	2	11	52	105	37	2	207
		5.3	25.1	50.7	17.9	1.0	38.6
		34.4	32.5	41.7	42.5	40.0	
		2.1	9.7	19.6	6.9	0.4	
	COLUMN TOTAL	32	160	252	87	5	536
		6.0	29.9	47.0	16.2	0.9	100.0

RAW CHI SQUARE = 4.32283 WITH 4 DEGREES OF FREEDOM. SIGNIFICANCE = 0.3641
KENDALL'S TAU B = 0.07514, SIGNIFICANCE = 0.0046
KENDALL'S TAU C = 0.08405, SIGNIFICANCE = 0.0018

NUMBER OF MISSING OBSERVATIONS = 99

FILE HARKER (CREATION DATE = 09/27/76)
SUBFILE EUROP MAORI

* C R O S S T A B U L A T I O N O F *
VAR04 ETHNICITY BY VAR44 TEACHER RATING, PERSEVERENCE

		VAR44					
	COUNT / ROW % / COL % / TOT %	SUPERIOR 1	ABOVE AV AVERAGE 2	AVERAGE 3	BELOW AV AVERAGE 4	INFERIOR 5	ROW TOTAL
VAR04							
EUROPEAN	1	15	101	152	57	4	329
		4.6	30.7	46.2	17.3	1.2	61.4
		68.2	67.3	59.1	60.0	33.3	
		2.8	18.8	28.4	10.6	0.7	
MAORI	2	7	49	105	38	8	207
		3.4	23.7	50.7	18.4	3.9	38.6
		31.8	32.7	40.9	40.0	66.7	
		1.3	9.1	19.6	7.1	1.5	
	COLUMN TOTAL	22	150	257	95	12	536
		4.1	28.0	47.9	17.7	2.2	100.0

RAW CHI SQUARE = 7.27253 WITH 4 DEGREES OF FREEDOM, SIGNIFICANCE = 0.1222
KENDALL'S TAU B = 0.08109, SIGNIFICANCE = 0.0025
KENDALL'S TAU C = 0.09060, SIGNIFICANCE = 0.0009

NUMBER OF MISSING OBSERVATIONS = 99

Table A2.55

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