

**THE CROSS-CULTURAL COMPARABILITY OF THE
16 PERSONALITY FACTOR INVENTORY (16PF)**

FATIMA ABRAHAMS

**THE CROSS-CULTURAL COMPARABILITY OF THE 16
PERSONALITY FACTOR INVENTORY (16PF)**

by

FATIMA ABRAHAMS

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PROMOTER: PROF K F MAUER

30 NOVEMBER 1996

**THIS THESIS IS DEDICATED TO MY PARENTS, ACHMAT AND WARALDIA
GYDIEN, MY HUSBAND, RAMZIE AND MY DAUGHTERS, ZAREEN AND
MISHKAH.**

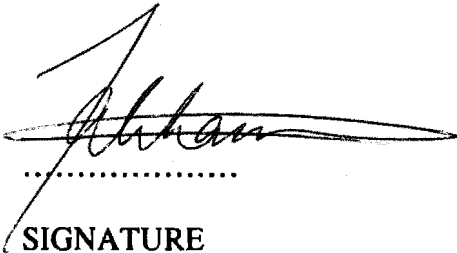
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I declare that **The cross-cultural comparability of the 16 Personality Factor Inventory (16PF)** is my own work and all that I have used or quoted have been indicated and acknowledged by means of complete references.



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(MRS) F ABRAHAMS

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SUMMARY

This study focused on the 16PF (SA 92), a personality questionnaire that was developed in the USA and adapted for South African conditions. The main aim of the study was to determine whether the scores of the 16PF are comparable in a cross-cultural setting in South Africa. The influence of age, language, socio-economic status and gender on the scores were also determined.

The sample consisted of black, white, coloured, and Indian university students and were drawn from the University of Western Cape, University of Pretoria, University of Durban-Westville, and University of Natal.

To achieve the aims outlined construct comparability studies and item comparability studies were conducted. In addition, descriptive statistics were also calculated to provide a general picture of the performance of the various sub-samples. A qualitative study was also conducted to determine some of the reasons for the occurrence of item incomparability of the racial sub-sample.

The results showed that the racial variable had the greatest influence on the scores obtained. Problems existed with the construct and item comparability of the 16PF when the different race groups were compared. In addition, significant mean differences were also found on the majority of factors when the scores of the different race groups were compared. The results of the qualitative study showed that participants whose home language was not English or Afrikaans had difficulty in understanding many of the words and the construction of

sentences contained in the 16PF.

The implications of using the 16PF in South Africa, with its multicultural population was outlined, taking the new labour legislation pertaining to selection into consideration.

Finally, a number of options for test users, and users of the 16PF in particular were presented.

Key Terms

16 Personality Factor Inventory (16PF); Cattell; Personality questionnaire; Cross-cultural; Comparability; Construct comparability; Item comparability; University students; Personality theory; Selection; Age; Language; Socio-economic status; Gender.

CHAPTER 1

INTRODUCTION

1.1 Background

The Sixteen Personality Factor Questionnaire (16PF) is an objective paper-and-pencil test designed to measure personality attributes and behavioural style. It was developed by Cattell in the USA in 1949 (Cattell, Eber & Tutsuoka, 1992).

By 1985, more than 2000 articles concerning the 16PF had been published. The major emphasis of this research revolved around career guidance, vocational exploration and personnel testing (Wholeburn, 1985).

From 1961 onwards, starting with Levonian's attempt to replicate Cattell's factor structure, a number of researchers failed to find the same result. This led to a great deal of criticism against the 16PF in terms of issues such as validity, item structure and theoretical framework (Barrett & Kline, 1982; Bouchard, 1972; Bull, 1974; Eysenck, 1971, 1972; Howarth, Browne & Marceau, 1972; Karson & O'Dell, 1974; Levonian, 1961; Noller, Law & Comrey, 1987; Stewart, 1977).

Although the popularity of the test has declined in the USA, the test publisher, IPAT (Institute for Personality and Ability Testing), continues to export the test to a number of countries.

According to Cattell et al. (1992), the 16PF has been adapted and translated with factor checks in the following countries: Australia, Brazil, Chile, France, Germany, Great Britain, Italy, Japan, New Zealand, Sweden and India. In other countries such as Czechoslovakia, Finland, Poland, Holland, Israel, Mexico, Pakistan, Peru and South Africa, it has been imported and translated without factor checking.

Some researchers (Kline, 1967; Tsujioka & Cattell, 1965; Zak, 1976) have found non-significant differences cross-culturally at the factor level. However, larger numbers of researchers (in various countries) have demonstrated that cross-cultural differences do occur (Adcock, 1974; Adcock & Adcock, 1977; Cattell & Warburton, 1961; De Andrade, De Godoy Alves & Ford, 1969; Golden, 1978; Mehryar, 1972; Meredith, 1966; McQuaid, 1967; Phillip, 1972; Thompson & Dayries, 1975; Vaughan & Cattell, 1976). In fact, in their 1992 handbook, Cattell et al. write "... highly significant differences have been found cross-culturally on factor levels, related to cultural dynamics..." (p. xxi).

In spite of these findings, the 16PF is still being used in South Africa today. There are four forms of the test available in South Africa. Test A and Test B were the only two forms available in South Africa until 1992. These tests are being used predominately in industry to aid with selection and promotion decisions. Although the test has been standardised on a white South African population, it is now being used cross-culturally.

In 1992, Form E and form SA 92 were developed because of the assumed limitations of the 16PF form A and B. Form SA 92 was developed with the aim of eliminating bias, increasing reliability and rationalising existing forms, thereby ensuring that the test is appropriate for all groups in South Africa. Form E was developed to make it suitable for persons who have reached Standard 4 to Standard 7, simplifying language usage, vocabulary and format. Further research is necessary to determine whether the aims of the test have been achieved (Prinsloo, 1992).

In the past, the development and/or administration of separate tests for the different population groups was common because the various population groups rarely competed for the same job, due to apartheid legislation. However, the socio-political situation in South Africa has changed rapidly, and the use of separate tests for different groups is no longer politically acceptable. Therefore, tests that have previously been developed and/or administered to whites are now being used cross-culturally (Owen, 1989; Taylor, 1987).

Very little research has, however, been conducted on the cross-cultural applicability of personality tests in South Africa. In 1991, Taylor and Boeyens investigated the comparability of the scores of Blacks and Whites on the South African Personality Questionnaire (SAPQ) and concluded that it was unsuitable for cross-cultural applications. Spence (1982) also found the test inadequate when she administered it to black South African teachers and found low alpha coefficients. White (1982) administered six tests adapted and imported from the USA to measure aspects such as escapist drinking, anxiety, job satisfaction and tension. Once again, he

found scale reliabilities of an unacceptably low level. As far as can be established, no research has been conducted on the cross-cultural applicability of the 16PF in particular. In fact, as far as can be established, there has been only one research article concerning the appropriateness of the test in South Africa (Prinsloo & Van Eeden, 1995). Test users relied on the research findings in the USA to assume appropriateness.

Personality tests in general, developed in the USA and used in European, African and Middle Eastern countries, have consistently yielded mixed results in terms of their cross-cultural applicability. A vast body of research indicates that these tests are inadequate (Chiu, 1990; Di Scipio, 1971; Eysenck, Adelaja & Eysenck, 1977; Frymier & Klopff, 1990; Kline, 1975; Kline & Mohan, 1974; Kuo & Marsella, 1977; Nagelschmidt & Jacob, 1977; Parsons & Schneider, 1974; Reimanis, 1977; Wohl, Horowitz, Tapingkae & Pardthaisong, 1970), while other research supports the use of these tests across cultures (Eysenck & Jamison, 1986; Eysenck, Von Knorring & Von Knorring, 1988; Forbes, Dexter & Comrey, 1974; Hentschel & Holley, 1977; Middelbrooks & Wakefield, 1987; Noller, Law & Comrey, 1988; Ravinder, 1986; Wilson, Sibanda, Sibanda & Wilson; 1988).

Even within the USA, research on the cross-cultural application of personality tests on different ethnic groupings has shown mixed results. For example, the Minnesota Multiphasic Personality Inventory (MMPI), a very popular personality test in the USA, has come under heavy criticism for the problems encountered when using the test on different ethnic groups. Gynther (1979) came to the following conclusion after summarizing 18 articles:

First, there were distinctive differences between the MMPIs of blacks and whites...
Second, these differences appear to reflect differences in values and perception ...
Finally, there was some evidence to suggest that prospective black employees were disadvantaged when the MMPI was used for screening (p. 113).

On the other hand, Dahlstrom, Lachar and Dahlstrom (1986) found that "The evidence presented here documents the lack of serious bias or distortion in the use of the MMPI in mental health settings for the assessment of the emotional status of black clients ..." (p. 205).

An important question in the area of cross-cultural research is the use and comparability of personality tests that were developed in the USA and used on different cultural groups in the USA and in other countries. That is, whether the use of personality tests, developed in a different cultural environment, is appropriate for use in a given culture without conducting the necessary research (Rogers, 1972). Such research must demonstrate that the psychological constructs applicable in the USA have equivalent counterparts in the target culture and/or country.

1.2. Importance of research

The importance of this kind of research in a new South Africa cannot be ignored. According to Taylor (1987), there is a great need to conduct research on test bias based on different race groups. The reason is that the social structure has been based on race for a long time and still

remains so to a large extent, largely due to the legacy of apartheid. It is, therefore, possible that other variables such as socio-economic status and education might correlate with race to a greater extent than in many other countries. Thus, the possibility of tests being biased or unfair to certain groups of people in South Africa is even greater. However, tests differ in quality, and the determination of bias or unfairness of tests can only be done on a test-by-test basis (Reynolds & Brown, 1984).

Prior to the adoption of the new Constitution and the new Labour Relations Act (to be adopted 11 November 1996), individuals were not legally protected against any form of discrimination. However, according to Taylor and Radford (1986) it was possible that the use of certain psychometric tests in industry could be shown to involve unfair labour practice as defined in the old Labour Relations Act (Act 28 of 1956). This legislation pertained to existing employees only, and applicants were not given the same protection. It was possibly for that reason that the use of tests was not challenged by many applicants and employees. The first testing issue challenged by a union took place in 1985, when the South African Allied Worker's Union objected to the use of psychological tests by the Continental China Group as a basis for re-employing workers who had been dismissed. They (Taylor & Radford, 1986) argue that as unions have grown tremendously in strength and numbers, it is likely that these unions would start questioning the use of psychological tests in industry in general.

In addition, unions now have the support of legislation (the new Constitution and the new Labour Relations Act) that specifically forbid any discriminatory practices in the workplace, including

providing protection for applicants as they have all the rights of current employees. Test users will have to be sure that the tests that are used for selection and promotion will be able to stand up to court scrutiny. The new Constitution (adopted on 8 May 1996) lists the fundamental rights of individuals in Article 9 and states:

Equality

- 9.(1) Everyone is equal before the law and has the right to equal protection and benefit of the law....
- (3) The state may not unfairly discriminate directly or indirectly against anyone on one or more grounds, including race, gender, sex, pregnancy, marital status, ethnic or social origin, colour, sexual orientation, age, disability, religion, conscience, belief, culture, language, and birth.
- (4) No person may unfairly discriminate directly or indirectly against anyone on one or more grounds in terms of subsection (3). National legislation must be enacted to prevent or prohibit unfair discrimination.
- (5) Discrimination on one or more grounds listed in subsection (3) is unfair unless it is established that the discrimination is fair (pp. 7,8)

In the USA several cases have come to court on the issue of claimed discrimination when a particular psychological test was used in industry. This is possible as the US Constitution also

specifically prohibits discrimination on the grounds of race, colour, religion, gender or national origin (Anastasi, 1990). It can be expected that South Africa will follow the USA example as the emphasis of the unions' activities will most probably shift from largely political to specific organisational issues. There is a strong possibility that the use and the non-comparability of psychological tests might become issues addressed by the unions.

The implication for the testing movement will probably be far-reaching as test users and test publishers will be called upon to demonstrate, or prove in court, that a particular test does not discriminate against certain groups of people.

1.3. Aims

The following are the main aims of the study:

- (a) To determine whether the scores of the 16PF (SA92) are comparable in a cross-cultural setting in South Africa. In other words, to determine the suitability of the 16PF for coloureds, Indians and blacks;¹
- (b) To determine the influence of race, gender, socio-economic status, language and age on the scores of the 16PF (SA92);

¹"Whites, Indians, coloureds and blacks" are terms used to describe racial groups as defined by the repealed Race Registration Act No. 30 of 1950. This researcher is personally opposed to such a racial classification, but the reality of the South African situation, and the nature of the research, forces her to use it.

- c) To establish whether differences exist between races, genders, socio-economic status, and ages in terms of their responses to the 16PF; and
- d) To establish the reasons for the differences in responses to items by the various race groups (focusing on black-white differences).

1.4 Conclusion

Many educational and business institutions in South Africa use psychological tests that have either been developed in the USA or by the Human Sciences Research Council (HSRC), and which had been standardized on white samples. It is, therefore, important to conduct research to establish whether the bias and fairness of the tests in question are above reproach.

CHAPTER 2

CROSS-CULTURAL PSYCHOLOGY

2.1 Introduction

The area of cross-cultural research is a relatively new discipline in the field of psychology. In the past four to five decades research in this area has grown tremendously. It has borrowed from a number of disciplines, especially anthropology. To date, the field is still riddled with conceptual difficulties. Consensus has not been reached concerning the definitions of central terms used in the discipline. Furthermore, attempts are still being made to develop a tight and workable theory that can be used as a basis for providing a framework for the discipline.

2.2 Cross-cultural psychology

By its very nature, cross-cultural psychology could, in principle, touch every substantive area in psychology and could include everybody in the world (Price-Williams, 1975). It is this very reason that makes the delineation and the definition of the discipline so difficult. In an early attempt to define the field, Frijda and Jahoda (1966) drew a distinction between "cross-national" and "cross-cultural" studies. Cross-national studies refers to studies conducted within western nations, and cross-cultural refers to studies conducted between a western country and a non-western nation or/and studies conducted between two non-western nations. However, because methodology remains the same they assimilated cross-national studies under the general heading

of cross-cultural studies. Interestingly, they excluded the following types of research from the definition: research concerned with sub-cultural groups such as social class, regional differences, and cross-ethnic work.

However, later definitions differed from Frijda and Jahoda's (1966) position in terms of research to be included. According to Berry (1979) and Berry, Poortinga, Segal and Dasen (1992) the study of various cultural groups within a nation state, called ethnic psychology is becoming increasingly important and popular. However, studies carried out in two populations that are closely related to one another (e.g. Scots-Irish or French-Spanish) are excluded from the definition. The following are suggested as possible reasons for the increase: cost of foreign travel; political and personal difficulties associated with working in other countries; recognition that local problems are more important or rather as important, and research questions of interest to cross-cultural researchers can also be addressed in the home country.

In 1973, Brislin, Lonner and Thorndike defined the discipline as follows:

Cross-cultural study is the empirical study of members of various cultural groups who have had different experiences that lead to predictable and significant differences in behaviour. In the majority of such studies, the groups under study speak different languages and are governed by different political units (p. 5).

This definition emphasises the identification of the kinds of cultural experiences that could contribute to behavioural diversity in human beings (Berry et al., 1992). According to Triandis (1980):

Cross-cultural psychology is concerned with the systematic study of behavior and experience as it occurs in different cultures, is influenced by culture, or results in changes in existing cultures (p. 1).

This definition tends to focus on cultural change and its relationship to individual behaviour (Berry et al., 1992). However, these definitions tends to exclude a number of important variables. First, cross-cultural psychology is also concerned with universality (i.e. the common characteristics of human beings), not only diversity (Lonner, 1980). Secondly, other contextual variables have been considered to fall within the ambit of cross-cultural psychology e.g. ecological and biological variables. Ecological variables refer to genetic inheritance, nutrition and hormonal processes that may vary across cultures. Biological variables refer to the process of adaptation, focusing on factors such as economic activity and population density (Dawson, 1971).

To include all the variables defined above for the purpose of this study the following definition, proposed by Berry et al. (1992), will be adopted:

Cross-cultural psychology is the study of similarities and differences in individual functioning in various cultural and ethnic groups; of the relationships between psychological variables and socio-cultural, ecological, and biological variables; and of current changes in these variables (p. 2).

Although quite lengthy, it appears to encompass all the variables that should and could be included in the field of study.

Closely related to the definition are the goals of cross-cultural psychology. Although the goals of cross-cultural psychology can be deduced from the above definition, it is necessary explicitly to outline them. This will be discussed in the next section.

2.3. Goals of cross-cultural psychology

It is important to remember that the goals of cross-cultural psychology are not very different from those of any other psychological research, i.e. validity, reliability, representativeness of experimental tasks, etc. The difference lies in the focus and methods employed when conducting cross-cultural research.

First, the obvious and major purpose of cross-cultural psychology is to test the generality of psychological theories and knowledge. For this goal, the starting point is one's own culture and the testing of that knowledge in another culture, thereby being insensitive to the discovery of

psychological phenomena that are of importance to the other culture. This is called the **transport and test** goal by Berry and Dasen (1974).

Secondly, to rectify the above, to **explore** other cultures, in order to **discover** psychological variations absent in one's own cultural experience (Berry & Dasen, 1974). This second goal makes it clear that if the generality of a specific behaviour was not discovered, we should attempt to seek ways to explain the difference or find alternatives.

Thirdly, to generate greater universal **generalisations** about human behaviour. This will be attained by comparing prior understanding of knowledge with the newer knowledge obtained from the other culture studied. This is necessary because, in the pursuit of the first goal, limits might be found in the generality of the existing psychological knowledge, while in pursuit of the second, we might discover new psychological phenomena that need to be used in the development of a more general psychological theory (Berry, 1979; Berry *et al.*, 1992; Brislin, 1976; Frijda & Jahoda, 1966; Triandis, 1980).

Taking the definition and goals of cross-cultural psychology into account, it is evident that cross-cultural psychology has the characteristics of an interdisciplinary enterprise. To have a better understanding of the field it is important to know the relationships different disciplines have with cross-cultural psychology.

2.4 Relationships with other disciplines

Cross-cultural psychology attempts to discover systematic relationships between individual psychological data and data from ecology, biology, and anthropology (i.e. population level data). The use of levels of analysis allows for the study of a phenomenon without the threat of reductionism, i.e. reducing the phenomenon of one discipline to the level of explanation used in the other more basic discipline. Thus, certain cultural phenomena can be studied on their own level, but not in psychological terms. Figure 2.1 gives an outline of the relationship of cross-cultural psychology to other disciplines.

