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ABSTRACT

This study asks two questions: Is there intracultural variation among the Baganda of Uganda in the cognition of color terms; and if there is, what are the sociocultural correlates of this variation? The color terminology of the Baganda is described, and several psycholinguistic techniques are used to determine the cognition of these terms. These include: (1) word associations, (2) triad sorts, (3) the semantic differential, and (4) listing tasks. Data were collected from samples which maximized the variance in sociocultural characteristics. A multivariate analysis of the data demonstrated a large degree of intracultural variation in the cognition of terms which can be related to formal education, reading and speaking English, residence, age, reading Luganda, and sex. Evidence from the four psycholinguistic techniques provides a considerable degree of convergent validity for these claims. The significance of these findings with regard to various communication situations (e.g., education, public information) and anthropological research methods which have been based on the assumption of cultural homogeneity are noted, and areas for further research are indicated which can potentially result in findings that can be used to facilitate the communication process within the research population. (Author)

Final Report

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A CROSS-CULTURAL STUDY OF PROBLEMS OF SEMANTIC EQUIVALENCE IN COMMUNICATION

Variation in the Cognition of Luganda Color Terms

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PREFACE

In an imaginative and sensitive study of communication systems in Africa Leonard Doob, a social psychologist, succinctly observed "At a bare minimum, at least two factors must be considered in analyzing or understanding communication: the communication itself, and the audience, the people who receive the communication" (Communication in Africa, 1961, Yale University Press). The research reported here concerns this latter factor -- the problems that may result in communication due to cognitive and linguistic differences.

A central problem in education is semantic congruence between those who send and receive information. It is possible to comprehend an utterance only to the degree to which the receiver's semantic structure is congruent with or at least equivalent to the sender's. The semantic structure of an utterance for example is often hierarchical and congruence may occur at only one level. The sender receives signals of comprehension, and the receiver assumes that he comprehends the message when in fact the communication act may be incomplete. Despite this, many educational systems are based on the assumption that all individuals share the same semantic structures. Recently, anthropologists and linguists conducting research in the field of ethnosemantics, have called this into question by demonstrating considerable cross-cultural variability. To date however, little or no attempt has been made to systematically investigate the nature and extent of inter-individual variability within a single culture (especially in non-Indo-European speech communities). The present study strongly suggests that different experiential factors operative within the same culture also result in a significant amount of inter-individual cognitive and linguistic variability, at least in the Buganda region of Uganda. Moreover, as is demonstrated, since semantic variability can be predicted from certain specific experiential (or background) variables, we can anticipate situations where particular groups of individuals may experience difficulties in communication and hopefully discover a basis for ameliorating them.

A full understanding of the communication process of course requires information on more than simply senders and receivers. Of at least equal importance is knowledge concerning the message itself, the channel used and the impact. Research, we currently have underway as a part of this same project, is being directed at the characteristics of both messages, channels and their effects in communication.

This we feel will greatly augment the data we have available on semantic variability among senders and receivers. For example, we are now engaged in a study of the form and content of sung communication. Our aim is not only to determine what information is transmitted _via_ this channel but the specific design features or vehicular devices employed to manipulate message form so as to facilitate communication, retention and impact. The investigation of sung communication is especially significant in Uganda for as in most African cultures, considerable emphasis is placed on music and oral-auditory channels of expression and communication. Also, other media are at present relatively underdeveloped, literacy is comparatively low and printed materials are expensive and often inaccessible. Songs, especially popular songs, serve as an important means for externally storing and retrieving information on a variety of life-situations. The data we are currently preparing on messages, channels and effects should help to roundout the findings we report here.

While our substantive results and conclusions are as yet rather meager and of import to few beyond ourselves, we are deeply grateful to all who aided us in this personally rewarding intellectual enterprise. Our greatest debt of gratitude must go to the hundreds of Baganda who gave so much of the patience and hospitality for which they have long been reknowned. The U.S. Office of Education financially supported us kindly and generously and the Makerere Institute of Social Research at Makerere University Kampala, Uganda provided us with all the means at their disposal to enable us to execute the project in Uganda. We hope that what will grow out of this research may serve as some token of gratitude and consolation to all.

TABLE OF CONTENTS

Chapter | Page

LIST OF TABLES

Table		Page

LIST OF FIGURES

Figure | Page

CHAPTER I

INTRODUCTION AND THEORETICAL BACKGROUND

Introduction

There has been an increasing focus of attention on cognitive anthropology recently, and the divisions and schools of thought that have developed within the field are becoming quite apparent. Despite these divisions, cognitive anthropologists, in general, would agree that their goal is to answer a pair of related questions: "What material phenomena are significant for the people of some culture; and, how do they organize these phenomena?" (Tyler, 1969: 3). In addition, those anthropologists and others mainly interested in semantics would add that "the ultimate goal is an understanding of the evaluations, emotions, and beliefs that lie behind word usage" (Colby, 1966: 3). The means by which cognitive anthropologists achieve and evaluate these goals has, however, become the object of considerable controversy.

The goal of this study is to present a description of the cognitive domain of color terminology in Luganda, the language of the Baganda of Uganda. As a part of this description, the methodology by which it is determined will be fully explicated. It will be argued here that the continually changing and complex nature of human societies requires a radically different methodology than that commonly used in cognitive anthropology.

Plan of Report

In this chapter a cursory review of the methodological and theoretical problems of cognitive anthropology will be provided. In addition, the methods to be used in this study will be outlined, and a brief historical sketch of anthropological interest in the domain of color terminology will be made. Chapter II will include an overview of the research population and a description of the data collection methods. Chapters III and IV will consist of a description of Luganda color terminology and an analysis of the variability in the conceptualization of color terms among the Baganda. The final chapter, Chapter V, contains a summary, conclusions, and suggestions for further research.

Theoretical and Methodological Background

Cognitive anthropology focuses on the means by which peoples organize and use their cultures. Thus, rather than focusing on material phenomena, the emphasis is on the organizing principles which underlie the overt manifestations of culture. Since peoples of different cultures differ with respect to these underlying principles, it is assumed that culture is learned and includes beliefs, concepts, preferences, principles and standards (Goodenough, 1971). Learning such as this depends in large part on some sort of sign or symbol behavior; therefore, these signs or symbols are basic to the study of culture. As Tyler has written, the names of things

> . . . are both an index to what is significant in the environment of some other people, and a means of discovering how these people organize their perceptions of the environment. (p. 6)

Furthermore, some anthropologists (e.g., Kay, 1966) commonly refer to culture as a system of symbols. In many instances, however, this theoretical position has led anthropologists to treat a society's culture as an undifferentiated whole on analogy with the commonly held view of a society's language.

The problem as to whether a society's culture can be viewed as an undifferentiated whole or not has a long and continuous history in anthropological theory. Sapir (1917) reacting to Kroeber's (1917) superorganic theory argues that we cannot neglect the individual in the study of society. Boas (1928) emphasizes the importance of the individual carriers of culture and warns against reifying the culture concept, while Murdock (1932) argues that culture does not depend on individuals; that group habits are the proper data of the science of culture. Sapir (1938) questions the methodological foundations of the holistic statements made by many anthropologists. He asks whether they are based on the observations of one or many informants and concludes that

> perhaps it is just as well that no strict methodology of field inquiry was perfected and that embarrassing questions as to the factual nature of the evidence which led to anthropological generalizations were courteously withheld by a sort of gentleman's agreement (1938: 7).

Nevertheless, the idea that there is such a thing as homogeneous culture continued as an issue. For example, Aberle, et al., (1950) claim that the functional prerequisites of a society include shared goals and cognitive orientations. Wallace (1970), however, opposes this view and argues that cognitive diversity may be a functional desideratum of society. It is apparent, however, that the myth of a holistic, monolithic culture still lives as evidenced by the following extensive quote from the pen of the respected folklorist Alan Dundes. Dundes, in a comment on W. T. Jones (1972), who takes an individualistic viewpoint in discussing world view, writes that:

> . . . anthropologists seldom speak of the world view of individuals. Rather, they are concerned with culture wide phenomena. It is what individuals share that has taken up most of the anthropologist's attention. . . . I doubt that many anthropologists would agree with Jones that the different (individual) world views of the participants at the conference resulted in different opinions about the nature and function of world views. The participants were, with one exception, Americans. I would contend that essentially all the participants shared American worldview. . . (1972: 92).

These contrasting views of culture are also evident in contemporary analyses in cognitive anthropology.

In a recent article, however, Sanjek (1971) asserts that the most important disagreement among cognitive anthropologists, whom he refers to as the "new ethnographers," is the division between the formalists who evaluate their analysis on the bases of internal elegance, economy, and prediction and those who would accept or reject a given analysis on the basis of psychological validity (1971: 1126). Wallace and Atkins (1960) had earlier referred to these two approaches as resulting in descriptions which were structurally real on the part of the formalists and psychologically real on the part of those stressing psychological validity. Wallace, a little later and in a less charitable mood, wrote that the rejection of interest in native cognition on the part of formalists ". . . renders trivial the claim that the analysis is semantic at all. . . . since the only cognitive processes considered is that of the analyst himself" (1965: 230). Scheffler and Loundsbury, however, disagree with this claim and argue that a parsimonious model which accurately predicts usage is psychologically or cognitively real, and that structural reality implies psychological or cognitive reality (1971: 138).

They argue that analyses such as Goodenough's (1956) which suggest alternative solutions are the result of the use of an inadequate semantic theory, and that "inasmuch as one and only one truly adequate and parsimonious model can be offered for a given system, the psychological or cognitive 'reality' of the model is not particularly problematic" (1971: 140). Goodenough (1967) argues, however, that if componential analysis is a formal model which reflects the procedures by which individuals learn what others seem to mean by the words they use, the fact that there are alternative solutions indicates that people speaking the same language do not necessarily share cognitive processes, a point repeatedly emphasized by Wallace (1970). The assumption of cognitive sharing becomes even harder to accept when we observe the multiple alternative solutions of the American Kinship System that have been provided by American ethnographers (e.g., Burling, 1970; Sanday, 1968; Bock, 1968; Goodenough, 1965; Schneider, 1965; Romney and D'Andrade, 1964; Wallace and Atkins, 1960). As Goodenough has noted, how can we expect to find cognitive sharing among other groups of people if the investigators themselves lack such sharing (1967). Tyler discusses the existence of intracultural variation in cognition and notes that the variations ". . . important from the anthropologist's point of view are those variations which are used by different classes of people and/or occur in different situations or contexts" (1969: 4). Moreover, Hammel asserts that ". . . it is difficult to speak of one folk model unless the investigator has used only one informant at a single sitting" (1970: 654). Other investigators (e.g., Wallace, 1970; Harris, 1970) have gone as far as to state that cognitive diversity or ambiguity may be a functional desideratum of society by providing for economy of cognition.

Despite some recent statements to the contrary (e.g., Tyler, 1969; Sanjek, 1971), the evidence cited above indicates that at least the leading formalists claim psychological validity for their analyses, although little or no attention was devoted to this topic in some of their earlier writings (e.g., Loundsbury, 1956; Hammel, 1965; Romney, 1965). Some of them, however, operating under the assumption of cultural uniformity, will permit only one valid solution, while others, assuming cultural diversity, will permit more than one. The problem among the formalists thus becomes one of testing the basic assumption of cultural uniformity. Some have responded to this challenge by merely developing more sophisticated formal criteria for the internal evaluation of their solutions (e.g., Boyd, 1971). The analysts who continually look for more formal criteria, however, seem to have forgotten that the locus of psychological reality is the individual, thus necessitating validation of the solutions by the intuitions of the native speakers. Nevertheless, Scheffler and Loundsbury claim that we cannot rely on the informant's statements to provide the ". . . ground structure and implicit premises that underlie his discriminations and give shape to his world of meanings" (1971: 141). Although it is certainly true that we cannot rely on the informant to provide a formal analysis of the discriminations he makes, we can obviously use his discriminations and the rationale he provides for them to test the adequacy of any given solution that we provide. Moreover, if we are testing the validity of the cognitive diversity hypothesis, it is essential that we determine the patterns of discriminatory processes within the population as a whole. If there is only one pattern, then we can accept the assumption of shared cognition. No amount of sophisticated juggling of data from an unspecified data base will resolve this problem. It is a fundamental error in research strategy to assume homogeneity without first testing for it. In addition to this rather obvious error in research strategy, quite a bit of empirical evidence has been accumulating which argues against the assumption of cognitive homogeneity. Anthropologists, as well as psychologists, have provided empirical evidence which either directly or indirectly supports the view that the processes by which a people organize the world around them cannot be assumed to be the same for everyone within a society. For example, Harris (1970) presents evidence that indicates that the domain of racial identity terms in Brazil is characterized by disagreement and ambiguity. Sanday (1968, 1971), using an information processing approach, presents data which indicates that the individuals in her sample manifested several cognitive structures and processes with respect to American kinship terms that could be related to other sociocultural variables (e.g., marital status, education, race, and sex). Both Sankoff (1971), in an analysis of sharing and variability in a Buang cognitive model, and Sanjek (1971), in a study of Brazilian racial terms, argue that there is sufficient diversity to justify a quantitative approach and present data to support their claims. Cole, et al., (1971) in a study of the cultural context of learning and thinking among the Kpelle of Liberia present massive evidence which indicates a fair degree of intracultural variability in cognition. Psychologists have also been accumulating evidence that supports the assumption that there is intracultural cognitive variability. For example, Bruner, et al. (1966), in the process of describing intracultural variation in cognitive development, have supported the hypothesis of cognitive diversity and have demonstrated that this diversity is related to experiential factors such as education and area of residence. Ervin (1961) and Lenneberg and Roberts (1956) have presented evidence which indicates the possibility of intracultural variation in a domain as basic as color. Finally, Wiggens and Fishbein (1969) have demonstrated that differential factor structures for the semantic differential can be found within a group as ostensibly homogeneous as college sophomores.

The conclusion that must be drawn from this evidence is unavoidable. First, we must agree with Sanjek that one of the problems confronting the formalists is their lack of quantitative methods (1971). If they used quantitative methods, they would be able to respond effectively to the problem posed by alternative formal solutions without relying on the fabrication of ever more abstract evaluation criteria. Further, since cognitive anthropology has been basically a descriptive science thus far, the relatively meager number of quantitative analyses presented reflects adversely on the state of the field. How can one be sure that the analyses that have been provided are representative of the populations described when the data collection and verification procedures are not specified? Sanjek (1971), among others, has attributed this failing to the uncritical application of the linguistic model. It seems, however, that this so-called linguistic model is not even applicable in linguistics. Hymes (1964) is one anthropologist who has noted that the obvious facts of heterogeneity and individual differences in linguistic competence, although not denied, do not enter into anthropological theories concerning the nature of language and its cultural role. He also asserts that no attention has been paid to sampling, reliability and validity in linguistics. Psycholinguists (e.g., Carroll, 1971) have also pointed out that there is a wide range of variation in both language competence and performance among adults. Furthermore, this variation has been commented upon by some linguists recently. For example, Chafe proposes that

> . . . many underlying forms and many processes which the linguist may posit may have no psychological validity for any speakers, while others may have validity for some speakers and not for others (1970: 38).

Thus, scholars in diverse fields who are interested in linguistics have acknowledged the fact that there is intracultural variation in language competence as well as performance. Nevertheless, in both linguistics and anthropology we still find investigators applying a linguistic model which is based on the assumption that all the speakers of a language share the same set of rules. In addition, Levi-Strauss himself has argued that the uncritical application of the linguistic model has resulted in kinship analyses which are ". . . more complex and more difficult to interpret than the empirical data" (1963: 36). Thus the improper interpretation and use of the linguistic model is receiving criticism from both ends of the quantitative continuum.

It seems, therefore, that quantitative procedures of some sort are essential in cognitive anthropology; but just as the uncritical application of the linguistic model can lead to disastrous results, so can the uncritical application of quantitative models. The various applications of quantitative models in cognitive anthropology have been admirable thus far, but most fall short in one respect or another. Perhaps the strongest charge that can be leveled against them is that they have not been able to adequately account for the cognitive diversity present in the data.

It seems that the most basic error committed is to assume that a description of the modal model (Sanjek, 1971) or a model based on sample means (Romney and D'Andrade, 1964; Sankoff, 1971) adequately handles the problem of variation because it is the model which, overall, deviates least from the set of models in the sample population. Research has shown that although models based on population means may be interpretable, a form of analysis which first segregates the sample into subgroups on the basis of similarity in cognitive patterns and then constructs separate models for each of the subgroups is preferable (Wiggens and Fishbein, 1969; Pollnac, 1972). Analyses of the resultant subgroups have resulted in the discovery of models which manifest such marked variation that one can call into question the representativeness of the mean population model. Other studies have weakened their potential to account for cognitive variability by first forming a priori groups on the basis of sociocultural variables and then looking for differences in cognitive behavior between groups (Cole, et al., 1971; Bruner, et al., 1966). A superior research strategy would be one similar to Sanday's (1968, 1971). She first analyzed her data into types of cognitive structures and processes and designated these types as the dependent variables. She then used multiple regression in an attempt to account for variation in type in terms of life cycle, social role, and experiential variables. Her attempt was moderately successful and represents what is, in general, probably the most efficient research procedure used in anthropology to account for cognitive variability.

Methodological Overview

The approach to be employed here builds on the strengths of the analyses cited above and attempts to overcome their weaknesses. The usefulness of a variety of techniques for the discovery of cognitive structures will be explored, and the interrelationships between these techniques as well as between the structures delineated and other sociocultural variables will be investigated.

The form of inference to be used here will be predominantly statistical. Statistical inference is based on probability and distribution, factors which are obviously basic to an investigation of cognitive variability. It is assumed that statements providing a numerical or quasi-numerical value (e.g., 80% of X are Y, or most X are Y) are, in terms of theory building, superior to those of an "all," "none," or "some" character.

Fundamental to the research design, and following Sanday (1968, 1971), it will first be determined whether or not there are differential patterns of cognition within the research population. A variety of techniques, which will be discussed in detail in later chapters, will be used to infer the structure of the relationships between the terms within a given domain.

The theory of meaning used in this analysis will closely follow Osgood's presentation of the representational mediation theory (1952, 1971). This theory has been criticized on several points (Fodor, 1965, 1966), but Osgood (1971) adequately answers the criticisms. Basically, it is assumed that a word acquires its meaning by being associated with the thing for which it stands. Following Osgood, a STIMULUS-OBJECT elecits a particular pattern of behavior, RESPONSE-T. If other stimuli (e.g., STIMULUS-SYMBOL) previously associated with the STIMULUS-OBJECT are later presented apart from the STIMULUS-OBJECT, they tend to elicit a portion (RESPONSE-X) of the RESPONSE-T associated with the STIMULUS-OBJECT. The STIMULUS-SYMBOL now evokes a mediating reaction (r_m) which produces a pattern of self-stimulation (s_m) that elicits a variety of overt behaviors (RESPONSE-X). r_m's are hypothetical constructs derived from and distinctively representational of the RESPONSE-T's. They are not a subset of the responses making up the RESPONSE-T. It should be noted that subsequent symbols can be established with the use of the r_m's of previously learned symbols as RESPONSE-T's. Osgood refers to this process as <u>assign learning</u>.

According to Osgood the r_m:

> (a) renders functionally equivalent classes of different behavioral events, either signs having the same significance for the receiver of behaviors expressing the same intention for the source, (b) is an abstract entity, unobservable itself but necessary for interpretation of what is observed, and (c) is resolvable into a 'simultaneous bundle' of distinctive features or components which serve to differentiate among classes of meanings. . . . (1971: 524).

These r_m's will be referred to as the cognition of a set of terms and will include their interrelationships in terms of denotation, association, and affect. Because it is impossible to directly observe how a set of terms is structured in the mind, it is necessary to draw inferences from the way behavior is patterned on specific tasks wherein the terms are manipulated. These structures are assumed to be "real" only in the sense that they reflect the manner in which particular individuals or groups of individuals respond to certain tasks. It must be noted, however, that it is not being claimed that the total meaning of any domain will be presented. The techniques used will provide subsets of the total connotative, denotative, and associative meaning, and it is these subsets that will be analyzed in detail.

As a first step in the analysis, individuals will be formed into groups on the basis of similarity in responses to a given task. The patterning of the responses within each of the groups will then be used to infer their cognition of the domain. This approach has been referred to as a "points of view" analysis (Tucker and Messick, 1963; Ross, 1966; Cliff, 1968). The cognitive structures for each group will then be examined in relation to the group's sociocultural characteristics.

A brief description of the four major techniques that will be used to make inferences concerning cognition in this study will be presented at this point. A more complete description will be included in the chapters which contain their applications. The techniques used will be: (1) triadic sorts; (2) semantic differential; (3) free association; and (4) organization in free-recall.

1. The technique of triadic sorts is fully explicated by Torgerson (1958), and an anthropological example has been provided by Romney and D'Andrade (1964). Essentially, it is a technique for determining the relative distance between concepts in terms of total meaning. All

of the possible triads of a set of terms are formed, and the respondent is requested to select the term which is most different in meaning in each triad. The two remaining terms are, of course, considered to be the most alike. For each possible pair of terms, the total number of times that they are classified as most alike in all of the triads containing them is then calculated. The larger this sum is, the closer the two terms are in meaning. The technique, when administered to a sample population, results in a distribution of term-to-term distance matrices which can be further analyzed into multidimensional models of the meaning-space of the terms. Variability in the structure of meaning-space, as determined by the triad technique, will be explored as a part of this investigation.

2. The semantic differential will be used to explore intracultural variation in the dimensions of connotative meaning. The semantic differential has been used extensively in the behavioral sciences, and several comprehensive sources concerning the technique are available (Osgood, et al., 1957; Snider and Osgood, 1969). The technique consists of asking an individual to judge a concept on the basis of bipolar rating scales such as good-bad, fast-slow and strong-weak. An analysis of the responses provided by a sample of individuals results in what is referred to as connotative meaning, or the emotional or affective meaning of concepts (Osgood, et al., 1957).

3. The free association technique has a long history in psychology, and its various uses have been commented upon extensively (e.g., Cramer, 1968). Basically, the free association test consists of a list of words which are read to the respondent, one at a time, and the respondent is requested to reply with the first word that comes to mind. The test results in a distribution of responses to the individual stimuli across a sample population. Although not totally context-free, the free-association test is perhaps as close to a context-free testing situation as any yet devised (Deese, 1965). Deese argues that the responses to the free association test provide ". . . a useful approximation to the hypothetical potential distribution that defines the most general case of meaning" (p. 42). He refers to this type of meaning as associative meaning and claims that it represents the largest subset of meaning that can be empirically obtained by any single technique. In this study, the differential patterning in the relations among the distributions of free-associations to verbal stimuli will be used to investigate variability in intraverbal associative meaning.

4. Free-recall tasks have been used quite extensively in learning and memory experiments in psychology. Organization in free-recall has also been used by psychologists to test propositions concerning the organization of information in memory (e.g., Wortman and Greenberg, 1971; Bower, et al., 1969). A free-recall task involves asking an individual to think of all of the terms relevant to a given domain that he can. The order in which these terms are recalled is used to infer their relative salience, the format by which they are stored in memory, and the operators and decision rules that are used in generating them (Sanday, 1968).

Studies of Color Terminology

The domain of color terminology was selected for several reasons. First, as Lenneberg (1971) has written, color is part of the language of experience. He defines "language of experience" as ". . . words that have simple referents, in the sense that they can be exhaustively described by objective measurements of all of their physical properties" (p. 539). The advantage of investigating words from within the language of experience are that (1) objective, logical criteria can be used to order them; (2) the referents have continuity in nature; (3) they refer to closed classes; and (4) their referents may be specified by a relatively small number of fixed measurements.

The second reason for selecting the domain of color terminology is that there has been a relatively long and sustained history of interest in color perception and color vocabulary in anthropology, psychology and linguistics. The history of these earlier investigations has been reviewed in several recent publications (Berlin and Kay, 1969; Segall, Campbell, and Herskovits, 1966); thus only a brief outline will be presented here.

Some of the earliest investigators (e.g., Gladstone, 1858; Geiger, 1880) concluded that deficiencies in color vocabularies, noted in ancient texts, were indicative of an earlier stage in the evolution of man's color sense. Geiger even proposed an evolutionary sequence for the acquisition of the ability to distinguish various colors. Allen (1879) criticized this viewpoint, claiming that the analysis of texts tells us nothing about color perception, and that paucity of terms is no indicator of deficient perception. He, as well as Woodworth (1910), argued that color terms will develop when and where there is a need for them, i.e., where they fulfill a function. In addition, Magnus (1880) conducted a cross-cultural study which led him to conclude that the perception of color is not underdeveloped in primitive peoples despite considerable differences in the color lexicon.

The argument that a less developed color sense was responsible for deficiencies in color terminology was, however, proposed again by Rivers (1901) as the result of an extensive study of color terminology and perception among peoples of the Torres Straits. He wrote that there was an insensitivity to blues and greens because they were absorbed by the strongly pigmented retina of the Papuan. In a review of Rivers' work, Tichner (1916) concluded that there is no evidence that the color perception of the Murray Islanders differs from ours, and that naming reflects the functional importance of color discriminations rather than perceptual ability.

Later work in the first half of the twentieth century was carried out under the linguistic relativity hypothesis resulting in descriptions of color terminologies for numerous societies. The results of this work led many ethnologists and linguists to conclude that the division of the spectrum is completely arbitrary (e.g., Gleason, 1961; Bohannan, 1963; Nida, 1959). The focus of attention now shifted to the possibility of a relationship between color terminology and cognition. This line of research was stimulated by the writings of Whorf (1956).

Perhaps the most important of these studies was conducted by Brown and Lenneberg (1954). Brown and Lenneberg investigated the relationship between color codability, that is a measure of the degree of intersubject agreement in giving a name to a stimulus, and the ability to recognize a previously administered stimulus color in an array presented at a later time. They found that codability was not related to recognizability when one color was to be identified after a seven second waiting period, but that there was a relationship when the difficulty of the task was increased to four colors after a three minute waiting period. Burnham and Clark (1955), however, arrived at an opposite conclusion using essentially the same procedure but a different sample of colors arrayed in a different way. Later work, moreover, (Lantz and Stefflre, 1964) has led Lenneberg (1967) to conclude that only in certain experimental situations can one find a relationship between semantic structure and recognition, and these situations are restricted to a difficult task with a specific set of stimuli.

The affective meaning of color names has also been the subject of recent investigations. Williams, Morland, and Underwood (1970) found general agreement in the rank-order placement of ten colors along the evaluation, potency, and activity dimensions of the semantic differential for six groups of college students from the U.S.A., Europe, and Asia. In another recent study (Williams, Tucker, and Dunham, 1971) investigated changes in the connotations of color names among Black and White Americans and found intergroup differences. Williams and Foly (1968), moreover, have found a strong relationship between the connotative meaning of color names and color hues. This in combination with the extensive work conducted with regard to the connotative meaning of color stimuli (e.g., Bright and Rainwater, 1962; Kansaku, 1963) provides a great deal of information concerning the affective meaning of color.

With respect to the cross-cultural study of differences an environmental explanation has recently been proposed. Van Wijk (1959) has presented data which he claims indicates that in tropical areas, where the intensity of light is greatest, color nomenclatures focus on brightness and generally neglect hue terms which receive more emphasis in regions toward the poles. Berlin and Kay (1969), however, have argued that societal complexity, which is related to color terminology as well as distance from the equator, is a confounding factor in Van Wijk's interpretation of the data (cf. Naroll, 1970).

Berlin and Kay present the most recent comprehensive cross-cultural study of color terminology. On the basis of a considerable amount of data, they conclude that: (1) "There exist universally for humans eleven basic perceptual color categories, which serve as the psychophysical referents of the eleven or fewer basic color terms in any language"; (2) Historically, a fixed partial order is followed in the encoding of perceptual categories into basic color terms; and (3) the temporal ordering is considered evolutionary, with relatively simple societies using few terms and more complex societies using many.

These conclusions have not gone unchallenged, however. The most cogent critique of Berlin and Kay's work has been written by Hickerson (1971). Among other valid criticisms, Hickerson writes that Berlin and Kay's sample was biased both geographically and by language family. Another criticism of Berlin and Kay's study deals with their claim that the perceptual categorization of color is universal. This claim is based on their observations that the foci of basic color terms are similar in all languages they studied. The difficulty resides in the fact that these observations were, for the most part, made of individuals residing in the San Francisco Bay Area who were bilingual in English, and as Hickerson has noted, there is evidence that bilingualism has an effect on the categorization of color space (Ervin, 1961; Landar, Ervin, and Horowitz, 1960; Lenneberg and Roberts, 1956). Berlin and Kay cite Ervin but, with no evidence provided, claim that ". . . we find it hard to believe that English could so consistently influence the placement of the foci in these diverse languages" (p. 12). Further, Berlin and Kay write that in their tests speakers of the same language (Tzeltal) tended to show slightly more variability among themselves than speakers of different languages. It is this intracultural variability in the conceptualization of color that is of interest here: both the variation that could be the result of multilingualism as referred to above and that which Berlin and Kay referred to.

In addition to the studies already cited, other investigators have indicated that there is intracultural variability with regard to the cognition of color names. Chapanis (1965), for example, has indicated that even among color-normal individuals, interindividual differences are quite large when they are asked to locate that part of the spectrum which represents the purest purple, etc. Other investigators (e.g., Beare, 1963; Dimmick and Hubbard, 1939) report some variation in color term-referent correspondences, but note that there is a general conformity. It must be noted, however, that these investigators used relatively homogeneous college populations. Sex is another variable that has been associated with differential naming of color. Overall, studies have shown that females tend to be more proficient at color naming than males (Chapanis, 1965; Du Bois, 1939; Ligon, 1932).

The brief summary provided here indicates that there is reason to believe that the study of color terminology cannot be properly carried out if it is assumed that a common language or culture implies a common or shared cognition of the color domain. It is further proposed that it is impossible to state with confidence any universals in the conceptualization of color until the ranges and correlates of intracultural variability in the cognition of color have been determined.

Summary

In sum, it has been indicated that the usual approach in cognitive anthropology is not capable of adequately describing any cognitive domain if, in fact, societies are not homogeneous wholes. Evidence was cited which indicates variability in the cognition of color terminology, a situation which theorists such as Taylor (1962) have predicted would be related to differential experiential factors. It thus remains for us to make some general predictions concerning the factors which may be related to intracultural variation in the cognition of color terms in Buganda.

The evidence cited above indicates that there may be a relationship between both bilingualism and sex and variability in the cognition of color terms. The work of Williams, Tucker, and Dunham (1971) has indicated that the connotation of race-related color names underwent a change for Black Americans between the years 1963 and 1969. Since an awareness of being black, or *negritude*, is evident among certain sectors of the African population (e.g., those more exposed to modernizing influences such as education and urban living), it is predicted that these people will differ in the affective meanings they attach to the colors black and white. In addition, since the cognition of color terms seems to be related to the ranges of experience with variously colored items, it is proposed that differential exposure to mass media within which colors are used (e.g., magazines, school texts, advertisements in urban areas) and to urban life where the range of colored objects is the greatest will have an effect on the cognition of color terminology. All of these factors will be examined in conjunction with an analysis of the cognition of color terms in subsequent chapters.

CHAPTER II

THE RESEARCH POPULATION AND METHODS OF DATA COLLECTION

The Baganda

The Baganda live along the northwestern shore of Lake Victoria in the Buganda Region of Uganda. The Buganda region stretches some two hundred miles along the lake shore and extends inland an average depth of about eighty miles. Most of the land lies at approximately 4,000 feet above sea level (Southwold, 1965). The total population of the Buganda region, according to the 1969 Census figures, is approximately 2.7 million. A large degree of migration to Buganda is evidenced by the fact that only a little over 1.9 million of this total were born in Buganda. This indicates that a significant proportion of the population of Buganda are not Baganda. The Buganda Region includes Kampala, the major city of Uganda, with a population of 330,700 (Uganda Government, 1971), of which it can be estimated that nearly one half are Baganda (cf. Parkin, 1969). The only other moderately sized town in the Buganda Region is Masaka with a population of 12,987 (Uganda Government, 1971); thus the majority of the population consists of rural, peasant cultivators.

Buganda was formerly one of the Interlacustrine Kingdoms of East Africa. At the time of the first European arrivals in the interlacustrine area (1862--), Buganda was already one of the largest and most powerful of these kingdoms. The political organization of Buganda was characterized by a territorial bureaucracy under the rule of a paramount ruler (the Kabaka) who was chosen from among the members of a royal kinship group. Territorial subdivisions of the kingdom were in the charge of chiefs who were usually commoners chosen either by hereditary succession or, more commonly, by personal choice of the Kabaka (Fallers, 1960). Buganda eventually became a part of the Uganda Protectorate, within which it played a central and favored role. Buganda had a greater degree of autonomy than any other African Kingdom during the colonial period (Low, 1971a). Of all the groups within the british Protectorate of Uganda, Buganda had the greatest European impact, possessed the largest population, and enjoyed the most privileged constitution. The favored position of Buganda, combined with the active and articulate negotiations of its leaders throughout the colonial period, resulted in Buganda's retaining a greater African character than any other part of Eastern, Central, or Southern Africa (Low, 1971b). The Baganda retained this favored position throughout the colonial administration and into the independent period until the Kabaka's palace was assaulted by the forces of Dr. Milton Obote in May, 1966.

The Baganda speak Luganda, which is classified by Greenberg as being a part of the Benue-Congo branch of the Niger-Congo languages (1963). Like most Bantu languages, Luganda makes extensive use of noun classes, lacks grammatical gender, and manifests phonological contrast for both pitch and duration.

Both tone and duration play an important part in the meaning of words in Luganda. Duration in Luganda is relatively independent of tone. Surface units of duration are manifested by both consonants and vowels. All vowels and most consonants may occur double and both may occur single (Stevick, 1969). An example of contrast in duration for vowels is kuseka (to laugh) versus kuseeka (to be grindable); for consonants, kide (bell) versus kidde (bad weather). An example of contrast in tone would be kùlanga (to announce) versus kùlânga (to plait rope), where the grave accent indicates a relatively low voice with the unmarked syllable following it about a major note higher, and the circumflex indicates a falling tone (Tucker, 1967).

The noun classes are basically grammatical categories. Obligatory agreement between a noun and the words which modify it (e.g., adjectives, verbs) is marked by a prefix. The noun class markers are used to distinguish singular from plural as well as other changes in the meaning of the stem. For example, the Baganda are the people who live in Buganda and speak Luganda. The singular form of Baganda is Muganda, and things of the Baganda, are referred to as Kiganda things. Although the noun classes are basically grammatical categories, many of the members of a given class also have certain meanings in common (cf. Cole, 1965). For example, many of the nouns in the class marked by lu- are elongated. As a consequence, in many cases if a noun which is not in the class marked by lu- is moved to that class it acquires a modification which indicates that it is elongated. For example, a man is musajja. Lusajja, however, refers to a tall, thin man. The possibility of shifting a noun from one class to another to change its meaning thus makes Luganda quite productive in terms of forming new words from old ones. As we shall see, this productivity also affects the domain of color in Luganda as indicated by the many color terms which are derived from other words by changing the noun class.

Luganda is a well documented language with usable dictionaries, grammars, texts, and audio materials. It has been systematically used for administrative purposes, has recognized usage in the official school system, and is used in several newspapers and magazines as well as on the radio. There also exists a tradition of written literature apart from translations, text books, and religious materials (Alexandre, 1972). Snoxall, as early as 1942, commented upon the high degree of literacy among the Baganda (1942). M. C. Fallers (1960) contains an extensive list of Luganda literature.

Traditional Kiganda culture and social life have been extensively documented (e.g., Roscoe, 1911; Mair, 1934; Fallers, 1960; Southwold, 1965; Richards, 1966), including several excellent accounts of urban life (Southall and Gutkind, 1956; Parkin, 1969). In addition to retaining a strong sense of their separate cultural identity, the Baganda, in general, are committed to modernization as evidenced by their eager acceptance of Western education, religions, and technology (cf. Fallers, 1961; Low, 1971b; Richards, 1969). Nevertheless, within a single village one can find individuals who manifest wide ranges of variation with respect to these variables (cf. Robbins, et al., 1969; Robbins and Pollnac, 1969).

Differences in formal education, occupation, and land ownership have all contributed to this variation. Robbins and Kilbride (1972: 205-206) have characterized the social structure of one rural area in Buganda as consisting of four broad strata or categories of people: (1) a *rural elite* which is relatively modern and has considerable wealth and access to a modern way of life as evidenced by their modern homes and automobiles. They often maintain a residence in Kampala as well as in the rural area, and their children are generally well educated, often abroad. (2) A group of *young moderns* who are the younger, less affluent individuals who manifest modern attitudes and dress and are relatively well educated. This group includes teachers, medical assistants, small businessmen, and other skilled individuals. In contrast to the rural elite, however, they do not have the land or wealth to acquire an elaborate material and social life style. (3) The *peasant farmers* who have relatively little land, wealth, or education and are the older, more traditional individuals who usually speak little or no English. (4) The *marginal* individuals who belong to none of the preceding groups. They are generally landless and unemployed, and are often school-leavers. This group includes non-Baganda, as well as Baganda, many of whom are porters.

In greater Kampala itself, the Baganda perform a wide variety of occupations (Parkin, 1969). These occupations range from the unemployed school-leavers, graduates, and individuals who have just arrived in Kampala and are searching for employment through the self-employed barbers, carpenters, bicycle repairment, etc., up to those holding clerical, managerial, and professional positions. Thus, a wide range of variation with respect to occupation and the resultant wealth needed to participate in a modern material and social life style is also present in the urban area.

