USE OF THESES

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THE DEVELOPMENT OF THE CONCEPT OF CONSERVATION
IN AUSTRALIAN ABORIGINAL CHILDREN

A Thesis Submitted for the
Degree of Doctor of Philosophy
in the Australian National University

M. Murray de Lemos
(M.Sc., Natal)
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This thesis incorporates original research carried out by the author during the tenure of an Australian National University Research Scholarship in the Department of Psychology of the Australian National University from February 1963 to November 1966.
Two glasses are set in front of the subject - a long, thin glass and a short, wide glass.

While she watches, one full measure of sugar is poured into the long thin glass, and one full measure plus a further half measure is poured into the short wide glass.

The level of sugar is higher in the long glass.

The subject is asked to choose which sugar she wants.

She takes the sugar from the long thin glass and pours it into her cotton bag.

(See Appendix 4)
I would like to thank Professor G.N. Seagrim for his guidance in the planning and carrying out of this study, for his advice and suggestions on the presentation of the results, and for his critical reading of the drafts. I would also like to thank Professor C.A. Gibb for his assistance, Mrs S. Page and Mr M. Cook for advice on the statistical treatment of the results, and other members of the Department of Psychology whose comments and criticisms contributed to the study.

I am indebted to the authorities of the Finke River Mission and the Methodist Overseas Mission who granted permission for me to carry out this research on the missions under their control, and to the superintendents of the missions visited, Mr G. Stoll, Rev. H. Shepardson and Rev. M. Spengler, for the facilities they granted me. I would particularly like to thank Mr R. Arnold and Mr D. Williams and their teaching staffs for their ready co-operation and assistance in organizing the testing programme. I am also very much indebted to Miss Beulah Lowe, of Milingimbi, who translated the tests into the Gupapuyku language, and other members of the Milingimbi staff who co-operated in the preliminary testing at this mission.

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Finally, I must thank the subjects themselves, for without their co-operation, willing or unwilling, this study would not have been possible.

The thesis was typed and produced through the University Thesis Typing Scheme, and the copies of the figures and illustrations were prepared by the Visual Aids Unit of the Australian National University.
This study describes the application of Piaget's tests of conservation of quantity, weight, volume, length, area and number to two groups of Aboriginal children living on mission stations in the Northern Territory of Australia.

The first part of the thesis is devoted to a consideration of the theoretical background of the study. In the first chapter Piaget's general theory of intellectual development is outlined, and the problem of the comparative study of intellectual development is considered. It is pointed out that little research in this area has been undertaken, and reasons for this neglect are suggested. Levy-Bruhl's theory of primitive thinking is reviewed, and the parallels between the theories of Piaget and Levy-Bruhl are discussed. It is suggested that the techniques developed by Piaget in his study of the intellectual development of children could be applied to the study of intellectual development in primitive peoples, and that these techniques could be used to test Levy-Bruhl's theory. The implications of Piaget's theory and its relation to other problems in psychology are also discussed.

In the second chapter the theoretical basis of the tests used in the present study is outlined, and in Chapter III a number of related studies are reviewed.

The second part of the thesis deals with the study itself.
In Chapter IV the cultural background, living conditions and general activities of the Aboriginal people are described. It is pointed out that the traditional life of the Aborigines was extremely simple, and that their present housing, health, nutrition and educational standards are considerably below those of the white Australian. Since it has been shown that the environment can influence intellectual development, these factors are relevant to the study of conceptual development in Aboriginal children. The games and leisure activities of the Aborigines are also described, since these may indicate the types of thinking required and used in the society. Some studies on the intellectual capacity of the Aborigines are reviewed, and the characteristics of Aboriginal languages are discussed.

Chapter V deals with the actual testing procedures, in Chapter VI the results of the study are reported, and in Chapter VII the qualitative results are described and discussed.

It was found that the concept of conservation develops much later in Aboriginal than in European children, and that in some cases non-conservation was still found up to the age of 15 years. However, the stages of development and the explanations and justifications for correct and incorrect responses were the same as those reported by Piaget. There was a close correspondence between the results of the two groups tested, although some differences were found.
Significant differences were found between the full-blood and the part-blood children tested at the Hermannsburg mission.