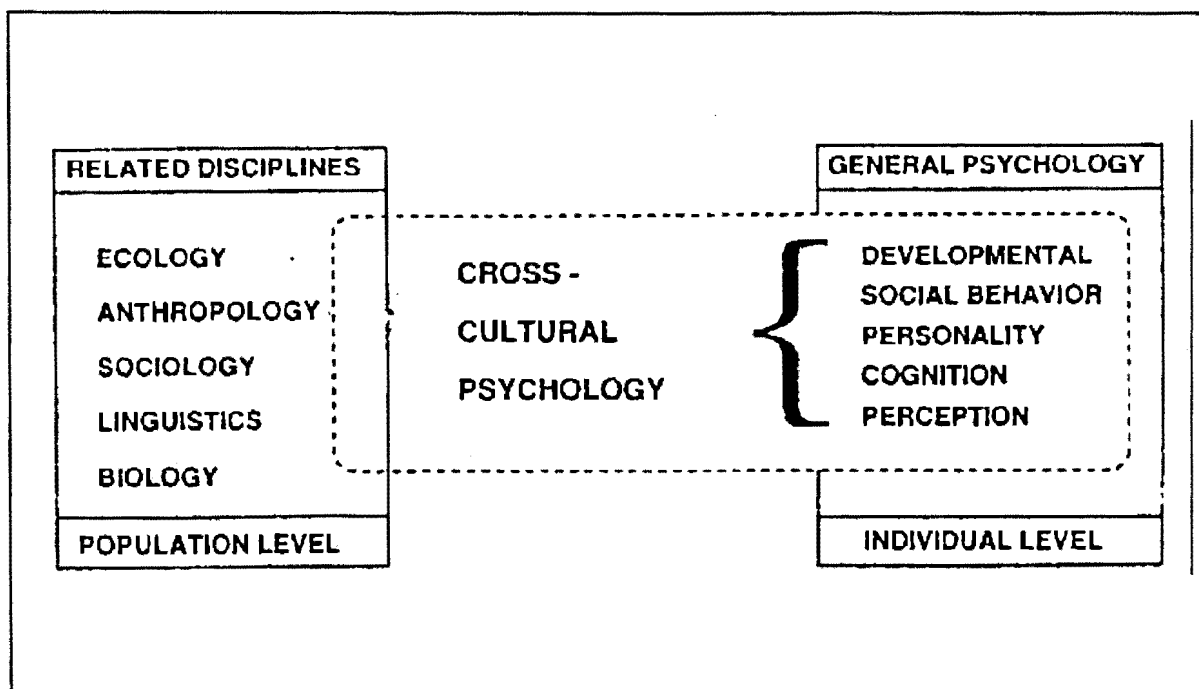


Figure 2.1 Relationship among cross-cultural psychology, general psychology, and population-level analysis (Berry *et al.*, 1992; p. 7)

Population-level disciplines concentrate on the description, analysis and understanding aspects of collectives, groups or entire populations. Individual level phenomena are primarily concerned with inter- and intra-individual phenomena. Cross-cultural psychology can obtain a substantial amount of information from these population-level disciplines.

This can be used to understand differences in individual behaviour demonstrated in different cultural populations, and to establish the general context for the psychological development and functioning of individuals. Located at the centre of the figure is the field of cross-cultural psychology because it provides insight into individual behaviour as it relates to population-level phenomena. The areas of general psychology included in Figure 2.1 are obviously not exhaustive, as other areas could also have been included. Anthropology is the most substantial of the interdisciplinary relationships (Berry *et al.*, 1992). In fact, cross-cultural psychology has its roots in anthropology. An outline of the influence of certain of these disciplines on the field of cross-cultural psychology will now be presented by briefly focusing on the historical development of the field of cross-cultural psychology.

2.4.1 Historical development

With the first contacts across national or tribal boundaries, the interest in the behaviours of other people probably began. Such contacts did not lead to true understanding of the other groups as they were usually seen as inferior, strange and exotic. This is evident in the writings of Herodotus who lived in the fifth century B.C. He wrote of the "barbarians" who spoke no

Greek, and he emphasised the superiority of his own people. The belief that difference could be equated with inferiority appeared to have been widely held. This is evident by a pamphlet by an anonymous writer in 1788, titled "Slavery no Oppression" which stated:

It is well known that the eastern and western coasts of Africa are inhabited by stupid and unenlightened hordes; immersed in the most gross and impenetrable gloom of barbarism, dark in mind as in body, prodigiously populous, impatient of all control, unteachably lazy, ferocious as their own congenial tigers, nor in any respect superior to these rapacious beasts in intellectual advancement but distinguished only by a rude and imperfect organ of speech, which is abusively employed in the utterance of jargon (Andor, 1966, p. 31).

Eventually such observations and judgements were replaced by the contributions of social scientists such as anthropologists, sociologists, psychologists and linguists. However, in most cases it remained difficult to avoid hierarchical conclusions as the "others" with whom one's own group was compared were those to whom the term "primitive" was applied. This sentiment is apparent in the following statement made by Kidd (1906):

... In the European the higher faculties go on developing throughout life, whereas in the case of the Kaffirs the development of the higher nature is arrested soon after puberty as a rule ... (p. 119 in Andor, 1966).

The belief in social evolution, predating Darwin in some cases, and stimulated by him in others, was one of the pervasive influences in the early interest in cross-cultural comparison. Common in most of these formulations was the notion that "others" were at earlier stages of development, and that people in the western world were ahead of them in all respects. In recent years this evolutionary approach has been revived in a more sophisticated form without the earlier ethnocentric bias (Steward, 1953 and Campbell, 1975 in Klineberg, 1980).

The idea of a more lasting inferiority only came when variations in people's behaviour were assumed to have a genetic or racial basis. In such cases the "others" would never be able to reach the levels of complexity and achievement characteristic of western civilization. This position was promoted by appeals to history, by religious considerations, by the belief in natural selection, by the alleged consequences of the physical environment, by the results of psychological tests, or simply by an intuitive conviction that "others" were inferior. Such a belief is still accepted by many, including those in the social and biological sciences. For example, Rushton (1987, 1989) postulated that evolutionary history has resulted in three races i.e. oriental, white and black that are ranked in a genetically coded continuum for a number of traits, including sexual promiscuity, genital size, intelligence, cranial capacity, etc. On each trait, blacks are located at the primitive, "animal-like" end of the continuum and the whites and orientals on the "refined" end.

However, the history of cross-cultural psychology can be characterised in general as a movement away from the assumed hierarchy of superiority to an appreciation of differences. These

differences are looked at as differences in lifestyles, rather than steps on a scale of progress (Klineberg, 1980).

According to Holtzman (1968), there has been considerable growth in interest in the area of cross-cultural psychology since the 1950's. In fact, it is rather unusual that psychologists did not develop an interest in cross-cultural comparisons at a far earlier stage of the development of the discipline as it may be shown that social scientists such as historians, anthropologists, and sociologists have long shown an interest in these matters (Klineberg, 1980).

The relative tardiness on the part of psychologists to study cross-cultural phenomena is possibly due to the fact that they viewed the search for universal laws as their major function. This viewpoint favoured the emphasis of a biological approach which stressed the importance of instincts and animal origins of behaviour, rather than an interest in individual and group behaviour. Behaviourists within the discipline of psychology started the critical attack against this view (aided by sociological and ethnological data). Psychologists came to realize that some of their conclusions might not apply equally well everywhere, and that if generalisations were to be valid, knowledge of other cultures was vital. They began to appreciate the research findings of anthropologists (Klineberg, 1980).

However, psychologists started questioning the methodology used by anthropologists to arrive at certain conclusions. When anthropologists reported on psychological aspects of culture, they relied heavily on participant observation, and material provided by the participants in the study.

This approach formed the basis for general statements about the personality found within a cultural group. These general statements were criticised as the relevance of these descriptions to subgroups and individuals within the population was questioned. In the exchange that followed these and other criticisms were expressed by psychologists and accepted by a few anthropologists. A consequence of this was that these anthropologists started using psychological instruments and later studied samples of groups rather than the entire group (Klineberg, 1980).

This situation has changed as psychological studies of different cultural groups have become common throughout the world. This is evident in the number of journals and books concerned with cross-cultural studies that has been established and published since the early seventies (Price-Williams, 1975).

Although modest in comparison, the historical development of cross-cultural psychology in South Africa followed a distinct pattern, starting in 1915 with the use of a psychological test on black children.

2.4.2 Cross-cultural psychology in South Africa.

Cross-cultural research in South Africa has a history of more than eighty years. Much of the research that has taken place arose out of a need for selection and classification in educational and occupational spheres. Most of this research was conducted by expatriates from Western Europe, North America and their descendants (Verster, 1987). According to Biesheuvel (1987),

although South African anthropologists have a number of achievements to their record, as many gained international status in this area, psychologists have a modest record in comparison. One of the most notable contributions was the bibliography that was published by E. Andor in 1966, titled **Aptitudes and abilities of the Black man in Sub-Saharan Africa", 1784 - 1963**. She also published the **Psychological and sociological studies of the black people of Africa, South of the Sahara, 1960-1975: an annotated select bibliography** in 1983.

In the earlier years, cross-cultural psychology was largely concerned with the measurement of ability between black and white, using inappropriate tests and constructs, largely imported from the West (Biesheuvel, 1987). In 1915, Martin (in Andor, 1966) experimented with the Binet-Simon test with black children and came to the following conclusion:

... Of the tests that could be tried, it was found that those requiring memory and observation were readily answered, but those requiring abstract thought were seldom answered. On the whole, the tests above the seventh year would have to be recast in great measure before they could be used for uncivilised children and adults ... (pp. 122-123 in Andor, 1966)

In addition, many of the earlier cross-cultural studies also supported the hereditarian view of the abilities of blacks. Fick (1934 in Dubow, 1991) administered individual tests of motor and reasoning abilities and concluded that the IQ of black children was inferior to that of Indian and coloured children, with whites superior to all groups. In 1939 he extended his research to

confirm his findings and reiterated his viewpoint making the following statement:

Although all the facts regarding the educability of the Native may not be in, the available data point to a marked inferiority on the part of the Native in comparison with Europeans. This inferiority occurring in certain tests in which learning or environmental conditions are equalised for the Native and European group does not appear to be of a temporary nature (Fick, 1939, p.56).

Fick's viewpoint was supported by Van Rensburg (1938) who, after administering a series of four manipulative type tests to black and white children, concluded that:

... the South African Native has not the learning ability to compete on equal terms with the average European, except in tasks of an extremely simple nature (p. 43 in Dubow, 1991).

Fick's position was challenged and disputed by Van den Berg (1938). But the most comprehensive criticism of Fick's work was made by Biesheuvel in his book **African Intelligence**, published in 1943, where he devoted an entire chapter to this issue. This book considered the cultural appropriateness of psychological tests and highlighted the influence of different cultural, environmental and temperamental factors and the effects of malnutrition on intelligence.

He concluded:

... under present circumstances, and by means of the usual techniques, the difference between the intellectual capacity of Africans and Europeans cannot be scientifically determined (Biesheuvel, 1943, p. 191).

Another important contributor to this area was the National Institute of Personnel Research (NIPR), established in 1946, under the direction of Simon Biesheuvel. They focused on development, selection and classification tests for black mineworkers. These tests measured trainability and leadership amongst a predominantly preliterate black population, speaking a number of dialects and languages. The NIPR's activities generated a vast amount of cross-cultural research and publications nationally and internationally (Biesheuvel, 1987; Dubow, 1991).

However, psychology in general, and the activities of the NIPR in particular, have been criticised as being heavily reliant on psychometrics, a tool of the Nationalist government and business organisations, and technocratic. In addition, because much of the work remained in the area of racial differences, it remained part of a general racist discourse (Cloete, Muller & Orkin, 1987; Dubow, 1991; Nzimande, 1995). Thus, Cloete *et al.* (1987) stated:

... psigometriese tradisie is kort na die Tweede Wereldoorlog ontwikkel deur...Hudson en Biesheuvel. Hul werk was gerig op die belange van die groot (Engelse) nywerhede, in besonder die myne (p. 11).

Biesheuvel (1987) refuted these criticisms by making the following points. First, there was a vast amount of basic research conducted by the NIPR that was neither technocratic nor could it be construed as having any relevance on business profits. Secondly, although extensive use was made of psychometric techniques, they were always aware of the limitations and the need to take the environment in which they work into consideration. Thirdly, the work conducted had the following important implications for cross-cultural research in South Africa:

- a) Attention was given to the problem of test comparability and equivalence, the selectivity of the constructs and the possibility of generalising across cultures.
- b) The concept of culture-fair testing was rejected as it disregarded the incompatibility of Western constructs with traditional black cognitive modalities and perceptions of causal relationships.

In 1987, after analysing relevant journals and conference proceedings, Biesheuvel concluded that recent research in the area of cross-cultural psychology in South Africa is rather limited. He attributed this trend to the fact that undertaking research in the political domain often led to unfortunate consequences for the researcher and cooperation from the disadvantaged groups was problematic as researchers were often viewed with suspicion due to the apartheid policies. Since 1987 research in this area has increased slightly, but the major emphasis appears to be in counselling and psychotherapy (Barnsley, 1992; Hickson, 1989; Hickson & Christie, 1990; Van der Want, 1994; Van Zijl, 1994).

A certain amount of the research is being conducted in the area of theory building, i.e. determining the appropriateness of Western constructs and theories in a South African context (Biesheuvel, 1987). The main contribution in this area is being made by Vester (1983, 1986a, 1986b), where he focuses on the problems and prospects of cross-cultural research, giving some detail as to the progress made in defining universals. He criticised psychometric theory quite harshly as he believed that:

- a) it led to the development of constructs such as intelligence that have no world referents, unlike cognitive performance and processes which deserve careful attention;
- b) contemporary psychometric practices are not based on scientific principles; and
- c) it can be incorrectly manipulated to support a certain ideology.

Biesheuvel (1987) disputed this criticism as being too harsh and believed that psychological tests should and would continue to be used. The abuse and misinterpretation that occurred were caused by test users, and not by the tests themselves.

Many researchers (as indicated in Chapter 1) would differ with Biesheuvel as their research has shown that often it is the test itself that is the problem in terms of its validity and comparability. This issue will be discussed in more detail in chapter 3.

2.4.3 Academic interest in cross-cultural psychology

According to Lonner and Malpass (1994) the area of cross-cultural psychology still receives scant attention by American academic institutions as it is not taught at the majority of them.

They cite the following as reasons: First, psychology has been culture-bound and culture-blind. It is culture-bound as its roots are deeply embedded in European-American thought and theory. It is estimated that 90% of all psychologists who have ever lived come from the western world. Culture-blindness stems from the fact that psychology has not adequately taken into account the factors not generally found in the west that influence behaviour. Secondly, the typical American (White Anglo-Saxon) has had relatively little direct contact and experience with other cultures. Thirdly, there is a desire by scientists to simplify events and behaviours in the interests of finding psychological order. Aspects that tend to be complicated, such as culture, might easily be avoided in the search for order. Finally, the majority of lecturers at institutions in the psychology departments are not familiar with the relevant literature in the field of cross-cultural psychology.

To get some idea of the interest in cross-cultural psychology by South African universities, ten calendars of universities were analysed to determine the content of their psychology or industrial psychology courses. It appears that the study of cross-cultural psychology at universities is almost non-existent. It might be included as part of a specific course or at the post-graduate level in certain institutions, but it appears that the majority of universities do not offer a course in cross-cultural psychology at all.

This section has dealt with the relationship with other disciplines, focusing on the historical development generally and in South Africa in particular. It has also highlighted the scant

attention that is given to the field by American and South African universities. Throughout the development of cross-cultural psychology, there existed a tension amongst researchers about the methods employed to conduct cross-cultural research. Two approaches have been identified and employed i.e etic research and emic research.

2.5 Etic-Emic Distinction

There is a long-standing tension in cross-cultural psychology between those who propose working intensively in one culture in order to determine indigenous psychological phenomena, and those who seek to work across cultures, thereby producing generalizations about human behaviour that are universally valid. Berry (1989) believes that these are not exclusive, and both are important aims in cross-cultural research. In order to understand and explain this tension, psychologists have coined the terms "etic" and "emic". These terms were used by Pike (1967), a linguist who derived these terms from the terms "phonetics" and "phonemics". Phonetics has to do with the universal properties of sound, and phonemics centres around the ways in which sounds are formulated within the context of particular words and languages. He used these terms to refer to understanding that is either culture specific or universal. Berry (1979, 1989) elaborated this view even further and made the distinctions as follows: an emic approach studies only one culture and examines behaviour from within the system using criteria relative to the internal characteristics of that structure. An etic approach, on the other hand, examines and compares many cultures from a position outside the system, i.e. focusing on universals. He argued that many investigations attempting to replicate United States studies in other parts of the

world can be called "imposed etic". It is assumed by the measures used that the situation being studied has the same meaning for the new participants as it did for those for whom the measures were originally designed, and that responses will have equivalent meanings. The use of imposed etic measures could be a major reason for replication failures. Although limited, imposed etic studies have been conducted in South Africa, largely centring around locus of control (Barling & Fincham, 1978; Heaven, 1983; Heaven, Rajab & Bester, 1986; Lambley, 1973; Momborg & Page, 1977; Riordan, 1981).

Because cross-cultural psychologists, in most instances wish to produce generalizations which are etically valid, Berry (1989) described a strategy to reach a valid set of "derived-etic" generalizations. These generalizations are established by conducting parallel emic studies within a series of national cultures. Measures should be constructed separately in each national culture studied and, if some convergence between the results is obtained within each culture, it can be assumed that processes have been identified that are equivalent. It is then possible to make derived-etic generalizations about the range of cultures sampled.

However, according to Segall (1986), the debate around the etic-emic dilemma still rages. He argued that cross-cultural psychology was still plagued by a continuing debate as to how to resolve this dilemma, whether it could be resolved, and whether it is a real dilemma.

Increasingly, non-western societies are questioning the relevance of psychology developed in the west and imported (imposed-etic strategy), possibly contaminated with ethnocentrism. To

overcome this problem, psychologists in non-western countries are advocating the development of indigenous psychologies, which resembles the emic strategy. This strategy will be the focus of the next section.