The Research Areas

The research presented here does not call for systematic random sampling. Our goal will not be to estimate population parameters, but to investigate cognitive processes in individuals which manifest differential exposure to experiential factors such as the urban environment, formal education, and occupational experience. Thus, several research sites were selected which maximize the variance in these experiential factors. Our previous research in Buganda facilitated the selection of these sites. An attempt was made to interview all of the individuals residing in the research areas, and, in fact, everyone contacted, with one exception, agreed to cooperate. Several samples of students from the same areas, in addition to the urban area, were also used. These sampling procedures are common in psychological research. Brislin and Baumgardner (1971), however, have recently suggested that such samples need to be more carefully described so that other scholars can more accurately assess the value of the research and possibly use the results as an aid in selecting samples from the same population. The following discussion of the research sites, in addition to the preceeding description of the Baganda, is provided with this suggestion in mind.

The greater part of the study presented here was carried out in two major research areas. The first, which will be referred to as the peri-urban area, consists of two separate areas: one, approximately six miles south; and the other, about five miles southwest of the center of Kampala. Both of these areas are adjacent to a paved road. The second major research area is located approximately fifty miles southwest of Kampala on the shore of Lake Victoria; it includes one small island and is referred to as the rural area.

Perhaps the most significant variable that distinguishes the peri-urban from the rural area is the proximity of the former to Kampala. Kampala is in all aspects a modern urban area, and, as Southwold has noted, for the past half-century it has been the center of Asian and European commercial, educational, religious, and cultural activity (1965). Both of the peri-urban areas are adjacent to a paved road, and are frequently served by both taxis and Uganda Transport System buses which travel back and forth from Kampala. It should be noted that taxis are the primary means of transportation. They operate more frequently than the buses, and are almost as inexpensive. It is unusual to wait along the road in either of the peri-urban areas for more than ten or fifteen minutes for a taxi except during the rush hours. These rush hours occur when commuters who work or go to school in Kampala travel back and forth. This easy access to the city provides many employment opportunities absent in the rural area. The peri-urban sample, for example, includes a civil engineer, several surveyors, a supervisor of a community center, secretaries, clerks, and various types of skilled and unskilled laborers who work in and around the city and commute on almost a daily basis. This access allows more shopping and pleasure-seeking trips to the city, and results overall in greater exposure to the modern urban center and the goods and services it provides.

The physical appearance of peri-urban villages is rather similar to the rural research area. The majority of houses are constructed of mud bricks or wattle and daub with tin roofs, and each house has associated with it a substantial garden which provides the family with food. The most important food crops include cooking bananas (matooke, the staple crop of the Baganda), sweet potatoes, common beans, ground nuts, various greens, and many different kinds of fruit. The Baganda also grow some coffee and cotton as commercial crops. In addition, some enterprising individuals grow a surplus of food crops to be sold in the city, where fresh produce commands relatively high prices. The major differences between the physical appearance of the rural and peri-urban areas is that in the latter there are more houses constructed of cement block or fired brick with glass windows, fewer houses with thatched roofs, and electricity available to those who can afford it.

In contrast, the rural research area ranges from four to eight miles from a paved road approximately fifty miles from Kampala. It is serviced by Uganda Transport System buses only by way of this paved road and by taxis that come all the way into the area on an average of six times per day. The island in this sample is approximately one mile from the mainland and is served by small oar boat taxis. Thus the urban area is much less accessible to these rural dwellers. As a consequence, there are fewer opportunities for employment and exposure to the modern goods and services provided by the city. The majority of the general population in the rural area are either farmers or fisherman. There are several local shops in the area, and a small trade center is located about five miles away, but the goods and services provided are far inferior to those available in Kampala. Consequently, people still travel to Kampala to shop or trade or for adventure, but these trips are far less frequent than in the peri-urban area.

Perhaps the most efficient way to describe the differences between the two major research areas is to present the results of a background survey instrument that formed part of the interview. This protocol was constructed in Luganda and back-translated several times by several different native Luganda speakers to test its accuracy. It included the items in Table 1.

Table 1

Means and Percent Distributions of Background Variables for Rural and Peri-Urban General Population Samples

	Peri-urban General Population Sample	Rural General Population Sample
1. Age (years)	33.0	40.6
2. Sex (male) (%)	52.9	65.4
3. Number of languages spoken	1.89	1.96
4. Speaks English (%)	48.8	32.3
5. Speaks a Bantu language other than Luganda or Swahili (%)	09.9	12.6
6. Speaks Swahili (%)	21.5	26.0
7. Reads Luganda (%)	90.9	83.5
8. Reads English (%)	47.9	29.1
9. Owns radio (%)	71.1	61.4
10. Years had radio	5.45	4.14

Table 1 (continued)

	Peri-urban General Population Sample	Rural General Population Sample
11. Owns T.V. (%)	01.7	00.0
12. Number of Luganda books or magazines regularly read	0.777	0.567
13. Number of Luganda newspapers regularly read	0.917	0.787
14. Number of English books or magazines regularly read	0.247	0.197
15. Number of English newspapers regularly read	0.339	0.142
16. Number of times to Kampala per year scale (adjusted)	3.21	1.55
17. Occupation scale	0.78	0.95
18. Formal Education (years)	6.24	4.91
19. Past occupation scale	0.90	1.00
20. Religion Catholic %	32.8	73.2
21. Religion Protestant %	56.7	20.7
22. Religion Muslim %	10.5	06.1
Total Sample Size	121	127

Table 1 indicates that the mean age of the peri-urban sample is less than that of the rural sample. These data were gathered by asking the informant how old he was. If a person did not know his age, the age was estimated by asking who the king was or what special events occurred around the time of his birth. The frequency distribution of ages can be found in Table 2.

Table 2 shows that there is a greater frequency of people in the younger age brackets in the Peri-urban sample than in the Rural Sample.

The sex of the respondent was also recorded, and Table 1 indicates that there are more males in the Rural

Table 2

Frequency Distribution of Age in Years for Rural and Peri-Urban General Population Samples

Age (years)	Rural General Population Sample	Peri-Urban General Population Sample
10 - 19	08	31
20 - 29	25	29
30 - 39	30	23
40 - 49	26	12
50 - 59	16	15
60 - 69	12	07
70 - 79	07	04
80 - 89	02	00
90 - 99	01	00

Sample than in the Peri-Urban Sample. Each respondent was also asked to name the languages he could speak. The names of the languages were recorded and were used as the data for items three through six. If a respondent claimed that he spoke English, the interviewer checked to determine if he could answer some simple questions in English. This variable thus reflects at least a minimal command of English. It is also doubtful that the informant would deceive the interviewer concerning his ability with English when a European investigator was present at every interview. Informants' statements concerning speaking other languages were taken at face value along with claims of being able to read Luganda and English (items seven and eight).

Table 1 also indicates that a greater percentage of individuals in the peri-urban area have possessed radios for longer periods. Robbins and Kilbride (1972) have noted that the radio permits rural Baganda to ". . . gather information about and participate in activity sequences far removed in time and space" (p. 215). They have also noted that the radio forms part of the mass media through which the rural Baganda perceive the modern national culture. This greater exposure to the mass media by the peri-urban sample also extends to reading material, as can be seen in items twelve through fifteen in Table 1. Here the respondent was asked to name the magazines, books, and newspapers that he regularly read. The responses formed the data for these items. These items are probably indicative of exposure to the mass media rather than actual purchases or ownership. Many of the people read the newspapers at the local shops in both the rural and the peri-urban areas, and newspapers are passed from person to person, especially when important events are in progress.

Each respondent was also asked how often he went to Kampala. The responses to this question ranged from never to every day. Often the response was a vague "about four times a month," or "usually once a week"; thus, it seemed advisable to scale the responses. If the respondent went to Kampala less than one time per year, he received a score of zero; one to six times, a score of one; seven to twelve, a score of two; thirteen to twenty-four, a score of three; twenty-five to one hundred, a score of four, and more than one hundred, a score of five. Table 1 indicates that the people in the peri-urban area travelled to the city more than those in the rural area. This is due to both proximity and commuting to work. Table 3 presents the range of frequencies of travel to Kampala from both sample areas.

All respondents were asked to name their present and past occupations. The responses were scaled on a scale of from zero to four with subsistence farmer or unemployed receiving a score of zero; unskilled (e.g., fisherman, laborer) a score of one; semi-skilled (e.g., local

Table 3

Frequency Distribution of Travel to Kampala for Rural and Peri-Urban General Population Samples

Frequency (per year)	Rural General Population	Peri-Urban General Population
00	31	10
01 - 06	44	14
07 - 12	11	18
13 - 24	14	19
25 - 100	15	24
Over 100	03	36
Missing	09	00

carpenter, clerk) a score of two; skilled (e.g., primary school teacher, nurse, secretary) a score of three; and professional (e.g., doctor, engineer) a score of four. Table 1 indicates that the rural sample received the higher mean occupational rating. This is doubtless due to several factors: First, the existence of a fairly large number of fishermen in the rural area inflated the mean for the rural area; and second, in the peri-urban areas we sometimes missed the wage earner in a household because he was away at work while the interview was taking place. In the village much of the work was done around the home (e.g., carpentry) or early early in the morning (e.g., fishing), thus giving us easier access to the wage earner.

The response of each person when asked how many years he attended school formed the data for item eighteen. Here is can be observed that the rural sample has had less formal schooling than the peri-urban sample.

In general, Table 1 clearly indicates that the rural sample has had less exposure to mass media, the educational system, and the urban area than has the peri-urban sample. This is to be expected, considering the degree of isolation of the rural sample, and it provides an excellent situation for testing the effect of different experiential factors on cognition.

In this study we will refer to the combined peri-urban and rural samples as the general population sample. In addition to the population sample, several samples of school children were also interviewed in these same areas. Primary six and seven school children from two primary schools in the rural area and one in the peri-urban area took part in our investigation. A small sample of secondary and higher students from Kampala participated in the study also.

The primary schools consist of grades one through seven. In the past, the primary school extended to grade eight. When a student leaves primary grade seven, he takes an examination which permits him to enroll in a secondary school, if he scores high enough. Secondary schools include secondary grades one through four. If a student scores high enough on an exam when he leave secondary school grade four, he may attend a higher secondary school for two more years which prepares him for the university.

The peri-urban primary school is larger than either of the two rural schools, but they are all rather evenly matched with respect to facilities.

The secondary and higher students from Kampala are part of what could be considered an elite. They are required to pass a series of difficult examinations with high scores to get into secondary school, and there is little doubt that many will be among the few Ugandans who enter the university. Most of this elite sample has lived in or near Kampala for the greater part of their lives, and all speak fluent English in addition to Luganda. This sample will be referred to as the Secondary Student Sample, while the primary students will be referred to as the Primary Student Sample. Combined, they will be referred to as the Student Sample.

The student sample completed a background schedule that was in most respects similar to the one completed by the population sample. The results of an analysis of this survey can be found in Table 4.

The variables concerning reading and speaking English, reading Luganda, occupation, and education were not included in Table 4 because the samples were stratified on these variables. All of the student samples are able to speak and read English and Luganda, and are not employed. Since the secondary student sample resides in Kampala, item thirteen does not apply to them.

The description of the items in Table 4 is the same as for Table 1. Again, we see that the peri-urban sample manifests greater exposure to mass media such as reading material, radio, and television. The senior secondary sample, which is an elite urban sample, manifests even more exposure than either of the primary student samples, as would be expected.

The range of variation in experiential factors manifested by these three student samples, as well as the two general population samples, provides an excellent data base for investigating the correlates of cognitive variability.

Methods of Data Collection

An interview schedule was constructed and administered in Luganda to individuals in the samples discussed above. This interview schedule included sections designed to provide data which could be used to infer the cognition of color terms as well as the socio-cultural background information described above. Data was also collected to infer the cognition of four other domains: communication devices, ingestible items, kinship terms, and food-plant terms. These instruments will not be described in detail

Table 4

Means and Percent Distribution of Background Variables for Student Samples

	Senior Secondary Sample	Peri-urban P.6 and P.7 Sample	Rural P.6 and P.7 Sample
1. Age (years)	18.1	13.1	13.1
2. Sex (male) (%)	69.4	51.7	50.8
3. Number of Languages Spoken	3.19	2.28	2.17
4. Speaks a Bantu Language other than Luganda or Swahili (%)	25.0	16.7	07.9
5. Speaks Swahili (%)	41.7	08.3	12.7
6. Owns radio (%)	100	91.7	68.3
7. Years had radio	11.4	5.63	3.68
8. Owns T.V. (%)	33.3	10.0	0.00
9. Number of Luganda books or magazines regularly read	0.57	1.17	1.11
10. Number of Luganda newspapers regularly read	1.14	1.22	0.63
11. Number of English books or magazines regularly read	2.09	1.10	0.65
12. Number of English newspapers regularly read	1.71	0.32	0.14
13. Number of times to Kampala per year adjusted scale	--	2.36	0.76
Sample Size	36	60	63

here, however, since this study covers only color terminology.

Four separate sections of the questionnaire were designed to elicit the color term cognitive data: (1) the word association test; (2) the triadic sort; (3) the semantic differential; and (4) the listing task (order in recall). The potential value of each of these techniques was briefly discussed in Chapter I. Here we will describe their construction and administration.

All four of the instruments were constructed in Luganda and back-translated several times by native Luganda speakers to insure accuracy. A brief discussion of the back-translation procedure is provided here since the equivalence of the Luganda and English versions of the questions described here is crucial in evaluating the results of this investigation (Brislin, 1970). The interview schedules were first constructed in English and then translated into Luganda by two different Luganda-English bilinguals. The translated versions were compared, and areas of disagreement were resolved. The Luganda versions of the interview schedules were translated back into English by two individuals who had no previous familiarity with the original translation. Problems in the translations were again resolved, and the resultant Luganda versions were once again translated into English by a Luganda-English bilingual who was unaware of the original English versions. No further ambiguities were noted at this stage, and the instruments were pretested with a small sample (N=10). This pretest indicated that the respondents had no difficulty interpreting the protocols. The form of the instruments is provided below.

(1) The word association test contained ten frequently used color terms from the Kiganda vocabulary. In addition to the ten color terms, twenty-six terms from other domains of interest were added to the list. Each term was assigned a number, and a table of random numbers was used to construct a randomly ordered list. The resultant list of thirty-six randomly ordered terms was read one at a time to the respondent who was asked to reply with the first word he recalled.

(2) The triadic sort test consisted of the seven most frequently used color terms in the Luganda vocabulary. The seven terms were arranged into all possible triadic combinations and then randomly ordered within each triad. In addition, each separate triad was randomly located on the instrument. This resulted in thirty-five triads which were randomly ordered both internally and externally. The

respondent was presented with each triad and requested to indicate the most different term of the three.

(3) The semantic differential instrument consisted of eleven bi-polar adjectival scales which were used to rate a set of color terms. The bi-polar scales included:

(a)	exciting-unexciting	nkyamufu-sinkyamufu
(b)	pleasant-unpleasant	esanyusa-tesanyusa
(c)	weak-strong	nnafu-yamaanyi
(d)	beautiful-ugly	nnungi-mbi
(e)	slow-fast	erimpola-nyangu
(f)	small-big	ntono-nnene
(g)	clean-dirty	nyonjo-njama
(h)	bright-not bright	ntukuvu-sintukuvu
(i)	heavy-light	nzito-ewewuka
(j)	dense-thin	nkwaafu-ntangaavu
(k)	smell good-smell bad	ewunya bulungi-ewunya bubi

This set of scales were selected for two reasons: First, it is as close as translation problems would permit to the set of scales used by Williams, Moreland, and Underwood (1970) in an extensive cross-cultural study of the connotative meaning of color terms; and second, it includes scales representative of the three major connotative meaning dimensions derived from extensive work with the semantic differential (cf. Osgood, et al., 1957) and two scales which are denotative with respect to color terminology.

The three major dimensions of connotative meaning are the Evaluative, Potency, and Activity dimensions (cf. Osgood, et al., 1957). In the instrument described above, scales b, d, g, and k belong to the Evaluative dimension; c, f, and p to the Potency dimension; and a and e to the Activity dimension. Scales h and j are denotative with respect to color terms and refer to brightness and saturation respectively.

The bipolar adjectives in the above eleven scales were modified to form a continuous seven point scale. For example, in English the fast-slow scale would be "very fast, fast, slightly fast, fast and slow, slightly slow, slow, very slow." Informants were asked to judge a set of colors against each of the eleven scales. Once again, only the seven most frequently used colors were included in the set.

(4) The listing task consisted of asking the respondents to list, in Luganda, all the color terms they could remember.

The research instrument was administered by trained interviewers who were native Luganda speakers. An attempt was made to use interviewers from the areas where the research was conducted. If the interviewer was unknown to the people, he was accompanied by one of the local chiefs or someone else locally well known. The investigator was present at all interviews.

Prior to administering any protocols, the interviewer explained the importance of the research and noted that it was sanctioned by the Ugandan Government. He tailored his explanations to his perception of what the interviewee would understand and desire to hear. This, no doubt, had a great deal to do with the splendid cooperation we received from the people.

Due to the length of the research instrument, it was not administered during one session. The first interview session included the test instruments constructed for the non-color domains, as well as the word association test which contained color terms.

The word association list was probably the most difficult instrument to administer to the population sample. Almost invariably, the respondent would either remain silent or respond with the stimulus for the first word in the word association list. The first word, incidently, was not a color term. The interviewer would then explain, once again, what was expected and proceed with a set of example words until the respondent responded in a manner which indicated that he understood the task. The interviewer recorded all responses in Luganda for further analysis.

The word association task was administered to the student samples in a classroom situation. The interviewer explained the task to the students, who were given a sheet of paper with numbered blanks and asked to fill in the blanks with the first word that "came in mind" when the interviewer read the stimulus to them. The students seemed to have no trouble with this task.

The listing task was only administered to the primary student sample. It was administered prior to any other color protocols to avoid influencing their responses. The students were provided with a sheet of paper with numbered blanks and requested to list all the color terms they could think of in Luganda. They were allowed ten minutes to complete the task and then returned the forms to the investigator.

The triadic sort and the semantic differential were administered at the same interview session. The interviewer first provided examples until he was sure that the respondent understood the task. He then asked the interviewee to point out objects in the immediate environment which manifested each of the colors in the task. When the interviewer was confident that the respondent knew the referents of the color terms and understood the task, he proceeded with the triadic sort. Each triad was verbally presented to the respondent who was asked to select the most different of the three terms. This task was easily understood and rapidly completed. The semantic differential was administered following the triad sort. The interviewer would ask the respondent to judge each of the seven colors on each of the eleven adjectival scales. For example, he would ask "Is red beautiful, ugly, or both?" If the response were "beautiful," he would then ask, "Is red very beautiful, beautiful, or only slightly beautiful?" He would then record the response. The semantic differential was also easily understood and simple to administer. Interviewees often responded with bursts of laughter, however, when asked if a given color were big or little, or smelled good or bad. Nevertheless, they would respond when asked to provide the answer they thought was best.

Overall, the protocols generated little resistance. Most of the people seemed happy to cooperate in what they considered a worthwhile project. This can no doubt be attributed to both the skill of the local interviewers and the well-known hospitality of the Baganda.

Summary

In the first section of this chapter it was noted that the Baganda are an extensively documented East African people who manifest a wide range of variation with respect to exposure to and acceptance of the modern style of life which is concentrated, to a greater extent, in Kampala, the major urban center of Uganda. It was argued that this variability provides an excellent setting for the administration of the research instruments which were described in the second section of this chapter. If we find variation in the response patterns to the research instruments, designed to infer the cognition of color terms, we will be able to determine if they are related to the wide range in experiential factors manifested by this society. This will permit us to formulate propositions concerning the determinants of cognitive variability.

CHAPTER III

THE COLOR TERMS OF THE BAGANDA

Color in the Kiganda Environment

Color terminologies exist to be used as labels for a subset of perceptual phenomena in the world around man. Thus, the study of a color terminology cannot be divorced from the environment within which it is used. We will therefore begin our discussion of Luganda color terminology by presenting a general description of color in the Kiganda environment.

Perhaps the most striking feature about the Kiganda environment is the brilliant contrast between the reddish-brown soil and the bright green foliage. Even in Kampala, the parks and open areas provide this contrast. Kampala itself appears white when approached from a distance. One word association response for the color term white, for example, was--Kampala. The impression of whiteness is due to the pastel shades of blue, pink, brown, and green paint that cover most of the buildings. White, itself, is often used as an exterior color for most buildings, especially downtown stores, government buildings, hotels, the impressive mosques and the Muslim schools attached to them. In the city, many polychrome advertisements greet the eye, and shop windows are filled with a colorful assortment of goods that would rival almost any city in the world. The streets are crowded with automobiles, most either black or white, but other colors were increasingly common in 1971-72. Roads and buildings are colorfully decorated with banners and flags on various holidays. During the first annual celebration of the Second Republic of Uganda in January 1972, the shop windows and streets were covered with small and large reproductions of the black, red, and yellow Ugandan National Flag. Huge black, red, and yellow banners were stretched across the streets and wrapped around the utility poles. The display of these colors was also in evidence in the rural areas as well. In addition to its use in decoration, color is used in the urban areas for traffic signals and street signs, thus increasing its importance as a symbol system.

The Baganda themselves dress very colorfully. The women wear <u>busuuti</u>(s) (traditional dress) and modern clothing of the same colors that are worn in Europe and America. In addition, they wear beautiful, multicolored, richly designed kitenge cloth from Indonesia. The men also wear kitenge shirts. Moreover, most men wear European-style clothing with color combinations one would expect on the streets of London or Paris. The traditional dress for the man, and one often seen in the villages, however, is an ankle length white robe called ekanzu. This robe is sometimes decorated near the neck with a small, deep red or maroon design.

In the peri-urban and rural areas most of the houses are made of reddish mud brick or wattle and daub, and are consequently the color of the local soil. The silvery metal roof is the most common type, but many thatched roofs are also common in rural areas. The outside walls of a few of these houses are often painted. The most common decoration is a slip of light reddish=brown soil painted on the lower half of the house exterior. A wattle and daub house painted a brilliant white and green was observed in one of the peri-urban areas. Whitewash is occasionally used on the interior walls, but the most common interior decorations are colored and black and white pictures from magazines, commercially produced pictures of the president of Uganda, past rulers, the British Royal Family, and religious paints. Hand drawn pen and ink illustrated proverbs in green, red, black, and blue, which are manufactured and sold on the streets of Kampala, are also quite popular as interior decorations. Photos of family members and friends are also commonly found in the houses, but they are predominantly black and white. A study conducted in rural Buganda in 1967 revealed that 68% of the sample had photographs on inside walls while 47% had paintings or magazine illustrations. A restudy in 1969 indicated that the frequency of photographs, in this same area, had increased to 76% (Robbins and Kilbride, 1972).

Both the rural and the urban markets are filled with the colorful produce of the region: ripe yellow bananas, green cooking bananas, fruits of all hues from brilliant red through orange to bright yellow and yellow-green, beans of all colors, blood-red meat, and brilliant white cassava flour.

Many of the books and magazines available in Buganda have colored illustrations, and school children make use of colors in much of their coursework (e.g., geography maps, drawing charts for science courses, and illustrations in readers). Every school visited had colorful examples of the pupil's artwork and other projects displayed on the walls.

The Kiganda environment is thus a colorful one, but not uniformly so. In the rural areas very few of the soil colored houses are decorated on the exterior, and the few flashy advertisements are limited to the vicinity of the local shop keeper. This contrasts vividly with the brightly painted, advertisement filled city. In addition, the wide range of polychrome goods available in Kampala are not seen by rural residents unless they visit the city. Thus, exposure to the urban environment is strongly related to a greater degree of exposure to the many uses and varieties of color in Buganda.

Familiarity with various colors also results from both exposure to illustrated materials in schools and the necessity to learn color codes and discrimination. Differences in the cognition of color would be expected to be closely related to these variables.

The Luganda Color Terminology

In the earliest complete ethnography of the Baganda, Roscoe (1911: 298) reported that for most of their history the Baganda only had words for the colors red, white, and black. More recently Van Wijk (1959) and Berlin and Kay (1969) only report these three same basic color terms. Lugira, in a study of Kiganda art, agrees that there are the only three basic color terms in Luganda, and correctly adds that other colors are designated by deriving terms from objects, which commonly manifest the color (1970: 147).

The major technique used here to elicit Luganda color terms was to request a sample of 102 Primary Six and Primary Seven level students to list, in Luganda, all the color names they could think of. This request was easily formulated in Luganda since the language has a superordinate category for color (langi). The results of this listing task were then translated into English by five different native speakers of Luganda with the aid of a color chart. Discrepancies noted in the different translations were worked out by the translators or by calling in outside judges who were Luganda monolinguals. These translators were also asked to add any color terms they recognized were missing from the lists. The most common responses were also coordinated with a color chart by ten individuals in the general population sample.

The results of the listing task are presented in Table 5. The order of entry in Table 5 reflects the number of individuals recalling a given color term. The color which was recalled by the greatest number of respondents is entered first, the second greatest number, second, and so on.

Each color was ranked according to its order of entry into each respondent's list. The mean of this rank was calculated for all individuals listing a given color and can also be found in Table 5. For example, the mean rank for kiragala (green), which is smaller than the mean rank for any other color, indicates that this color had a tendency to appear earlier in the lists than any of the others. The mean rank, in combination with the frequency of recall, gives some indication of the relative salience of the individual colors. Following Romney and D'Andrade (1964: 155), we will assume that the nearer the beginning of a list a term occurs and the higher its frequency of recall, the more salient the term is for the sample. Like Romney and D'Andrade we find a fair degree of correspondence between these two measures of saliency, at least for the terms with response frequencies exceeding five.

We will first examine the color terms listed in Table 5. The first term in the table, kyenvu, is the Luganda term for yellow. This term is derived from lyenvu, a ripe, sweet banana which is yellow in color. The reduplicated form of this color, kyenvunvu, can be translated as yellowish or yellow-like. As will be seen below, reduplication like this on color terms always functions like the -ish suffix in English.

The color term kiragala is derived from the Luganda term for banana leaf (lulagala) and refers to the color green. Its reduplicated form (kiragalalagala) also appears in Table 5 and refers to a greenish color. Myufu is one of the basic colors in Luganda, and refers to red. Snoxall (1967) in his dictionary, defines myufu as red, scarlet, brown, or pink. None of my informants, however, pointed toward a color that could be identified as either brown or pink when asked to locate myufu on the color chart. These colors were adjacent to the "red" area on the chart, and thus could have easily been included in the area designated for myufu if they belonged there. Both the reduplicated form kimyufumyufu and myukirivu refer to reddish colors. Bbulu is obviously a borrowed word and refers to the color blue. Snoxall (1967) entered the form bbululu in his dictionary. This form, however, was not used as widely as bbulu. Bbulubbulu is the reduplicated form which refers to a bluish color. Kitaka is the Luganda term which refers to the color brown. Most of the informants located the foci for this term a bit closer to red on the color chart than would be expected, and thus the

Table 5

Mean Rank and Frequency of Color Terms on Listing Task

Color	Frequency	Mean Rank	Color	Frequency	Mean Rank
1. Kyenvu (yellow)	101	3.485	18. Myukirivu (reddish)	4	9.500
2. Kiragala (green)	100	2.940	19. Kakofu (spotted black-white)	4	6.750
3. Myufu (red)	98	4.143	20. Kitosi (grey to brown, clay-colored)	3	8.000
4. Bbulu (blue	90	4.822	21. Lukonge (dark green)	2	8.500
5. Kitaka (brown)	90	5.567	22. Kiragalalagala (greenish)	2	12.000
6. Njeru (white)	89	5.258	23. Kakobekobe (purplish)	2	14.500
7. Kakobe (purple)	89	5.562	24. Kawembawemba (deep reddish brown)	1	6.000
8. Nzirugavu (black)	89	6.640	25. Kiwuugulu (greyish brown)	1	12.000
9. Kipapaali (orange)	73	6.849	26. Kabugo (red-brown)	1	5.000
10. Pinka (pink)	46	8.935	27. Bitanga (white-black patches)	1	13.000
11. Kachungwa (orange)	42	7.905	28. Kimyufumyufu (reddish)	1	10.000
12. Kikusi (reddish brown grey)	37	7.757	29. Kivuvuvu (ash grey)	1	7.000
13. Kasaayi (blood red)	16	9.813	30. Kasiriiza (charcoal black)	1	8.000
14. Kitakataka (brownish)	8	10.125			
15. Kyenvunvu (yellowish)	5	9.800			
16. Bbulubbulu (bluish)	4	10.750			
17. Katakke (chocolate brown)	4	9.750			

best translation would be "reddish-brown." This term is derived from the Luganda term for soil (ttaka) which is quite reddish in Buganda because of its high iron content. The reduplicated form, kitakataka refers to a brownish color. Njeru refers to the color white. Lugira writes that the Luganda term for white ". . . covers a range of colors, can mean 'clean' and generally speaking distinguishes objects of relative brightness, paleness, smoothness and gloss." (1970: 147). Although my informants agreed that njeru could be extended to include hues close to the brightest portion of the color solid which were included on the color chart used, they invariably indicated the white border of the chart as njeru. Nzirugavu (black), however, was extended to the darkest shades of red, blue, green, and brown on the chart although there was available a brightness strip that ranged from grey to true black. The term kakobe is derived from kkobe, the fruit of mukobe a type of yam (Dioscorea bulbifera) and refers to the color purple. The reduplicated form kakobekobe is also found in Table 5 and refers to a purplish color. Both kipapaali and kachungwa refer to the color orange for most of the informants and are derived from papaali (papaya, Carica papaya) and muchungwa (orange, Citrus sinensis and C. aurantium) respectively. There was, however, a tendency for the older rural monolinguals to shift toward a dark yellowish-green reference for kachungwa reflecting the usual true color of orange fruit in the rural areas. Pinka is a borrowed term which refers to the color pink. Kikusi is derived from the light reddish-brown soil type lukuusi and refers to a light reddish brown. When one asks for a direct translation of kikusi, however, they are often given the response grey, although grey is never indicated on the color chart for kikusi. The term kasaayi refers to a blood-red color and is derived from the Luganda word for blood (musaayi). Katakke is the Luganda term which refers to a chocolate brown skin color and is used only in reference to skin color. Kakofu is derived from nkofu (guinea fowl) and refers to a spotted black and white color like the guinea fowl's breast. The term kitosi is quite unstable in its reference. It could be used by different individuals to refer to either grey or dark brown. The term is derived from the Luganda term for mud, ttosi. Lukonge refers to a dark green color and is derived from nkonge, the Luganda word for moss. The Luganda term for sorghum (Sorghum vulgare), muwemba, was used as the source for the color term kawembawemba, which refers to a deep reddish brown, the color of ripe sorghum seeds. Kiwuugulu refers to both the owl and the owl's greyish brown color. This color also had an unstable reference ranging from grey to pale brown. Kabugo refers to the red-brown color of barkcloth and is derived from *lubugo*, the Luganda term for barkcloth. *Bitanga* refers to white and black patches, especially on a goat. *Kivuvuvu* refers to an ash-grey color and is derived from the Luganda term for ashes, *vvu*. Finally for Table 5, the term *kasiriiza* (charcoal-black) is derived from *bisiriiza*, the Luganda term that refers to charcoal or cinders.

The thirty color terms listed in Table 5, elicited by the listing task, do not exhaust the rich possibilities for generating color terms in Luganda. For example, all the possible reduplicated forms were not present in the table, nor were the almost infinite possibilities for deriving color terms from non-color terms exhausted. We would argue, however, that the terms discussed above include those most psychologically salient among the Baganda. Nevertheless, we will discuss several other color terms encountered in the course of the investigation.

The Luganda color terms *kagongolo* and *kizima*, and the color term specific modifiers *twa-twa-twa* and *zigizigi* were elicited as responses in the word association test which will be discussed later. *Kagongolo* refers to a very black color. The term is derived from *eggongolo*, a common type of black millipede. *Kizima* refers to a dark maroon color and is derived from *muzima*, the ripe, dark *mpafu* fruit of the *muwafu* tree (*Canarium schweinfurthii*). *Zigizigi* is used to modify the color black and changes its meaning to "jet black" or "very black." *Twa-twa-twa* modifies red (*myufu*) and shifts its primary reference to a crimson color.

In concluding this section, it must be noted that intensive work with several informants prior to conducting the listing task and word association failed to result in as complete a description of Luganda color terminology as the procedure described above. Intensive work with single informants, in addition to producing less data, was also more time consuming. These practical considerations, and certain theoretical implications provided later, argue strongly for the methodology adopted.

The Associative Meaning of Luganda Color Terms

The technique used to determine the associative meaning of Luganda color terms is the word association test described in Chapters I and II. Basically, the word association technique defines the associative meaning of a term as the verbal response to a term when it is used as a stimulus. One difficulty with this definition is that a given term can elicit a variety of responses from the same person at different times. Thus the meaning of a term is not given by a single response but by the potential distribution of responses to the term (Deese, 1965: 41). The word association test provides a distribution of responses to given terms across a sample of speakers of a language. It thus can be used as a data base for statistically determining the potential distribution of responses.

The word association test, as described in Chapter II, was administered in Luganda to a sample of 208 Baganda. The ten terms in the test were the ten most salient as determined by the previous listing task. The sample included 98 primary level six and seven students and 110 individuals from the general population in a rural and a peri-urban area. All responses were in Luganda and were translated and back-translated by native speakers of Luganda who were bilingual in English. The results will be presented here in English except where confusion may arise because of nonequivalence.

We will first examine the absolute character of the distribution of responses to the ten Luganda color terms. A total listing of the responses is provided in the Associative Dictionary in Appendix I. Here we will describe the responses with a frequency equal to or greater than five.

The greatest frequency of responses to black was its opposite, white (n=57). The next highest frequency was the superordinate category color, (n=33). Thirteen responses consisted of a stem for black (-ddugavu) with the ki- noun class concordance prefix. This term (kiddugavu) means "it is black." Nine responses were red, and eight were jet black. There were six hair and very (nnyo) responses, and five pencil, cookpot, and soot responses. Cooking pots, although for the most part made of stamped aluminum, are used over a wood or charcoal fire and thus become covered with black soot on the outside. The response cookpot is therefore descriptive.

Orange (kipapaali) was responded to with yellow with the greatest frequency (n=37). Second we again find color with a frequency of thirty-one. Both to eat and papaya were used sixteen times. The explanation for these responses is probably the fact that the Luganda term for orange is derived from the term for papaya. Eleven responses were green, the usual color of the papaya skin, and the color of most fruits before they turn orange. Mango and cloth were each used seven times and sweet and ripe six times each. The inside of a mango is usually a yellowish orange, and the exterior on some varieties is a orangish-yellow when ripe. In addition, most of the local fruits approach a yellow or orange color when ripe. Five of the responses were fruit.

Most of the responses to red were the superordinate category color (n=41). Twenty-five responses were blood, which has an obvious association with red. Green, red's complement, was used nineteen times and the colors black and white sixteen and nine times, respectively. Again we find very (nnyo) as a response nine times. Blood-red was used eight times, pencil seven, yellow six, and red (myufu) with the noun class concordance marker ki- was used five times.

The color term for brown (kitaka) is derived from the term for soil (ttaka), and soil was used as a response for brown (n=30). This is closely followed by the color term kikusi (a light red grey-brown color) which is derived from a soil type called lukuusi and thus linked to kitaka by its reddish quality in addition to the fact that it is also derived from a soil type. Yellow occurs with a frequency of eight, and the colors purple, black, and barkcloth-brown each have a frequency of seven. Good is used as a response six times, and orange (kipapaali), dust, and kikusikusi (a light red-greyish-brownish color) each occur five times as a response to brown.

Purple elicited the superordinate category color more than any other color (n=77). The response blue was given sixteen times, and kobe, the yam type (Dioscorea bulbifera) from which the Luganda term purple is derived, was used fourteen times. The colors green, red, and brown were responses twelve, nine, and six times respectively. Cloth was used as a response to purple eight times.

Yellow elicited the response color forty-seven times and the responses green and orange (kipapaali) sixteen times each. A response which refers to the ripened sweet banana (menvu) was given twelve times. As written above, menvu is the term from which the color term kyenvu (or yellow) is derived. Yellow, like orange, is also associated with ripe (n=10) because ripe fruits are often yellow or orange in color. Red was also used as a response ten times, and cloth and good have a frequency of six. Purple, blue and of yellow (kyakyenvu) were used five times a piece.

Kikusi had a response pattern which overlapped quite noticeably with brown. Color was the most frequent (n=42) followed closely by brown (n=40) and soil (n=33). Kikusikusi (a light red-greyish-brown color) and lukuusi, the soil type from which the color term is derived, each had a frequency of eight; while ant hill, red, and bad had frequencies of seven, six, and five respectively.

Color was used as a response forty-three times for green and once again was the most frequent response. Green elicited banana leaf (olulagala) as a response twenty-nine times. The Luganda term for green is derived from olulagala. Leaves (bikoola) had a frequency of fifteen, and the colors blue, red, and yellow had frequencies of thirteen, eleven, and ten respectively. Muddo (grass or weeds) and plants (bimera) were used as responses eight and seven times respectively, while the color black was used five times.