A scalogram analysis applied to the results indicated that the tests were scalable by Guttman's criteria, and Loevinger's test for homogeneity yielded high homogeneity coefficients. However, some divergences from the invariant order postulated by Piaget and Inhelder were found. An analysis of the non-scale patterns of response obtained was made.

In the final three chapters the results of the study and their implications are discussed.

In Chapter VIII the order of difficulty of the tests, the later development of conservation in Aboriginal children, and the differences between the Elcho and the Hermannsburg groups are discussed in relation to the effects of experience on the previous tests and environmental influences. The factors of intelligence and maturation in intellectual development are also considered, and the significant differences between the full-blood and the part-blood children and the question of racial differences in intelligence are discussed.

In Chapter IX Piaget's theory is examined in the light of our findings and those reported by other investigators. Some of the problems that have been raised by these studies are considered, and an attempt is made to clarify these problems and to point to those aspects which require further investigation. An
alternative interpretation of the findings reported is also discussed.

In the final chapter the general implications of our findings are considered, some linguistic and methodological problems of cross-cultural studies are discussed, and suggestions are made for future research.

We find that our results confirm Piaget's general theory of intellectual development, but that further research is required to determine whether or not there is an invariant order for conceptual development. Our results also appear to support Levy-Bruhl's theory of primitive thinking, but further research on the logical thinking of adult Aborigines would be required to confirm this.

The implications of our findings for Aboriginal intelligence and education are also considered. It is pointed out that the question of possible racial differences in average intellectual potential does not have important implications, since it would not be expected that such differences would be absolute, and considerable overlap in intellectual potential between different racial groups would be expected. However, it is suggested that the actual differences found between Aborigines and Europeans in the rate of intellectual development and the final level of mental functioning achieved does have important implications, since an unfavourable environment in early life may have permanent and lasting effects.
Emphasis has therefore been placed on the importance of investigating what aspects of the environment influence development, what experiences will lead to most rapid development, and to what extent appropriate experiences at the adult level can overcome the handicaps of a poor environment in early development.
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INTRODUCTION

This study investigates the development of the concept of conservation in Australian Aboriginal children. It is based on the work of Piaget, and its purpose is primarily to determine whether the stages of development described by Piaget occur in children from an entirely different cultural background to that of the Western European child.

Piaget has described intellectual development as proceeding through a series of stages. Each stage marks a particular level or mode of thinking, which determines the child's ability to deal with concepts and problems in a number of different areas. Each stage develops as a result of the increasing organisation and systematisation of thought processes, and depends on the integration of the achievements of previous stages with succeeding stages. From this it follows that:
1. The appearance of a particular stage of development will affect the child's ability to deal with a wide range of concepts.
2. The order of successive stages of development must remain invariant.

Piaget maintains that the structures of thought are determined by three main factors:
1. Maturation of the nervous system.
2. Experience acquired in interacting with the physical environment.
3. The influence of the social milieu.
However, he states that these factors are limited by the laws of equilibrium, which are determined by the biological structures and functions of the human organism. Since these structures and functions are independent of society, Piaget maintains that while the physical environment and the social milieu may modify development to some extent, development must necessarily follow the same pattern. He therefore maintains that the stages of development he has described will occur in all societies, and that the order of succession of these stages must be invariant. But since development also depends on the social and physical environment, societies may vary with regard to the average ages at which these stages are achieved, and in some societies the higher levels may not be achieved at all.

The aim of this study is therefore to test Piaget's hypothesis that the same stages of development will occur in Aboriginal children as in European children, and that these stages will follow the same order of succession as in European children.

This study is essentially exploratory, since prior to carrying out the testing it was not known whether or not Piaget's techniques could be successfully applied to Aboriginal children, or what particular difficulties of understanding or interpretation might occur as a result of the different cultural and linguistic background of the children.

The thesis is divided into two main parts. The first part is devoted to a consideration of the theoretical basis of the study, and the second part is
devoted to the study itself. In a final section the general implications of the study will be considered.