2.6 Ethnocentrism of psychology

In the previous discussion, it was shown that earlier approaches to cross-cultural comparisons were contaminated by the belief that differences equal inferiority. This belief is still accepted by some social psychologists (see section 2.4.1), and is referred to as ethnocentrism.

Ethnocentric attitudes on the part of researchers would appear to result in a number of unfortunate consequences, which have been evident for a number of years, as shown by authors such as Berry *et al.* (1992), Durojaiye (1979), and Rogers (1972). These effects include:

1. Incorrect interpretations of observations can take place if an evaluative stance is assumed in respect of differences;
2. The use of assessment instruments that were developed in one cultural setting is used in another. It should not be assumed that an item or psychological test will measure the same constructs in different cultures;
3. Psychologists in so-called third world countries have objected to the choice of research topics that have no value for the people living in these regions. They believe that research should contribute to the wellbeing of these people; and
4. Theories formulated on the basis of results derived under circumstances in which

ethnocentrism played a major role, will most probably present a biased and incorrect frame of reference concerning the phenomenon which has been investigated.

Because of these consequences, it is important that attempts be made to reduce ethnocentrism. According to Berry *et al.* (1992) cross-cultural ethnocentrism can be reduced in the following ways: First, by recognizing that our current knowledge has limitations and by attempting to extend our knowledge and theories to non-western societies as well. In this way the culture boundness of the discipline can be reduced. Secondly, is to carry out all cross-cultural research four times (Figure 2.2). The researcher (A) conducts research in the culture (A) of which the person is a member of; the research remains culture bound (study 1).

RESEARCHER FROM CULTURE	CULTURE STUDIED	
	A	B
A	STUDY 1	STUDY 2
B	STUDY 4	STUDY 3

Figure 2.2 Multiple studies to distinguish differences across culture due to the observer and due to the observed (Berry *et al.*, 1992).

In study 2, a researcher from culture A conducts the study in culture B, and compares the result obtained in study 1. In studies 3 and 4, a researcher from culture B studies his/her own culture and then the other culture. The advantage of this type of research will allow researchers to determine whether differences between groups are due to ethnocentric bias in the researcher or whether they are actually present between the groups. Although this will probably reduce ethnocentrism, the cost, time and effort that will have to be invested in this study will probably be too high to be practical (Campbell, 1970 in Berry, et al., 1992).

Thirdly, attempts are slowly being made to develop indigenous psychologies. Berry et al. (1992) define indigenous psychology as follows:

... a psychology of a cultural group based on the day-to-day behavior of its members, for which local points of view provide the paradigms that guide the collection and interpretation of psychological information (p. 379).

Smith and Bond (1993) defined it as:

... a series of psychologies each of which reflects the preoccupations, historical antecedents and practices of a particular national culture, or even of a subculture
p. 75).

For the purpose of this research it appears that these two definitions are acceptable and could be combined as follows:

... a psychology that reflects the preoccupations, historical antecedents and practices of a particular national culture, or even of a subculture that act as a paradigm to guide the collection and interpretation of psychological information.

Thus, the aim of indigenous psychology is the development of a behavioural science that matches the sociocultural realities of one's own society (Berry *et al.*, 1992).

Psychologists in non-western societies are increasingly questioning the relevance and appropriateness of western psychology, particularly American psychology, in their societies (Ardila, 1982; Biesheuvel, 1958; Gilbert, 1974; Ho, 1986; Kagitcibasi, 1984; Lagmay, 1984; Mauer, 1987; Moghaddam & Taylor, 1986; Moghaddam, 1989; Sinha, 1984, 1990).

Moghaddam and Taylor (1986) proposed that the following six criteria be used to assess the appropriateness of psychology for non-western cultures.

a) Self-reliance

Psychologists in the non-western countries are heavily reliant upon western psychology and psychology departments. This can be overcome to a certain degree, if links are forged with other psychology departments in non-western countries and the training of psychologists takes place locally. To achieve this greater cooperation is necessary amongst non-western countries. In addition, although all western theories are not irrelevant to non-western societies, the extension of psychology to these countries (with illiteracy, traditional rural culture, etc.) would

lead to a need for additional theories and concepts.

b) Needs responsiveness

This refers to the effectiveness with which psychology meets the needs of non-western countries. Psychology in these countries has tended to neglect the needs of the traditional sector. This has resulted because most research instruments and textbooks are imported from western countries and very little research is conducted on issues that are relevant to the traditional sector.

c) Cultural compatibility

Attention should be given to the establishment of criteria to ensure appropriate methodologies for non-western societies, irrespective of whether it is useful in western countries.

d) Institutional feasibility

Institutional support for psychological endeavours in non-western societies is often very poor. To determine its appropriateness, one should determine the feasibility of making that psychology effective, given the kind of institutional support available in developing/non-western countries.

e) Economic suitability

The exportation of psychology from western countries to non-western societies often involves investments that might be better used to nurture the development of indigenous psychology. One solution would be to nurture a psychology that is economically appropriate for the developing

countries, requiring a different emphasis in terms of investments and training, equipment and infrastructure.

f) Political practicability

The process of transferring psychological knowledge must be grounded on an understanding of the political context in which psychology must become effective, as ideology in non-western countries has a different influence on the practice of psychology than it has in western countries.

An advantage of the development of an indigenous psychology is that a reasonable match will most likely occur between the psychological phenomenon to be understood and the description and interpretation of that phenomenon. A disadvantage is the proliferation of psychology that might occur, as it is then possible that one could regress to provincial, city, or even village psychology. In this development it is necessary to find a balance between the use of western psychology and the acknowledgement that it is necessary to take other views of human behaviour into account (Berry *et al.*, 1992).

In conclusion, a number of volumes have appeared that draw together research findings of different cultures and specific countries. They indicate a trend to achieve a psychology that is relevant to local, cultural and regional phenomena. However, there is still too little or available research to make a major impact on the discipline of psychology (Moghaddam, 1987).

2.7. Culture and ethnicity

In the previous sections the words "culture" and "ethnicity" were used quite often. Therefore, it is essential that an attempt be made to define the concepts as clearly and concisely as possible.

2.7.1 Culture

The word "culture" was first used in a manner acceptable to sociologists by E.B. Taylor in 1871. He defined the term as "that complex whole which includes knowledge, belief, art, law, morals, customs and any other capabilities and habits acquired by man as a member of society" (p. 1 in Barnouw, 1979). Since then, it has been estimated that approximately 175 definitions of culture have been formulated in the social science literature (Lonner & Malpass, 1994). Unfortunately, consensus has not yet been reached on a definition. Culture is obviously a central concept in the field of cross-cultural psychology, and for this reason a clear definition is needed. Earlier cross-cultural psychologists accepted the definitions proposed by anthropologists, and the most common is the definition by Kroeber and Kluckhohn (1952):

Culture consists of patterns, explicit and implicit, of and for behavior acquired and transmitted by symbols, constituting the distinctive achievements of human groups including the embodiments in artifacts; the essential core of culture consist of traditional (i.e. derived and selected) ideas and especially their attached values; culture systems may, on the one hand, be considered as a course of product or action, and on the other as conditioning elements of further action (p. 181).

This definition is a rather lengthy, and the definition accepted by Triandis (1980) was the one by Herskovitz (1948): "Culture is the man-made part of the human environment" (p. 7).

In 1984 Rohner reviewed numerous definitions of culture in the anthropological literature, outlined the perceived problems and urged that cross-cultural psychologists use a tight concept of culture and develop a shared sentiment about the concept of culture. He proposed the following definition:

...the totality of equivalent and complementary learned meanings maintained by a human population, or by identifiable segments of a population, and transmitted from one generation to the next (Rohner, 1984, pp.119-120).

Jahoda (1984) claimed that Rohner's emphasis on meanings was not necessary because of the restrictions that they necessarily imply. He reiterated his recommendations for the development of an empirical definition. Segall (1986), after reviewing literature in the field of cross-cultural psychology, found no adequate definition, but concluded that culture *per se* is not a variable as very few research reports explain a behaviour as a product of culture.

Later definitions became tighter and much shorter. Berry *et al.* (1992) defined culture as "the shared way of a group of people" (p. 1). Smith and Bond (1993) viewed culture as a "relatively organized system of shared meanings" (p. 36).

It appears as if the two latter definitions are acceptable and could be combined for the purpose of this research:

Culture is a relatively organized system of meanings shared by a group of people.

Rohner (1984) also proposed that a distinction be made between the concepts of culture and social systems. A social system is defined in terms of behaviours found within a specific culture as the behaviours of individuals are not always consistent with their stated attitudes. He also discussed the concept of society, and acknowledged the degree to which social systems and culture are interrelated. Society is defined as "the largest unit of a territorially bounded, multi-generational population, recruited largely through sexual reproduction and organized through a common culture and a common social system" (pp. 36-37).

2.7.2 Ethnicity

As discussed in the definition of cross-cultural psychology, ethnic psychology is becoming increasingly popular and important, and it is an integral part of cross-cultural psychology.

This is so as most societies do not contain a single cultural tradition, but are constituted of cultural groups interacting in different ways in a larger national framework. These plural societies originated because of a number of historical factors such as colonization, migration and nation building (Berry *et al.*, 1992).

These groups usually distinguish themselves from others on the basis of ethnicity. Berry *et al.* (1992) referred to these groups as ethnocultural groups. In an earlier article (1979) he referred to them as ethunits. Triandis (1980) referred to them as cultunits and accepted Naroll's definition of cultunits as "people who are domestic speakers of a common dialect language and who belong either to the same state or the same contact group (1970, p. 248).

Irrespective of what these cultural groups are called, they distinguish themselves on the basis of ethnicity. Since there is no universally accepted definition of the term as shown by Isajiw (1974), the definition of Eaton (1980) appears to be sufficiently comprehensive and general to be accepted:

Ethnic status is defined as an easily identifiable characteristic that implies a common cultural history with others possessing the same characteristic. The most common ethnic "identifiers" are race, religion, country of origin, language, and/or cultural background. Ethnic status is an ascribed status...(p. 160).

As Berry *et al.* (1992) explained, any definition must include an objective and subjective facet. The objective facet refers to descent from an earlier cultural group (being offspring and derivative), and the subjective facet refers to an attachment to, or sense of identity with, the group.

2.8 Conclusion

In this chapter an attempt was made to discuss the discipline of cross-cultural psychology. It was shown that the discipline draws heavily on other disciplines such as anthropology, ecology, sociology, linguistics and biology. Although psychologists developed the discipline relatively late, they have shaped and moulded it to what it is today i.e. an important, growing field. Nonetheless, it is still grappling with conceptual difficulties, ethnocentrism, and finding a place at academic institutions. To provide the discipline with more depth and breadth of meaning, Price-Williams (1980), and more recently Schweder and Sullivan (1993), have advocated the idea of a cultural psychology. This refers to an interdisciplinary subfield at the interface of anthropology, psychology and linguistics. The aim is to examine ethnic and cultural sources of psychological diversity in emotional and somatic functioning, self-organisation, social cognition, moral evaluation and human development. The success of this subfield will depend on whether anthropologists, linguists and psychologists can unite successfully in their research endeavours.

CHAPTER 3

COMPARABILITY OF PERSONALITY TESTS

3.1 Introduction

The issue of comparability of psychological tests has raged in the USA since the 1960's. Although various terms have been used to refer to it e.g. "equivalence", "bias", "invalidity", the attack against the use of tests (especially intelligence tests) has remained fierce and emotional. Since 1968, the Association of Black psychologists and other black groupings have called for a moratorium on the use of psychological tests and cited the following as reasons:

- 1) Minority groups in the USA are not exposed to the kind of material involved in the tests. The test content is geared toward white middle-class homes, values and knowledge. In other words, psychological tests measure different constructs when used for groups other than the white middle class culture that the test was largely based on;
- 2) Minority groups are not adequately represented in standardisation samples used for NE
normative data;
- 3) White examiners might intimidate minority testees because the former only speak standard English;
- 4) As a result of bias in psychological tests, minorities, who are already at a disadvantage because of the past, are further disadvantaged because they are placed in low level jobs; and

- 5) Psychological tests do not predict relevant behaviour for minority groups as successfully as it may for whites (Reynolds & Brown, 1984).

In the South African context, many of these accusations might also be applicable as the historically disadvantaged groups in South Africa suffered similar discrimination as the minority groups in the USA. Taylor (1987) maintained that because the social structure in South Africa had been based on race for decades, there is a strong possibility that race correlates with other variables such as socio-economic status and education to a greater extent than most other countries. Also, the majority of tests that are used in South Africa are either imported from the USA or are based on white South African norms.

According to Taylor and Boeyens (1990), an extensive programme of research has been started in order to investigate the above accusations. At first the focus was exclusively on cognitive tests because of their prominence in selection batteries. However, these researchers soon realized that the issue of comparability was complex and that simple methods could not be used to test for comparability. This issue is further complicated by the proliferation of related and often overlapping terminology that has developed as a result of parallel advances in the field of assessment. Concepts such as "bias", "fairness", "equivalence", and "culture-loadedness" have all been used as synonyms for comparability (Verster; 1987).

In South Africa, the first thorough study of bias took place in the domain of intelligence tests where Owen (1986) investigated test and item bias using the Senior Aptitude Test, Mechanical

Insight Test, and the Scholastic Proficiency test on black, white, coloured and Indian subjects. In 1987, Taylor wrote a report on the responsibilities of test users and publishers with regard to bias and fairness of tests. Since then a number of intelligence tests has been shown to be biased (Holburn, 1992; Owen, 1986, 1989a; 1989b; Taylor & Radford, 1986) but are still used in South Africa. Research on the non-comparability of personality tests is almost non-existent in South Africa.

In this chapter the issue of comparability of psychological tests will be discussed by focusing on the underlying logic of comparison; defining comparability; defining bias; indicating the relationship between bias and comparability; and concentrating on research conducted on the cross-cultural comparability of personality tests.

3.2 Comparability

3.2.1 The logic of comparison

According to Poortinga (1989), a comparison between, for example two people, A and B can be deceptive for two important reasons. First, the attribute of A in terms of which the comparison is made might not be the same as B's, e.g. comparing the length of A with the weight of B. Secondly, scale units of A and B might not be the same, e.g. comparing A's weight in pounds and B's in kilograms. To make meaningful comparisons it is therefore essential that the variable that forms the scale has identical properties for the persons or groups

to be compared. This common scale can be an observable scale-such as reaction time, or job performance or an unobservable scale such-as a particular personality trait or ability. He postulated that any unobservable variable i.e. construct that is used to make comparisons forms an identical scale across cultures, called a comparison scale.

Such a comparison also presupposes that information that is relevant to the variable of interest is available. Data can be obtained by means of tests, questionnaires, interviews or observations. This information is referred to as the measurement scale. To make meaningful comparisons, the relationship between the measurement scale in each group with the comparison scale that is of interest must be determined. Often this relationship is not the same in different cultural groups. The following formal definition of this relationship was proposed:

Data are equivalent when an observed cross-cultural difference on a measurement scale is matched by a corresponding difference on a comparison scale (Poortinga, 1989, p. 738).

Because this relationship is often not the same, e.g. the concept of intelligence is often viewed differently in different groups. This implies that the relationship between the concept (comparison scale) and intelligence tests (measurement scale) is not the same in two groups. Thus, the relationship between the measurement and the theoretical concept often remains unclear and unspecified. The measurement scale is then seen as directly representing the concept. Importantly then, the measurement scale is taken as a comparison scale and because

of that the measurement scale must be identical across cultures.

Although a bit complicated, it serves as a useful basis for the understanding of comparability. However, to understand it fully, it is important to define the term as comprehensively as possibly.

3.2.2 Defining comparability

Berry (1980) claimed that, in order to compare two phenomena, it is necessary that they share some feature and that they should differ on some feature. In other words, it must be possible to place two phenomena on a single dimension so that they can be judged validly in relation to each other, and for this judgement to be valid they must not be identical in all aspects. This first idea was originally referred to as "dimensional identity" by Frijda and Jahoda (1966), when they stressed the importance of describing individuals from two different cultures by means of identical category systems. When such dimensional identity is demonstrated, comparability is established.

This type of dimensional identity can be achieved by looking for equivalence or by searching for an underlying universal. There appears to be some tension between the quest for dimensional identity, universals and equivalence on the one hand, and the need for variation in the observed phenomenon, on the other. The resolution of this tension lies in the level of analysis i.e. on the one level, identified by structure or function, identity can exist, on the other,

usually identified by observable phenomena, there can still be variation (Berry, 1980).

Different researchers have identified different comparability concepts that make the description of the concept quite confusing. According to Webster's Comprehensive Dictionary (1992), comparable means "capable of comparison" and "worthy of comparison" (p. 266). Researchers define comparability more comprehensively by identifying different categories. Van der Vijver and Poortinga (1982) identify four categories of comparability or equivalence that can be placed along a dimension of experimental rigour or strictness i.e. conceptual, functional, metric, and scalar equivalence. Conceptual equivalence refers to theoretical concepts at a high level of abstraction. Examples are constructs such as "intelligence" and "adaptability", when the meaning of these concepts is not further operationally specified. It is impossible to make psychologically meaningful comparisons between conceptual universals in different cultures. Functional equivalence refers to concepts that have been operationally defined, even though they might differ across cultures. It is important that construct validity be demonstrated. The use of an identical method is not a prerequisite, as long as the validity of the measurements across cultures in respect of the same construct has been clearly established. Rigid testing of hypotheses becomes possible. To investigate functional equivalence, correlational and factor analytic studies are used. Metric equivalence refers to concepts that have the same metric across cultures, although the scale may have a different origin in each culture. Examples which can be used to demonstrate the notion are the Celsius scale and the Kelvin scale. Even though cross-cultural score comparisons of absolute magnitude may be meaningless, intracultural score differences can be compared across cultures, making sure there is a common metric. This is applicable in studies in which relative, rather than absolute, differences between cultures have been

investigated. Metric equivalence also refers to the measurement of concepts that have to show an equal metric and equal scale origin in each of the cultures concerned. Differences between the means in the performance of culturally different groups on a scale that is presumed strictly equivalent can be taken as falsifying the hypothesis that the construct has strict scalar equivalence. There is a close relationship between the psychometric requirements discussed and the four levels of measurement viz. nominal, ordinal, interval and ratio.