Color was the most frequent response for blue and was closely followed by the verb to wash. This association is probably explained by the fact that a widely advertised soap in Uganda (Omo) comes in a blue box, and blue soap bars are commonly sold in the markets. A variant of the term for blue (bbululu) received a frequency of twenty. Bbululu is the term used for blue in Snoxall's dictionary (1967: 17), but it was not the usual term used for blue at the time of this investigation. Put on clothes was the response ten times, and cloth, purple, white, and water were the responses to blue eight, seven, five and five times respectively.

White also had color as its most common response (n=43). This was followed by white's polar opposite black (n=32). The response is clean was recorded sixteen times, and the response kyeru (white), formed by changing the noun class concordance prefix of njeru (white), was given ten times. The responses red and papers were used nine times each, while cloth and shirt were used eight times each. The color pink was the response to white five times.

Even a casual glance at the above description of the associative meaning of the ten color terms indicates that there is a great deal of overlap in the response patterns. As Deese (1965: 43-45) has noted, we must go beyond a mere description of the nature of the distribution of responses to a particular word and investigate the relations that the distribution has to the distributions of responses to other words used as stimuli. Since these distributions are obtained from a population of individuals, they do not represent the meaning for a single individual.

Theoretically they represent a socially agreed upon meaning structure which is supposedly representative of the major structural characteristics of any individual in the population.

The basic assumption underlying the comparison of words in terms of associative meaning is that the words are considered to have the same associative meaning if the distributions of their responses are the same, and that the degree that these distributions agree is an indication of the extent of shared associative meaning. Distributions such as those presented above and in Appendix I are said to agree to a certain extent because they manifest examples of the same linguistic forms. The co-occurrence of these common elements indicates the intersection of the distributions of associative meaning.

The most obvious intersection in the distributions of associative meaning for the ten color terms presented above is the superordinate term for color, langi, and the color terms themselves as responses. First we shall look at the degree of intersection which is the result of responses from within the set of stimuli. Table 6 indicates the number of times that each of the stimuli elicited one of the other stimuli in the set as a response. For example, as presented in Table 6, black elicited red as a response nine times, and red elicited black a total of sixteen times.

If we accept the assumption that each stimulus not only yields the overt response but also yields itself as a response (Deese, 1965: 47), the amount of associative overlap (number of common responses) would be the sum of the number of times that two given words yield each other as responses. Thus the amount of associative overlap between red and black would be nine plus sixteen or twenty-five if we limit our analysis to responses from within the original ten stimuli. A matrix of the associative overlap was calculated from Table 6 and is presented in Table 7.

Only the lower left half of the matrix is presented in Table 7 since the matrix is symmetrical. Since the extent of shared associative meaning is indicated by the degree to which the distributions agree, the raw numbers in Table 7 can be used to estimate the degree of shared associative meaning between any two of the ten color terms. For example, white and black, which have 89 responses in common, share more associative meaning than do black and yellow with only one response in common. Therefore, the larger the entry for any two terms in Table 7, the closer they are together in terms of associative meaning.

Table 6

Word Association Color Term Response to Color Term Stimulus

Stimuli	Response									
	Black	Red	White	Yellow	Blue	Green	Brown	Orange	Kikusi	Purple
Black	--	09	57	00	02	00	01	00	01	00
Red	16	--	09	06	01	19	01	01	00	02
White	32	09	--	03	02	02	00	00	00	04
Yellow	01	10	03	--	05	16	03	16	00	05
Blue	04	02	05	01	--	04	00	00	00	07
Green	05	11	03	10	13	--	02	00	00	03
Brown	07	04	02	08	03	02	--	05	24	07
Orange	01	04	00	37	01	11	03	--	00	02
Kikusi	00	06	02	02	02	00	40	01	--	01
Purple	02	09	04	03	16	12	06	02	01	--

Table 7

Associative Overlap For Color Term Stimuli With Color Term Responses

	Black	Red	White	Yellow	Blue	Green	Brown	Orange	Kikusi	Purple
Black	--									
Red	25	--								
White	89	18	--							
Yellow	01	16	06	--						
Blue	06	03	07	06	--					
Green	05	30	05	26	17	--				
Brown	08	05	02	11	03	04	--			
Orange	01	05	00	53	01	11	08	--		
Kikusi	01	06	02	02	02	00	64	01	--	
Purple	02	11	08	08	23	15	13	04	02	--

Keeping in mind the fact that the entries in Table 7 are the result of limiting the analysis to responses from the original set of ten color terms and they do not represent the total degree of overlap, we can determine the dimensionality of the color term space by analyzing the degrees of associative similarity indicated in Table 7. The goal of the analysis of this matrix is to determine the minimum number of independent coordinate axes necessary to reproduce, to an acceptable degree, the variation present in the matrix. Such a goal requires a metric technique. This matrix was analyzed with the use of factor analysis.

As noted by Deese, one of the limitations in the use of factor analytic techniques in the study of the structure of associative meaning is that unless the linguistic universe is exhausted, it is impossible to arrive at the dimensionality of the factor space of associative meaning (1965: 72-73). We can, however, determine the structure of the relations within a set of words. Therefore, the analysis presented here makes no claims concerning the structure of total color space, but only claims to have delineated the structural relationships between the ten color terms in the original set of stimuli. This qualification applies to all the analyses presented here wherein only a subset of terms are analyzed.

Unity was entered into the principal diagonal of the matrix presented in Table 7, and the matrix was factor analyzed and rotated to orthogonal simple structure using the varimax technique. The factor analysis resulted in four factors or dimensions. The factors beyond four explained an insignificant amount of the variance in the data set. The four rotated factors are presented in Table 8.

Yellow and orange have their highest loadings on factor one, and are ostensibly perceptually similar. The color terms black and white have the largest loading on factor two. It is quite common for these two words to elicit each other in word association tests (Postman and Keppel, 1970). Their high degree of similarity in associative meaning is expected when the responses analyzed are color terms from within the set of stimuli. Factor three consists of the terms for blue, green, and purple. The perceptual similarity between blue and green and blue and purple are probably responsible for this dimension. <u>Kikusi</u> and brown have their highest loadings on factor four. As mentioned above, these two terms are probably related because both are derived from terms for soil types, and are slightly similar perceptually. The term red did not

Table 8

Factor Analysis of Associative Overlap For Color Term Stimuli with Color Term Response

	Factor			
	I	II	III	IV
Black	-0.016	0.968	0.011	0.030
Red	0.228	0.344	0.373	0.029
White	-0.010	0.952	0.033	0.003
Yellow	0.855	0.029	0.124	0.040
Blue	-0.096	0.009	0.681	-0.003
Green	0.339	0.055	0.596	-0.051
Brown	0.081	0.033	0.072	0.901
Orange	0.839	0.012	-0.061	0.031
Kikusi	-0.014	0.006	-0.001	0.904
Purple	-0.035	-0.001	0.681	0.098

achieve an exceptionally high loading on any one of the factors. Its highest loading, however, is on factor three with purple, blue, and green.

As Fillenbaum and Rapoport (1971: 12) have noted, it is desirable to supplement a dimensional model of analysis like factor analysis or multidimensional scaling with dimension-free techniques such as cluster analysis when one cannot be sure that the domain being analyzed has a continuous underlying space of well defined dimensionality. The purpose of a cluster analysis is to group variables (the variables can be cases) into clusters so that the variables within a given cluster are more like each other than the variables in other clusters.

The cluster analytic technique used here starts with the proximity matrix presented in Table 7 and groups those variables (color terms) which are most similar in associative meaning as indicated by the size of the cell entries. At each step, each newly formed cluster is treated as a single variable and new proximity measures between it and every other variable are calculated by averaging the original proximities of the variables included in the cluster. This grouping continues until all the variables are clustered into one group. The results of the cluster analysis of the proximity matrix in Table 7 can be found in Figure 1. The figures at the nodes in Figure 1 are for cluster identification purposes only and do not reflect the order of clustering. For example, in Figure 1 cluster six consists of clusters three and four, which consist of the color terms orange and yellow, and green and red respectively.

In general, the cluster analysis agrees with the factor analysis as evidenced by the fact that clusters one, two, three, and five have clustered the same color terms as those that load highest in factors four, three, one, and two respectively. Red, however, is clustered here with green. A glance at Table 7 indicates that the largest degree of overlap with green is with red and vice versa. Thus, in this case the dimension-free analysis was a useful supplement to the factor analysis.

Although revealing, this analysis did not consider the total intersection of the distribution of associative meaning obtained from the sample. The measure of associative intersection that will now be used is presented in Deese (1965: 50-53). In this analysis the intersection coefficient will be the joint frequency of occurrence divided by the total number of possible occurrences in common (2N=416), where the joint frequency of occurrence is the smaller frequency in the two distributions. For example, given the above assumption that each stimulus yields itself as a response as well as the overt response, the joint frequency of occurrence for X and Y in Table 9 would be 10+8+4=22;

Table 9

Example

	Response		
Stimulus	X	Y	Z
X	(50)	8	7
Y	10	(50)	4

N=50

and the intersection coefficient would be 22÷2N=0.22. This intersection coefficient can vary between 0.00 and

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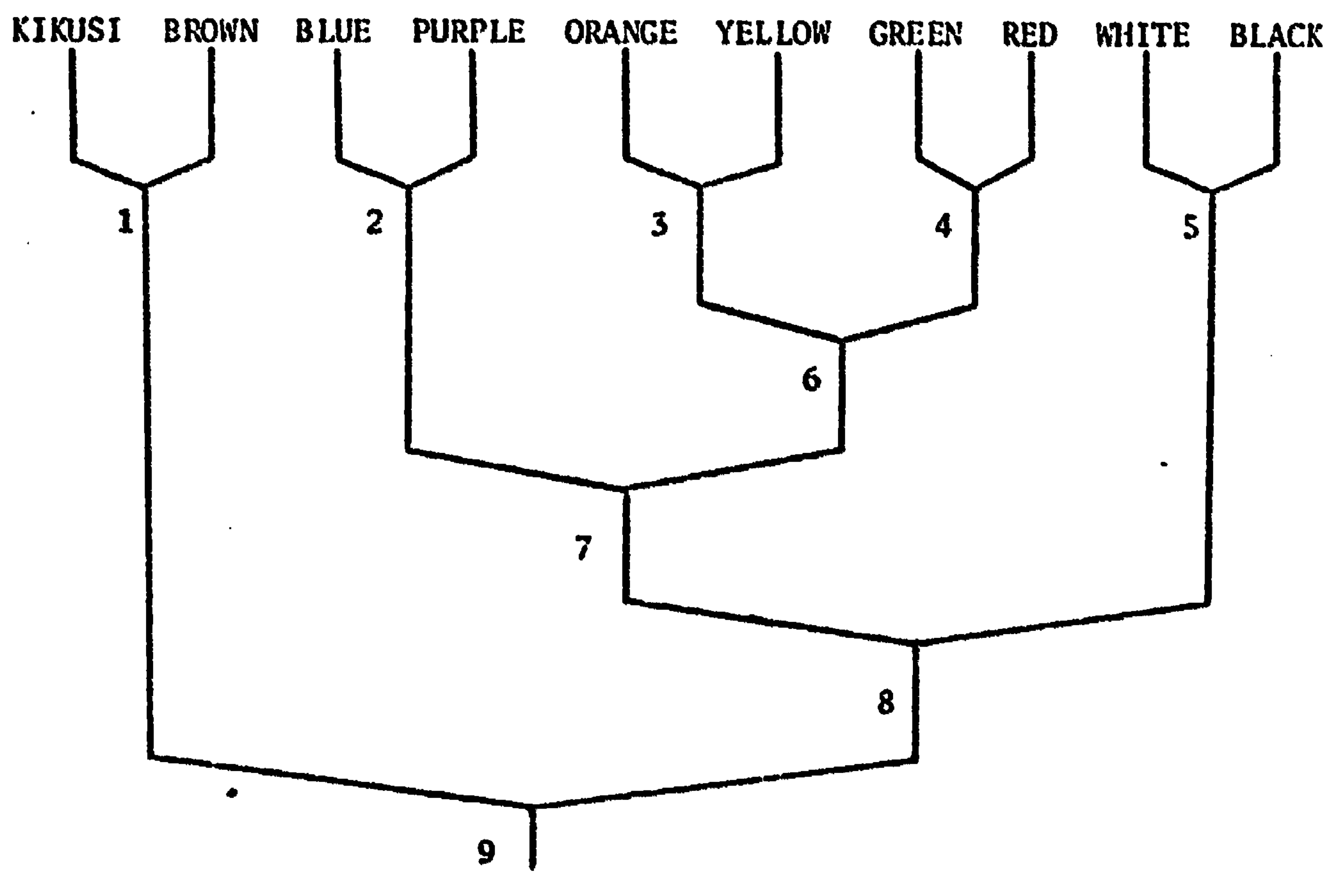

Fig. 1.--Cluster analysis of associative overlap for color term stimuli with color term responses.

1.00 with the latter value occurring only if the two distributions are identical.

Intersection coefficients were calculated for the ten color terms and are presented in Table 10.

The matrix presented in Table 10 was also factor analyzed and rotated to orthogonal simple structure using the varimax technique. Once again, the factors beyond four represented insignificant increments in total variance explained and will not be considered here. The four rotated factors are presented in Table 11.

The factor matrix presented in Table 11 is quite similar to that in Table 8. For example, the highest loading color terms in factors one, two, three, and four are the same as those in factors two, four, one, and three respectively in Table 8. This correspondence is no doubt due to the fact that the color terms themselves were, overall, the higher frequency responses as was noted in the description above. Nevertheless, it is interesting that the structure of the associative meaning space remained similar when all the responses were taken into account.

Factor one now consists of black, red, and white. Besides the considerable overlap of reciprocal responses within this set of three terms, they also shared numerous other responses such as very (nnyo), pencil, dark, auto, goat, cloth, shoes, chicken, and others with smaller frequencies (cf. the Associative Dictionary in the Appendix). Brown and kiķusi had the highest loadings on factor two. These two colors elicited each other as high frequency responses in addition to sharing other high frequency responses such as soil and kikusikusi, as was noted above, as well as other responses such as ant hill, kitosi, lukuusi, brownish, barkcloth-brown, and dirty. On factor three, yellow and orange received the highest loadings. These two color terms elicit each other with a high frequency in addition to cloth, ripe, papaya, the fruit orange, and others listed in the Associative Dictionary. The terms blue, green and purple received the highest loadings on factor four mainly because they tend to elicit each other as well as shared responses such as good and cloth.

The intersection coefficient matrix presented in Table 10 was also cluster analyzed by the technique described above, and the results can be found in Figure 2.

Table 10

Intersection Coefficients for Color Terms

	Black	Red	White	Yellow	Blue	Green	Brown	Orange	Kikusi	Purple
Black	1.000									
Red	0.202	1.000								
White	0.322	0.175	1.000							
Yellow	0.108	0.180	0.161	1.000						
Blue	0.111	0.118	0.130	0.132	1.000					
Green	0.103	0.197	0.135	0.197	0.139	1.000				
Brown	0.106	0.106	0.094	0.137	0.100	0.101	1.000			
Orange	0.089	0.103	0.101	0.274	0.099	0.135	0.113	1.000		
Kikusi	0.101	0.132	0.113	0.127	0.101	0.113	0.361	0.094	1.000	
Purple	0.103	0.163	0.156	0.180	0.175	0.159	0.127	0.115	0.130	1.000

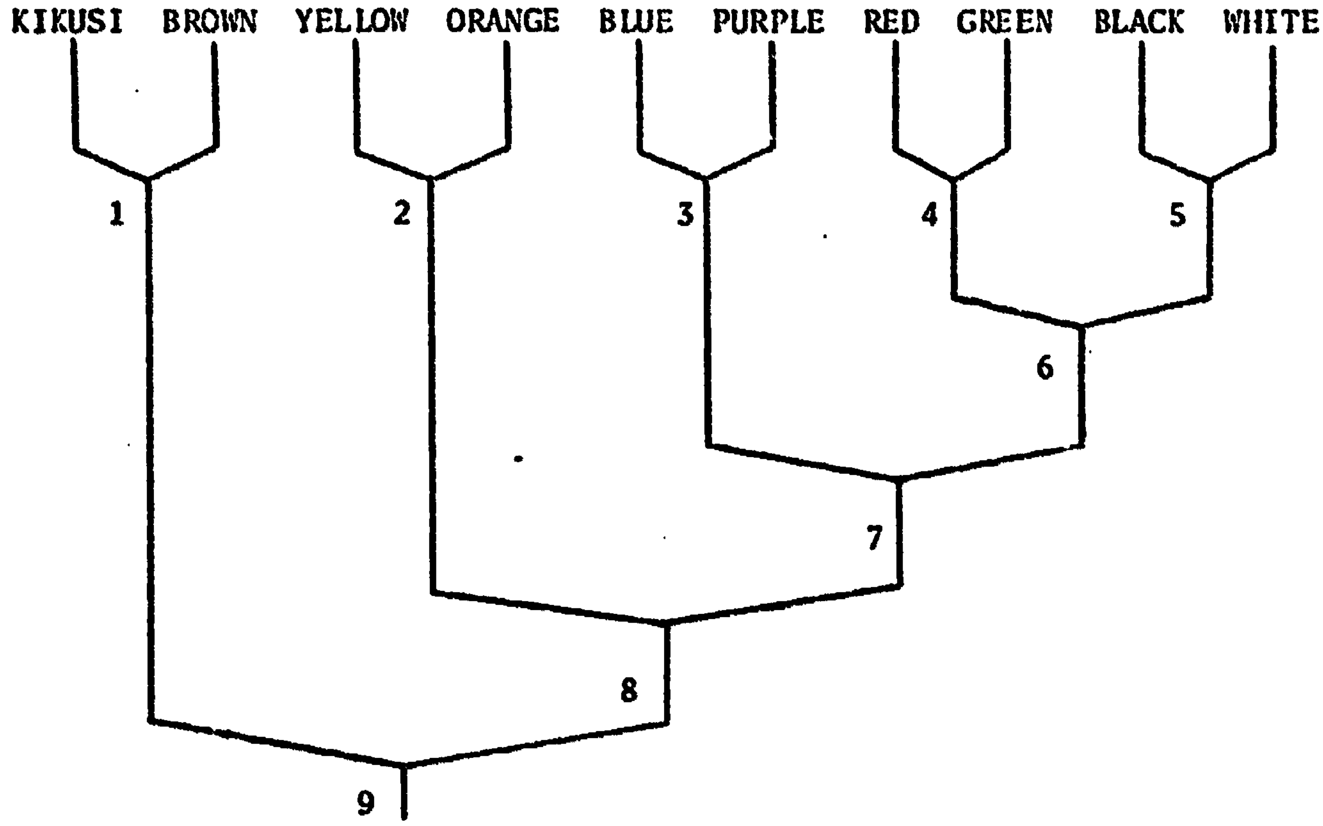

Fig. 2.--Cluster analysis of intersection coefficients for color terms.

Table 11

Factor Analysis of Intersection Coefficients For Color Terms

	Factor			
	I	II	III	IV
Black	0.815	0.069	0.013	-0.001
Red	0.413	0.069	0.157	0.337
White	0.749	0.038	0.077	0.109
Yellow	0.110	0.078	0.710	0.208
Blue	0.050	0.045	-0.059	0.719
Green	0.099	0.018	0.299	0.500
Brown	0.053	0.817	0.092	0.064
Orange	0.040	0.062	0.817	-0.011
Kikusi	0.080	0.811	0.042	0.101
Purple	0.072	0.109	0.083	0.652

Once again the results compare favorably with the factor analysis. Here, the clusters one, two, three, and five include the highest loading color terms appearing in factors two, three, four, and one respectively. Moreover, the term red is again grouped with green because of the high degree of overlap between these two terms.

In sum, the analysis of the word association data has indicated that there is a fair amount of associative overlap among the ten terms analyzed. Most of this overlap is due to the common response being either the superordinate category langi (color) or one of the other color terms from within the set analyzed. Overall, the structure of the associative color space, as determined by the factor analysis, can be attributed to perceptual similarity or dissimilarity (e.g., black and white) although factors such as affective meaning (good, bad, etc.) and objects commonly associated with the color entered into its definition. Nevertheless, the above analysis in conjunction with the Associative Dictionary found in the Appendix clearly define the associative meaning of the Luganda color terms analyzed.

Luganda Color Name Space in Terms of Total Meaning

The technique that will be used to determine the distribution of color terms in semantic space is the triadic sort which has been briefly discussed in Chapters I and II. The triadic sort results in a quantitative description of the degree of difference between all the color terms in the set analyzed.

The terms to be analyzed here are the Luganda equivalents of black, red, white, yellow, blue, green, and brown. These terms were selected because of their relative salience determined by the listing task discussed above. Although purple precedes black in terms of relative salience, black was selected because it is one of the three basic colors in Luganda. All possible triads (35) of the seven color terms were formed. Individuals from the primary and secondary student and general population samples were then asked to select, from each triad, the color term which was the most different in meaning. The two remaining terms were considered most alike in the triad. For each possible pair of terms, the total number of times they were classified as most alike was then calculated. The sample means of these totals were then divided by five (the maximum number of times that any dyad appeared in the set of thirty-five triads) resulting in a distance coefficient that varied between zero and one. The smaller this coefficient is, the further apart in total meaning the two terms are. The color term distance coefficients for the three samples can be found in Tables 12, 13 and 14.

Table 12

Triad Distance Coefficients For Color Terms Population Sample

	Black	Red	White	Yellow	Blue	Green	Brown
Black	---						
Red	0.35	---					
White	0.20	0.26	---				
Yellow	0.29	0.34	0.36	---			
Blue	0.39	0.29	0.27	0.31	---		
Green	0.29	0.30	0.25	0.39	0.38	---	
Brown	0.51	0.43	0.26	0.45	0.31	0.35	---

Table 13

Triad Distance Coefficients for Color Terms
Secondary Student Sample

	Black	Red	White	Yellow	Blue	Green	Brown
Black	---						
Red	0.28	---					
White	0.12	0.20	---				
Yellow	0.09	0.42	0.61	---			
Blue	0.63	0.18	0.26	0.29	---		
Green	0.33	0.22	0.12	0.51	0.67	---	
Brown	0.44	0.62	0.06	0.38	0.26	0.31	---

Table 14

Triad Distance Coefficients for Color Terms
Primary Student Sample

	Black	Red	White	Yellow	Blue	Green	Brown
Black	---						
Red	0.21	---					
White	0.14	0.18	---				
Yellow	0.18	0.42	0.42	---			
Blue	0.43	0.29	0.23	0.31	---		
Green	0.36	0.40	0.17	0.40	0.59	---	
Brown	0.56	0.48	0.12	0.39	0.36	0.34	---

The larger a coefficient for two colors is in these tables, the closer they are in meaning. For example, in Table 12, black is closest in meaning to brown (0.51) and furthest from white (0.20).

The technique most suitable for the analysis of a distance matrix derived from a triadic sort is some form of non-metric multidimensional scaling (Torgerson, 1958). The reason is that each decision in the triadic sort cannot be assumed to be made on the basis of equal intervals of difference in meaning, and thus, the sums of these decisions must be considered as an ordinal scale. Hence, the goal here, in contrast to the goal of the analysis of the word association data, is to reproduce only the rank orders of the values in Table 12 through 14 with fewer dimensions than those present in the matrices. The scaling method used here is Torgerson and Young's TORSCA-9. The TORSCA-9 program serially factor analyzes the scalar products of matrices which are successively corrected and monotonic with the original distance data.

Several distance functions are available to be used in the solution of these matrices. The two most common distance models are Euclidean and City Block distance. In Euclidean space the distance between any two points is the square root of the sum of the squares of the differences in projection over all orthogonal axes of the space. When the City Block metric is used, however, the distance between two points is the sum of the absolute differences in their projections over all the axes of their space.

A simple two-dimensional illustration of these two distance models will make the distinction between them clear. In a two dimensional Euclidean space, the distance between the vertices of the two acute angles of a right-triangle is equal to the hypotenuse (the shortest straight-line distance between the points). This indicates that the technique for finding distance in Euclidean space is a direct application of the Pythagorean theorem. In a two-dimensional City Block space, however, the distance between these same two points would be the sum of the length of the two sides opposite the hypotenuse.

It has been argued that the nature of the stimuli objects is related to the type of spatial model most appropriate for a given analysis (Torgerson, 1958: 251-254). In the case where separate dimensions of meaning are not obvious, the overall difference between the two stimuli would probably be judged directly, and the Euclidean model would most accurately describe the space.

However, if the stimuli differ on obvious dimensions and if these dimensions are combined in an additive manner to evaluate the difference between the stimuli, the City Block model would be the most appropriate. With respect to color, the City Block metric would be most appropriate if decisions concerning the similarity of two terms were made in the following manner: "colors X, Y, and Z are almost the same, but I like Y better, so it is the most different," or "X and Y are both darker than Z, but Z and Y are both reddish and are less attractive so X is the most different." Verbalizations, such as the above, were made during the administration of the triadic sort protocol. Thus the City Block metric may be the most appropriate model. However, if the decision process is based on the overall evaluation of some sort of model of color space in the mind of the respondent, the Euclidean model would be the more appropriate. Since only occasional verbalizations were made, any assumption concerning the color space, without further analysis, would be based on inadequate information. We therefore decided to scale the matrices in Tables 12, 13, and 14 using both metrics and select the one which resulted in the best fit to the data.

The three matrices were scaled using both the Euclidean and the City Block metrics for four, three, and two dimensions. The City Block metric provided the best fit, with the least stress for the three dimensional model. Kruskall's stress was lowest for the three-dimensional City Block solution for all three samples. The TORSCA-9 index of fit and the stress values also indicate that each three-dimensional solution has satisfactory degree of fit with the original distance matrix (Young, 1968). These values can be found in Table 15.

Table 15

Index of Fit and Stress Values For Multidimensional Scaling of Triad Distances of Color Terms With City Block Model

Dimension	Primary Students		Secondary Students		Population Sample	
	Index	Stress	Index	Stress	Index	Stress
4	0.9999	0.018	0.9999	0.014	0.9999	0.022
3	0.9999	0.015	0.9999	0.014	0.9999	0.015
2	0.9981	0.087	0.9904	0.195	0.9985	0.077

The results of the three dimensional solutions can be found in Table 16 and are plotted in Figures 3, 4 and 5.

The most easily interpreted dimension in Figures 3, 4 and 5 is the vertical one. It is quite obviously a brightness dimension with black or brown at one extreme and white or white and yellow at the other. With regard to the other color terms, although there are some differences between the three samples, overall we find yellow, blue, and

Table 16

Three Dimensional Solutions of Triad Distances of Color Terms

	Primary Students			Secondary Students			Population		
	Dimension			Dimension			Dimension		
	I	II	III	I	II	III	I	II	III
Black	0.719	0.193	-0.298	-0.706	-0.308	0.295	0.671	0.031	-0.268
Red	-0.086	-0.650	0.048	-0.009	0.356	0.480	-0.192	-0.650	-0.033
White	-0.812	0.501	-0.135	0.791	-0.278	0.286	0.999	-0.057	-0.100
Yellow	-0.587	-0.148	0.030	0.592	0.351	-0.281	0.367	-0.049	0.169
Blue	0.341	0.387	0.234	-0.081	-0.402	-0.275	-0.078	0.526	-0.315
Green	0.150	0.097	0.506	-0.079	-0.231	-0.391	-0.062	0.274	0.493
Brown	0.275	-0.379	-0.386	-0.509	0.513	-0.115	-0.629	-0.076	0.053

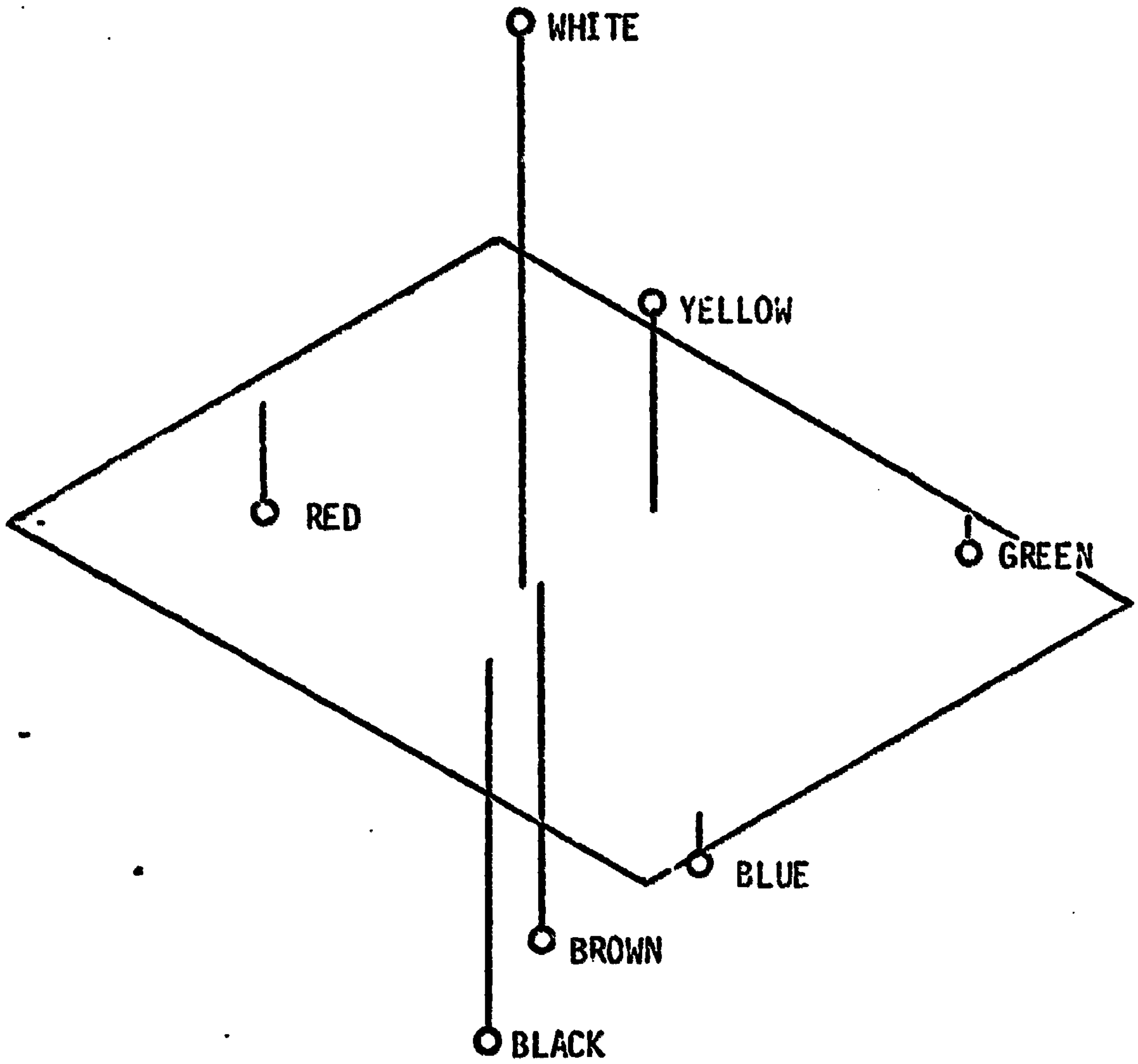

Fig. 3.--Three dimensional representation of triad distance of color terms for the General Population Sample.

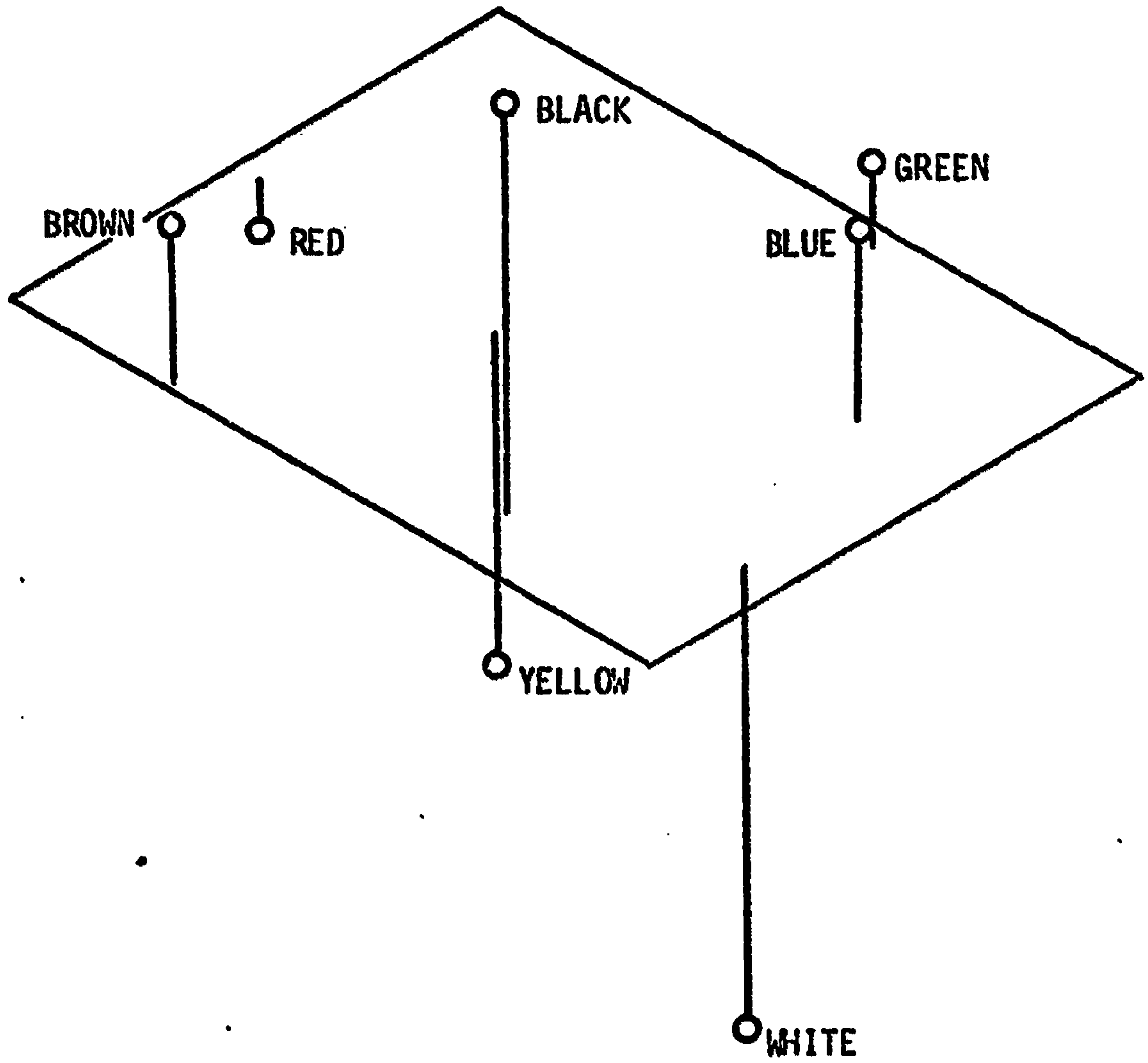

Fig. 4.--Three dimensional representation of triad distances of color terms for the Primary Student Sample.

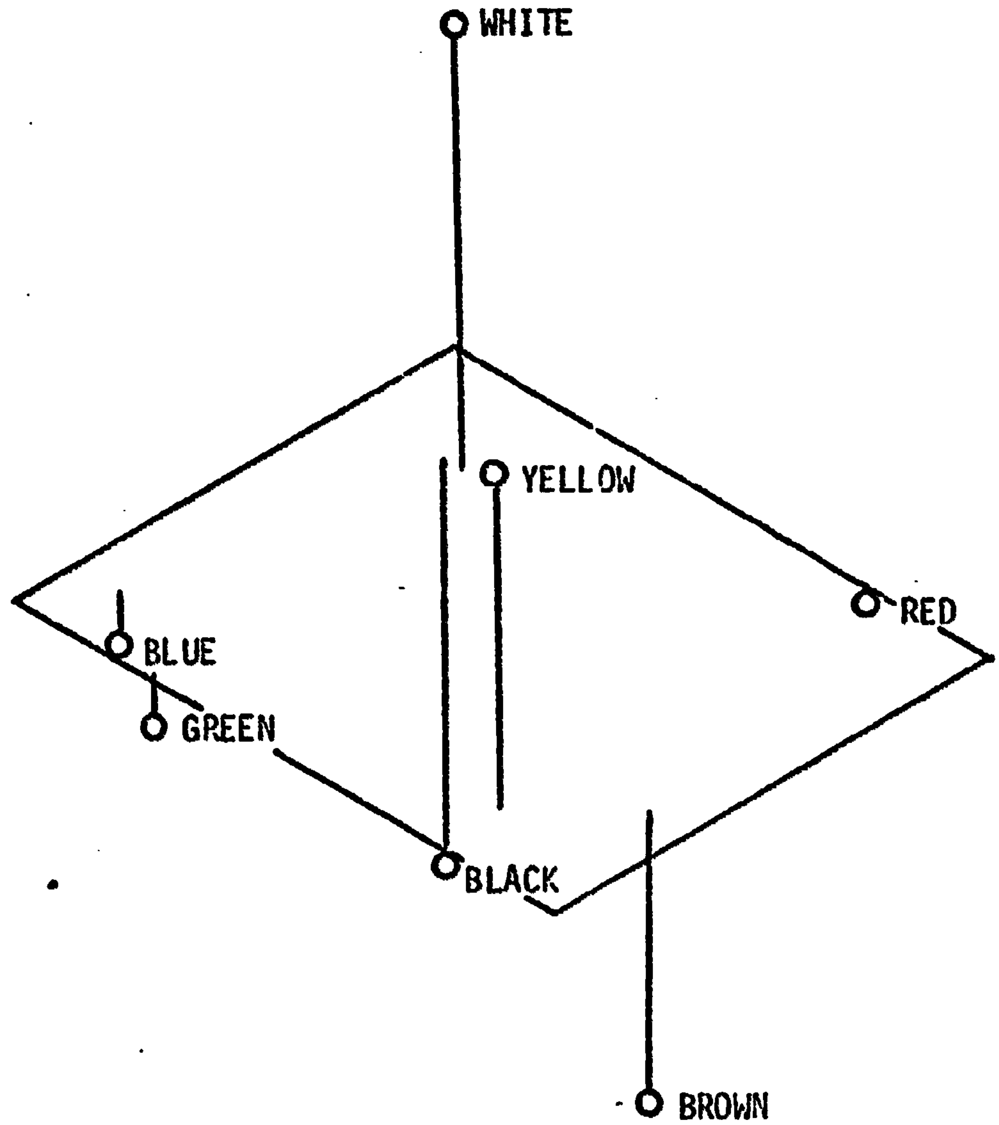

Fig. 5.--Three dimensional representation of triad distances of color terms for the Secondary Student Sample.

red rather far from each other (as they are in the color circle). Blue and green are in close proximity in both student samples, while in the general population sample, green is approximately equidistant from both yellow and blue.