Poortinga (1971) referred to another form of equivalence, similar to scalar equivalence which he called item equivalence. This is narrower than scalar equivalence and it is used to investigate the items that make up a particular scale. If performance on all the items is found to be comparable, then the scale can be deemed comparable. Unfortunately, if all items are incomparable (i.e. pervasive incomparability) it is not possible to remove incomparability from individual items as the techniques that are used to detect item incomparability rely on the other items in the scale as a reference. Poortinga and van der Vijver (1987) go further and suggests that when examining cross-cultural differences, it is important to consider and measure the influence of context variables (e.g. degree of urbanization, socio-economic status, level of education) on differences in test scores.

Berry (1980), on the other hand, referred to functional, conceptual and metric equivalence. Functional equivalence exists when more than one behaviour (in different cultures) are related to similar problems. Conceptual equivalence exists when the meaning of research materials (e.g. stimuli, concepts), or of behaviour, is equivalent before comparison is possible. Both functional

and conceptual equivalence are a precondition for comparison. Two examples of the operationalisation of this requirement is forward and back translation of words and semantic differential analysis. Metric equivalence exists when the psychometric properties of two or more sets of data from two or more cultural groups show the same structure. This is evident when statistical relationships are constant among independent and dependent variables, and when statistical relationships among dependent variables have the same patterns before comparisons are made. This type of equivalence can be established only after the data have been collected and analysed. It is only once the three forms which were discussed in the preceding section have been established, and comparability has been shown to exist, that it is possible to claim that construct validity has been demonstrated across the cultural groups in question.

If one looks at the comparability concepts identified by Berry (1980), Poortinga (1971), and Poortinga and Van der Vijver (1982), there seem to be an overlap on the one hand and definite differences on the other hand. First, Berry's (1980) definition of conceptual comparability is similar to Van der Vijver and Poortinga's (1980) functional comparability. Secondly, Berry's (1980) definition of metric equivalence is equal to Poortinga and van der Vijver's (1982) scalar equivalence. For the sake of clarity, the definition of comparability as presented by Poortinga (1971) and Poortinga and Van der Vijver (1982) will be accepted for the purposes of this investigation.

There is a number of statistical techniques that can be used to analyse comparability. However, because they are mostly described in the literature as the analysis of test bias, it is important to define the concept "bias", and to show the relationship between bias and comparability.

3.3 Bias

The word bias has several meanings, depending on an individual's point of view. According to Webster's Comprehensive Dictionary (1992) bias refers to "prejudice" and "to influence or effect unduly or unfairly" (p. 135). In a statistical sense, bias refers to "constant or systematic error, as opposed to chance or random error, in the estimation of some value" (Reynolds, 1982, p. 199). According to Reynolds and Brown (1984), these two definitions are sometimes entwined, but the second definition should be used if bias is to be discussed in a scientific manner.

Some authors use the term bias and fairness interchangeably (e.g. Mercer, 1984; Shephard, 1984), while others (e.g. Jensen, 1980, Taylor, 1987) viewed the terms as having different meanings. Shephard (1984) claimed that the everyday understanding of the terms does not convey a difference, and Mercer (1984) would rather integrate the term into a single model. Taylor (1987) said that fairness only comes into consideration when psychological test scores are used to make selection decisions (i.e. in education and employment). In this investigation, Taylor's (1987) view will be adopted, using the term fairness only when selection and promotion issues are at stake. This view was also adopted by Abrahams (1992) who investigated the existence of item bias in the Senior Aptitude Test.

According to Jensen (1980), bias, in psychometric terms, refers to the constant errors in predictive validity or the construct validity of the test scores of individuals that are associated

with the group membership of those individuals. In other words, the word "bias" refers to more than one concept. A number of other authors (e.g. Linn, 1984; Reynolds & Brown, 1984, Shephard, 1984) also view bias as a type of invalidity, and bias is researched from a validity point of view. In 1971, Cronbach (in Cole, 1981) said:

.. narrowly considered, validation is the process of examining the accuracy of a specific prediction or inference made from the test score ... More broadly, validation examines the soundness of all the interpretations of the test (p. 1068).

} NB

In other words, cultural bias can occur in different aspects of validity viz. predictive, construct, and content validity. Flaughner (1978) goes further and adds additional bias dimensions viz. bias in sexism, bias in selection, bias as the wrong criterion, and test bias as a result of different test environments. Because bias refers to the systematic error in different types of validity, content, construct and predictive validity will be further discussed.

3.3.1 Bias in predictive validity

A great deal of research that has been conducted to date examined the predictive validity of intelligence tests. According to Cleary (in Reynolds, 1984):

A test is considered biased with respect to predictive validity when the inference drawn from the test score is not made with the smallest feasible random error or if there is a constant error in inference or prediction as a function of group membership (p. 216).

When examining this type of bias, the correlation between the psychological test and a criterion is examined. This type of bias is also referred to as selection bias. Various models have been designed to look for evidence of predictive bias. According to Reynolds and Brown (1984), one must decide before selecting a model whether the ultimate goal is equality of opportunity, equality of outcome, or representative equality. Equality of opportunity is a democratic model and it is based on ability. Equality of outcome is based on ability deficits and programmes such as remedial and educational teaching are based on this model. Representative equality is based on the selection of a proportionate number of people and is determined by calculating the numerical representations of subgroups in the population. The ultimate model chosen will depend on the value system and goals of society. The selection model does not focus on the test itself but on the decision-making system and are not internal to the issue of test bias (Reynolds, 1982). Various selection models have been proposed by Jensen (1980), Lautenshlager (1986), and Petersen and Novic (1976).

Although some studies on predictive bias in the USA and elsewhere (e.g. Cleary, 1968; Drasgrow, 1987; Zeidner, 1987) showed no existence of such bias, one should be wary of assuming that these findings are necessarily applicable to the South African situation. In 1986, Taylor and Radford used the Reading Comprehension Test and the Blox Test as predictors and investigated the relationship between test results and the academic performance of black and white Technikon students in South Africa. They found that predictive bias existed as the regression line for both predictors for whites was below that for blacks.

Closely related to the predictive validity of tests is the criterion problem. According to Flaughner (1978) and Shephard (1982), the assumption is made that the criterion is unbiased in all predictive validity studies. They claim that the possibility exists that the criterion chosen is biased e.g., supervisor's performance ratings. This has the following implications for test bias studies (Flaughner, 1978). First, the typical difference in reliability between the predictor and criterion often causes the mean difference between groups to be greater on the criterion which can be wrongly assessed as bias in the predictor. Secondly, if the traditional criterion measures are accepted blindly for research purposes and an attempt is made to maximise the correlation of an academic achievement test with this type of criterion, these tests can easily be seen as biased as no attempt has been made to improve the criterion. Thirdly, the criterion problem was the reason why many legal battles have taken place in the USA. It is essential that the criterion be thoroughly examined before it is used in any predictive validity study.

3.3.2 Bias in construct validity

Another major field of test bias, is the construct validity of intelligence tests. Reynolds (1982) defines bias in construct validity as follows:

Bias exists with regard to construct validity when a test is shown to measure different hypothetical traits (psychological constructs) for one group than another or to measure the same trait but with differing degrees of accuracy (p. 200).

Bias in construct validity occurs when a psychological test measures different constructs in different groups, even though the assumption is made that the same constructs are measured (Cole, 1981). Reynolds (1982) believed that construct validity is probably the most complex validity conceptualization and requires more inference and logical argument than the other types of validity. This type of research takes place in the absence of an external criterion (Owen, 1989a).

Various methods are employed to examine potential bias in psychological tests. These methods include the following: factor analytic methods, reliability, rank order of item difficulty and multitrait-multimethod validation (Reynolds, 1982). In 1989, Owen investigated the potential bias in the construct validity of the Junior Aptitude Test in South Africa. He compared the scores of white, Indian and black pupils and found that there was no evidence of construct bias in the test. Taylor (1990) compared the performance of white and black groups on the South African Personality Questionnaire and found reasonable support for the construct comparability of two out of the five scales.

3.3.3 Bias in Content Validity

According to Reynolds and Brown (1984), bias in the item content is a common and constant charge against the use of standardised tests for minorities in the USA. This is also referred to as item bias.

Reynolds (1982) defined content bias for aptitude tests as follows:

An item or subscale of a test is considered to be biased in content when it is demonstrated to be relatively more difficult for members of one group than another when the general ability level of the group compared is held constant and no reasonable theoretical rationale exists to explain group differences on the item (or subscale) in question (p. 188).

However, the literature refers to item bias rather than to bias in the content validity. To detect item bias two approaches have been established, i.e. the conditional and unconditional approach. An unconditional approach, according to Cleary and Hilton (1968) refers to a approach where an item in a test is biased against (or for) members of a particular (e.g. minority) group, and when this group obtain a mean score that is different from the mean score of another group, by more than the latter group's performance on other items of the scale. This is referred to as unconditional because group differences are evaluated in an overall way with scores of individuals only being taken into account to calculate group means (Owen, 1989a; Taylor & Boeyens, 1990). The problem with this method is that it assumes that all individuals have equal abilities or that they have had the opportunity to develop abilities equally. Jensen (1980) referred to this assumption as the egalitarian fallacy.

According to Humphreys (1986), item bias is increasingly being defined in terms of item response theory and methodology. This is viewed as a conditional approach as only testees with

similar ability levels are compared (Owen, 1989a; Taylor & Boeyens, 1990).

Humphreys (1986) defined the unconditional approach as follows:

When one holds constant the score on the latent trait (θ), an item is said to be biased if the probability of a right answer differs from group to group (p. 327).

Although Humphreys' definition was formulated with ability tests in mind, its logic can be transferred to the personality domain, where the correctness of a response is not at stake (Taylor & Boeyens, 1990). The second definition is accepted by most researchers (e.g. Marascuilo & Slaughter, 1981; Shephard, 1982; Van der Vlier, Mellenberg, Ader & Wijn, 1984) and is also reflected in the definition of item bias based on the item response theory:

... an item is generally considered unbiased if equally able members of different groups have unequal chances of success on the item (Subkoviak, Mack, Ironson & Craig in Owen, 1989a, p. 40).

Various techniques have been developed to detect item bias in psychological tests. There are basically two broad approaches viz. statistical methods and judgemental methods. These approaches are not mutually exclusive as both methods can be used to detect the existence of biased items. The use of judgemental methods is not enough to detect and eliminate items that

are biased. Statistical methods are needed to detect biased items that cannot be detected by subjective means. In recent years a number of statistical methods have been developed to detect items that are biased. Ironson (1982) maintained that these techniques differ in their conceptualization of bias, the cost involved, sample size requirements, statistical complexity, and theoretical soundness. A major problem with the use of these methods is that they cannot detect pervasive bias because they lack an internal criterion. The following techniques are used to detect biased items: discrimination value of the item, rank order of item difficulty values, transformed item difficulty values, analysis of variance, analysis of the responses to item detractors, chi-square, item characteristic curve, log-linear and logit methods (Owen, 1989a; Taylor, 1989). Because these methods have certain strengths and weaknesses, Taylor (1987) proposes the use of the multimethod and multisample approach. In other words using more than one bias detection method and more than one sample group to eliminate the possibility of making false positive and false negative errors.

Jensen (1980) differs from many researchers as he believes that the inspection of items is irrelevant and unimportant. Taylor (1987), on the other hand, regards the detection of item bias as the most important task of the test constructor. In 1987, Owen investigated the existence of item bias in the Junior Aptitude Test and found many items that are biased. Holburn (1992) found the Mechanical Comprehension test and the High level and Intermediate Mental Alertness tests (which form part of the High level and Intermediate batteries respectively) unsuitable for use in a multi-cultural environment. She reached the following conclusion "research has shown that item bias does seem to exist in South African tests" (1992, p. 6).

According to Reynolds and Brown (1992), the biggest problem encountered when using the validity conceptualization to test bias, is that one can lose sight of the larger picture as a result of fragmentation of the large context of test validity, losing sight of the larger picture. This can lead to a narrow examination of potential bias in a test. To counter this problem, Cronbach (1980) in Cole (1981) suggest that the different validity approaches to the study of bias should be placed under the construct validity umbrella. Cole (1981), on the other hand, viewed these different methods as different types of information relevant to a better understanding of a test score. This suggests that no single bias approach should stand alone and various types of information (e.g. judgemental procedures, statistical analysis) provide different types of evidence. Nonetheless, many researchers continue to use the validity conceptualization approach for clarity and convenience.

3.4 Relationship between comparability and bias

Because bias and comparability are such similar concepts it is important to relate these concepts to one another. Predictive bias is not really related to comparability as an external criterion is used to detect bias. Research into the functional equivalence of a test is largely cross-cultural construct validity research. Scalar and item equivalence are related to content validity or more specifically to item bias studies (Taylor, 1987; Taylor & Boeyens, 1990). Functional, scalar and item equivalence are most frequently investigated and, according to Hui and Triandis (1983), they should be used in any comparability study.

In this investigation, both the functional and scalar/item comparability will be determined for the 16PF. In addition, the influence of context variables on the test scores will be analysed.

Although limited in South Africa, quite a substantial amount of research on the cross-cultural comparability of personality tests has taken place. In the next section, this research will be outlined by focusing on: research in general, research conducted on the 16PF, and research in South Africa.

3.5 Research on the cross-cultural comparability of personality tests

Personality tests developed in the West, particularly the USA, are used in European, African and Middle Eastern countries. Research on the cross-cultural comparability of these tests has yielded mixed results. A great deal of research indicates that these tests are inadequate, while other research indicates that they can be used successfully across cultures.

The following authors reported differences when the tests were used across cultures. These studies differed in the way comparability was determined. In other words, with certain studies, comparability was more vigorously determined than others.

Studies by Kline (1975), Khatena, Bledsoe and Zetenyi (1975), Stetson and Wagner (1980), and Whol *et al.* (1970) compared different cultural groups on various tests by calculating means and standard deviations only. Differences were found on the Pinmen Test, Something about Myself

Inventory, Hand Test, and Test of Social Insight respectively. Similar studies were conducted by Chui (1990) and Irfani (1977), using the Pen Personality Inventory (PEN) and the Edwards Personal Preference Schedule respectively. The data was analysed for the different cultural groups, and males and females. However, these results must be used with caution as they were very superficially done (descriptive data analysis only).

In the following studies cross-cultural comparability was much more vigorously determined. In the studies by Hosch and Marchioni (1986), Kuo and Marcello (1977), Loo and Shiomi (1982), and Iwawaki, Eysenck and Eysenck (1977) means, standard deviations, and factor analysis (principal components solutions and varimax rotations) were calculated for the various cultural groups, and in certain cases, males and females separately.

In the study by Horch and Marchioni (1986), they administered the translated Spanish version of the Self-Monitoring Scale to 138 Mexican, 154 Mexican-American, and 145 Anglo-Americans. Although they found no significant differences between the groups in terms of means and standard deviations, the factor structure differed greatly. However, no indication was given of the mean ages, socio-economic status (SES), level of education, and the gender composition of the people in the sample. In addition, no scale reliabilities were given.

Kuo and Marsello (1977) found similar results when they administered the Mach IV Scale to 64 Chinese (32 males and 32 females) and 64 white American College students in Hawaii (32 males and 32 females). The mean age of the Chinese sample was 26,2 and the Americans 25,6. The

samples were matched for age, education and social desirability. However, the data was not analysed separately for males and females, nor were scale reliabilities given.

The most comprehensive studies were conducted by Loo and Shiomi (1982) and Iwawaki *et al.* (1977). Loo and Shiomi (1982) administered the Eysenck Personality Inventory (EPI) to undergraduate Japanese (131 males and 127 females) and Canadian (142 male and 136 females) with ages ranging between 18 to 25. Means, standard deviations, internal reliabilities, scale intercorrelations, and factor analysis were determined for the Japanese, Canadian, male, and female sub-samples. Significant cross-cultural and gender mean differences were found and the factor analysis showed support for two of the four factors. Iwawaki *et al.* (1977) used the same methodology and found very similar results when they administered the PEN (an earlier version of the EPI) to Japanese and English schoolchildren, psychotic patients and college students. However, in both these studies, no indication was given of the SES of the groups and related statistics.

Differences were also found when the Locus of Control was measured cross-culturally (Niles, 1981; Nagelschmidt & Jacob, 1977; Parsons & Schneider, 1974; Ryckman, Posen & Kulberg, 1978; Reimanis, 1977). The majority of the researchers used Rotter's Internality-Externality Locus of Control Scale (except Ryckman *et al.* (1978) in studies conducted at colleges or universities, where Nigerians and Americans; Brazilians and norm group; Eastern, Western and Middle Eastern Societies; Americans and Rhodesians; and Sri-Lankans and the norm group were compared. Reimanis (1977), Parsons and Schneider (1974) calculated means and standard

deviations for males and females and the various cultural groups. Although the samples were matched for age and education, no information on the SES of the sample was given. Also, no factor analysis nor reliabilities were presented.

Nagelschmidt and Jacob (1977), Rychman (1978), and Niles (1981) determined cross-cultural comparability more vigorously as they determined means, standard deviations, and factor analysis (principal components solutions and varimax rotations) between cultural groups. However, although all the researchers found differences cross-culturally, no indications were given of the possible gender differences or SES differences. In fact, Hui (1982) reviewed 70 research articles on locus of control and concluded:

Findings of cross-cultural and cross-ethnic similarities and differences are generally inconsistent and inconclusive (p. 301).

On the other hand, research exists that supports the use of personality tests cross-culturally. Studies by Ravinder (1986), Wilson *et al.* (1988), and Hammond (1987) analysed the data by comparing different cultural groups by calculating frequencies and percentages of scores for Madras (India) and Australian males and females; correlation studies for black and white Zimbabweans; and various other descriptive statistics for Irish males and females respectively. The results supported the cross-cultural comparability of the EPQ, Loewinger's Sentence Completion Test of Ego Development, and the UCLA Loneliness Test. However, these results must be used with caution as they were very superficially done. No indication was given of the

socio-economic status (SES) of the sample and no factor analysis nor scale reliabilities were determined.

In the following studies, comparability was more vigorously determined. In all cases, means, standard deviations, and factor analysis (mostly principal components solutions and varimax rotations) were conducted. In addition, in certain studies, reliability coefficients and item analysis were determined.

In 1983 Querishi administered the translated Urdu Mitchell Adjective Rating Scale to American (91 females, 110 males) and Pakistani (96 females and 117 males) college and university students. He found a reasonable degree of generality between the groups, although he still cautions against using the instrument cross-culturally. Forbes, Dexter and Comrey (1974) administered the Comrey Personality Scale to 179 New Zealand and 727 American (norm group) students with a mean age of 20,72. They found stability in the structure between the norm group and the New Zealand sample. Hentschel and Holley (1977) administered the Guilford-Zimmerman Temperament Survey (Swedish translation) to 170 Swedish subjects. The following techniques were used: item analysis, means, standard deviations, reliabilities, intercorrelations of scales, and factor analysis. They concluded that the test is comparable across the two cultures but also cautions users of the test. However, with the above studies, no indication was given of any possible gender differences nor SES differences.

The most comprehensive studies were conducted by Hanin, Eysenck, Eysenck and Barrett (1991) and Noller *et al.* (1988). Hanin *et al.* (1991) administered the Russian EPQ to Russian subjects (males 538, females 529) with a mean age of 34,9 for females and 35,4 for males. Means and standard deviations were calculated separately for Russians, English (norm group), males, and females. Factor analyses was conducted separately for the Russian and English samples. The results indicated that the gender differences found were in line with other similar studies and the factor analysis showed very similar factor structures for the two groups.

Noller *et al.* (1988) administered the Comrey Personality Scale to 669 Australians (326 males and 343 females) with a mean age of 39,5. The sample was further divided into working class and middle class. Means and standard deviations were conducted for males and females separately and factor analysis was conducted on the total group. Results indicated that the factor structure remained the same even though differences existed in ages, social class and culture.

Thus, differences and support were given by various researchers for the cross-cultural comparability of the tests discussed above. However, even when researchers prove comparability the findings are still disputed by others. Researchers such as Bijnen, Van der Net and Poortinga (1986) and Bijnen and Poortinga (1988) questioned the conclusions of Eysenck and associates concerning the cross-cultural applicability of the EPI as it is argued that considerable bias cannot be ruled out completely.

Even within the USA, research on the cross-cultural application of personality tests has shown mixed results. For example, the Minnesota Multiphasic Personality Inventory (MMPI), a very popular test in the USA, has come in for heavy criticism for the problems encountered when the test is used on different ethnic groups. Reh (1990) compared the MMPI profiles obtained from Anglo-Americans and Asian-Americans and found that differences existed between the two groups. Gynther (1979), after summarizing 18 research articles, concluded that definite differences exist between the MMPIs of blacks and whites and that this reflects differences in values and perception. He also indicated that evidence suggested that black employees were placed at a disadvantage when the MMPI was used for selection. Holland (1979) found ethnic group differences when he compared the factor structures of black, white and Mexican adult offenders and found different profile patterns. Hibbs, Kobos and Konzales (1979) went further and studied the effects of ethnicity, gender and age on MMPI profiles. They found that the differences between Mexican-Americans and Anglo-Americans could not be attributed to ethnicity alone but rather that the interactions between these variables contributed to the observed difference. The data were analysed by determining means, standard deviations and multiple analyses of variance.

On the other hand, other studies showed no significant differences cross-culturally when administered to different ethnic groups in the USA. For example, after conducting a series of investigations, Dahlstrom *et al.* (1986) concluded that very little bias or distortion exists when the MMPI was used for blacks in mental health settings. Dahlstrom (1986) also conducted a survey of the research on the MMPI with various minority groups (Asian-Americans, Native

Americans, Hispanic Americans) but concluded that a great deal of work was still required before the adequacy of the MMPI for use with these groups could be ascertained.

Although the studies differed in the way comparability was determined i.e. some were more vigorously determined than others, it is clear that very mixed results were determined in terms of the cross-cultural comparability of personality tests, even within the USA.

Where differences existed, there are suggestions that the unfavourable status of the minority groups in the USA (viz. lower economic and educational levels) results in a great deal of stress on individuals. This is reflected in the scores obtained when minority and majority groups are more evenly matched in terms of those variables. Thus, it should not automatically be assumed that the test is not comparable when large differences are found (Dahlstrom, 1986).

3.5.1 Cross-cultural research on the 16PF

As with other personality tests, mixed results have been obtained when using the 16PF cross-culturally. However, a number of researchers have found major differences when the test was administered cross-culturally. Once again, these studies differed in the way comparability was determined.

The weakest study were conducted by Mcquaid (1967) who administered the 16PF to 1700 Scottish subjects divided into eight groups. The data were calculated by determining means and

standard deviations and he found that the Scottish subjects obtained higher anxiety scores and lower introversion scores than the American norm group. His study confirmed the results found by Cattell and Warburton (1966). However, no indication was given of the mean ages, SES, level of education, and gender composition of the sample. In addition, merely recording the descriptive data is not sufficient to make conclusions.

The following studies (De Andrade *et al.*, 1969; Mehryar, 1972; Meredith, 1966; Thompson & Dayries, 1975; Vaughn & Cattell, 1976), also determined comparability by descriptive statistics only, but more biographical information was given and the results were analysed separately for males and females. De Andrade *et al.* (1969) administered a Spanish version of the test to 1325 (770 males and 555 females) Brazilian university students with a mean age of 24. The results were compared to the American norms and significant differences were found between genders and cultures. However, these results are questionable as the national language of Brazil is Portuguese, and not Spanish. No justification was given by the authors for the use of a Spanish questionnaire.

Mehryar (1972) administered a Persian translation to 508 (250 females and 339 males) Iranian secondary school students, with an mean age of 18. The data were analysed with respect to gender and academic specialisation, and compared with American norms. Significant gender differences were found, but less differences were found with respect to academic specialisation. He concluded that many of the observed differences were in the expected direction, judging from his day-to-day experiences of the Iranian people, and this tentatively supported the validity of

the 16PF. However, such conclusions can only be made if validity is more vigorously determined.

Meredith (1966) administered the test to 154 Japanese Americans (males 82, females 72) and 60 Caucasian Americans (males 30, females 30) at the University of Hawaii. Significant gender and cultural differences were found. Thompson and Dyaries (1975) administered the test to 20 American and 45 New Zealand University students (with education majors) and found significant cross-cultural differences.

The 16PF was administered by Vaughn and Cattell (1976) to 3115 American (1464 males and 1651 girls) and 597 New Zealand (300 males and 297 females) high school students with a mean age of 18. Significant gender and cultural differences were found for the first and second-order factors.

In the following studies comparability was much more vigorously determined. In the majority of studies, the researchers attempted to confirm the factor structure found by Cattell and conducted factor analysis (mostly principal components solutions, scree tests, and varimax rotations). In addition, in certain studies, means and standard deviations were also reflected.

Golden (1978) administered the test in Hawaii to American students with Japanese ancestry (117) and American students with European ancestry (100). The sample consisted of 113 females and 104 males, with a mean age of 20. The results showed that the Americans with the

Japanese ancestry had a different factor structure than the other group. The factor structure of the sample with European ancestry did not differ from previous studies reported by Cattell.

In 1974 Adcock administered the test to 164 New Zealand university students (74 females and 90 males). Factor analytic studies indicated that the test has weaknesses and that many items were loading on related factors rather than those for which they were designed. In 1977 Adcock and Adcock analysed the results of a large New Zealand sample (1889 men). Using the computer program, BMD/08, they found that while the test confirmed the general factor structure of the test, it was not regarded as an adequate measure in its present form.

In 1974, Phillip examined the second-order factor structure of the 16PF by administering the test to 284 British subjects, and compared it with Cattell's data. The sample was composed of 105 males and 179 females, with fairly high SES. After analysing the data separately for men and women (means, standard deviations, factor analysis), he concluded that the cross-cultural and cross-gender stability cannot be substantiated. Cattell and Warburton (1966) also administered the test to 204 British subjects and 604 American students. They found that significant differences occurred on the first and second-order factors. Although more in detail statistical analysis took place, no indication was given of the SES and gender statistics of the sample.

In the following studies, researchers found the same or similar factor structure when they administered the test to different cultural groups. In the majority of these studies, means, standard deviations, and factor analysis (mostly principal components solutions, scree tests, and

varimax rotations) were computed. Zak (1976) administered the Hebrew version of the test to a group of 514 university applicants. The results showed that the test had the same properties as had been found in the original American sample.

In 1976 an Arabic version of the test was administered to a group of Egyptian students and the results supported the broader second-order factors (Abdel-Khalek, Ibrahim & Budek, 1986). Nowakowska (1974) translated the 16PF into Polish and administered the test to 240 Polish subjects (100 males, 100 females) subjects, and then compared the findings with scores obtained by Cattell. She found similar reliabilities and the second order factor analysis also showed very similar patterns.

In 1965, a Japanese version of the test was administered to 300 Japanese university students and the results were compared to 117 American students. Highly congruent structures were determined between the groups, and this suggested that source traits have high universality. However, on factor levels significant differences were found. However, although more in detail statistical analysis took place, no indication was given of the SES, gender composition and comparative statistics of the sample (Tsuijioka & Cattell).

The research on the 16PF shows very clearly that in many instances, scores are not comparable cross-culturally. For example, studies in New Zealand clearly indicate that the test is not suitable for a New Zealand population. The test seems to be unsuitable in a western country with a largely western population which is ostensibly very similar to that of the United States.

In South Africa, with its multicultural population which is not fully westernized, and suffering from the after-effects of apartheid, there is a great possibility that the test does not measure the same constructs as found in the USA. In fact, in their 1992 handbook, Cattell *et al.* wrote "... highly significant differences have been found cross-culturally on factor levels, related to cultural dynamics..." (p. xxi). Although they state that the 16PF shows that personality structure is essentially universal, they also acknowledge that significant differences exist on source-trait levels and at second-order levels. They further caution that the test can be considered as quite sensitive to cultural differences.

3.5.2 Cross-cultural research on Personality Tests in South Africa

In South Africa, as stated earlier, cross-cultural research on personality tests has not been conducted in any major way. To date, four relevant research articles have been published concerning these issues. In three cases the tests were found to be unsuitable in the South African context. In 1995 Prinsloo and Van Eeden validated the 16PF (SA92) in a cross-cultural context and defined cultural groups on the basis of the home language that they spoke. They conducted factor analysis on the second-order factors and confirmed the structure of the original factors. However, their study only focused on the second-order factors and did not conduct any other analysis. In 1991 Taylor and Boeyens investigated the comparability of the scores of blacks and whites on the South African Personality Questionnaire (SAPQ). This test was developed by Steyn in 1974, on a sample of South African whites. In fact, this instrument was not designed to assess all racial groups in South Africa. Two black and two white samples were

included, and a number of statistical methods were used to analyse the data and to determine item and construct comparability. These methods included: item analysis; tests for the comparability of scale correlation matrices; exploratory and confirmatory factor analysis; iterative logit and transformed item difficulty methods. Modest support for the construct comparability of scales in both white and one black group was found, but the bulk of the questions failed to meet the no-bias or item-total correlation criteria.

Spence (1982), in a study to investigate the characteristics of black guidance teachers, administered the SAPQ and other instruments to black teachers. She found that the alpha coefficients for blacks were far lower than what was required by the test developer. An attempt was made to obtain optimal reliability by removing items with low validity coefficients. However, this still resulted in low reliabilities i.e. 0,68 for the best scale and 0,313 for the worst scale. She concluded that the test was unsuitable for the black sample and questioned the suitability of this instrument for blacks *per se*.

In 1982, White investigated work stress experienced by blacks and whites on South African mines and administered six tests from the USA and measured job satisfaction, anxiety, escapist drinking, and job tension. For the black samples, the tests were translated and administered by an interviewer. Although the researcher conducted a number of item analyses to improve the tests, scale reliabilities remained at an unacceptably low level.

3.6 Conclusion

The issue of comparability of psychological testing in a new South Africa is of utmost importance. Labelling a test as biased or non-comparable without proper research will not solve the problem. Instead we need to thoroughly investigate these charges and to conduct proper research to ascertain whether psychological tests are cross-culturally comparable.

In this chapter, the issue of comparability of psychological testing was discussed. It was shown that the issue of comparability has raged in the USA since the 1960's, but in South Africa the issue was only taken up in the 1980's with scant research till now. Comparability and related concepts such as bias were defined, and methods were mentioned to determine the various kinds of comparability. Also, the relationship between bias and comparability was clarified. Finally, cross-cultural research on personality tests in general, the 16PF in particular, and research conducted in South Africa was presented.

CHAPTER 4

CATTELL'S FACTOR THEORY

4.1 Introduction

Cattell's factor theory is one of many in which an attempt is made to describe the personality of people. The word "personality" originated from the Latin word "persona", associated with ancient Greek theatre. A Greek actor commonly covered his face with a mask, called a "persona". Eventually, the term was used to describe the actor and, later, people in general (Allport, 1937).

However, the origin of the development of personality theories dates back to approximately 460 B.C. with the contributions of classic scholars such as Hippocrates, Plato and Aristotle (Hall & Lindsey, 1970). For example, Aristotle, who believed that there exists a relationship between the body of a person and mental functions such as intelligence, temperament and character, described four temperaments, related to body fluids viz. the choleric, the sanguine, melancholic, and phlegmatic. Each of these temperaments displays its own behaviour patterns e.g. a "choleric", who has an excess of yellow bile, is easily angered and a "sanguine", with an excess of blood, is cheerful and athletic. These early attempts to describe personality were based on the perceived uniformity of behaviour. More recently, Sheldon (1954) proposed that individuals could be classified into one of three types viz. endomorph, mesomorph and ectomorph. An endomorph is a person with a large, soft, round stomach who is gregarious, relaxed and food loving. A mesomorph is strong, athletic and muscular person who is assertive and courageous. An ectomorph is a tall thin person who

is introverted and fearful. Although criticised by many, these ideas, and similar ones, are still being used today by lay people in the form of pseudo-scientific methods to analyse personality such as phrenology, physiognomy, and graphology (Aiken, 1994; Du Toit & Van der Merwe, 1966; Murphy & Davidshofer, 1991; Santrock; 1995).

Since the days of Aristotle, personality has been described in many different ways, by various theorists. For the sake of convenience it can be understood in terms of four broad approaches/perspectives viz. psychoanalytic; behaviourists and social learning; phenomenological and humanistic; and the trait theories. Because the main focus of this chapter is on Cattell's factor theory, this chapter will deal only briefly with the contributions of various trait theorists (Allport, Guilford, and Eysenck).

4.2 Trait Theorists

4.2.1 Allport

Gordon Allport is regarded as the father of trait theory as he was the first person to describe personality as being composed of a number of traits. He began his research on traits by listing 17 953 words in the English dictionary that describe personality. He then reduced them to a smaller list of trait names by using several overarching categories (Allport & Odbert, 1936). Allport's first publication, **Personality traits : Their classification and measurement (1921)**, written in conjunction with his brother Floyd, centred on traits as an integral part of personality theory. In 1924, he presented the first course on personality that was ever taught in the USA, and in 1937 published a book called **Personality: A**

psychological interpretation, that was used as a basic text in the field for 25 years.

He defined personality as follows:

Personality is the dynamic organization within the individual of those psychosocial systems that determine his unique adjustment to his environment (1965, p. 266).

Besides emphasising traits, he also emphasised the concepts **functional autonomy** and **proprium**. Functional autonomy suggests that adult motivation need not be reduced to the motives of childhood. In other words, although the motives of an adult are rooted in the tension-reducing motives of the child, the adult outgrows them and becomes independent of those earlier tension-reducing efforts. For example, what originally began as an effort to reduce hunger, can become a source of motivation. He also made a distinction between **cardinal traits**, **central traits** and **secondary dispositions**. A cardinal trait, although not always present, expresses a disposition that is so important that it influences every act in an individual's life. Central traits refer to a narrower range of dispositions describing an individuals' personality (e.g. assertive, honest) than cardinal traits. Secondary traits represent dispositions that are the least generalized, consistent and conspicuous. He also recognised the importance of the contexts and the way behaviour varies across situations. He maintained that a trait expresses the behaviour of a person in general, and not in specific situations.

Although Allport introduced the concept of traits into personality theory, it appears that he will be remembered more for principles he emphasised and issues he raised as he did not

conduct any substantial research to support his theory (Aiken, 1994; Allport, 1937; 1965; Hall & Lindsey, 1970; Möller, 1995; Pervin, 1980; Santrock, 1995; Zimbardo & Weber, 1994).

4.2.2 Guilford

Another trait theorists who contributed to the field was J.P. Guilford. He is also known for his work on intelligence and creativity, and for his books on statistics and psychometric methods. In 1959 he published a book called **Personality** in which he described his views on personality, strongly emphasising factor analytic studies. He defined personality as follows:

An individual's personality is his unique pattern of traits (1959, p. 5).

He viewed personality as being a hierarchical structure of traits, composed of the broad types at the top, followed by primary traits, to hexes (habits), and, at the bottom, actions (See Figure 4.1). He perceives major subareas within the personality viz. **ability dimensions, temperament dimensions, hormetic dimensions, somatic dimensions, and pathological dimensions**. Somatic and pathological dimensions are used to describe personality disturbances. He organised the dimensions in any area in two or three dimensional matrices. A particular factor is then viewed as a more general function being expressed in a certain area of behaviour. This scheme is similar to Guilford's "structure of the intellect" model, developed in 1956. A result of his research led to the development of the Guilford-Zimmerman Temperament Survey in 1949, which was designed to measure 18 traits (Hall & Lindsey, 1970).