The three distance matrices in Tables 12 through 14 were also cluster analyzed using the same technique described in the word association analysis section. The results of this analysis are presented in Figures 6 through 8.

The cluster analyses are much less informative than the multidimensional scaling, but they are in general agreement. Blue and green remain together in the two student samples, and black and brown remain close in the population sample. The final clustering of white with the other colors probably reflects the strength of the brightness dimension. Overall, however, the cluster solution is less easily interpreted than the multidimensional scaling.

In sum, the configuration of Luganda color term space, as determined by the triadic sort technique, appears to consist primarily of a brightness axis with blue, yellow, and red distributed around this axis. Yellow is, of course, higher than blue or red on the brightness dimension and blue is found relatively close to green. In general, the spatial configuration of these terms is relatively similar to that in the color solid (cf. Nickerson and Newhall, 1943). In addition, the fact that the City Block model reduced the color term space to the least dimensions with the best fit seems to indicate that separate components of the meaning of the color terms were analyzed individually and then combined in making the decision as to which term was the most different in the triad.

The Connotative Meaning of Luganda Color Terms

The semantic differential test, as described in Chapters I and II, was used to determine the connotative meaning of a set of Luganda color terms. This test was administered to three separate samples (the general population sample, the primary student sample, and the secondary student sample). Individuals in each of the three samples were asked to judge the same set of seven color terms that were analyzed in the previous section against a set of eleven polar adjectival scales. As noted in Chapter II, these adjectival scales included qualifiers from the three dominant factors (evaluative, potency and activity)

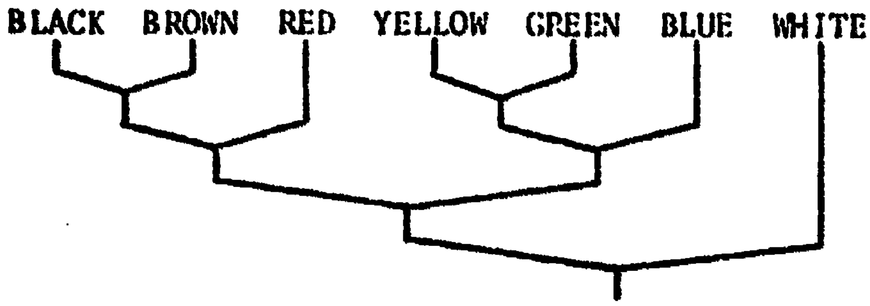

Fig. 6.--Cluster analysis of triad distances of color terms for the General Population Sample.

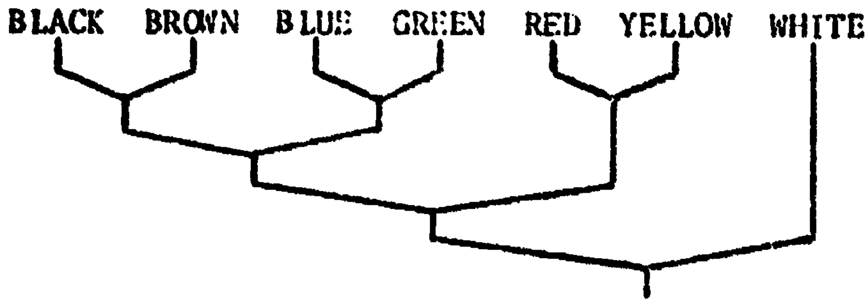

Fig. 7.--Cluster analysis of triad distances of color terms for the Primary Student Sample.

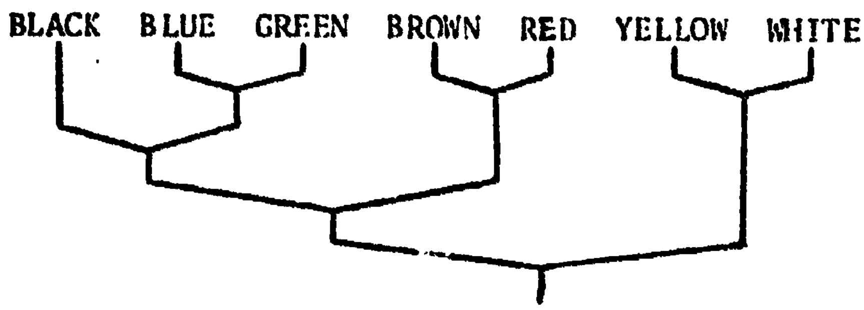

Fig. 8.--Cluster analysis of triad distances of color terms for the Secondary Student Sample.

which have appeared in many studies of connotative meaning (cf. Osgood, et al., 1957).

Each of the samples rated each color according to its position on all eleven of the adjectival scales. The test is constructed so that there are seven positions along each scale, and a given color is scored from one to seven depending upon where it is ranked along the scale. For example, if the scale is a bad-good scale, a given color could be judged "very bad (1), bad (2), slightly bad (3), bad and good (4), slightly good (5), good (6), or very good (7)." If the color were judged very bad, it would receive a rank of one on the scale; if judged bad, a rank of two, and so on.

The serial order of the two qualifiers for each adjectival scale in Table 17 through 19 reflects the orientation of the scale, with the qualifier on the left reflecting the low end of the scale and the one on the right, the high end. For example, if a color were rated as very strong in Table 17, it would have a value of one; if rated very weak, a value of seven. The mean values for the seven colors ranked on each of the eleven adjectival scales can be found in Tables 17, 18, and 19.

In Tables 17 through 19, we find that white is ranked as the most exciting color among the population sample and the secondary students, while the primary students rank red as the most exciting with white coming in second. All three samples rank brown as the least exciting. White is judged as being the most pleasing color among both the population and primary student samples with yellow coming in a close second among the primary students. The secondary students, however, rank yellow as the most pleasing with white a close second. Black is considered the least pleasing in both student samples, as is brown in the population sample. Red is ranked as the strongest color among both student samples and second strongest among the population sample where white is ranked first. All three samples judged yellow to be the weakest color term. The most beautiful color, according to both the population and secondary student samples, is white. The primary student sample ranks yellow as the most beautiful with white coming in second. All three samples ranked black and brown as being the least beautiful. The fastest color is red for both student samples and the population sample. Brown is the slowest for the population sample, black for the secondary students, and blue for the primary students. White, black, and red are the biggest colors for the population, secondary, and primary student samples respectively, and yellow is the smallest for all three samples. White is

Table 17

Mean Values for Semantic Differential of Color Terms. Population Sample

Qualifier	Red	Black	Yellow	White	Green	Blue	Brown
Not/Exciting Exciting	5.206	3.539	4.506	6.333	4.083	4.422	3.283
Pleasing/ Not Pleasing	2.950	3.511	2.328	1.528	2.322	2.428	3.889
Strong/Weak	2.100	2.278	3.422	2.078	2.794	2.756	2.861
Beautiful/Ugly	2.917	3.144	2.417	1.539	2.278	2.289	3.261
Slow/Fast	5.456	4.661	4.817	6.022	4.589	4.628	3.967
Small/Big	5.494	5.122	4.372	5.500	4.961	4.828	4.789
Clean/Dirty	2.722	3.617	2.589	1.917	2.544	2.672	3.906
Bright/Dull	3.967	4.600	3.383	1.378	4.117	3.756	4.800
Heavy/Light	2.917	2.639	4.222	4.189	3.556	3.667	3.111
Dense/Thin	2.389	2.139	3.889	3.672	3.100	3.006	2.817
Smell Bad/ Smell Good	4.572	4.322	5.172	5.744	4.983	5.194	4.444

Table 18

Mean Values for Semantic Differential of Color Terms.
Secondary Student Sample.

Qualifier	Red	Black	Yellow	White	Green	Blue	Brown
Not Exciting/ Exciting	5.500	2.444	5.000	5.611	3.750	4.861	2.278
Pleasing/ Not Pleasing	3.250	5.472	2.361	2.750	2.806	2.778	4.917
Strong/Weak	1.750	2.667	3.806	3.472	3.083	2.833	3.639
Beautiful/Ugly	3.028	4.972	2.194	2.139	2.611	2.306	4.889
Slow/Fast	4.694	3.167	4.388	4.667	4.306	4.250	3.056
Small/Big	4.972	5.139	3.889	4.194	4.472	4.444	4.278
Clean/Dirty	3.083	5.250	2.222	1.528	3.278	2.583	5.306
Bright/Dull	4.306	5.722	2.806	1.361	4.222	3.250	5.500
Heavy/Light	2.528	2.056	4.667	4.500	2.889	2.889	2.889
Dense/Thin	2.528	1.528	4.778	5.722	3.000	3.056	2.472
Smell Bad/ Smell Good	4.333	3.000	5.083	5.278	4.667	4.778	3.306

Table 19

Mean Values for Semantic Differential of Color Terms.
Primary Student Sample

Qualifier	Red	Black	Yellow	White	Green	Blue	Brown
Not Exciting/ Exciting	5.203	4.000	3.780	4.724	4.016	3.542	3.195
Pleasing/ Not Pleasing	3.186	5.220	1.911	1.886	2.797	3.220	4.309
Strong/Weak	2.374	2.797	3.821	3.317	2.927	3.309	3.195
Beautiful/Ugly	2.780	4.350	2.081	2.114	2.675	2.886	3.951
Slow/Fast	5.276	4.317	4.447	4.545	4.236	3.764	3.992
Small/Big	4.951	4.276	3.691	4.089	4.528	4.195	3.911
Clean/Dirty	3.024	4.390	2.789	2.057	3.122	3.098	4.195
Bright/Dull	4.293	5.163	3.276	1.675	4.211	4.098	4.772
Heavy/Light	3.951	3.358	4.073	4.057	3.528	3.553	3.374
Dense/Thin	2.236	1.821	3.659	4.057	2.634	2.846	2.528
Smell Bad/ Smell Good	4.480	3.789	5.268	5.545	4.669	4.724	4.098

ranked as the cleanest and brightest in all three samples while brown and black are the dirtiest and dullest. Yellow is the heaviest and black the lightest in weight in all three samples. White is judged to be thinnest in density by both student samples while the population sample judges yellow to be the thinnest with white coming in second. Black is considered the most dense color by all three samples. Finally, white smells the best and black smells the least best for all three samples.

Although there are obviously some differences between the three samples, overall there is a general tendency toward agreement. These differences, however, will be investigated in the following chapter.

We will next investigate the degree to which the various color terms share mean rankings on each of the eleven adjectival scales. The most efficient way to accomplish this is to group the colors on the basis of similarity in their mean adjectival scale values. This was done with a hierarchical form of cluster analysis which differs from the clustering technique discussed above. The present technique first defined each of the seven basic colors in the set as a group. These seven groups were then reduced in a stepwise manner, with a pair of groups being combined at each step on the basis of a minimal increase in the total within groups variation with respect to the adjectival scale values. At each step in the analysis an error index based on the sum of squared deviations from group means is calculated. An unusually large deviation in the increase of this index indicates a grouping step which is less natural than the preceding groupings and thus can be used as a guide in selecting optimal levels of grouping. The computer program used is fully described in Veldman (1967). The results of this analysis for each of the three samples is presented in Figures 9, 10 and 11. The height of the nodes in the above figures indicate the order of grouping. The higher a node, the earlier a grouping was performed. As was mentioned above, this order of grouping is related to the similarity of the pair of groups being combined with the most similar being combined first. Thus, for each of the samples, green and blue were most similar in terms of the eleven mean adjectival scale values which were presented in Tables 17, 18 and 19. The figure at each node is the error term for the cluster above the node.

The first two clustering steps were identical for all of the samples. The steps clustered green and blue together first and then black and brown. The population sample separated from the student samples at step three. The student samples clustered white and yellow at step three and then added red to the green-blue cluster at step

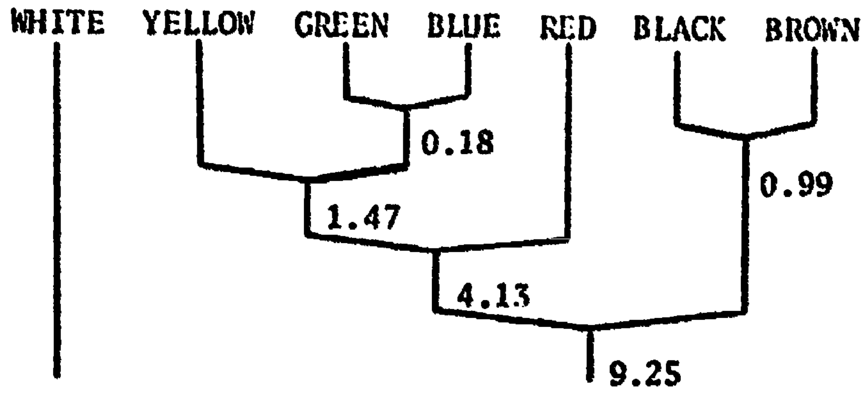

Fig. 9.--Cluster analysis of mean semantic differential values for the General Population Sample.

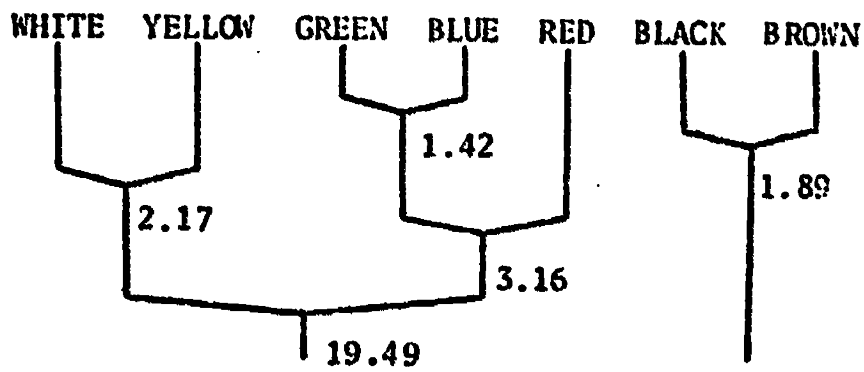

Fig. 10.--Cluster analysis of mean semantic differential values for the Secondary Student Sample.

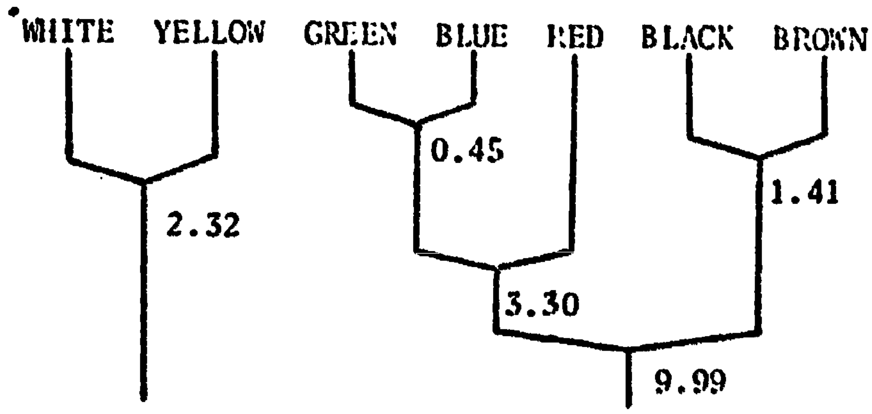

Fig. 11.--Cluster analysis of mean semantic differential values for the Primary Student Sample.

four while the population sample added yellow to the blue-green cluster at step three and red at step four. The two student samples separated at step five where the green-blue-red cluster was combined with the white-yellow cluster among the secondary students and to the black-brown cluster among the primary students. At step five, the population sample clustered the black-brown group into the yellow-green-blue-red cluster, and white remained ungrouped.

As noted above, the optimal level of groupings can be determined by examining the error index. Both of the student samples manifest marked increases in this index at step five, thus the optimal level of grouping for these two samples is step four, which results in three clusters. The error term begins to increase rapidly at step four in the analysis of the population sample data, indicating that the four clusters formed at step three represent the optimal level of grouping.

The cluster analysis of the mean adjectival scale values for each of the colors provides a parsimonious description of the mean distribution of these values, but may not represent the actual color-term-to-color-term differences on the scales on an individual basis. This can best be demonstrated with an example.

For convenience sake, let us say that we have a sample of ten individuals. Five of these individuals assign colors W and X ranks of two and six respectively on scale Y. The other five assign W and X ranks of six and two respectively on the same scale. The resultant mean ranks of colors W and X on scale Y would both equal four for the total sample. It would appear thus that there is no difference between them in terms of scale Y when in fact there is considerable difference on an individual basis. If, however, the absolute value of the individual differences between colors W and X on scale Y are analyzed, we find that this mean difference would equal four and would give a good indication of the average difference in meaning between the two terms on scale Y. This procedure will be followed here in an attempt to create a mean model of connotative meaning space for the general population sample.

First the mean of the absolute differences between all possible pairs of the seven colors (21 pairs) on all eleven scales were calculated. This resulted in eleven mean distances for each of the twenty-one dyads. The distances of each color pair on each of the eleven scales was then summed to give an overall distance between the two terms in each dyad in terms of connotative meaning.

These distances were scaled by dividing by a constant and were then converted into the similarity matrix presented in Table 20. The larger the entry given for any two terms the closer the terms are in meaning.

Table 20

Similarity Matrix of Connotative Meaning of Color Terms. Population Sample

	Black	Red	White	Yellow	Blue	Green	Brown
Black	1.000						
Red	0.750	1.000					
White	0.653	0.727	1.000				
Yellow	0.702	0.728	0.749	1.000			
Blue	0.743	0.772	0.735	0.775	1.000		
Green	0.745	0.762	0.727	0.774	0.816	1.000	
Brown	0.778	0.729	0.642	0.716	0.758	0.769	1.000

The similarity matrix is derived from ordinally scaled data, and the appropriate technique for its analysis is thus non-metric multidimensional scaling. The matrix was scaled with the TORSCA-9 multidimensional scaling program and reduced to four, three, two, and one dimensions with both the City Block and Euclidean distance functions. The Euclidean model resulted in the least strain for all dimensions, and will be presented and discussed here.

The general procedure used for determining how many dimensions a data set should be reduced to is to set a criterion on the stress or index of fit. Then the data are reduced to the smallest number of dimensions which will not violate this criterion. Here we were able to reduce the data to two dimensions and still maintain the stress and index of fit at an acceptable level. However, since most of the data presented here could not be reduced to less than three dimensions without objectionable stress or an index of fit that was less than acceptable, we will present both the three and two dimensional reductions of the data for comparative purposes.

The varimax rotated configuration for both the three and two dimensional solutions are presented in Table 21 along with their associated stress and index of fit. The two solutions presented in Table 21 are plotted in Figures 12 and 13. Both of these solutions clearly indicate a dimension of connotative meaning which is related to the brightness dimension. This is in total agreement with the opposition of white and yellow to brown and black with respect to connotative meaning as was discussed above. The horizontal dimension in Figure 12 separates red, white, and black (the three basic colors in Luganda) from the other colors. A glance at Table 17 will indicate that the colors are also judged relatively bigger, faster, and stronger than the others; thus the horizontal dimension seems to be a potency-activity dimension.

The matrix presented in Table 20 was next cluster analyzed with the same technique used in the word association analysis. The results of this analysis are presented in Figure 14.

The cluster analysis presented in Figure 14 is quite similar in general configuration to both the three and the two dimensional multidimensional scaling solutions and can be interpreted in a similar manner. It appears, however, that the best technique for identifying the dimensions will be to first reduce the number of dimensions in the adjectival scale space with factor analysis, as has been traditionally done with semantic differential data, and then locate the individual colors in this reduced space and compare these results with the above analyses.

The semantic differential data was factor analyzed and rotated to orthogonal simple structure using the varimax technique. The results of this analysis for the three samples can be found in Table 22. The first factor for the population sample consists mainly of evaluative scales (pleasing, beautiful, clean, smells good). In addition, these scales have the highest loadings on the factor. It is revealing that the two scales which are denotative with respect to color (brightness, density) also load high on this factor, confirming the observation that brightness is related to a positive evaluation. As will be seen, bright loads high on the evaluative factor for all three samples. The strong, fast, and big scales receive their highest loading on factor two of the population analysis, and thus will be used to characterize the factor. Strong and big scales usually load high on a potency factor (Osgood, et al., 1957). The fast scale is usually associated with an activity factor (cf. Osgood, et al., 1957), and it is revealing that exciting, which is

Table 21

Three and Two Dimensional Solutions of Similarity Matrix of Connotative Meaning of Color Terms. Population Sample

	Three Dimensional Solution Varimax Rotated Configuration			Two Dimensional Solution Varimax Rotated Configuration	
	Dimension			Dimension	
	I	II	III	I	II
Black	0.407	0.617	0.027	-0.710	0.257
Red	-0.067	0.025	0.662	-0.038	0.532
White	-0.842	0.293	-0.115	0.976	0.227
Yellow	-0.226	-0.440	-0.354	0.541	-0.362
Blue	0.005	-0.439	0.033	-0.008	-0.194
Green	0.094	-0.338	-0.063	-0.008	-0.203
Brown	0.630	0.282	-0.190	-0.753	-0.258
	Index = 1.0000	Stress = 0.001		Index = 0.9999	Stress = 0.005

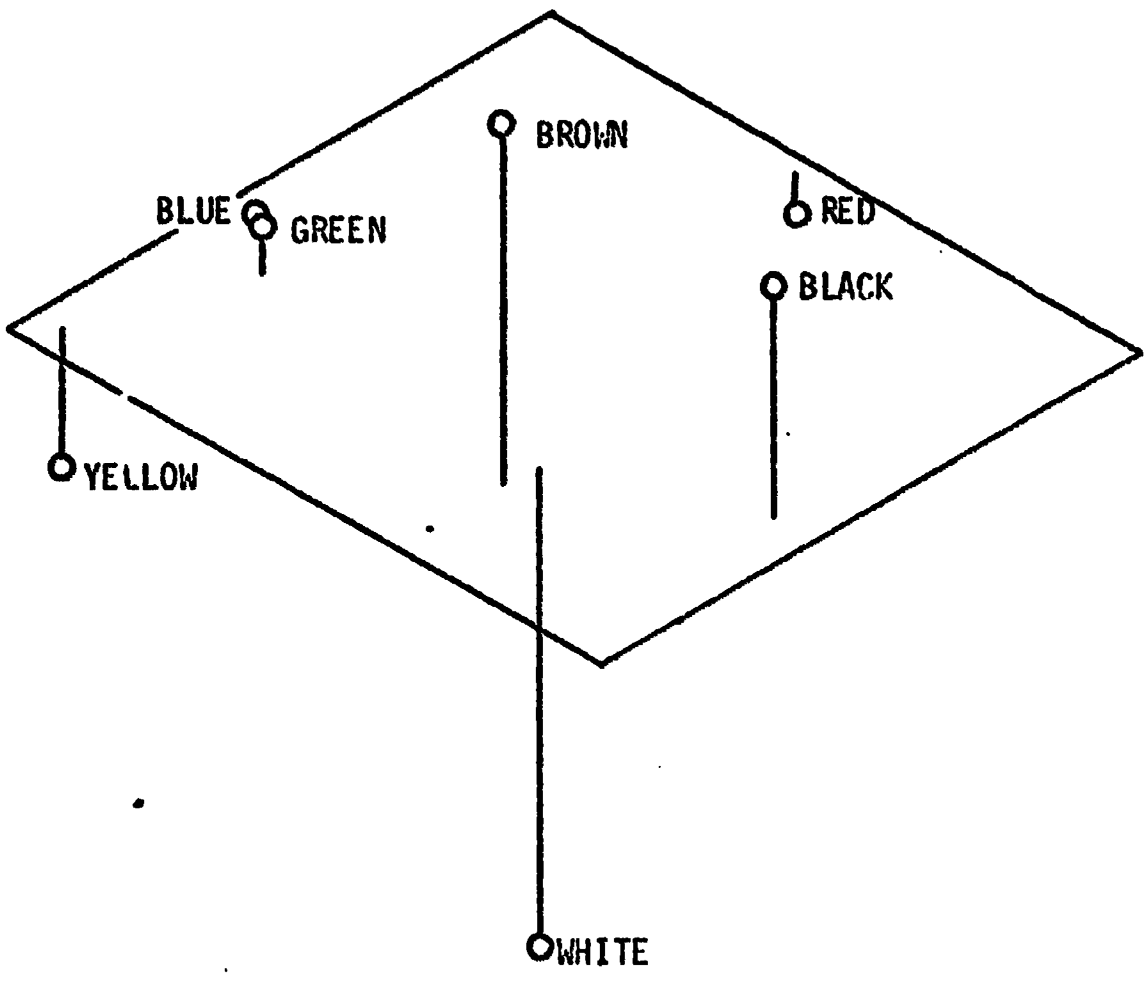

Fig. 12.--Three dimensional representation of similarity matrix of connotative meaning of color terms for the General Population Sample.

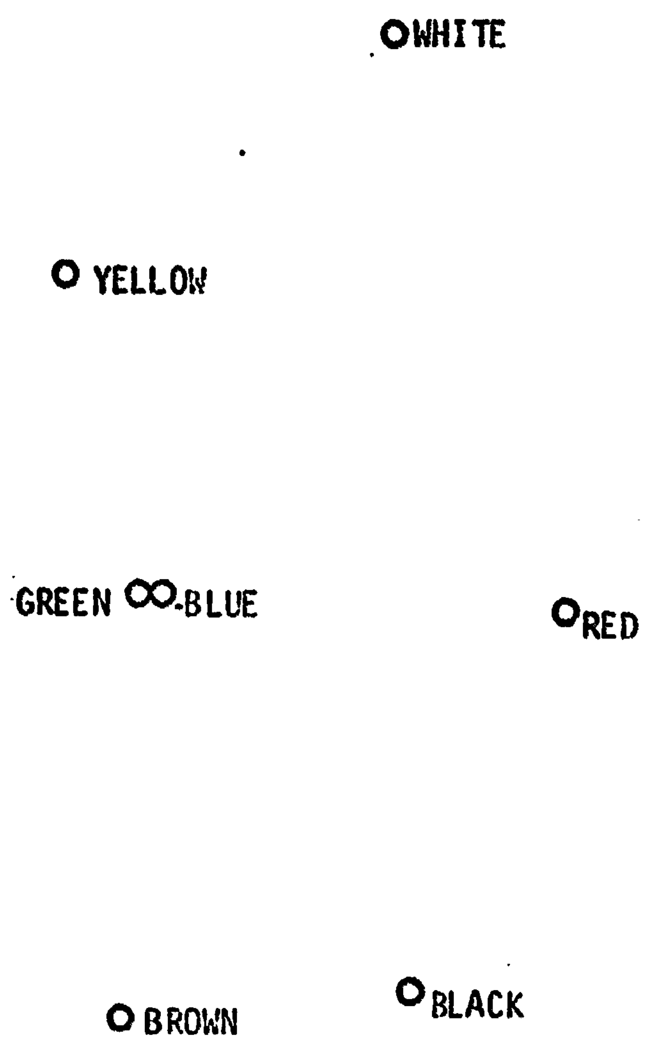

Fig. 13.--Two dimensional representation of similarity matrix of connotative meaning of color terms for the General Population Sample.

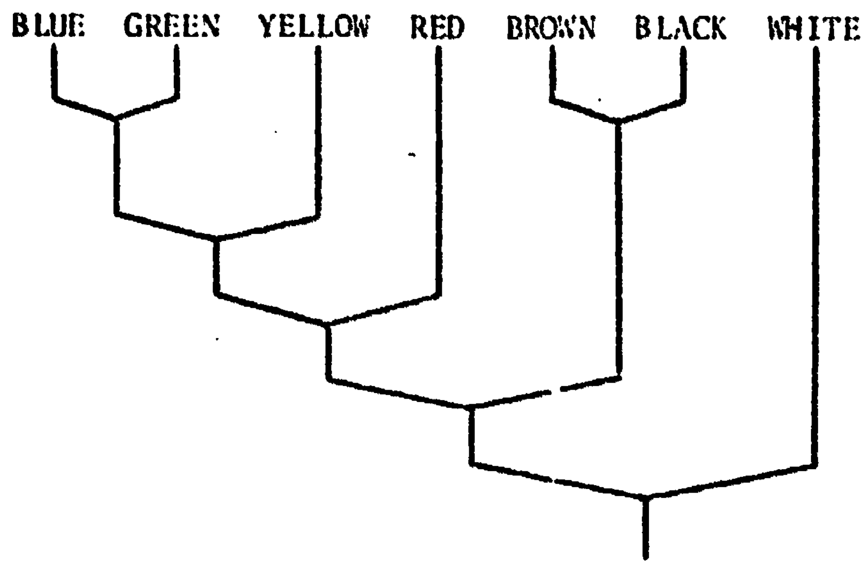

Fig. 14.--Cluster analysis of similarity matrix of connotative meaning of color terms for the General Population Sample.

Table 22

Factor Analysis of Semantic Differential Data for Color Terms

	Population			Secondary Students			Primary Students		
	Factor			Factor			Factor		
	I	II	III	I	II	III	I	II	III
Exciting	-0.743	0.556	0.325	0.916	-0.026	0.343	0.346	0.620	0.658
Pleasing	-0.990	0.129	-0.014	0.959	0.289	-0.070	0.960	-0.088	0.128
Strong	0.066	0.978	-0.042	0.161	-0.983	-0.013	-0.452	0.838	0.256
Beautiful	-0.980	0.123	-0.009	0.960	0.245	0.052	0.951	0.004	0.160
Fast	-0.604	0.697	0.286	0.965	-0.051	0.191	0.150	0.442	0.851
Big	-0.049	0.978	-0.018	-0.310	-0.914	-0.001	-0.116	0.977	0.188
Clean	-0.923	0.242	0.052	0.918	0.253	0.298	0.982	0.102	0.171
Bright	-0.854	0.324	0.350	0.764	0.425	0.434	0.877	-0.197	0.206
Heavy	-0.896	-0.354	0.276	0.477	0.766	0.372	0.769	-0.068	0.612
Dense	-0.806	-0.444	0.356	0.588	0.648	0.483	0.873	-0.454	0.056
Smell Good	-0.971	-0.001	0.136	0.921	0.360	0.133	0.981	-0.193	0.099
Percent Variance	0.622	0.293	0.049	0.598	0.303	0.075	0.567	0.231	0.160

usually included in an activity factor, also receives a relatively high loading on this factor. We will, however, only include the three scales which load highest and refer to factor two as a potency factor. Factor three accounts for very little of the variance and has no exceptionally high loadings, thus it will be eliminated from consideration.

The secondary student analysis reveals a different factor structure. Here the first factor consists of the four evaluative scales (pleasing, beautiful, clean, and smell good), the activity scales (exciting and fast), and once again, the brightness scale. This factor can be characterized as an activity-evaluative scale. Factor two includes strong, big, and heavy (weight)--three scales that are generally associated with a potency factor (cf. Osgood, et al., 1957)--in addition to dense. The latter two scales, however, are inversely related to the other two. Factor three, again, explains very little variance.

The primary student analysis is the only one of the three that resulted in a clearly defined three-factor structure. In addition (except for the fact that light (weight) received its highest loading on the first factor) the scales loading highest on each of the first three factors can be clearly identified as evaluative, potency, and activity respectively.

These factor analyses have succeeded in reducing the dimensionality of the adjectival scale space, thus achieving more economy of description. The patterns of interrelatedness of the separate scales allows us to combine them into fewer scales, and then use them to describe the Luganda connotative meaning of color space. This new description of the color term space should be similar to the previous ones, but it will indicate the distribution of the terms along the named dimensions.

In order to determine the coordinates of the color terms in this newly defined connotative meaning space, a score was calculated for each color on each dimension. This was done in a direct manner by selecting the variables which loaded highest on each significant factor and then summing their values for each color, taking into account the polarity of the variable's loading. These factor scores were then used as coordinates for plotting the terms in connotative meaning space. The results of these plots can be found in Figures 15, 16 and 17.

With respect to connotative meaning, the distribution of the color terms in Figures 15, 16 and 17 compares

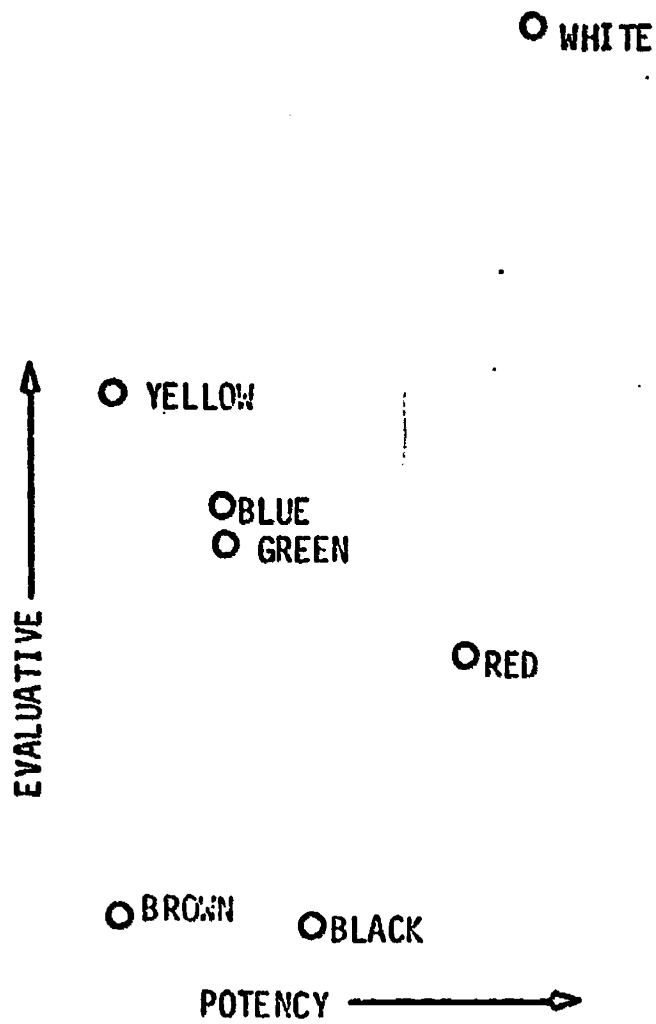

Fig. 15.--Two dimensional representation of factor scores for color terms on the Evaluative and Potency factors for the General Population Sample.

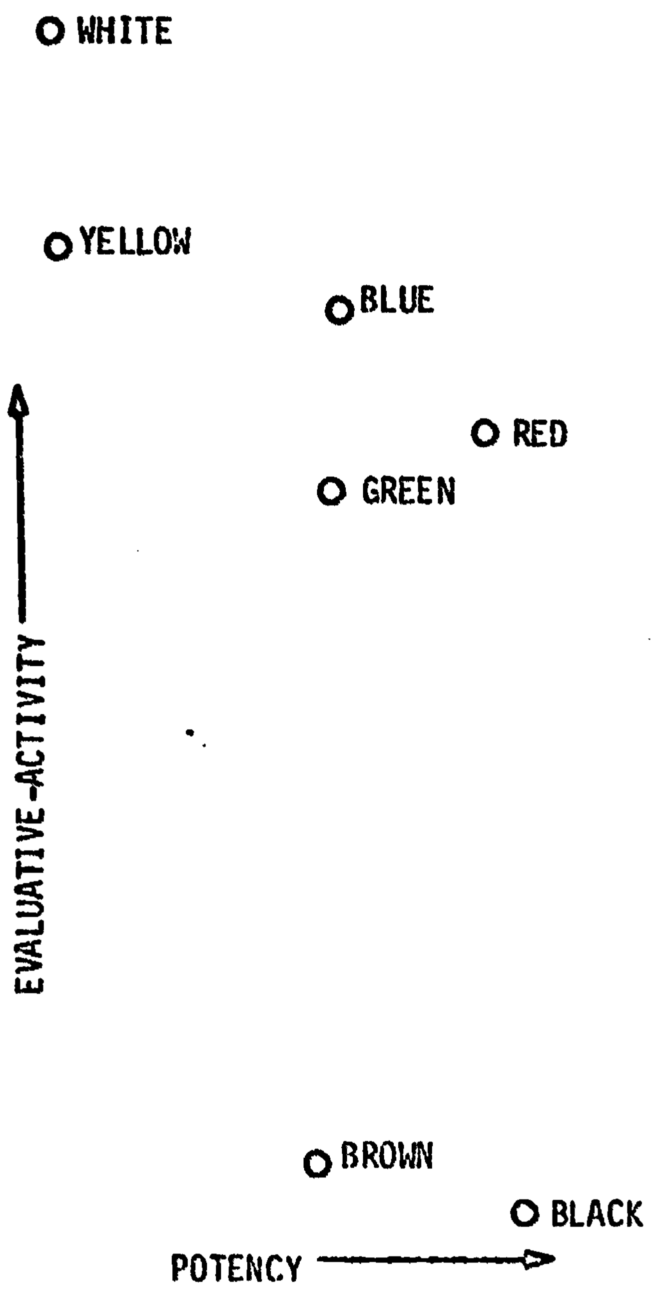

Fig. 16.--Two dimensional representation of factor scores for color terms on the Evaluative-Activity and Potency factors for the Secondary Student Sample.

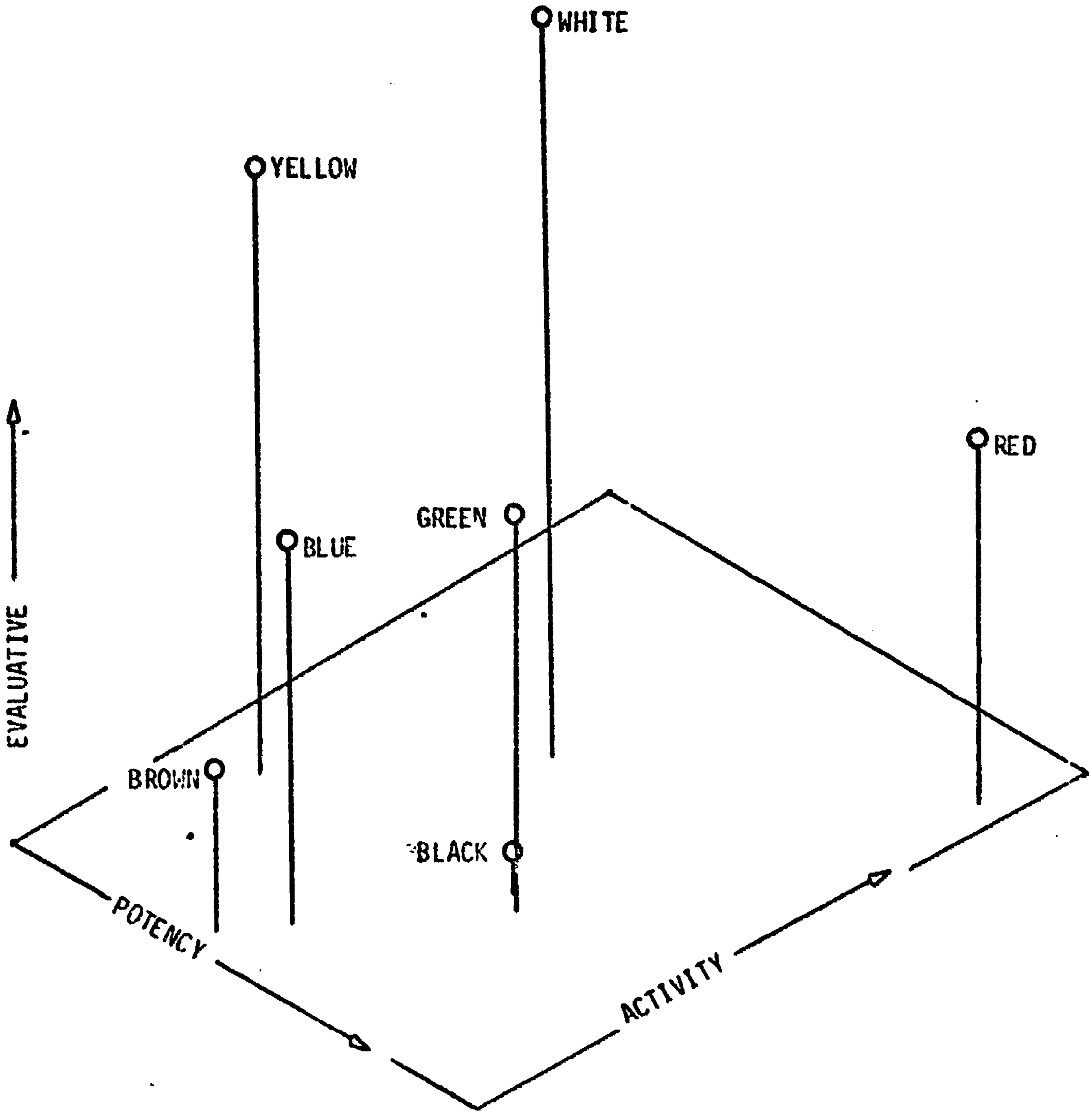

Fig. 17.--Three dimensional representation of factor scores for color terms on the Evaluative, Activity, and Potency factors for the Primary Student Sample.

favorably with the earlier cluster analyses of the terms. Further, since Figure 15 is so similar to the multidimensional scaling solution plotted in Figure 13 we are probably justified in attributing the same dimensions of meaning to both.

The factor analyses have thus allowed us to reduce the dimensionality of the adjectival scale space, and locate the color terms with respect to the coordinates of this new space.

In sum, the color terms blue and green were, overall, rated in a similar manner on the eleven adjectival scales, but as can be seen in Tables 17 through 19, they received very few extreme mean ratings on any of the scales. Black and brown were next most similar, and they were, in general, rated the farthest from yellow and white on all of the scales, and usually in an unfavorable direction. In general the overall negative evaluation of black and brown and positive evaluation of white has been a rather consistent finding in cross-cultural research with the semantic differential on color (cf. Williams, Morland and Underwood, 1970). One interesting difference is that while Williams, Moreland and Underwood found white to be rated relatively weak on the potency scale, our population sample, which included the older and more traditional individuals, rated white as the strongest and biggest. These general findings concerning the evaluation of white, among the Baganda, may be explained by the fact that traditionally white was considered the color of super-human powers. Lugira, citing Roscoe (1911), writes that animals used in Kiganda rituals are usually white, and that "priests in service of the temple, in addition to the two barkcloths knotted over each shoulder, tied nine white goatskins around their waist" (1970: 148). Moreover, Roscoe has written that ". . . for the king of a species of tree was grown, which gave a white barkcloth" (1911: 406).

Overall, it should be noted that there was a fair amount of agreement in the general configuration of the mean ratings of the seven color terms on the eleven adjectival scales across the three samples. The intra-cultural differences will be investigated in the following chapter.

Organization in the Recall of Luganda Color Terms

In this section we will further analyze the results of the listing task which was discussed earlier in the chapter. Listing tasks are a special case of long-term recall, and Wortman and Greenberg (1971) have presented experimental findings which indicate that information in long-term memory is gradually organized into hierarchical structures. Further, as noted in Chapter I, the order by which terms are recalled can be used to infer their relative salience, the format by which they are stored in memory, and the operators or decision rules that are used in generating them (Sanday, 1968; Bower, et al., 1969; Henley, 1969; Wortman and Greenberg, 1971). Thus if color terms are organized in memory with the use of hierarchical units such as dark colors, warm colors, etc., the organization of the terms in the listing task may reflect these components.

We have already used the frequency and rank order of a term in the listing task to infer its relative salience. We will now examine in detail the structure of the organization of the terms in the lists. Here, once again, we will concentrate on the same seven terms: black, red, white, yellow, blue, green, and brown. As was noted earlier, these data were collected from a sample of 102 primary form six and seven students.

The first step in delineating the structure of the color terms in recall is to determine their mean differences in rank order of recall. This was accomplished by calculating the absolute difference in ranks between every possible pair of color terms on an individual basis and then calculating the sample means of these figures for each dyad. These differences were then scaled by dividing by a constant, and the resultant dissimilarity matrix was transformed into the symmetric similarity matrix presented in Table 23.

Table 23

Similarity Matrix of Distance In Recall of Color Terms

	Black	Brown	Red	Green	White	Yellow	Blue
Black	1.000						
Brown	0.681	1.000					
Red	0.606	0.648	1.000				
Green	0.518	0.627	0.718	1.000			
White	0.688	0.641	0.660	0.552	1.000		
Yellow	0.602	0.718	0.708	0.763	0.590	1.000	
Blue	0.601	0.662	0.642	0.651	0.547	0.679	1.000

Since the similarity matrix presented in Table 23 is based on rank order data, the multidimensional scaling program, TORSCA-9, was again used to determine its dimensionality. The data was analyzed using both the City Block and Euclidean spatial models. The Euclidean distance model resulted in less overall stress, and produced a three dimensional solution with a satisfactory index of fit and stress. The varimax rotated three dimensional solution is presented in Table 24.

Table 24

Three Dimensional Solution of Similarity Matrix of Distance in Recall of Color Terms

	Dimension		
	I	II	III
Black	0.690	0.167	-0.291
Brown	-0.033	-0.000	-0.492
Red	-0.092	0.066	0.422
Green	-0.592	-0.149	0.379
White	0.491	0.651	0.130
Yellow	-0.461	0.002	-0.138
Blue	-0.003	-0.737	-0.011

Black and white have high positive loadings on dimension one and are opposed to green and yellow, which have high negative loadings. Dimension two appears to oppose blue and white while dimension three opposes black and brown to red and green. The three dimensional plot of this solution found in Figure 18 does not do much to clarify this interpretation.

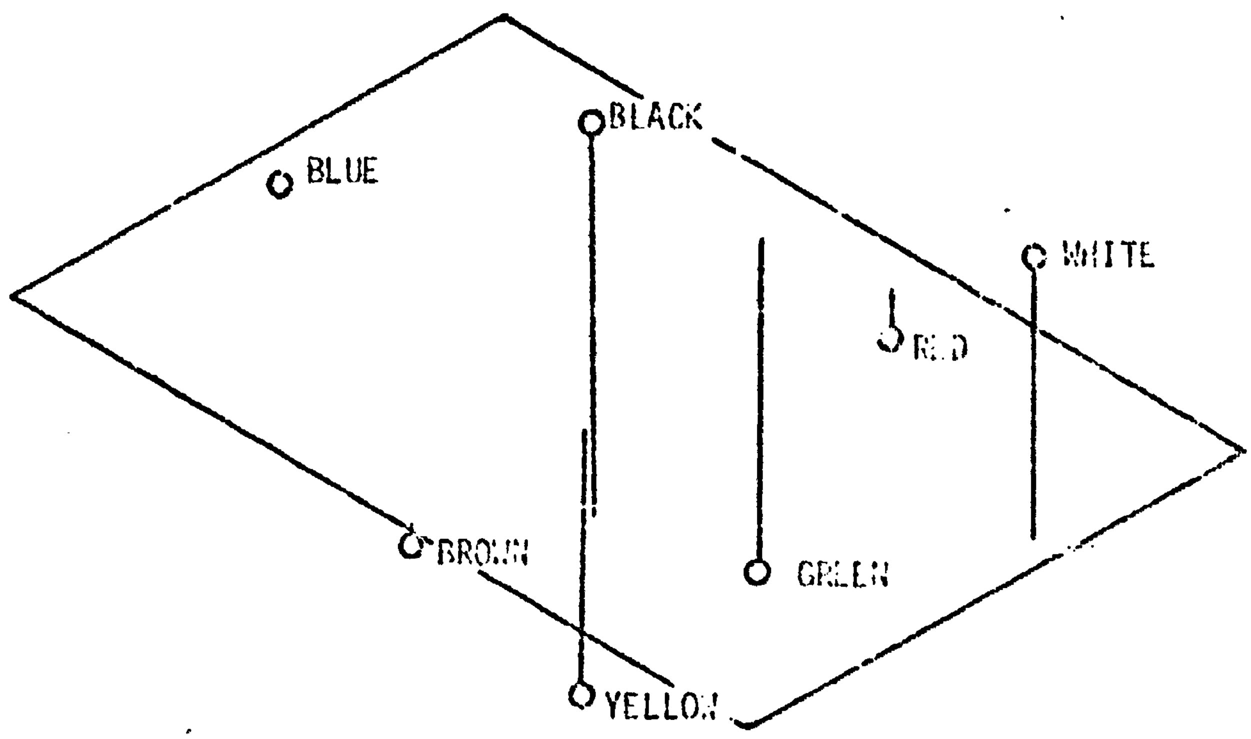

Fig. 18.--Three dimensional representation of distance in recall of color terms.

The matrix in Table 23 was also subjected to a cluster analysis. The technique used was the same as that applied to the word association data. The results of this analysis can be found in Figure 19.

The clusters in Figure 19 closely approximate the distributions of the terms in the three dimensional space depicted in Figure 18; and the two analyses support each other.

Overall, the analyses of the listing task presented here tend to indicate that several different operators are employed to generate the color terms in free recall and/or to retain them in memory. Black and white, which appear close to each other in the listing task, are opposites on the brightness continuum and are perceptually distinct. In contrast, yellow and green are perceptually close and are also relatively proximate in recall. Further, red and green, also relatively close in the analysis presented above, are complements. In sum, the structure revealed in this analysis appears to be based on both opposition and similarity. Both of these components therefore must be integrated into the analysis of the structure of the Luganda color lexicon.

Summary

In the first part of this chapter we described the variability in the distribution of colors in the Kiganda environment and then described their terminology. In the next four sections, the word association, triadic sort, semantic differential, and organization in recall techniques were separately used to describe a select subset of the most salient Luganda color terms. In general, the multidimensional scaling of the semantic differential and the triad data resulted in configurations within which one of the major axes was related to a brightness dimension, with brown and black opposing white and yellow. The brightness axis was also strongly related to the evaluative factor on the semantic differential. This evaluative factor explained the most variance in the semantic differential with dark and light colors being negatively and positively evaluated respectively. Since the City Block metric resulted in the best multidimensional solutions of the triad data, we concluded that separate components of the meaning of color terms were analyzed individually and then combined in the decision making processes which resulted in the mean distance matrices for the three samples.

The results of the word association and order in recall tests, however, indicated that opposition as well as

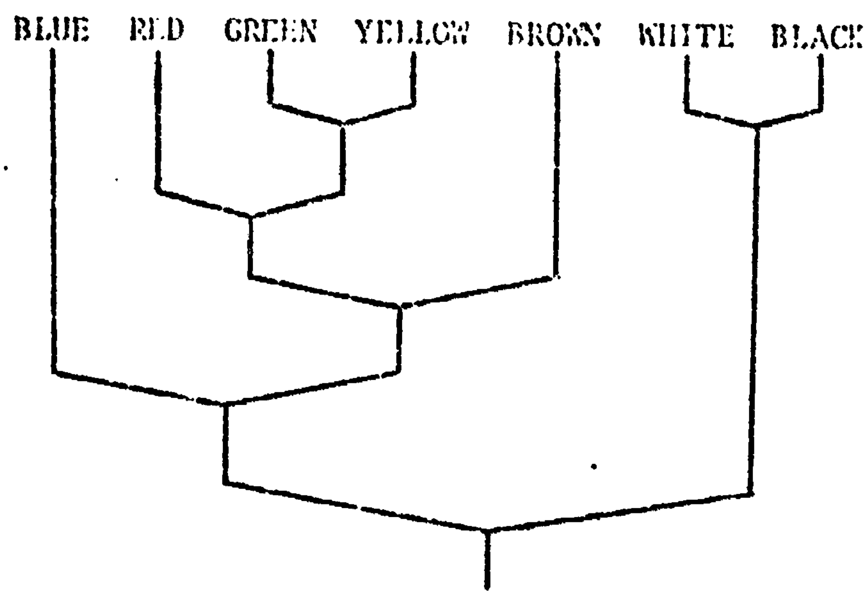

Fig. 19.--Cluster analysis of distance in recall of color terms.

similarity is used in the cognition of color terms. Further, the high percentage of color term responses in addition to the superordinate category langi (color) indicate that this is a rather coherent domain.

Overall, the consistently interpretable results lead us to believe that these techniques succeeded in allowing us to determine the shared model of color cognition that permits communication concerning color among the Baganda. Some differences were noted between the three samples, but they were not stressed in this chapter. It remains to be seen how much differentiation there is in these models within the samples. This will be the subject of the following chapter.

CHAPTER IV

INTRACULTURAL VARIATION IN THE COGNITION OF COLOR TERMS IN BUGANDA

Introduction

In this chapter we will investigate the nature and extent of variation in the cognition of color terms among the Baganda. The first section will examine the data from the general population sample to determine if there is any systematic patterning in the variability of conceptualization of color terms. Relationships between these patterns and other non-cognitive variables will then be explored. In the next section, all of the samples (rural and peri-urban general population and student samples, and the secondary student sample) will be compared in terms of their response patterns on the test instruments to determine the extent to which they differ from each other. The results of these analyses will indicate the degree of intracultural variability in the cognition of color terms among the Baganda and provide information which may permit us to infer the source of its variability.

Variability in the General Population Sample

We will begin with an analysis of intracultural variation in response to the triad sort task. This is logical because the configurations derived from the triadic sort are the result of a series of decisions wherein the respondent uses a set of criterial attributes to decide which of three terms is most different. The differential use of these attributes is the source of the variation in the resultant configuration of terms in triadic-sort-derived meaning space. This meaning space is therefore potentially based on any or all aspects of meaning (e.g., connotative, associative, or denotative). Hence, the relative salience of these various aspects of meaning, either singly or in combination, will determine the structure of the resultant meaning space. Moreover, if the contents of associative, denotative, or connotative meaning space differ from individual to individual, this can also be related to the distances derived from the triadic sort. Thus, the triadic sort defines the most comprehensive meaning space and is a logical starting point for our analysis.

In order to determine whether or not there are relatively homogeneous subgroups which differ with respect to their responses to the triad test, the population sample triad data was cluster analyzed using the same hierarchical cluster analytic technique discussed in connection with the semantic differential in the previous chapter. In brief, this technique forms groups in a stepwise manner by combining groups which result in the least within-group variation in the triad data. At each step an error term is calculated. A sharp increase in this error term indicates a grouping less natural than the preceding ones and can thus be used to select optimal levels of grouping. With respect to the triad data, the error term increased markedly at the formation of seven groups, indicating that the optimal level of grouping is most probably eight groups.

Table 25 includes the means of the raw triad distance values for each of the eight groups. The larger the value of the entry in Table 25, the more similar in meaning the two color terms are.

Each of the eight distance matrices in Table 25 were scaled using the TORSCA-9 program with both the City Block and Euclidean distance models. In contrast to the analysis of the population sample triad data in the previous chapter, the Euclidean model provided the best fit in this analysis. This may indicate that in the analysis of the population data as a whole, the sum of the decisions made along distinct dimensions by relatively homogeneous subgroups in the population resulted in a mean model average for the group possessing a configuration with properties unlike any single distance matrix used in its construction. This is why a "points of view" analysis is essential if there is any chance that the population analyzed may consist of divergent points of view. (cf. Tucker and Messick, 1963; Ross, 1966; Cliff, 1968; Tucker, 1972).

Here, the cluster analysis, discussed above, was used to decrease this within-group divergence of viewpoint by segregating the population into relatively homogeneous subgroups whose mean distance matrices were subsequently analyzed as discussed above. The results of this analysis can be found in Table 26.

This is not to say, however, that a measure of central tendency is completely useless. It provides a model which deviates least, overall, from the separate models which have gone into its construction, and as long as we remain aware of its potential weaknesses, it can be useful.

The solutions presented in Table 26 represent the fewest dimensions that could be achieved without increasing the stress above a criterion of 0.015 or below an index of fit of 0.9999. These solutions are plotted in Figures 20 through 27.

Table 25

Mean Color Term-to-Term Distances from Triadic Sort for Eight Subgroups of Population Sample

Variable	Group							
	A	B	C	D	E	F	G	H
Black-Red	4.29	2.67	1.06	1.15	1.40	2.32	1.74	0.86
Black-White	1.29	2.33	0.38	0.44	1.29	0.68	0.26	0.71
Black-Yellow	2.57	1.56	1.63	0.74	1.33	3.32	0.47	0.50
Black-Blue	3.14	2.15	2.56	1.33	1.83	1.59	3.58	0.43
Black-Green	2.29	1.07	2.56	1.33	1.17	2.00	1.95	0.36
Black-Brown	1.14	4.26	3.13	2.11	2.04	3.50	2.47	0.36
Red-White	1.29	1.41	0.19	0.81	1.69	0.64	0.84	3.50
Red-Yellow	2.00	1.56	1.13	1.74	1.25	2.59	1.47	2.93
Red-Blue	3.43	1.44	1.56	1.59	0.94	1.18	1.32	2.86
Red-Green	2.43	1.22	1.13	1.89	1.42	1.18	1.53	2.14
Red-Brown	0.71	2.63	1.06	2.52	1.58	2.68	4.05	1.14
White-Yellow	0.57	1.04	0.69	1.74	1.98	0.91	3.95	3.29
White-Blue	1.14	1.44	0.63	1.33	1.96	0.45	0.68	2.43
White-Green	0.71	1.04	0.88	0.81	2.12	0.45	0.89	1.86
White-Brown	0.43	1.85	0.63	0.74	2.02	0.91	0.63	1.21
Yellow-Blue	2.14	1.11	2.19	2.56	1.31	1.00	0.79	2.43
Yellow-Green	1.43	0.63	2.31	2.70	1.92	2.18	1.95	2.57
Yellow-Brown	0.71	1.81	2.19	3.19	2.50	3.23	1.21	1.14
Blue-Green	2.29	0.67	2.25	2.81	2.02	1.09	2.79	1.86
Blue-Brown	0.43	2.00	3.50	1.48	1.48	0.68	1.26	1.43
Green-Brown	0.57	1.11	3.38	1.96	1.75	2.41	1.16	1.00

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Table 26

Multidimensional Scaling Solutions of Color Term to Term Distances From Triadic Sort For Eight Subgroups of Population Sample

Group	A		B			C	
Dimension	I	II	I	II	III	I	II
Variable							
Black	-0.049	0.131	-0.092	0.007	-0.099	-0.032	0.190
Red	[illegible]	0.145	0.077	-0.022	-0.323	-1.131	-0.089
White	0. [illegible]	0.682	-0.019	0.136	0.573	1.205	-0.296
Yellow	-0.032	-0.658	-0.006	-0.838	-0.094	-0.009	-0.080
Blue	-0.112	0.107	-0.759	0.028	0.046	-0.016	0.118
Green	0.613	-0.250	0.869	0.678	0.016	-0.002	0.040
Brown	-0.874	-0.156	-0.070	0.012	-0.118	-0.015	0.118
Stress	0.015			0.004		0.015	
Index of Fit	0.99994			1.00000		0.99994	

Group	D				E		
Dimension	I	II	III	IV	I	II	III
Variable							
Black	-0.973	-0.030	-0.024	-0.036	-0.073	0.723	-0.207
Red	-0.046	0.474	-0.039	-0.061	0.849	0.034	-0.213
White	1.002	-0.097	-0.127	0.156	0.057	-0.406	-0.102
Yellow	0.371	-0.102	-0.052	-0.171	-0.019	-0.066	0.600
Blue	-0.017	-0.080	-0.054	0.400	-0.694	0.038	-0.329
Green	-0.042	-0.040	0.466	-0.036	-0.174	-0.518	-0.156
Brown	-0.297	-0.124	-0.169	-0.252	0.053	0.195	0.407
Stress	0.003					0.014	
Index of Fit	1.00000					0.99995	

Group	F			G		H	
Dimension	I	II	III	I	II	I	II
Variable							
Black	-0.016	-0.076	-0.259	-0.830	0.067	1.110	-0.697
Red	0.024	0.006	0.500	-0.045	0.482	-0.027	-0.117
White	1.025	-0.407	-0.104	0.803	-0.432	-0.020	-0.094
Yellow	0.043	-0.052	-0.082	0.709	0.029	-0.281	-0.094
Blue	-0.308	0.802	0.070	-0.497	-0.275	-0.086	0.211
Green	-0.752	-0.034	-0.044	-0.074	-0.385	-0.659	-0.039
Brown	-0.015	-0.239	-0.081	-0.066	0.515	-0.036	0.829
Stress	0.015			0.010		0.013	
Index of Fit	0.99995			0.99997		0.99996	

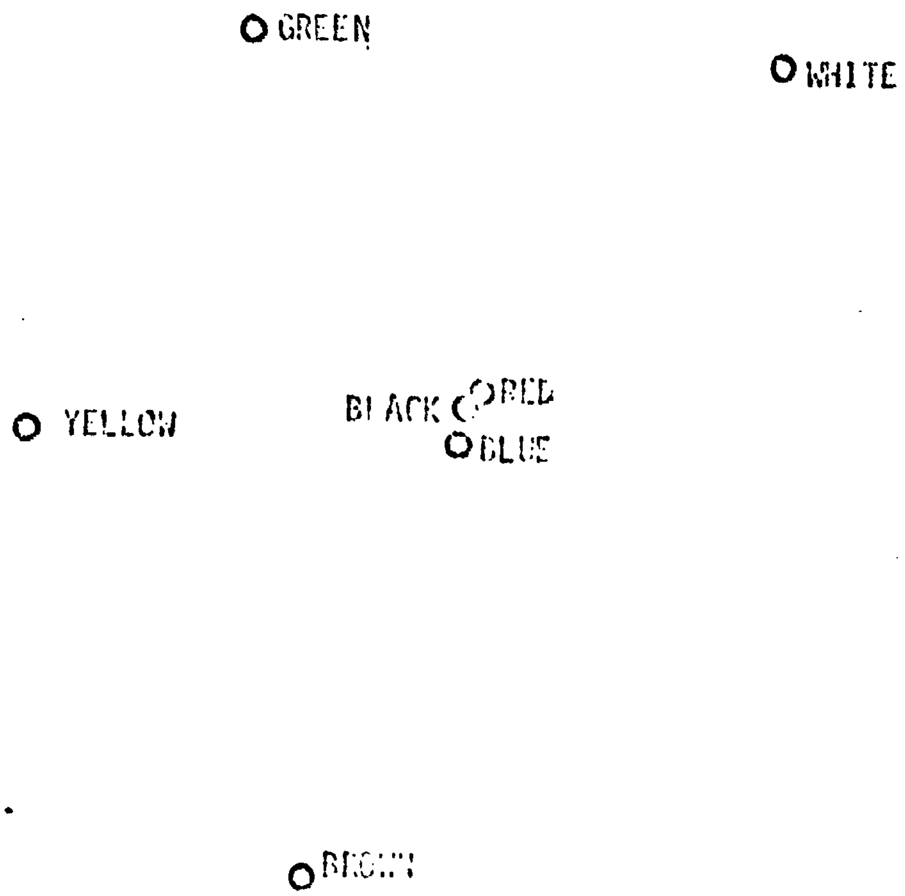

Fig. 20.--The [illegible] representation of [illegible] of color terms for Group A of the General [illegible] Sample.

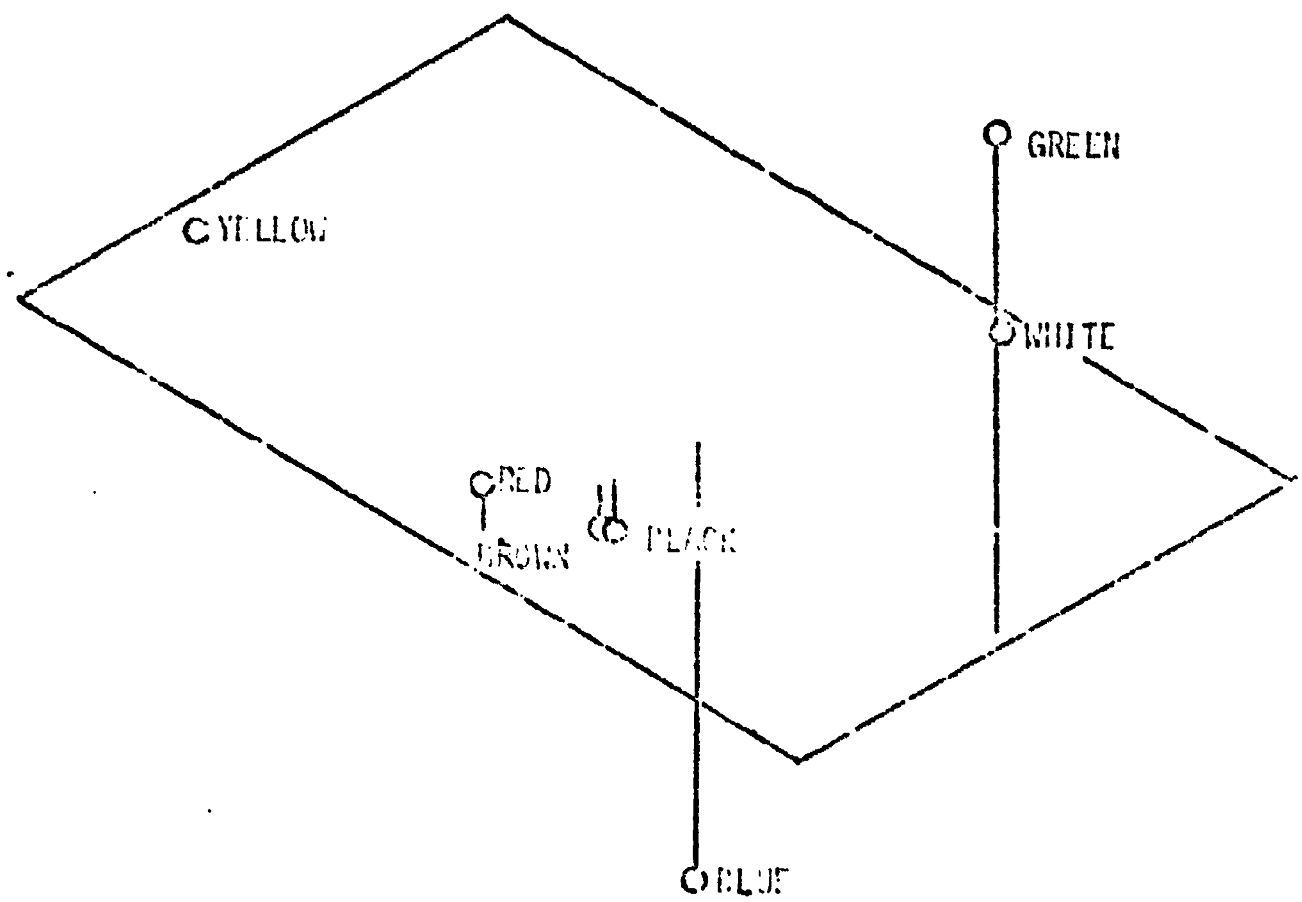

Fig. 21.--Three dimensional representation of triad distances of color terms for Group B of the general population sample.

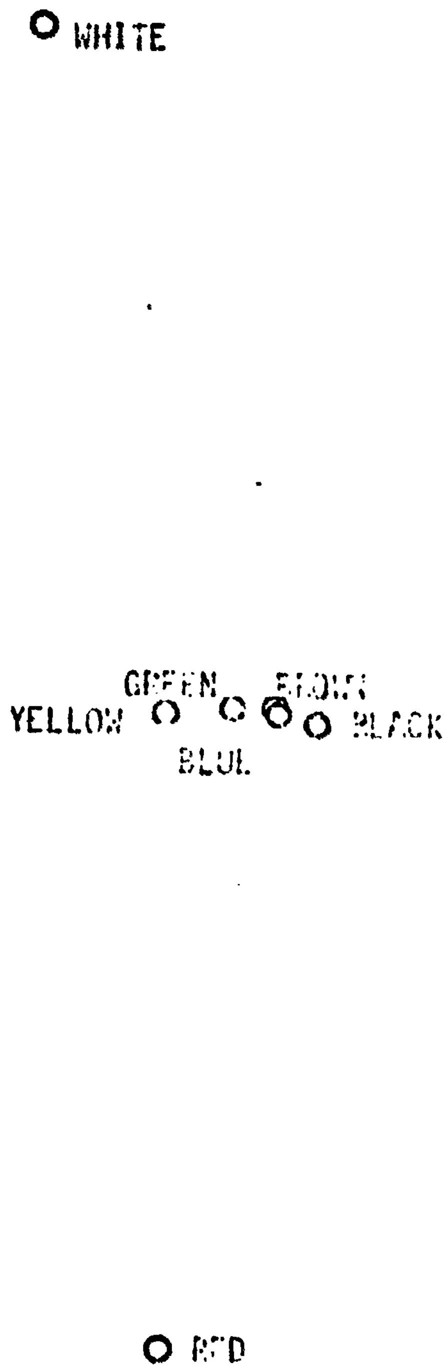

Fig. 22.--Two dimensional representation of triad distances of color terms for Group C of the Central Population Sample.

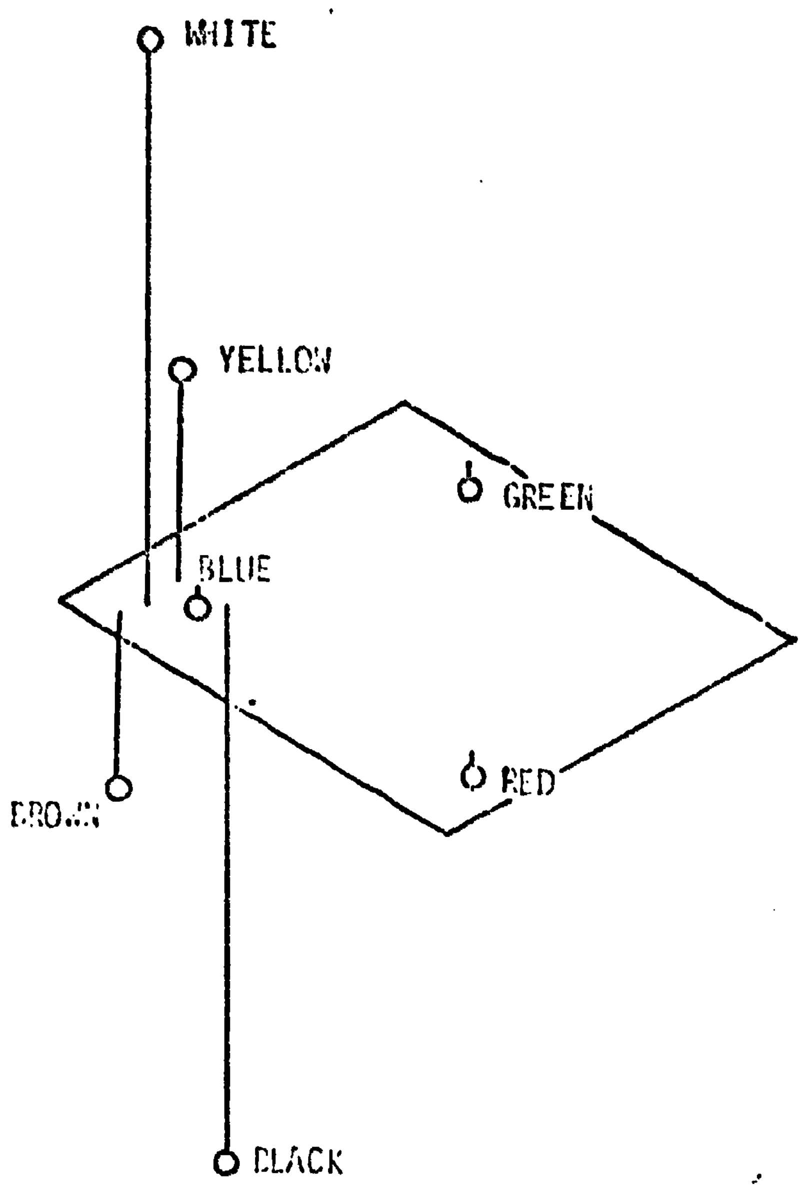

Fig. 23.--Three dimensional representation of triad distances of color terms for Group D of the General Population Sample.