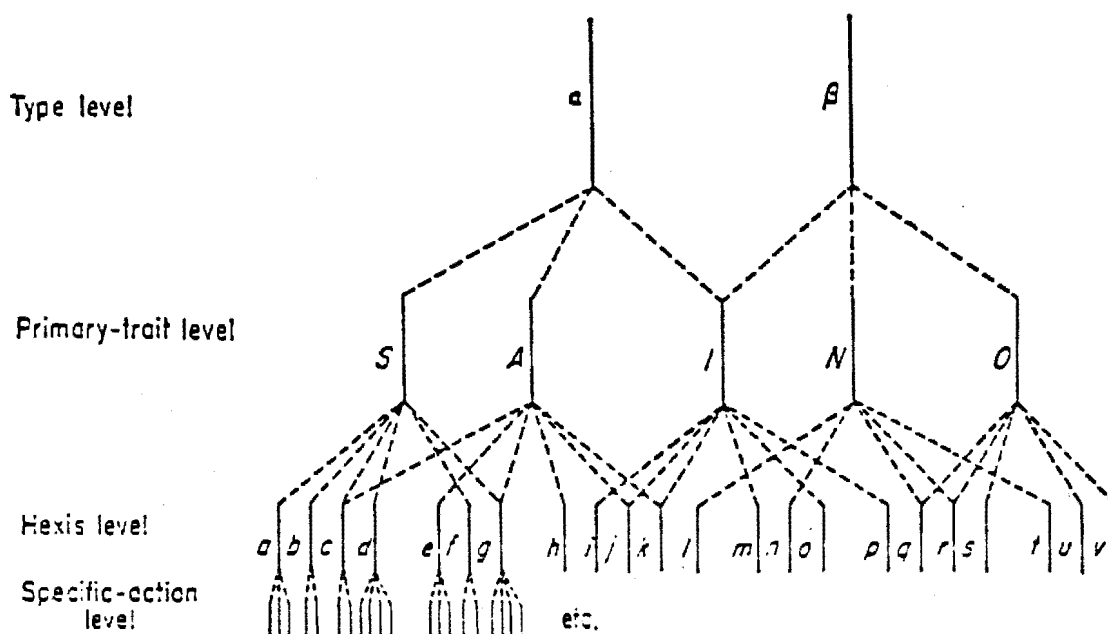


Figure 4.1 Diagram showing how personality structure can be conceived as a hierarchy of traits at different levels of generality (Guilford, 1959, p. 100).

4.2.3 Eysenck

Another major contributor in the area is Hans J. Eysenck, who was born in Germany and escaped to England to avoid Nazi persecution. Like Guilford, he was influenced in his work by the statistical technique, factor analysis, pioneered by Spearman; and the theories and thinking of Jung, Kretschmer, Burt and Hull.

He defined personality as:

the sum-total of the actual or potential behaviour-patterns of the organism, as determined by heredity and environment; it originates and develops through the functional interaction of the four main sectors into which these behaviour-patterns are organized: the cognitive sector (intelligence), the conative sector (character), the affective sector (temperament) and the somatic sector (constitution)(1965, p. 421).

He is a prolific publisher, and by 1970, he had published a dozen books and over 300 articles and handbook chapters. He used factor analysis as the basis of his emphasis on measurement and to classify traits. Factor analysis is used to yield factors or traits, which are then named according to the characteristics that appear common to the behaviours/items found related to each other. Through further factor analysis (second-order) the basic dimensions, called types, that underlie the factors or traits are extracted. On the basis of his research, he postulated three basic dimensions to personality viz. **Introversion-Extroversion, Neuroticism (stable-unstable), and Psychoticism.**

He believed that behaviour is organised into four levels. Specific responses take place at the lowest level and they are acts which are observed once and may not be characteristic of the individual. At the second level, habitual responses occur which are specific and tend to recur under similar circumstances. These habitual acts turn to traits e.g. accuracy, irritability, persistence, rigidity, which are theoretical constructs. His identification of traits are based on observed intercorrelations between a number of different habitual responses and they can be viewed as group factors. At the highest (fourth) level, traits are organised into general

type e.g. introvert. This organisation is based on observed correlations between the traits. He claimed that any trait theory should be based on careful measurement and therefore, an outflow of his research was the development of two instruments to measure personality viz. the Maudsley Personality Inventory and the Eysenck Personality Inventory (Eysenck, 1965; Hall & Lindsey, 1970; Maddi, 1972, Pervin, 1980; Santrock, 1995).

4.3 Cattell's factor theory

Although reluctant to use the term "traits", because of what he regarded as misinterpretations made by others, Raymond B. Cattell is regarded by many as one of the most important trait theorists. He has an impressive academic and publishing record, and it is important to describe his background fully to appreciate the kind of person he is.

He was born in Staffordshire, England, in 1905, and received all his academic training in England. In 1924 he obtained his BSc (majoring in chemistry and physics), and 1929 his PhD in psychology under Spearman, at the University of London. This occurred at a time when Spearman was finalising his development of factor analysis. From 1928 to 1932 Cattell was a lecturer at the University College, Exeter, England, and from 1932 to 1937 he was Director of City Psychological Clinic, Leicester, England. He received an honorary DSc from the University of London in 1937 for his contribution to personality research. From 1937 to 1938 he served as a research associate to E.L.Thorndike at Columbia University, and from 1938-1941 he was Professor of Psychology at Clark University. In 1941 he moved to Harvard as Lecturer in Psychology and in 1944 he moved to the University of Illinois as Research Professor of Psychology and Director of the Laboratory of Personality and Group

Analysis. In 1953 the New York Academy of Science awarded him the Wenner-Gren prize for his work on the psychology of the researcher. He was instrumental in the formation of the Society for Multivariate Experimental Psychology in 1960, and he served as its first president. He retired from the University of Illinois in 1972, but still remained an active publisher for many years and was one of the founder members of IPAT (The Institute for Personality and Ability Testing).

Cattell is deeply indebted to the pioneering work of Spearman and the developments by Thurstone on factor analysis. Many of Cattell's theoretical ideas, especially related to development, are closely related to the writings of Freud and subsequent psychoanalytic theorists. He is a prolific publisher, writing books and articles that not only cover the area of mental measurement and personality research, but also covered areas such as experimental psychology, social psychology and human genetics. By 1984 he had published, about 439 articles in American and foreign scientific journals and about 51 books and monographs (often written with co-authors); 59 chapters requested in books edited by other authors; and 24 psychological tests based on structural findings by himself and other authors (Cattell, 1956; 1965; 1983; Hall & Lindsey, 1970, Pervin, 1980).

To understand his theory of personality, and to see the importance of factor analysis in his work, the following areas will be discussed: definition of personality; structure of personality (focusing on traits); research methods employed; the development of personality; the influence of heredity-environment; and an evaluation of his theory.

4.3.1 Definition of Personality

Although Cattell's factor theory strongly resembles Allport's trait psychology, he, unlike Allport, depended heavily on results obtained from factor analysis, with particular reference to traits. Although most of the concepts are derived from factor analytical studies, some are derivations from experimental findings or simple behavioural studies. The latter are considered only as an aid, as revealed by Cattell:

Our knowledge of dynamic psychology has arisen largely from the clinical and naturalistic methods and secondarily from controlled experiment. "Findings" of the former, and even of the latter, are in the process of being placed on a sounder basis by the application of more refined statistical methods. In particular, experiments and clinical conclusions need to be founded on real conceptions as to what traits (notably drives) are really unitary and this requires a foundation of factor-analytic research (1950b, p. 176).

Cattell provided a very short, general definition at the beginning of his book "Personality" as he believed that a complete definition of a concept can only be given after a theory is fully described by a theorist. He defined personality as follows:

Personality is that which permits a prediction of what a person will do in a given situation (1950a, p. 2).

He continued to describe the goals of psychological research in the following manner:

The goal of psychological research in personality is thus to establish laws about what different people will do in all kinds of social and general environmental situations ... Personality ... is concerned with all the behavior of the individual, both overt and under the skin (1950a; pp. 2-3).

In 1965, he proposed a very similar definition of personality:

The personality of an individual is that which enables us to predict what he will do in a given situation (p. 389).

Mathematically expressed, personality is defined as:

$$R = f(P.S.)$$

Where S is a definition of the situation (or stimulus); R is a description of the behaviour (or reaction); and P, in terms of all its elements, is the object of the investigation of personality. He believed that the use of mathematical language forces the theorists to be as precise and exhaustive as possible when defining terms.

He was just as precise with his terminology when he described the structure of personality which will be dealt with in the next section.

4.3.2 Structure of personality

Cattell viewed personality as a differentiated and complex structure of traits, where an individual's motivation is dependent largely upon a subset of these traits, called dynamic traits. He regarded traits as the basic structural elements of personality and defined them as follows:

A trait, whether unique or common, is a collection of reactions or responses bound by some kind of unity which permits the responses to be gathered under one term and treated in the same fashion for most purposes (1946, p. 61).

He classified traits in a number of ways which will be described as follows:

4.3.2.1 Classification of traits

a) Common traits and Unique traits.

Cattell agreed with Allport that people possess common and unique traits. **Common** traits are possessed by all people to some degree, as human beings have more or less the same hereditary possibilities. **Unique** traits are peculiar to a particular individual and can be found in no other individual in exactly the same form. Examples of common traits are general mental capacity and the degree of character integration. Unique traits are more obvious in the area of interests and attitudes.

He also subdivided unique traits into intrinsically unique and relatively unique traits. **Intrinsic** traits introduce a new dimension to be measured-in other words the individual possesses a genuinely different trait which is possessed by no other person. **Relative** traits suggest only a slight deviation from the pattern of the common traits. In other words the uniqueness is obtained from a slightly different arrangement of the elements making up a particular trait. It has been suggested that unique trait patterns do not differ much from common traits in the major dimensions of personality.

b) Surface Traits and Source Traits

Central to Cattell's theory is the distinction between source traits and surface traits. **Surface** traits are a collection of trait-elements which appear to go together in many different individuals and circumstances, but which do not necessarily have a common cause. If the surface trait is very wide, the extremes can be called "types". Surface traits correspond to clusters of observable behavioural events that are less stable and more descriptive. Surface traits therefore appear as if they belong together, and they can be viewed as a single variable, which is referred to as a syndrome in abnormal psychology. **Source** traits, on the other hand, express an association among behaviours that vary together to form a unitary independent dimension of personality. The source traits correspond to factors, and they can be identified only by way of factor analysis which permits the estimation of factors that are the basis of the surface behaviour. Source traits may be viewed as the building blocks of personality and they are considered to be more important than surface traits. The reason is that more powerful descriptions are possible with source traits as they seem to be the real structural influences underpinning personality.

In this regard, Cattell (1950) stated the following:

... the source traits promise to be the real structural influences underlying personality, which it is necessary for us to deal with in developmental problems, psychosomatics, and problems of dynamic integration ... these source traits correspond to real unitary influences-physiological, temperamental factors; degrees of dynamic integration; exposure to social institutions-about which more can be found out once they are defined (p. 27).

Therefore, the interaction of source traits produces surface traits, which are possibly less stable. Cattell (1950) uses the following example to illustrate the meaning of source traits. If one considers a surface trait, revealed by the positive correlation between vocabulary, arithmetic ability, and tactfulness in social situations, the correlation might be attributed to two independent source traits. This, in turn, can first be traced back to the most important trait, general mental ability. Secondly, an individual who has had better and longer schooling tends to be better in all three the above-mentioned traits. Schooling can be considered to be a second source trait. Therefore, general mental capacity and the amount of education that a person has undergone may be regarded as two source traits responsible for the observed surface trait.

c) Constitution and Environmental-mould Traits.

Traits, whether source or surface, are influenced either by environmental factors, hereditary factors, or a combination of the two. Surface traits appear to be influenced by a combination

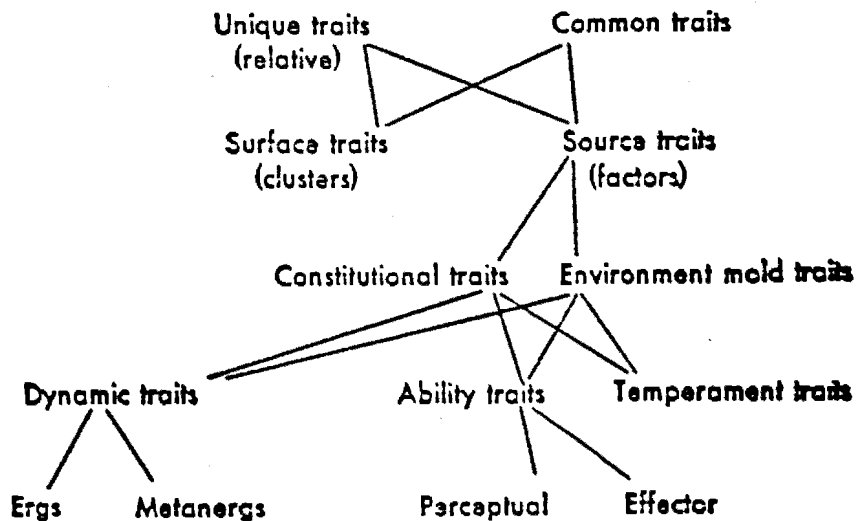


Figure 4.2 Classifactory scheme of trait forms and modalities (Cattell, 1950, p. 35)

of these two factors, whereas source traits are influenced either by hereditary (constitutional) factors or by environmental factors.

Factors that spring from internal conditions, hereditary in certain cases, are regarded as **constitutional source traits**. Factors that originate from the environment, constituting the cultural pattern in which an individual grew up, are regarded as **environmental source traits**.

d) Ability, Temperament and Dynamic Traits.

These traits are divided according to the modality through which they are expressed. Under **dynamic traits** are included basic traits or drives, and acquired interests such as attitudes, sentiments and complexes and innate drives, called ergs. They are concerned with starting the individual into action toward some goal. **Ability** or cognitive traits concern how effective

the individual is in achieving the goal. Abilities include such aspects as general intelligence, verbal ability, spatial ability, musical aptitude, various powers of memory, and many acquired skills and capacities. **Temperament traits** deal with pervasive, unchanging qualities in actions, and they are unaffected by incentives. The various kinds of traits are illustrated in Figure 4.2.

The traits described above can be combined in a particular way to describe behaviour in terms of the **specification equation**. This equation can be used to predict the reaction of an individual in a particular situation and is expressed as follows:

$$P_{ij} = S_{1j}T_{1i} + S_{2j}T_{2i} + \dots + S_{Nj}T_{Ni} + S_jT_{ji}$$

Where P_{ij} is the performance or reaction of the individual i in the situation j , S_{nj} is the situational index for the source trait T_n in the situation j ; T_{Nj} is the individual's i 's degree of possession of the source trait T_n ; and S_j and T_j are the index and the trait specific to this situation.

P_j can sometimes be measurable along an acceptable continuum, e.g. the number of items scored on the test or the intensity of a neurotic syndrome. Any single S describes the emotional meaning or complexity for one particular source trait. The T 's represent the source trait (according to their P or R data) which provides the dimensions of the individual's personality (Arndt, 1974; Cattell, 1946, 1950, 1965; Hall & Lindsey, 1970; Pervin, 1980).

The dynamic traits were of particular importance to Cattell as they were regarded as the driving force in behaviour, and they will therefore be discussed in more detail in the next section.

4.3.2.2 Dynamic structure

As stated earlier, the dynamic surface traits were regarded as very important by Cattell. They consist of attitudes, ergs and sentiments (Cattell, 1946, 1950; Hall & Lindsey, 1970; Pervin, 1980)

a) Attitude

An attitude refers to the strength of interest an individual has in following a particular course of action. It is the underlying dynamic structure from which ergs and sentiments, and their interrelationships, must be inferred. They need not be stated by individuals as they can be measured by means of a number of direct and indirect measures. Cattell and his associates intercorrelated approximately 70 different devices aimed at measuring attitude strength. The data was obtained in a series of studies with aimed at developing an efficient test battery which would measure the conscious and the unconscious components of attitudes. He identified five attitude component factors related to psychoanalytic concepts i.e. alpha, beta, gamma, delta, and epsilon. **Alpha** (conscious id) refers to behaviours that express a desire by an individual to do something because he/she wants to do it. In other words, it has an "I want" quality to it. **Beta** (ego-expression) describes behaviour that represents an interest that is mature as it has been brought into contact with reality. **Gamma** (Ideal Self or

Superego) expresses behaviour that suggests a rather primitive quality to an interest i.e. "I ought to be interested". **Delta** (physiological needs) refers to behaviour that is expressive of physiological reactivity. Delta is expressed in terms of galvanic skin response, drop of blood pressure, etc. **Epsilon** (repressed complexes) describes behaviour that has been repressed and rendered unconscious as a result of conflict. These categories are not typical of all individuals as every interest of an individual contains a bit of each component.

Although the above five were described by Cattell, only two second-order components of attitude strength are usually measured. The first is concerned with the relatively conscious and integrated aspects of an attitude, possibly measured by information tests. The second is concerned with attitudes that are not as integrated and conscious, possibly measured by wishful thinking or forgetting tests. To determine the strength of an attitude, the scores of the two components may be added. Cattell identified approximately 50 different attitudes and interests, and his research in this area relied heavily on a selected sample of attitudes.

A number of factor analytic studies were conducted in an attempt to examine and measure all possible attitudes. These studies resulted in a variety of factors that Cattell divided into two categories - ergs and sentiments.

b) Ergs

An erg is a constitutional, dynamic source trait. In other words, they are traits that are innately determined.

They were defined by Cattell as follows:

An innate psycho-physical disposition which permits its possessor to acquire reactivity (attention, recognition) to certain classes of others more readily than others, to experience a specific emotion in regard to them, and to start on a course of action which ceases more completely at a certain specific goal activity than at any other. The pattern includes also preferred behavior subsidiary paths to the preferred goal (Cattell; 1965, p. 59).

This definition consist of four parts:

- a) preferential attention to certain situations;
- b) specific emotional patterns that are revealed consciously and unconsciously;
- c) a specified goal satisfaction; and
- d) an innate preference to behave in a certain way in attaining the goals.

If the last two aspects are combined it corresponds to McDougall's definition of instinct, and consists of cognitive, affective and conative components. Cattell, after conducting factor analytic research considered seven ergs to be well established. They are: sex, gregariousness, parental protectiveness, curiosity, escape (fear), self-assertion, and narcissistic sex. The last erg refers to general self-indulgence: smoking, drinking, laziness, etc.

c) Sentiments

This is an environmental-mould, dynamic source trait, parallel to the erg, except that it results from sociocultural dynamics. Cattell defined sentiments as :

... major acquired source trait structures which cause the possessors to pay attention to certain objects or classes of objects, and to feel and react in a certain way with regard to them (1950, p. 161).

The definition and the use of this concept is also very close to the parallel concept of McDougall, also referred to as sentiment. Sentiments tend to be organised around important cultural events, social institutions or persons. Thus, during an individual's life experience, an elaborate number of attitudes collect. The following sentiments were found by Cattell and his associates: career and profession; sports and games; mechanical interests; religion; parent, self or sweetheart; and the self. The self is one of the most stable sentiments and also the most consistently reported in research. The self is particularly important in Cattell's view of functioning of personality as nearly all sentiments reflect the self to some degree.

These dynamic traits are interrelated by a pattern called subsidiation and they are represented pictorially by the dynamic lattice.