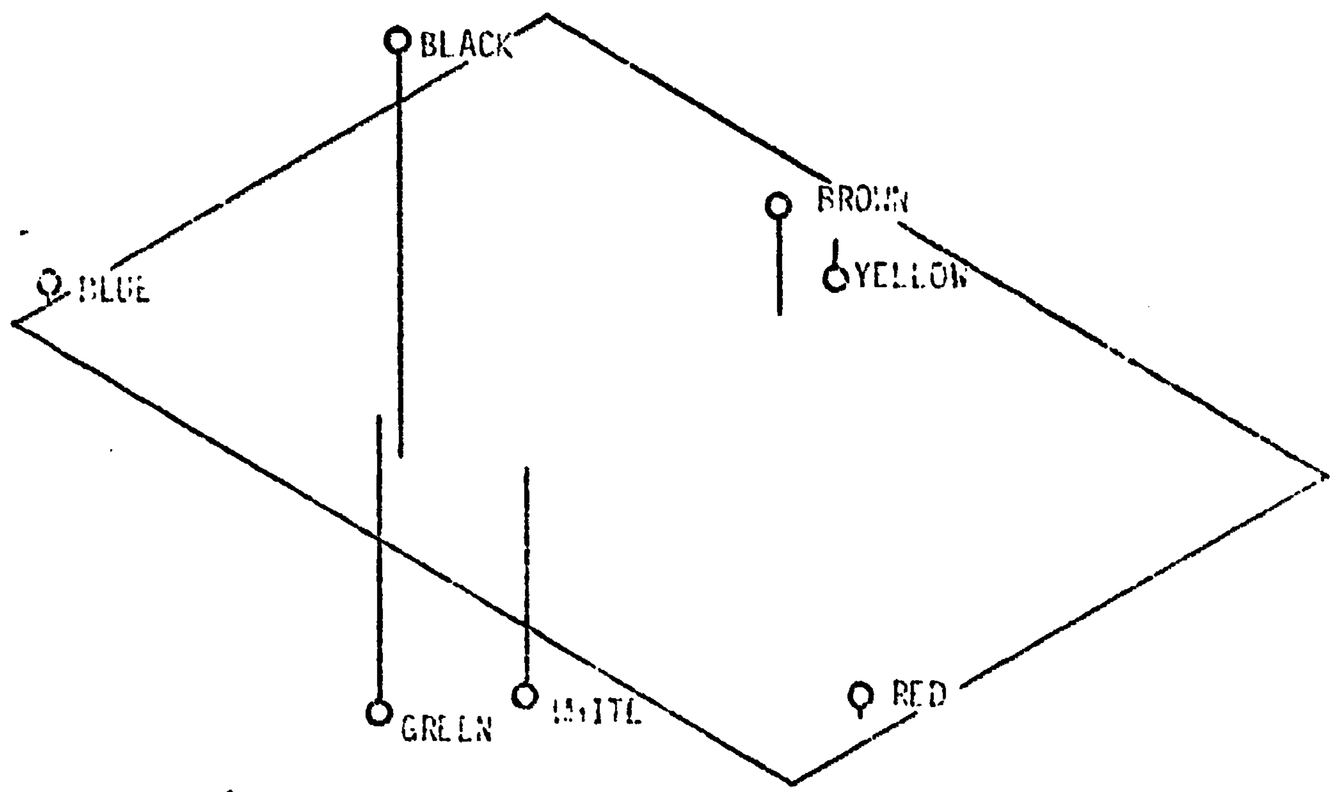

Fig. 24.--Three dimensional representation of triad distances of color terms for Group E of the General Population Sample.

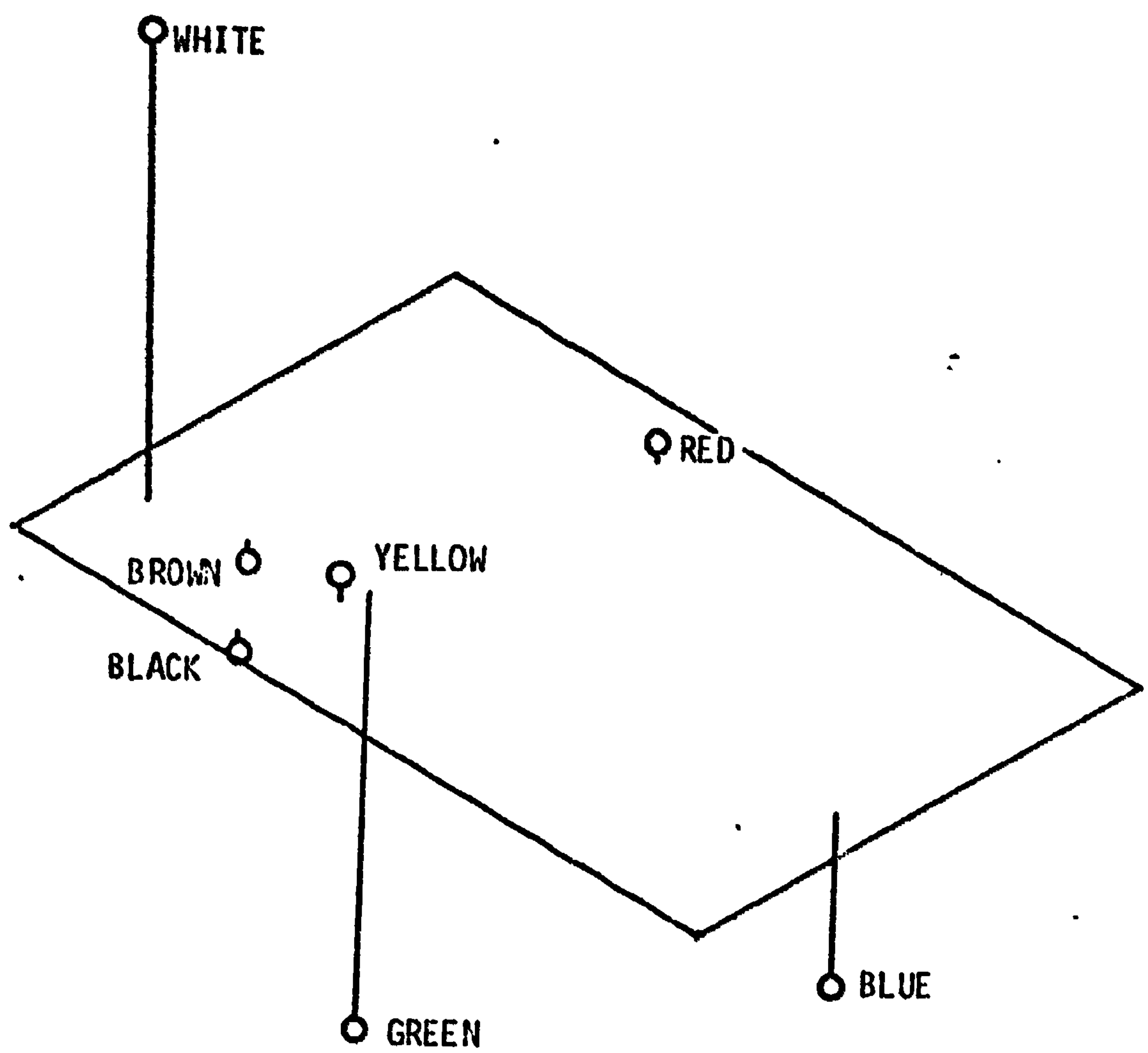

Fig. 25.--Three dimensional representation of triad distances of color terms for Group F of the General Population Sample.

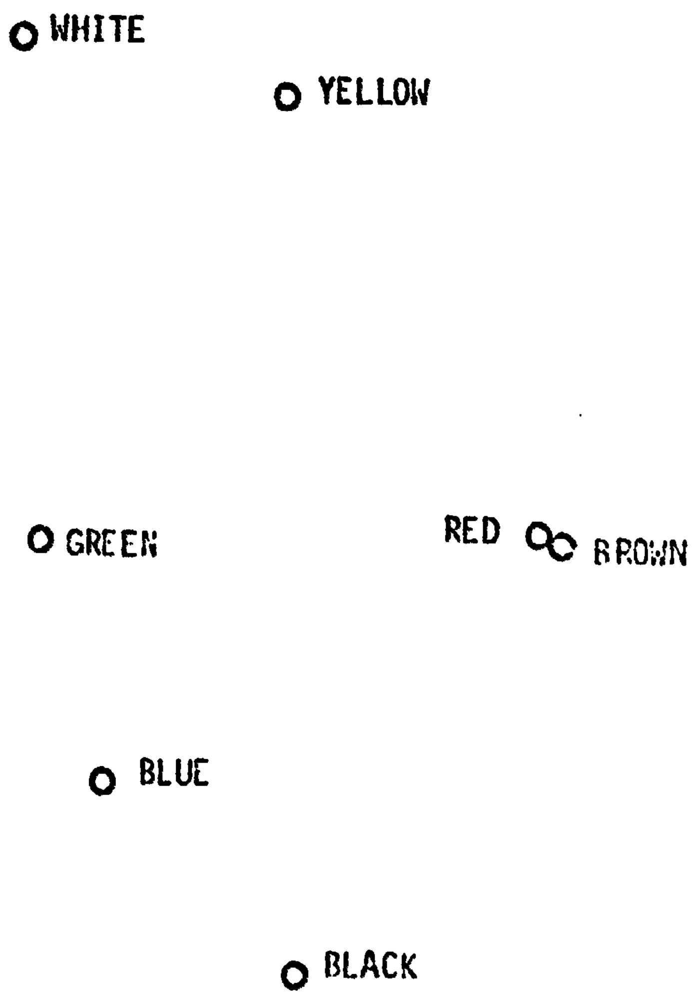

Fig. 26.--Two dimensional representation of triad distances of color terms for Group G of the General Population Sample.

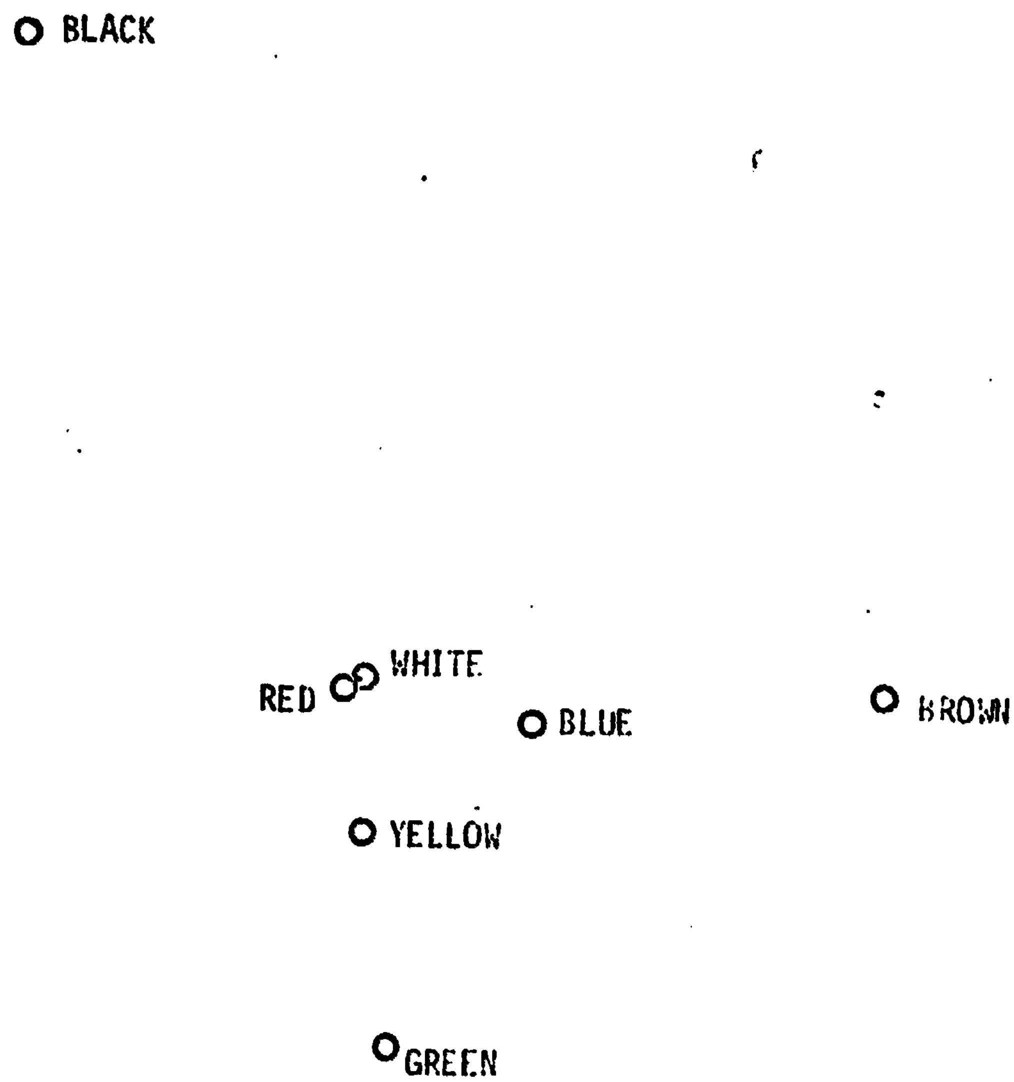

Fig. 27.--Two dimensional representation of triad distances of color terms for Group H of the General Population Sample.

The distance matrices were also cluster analyzed using the clustering technique discussed in the previous chapter with respect to the triad data. The results of these analyses are presented in Figure 28. It should be noted that, in general, the cluster analyses are in close agreement with the multidimensional scaling solutions.

In contrast to the analyses of the triad data for the general population sample as a whole the results presented here are extremely complex. The multidimensional configurations for groups C, D, E, and G have relatively clearly defined brightness dimensions, and the general configuration of the other color terms in groups E, F, and G tend to conform to the color circle, but there are configurations which are difficult to interpret in any simple straightforward manner. It is obvious that something more than denotative meaning was used to select the most different terms in each triad, and the verbalizations made during the test tend to confirm this assumption. In Chapter III it was noted that individuals made decisions based on affective, as well as denotative, meaning (e.g., whether they liked a given color or not, etc.). They also made verbalizations which indicated that associative meaning may influence the response. For example, some respondents mentioned that certain objects (automobiles, animals, etc.) often display two of the three terms, but the third color was never part of these objects; thus it was considered the most different in the triad.

The use of such complex criteria in decision-making on the triad test is sufficient justification for assuming that interindividual variability on this test can be expected. An important question, however, is whether this variation reflects profound cognitive variation or merely a random, transitory, and/or situational selection of criteria at the time the stimulus was presented. It is argued here that response patterns which vary in a systematic manner, and that can be consistently related to response patterns on other cognitive tests on an individual basis, are indicative of systematic differential patterning in cognition. It is further argued that this differential patterning reflects considerably more than simple random variation in the response of an individual at the time stimuli are administered, if the response patterns can be significantly related to other non-cognitive variables. As was noted above, the structure of the resultant configurations will be related to the relative salience of various aspects of meaning as well as differences in meaning. Since these structures obviously vary considerably from group to group, we can thus infer that there is possibly quite a bit of cognitive variability in this population with respect to

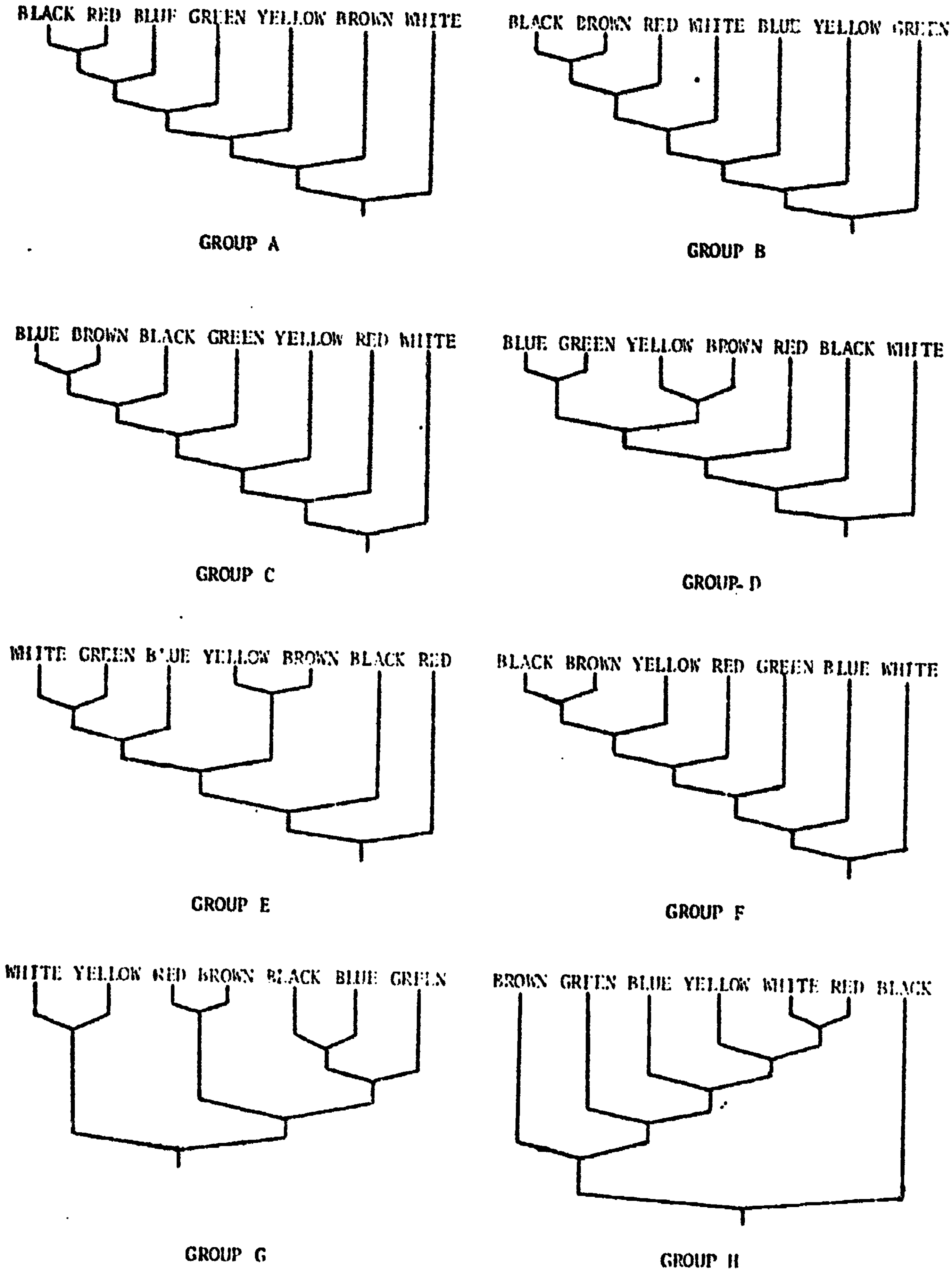

Fig. 28.--Cluster analyses of triad distances of color terms for eight subgroups of the General Population Sample.

color terminology. It remains to be seen exactly what this apparent variability is related to.

In the reamining sections of this chapter, relationships between the conceptualization of color terms as determined by the triadic sort and other cognitive and noncognitive variables will be investigated.

Triad Sort Distances and Connotative Meaning

The first step in this analysis was to determine the relationship between connotative meaning and the term-to-term distances derived from the triadic sort. Several approaches were used to determine these relationships: First, the differences between the eight subgroups of the population sample with respect to the connotative meaning of color terms are described; and second, the relationships between color term-to-term distances in connotative meaning and the distances derived from the triadic sort will be investigated on an individual-to-individual basis.

As described in Chapter III, each of the seven color terms was rated on eleven adjectival scales. This procedure resulted in 77 ratings per individual. The differences between the eight subgroups with respect to each of these seventy-seven variables was determined by an analysis of variance. The analysis of variance indicates the extent to which the adjectival scale ratings differ across the eight groups. The results of this analysis and the statistical significance of the differences in ratings can be seen in Table 27.

Overall, the eight groups differ significantly on about half of the scales which indicates that individuals who can be differentiated on the triadic sort responses can also be distinguished on the basis of their responses to the semantic differential.

Table 27 indicates that the color term for black differs between the eight groups to a greater extent than that of any other color in the set of connotative meaning. The F Ratios on eight of the eleven scales are significant at the 0.01 level. In addition, black has two of the highest F ratios in Table 27. With respect to the scales, the "clean-dirty" scale has the largest number of F ratios significant at the 0.01 level.

Let us now turn to the data and describe the between-group differences in connotative meaning. We will focus only on the most significant scales for each color

Table 27

Analysis of Variance of Differences in Semantic Differential Ratings Across the Eight Subgroups of the Population Sample

	Red	Black	Yellow	White	Green	Blue	Brown
Exciting	2.13*	2.62*	2.45*	1.86	1.84	2.42*	2.03
Pleasing	2.38*	4.36**	1.15	1.29	1.13	2.19*	3.38**
Strong	1.11	2.12*	0.68	1.32	0.77	0.79	1.55
Beautiful	0.83	3.35**	0.54	2.56*	2.27	2.15*	2.83**
Fast	3.52**	1.44	2.15*	1.40	0.96	2.18*	1.05
Big	0.35	1.94	0.57	1.79	0.42	2.09*	0.40
Clean	1.27	6.76**	1.41	1.16	3.75**	3.40**	3.24**
Bright	1.22	2.79**	0.71	1.54	1.64	1.37	3.09**
Heavy	2.35*	0.99	0.83	2.33*	1.93	0.81	1.47
Dense	1.26	2.45*	2.00	3.92**	0.72	0.63	0.86
Smell Good	0.29	3.26**	2.50*	0.95	2.30*	1.82	2.56*

* = $p<0.05$ ** = $p<0.01$ d.f. = 7 173

(p<.01). The mean values for each group on these scales are entered in Table 28.

The interpretation of the tabular entries in Table 28 is the same as for Table 17 in the previous chapter. Each entry indicates the mean value that a given color was rated by the indicated group on a specific scale. The ratings can vary between 1.0 and 7.0 with 1.0 being assigned to the left extreme of the scale and 7.0 to the right. The scales are oriented the same as the scale identification entries in Table 28. Red, for example, is judged as "very fast" by group A and "slow and fast" by group G. The other groups judge red somewhere in between these extremes.

Black receives its most favorable ratings from group H on the pleasing, beautiful, clean, and odor scales. It is interesting to note that group H also judges black to be brighter than any other group. In general, black receives its most negative and "least bright" ratings from group G. Further, white is judged as thinnest (least saturated or least dense) by group G and most dense by group H. Groups G and H seem to be maximally distant on their ratings of the color terms for black and white. With regard to blue and green, Groups A and G are furthest apart on their ratings. Group A judges both colors to be cleaner than G does. Brown receives its least pleasing, least beautiful, least clean, and least bright ratings from group C. Group A gives brown the highest rating on the first three of these scales while E rates brown brightest.

The semantic differential data was also cluster analyzed using the hierarchical clustering technique discussed in Chapter III in the section concerning the semantic differential. The results of this analysis are presented in Figure 29. In general, we find that blue and green are clustered together at a relatively early step in group B, C, D, G, and E. In contrast, yellow is clustered with green in groups A and F. Yellow, however, is the next term joined to blue-green clusters in groups C and E. Group H stands alone; clustering green with brown and yellow with blue. Black and brown are also clustered early in most of the groups (A, B, C, D, F, E). Groups G, in contrast, groups brown with the blue-green cluster, and group H groups black with red and white forming a cluster of the three basic colors in Luganda. White remains unclustered in group C, D, F, and E emphasizing its difference from the other colors in connotative meaning. A cluster formed of white and yellow stands alone in group G, comparing closely with the brightness dimension revealed in the multidimensional scaling of the triad data for this group. Although the cluster analysis indicates

Table 28

Mean Values of Selected Semantic Differential Scales on Selected Colors

Color Term	Scale	Group A	B	C	D	F	H	G	E
Red	Slow-Fast	6.83	6.22	6.25	5.52	5.30	5.00	4.00	5.31
Black	Pleasing-Unpleasing	2.67	4.59	4.06	3.81	3.35	1.93	4.72	2.79
Black	Beautiful-Ugly	2.33	3.78	4.06	3.48	3.35	2.14	3.72	2.44
Black	Clean-Dirty	4.33	4.07	4.37	4.19	3.65	1.79	5.17	2.71
Black	Bright-Not Bright	4.16	4.81	5.44	4.74	4.30	3.64	5.88	4.13
Black	Smell Good-Smell Bad	5.17	3.85	4.88	4.11	4.50	5.21	3.06	4.54
White	Dense-Thin	4.16	2.93	4.31	4.30	2.55	2.79	5.67	3.46
Green	Clean-Dirty	1.50	2.41	2.69	2.74	2.00	3.14	3.56	2.29
Blue	Clean-Dirty	2.00	2.37	2.63	3.07	2.45	2.43	3.94	2.42
Brown	Pleasing-Unpleasing	2.33	4.78	4.88	4.07	3.95	2.86	4.22	3.35
Brown	Beautiful-Ugly	1.83	3.81	3.88	3.52	3.40	2.71	3.78	2.73
Brown	Clean-Dirty	2.50	4.56	4.56	4.52	3.95	2.93	4.28	3.33
Brown	Bright-Not Bright	4.17	5.19	5.94	5.11	4.75	4.50	5.33	4.08

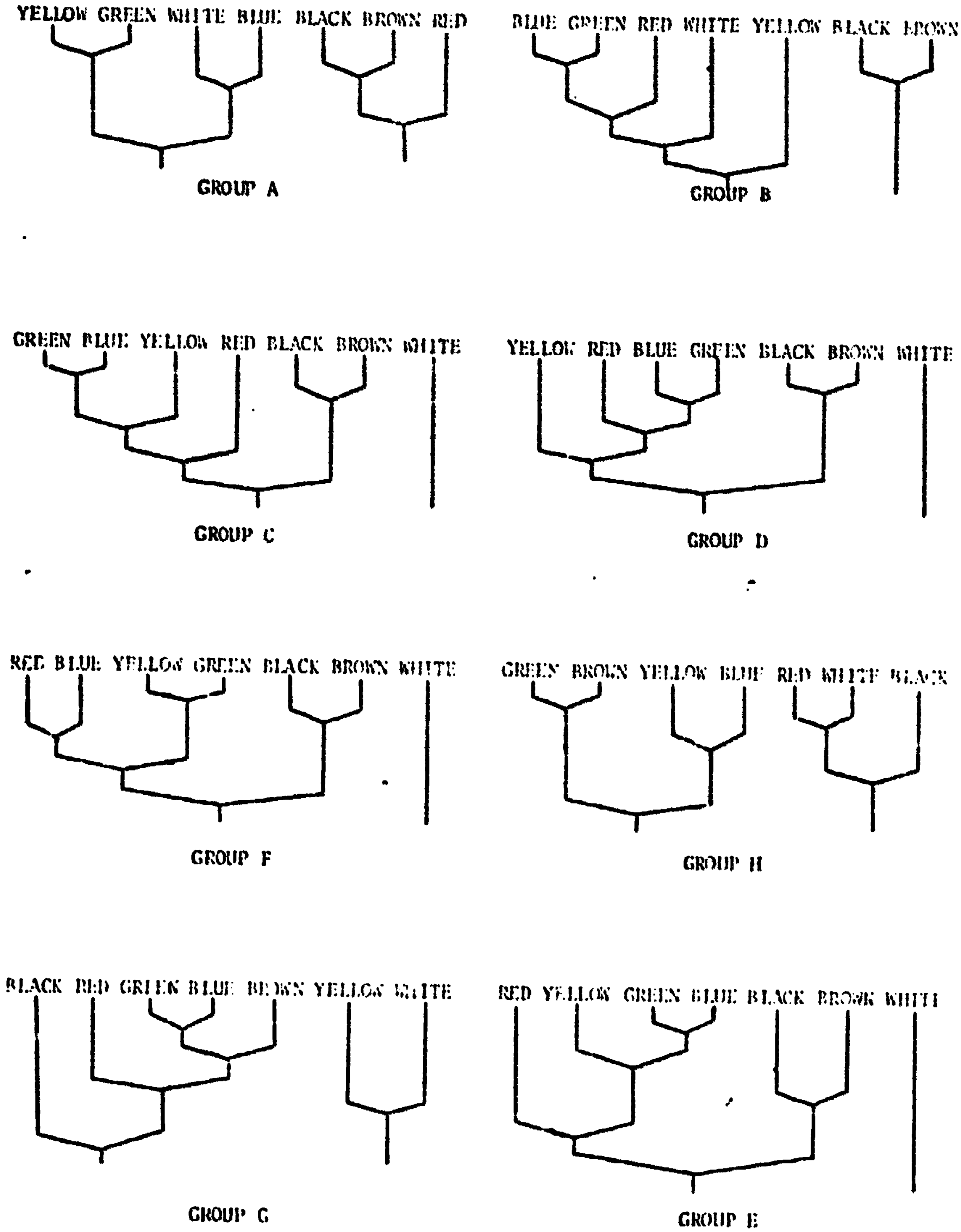

Fig. 29.--Cluster analyses of mean semantic differential values for eight subgroups of the General Population Sample.

some similarity between the subgroups, it also clearly demonstrates that these subgroups differ with respect to the connotative meaning of color terms.

Next in the analysis, the Mahalanobis' distance (Rao, 1952) of each case from the means of each group as defined by the seventy-seven semantic differential variables was calculated. The resultant distances were used to reclassify each case into the group with which it had the smallest Mahalanobis' distance. A summary of the reclassifications is presented in Table 29.

Table 29 is most easily read from left to right. For example, group G originally had 27 cases. Twenty-three of these were reclassified back into B and four were reclassified into other groups: one into group F and three into group E. Looking across the rows for the other groups, we find that one case from group F and five cases from group E were reclassified into group B.

Table 29

Reclassification of Cases From Triad Groups on the Basis of Mahalanobis' D^2 From Subgroup Means of Semantic Differential Data for General Population Sample

Group	A	B	C	D	F	H	G	E
A	6	0	0	0	0	0	0	0
B	0	23	0	0	1	0	0	3
C	0	0	14	1	0	0	0	1
D	0	0	0	24	0	1	0	2
F	0	1	0	0	17	0	0	2
H	0	0	0	0	0	14	0	0
G	0	0	0	0	0	0	17	1
E	0	5	0	5	2	0	1	39

Overall, we find that 154 of the 180 cases in this analysis were reclassified back into the group they were originally placed in on the basis of the triad analysis. This is almost seven times as many as we would excpect by chance alone! Thus, once again, these groups, which were determined on the basis of response to the triadic sort test, differ also with regard to the connotative meaning they assign to the seven color terms.

Although the analysis presented above indicates that the groups differ significantly with respect to their mean responses to many of the semantic differential qualifiers, a more direct method for determining the relationship between the triadic sort distances and connotative meaning would be to attempt to predict the triadic sort term-to-term distances from the term-to-term distances derived from the semantic differential. We will designate the triadic sort distance between two terms as the dependent variable and the absolute differences between the adjectival scale values for the same two terms on the semantic differential as the independent variables and determine the relationship between these variables. Here the absolute difference between the values for each of the eleven qualifiers are used as the independent variables and entered stepwise, on the basis of amount of variance explained, into a multiple regression on the dependent variable the triadic sort distance. The results of this analysis are presented in Table 30.

The numbers in parentheses in Table 30 are the variable identification numbers. They refer to the semantic differential scales which are also coded in Table 30. The figure following the variable identification number is the multiple correlation coefficient for that variable and those preceding it in the column. For example, the correlation coefficient between the absolute difference between black and red on the clean-dirty adjectival scale and the distance between black and red derived from the triadic sort technique is 0.19. The multiple R increases to 0.26 when the distance between black and red on the strong-weak scale is added as an independent variable in the equation. The table also indicates that the two values we have just discussed are statistically significant at the 0.01 level.

Although a fair number of the relationships indicated in Table 30 are statistically significant, the amount of variance explained (R^2) is disappointingly small. The analysis of the total population sample is presented in Table 30 and it is possible that there may be between-group differences in the use of connotative meaning for decision-making on the triadic sort. Thus is seems necessary to look at each of the groups separately to determine if there

Table 30

Multiple Regression of Semantic Differential Term-To-Term Distances For Total General Population Sample

Black Red	Black White	Black Blue	Black Green	Black Brown	Red White	Red Yellow	Red Blue	Red Green	Black Yellow	Red Brown	White Yellow	White Blue
(7) 19**	(7).15*	(11).10	(3).14	(10).14	(11).22**	(9).13	(8).17*	(3).12	(9).18*	(1).16*	(4).11	(7).17*
(3).26**	(5).23**	(1).15	(6).22*	(2).18*	(7).25**	(11).19*	(2).21*	(7).16	(1).20*	(3).19*	(3).18*	(4).20*
(1).29**	(8).26**	(4).17	(9).25**	(5).21*	(2).27**	(5).21*	(11).22*	(5).19	(3).21*	(8).20	(11).23*	(1).22*
(2).32**	(10).27**	(7).21	(2).28**	(6).23*	(5).28**	(6).24*	(4).23*	(6).21	(10).23*	(10).21	(5).26*	(11).24*
(4).34**	(6).27*	(9).22	(8).30**	(11).24	(8).29**	(4).25*	(1).24*	(4).23	(2).24*	(6).21	(8).28*	(8).25*
(5).36**	(9).28*	(8).23	(11).33**	(8).25	(6).29*	(2).26*	(4).24	(10).24	(11).25	(9).22	(2).29*	(10).26*
(8).37**	(1).28*	(2).23	(10).33**	(7).25	(9).30*	(7).27	(3).24	(11).24	(5).25	(5).22	(7).29*	(6).27
(10).37**	(3).28*	(6).23	(4).33**	(3).25	(10).30*	(10).27	(6).24	(9).25	(6).25	(4).22	(9).29*	(5).27
(6).38**	(2).28	(5).23	(1).33*	(1).25	(3).31*	(1).27	(10).25	(2).25	(8).25	(7).23	(6).29	(2).27
(9).38**	(4).28	(10).23	(7).33*	(9).25	(1).31*	(8).27	(7).25	(8).25	(7).25	(11).23	(10).29	(3).27
(11).38**	(11).28	(3).23	(5).33*	(4).25	(4).31	(3).27	(5).25	(1).25	(4).25	(2).23	(1).29	(9).27

White Green	White Brown	Yellow Blue	Yellow Green	Yellow Brown	Blue Green	Blue Brown	Green Brown
(9).17*	(10).25**	(3).14	(11).17*	(9).11	(7).14	(4).20**	(11).14
(1).21*	(4).30**	(2).20*	(10).17	(6).17	(9).18	(1).25**	(4).15
(8).24*	(8).31**	(1).26**	(6).18	(4).21*	(8).20	(8).27**	(1).15
(10).26*	(2).32**	(7).28**	(9).19	(11).22	(3).20	(7).28**	(3).16
(6).27*	(9).33**	(6).28*	(4).19	(8).22	(6).21	(9).29**	(2).16
(5).27*	(3).34**	(5).24*	(7).19	(10).23	(2).21	(10).30**	(10).16
(2).27	(11).34**	(9).29*	(8).20	(5).23	(10).21	(11).30*	(9).16
(3).27	(7).34**	(10).29*	(5).20	(1).24	(11).21	(3).31*	(6).16
(11).27	(5).34**	(8).29	(3).20	(3).24	(1).21	(5).31*	(8).17
(7).27	(1).34*	(11).29	(1).20	(2).24	(5).21	(6).31*	(7).17
(4).27	(6).34*	(4).29	(2).20	(7).24	(4).21	(2).31	(5).17

Variable Identifications

1. Exciting
2. Pleasing
3. Strong
4. Beautiful
5. Slow
6. Small
7. Clean
8. Bright
9. Heavy
10. Dense
11. Smell Bad

* P<.05
** P<.01

is intracultural variation in the relationship between connotative meaning and the triadic sort distances.

If we were to carry out the analysis for the subgroups with all of the distance values, it would require twenty-one multiple regressions for each subgroups, or a total of 168. It seems, however, that a more economical approach to this problem is to select the dyad which manifests the most variance, in terms of distance, across the eight subgroups, and limit our analysis to it. This will provide us with the relationship between the triadic sort and the semantic differential on a distance that is most important in distinguishing between the groups.

An analysis of the variance was performed on the twenty-one distance coefficients across the eight groups. The results of this analysis indicate that two diads--black-brown and yellow-white--far exceed the others in terms of F ratios. These two dyads, however, differ very little from each other. Table 30 indicates that of the two dyads yellow-white manifests the stronger relationships between the two instruments. In addition, the standard deviations of the yellow-white distances on the eleven semantic differential and the triad sort. Our analysis in this section will be limited to this dyad.

The distances between yellow and white on the semantic differential were used to predict their distances on the triadic sort. The results of this analysis are presented in Table 31. Group A was not included in this analysis because its sample size was too small for meaningful results (n=6).

The interpretation of Table 31 is similar to Table 30. Here, however, each column contains the multiple correlation between the semantic differential and triad distances for a single subgroup on the yellow-white dyad.

It is obvious that there are differences between the subgroups in Table 31. These differences extend to both the order of entry of variables and the magnitude of the multiple correlations. It is also important to note that the subgroup multiple correlations are substantially higher than the total population sample multiple correlations for the same variables. We must, however, account for the fact that the sample sizes of the subgroups are substantially smaller than those of the total population sample. Sample size has been taken into account with respect to calculating the levels of statistical significance, but it also has an effect on the magnitude of the multiple correlation.

Table 31

Multiple Regression Analysis of Relationship Between Yellow-White Term-to-Term Distance on Triadic Sort and Semantic Differential for Seven Subgroups of the General Population Sample

B	C	D	E	F	G	H
(6) 0.51**	(11) 0.56*	(2) 0.32	(5) 0.36**	(5) 0.47*	(9) 0.53*	(2) 0.32
(10) 0.55*	(8) 0.63*	(8) 0.51*	(4) 0.43**	(1) 0.54*	(11) 0.74**	(5) 0.59
(1) 0.61*	(5) 0.68*	(4) 0.56*	(1) 0.50**	(4) 0.64*	(5) 0.88**	(9) 0.68
(8) 0.66**	(1) 0.70	(1) 0.58*	(8) 0.50*	(10) 0.69*	(7) 0.92**	(7) 0.73
(5) 0.70**	(4) 0.72	(11) 0.59	(9) 0.51*	(2) 0.73*	(3) 0.93**	(6) 0.75
(3) 0.71*	(3) 0.74	(6) 0.60	(11) 0.51*	(9) 0.79*	(1) 0.94**	(8) 0.76
(11) 0.72	(6) 0.76	(5) 0.60	(3) 0.51*	(3) 0.80	(4) 0.95**	(11) 0.77
(9) 0.74	(10) 0.80	(7) 0.61	(2) 0.52	(8) 0.83	(2) 0.95**	(4) 0.78
(4) 0.74	(9) 0.81	(10) 0.62	(6) 0.52	(6) 0.84	(6) 0.95**	(10) 0.79
(7) 0.74	(2) 0.82	(3) 0.62	(7) 0.52	(11) 0.85	(8) 0.95**	(3) 0.82
(2) 0.74	(7) 0.82	(9) 0.62	(10) 0.52	(7) 0.85	(10) 0.95**	(1) 0.85
N 27	16	27	52	20	18	14

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

In the calculation of a multiple correlation coefficient, weights are assigned to the independent variables which ensure a maximum correlation coefficient. Thus, high multiple correlation coefficients can results from chance deviations which favor a high coefficient. This is especially true with small samples. In the analysis of the subgroups presented here, some of the samples are relatively small, and sampling error could result in an inflated value. It is therefore desirable to reduce the multiple correlation coefficient to a more probable population value. Guilford (1965: 401) suggests using the formula

$$_cR^2 = 1 - (1 - R^2)\left(\frac{N - 1}{N - m}\right)$$

where N = number of cases in the sample
m = number of variables correlated

The increase in the Multiple Correlation for most of the groups decelerates considerably after five variables have been entered into the equation. We will thus calculate a corrected multiple correlation coefficient for the first five independent variables entered. It is impossible for any of the "real" multiple correlations, with all eleven variables entered, to be less than the corrected figure for five, and by calculating the corrected coefficient with only the variables that account for most of the variance, we eliminate the possibility of reducing the coefficient excessively. The corrected coefficients can be found in Table 32.

Table 32

Corrected Multiple Correlation Coefficients for the First Five Semantic Differential Varibles Entered on Triad Distance Between Yellow and White

Group	R
B	0.61
C	0.53
D	0.44
E	0.42
F	0.61
G	0.90
H	0.54

Table 32 indicates a fair degree of difference between the subgroups of the general population sample in the relationship between the triad and semantic differential distances. We can thus tentatively conclude that these subgroups manifest differential usage of connotative meaning in decision-making on the triadic sort.

The sum total of evidence from both the triadic sort and the semantic differential presented above clearly indicates that the eight subgroups of the general population sample differ significantly with respect to the conceptualization of the seven color terms. The convergence of evidence from several instruments leaves little doubt that there is intracultural variation with regard to the cognition of color terms among the Baganda. We are now ready to inquire whether this variability is related to other non-cognitive socio-cultural variables.

The Relationship Between Cognitive Variability and Other Socio-cultural Variables

An analysis of variance was conducted on twenty-one variables from the background survey schedule data across the eight subgroups. The results of this analysis indicate both the degree of statistical significance of the differences between the groups with respect to the variables and the relative importance of each variable in distinguishing between the groups. The group means and percent distributions and an analysis of variance for each variable can be found in Table 33.

The analysis of variance in Table 33 clearly indicates that education is the most important of the twenty-two variables in distinguishing between the eight cognitively defined subgroups ($F = 6.796$, $p<0.001$). This variable is followed, in relative order of importance, by the speaking and reading in English, area of residence, frequency of travel to Kampala, and age. It is important to add that these same background variables were also most important in distinguishing between subgroups differentiated on the basis of variability in the cognition of terms for food plants (Pollnac, 1972). Given the differences in complexity of food plant and color term domains and the fact that the samples only overlapped slightly, agreement in results adds considerable strength to the conviction that these variables are the major predictors of cognitive variability.

Looking at Table 33 we find several groups which are clearly distinguished from the others. Group G is the

Table 33

Group Means, Percent Distributions, and Analysis of Variance of Between Group Differences on Background Variables for Eight Subgroups of the General Population Sample

	A	B	C	D	E	F	G	H	Total Sample	F. Ratio	p <
1. Age (Years)	29.7	32.5	36.2	36.6	42.1	42.0	25.0	36.1	36.7	2.978	0.01
2. Percent Male	66.7	55.6	62.5	44.4	59.6	70.0	44.4	71.4	57.8	0.853	--
3. Number of Languages	2.00	2.07	1.88	1.56	1.96	1.90	2.39	1.79	1.93	0.562	--
4. Speak English (%)	66.7	48.1	56.2	37.0	25.0	30.0	77.8	07.1	38.9	4.387	0.001
5. Speak Other Bantu (%)	00.0	18.5	18.8	00.0	13.5	10.0	16.7	21.4	12.8	1.067	--
6. Speak Swahili (%)	33.3	18.5	06.3	14.8	23.1	40.0	16.7	28.6	21.7	1.189	--
7. Read Luganda (%)	100.0	81.4	100.0	88.8	73.1	85.0	100.0	78.6	84.4	1.983	--
8. Read English (%)	66.7	48.1	50.0	37.0	23.1	30.0	77.8	07.1	37.8	4.436	0.001
9. Urban Scale	1.67	1.63	1.31	1.74	1.38	1.60	1.94	1.43	1.56	3.258	0.01
10. Owns Radio (%)	83.3	70.3	75.0	66.7	63.5	65.0	83.3	50.0	67.8	0.801	--
11. Years Had Radio	5.50	4.63	5.69	3.74	4.50	5.60	7.28	1.43	4.70	1.557	--
12. Luganda Books	0.33	0.63	0.75	0.70	0.54	0.65	0.72	0.29	0.60	1.021	--
13. Luganda Newspapers	1.17	0.93	1.19	1.00	0.79	0.70	1.00	0.43	0.87	1.490	--
14. English Books	0.17	0.19	0.31	0.30	0.06	0.45	0.50	0.71	0.23	1.263	--
15. English Newspapers	0.33	0.37	0.19	0.37	0.10	0.25	0.50	0.71	0.25	1.677	--
16. Fq. to Kampala Scale	3.50	2.93	2.81	2.44	1.96	2.45	3.39	1.07	2.43	3.121	0.01
17. Occupation	1.00	1.15	0.94	0.96	0.90	0.50	0.94	0.57	0.89	0.724	--
18. Education (Years)	7.17	6.30	6.13	6.15	3.98	5.10	9.72	2.36	5.52	6.796	0.001
19. Past Occupation	1.33	1.33	1.19	1.19	1.10	0.80	1.06	0.79	1.10	0.578	--
20. Urban Residence (%)	16.7	03.7	00.0	00.0	03.8	05.0	05.6	00.0	03.3	0.815	--
21. Rural Residence (%)	50.0	40.7	68.8	25.9	65.3	45.0	11.1	57.1	47.2	4.010	0.001
22. Peri-Urban Residence (%)	33.3	55.5	31.2	74.1	30.8	50.0	83.3	42.9	49.4	4.050	0.001

youngest, speaks the greatest number of languages, and has the highest percentage of English speakers and readers. They have also possessed radios longer than any other group, are second in frequency of travel to Kampala, have the highest level of education and the largest percent of people living in the peri-urban area. Our analyses of the cognition of color terms among this group indicated that the relationship between the semantic differential and the triad sort is the highest among this group. In addition, the two dimensional configuration of the terms derived from the mean triad sort distances shows a definite brightness dimension as well as a close approximation to the color circle (cf. Table 26 and Figure 26).

In contrast, group H has the lowest reported level of formal education, and the lowest percentage of English speakers and readers. They are, overall, older than group G but not the oldest subgroup of the sample. They manifest the lowest percentage of radio ownership, travel to Kampala less than any other subgroup, and over half live in the rural area. With respect to the cognition of color terms, group H also contrasts with group G. The two dimensional distribution of the color terms derived from the triad sort distances shows no definite brightness dimension and does not, in the least, approximate the color circle. In addition, the relationship between the semantic differential and triad distances, although strong, is not statistically significant. Groups G and H are thus widely divergent with respect to both their conceptualization of color terms and their background characteristics.

Another group of interest here is group E. This group is the modal group (N = 52) and also manifests certain characteristics which distinguish it from other groups. It is overall the oldest groups with the second smallest percentage of English speakers and readers as well as the lowest percentage of people who can read Luganda. It has the second highest percentage of rural residents and the second lowest number of years of formal education and frequency of travel to Kampala. With respect to the cognition of color terms, the best fit was achieved in three dimensions, rather than in two, as in the two previously discussed groups. This configuration manifests a weakly defined brightness dimension as well as a distribution of terms which approximates the color circle. This group is thus closer to G than H with respect to the cognition of color terms, but it still diverges markedly from both groups.

The analysis presented above demonstrates that there are significant differences between the eight cognitively defined subgroups in their experiential and background characteristics.

In order to determine each individual's approximation to the mean models of several of the groups and relate this distance to the background variables, the Mahalanobis' distances between each individual and the group means were calculated. This generalized distance coefficient accounts for the interrelationships between the variables and provides a weight for each variable (here the term to term distances) that maximizes the separation between the groups (Rao, 1952).

The distance coefficient is not a simple linear compound of the differences between the group mean values and the case values, but a weighted combination which, in this case, gives more weight to the cognitive elements which are most important in distinguishing between the groups.

The Mahalanobis' D^2 of each individual in the sample from the group means of the three groups discussed above (E, G, and H) are the dependent variables in the following analysis. The independent variables consist of nineteen background variables which were described above and are identified in Table 34. These nineteen variables were entered in a stepwise manner (on the basis of explained variance) into a multiple regression on each of the three Mahalanobis' distances separately. If a variable failed to achieve an F ratio greater than 0.01, with the entered variables controlled, it was eliminated from the analysis. The results of these three multiple regressions can be found in Table 34.

These analyses indicate that there is a significant relationship between the background variables and distance from a given cognitive configuration. The most important variables in this analysis are again education, age, past occupation, sex, location relative to Kampala, and reading Luganda. The speaking and reading of English, although highly significant in the analysis of variance presented above, did not appear early in the multiple regressions because they are highly related to education, and when education is controlled they explain very little of the variance in the dependent variable.

In sum, the analysis of the general population sample has indicated a lack of homogeneity with respect to the cognition of color terms. It was found that in general there is a relationship between color term-to-term distances derived from the triadic sort and distances in connotative

Table 34

Multiple Correlations Between Background Variables and Individual Distances From Triad Sort Distance Group Means for Selected Subgroups of the General Population Sample

Dependent Variable D^2 From E		Dependent Variable D^2 From G		Dependent Variable D^2 From H	
Independent Variables	R	Independent Variables	R	Independent Variables	R
Age (Years)	0.311**	Education	0.172*	Education	0.319**
Education	0.329**	Age	0.218*	Urban Location	0.362**
Luganda Books	0.346**	Past Occupation	0.245*	Read Luganda	0.385**
Past Occupation	0.359**	Sex	0.259*	Sex	0.400**
Occupation	0.374**	English Books	0.267*	Travel to Kampala	0.413**
Read Luganda	0.381**	Read Luganda	0.274*	Past Occupation	0.424**
Read English	0.387**	Speak Bantu Other Than Luganda or Swahili	0.279*	Age	0.431**
Urban Location Scale	0.392**	Number of Languages Spoken	0.293	English Books	0.438**
Owns Radio	0.397**	Speak English	0.300	Luganda Books	0.443**
Sex	0.401**	Urban Location Scale	0.303	Speak English	0.450**
Luganda Newspapers	0.403**	English Newspapers	0.306	Owns Radio	0.452**
Speak Bantu Other Than Luganda or Swahili	0.404**	Speak Swahili	0.309	Years Had Radio	0.458**
Number of Languages Spoken	0.409**	Read English	0.311	Speak Swahili	0.458**
Speak Swahili	0.412**	Years Had Radio	0.312	Read English	0.459**
English Books	0.413*	Owns Radio	0.313	Luganda Newspapers	0.459**
English Newspapers	0.414*	Luganda Books	0.313	English Newspapers	0.460**
		Luganda Newspapers	0.314	Number of Languages Spoken	0.460**
		Occupation	0.314	Speaks Bantu Other Than Luganda or Swahili	0.460**
		Frequency of Travel to Kampala	0.314		

** $p < 0.01$ * $p < 0.05$ $N = 180$

meaning. Nevertheless, the strength of this relationship varied from subgroup to subgroup within the general population sample. Moreover, an analysis of variance demonstrated that the subgroups differ considerably with respect to certain non-cognitive socio-cultural variables such as education, age, the speaking and reading of English, area of residence, and frequency of travel to Kampala. In addition, it was found that education, age, past occupation, sex, area of residence, and reading Luganda are important variables for predicting a person's approximation to the mean triad distance matrices for three of the subgroups.

An Inter-Sample Comparison of Cognitive Variability

The analysis of variability in cognition within the general population sample indicated that this variability was related to a number of variables including education, age, area of residence, and the speaking and reading of English. The five samples described in Chapter II are stratified by several of these variables, and it should be productive to investigate the differences between the rural and peri-urban primary student and general population samples as well as the urban secondary student sample.

In Chapter III differences were noted between the various groups, but these were not extensively discussed at the time. The purpose of this section will be to examine the between-sample variation with respect to all of the instruments used to infer the cognition of color terms in Buganda.

Inter-Sample Differences in Word Associations

In Chapter II we combined the responses of the different samples to the word association and discussed the associative meaning of Luganda color terminology using this combined model. Here we will examine the between-sample differences in response pattern.

The word association test was administered to four distinct samples: (1) Peri-urban general population, (2) Rural general population, (3) Peri-urban Primary Six and Seven students, and (4) Rural Primary Six and Seven students. These data will be analyzed to determine whether or not there are any differences in the response patterns between the four samples.

Table 35

Analysis of Variance of Differences in Word Association Responses Across Four Samples

No.	Response	F
	STIMULUS-BLACK	
1.	White	20.393***
2.	Red	2.283
3.	Color	1.754
4.	Cookpot	0.691
5.	Jet Black	1.437
6.	Its Black	4.339**
7.	Very	4.752**
	STIMULUS-ORANGE	
8.	Green	5.762***
9.	Yellow	1.809
10.	Papaya	1.427
11.	Color	2.154
12.	Mango	3.939**
13.	To Eat	3.561*
14.	Fruit	0.712
15.	Sweet	7.703***
	STIMULUS-RED	
16.	Green	8.048***
17.	Black	1.133
18.	White	2.144
19.	Yellow	1.038
20.	Blood	4.431**
21.	Blood Red	0.174
22.	Pencil	6.018***
23.	Color	2.674*
24.	Very	4.106**
	STIMULUS-BROWN	
25.	Kikusi	1.527
26.	Soil	0.614
27.	Black	0.267
28.	Good	2.449
29.	Color	1.892
	STIMULUS-PURPLE	
30.	Color	3.449*
31.	Blue	3.446*
32.	Green	3.321*
33.	Kobe	3.254*
34.	Cloth	2.580
35.	Red	0.988
	STIMULUS-YELLOW	
36.	Green	1.400
37.	Orange	6.633***
38.	Red	1.783
39.	Sweet Banana	0.755
40.	Blue	0.939
41.	Color	4.094**
42.	To Ripen	3.117*
43.	Cloth	1.403
44.	In Yellow	0.712
	STIMULUS-KIKUSI	
45.	Brown	19.756***
46.	Soil	0.259
47.	Color	2.709*
48.	Lukusi	2.723*
49.	Ant Hill	0.137
50.	Red	0.896
	STIMULUS-GREEN	
51.	Yellow	2.447
52.	Blue	2.205
53.	Red	7.572***
54.	Banana Leaf	1.414
55.	Leaves	3.152*
56.	Color	3.845*
57.	Plants (Bimera)	2.012
	STIMULUS-BLUE	
58.	To Wash	3.365*
59.	Put on Clothes	2.866*
60.	Bbululu	1.059
61.	White	0.858
62.	Color	1.320
	STIMULUS-WHITE	
63.	Black	13.797***
64.	Red	2.351
65.	Papers	2.749*
66.	Clean	1.977
67.	Shirt	1.571
68.	Color	2.965*
69.	Cloth	1.437

*$p < 0.05$

**$p < 0.001$

d.f. 3 204

Table 36

Percent Distribution of Selected Word Association Responses

	Rural Population	Peri-Urban P. Students	Rural P. Students	Peri-Urban Population
Black				
1. White	0.172	0.106	0.647	0.174
6. Its Black	0.125	0.000	0.000	0.108
7. Very	0.000	0.106	0.000	0.022
Orange				
8. Green	0.047	0.000	0.157	0.000
12. Mango	0.031	0.000	0.000	0.109
13. Fruit	0.047	0.149	0.000	0.130
15. Sweet	0.000	0.128	0.000	0.000
Red				
16. Green	0.047	0.021	0.255	0.043
20. Blood	0.125	0.021	0.098	0.260
22. Pencil	0.000	0.128	0.020	0.000
23. Color	0.203	0.255	0.059	0.239
24. Very	0.000	0.106	0.000	0.087
Purple				
30. Color	0.375	0.340	0.196	0.500
31. Blue	0.000	0.085	0.157	0.087
32. Green	0.031	0.000	0.137	0.065
33. Kobe	0.125	0.021	0.000	0.087
Yellow				
37. Orange	0.031	0.021	0.216	0.043
41. Color	0.297	0.170	0.078	0.326
42. To Ripen	0.016	0.021	0.039	0.130
Kikusi				
45. Brown	0.094	0.043	0.510	0.109
47. Color	0.203	0.213	0.078	0.304
48. Lukuusi	0.094	0.000	0.020	0.022
Green				
53. Red	0.016	0.000	0.176	0.022
55. Leaves	0.031	0.170	0.039	0.065
56. Color	0.281	0.170	0.059	0.283
Blue				
58. To Wash	0.156	0.000	0.176	0.196
59. Put on Clothes	0.109	0.000	0.039	0.022
White				
63. Black	0.094	0.043	0.412	0.065
65. Papers	0.016	0.106	0.059	0.000
68. Color	0.250	0.234	0.059	0.261

All responses to a stimulus word which occurred with a frequency of five or greater were coded according to their occurrence for each individual. From this set of responses an analysis of variance was conducted across the groups on responses which occurred: (1) in three or more groups, or (2) in less than three groups but with a frequency of occurrence in one group of at least ten percent. The results of this analysis are presented in Table 35.

Table 35 indicates that thirty of the sixty-nine responses have significantly different response frequencies across the four samples ($p<0.05$ or better). The percent distribution of these thirty variables are listed in Table 36.

Perhaps the most striking feature about Table 36 is that the rural primary student sample differs from the others by its high frequency of contrasting color responses. For example, they made the highest frequency of responses white to black, green to orange and red, green to purple, red to green, and black to white. They also use similar colors as a response more than any other sample (e.g., purple-blue, yellow-orange). The other samples respond with the superordinate category langi (color) to a greater extent, with the population samples, in general, using it more than the primary student samples. Other responses which differ markedly are "its black" as a response to black which occurs only in the two population samples; pencil and papers which occur as responses to red and white respectively, mainly among the two primary student samples; and "very" occurring as a response to both black and red among only the two peri-urban samples.

An analysis of variance was conducted to determine the significance of the differences between the four samples with respect to the sixty-nine variables listed in Table 35 (Rao, 1952: 246-247). The results of this analysis can be found in Table 37.

Table 37

Analysis of Variance of Between-Group Differences on Word Association Responses

	(1)	(2)	(3)	(4)
(1) Rural Population	---			
(2) Peri-urban Population	0.992	---		
(3) Rural Primary Students	2.960**	2.729**	---	
(4) Peri-urban Primary Students	1.924**	1.849**	2.729**	---

d.f. 69 136 **$p < 0.01$

The results of this analysis of variance indicate that the rural primary student sample is the most different among the four samples. The peri-urban primary students are closer to the peri-urban population sample than to any other sample, but it is interesting to note that they are more similar to both population samples than to the rural primary student sample. The differences between the peri-urban and rural population samples with respect to the use of the sixty-nine responses in Table 35 do not reach statistical significance. Nevertheless, when these variables are weighted to account for their interrelationships and Mahalanobis' distances are calculated and analyzed for each case in the two samples they become relatively distinct.

The Mahalanobis' distances of each individual from the sample means were calculated, and individuals were reassigned to the subgroups that they were least distant from in terms of the coefficient. The results of this analysis can be found in Table 38.

Table 38

Reclassification of Cases on the Basis of Mahalanobis' D^2 from Sample Means of Word Association Data

	(1)	(2)	(3)	(4)
(1) Rural Population	49	10	01	04
(2) Peri-urban Population	03	36	02	05
(3) Rural P. Students	01	05	43	02
(4) Peri-urban P. Students	04	04	01	38

This table can be interpreted in the same manner as the similar analysis of the semantic differential above (Table 29). For example, of the sixty-four individuals in the rural population sample, forty-nine were reclassified back into the same sample, ten into the peri-urban sample, one into the rural primary student sample, and four into the peri-urban primary student sample. Overall, 166 of the 208 cases were reassigned back into their original groups on the basis of response patterns to the word association. This is almost six times as many as would be expected by chance alone, and thus clearly indicates that these samples differ with respect to their responses to the word association test.

Inter-Sample Differences in Triad Sort Responses

The analysis of the triadic sort presented in Chapter III is partially based on the analysis of the total population sample and the total primary student sample. Here samples will be separated into their rural and peri-urban components and the between sample differences investigated.

The triad sort was administered to five distinct samples: (1) the secondary student sample, (2) the peri-urban population sample, (3) the rural population sample, (4) the peri-urban primary student sample, and (5) the rural primary student sample. The response patterns of the five samples will now be examined to determine their differences.

First, an analysis of variance was conducted across the five samples on the twenty-one term-to-term distances from the triad sort. The results of this analysis can be found in Table 39.

Table 39 indicates that thirteen of the twenty-one triad-sort-derived distances differ significantly across the five samples ($p<0.05$ or better). The means of the thirteen distances for each sample can be found in Table 40. The larger the entry in Table 40 the closer the two terms are in meaning as determined by the triadic sort.

Table 40 indicates that the two population samples rate the terms for black-red, black-white, and black-yellow closer in meaning than the student samples. With regard to black-blue, however, the students, in general rate them as further apart in meaning than the general population samples do. Red-white receives its most distant rating from the rural primary student sample and its closest from the rural population sample. Red-yellow and red-green are rated most similar by the rural primary student sample and most different by the peri-urban population and rural population samples respectively. Red-brown, white-yellow, and blue-green receive their closest ratings from the secondary student sample and their most different from the rural population, rural primary student, and rural population samples respectively. In addition, white-green and white-brown receive their most distant ratings from the secondary students and their closest from the rural population sample. Finally, yellow-green receives its closest rating from the rural population and its most distant from the peri-urban primary student sample.

An analysis of variance of the differences between the five samples with respect to the twenty-one distance coefficients is presented in Table 41.

Table 39

Analysis of Variance of Differences in Triadic Sort Term to Term Distances Across Five Samples

Variable	F Ratio	Variable	F Ratio	Variable	F Ratio
1. Black-Red	5.121***	8. Red-Yellow	4.595**	15. White-Brown	17.297***
2. Black-White	2.448*	9. Red-Blue	1.965	16. Yellow-Blue	0.267
3. Black-Yellow	7.873***	10. Red-Green	7.696***	17. Yellow-Green	1.641
4. Black-Blue	6.478***	11. Red-Brown	4.606**	18. Yellow-Brown	2.775*
5. Black-Green	2.076	12. White-Yellow	7.698***	19. Blue-Green	14.965***
6. Black-Brown	1.498	13. White-Blue	1.151	20. Blue-Brown	1.415
7. Red-White	5.717***	14. White-Green	5.028***	21. Green-Brown	0.482

d.f. = 4 334 *p < 0.05 **p < 0.01 ***p < 0.001

Table 40

Mean Triad Sort Term-to-Term Distances for Selected Color Terms Across the Five Samples

	Peri-Urban Population	Rural Population	Rural P. Students	Peri-Urban P. Students	Secondary Students
(1) Black-Red	1.763	1.651	1.095	1.033	1.389
(2) Black-White	0.990	1.024	0.635	0.717	0.583
(3) Black-Yellow	1.412	1.422	0.937	0.817	0.444
(4) Black-Blue	2.144	1.747	2.254	2.033	3.167
(7) Red-White	1.031	1.614	0.714	1.333	1.000
(8) Red-Yellow	1.608	1.771	2.429	1.750	2.111
(10) Red-Green	1.598	1.386	2.206	1.767	1.083
(11) Red-Brown	2.330	1.916	2.318	2.483	3.111
(12) White-Yellow	1.866	1.783	1.714	2.517	3.056
(14) White-Green	1.227	1.313	0.762	0.967	0.611
(15) White-Brown	1.082	1.578	0.635	0.600	0.306
(18) Yellow-Green	2.206	2.349	2.254	1.667	1.917
(19) Blue-Green	2.010	1.843	2.952	2.900	3.333

Table 41

Analysis of Variance of Between Sample Differences on Triadic Sort Distances

	(1)	(2)	(3)	(4)
(1) Peri-Urban Population	---			
(2) Rural Population	1.548	---		
(3) Rural P. Students	3.555**	5.390**	---	
(4) Peri-Urban P. Students	2.745**	4.549**	1.730*	---
(5) Secondary Students	4.758**	6.458**	3.731**	2.887**

d.f. 21 314 *p < 0.05 **p < 0.01

Table 41, once again, indicates that the two population samples are not significantly different from each other. All other dyads are significantly different, however, with the rural population and the secondary students being the most distinctly different samples with respect to their response patterns on the triad sort.

The Mahalanobis' distances of each individual from each of the group means was calculated, and individuals were reassigned to the samples with which they had the smallest distance coefficient. The results of this analysis can be found in Table 42.

Table 42

Reclassification of Cases on the Basis of Mahalanobis' D^2 from Sample Means of Triadic Sort Distances

	Number of cases classified into group				
	(1)	(2)	(3)	(4)	(5)
(1) Peri-urban Population	41	23	08	13	12
(2) Rural Population	19	47	04	08	05
(3) Rural P. Students	05	04	37	11	06
(4) Peri-urban Students	08	08	11	26	07
(5) Secondary Students	02	00	05	03	26

Table 42 is interpreted the same as Table 38 above. Of the five samples, the secondary student sample had the greatest number of cases reclassified back into the original sample and the peri-urban primary student sample the least. Overall, we find that 177 of the 339 cases were reclassified back into their original groups. This is almost three times as many as we would expect by chance alone and thus provides rather convincing evidence that there are patterned differences between these five samples with respect to their responses to the triadic sort instrument.

Inter-Sample Differences in the Semantic Differential

The semantic differential data will also be analyzed to determine if there are any differences between the five samples in connotative meaning. As a first step in the analysis, an analysis of variance of the differences between responses to the seven color terms on the eleven adjectival scales across the five samples was conducted. The results of this analysis can be found in Table 43.

Table 43 indicates that forty-eight of the seventy-seven responses differ significantly between the five samples. Overall, the response to the color terms for black and white manifest the most significant differences across the five samples on the semantic differential, while the terms for yellow, green and red manifest the least. Table 44 includes the mean values of the most significant scales for each color ($p<0.001$).

With respect to red, the peri-urban primary students give it the most pleasant rating while the secondary students judge it the strongest and heaviest. In contrast, the rural primary students give red its least pleasant and its weakest and lightest ratings. Black is rated overall least pleasant, beautiful, clean, and good smelling by the secondary student sample. It is interesting to observe that both the peri-urban student and population samples judge black less pleasant, beautiful, clean, and good smelling than the rural samples. They, as well as the secondary students, also judge black to be bigger, slower, and heavier than the rural samples do. White, moreover, is judged to be more exciting, less pleasant, stronger, and bigger by the rural samples than by the peri-urban or secondary samples. Green is rated densest by peri-urban primary students and least dense by the rural primary students. Brown is judged least beautiful, clean, and good smelling by the secondary student sample while the rural primary student and population samples judge brown more positively on these scales than their

Table 43

Analysis of Variance of Differences in Semantic Differential Scale Values Across Five Samples

	Red	Black	Yellow	White	Green	Blue	Brown
Exciting	1.530	4.436**	3.596**	12.686***	0.938	3.442**	1.863
Pleasing	4.913***	18.967***	2.029	5.932***	2.436*	4.112**	3.612**
Strong	5.590***	3.760**	1.426	10.083***	1.047	3.389**	4.012**
Beautiful	2.053	18.494***	1.355	4.927***	2.374	4.341**	11.220***
Fast	2.601*	5.077***	2.126	14.569***	1.734	4.250**	2.189
Big	2.416*	5.138***	3.732**	12.539***	2.264	3.120*	4.655**
Clean	1.941	14.447***	1.872	0.804	3.800**	2.372	7.712***
Bright	1.584	4.221***	1.834	4.795***	0.923	1.744	3.606**
Heavy	16.201***	6.882***	0.760	1.620	4.282**	3.649**	4.251**
Dense	1.702	3.716**	3.688**	8.124***	5.123***	0.849	1.645
Smell Good	0.343	8.224***	0.167	2.494*	1.508	2.711*	5.143***

d.f. 4 334 *$p < 0.05$ **$p < 0.01$ ***$p < 0.001$

Table 44

Mean Values of Semantic Differential Scales for Selected Color Terms

Color	Scale	Peri-Urban Population	Rural Population	Rural Primary Students	Peri-Urban Primary Students	Secondary Students
Red	Pleasant-Unpleasant	3.21	2.65	3.89	2.45	3.25
Red	Strong-Weak	2.08	2.12	2.87	1.85	1.75
Red	Heavy-Light	2.72	3.14	4.84	3.02	2.53
Black	Pleasant-Unpleasant	3.97	2.98	5.11	5.33	5.47
Black	Beautiful-Ugly	3.68	2.52	4.14	4.57	4.97
Black	Slow-Fast	4.45	4.90	4.46	4.17	3.17
Black	Small-Big	5.27	4.95	4.13	4.43	5.14
Black	Clean-Dirty	4.25	2.88	4.02	4.78	5.25
Black	Bright-Dull	4.84	4.33	5.38	4.93	5.72
Black	Heavy-Light	2.57	2.72	3.81	2.88	2.06
Black	Smell bad-good	3.98	4.72	4.10	3.47	3.00
White	Dull-Exciting	6.11	6.59	4.89	4.55	5.61
White	Pleasant-Unpleasant	1.52	1.54	1.92	1.85	2.75
White	Strong-Weak	2.14	2.00	3.22	3.42	3.47
White	Beautiful-Ugly	1.59	1.48	2.14	2.08	2.14
White	Slow-Fast	5.95	6.11	4.41	4.68	4.67
White	Small-Big	5.35	5.67	4.13	4.05	4.19
White	Bright-Dull	1.43	1.31	2.03	1.30	1.36
White	Dense-Thin	4.16	3.10	4.17	3.93	5.72
Green	Dense-Thin	3.11	3.08	3.19	2.05	3.00
Brown	Beautiful-Ugly	3.63	2.83	3.75	4.17	4.89
Brown	Clean-Dirty	4.26	3.49	3.87	4.53	5.31
Brown	Smell bad-good	4.14	4.80	4.17	4.02	3.31

peri-urban counterparts. This is understandable when we consider that people from rural areas are more favorably disposed to farming as a way of life. Farming is dependent upon the soil and the term for brown is derived from the term for soil, thus brown is rated in what appears to be a more favorable manner.

An analysis of variance was next performed in order to determine the degree of difference between the five samples in terms of the seventy-seven semantic differential variables. The results of this analysis can be found in Table 45.

Table 45

Analysis of Variance of Between Sample Differences on the Semantic Differential

	(1)	(2)	(3)	(4)
(1) Peri-urban Population	---			
(2) Rural Population	1.412*	---		
(3) Rural P. Students	3.006**	2.833**	---	
(4) Peri-urban P. Students	2.700**	3.300**	2.157**	---
(5) Secondary Students	1.653**	2.427**	2.514**	2.060**

d.f. 77 258 *p < 0.05 **p < 0.01

Table 45 indicates that each group is significantly different from each other group. The two maximally different groups are the rural population and the peri-urban primary student samples. The most similar, once again, are the two general population samples.

The Mahalanobis' distance of each individual from each of the sample means was calculated, and individuals were reassigned to the sample from which they manifested the least distance. The reassignment matrix is presented in Table 46.

Table 46

Reclassification of Cases on the Basis of Mahalanobis' D^2 from Sample Means of Semantic Differential Scale Values

	Number of cases classified into group				
	(1)	(2)	(3)	(4)	(5)
(1) Peri-urban Population	64	16	06	03	08
(2) Rural Population	14	63	02	02	02
(3) Rural P. Students	06	02	49	05	01
(4) Peri-urban P. Students	02	03	06	45	04
(5) Secondary Students	03	01	01	01	30

Table 46 indicates that 251 of the 339 cases were classified back into their original groups. This is almost four times as many as we would expect by chance alone, and, once again, provides rather strong evidence that there is intracultural variation in the cognition of color terms among the Baganda.

Inter-Sample Differences in Order of Recall

The order-in-recall data was obtained from part of the peri-urban and rural primary student samples. In Chapter III we combined these samples for our analysis, but here we will analyze each sample separately in order to determine if there are any significant differences between them.

As we noted in Chapter II, the respondents were asked to list as many color terms as they could remember. If they possess an equivalent repertory of equally salient terms we would expect that the samples would list a nearly equivalent number of terms. The mean number of terms recalled by the peri-urban primary student sample was 9.280, with a maximum of twelve, a minimum of two, and a standard deviation of 1.84 (N=50). The rural primary student sample listed a mean of 10.384 terms, with a maximum of eighteen, a minimum of seven, and standard deviation of 2.12 (N=52). A difference of means test calculated for these two values indicates that the difference between the two samples is statistically significant ($t=2.777$, $p<0.01$).

The primary students from the rural area thus recalled significantly more color terms than did their peri-urban counterparts. On the basis of our discussion in Chapter III, we would expect that the greater diversity of the use of color in the urban area would lead to a larger repertory of color terms for those with greater exposure to the urban setting. These results however, indicate the opposite. Nevertheless, we propose that these results can be explained by the fact that in the rural, more agriculturally-involved areas, relatively fine distinctions in the colors of soils and plants may be crucial in agricultural success; thus the lexical domain of color would be expected to be more elaborate, complex and salient. In addition, many of the terms are derived from natural objects which are more salient to the more rural populations.

Next, the mean order of appearance of the thirteen most frequently recalled terms was calculated. A difference of means test was calculated between these values for each color. The results of this analysis can be found in Table 47 along with the frequencies of recall for each samples.

Table 47 indicates that only two of the differences in mean order of appearance are statistically significant. These are the mean ranks for orange (kipapaali) and pink. The difference in mean order of appearance between the two samples for blood-red could not be calculated because only one person in the peri-urban primary student sample listed this color. Nevertheless, there is obviously a significant difference in the recall of the term blood-red. The general similarity between the two samples is, however, clearly demonstrated in Figures 30 and 31.

In sum, there are several significant differences between the samples with regard to the mean rank of order of recall of color terms in the listing task. The difference in mean number of terms listed is statistically significant and indicates that the rural sample has a more detailed repertory of color terms. Once again we have distinguished between samples on the basis of response patterns to a test instrument concerning color terms.

Summary

The major objectives of this chapter were first to determine if there is intracultural variation with regard to cognition of color terms among the Baganda, and second, to investigate the relationship between this cognitive variation and other socio-cultural variables.