4.3.3 The dynamic lattice

The various dynamic traits are interrelated in a pattern called subsidiation (this term was borrowed from Murray). Generally, attitudes are subsidiary to sentiments, sentiments are subsidiary to ergs, and ergs are the basic driving force in personality. The dynamic lattice is a pictorial representation of this relationship shown in Figure 4.3. This illustration represents a portion of the motivational structure of a typical American male. At the right of the diagram are the ergs, the basic biological drive; and in the middle are sentiments, each a subsidiary to several ergs. Thus, for example, the sentiment toward his wife is built on the expression of the ergs of sex, gregariousness, protection, and self assertion.

On the left of the diagram are attitudes towards a particular course of action, related to the denoted objects, e.g. to travel to New York. It is therefore apparent that each attitude is subsidiary to one or more sentiment, and through them a number of ergs. It is possible that attitudes might reflect ergs directly as well.

The self-sentiment has an important function in the dynamic lattice as the satisfaction of many of the ergs is dependent on what happens in relation to the self. It is the self that is responsible for the control of the impulses of ergs and for the integration of many other sentiments. Because of the complexity of motives, the potential exists for conflict when striving to achieve goals.

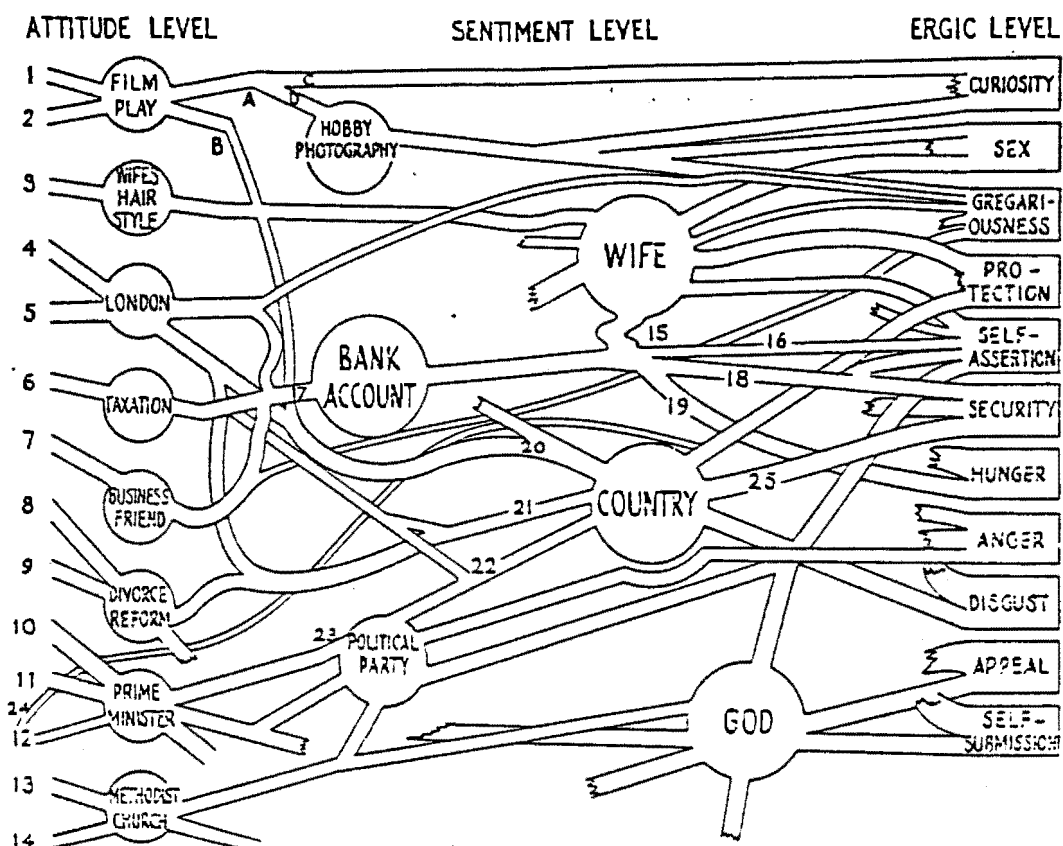


Figure 4.3 Fragment of a dynamic lattice, showing attitude subsidiation, sentiment structure and ergic goals (Cattell, 1950b, p. 52).

4.3.2.4 Conflict and the specification equation

Conflict arises when the satisfaction of one drive is accompanied by the frustration of another, and may either arise between attitudes or within a single attitude. This attitude can be expressed in terms of the specification equation. It expresses the involvement of the dynamic source traits (ergs and sentiments) in a particular course of action. The behaviour of the individual in a given situation will depend on relevant traits in a specific situation and variables that are transient but which may enter into a given situation. Two examples of

transient variables are roles and states. States refer to certain patterns of behaviour within the personality that come and go to a much greater extent than others. For example, if a particular person appears to be anxious, his behaviour in a specific situation will be influenced by the level of anxiety he is experiencing at that particular moment. Roles refer to the effect a stimulus is perceived in a different way, depending on the role portrayed by the individual in a given situation. Thus, although Cattell believed in a certain amount of stability of behaviour across factors, he also believed that behaviour is influenced by a person's mood (state), and the way the individual presents himself in a given situation (role) (Hall & Lindsey, 1970; Horn, 1966; Pervin, 1970).

4.3.3 Research methodology

Because a great deal of his theory is underpinned by empirical research, it is important to understand the sources of data, and the basic factor analytic technique used by Cattell.

4.3.3.1 Sources of data

According to Cattell (1950b; 1956; 1965) there are three sources which allow one to observe behaviour in the personality sphere, i.e. life record (L data); self-rating questionnaires (Q data); and objective tests (T data). These sources differ in terms of the nature of the data, their reliability, and the specific situation for which they are the most suitable.

a) Life Records (L data)

L data are based on the normal, everyday behaviour of individuals, independent of self-observations by individuals. Examples are school grades or ratings of individuals on specific traits such as sociability and emotional stability. Although the range of actual methods employed in this category is wide, they essentially consist of the following methods: time sampling; life-event statistics; and ratings. **Time sampling** occurs when specific behaviour is observed for all subjects at specified times and places, where the frequency of reactions of a certain kind are being recorded. **Life-events statistics** refer to a type of prolonged sampling where the frequency of certain incidences are recorded, e.g. accidents or changes of jobs. **Ratings** refer to observations by skilled observers.

b) Self-Rating Questionnaires (Q data)

Q data are obtained by introspection on the part of the individual, i.e. it involves statements by an individual about his/her own personality. It provides patterns of "mental interiors" (Cattell, 1950, p. 71), parallel to the behaviour exhibited by L data. Q data can therefore be treated in two ways, i.e. assertions that should be taken at face value and can only be used scientifically in a few cases; and data that are not direct, where meaning is inferred, and where such questionnaires can be used as objective tests in special cases. However, Cattell (1950) warned that:

The above considerations should suffice to warn the student not to regard the prevalence and popularity of simple questionnaires as any endorsement of their validity as personality measures... (p. 54).

c) Objective Tests (T data)

T data are obtained when a situation is created which is used to predict behaviour in other spheres and where the data may be objectively scored. These situations are artificially created by paper-and-pencil tests or by various kinds of apparatus. By 1984 Cattell and his associates have created 24 such tests. In 1967 Cattell and Warburton listed 400 of these types of tests.

General traits of personality were obtained by conducting separate factor analytic studies using all three of the above data sources. The assumption was made that factor analytic research should be able to determine the basic structures of personality. If so, the same factors should be obtained from all the data sources, viz. L, Q, and T data. Cattell started his research by focusing on L data, and the goal was to obtain information on all aspects of human behaviour which he called the **personality sphere**. He began his research by analysing Allport and Odbert's (1936) list of about 4500 trait names which had been derived from an English dictionary. They were initially reduced to about 160 traits by grouping synonyms, and they were further reduced to 35 surface traits by empirical clustering procedures. By rating these 35 traits, the basis for the initial L data, factor analysis was done which resulted in 15 L data factors that appeared to represent most of the behaviours represented in the personality sphere. After conducting Q data research, he found 12 factors that are common to both L and Q data (see Table 4.1). Some of the labels are taken from Greek and the others are taken from a combination of words taken from the initial letters of a phrase (e.g. Premsia is taken from Protected Emotional Sensitivity). The second part of

Table 4.1 Major Personality factors found in Both L and Q data (adapted from Cattell, 1966 in Hall and Lindsey, 1970, p. 391).

Letter	Symbol	Technical Title	Popular Label
A		Affectothymia-Sizothymia	Outgoing-reserved
B		Intelligence	More-intelligent-less-intelligent
C		Ego-strength	Stable-emotional
E		Dominance-Submissiveness	Assertive-humble
F		Surgency-Desurgency	Happy-go-lucky-sober
G		Super-ego-strength	Conscientious-expedient
H		Parmia-threctia	Venturesome-shy
I		Premisia-Harria	Tender-minded-tough-minded
L		Protension-Alaxia	Suspicious-trusting
M		Autia-Praxemia	Imaginative-practical
N		Shrewdness-Artlessness	Shrewd-forthright
O		Guilt-proneness-Assurance	Apprehensive-placid

Cattell's research strategy focused on the collection of Q data and determining whether comparable data could be found. The main result of his work was the development of the Sixteen Personality Questionnaire (16PF). He used the personality dimensions found in L data as his source in the development of items for the 16PF. Thousands of items were devised and administered to large groups of people and the data were then factor analysed.

This led to the development of the 16PF. The 16 PF will be discussed in detail in Chapter 6.

Although the factors found by means of L- and Q-data tended to be generally similar, T data factors did not match as well. It was found, however, that T-data factors seemed to correspond to second-order factors in questionnaire and rating data. Cattell suggested that this lack of similarity of data sources meant that the different measurement approaches sample data at rather different levels of generality, finding a modest degree of across level matching, rather than a one-to-one match of factors. Nonetheless, it is apparent that Cattell's initial hope of finding identical factor structures from all three data sources was only partially realised (Hall & Lindsey, 1970; Pervin, 1980).

4.3.3.2 Basic techniques in factor analytic methods

According to Cattell (1950; 1956; 1956; 1965) there are basically three techniques of data analysis when correlation coefficients are used viz, R, P, and Q-techniques.

a) R-technique

This technique is used when the scores of a large number of subjects on two or more tests are compared by using a correlation coefficient. This means that if an individual obtains a high score in one test, there should be a tendency to obtain a high score in the other test as well if a positive relationship exist between the variables. The argument for general intelligence or g as a single power rests on this technique.

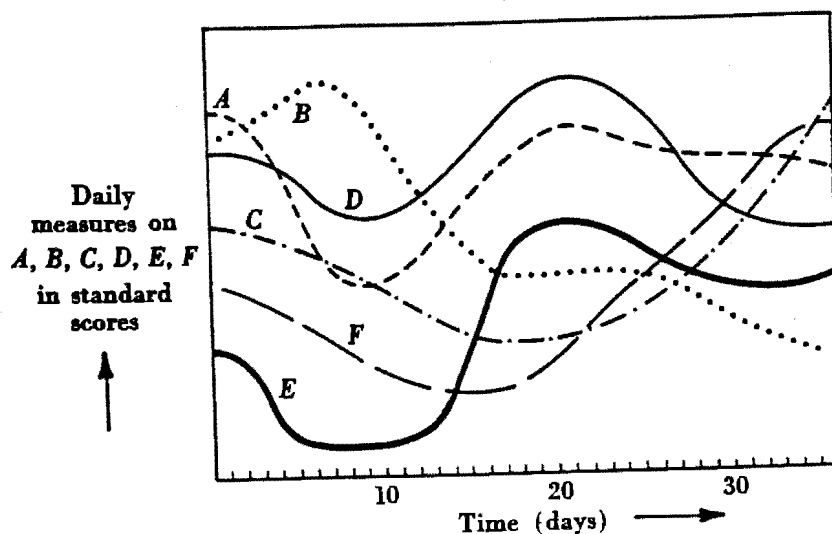


Figure 4.4 Traits in temporal covariation: the basis of P technique.

A variation of the R-technique is referred to as the R-deviation technique of individual differences and here measurement is repeated twice, and the different scores are correlated and factor analysed.

b) P-technique

This technique is used for the study of the individual. A single subject is measured on a number of tests/trait indicators across a number of days. The fluctuation trends are plotted and it can be observed that some trends will go together and others will fluctuate in different ways. This fluctuation can also be determined by examining the correlations of these tests. In Figure 4.4 the P technique is illustrated by showing the responses of an individual. Thus, A, D, and E would correlate and would indicate a source trait and C and F would indicate a second source trait.

c) Q-technique

This technique is used to determine the correlation between people rather than variables with the emphasis on typology. The individual who shows the highest average correlation, with all others in the cluster, is the purest representative of a type.

Thus, Q and R-techniques leads to different ways of expressing the same patterns of clustering and factorisation, and they do not lead to independent or divergent results. With the R-technique the pattern is identified by its highest scoring test, and with the Q-technique it is identified by its highest scoring person. Cattell described the advantages and disadvantages of the Q-technique as follows:

Q-technique has the advantage of being employable when there are only a few people and many tests; it lends itself better to identifying clusters (syndromes) than factors (source traits), but it cannot ... make a study on a few people ("small sample") as accurate and generalizable as one on many (1950, p. 30).

Cattell also carried out some work on the development of the individual and identified six stages of development.

4.3.4. Stages of Personality Development

Cattell (1965) described the development of personality in the following stages viz. infancy, childhood, adolescence, middle age and senility.

a) Infancy

This period ranges from birth to 6 years and it is considered to be the formative period of personality. Experiences such as relationships with the mother; reactions to the father; weaning and toilet training; and reactions to siblings, act as the deciding factors as to whether the individual will be prone to neuroticism.

b) Childhood

Childhood (6-14 years) is a period of relative calm in the development of personality. Cattell called it the period of the "hardy little savage" (1965, p. 410) characterised by a lack of the difficulties and anxieties that are prevalent in the next stage. Independence begins to develop as he/she moves out of the family to his friends, spreading emotional contact and ties. This phase is characterised by peer pressure as the laws of the group are most important. Personal ability, courage and loyalty to the group are regarded as the most important virtues. Originality in thinking and intellectual questioning are minimal. It is at this stage that the child with inferior intelligence will become frustrated at school and probably develop behaviour problems. Although the child daydreams less than in the infancy stage, daydreaming will still occur, mostly of adult adventures.

c) Adolescence

This stage (14 to 23) is characterised as being very stressful and stormy. Incidences of delinquency are very high, as well as mental disorders and neurosis. A major part of adolescent conflict occurs as an increased drive toward independence and self-assertion develops, associated with an increased sex drive and adult patterns of behaviour expected by society. This drive towards independence begins with vacillating behaviour that springs partly from a number of areas:

- a) the youth's inner uncertainty, i.e. wanting to grow up yet wanting the security of the family;
- b) society's own uncertainty as to how the youth should be treated;
- c) expectations of the school; and
- d) the development of the sex drive causes the greatest conflict as the youth has to learn to curb his/her sex drive, and the need for increased capacity for empathy, sympathy and the need to give love. This drive motivates the youth to pay increased attention to his/her appearance and manners, as well as leading to social and sexual awareness.

Some degree of personalty disorganisation occurs, manifested by increased moodiness and irritability, unwanted instability, and increased daydreaming.

d) Maturity

This period stretches from the age of 23 to 46, although in some instances men and women continue to mature until the day they die. At the start of this period the person usually

chooses a career and a wife/husband. For the majority of people this is a happy period: energies are spent building a career, buying a house and rearing a family. For the minority, this period is characterised by an inability to find a satisfactory career and a life-mate; mental disorder; and/or hardening of attitudes of delinquency or rebellion against society.

Whatever course has been taken by the individual, personality in general appears to be set as little change in attitude or interest patterns occurs between the ages of 25 and 50.

e) Middle Age

This is also a period of personality readjustment which is characterised by the menopause in women. Most of the readjustment is caused by inner changes that occur, viz. decline in sex drive; loss of energy; and a decline in physical health. Also, an increase of leisure time occurs as the children leave home; partial or complete retirement; and/or incapacities. Often, there is a reexamination of life values and a search for a philosophy, similar to that which occurred at adolescence.

f) Senility

According to Cattell, the meaning of senility is still uncertain as research has not demonstrated which changes are normal and necessary and which are due to disease. Some old people retain their intellectual capacity, while others show a marked decline. The ageing individual also has to cope with a vacillating and uncertain attitude held toward him/her by society.

In this development of the personality, Cattell emphasised the importance of both the environment and the hereditary factors, of nature and nurture, in shaping the personality of the individual.

4.3.5 Heredity-Environment Research and Learning

Cattell was also interested in the influence of genetic and environment factors on source traits. He developed a method, called the Multiple Abstract Variance Analysis (MAVA), to determine the relative weights each of the above factors play in the shaping of personality. MAVA was used on data based on the resemblances of siblings and twins, reared in the same home, or adopted in separate homes. The data were then used to determine the amount of variance attributable to environmental factors and the amount attributable to genetic factors. Although one estimate by Hundleby, Pawlik and Cattell (1965, in Pervin, 1980) suggests that personality is approximately two-thirds determined by environment and one-third by heredity, one tendency observed was that the heredity-environmental influences appeared to be mostly negative. Cattell interpreted the latter in terms of **the law of coercion to the biosocial mean**, i.e. the tendency by society to force the individual to conform to the norms of the society. This is done, for example, by encouraging the more introverted person and reining in the more dominant person. After much research, he arrived at the conclusion that superego strength, G; radicalism-conservatism, Q1; ergic tension, Q4; and control are largely determined by the environment. On the other hand, surgency, F; premsia, I; the self-sentiment, Q3; intelligence; and less strongly, H, parmia and A, affectia is determined by genetics (Cattell, 1983; Cattell & Scheurger; 1985).

This process of personality development is also complicated by maturation as this might delay the full appearances of genetic influences on traits. Also, maturation may influence the kinds of learning that take place in relation to traits (Cattell, 1983; Cattell, 1965; Hall & Lindsey, 1970; Pervin, 1980).

He also related the environment-genetics findings to his learning theory and stated:

... I became more clearly aware that learning theory cannot progress without behavior genetics; first, because estimating the magnitude of learning is possible only after slicing off the magnitude of genetic determination, and second, because maturation and learning intervene ... (Cattell, 1983, p. 33).