Table 47

Analysis of Differences Between a Rural and a Peri-Urban Primary Student Sample in Mean Order of Recall of Color Terms

	Rural Primary Students		Peri-Urban Primary Students		
	Mean Rank	Frequency	Mean Rank	Frequency	t
Green	3.216	51	2.653	49	1.224
Yellow	3.577	52	3.388	49	0.508
Red	4.255	51	4.021	47	0.460
Blue	5.000	50	4.600	40	0.611
White	5.021	47	5.524	42	0.735
Purple	5.111	45	6.022	44	1.655
Brown	5.188	48	6.000	42	1.695
Black	6.467	45	6.818	44	0.629
Kikusi	7.864	22	7.600	15	0.346
Orange (Kipapaali)	8.290	31	5.786	42	4.847**
Orange (Muchungwa)	8.500	22	7.250	20	1.693
Blood Red	9.667	15	---	01	---
Pink	10.000	24	7.773	22	2.894*
	N=52		N=50		

*p < 0.01

**p < 0.001

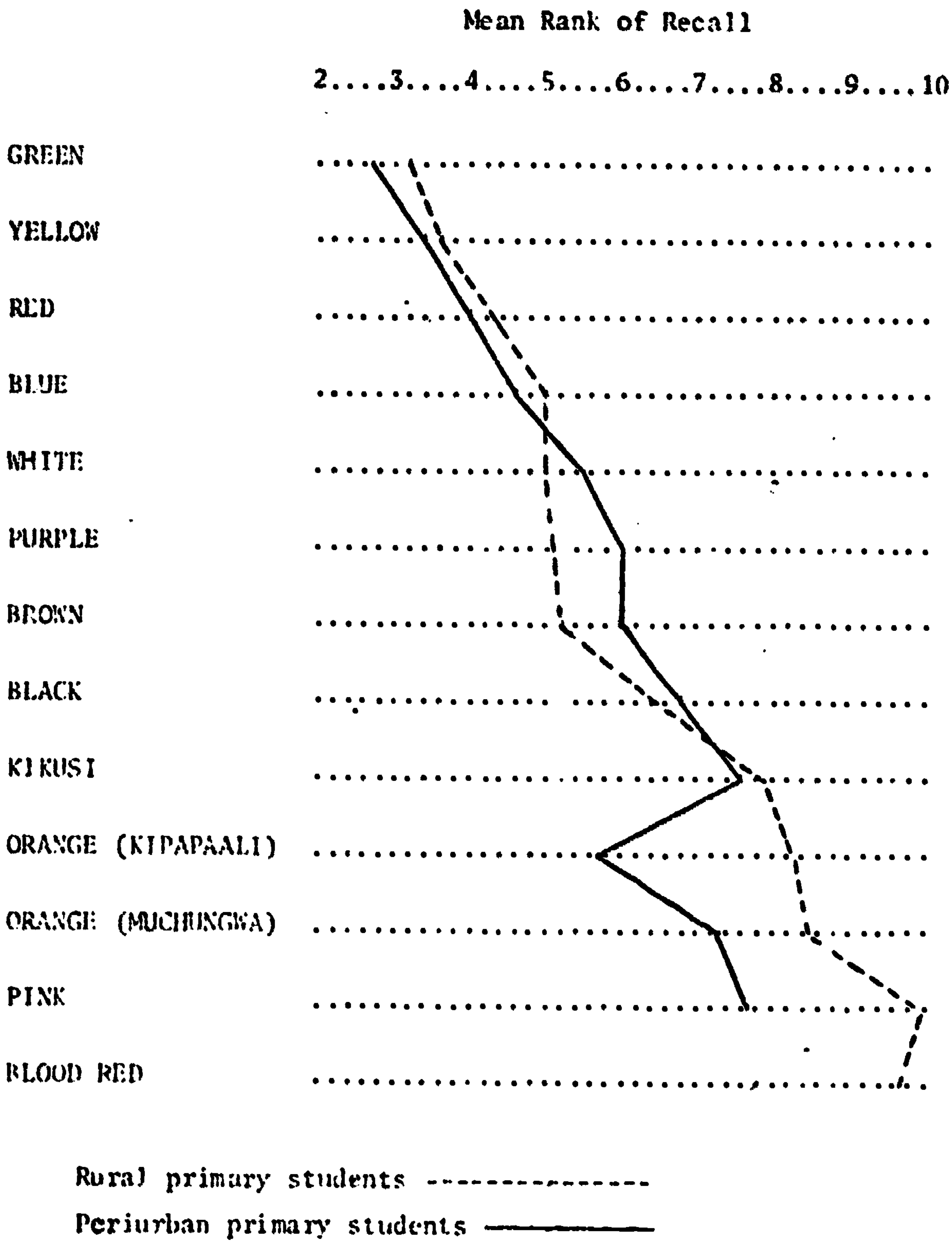

Fig. 30.--Mean order of recall of color terms

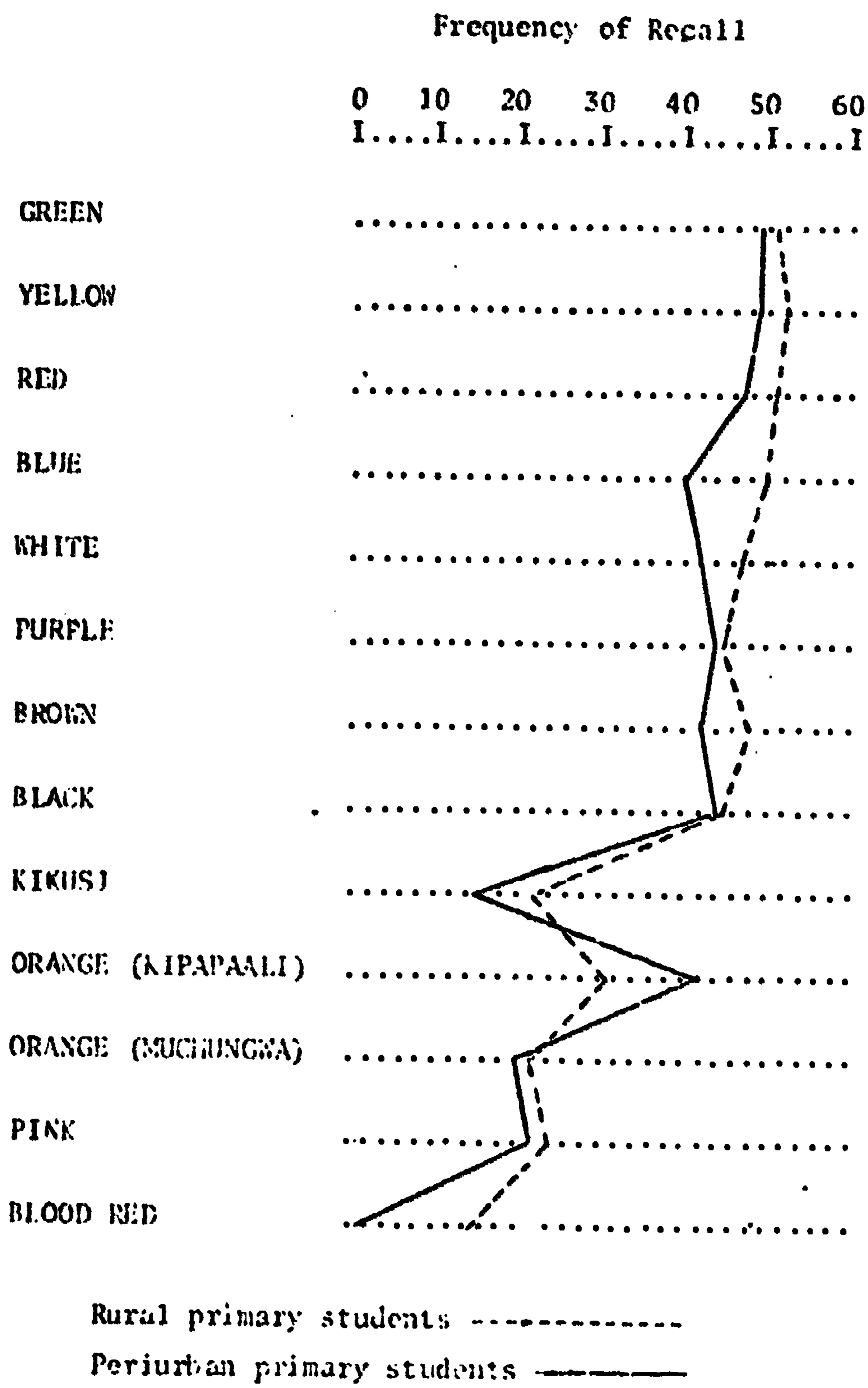

Fig. 31.--Frequency of recall of color terms

In the first section of this chapter we segregated the general population sample into relatively homogeneous subgroups on the basis of response patterns to the triadic sort and constructed multidimensional models which represented the mean color term-to-term distances for each group. Assuming that the results of the triadic sort define the most comprehensive meaning space, the between group variability in the resultant models represents extensive intracultural differences in the overall semantic structure of Luganda color term space. The differences in the configurations were wide ranging. For example, Group G has a configuration which is rougly similar to that arrived at by Fillenbaum and Rapoport (1971) using different techniques, more color terms, and a U. S. college samples. This model manifests a clear brightness dimension and the other colors are distributed in a near approximation to the color circle. In contrast to this model is the one for Group H, which has no clearly defined brightness dimension and does not even vaguely approximate the color circle. The other models lie somewhere between these two in terms of ease of interpretation. These groups are thus clearly different in terms of response patterns to the triadic sort.

Semantic differential data were also available for these groups, and the analysis of these data demonstrates that they can also be differentiated on the basis of connotative meaning. This led to an investigation of the relationship between the triad sort distances and distance in terms of connotative meaning from the semantic differential test. Here we found that although there is an overall relationship between these two distances, there are significant differences between the subgroups of the population sample with respect to the strength of this relationship. This led to the conclusion that there are systematically patterned differences between the subgroups of the general population sample with respect to the cognition of color terms.

These subgroups were next compared on the basis of their socio-cultural characteristics, and it was found that they differ significantly with respect to age, education, speaking and reading of English, area of residence, and frequency of travel to Kampala. Group G, whose triad model approximated that of the U. S. college sample reported by Fillenbaum and Rapoport (1971), is the youngest, most highly educated group with the greatest number of English speakers and readers, and the highest frequency of peri-urban residence and travel to Kampala. These two groups thus seem to represent polar extremes on what could be considered an exposure to modernization continuum. In fact, earlier investigations in Buganda have indicated that education, the speaking of English and visiting Kampala are strongly related to modernization (Robbins and Pollnac, 1969, Pollnac and Robbins, 1972). Thus, the variability in the cognition of color terms in Buganda is related to other socio-cultural variables.

We also investigated the between-sample differences with regard to all the instruments used, and found that, overall, the variation is quite significant.

In sum, the convergence of evidence from the multiple methods applied in this investigation provides strong evidence that there is intracultural variation with respect to the cognition of color terms in Buganda, and that this variation can be predictably related to other socio-cultural variables.

CHAPTER V

SUMMARY, CONCLUSIONS, AND SUGGESTIONS FOR FURTHER RESEARCH

Summary of the Research

In Chapter I we argued that much of the work in cognitive anthropology cannot be considered representative of the cultures within which it was conducted unless the assumption of cultural homogeneity is made. The problems associated with this assumption have a lengthy history in anthropological theory. We briefly reviewed some of the important arguments surrounding this assumption, and noted that even certain contemporary anthropologists advocate viewing culture as an undifferentiated whole. Some anthropologists however, have been concerned with the representativeness of the statements they make concerning cognition in other cultures and have begun using quantitative procedures. Others, equally concerned, have argued that the most parsimonious, formally elegant description is necessarily psychologically real to the people they are describing and have concentrated their efforts on developing more complex formal evaluation criteria. It was argued here, however, that more sophisticated evaluation criteria are no substitute for validation of the solutions by the intuitions of native speakers. The plural form of "speaker" is intentional and indicates support of those investigators who use quantitative methods in their investigations. It was indicated, nevertheless, that the majority of these investigations have not adequately accounted for the cognitive diversity in the data. This was attributed to the reliance on measures of central tendency to describe the data or to the formation of *a priori* groups with mere discussion of their differences. We argued that a superior strategy would be to first segregate the sample into subgroups on the basis of similarity in cognitive patterns and then construct separate models for each subgroup.

It was next discussed what instruments could be used to infer cognitive patterns. We selected the domain of color terminology as an example because of its basic position as a part of the language of experience, and because of the long and sustained history of interest in color vocabulary and perception in anthropology, psychology, and linguistics. A brief review of this literature led us to conclude that even in this domain, certain experiential factors may lead to a fair degree of cognitive variability.

Chapter II consisted of a brief description of the Baganda and the research samples among whom the research was conducted. It should be stressed that the Baganda have been extensively described beginning with the reports of earliest explorers in the nineteenth century up through the ethnography by Roscoe (1911) to the present day. This documentation, plus the extensive traditional histories (e.g., Kagawa, 1953) and our previous research provides a contextual base which we have used to interpret the results of this study.

The discussion of the Baganda indicated that, although committed to modernization, they still maintain a strong sense of their separate cultural identity. They have, in general, eagerly accepted Western education, religions, and technology, but there is a large degree of variation with respect to the distribution and acceptance of these attributes throughout Buganda. The analysis of selected sociocultural characteristics of the various samples clearly indicated a wide degree of variation which we noted made this an ideal population for a study of the relationship between the various sociocultural experiential factors and cognitive variability. In the remainder of Chapter II the research instruments and their administration were discussed.

In Chapter III a general description of the color terminology of the Baganda was provided. In the first part, the distribution of color in the Kiganda environment was described. We observed that the environment is a colorful one, but not uniformly so. The lack of exterior decoration on houses, the limited range of polychrome merchandise and advertisements in the rural area was found to contrast vividly with the brightly decorated city with its wide range of multicolored material artifacts. On the other hand, there is also a great variety of naturally occurring colors in the rural area which are absent in the city.

In the next section of the chapter we used the results of a listing task to provide the data for a description of Luganda color terminology. The mean rank order of the terms was used as a guide in estimating the relative salience of the individual terms. This was used in selecting the subsets of terms for further analysis with the other techniques.

Thirty terms derived from the listing task and two others discovered as a result of a word-association test were described in terms of their reference and derivation. It was noted that intensive work with several informants prior to conducting the listing task and word association test had failed to produce as extensive a list of terms.

We next examined the associative meaning of a set of ten color terms. The most frequent responses were listed and discussed, and an analysis of the associative overlap of the terms was conducted. A large proportion of the responses were from within the set of stimuli; thus the overlap of these terms was first examined. Here we found that both perceptual similarity and contrast contributed considerably to the associative overlap of the terms. When all of the responses were used in the analysis of the ten color terms, it was noted that there was a great deal of associative overlap. Once again, however, we found that the structure of the associative meaning space could, for the most part, be attributed to perceptual similarity or contrast although factors such as affective meaning (good, bad, etc.) and objects commonly associated with the color entered into its definition.

In the analysis of the data from the triad sort, we found that the City Block metric resulted in the best multidimensional solutions. This led us to infer that separate components of the meaning of color terms were analyzed individually and then combined in making the decisions as to which term was the most different in a triad. These analyses, however, were based on mean distance matrices of the total general population, total primary student, and the secondary student samples. We found in Chapter IV that when the general population sample was segregated into relatively homogeneous subsamples on the basis of response patterns to the triad sort, the Euclidean metric provided the best fit; thus indicating that, for the subgroups, the overall term-to-term distance was judged directly and not in terms of separate components of meaning.

The analyses of the mean distance matrices for the samples resulted in three-dimensional configurations which had distinct brightness dimensions with black or brown at one extreme and white, or white and yellow, at the other. The other terms were distributed around this brightness axis in an array quite similar to that of the color circle. Thus the configurations of the color term spaces for the three samples approximated that of the color solid (Nickerson and Newhall, 1943).

The analysis of the data derived from the administration of a semantic differential resulted in a connotative meaning-space which manifested an evaluative axis which was strongly related to the brightness axis discovered above. In addition, the two scales on the semantic differential, which were denotative with respect to color (brightness and density), received relatively high loadings on the evaluative factor in the facot analyses of the semantic differential data for each of the three major samples. Wright and Rainwater (1962), in discussing the relationship between color connotation and color perception, point out that the results of their research indicate that quite a bit of the variation in average color connotations can be accounted for by a linear function of hue, saturation, and brightness using the Munsell units. They found that, overall, hue accounts for the least amount of variation. The importance of brightness with regard to the change of affective values was also noted by Kansaku (1963). These findings with respect to the connotative meaning of color itself are in agreement with ours concerning color terms in Luganda.

In Chapter III, we noted that, overall, the negative evaluation of black and brown and the positive evaluation of white have been rather consistent findings in cross-cultural research. We also discussed the finding that the general population sample (the older, more traditional sample) evaluate white as strongest and largest. This we indicated could be explained by the fact that white was traditionally (pre-European period) considered to be the color of superhuman powers. As further support for this difference in the evaluation of white, in Chapter IV we found that the rural samples (the more traditional) judged white to be stronger and larger than either of the peri-urban samples or the secondary student sample.

One interesting configuration that turned up in the analysis of the connotative meaning of color terms in Luganda was the high position of red, white, and black on the potency dimension for the general population sample. This segregation of black, white, and red also occurred in the analysis of the total intersection coefficients of the word-association data. There red, white, and black loaded highest on the first factor. In addition to these configurations, we found in Chapter IV that the least modernized subgroup of the population sample manifested a two-dimensional configuration of color terms derived from the triad sort data which, once again, segregated red, white, and black from the other color terms. In this instance, however, red and white were very close and black was relatively isolated, but closer to red and white than to any of the other color terms. In addition, a cluster analysis of the semantic differential data for this same group produced a cluster which contained these same three color terms, thus indicating commonality in connotative meaning for them as well.

Victor Turner (1967), an anthropologist, has presented data which may aid in the interpretation of these configurations. He has observed that red, white, and black are widely associated in African initiation and life-crises rites. He mentions that:

> . . . white seems to be dominant and unitary, red ambivalent, for it is both fecund and "dangerous," while black is, as it were, the silent partner, the "shadowy third," in a sense opposed to both white and red, since it represents "death," "sterility," and "impurity." (p. 68)

He also writes that among the Ndembu red is regularly paired with white in action contexts, although in abstraction from real situations, red appears to share qualities of both black and white. Further, he cites archeological evidence concerning the importance of this trio of colors in ritual contexts in Africa as well as other areas.

Turner's discussion of red, white, and black is thus useful as an aid in interpreting the color term space configurations of the more traditional groups in our samples. In addition, as was noted above, they are the only basic color terms in Luganda, and Roscoe (1911) noted that they were the only ones the Baganda possessed for many years. It has also been reported (e.g., Roscoe, 1911; Trowell and Wachsmann, 1953; Lugira, 1970) that traditional Kiganda ritual objects were painted with these three colors (e.g., the sacred pipes) or some subset of them (e.g., the central ring for the traditional round house). Further, Berlin and Kay's (1969) extensive review of color terminologies around the world indicated that if a society used three basic color terms, they would be red, white, and black. The results of their study also permitted them to posit an evolutionary sequence for the acquisition of color terms. The first three terms acquired, according to their data, are red, white, and black. We may thus speculate that the segregation of these three color terms by the more traditional groups is related to the basic role these colors played in traditional Kiganda sociocultural life.

In the final section of Chapter III we analyzed the results of the listing task. The structure revealed by this analysis indicated that both perceptual contrast and perceptual similarity seemed to be the components of meaning used in generating color terms in the listing task. These same components were noted to be important in the structure of color term associative meaning.

The objective of Chapter IV was to determine the range, extent, and sociocultural correlates of intracultural variation in the cognition of color terms among the Baganda. In the first section of this chapter the general population sample was segregated into eight relatively homgeneous subgroups on the basis of response patterns to the triad sort. Mean models were constructed to represent the color term-to-term distances for each group, and striking differences between them were discovered. One group, the youngest with the greatest exposure to modernization, was found to have a mean model which manifested a brightness dimension as well as a configuration that closely approximated the color circle. In contrast to this configuration, the subgroup with the least exposure to modernization manifested a mean model which had no brightness dimension and could not be interpreted in terms of the color circle. The color term space configuration of this group, however, could be interpreted in terms of the traditionally basic position of the color terms red, white, and black as was noted above.

An analysis of variance indicated that differences between all eight cognitively defined subgroups in education, reading and speaking English, area of residence, and age are statistically significant. Further, a multiple-regression analysis demonstrated that education, age, previous occupation, sex, area of residence, and reading Luganda are related to the degree of approximation to the mean triad sort distance matrices of the modal and the two maximally divergent cognitive groups. In addition, it was determined that these eight cognitive groups also differed in the connotative meaning they ascribe to color terms. Term-to-term distances in connotative meaning space were found to be significantly related to the term-to-term distances derived from the triadic sort. Moreover, there was considerable difference between group variation with respect to the strength of this relationship even when corrected for sample size. This led to the conclusion that there are systematically patterened differences between the subgroups of the general population sample with respect to the cognition of color terms as determined by two different procedures that can be related to other sociocultural variables.

In the second section of Chapter IV we examined the differences between the samples with respect to all the instruments used. We first found that there were systematic differences between the samples in their responses to the word association test. The rural primary students were differentiated from the others by their high frequency of contrasting color responses (e.g., black-white, red-green, orange-green). They also used perceptually similar colors as responses more than any other sample. The other samples responded with the superordinate category "color" (langi) to a greater extent, with the general population samples using it more than the primary student samples. The differences in response patterns between all possible pairs of samples except the peri-urban and rural general population samples were found to be statistically significant.

The analysis of the triad sort data also turned up between-sample differences. Thirteen of the twenty-one triad-sort-derived distances varied significantly across the five samples. The differences between all possible pairs of samples except the peri-urban and rural general population samples were, once again, statistically significant.

The analysis of the semantic differential data indicated that 48 of the 77 responses varied significantly between the five samples, with the responses to the terms for black and white varying the most across the samples. The differences between all possible pairs of the five samples on the semantic differential were statistically significant.

The order of recall of color term data was only collected from the two primary student samples. Here we found that the rural primary students listed a significantly greater number of color terms than their peri-urban counterparts. This was attributed to the fact that in rural areas relatively fine distinctions in the colors of soils and plants may be crucial in agricultural success. The necessity for such distinctions generally leads to an elaboration of the lexicon for the domain concerned. We also pointed out that many of the color terms are derived from natural objects which are more salient for the rural populations.

Thirteen of the most frequently recalled color terms were examined to determine if their order of appearance differed significantly across the two samples. The terms for orange (kipapaali) and pink (pinka) were found to have a significantly different order of appearance. In addition, the term for blood-red appeared fifteen times in the rural sample and only once in the peri-urban sample. This was also a significant difference.

The evidence for intracultural variation with regard to the cognition of color terms, which was presented in Chapter IV, is quite compelling. Multiple techniques which permitted us to infer aspects of denotative, associative, and connotative meaning were used, and they all clearly indicated that there is quite a bit of intracultural variation with regard to the cognition of color terms among the Baganda which can be related to other sociocultural variables. The convergence of evidence from such a wide array of techniques provides a considerable degree of convergent validity for this claim and provides us with considerable confidence in our results.

Significance of the Research

We will not inquire into the significance of these findings. The results presented here have indicated that there is intracultural variation in the cognitive behavior associated with color terms in Buganda. Moreover, it is evident that this variability is associated with other sociocultural variables which are central to the modernization process, (e.g., education). These findings are significant because they provide additional evidence which comprises the long and continuous tradition in anthropology of viewing a culture as an undifferentiated whole. The methodological implications of these findings are also clear. We can no longer accept unequivocally descriptions in cognitive anthropology based on information derived from a single informant or from unspecified data sources. As argued here, cognitive anthropology will have to become concerned with quantitative data collection, sampling, and analytical procedures. Further, we have demonstrated that measures of central tendency must be interpreted with caution, especially when working with a heterogeneous sample composed of relatively homogeneous subsamples.

Perhaps more significant than this, however, are the practical implications of these findings. Studies, such as the one presented here, which deal with the structure of the meaning of symbols have unquestioned significance for all endeavors in which symbols are used in the communication act. A simplified communication situation consists of a message source and a receiver. The source encodes content into a transmittable linguistic form that is decoded by the receiver (Krippendorff, 1969). The source and/or receiver may be an individual or some group of individuals. The actual act of encoding and decoding, however, is commonly engaged in by individuals. Thus an analysis of the effectiveness of most communication situations (e.g., education, public information, etc.) must involve knowledge of the intent of the source (the intended content) and the understanding of the receiver (the perceived content of the message). This involves the acts of encoding and decoding, two procedures which involve the use of a code. A code presupposes a symbolic equivalence relationship between the symbol and the referent. It is well known, however, that there are symbols which have multiple denotata. Nevertheless, the intended denotata for a given symbol in a specific communication situation is commonly contextually determined. It thus seems that if the code is known, including the contextually determined interpretation of specific elements of the code, for both the source and the receiver, we will be able to determine both the intended and the perceived content of the message. It is important that the code for both the source and the receiver be determined because we cannot assume that they possess and operate with equivalent codes despite the fact that they use the same symbols.

Deese (1965) has written that common meaning in communication is largely determined by the existence of commonality of associative structures in those involved in the communication act (45). Triandis (1964) has noted that differences in responses to triad sorts can be considered as reflecting different categories of thought about concepts, and that subjects employing divergent sets of categories experience difficulties in communicating with one another.

Here we have found that, in fact, there is intracultural variation in the cognition of color terms in Buganda, as determined by several psycholinguistic instruments including the word association and triadic sort. We have related this variation to other sociocultural variables. We thus have the potential of predicting the existence of situations wherein there will be various degrees of inaccurate (or accurate) communications.

The importance of being able to predict problems in communication is immense in fields such as education and public information. In this study variation was found in the basic area of color terminology. In a previous study among the Baganda, variation was also found in the complex domain of food-plant terms (Pollnac, 1972). Thus, cognitive variability, which was systematically related to other sociocultural variables, has been clearly demonstrated in two domains which span a wide range of complexity. We thus argue that this study, in addition to the food-plant term study, indicates that individuals who participate in important communication situations such as education, public administration, agricultural development agents, etc., must insure that the codes they use are equivalent to those of the receivers (the students, the public, farmers, etc.). Only such an equivalence of codes will result in effective communication within and between the various sectors of the population.

Suggestions for Further Research

The most obvious area for further research is to determine the extent to which cognitive variation affects the communication of messages in a situation where the senders and receivers manifest varying degrees of differences with respect to a given domain. Here the sociocultural predictors of cognitive variability from the present research could be used to stratify the samples and thus increase our chances of setting up situations wherein there is a wide range of variation with respect to cognition. The various samples would, of course, be tested on the domain of interest with instruments similar to those used here to determine if, in fact, they manifest differential cognition. Communication dyads would then be constructed (e.g., between teacher and student, agriculture agent and farmer, etc.) and the degree of communication would be assessed and related to the degree of difference in cognitive structure as determined by various test instruments. We would expect an inverse relationship between the amount of information communicated and the degree of cognitive divergence between the sender and receiver. The significance of this type of research for national development is of course profound. Here we would determine if, in fact, our predictors do delineate situations of information exchange wherein communication is faulty. The description of such situations would indicate areas where remedial measures should be taken, and would, in the long run, facilitate education and public information.

A second line of research would be to investigate the relationship between cognitive variability in the native language and problems in learning and using a second language. Here the research design would necessarily be dischronic since the results of this study, and others, have indicated that second language learning is associated with changes in cognition with respect to the first language. Monolingual Baganda, for example, who are about to begin learning English could be tested on a wide range of carefully selected educationally relevant domains in order to determine their individual conceptualization of the domain. The structures of these individual conceptualizations would then be investigated through time, along with ascertaining the subject's facility with English. Variables such as attitudes toward the English language, its speakers, and its perceived usefulness would also be examined. In addition to providing predictors of success in learning English, this investigation would indicate the areas wherein the discriminations made in Luganda by certain subgroups of individuals inhibit the learning of English. There is no reason why concentrated efforts cannot change the structure of the cognition of the domain in question and therefore facilitate the acquisition of English.

In addition to these rather obvious practical benefits, it is also theoretically promising. As described above, bilingualism is related to differences in cognition.

It would be extremely valuable to follow the direction and extent of the changes in cognition that occur as an individual becomes relatively more fluent in a second language. The research design sketched above would permit us to do this, and the proposed research area, Uganda, is ideal for such a study because of the high proportion of bilinguals there.

A third line of research, and one which could be built into the previous design, would be to investigate the effects of English teachers who, themselves, manifest differential cognitive structures. In the previous design we would have controlled for teacher variability. In this design, however, we would purposefully maximize the cognitive differences between the teachers. We would then investigate, diachronically, the student's progress while controlling for the variability in cognition among the student sample. The results of this research design would be a valuable supplement to the previous one.

A fourth, potentially fruitful line of research would investigate the effects that between-language differences in cognition have on the learning of English. Once again, Uganda is an ideal research site for such an investigation. Numerous languages are spoken in Uganda--many representing markedly different language families. Domains would be selected which are maximally divergent, with respect to their semantic structure, across all languages involved. The structure of these domains in each language would then be described along with a description of the range of cognitive variability within each of the research samples. These inter- and intracultural differences in conceptualization would then be related to problems in the learning of English. It would also be important here to examine teacher variability and student attitudes toward the target languages.

We also need to discern, in a specific manner, the nature of the interaction between so-called cognitive and non-cognitive sociocultural variables. That is, for example, what are the specific components of the educational process that result in its relatively strong relationship with cognitive variation. Triandis, Malpass, and Davidson (1972) in a recent discussion of a large number of studies in cross cultural psychology have concluded that:

> . . . we have not made enough progress in our description of the independent variables--ecology, environments, etc.--that determine the phenomena of interest. For example, one finds repeatedly the statement that the respondent's level of education is a major determinant of his responses to perceptual, cognitive, or attitudinal tasks.

> Yet in most studies there is no further analysis of the meaning of the educational variable. What exactly mediates between education and the other phenomena? It is literacy, participation in institutional environments, the manipulation of symbols, conformity to a life style requiring attention to time, getting rewarded for what you do rather than for who you are, being able to communicate with people you do not see and to receive communications from the outside world, or some other variable that mediates between education and cognitive development? (p. 66)

The four research designs proposed above are all potentially valuable in a developing country that uses a second language as the vehicle of education. Any study which delineates potential problem areas in the learning of this second language also indicates potential barriers in a student's educational progress. Any factor which impedes education also impedes development of a nation.

In sum, we have discerned a great deal of cognitive variation among the Baganda and have related this variation to other sociocultural variables. The significance of these findings with regard to various communication situations (e.g., education, public information) was noted, and areas for further research were indicated which would result in findings that could be used to facilitate the communication process within the research population.

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APPENDIX I

ASSOCIATIVE MEANING DICTIONARY

The entries in this dictionary include English translations of all of the Luganda responses given to ten Luganda color terms on the Word Association Test by 208 Baganda. The figure following each response refers to the number of individuals giving that response.

1. Black: White 57; Color 33; Black 13; Red 9; Jet Black 8; Hair 6; Very 6; Cook Pot 5; Pencil 5; Soot 5; Dense 4; Auto 3; Cloth 3; Darkness 3; Dirty 3; Dog 3; Goat 3; Green 3; Blue 2; Board 2; Millipied 2; Shoes 2; Very Black (Kagongolo) 2; Animal (nsolo) 1; Bad 1; Belt 1; Black Person 1; Brown 1; Brown Skin Color 1; Charcoal 1; Chicken 1; Coat 1; Cow 1; Darkness Has Fallen 1; Flower 1; Frightens 1; Kikusi 1; Likeness 1; Night 1; Of Dad 1; Pale 1; Person 1; Shirt 1; Stale 1; To Paint 1; Very 1; Water Insect 1; No Response 2.

2. Blue: Color 31; To Wash 28; Blue 20; Put On Clothes 10; Clothes 8; Purple 7; Water 5; White 5; Black 4; Green 4; Bluish 3; Bud 3; Clouds 3; Good 3; Heaven 3; Ink 3; Make Clothes White 3; Omo 3; Soap 3; Bug 2; Dark 2; Lake 2; Red 2; Trousers 2; Bed 1; Blue Band 1; Danger 1; Dduka (Shop) 1; Door 1; Flour 1; How Many 1; I like it 1; In Lake 1; Is There 1; Key 1; Light Blue 1; Likeness 1; Look 1; Medicine 1; Moss 1; Not Dark 1; Orange (Kachungwa) 1; Pencil 1; Picking 1; Pink 1; Plate 1; Polish 1; Sadness 1; Shirt 1; Smarten 1; Smells 1; Sponge Gourd 1; They Buy It 1; Thing 1; Thunders 1; To Beat 1; To Hear 1; Totem 1; Up 1; Useful 1; Watery Green 1; Yellow 1; No Response 11.

3. Brown: Soil 32; Color 30; Kikusi 24; Yellow 8; Barkcloth brown 7; Black 7; Purple 7; Good 6; Dust 5; Kikusikusi 5; Orange (Kipapaali) 5; Ant Hill 4; Red 4; Blue 3; Brownish 3; Kitosi (grey) 3; Ashy 2; Black-White Spots (Kakofu) 2; Cloth 2; Death (The Spirit) 2; Dirty 2; Don't Like 2; Down 2; Eat it 2; Fertile 2; Green 2; Lukusi (reddish brown grey sandy soil) 2; White 2; Banana Root 1; Broken 1; Brown 1; Chalk 1; Dress 1; Flower 1; Food 1; Hard 1; Has died 1; House 1; I Step On It 1; Landowner 1; Many 1; Medicine 1; Name 1; Not good 1; Paint With 1; Pen 1; People On Which They Are 1; Plant Things In 1; Send 1; Shirt 1; Soft 1; Step on 1; Three Colors 1; To Plant 1; To Tie on Fruits 1; Water 1; No Response 3.

4. Green: Color 43; Banana Leaf 29; Leaves 15; Blue 13; Red 11; Yellow 10' Weeds 8; Bimera (Plants) 7; Black 5; Green 4; Good 3; Greenish 3; Purple 3; Banana Tree 2; Bluish 2; Brown 2; Cloth 2; Flower 2; I Like It 2; Kattake (Brown skin color) 2; Light Green 2; Orange (Kachungwa) 2; Pale 2; Pleasing 2; To Paint 2; Tree 2; Water 2; Auto 1; Barkcloth Color 1; Changed 1; Color of Fruit 1; Green Snake 1; Healthy 1; Is Enough 1; Mango 1; Moss Green 1; Nsunsa (a green vegetable)1; Orange (fruit) 1; Pink 1; Kasita (proper name) 1; Smells 1; Soil 1; To Love 1; Very 1; Wet 1; No Response 8.

5. Kikusi: Color 42; Brown 40; Soil 33; Greyish 8; Kukusi (reddish brown grey sandy soil) 8; Anthill 7; Red 6; Bad 5; Brownish 4; Kitosi (grey) 4; Barkcloth Brown 2; Blue 2; Clay 2; Dirty 2; Medicine 2; Of kikusi 2; White 2; Yellow 2; Barkcloth 1; Blackish 1; Bright 1; Cassava 1; Cloth 1; Dark 1; Dirty Thing 1; Dog 1; Dry Season 1; Ettosi (swampy soil) 1; Isn't Dark 1; Is Seen 1; Khaki 1; Knife Blade 1; Light Green 1; Likeness 1; Mixture 1; Orange (fruit) 1; Orange (Kipapaali) 1; Nalugoba (Proper name) 1; Purple 1; Reddish 1; Sandy Soil 1; Sewing Machine 1; Shirt 1; Smell Bad 1; Sweet Potato 1; Table 1; Thief 1; Yellowish 1; No Response 4.

6. Orange: Yellow 37; Color 31; Papaya 16; To Eat 16; Green 11; Cloth 7; Mango 7; Ripe 6; Sweet 6; Fruit 5; Red 4; Rotten 4; Brown 3; Has Fallen 3; Yellowish 3; Brownish 2; Good 2; Greenish 2; House 2; Kachungwa 2; Orange (fruit) 2; Papaya Tree 2; Plantation 2; Purple 2; Trees 2; Barkcloth Brown 1; Big 1; Black 1; Blue 1; Bug 1; Cement 1; Drink 1; Flower 1; Guava 1; Handle 1; Jack Fruit Tree 1; Many; Not Fruit 1; Not Pleasing 1; Not Sweet 1; Of There 1; Paper 1; Purplish 1; Refreshing 1; Ripe Banana 1; Seeds 1; Spot 1; Stain 1; Towel 1; Weak 1; No Response 5.

7. Purple: Color 77; Blue 16; Kobe (Dioscorea Bulbifera) 14; Green 12; Red 9; Cloth 8; Brown 6; Good 4; White 4; Two Colors 3; Yellow 3; Black 2; Blood-red 2; Dark 2; Medicine 2; Of Purple 2; Orange (Kipapaali) 2; Spiller 2; Algae 1; Barkcloth Brown 1; Bluish 1; Book 1; Bad 1; Button 1; Coffee 1; Cook Palm Leaves 1; Darkness (In) 1; Dead One 1; Don't Like It 1; Kikusi 1; Light 1; Mat 1; Ndagu (Yam) 1; Not Pleasing 1; Palm Leaves 1; Pencil 1; Pink 1; Rainbow 1; Reddish 1; Shirt 1; Sweet 1; Sweet Potato 1; Thief 1; Thread 1; To Blow 1; Tooth Disease 1; Two Types 1; What is it From 1; No Response 7.

8. Red: Color 41; Blood 25; Green 19; Black 16; Very 9; White 9; Blood-red 8; Pencil 7; Yellow 6; It's Red 5; Flower 4; Auto 3; Cloth 3; Good 3; Crimson 2; Danger 2;

Dark 2; Fire 2; Peppers 2; Purple 2; Shoes 2; Bean 1; Blue 1; Brown 1; Chicken 1; Doesn't Fade 1; European 1; Flag 1; Frightens 1; Fruit 1; Greyish 1; Harsh 1; Hat 1; Interesting 1; Inviting 1; Lawn 1; Likeness 1; Maroon 1; Medicine 1; Not Red 1; Orange (Kipapaali) 1; Pink 1; Plate 1; Pleasing 1; Really 1; Reddish 1; Shirt 1; Stale 1; Table 1; Thread 1; Wild Cherry 1; No Response 6.

9. <u>White</u>: Color 43; Black 32; Is Clean 16; Is White 10; Papers 9; Red 9; Cloth 8; Shirt 8; Pink 5; Light 4; Purple 4; Very 4; Chalk 3; Chicken 3; Glitter 3; Milk 3; Yellow 3; Blue 2; Good 2; Green 2; Teeth 2; And Who? 1; Auto 1; A White Cloth 1; Book 1; Bottle 1; Busuuti (Traditional Dress) 1; Clouds 1; Cotton 1; Dirty 1; Goat 1; Grey Hair 1; Has No Spot 1; Hut 1; I Like It 1; Kampala 1; Lost 1; Name 1; Only 1; On Papers 1; Plate 1; Soap 1; Space 1; Sweater 1; Sweet Banana 1; Times 1; Well 1; White Bird 1; Whitish 1; Young 1; No Response 4.

10. <u>Yellow</u>: Color 47; Green 16; Orange Papaya 16; Sweet Banana 12; Red 10; Ripe 10; Cloth 6; Good 6; Blue 5; In Yellow 5; Purple 5; Curry Pepper 4; Papaya 4; Brown 3; Flower 3; Paper 3; Shirt 3; White 3; Banana Leaf Turning Yellow 2; Dark 2; Orange (Kachungwa) 2; Much 2; Orange (fruit) 2; Wild Cherry 2; Bad 1; Barkcloth Brown 1; Bbogoya (large sweet banana) 1; Etooke (cooking banana) 1; Finished 1; Food 1; Hope 1; House 1; Light 1; Likeness 1; Medicine 1; Not Pleasing 1; Partly Ripe 1; Pencil 1; Pink 1; Pleasing 1; Rotten 1; Stale 1; Sun 1; Throw Away 1; Two Colors 1; No Response 9.