Cattell (1983) identified five principles of learning or learning mechanisms, that are important in personality development:

- a) **coexcitation** is basically cognitive, and it associates the subjective awareness of two feelings, linking two perceptions and two reproduced ideas;
- b) **means-end learning** essentially refers to classical conditioning by combining (a) and (b), operant conditioning is the same as means-end learning;
- c) **integration learning** refers to the discovery of behaviour that satisfies several goals. It is a key aspect in the formation of the self and superego sentiments, and it is also called **confluence learning**;
- d) **goal modification** describes goals that have been modified. It is reflected in race-preserving rather than individual-preserving ergs, e.g. hunger, fear, thirst; and
- e) **energy saving** refers to the tendency by individuals to save energy on all learning tasks.

According to Cattell, although the above principles came from existing learning data, the main influx of new concepts come from research in personality structure. Relevant concepts are dynamic structure and **dynamic calculus**. The central concept in the dynamic calculus is the **dynamic lattice**, which was described in detail earlier.

As described in the above, Cattell's theory is based largely on a great deal of research undertaken by him and a number of associates. However, his theory has also been severely criticised by many for a number of reasons. This will be discussed in the next section.

4.3.6 Evaluation of Cattell's Theory

Gilgen and Hultman (1979) reviewed the number of times authors were cited in the **Annual Review of Psychology** (1950 -1974) and came to the following conclusion:

The present study ... indicates that the most frequently cited individuals were R. B. Cattell and British psychologist H.J. Eysenck, both prominent and prolific factor-analytic personality theorists and psychometricians.

As indicated earlier in the chapter he continued to publish prolifically, either on his own or with associates. However, reviews of his work contain a mixture of praise and criticism.

He is praised by many researchers (e.g. Hall & Lindsey, 1970; Pervin, 1980) for the large body of empirical research underpinning his theory.

As Wiggins (1984) stated:

It seems fair to say that Cattell's original blueprint for personality study has resulted in an extraordinary rich theoretical structure that has generated more empirical research than any other theory of personality (p. 190).

Also, his research has touched on every relevant aspect of personality, i.e. structure, process, growth, development, learning and change. He has been a driving force in refining factor-analytic techniques and in the development of a technique to determine the genetic influence on personality. In his work he covered a wide variety of measurement techniques and focused his attention on almost all groups. He also attempted to place his work in a cross-cultural perspective (Pervin, 1980). For example, Cattell and Warburton (1961) attempted to determine the patterns of extroversion and anxiety in different countries.

However, according to Hall and Lindsey (1970) and Pervin (1980) it appears that he frequently made claims of a more stable empirical foundation than actually appears to exist. For example, he made the following statement about the dynamic lattice that does not necessarily warrant such certainty of conviction:

Essentially, the dynamic lattice is only at a low level of abstraction from the fact - it is an undeniable, almost literal description the way dynamic habit systems get organized in any organism that must learn ways to its goals (Cattell, 1959, p. 269 in Pervin, 1980).

Also, his theory is not as popular as those of other theorists, e.g. Freud, Roger, and Allport. This is probably due to two reasons: first, the technical details as well as the controversies surrounding factor-analysis are very complicated for the less well-informed reader; secondly, the exaggerated empirical stance and the denigration of alternative views are unlikely to impress the sophisticated reader.

Because factor-analysis lies at the core of his theory, the success of the theory will obviously depend on the success of the techniques and results found. However, a great deal of criticism has been levelled at using factor-analysis to describe behaviour. The criticisms include the following (Pervin, 1980; Hall & Lindsey, 1970):

- a) Factor theorists create systems of artifacts that have no real relation to an individual and therefore distort and misrepresent reality. In other words, the derived traits are not psychologically meaningful, and they do not necessarily fit with the observations of other theorists and researchers in their description of behaviour;
- b) Subjectivity is involved when naming the factors that result from factor analysis. In other words, although the factor analysis may be carried out with considerable care, the same amount of care is not always given to the steps that lead to the scores from which the factors are derived;
- c) Many psychologists have concluded that, contrary to Cattell, the same factors are not replicable in different factor-analytic studies (see chapter 3), and the nature of the test used influences the factors found;
- d) The statistical basis of the factor analysis technique is often questioned; and
- e) The disagreements amongst factor theorists are a cause of concern for critics. Factor theorists often disagree on the computation and interpretive steps used.

Finally, the trait theory approach has also been criticised as it does not explain the causes of behaviour or the development of personality. It only identifies and describes characteristics that are correlated with behaviour. Also, trait theories describe behaviour as it currently exists (static), unlike dynamic theories that concentrate on environmental factors that influence behaviour (Zimbardo & Weber, 1994; Santock, 1994).

Cattell and his associates responded to many of these allegations in numerous articles (e.g. Cattell, 1974; Buss, 1977; Wiggins, 1984), but his contribution, particularly the 16PF is still vigorously attacked by many (discussed in detail in Chapter 6). Nonetheless, he remains one of the most important contributors in the field of factor analysis and personality theory.

4.4 Conclusion

In this chapter an attempt was made to discuss the contribution of one of the major trait theorists, R.B. Cattell. It was shown that trait theories have a long history, actually starting with typologies in approximately 460 BC. However, Gordon Allport is regarded by many as the father of the trait theory approach to describe personality. Other important trait theorists also briefly discussed are Guilford and Eysenck.

In discussing Cattell's factor structure it was quite obvious that a great deal of thought and empirical research went into the formulation of his theory. His personality theory is based largely on traits and he distinguished between the following traits: common and unique traits; surface and source traits; constitutional and environmental-mould traits; and ability, temperament and dynamic traits. Dynamic traits are used to explain motivation and are

further divided into attitudes, ergs and sentiments. He relied largely on factor analysis as a research tool and identified three sources to collect data, viz. L, Q, and T data. He also conducted a great deal of research on heredity-environment influences on personality/behaviour, and developed the MAVA technique to determine the relative weights of the influences. Finally, in the evaluation of his work, critics are unanimous in their praise for the amount of empirical research underpinning his theory, but they also have problems with certain aspects of the factor analytic methods used, and the conclusions.

CHAPTER 5

STATEMENT OF THE PROBLEM AND HYPOTHESES

5.1 Introduction

The determination of the cross-cultural comparability of psychological tests is of major importance in South Africa. This is due to the fact that very often selection and promotion decisions are made on the basis of tests that are not, or have not, been shown to be comparable across cultures. According to Nzimande (1995) the testing movement need to acknowledge the influence of the changing context of society in present-day South Africa. This has implications in the following areas: First, test users are now accountable to the broader society through the new constitution. Secondly, the new Labour Relations Act will drastically influence the use of tests in the workplace as the proposed worker forums will scrutinise every work action and the use of tests will probably become the subject of collective bargaining. Thirdly, because the Reconstruction and Development Program (RDP) prioritises human resource development and affirmative action, tests will be required to determine potential, and not just measure existing skills. Fourthly, testing must be located within the social and economic environment of the society in which it is designed to serve. It must be locally validated and cannot be transferred from one context to another without adequate adaptation to comply with local circumstances. Fifthly, because tests, by their very nature, assess relatively stable traits, it is very difficult to test the impact of major socio-political and economic changes on individuals. Finally, the concept and definition of "culture" is questioned.

Based on the issues mentioned, Nzimande drew the following conclusion:

In conclusion, I would like to state that unless testing is able to satisfactorily explore and answer these social questions ... it is going to be irrelevant and ultimately overtaken by events. The constant refusal of psychometrics to confront these social questions is also very problematic...Unlike in the past, psychologists in this country have to start being accountable for their actions (Nzimande, 1995, p. 9).

Whether one agrees with the points outlined by Nzimande or not, it is apparent that there are major limitations/problems with regard to the use of psychological tests in South Africa. This is accompanied by increasing resistance to the use of these tests by the disadvantaged groups in South Africa. Psychologists are therefore compelled to conduct research to determine whether psychological tests have a place in the new South Africa. Also, it is important that we acknowledge the realities of the situation and that we do not use tests that have been proven to be non-comparable across cultures.

An attempt will therefore be made in this study to provide essential information to test users when choosing personality tests to assess individuals. In other words, an attempt will be made to add to the existing knowledge on the cross-cultural comparability of personality tests. As this can only be done on a test-by-test basis, the focus of the study is the 16PF (SA92) (hereafter referred to as the 16PF).

The specific aims of this study are the following: First, to determine whether the scores of the 16PF (SA92) are comparable in a cross-cultural setting in South Africa. In other words to determine the suitability of the 16PF that was imported from the USA and originally standardised on whites in South Africa, for coloureds, Indians and blacks. Secondly, to determine the influence of race, gender and socio-economic status, language and age on the scores of the 16PF. Thirdly, to determine whether differences exist between races, genders, socio-economic status, ages and languages in terms of their responses to the items of the 16PF. Fifthly, to establish the reasons for the differences in responses to items between the race groups.

3.2 Hypotheses

The following broad hypotheses are formulated for investigation:

Hypothesis 1:

There are no significant raw score differences between the means of the first and second-order factors of the 16PF for the black, coloured, Indian, and white students.

Hypothesis 2:

There are no significant raw score differences between the means of the first and second-order factors of the 16PF for male and female students.

Hypothesis 3:

There are no significant raw score differences between the means of the first and second-order factors of the 16PF for students speaking English, Afrikaans, Xhosa, and other black languages as their home language.

Hypothesis 4:

There are no significant raw score differences between the means of the first and second-order factors of the 16PF for students of the following age groups: 17-18, 19, 20, 21-22, 23-29, and 30-47.

Hypothesis 5:

There are no significant raw score differences between the means of the first and second-order factors of the 16PF for University of the Western Cape (UWC), University of Durban-Westville (UDW), University of Natal (UND), and the University of Pretoria (UP) students.

Hypothesis 6:

There are no significant raw score differences between the means of the first and second-order factors of the 16PF for high, upper middle, lower middle, and low socio-economic status students.

Hypothesis 7:

There are no significant interaction effects between the independent variables of race, gender, socio-economic status, language and age of students on the first and second-order factors of the 16PF.

Hypothesis 8:

The 16PF does not have lower reliabilities for black, coloured, Indian and white students than for the norm group.

Hypothesis 9:

The 16PF does not have lower reliabilities for male and female students than for the norm group.

Hypothesis 10:

The 16PF does not have lower reliabilities for 17-18, 19, 20, 21-22, 23-29, and 30-47 year old students than for the norm group.

Hypothesis 11:

The 16PF does not have lower reliabilities for students from UWC, UDW, UND, and UP than for the norm group.

Hypothesis 12:

The 16PF does not have lower reliabilities for students from high, upper middle, lower middle, and low socio-economic backgrounds than for the norm group.

Hypothesis 13:

There are no obvious differences between the factor patterns displayed on the 16PF by black, coloured, Indian, and white students.

Hypothesis 14:

The items on the 16PF do not correlate with what the test is measuring for students from the various race groups.

Hypothesis 15:

The items on the 16PF do not correlate with what the test is measuring for male and female students.

Hypothesis 16:

The items on the 16PF do not correlate with what the test is measuring for students from different age groups.

Hypothesis 17:

The items on the 16PF do not correlate with what the test is measuring for students from different institutions.

Hypothesis 18:

The items on the 16PF do not correlate with what the test is measuring for students with different socio-economic backgrounds.

Hypothesis 19:

There are no significant differences between students from the different population groups in terms of their responses on the 160 items to the 16PF.

Hypothesis 20:

There are no significant differences between male and female students in terms of their responses on the 160 items to the 16PF.

Hypothesis 21:

There are no significant differences between students who come from different socio-economic status in terms of their responses to the 160 items of the 16PF.

Hypothesis 22:

There are no significant differences between students from different age groups in terms of their responses to the 160 items of the 16PF.

CHAPTER 6

RESEARCH DESIGN

The focus of this chapter will be on the design of the study. To meet this aim, the samples involved in the study, the measuring instruments used, the procedures followed in gathering the data, and the techniques used in the analysis of the data will be discussed.

6.1 Sample

The sample consisted of black, white, Indian and coloured university students. They were all Industrial Psychology or Psychology students at the following universities: University of the Western Cape (UWC), University of Pretoria (UP), University of Durban-Westville (UDW), and University of Natal (UND). The research participants were chosen from the Psychology/Industrial Psychology departments in an attempt to limit extraneous variables as far as possible through keeping the groups as similar as possible. As the main aim of the study was to determine the cross-cultural comparability of the 16PF, the samples chosen reflect the various race groups in South Africa as defined by the now defunct Population Registration Act (No. 30 of 1950).

An attempt was made to gather data from 250 participants in each racial group. This was successful in the case of three racial categories, namely whites, blacks and coloureds. For the Indian group, data could only be collected from 229 participants. This does, however, not pose

a particularly serious problem and the sample was still large enough to comply with the requirements of the research design. The sample is shown in Table 6.1.

Table 6.1 Research participants according to racial groups

Population group	Frequency
Black	253
Coloured	252
Indian	229
White	249
TOTAL	983

Additional information (descriptive variables) were also collected by means of a biographical questionnaire. The data are reflected in Tables 6.2 to 6.12. Table 6.2 presents the number of male and female participants included in the study. This is large enough to make meaningful comparisons. Table 6.3 shows the frequency of participants according to both race and gender.

Table 6.2 Research participants according to gender

Gender	Frequency	Percentage
Female	583	59,31
Male	400	40,69
TOTAL	983	100,00

Table 6.3 Research participants according to race and gender

Gender	Race				Total
	Black	Coloured	Indian	White	
Male	135	126	54	85	400
Female	118	126	175	164	583
TOTAL	253	252	229	249	983

Table 6.4 portrays the frequencies of participants according to the language spoken in the homes. Although all the frequencies are presented by language group, the black languages (except Xhosa) are collapsed and referred to as **other black languages** for data analysis purposes to make the data more meaningful (Table 6.5). The black languages grouped together are Zulu, Venda, Tswana, Tsonga, South Sotho, and North Sotho. Table 6.6 shows the frequencies of participants according to race and home language. Only four black participants indicated that either English or Afrikaans is their home language.

Table 6.4 Research participants according to home language

Home Language	Frequency	Percentage
Zulu	24	2,4
Xhosa	172	17,5
Venda	1	0,1
Tswana	24	2,4
Tsonga	3	0,3
South Sotho	11	1,1
North Sotho	8	0,8
English	404	41,1
Afrikaans	321	32,7
Other	15	1,5
TOTAL	983	100,0

Table 6.5 Research participants according to home language (grouping together certain black languages).

Home Language	Frequency	Percentage
Other black lang.	71	7,0
Xhosa	172	17,5
English	404	41,4
Afrikaans	321	32,7
Other	15	1,5
TOTAL	983	100,0

Table 6.6 Research participants according to race and home language

Lang.	Race				Total
	Black	Coloured	Indian	White	
Zulu	24	0	0	0	24
Xhosa	172	0	0	0	172
Venda	1	0	0	0	1
Tswana	24	0	0	0	24
Tsonga	3	0	0	0	3
S.Sotho	11	0	0	0	11
N.Sotho	8	0	0	0	8
English	3	117	220	64	404
Afrikaans	1	135	3	182	321
Other	6	0	6	3	15
TOTAL	253	252	229	249	983

Table 6.7 indicates the frequencies of participants according to age groups. Although the participants are mostly in their twenties the distribution is still large enough to make meaningful comparisons between the age groups. The majority of the older participants were drawn from the part-time undergraduate classes at UWC (30-47). As may be gleaned from the table, sufficient participants are present in each group to make meaningful statistical comparisons.

Table 6.8 shows frequencies according to race and age group. It shows that the largest number of coloureds and Indians are between 17 and 19 years of age, the blacks are older with the largest proportion older than 21, and the largest proportion of whites are between 20 and 22 years old.

Table 6.7 Frequencies of participants according to age groups

Age group	Frequency	Percentage
17-18	267	27,16
19	169	17,19
20	165	16,79
21-22	166	16,88
23-29	164	16,68
30-47	52	5,30
TOTAL	983	100,00

Table 6.8 Research participants according to race and age groups

Age	Race					Tot
	Blk	Cld	Indn	Wht		
17-18	23	84	136	24	267	
19	30	44	50	45	169	
20	34	25	22	84	165	
21-22	42	36	13	75	166	
23-29	99	44	7	14	164	
30-47	25	19	1	7	52	
TOTAL	253	252	229	249	983	

Table 6.9 shows the frequencies of participants who lived in either rural or urban areas during their primary-school years. Table 6.10 shows the frequencies of participants who lived in either rural or urban areas during their high school years. From these tables it is apparent that the frequencies per group are not large enough to make meaningful comparisons. As some of the research participants were tested before the general elections (April 1994) and the others thereafter, it was difficult to use census information to code the responses as the borders for the provinces had changed. It was consequently difficult to ascertain whether an area was classified as rural or urban. This variable will not be used for further data analysis.

Table 6.9 Research participants who attended primary school in a rural or urban areas

Area	Frequency	Percentage
Rural	8	0,8
Urban	975	99,2
Total	983	100,0

Table 6.10 Frequencies of participants who attended high school in rural or urban areas

Area	Frequency	Percentage
Rural	6	0,6
Urban	977	99,4
Total	983	100,0

Table 6.11 shows the frequencies of participants according to race and institution. The largest number of black and coloured participants are students from UWC, all the white participants are from UP, and the largest number of Indians is at UDW and UND.

Table 6.11 Research participants according to race and institution

Institute	Race				Total
	Black	Coloured	Indian	White	
UWC	241	250	32	0	523
UP	0	0	0	211	211
UND	0	1	80	38	119
UDW	12	1	117	0	130
TOTAL	253	252	229	249	983

Table 6.12 indicates the frequencies of participants according to the socio-economic status (SES) and race. As can be gleaned from the data, the participants could be divided into four groups, i.e. high, upper-middle, lower-middle, and low. The high SES group consisted mostly of whites, and few white participants fell into the low SES group. On the other hand, the blacks and coloureds show exactly the opposite as the majority of participants fall within the low SES group, and relatively few in the high SES group. With the Indian participants, the majority fall within the upper-middle and lower-middle level group. These frequencies are in line with what may have been expected in South Africa given the socio-political disparities that were maintained under the policies of the previous government (Nationalists).

Table 6.12 Research participants according to socio-economic status and race

SES	Race				Total
	Black	Coloured	Indian	White	
HIGH	29	20	32	113	194
UPPER-MID	17	34	61	80	192
LOWER-MID	22	68	76	28	194
LOW	82	79	29	14	204
TOTAL	150	201	198	235	784*

*199 cases had incomplete data.

6.2 Measuring Instruments

For this investigation two measuring instruments were used: a biographical questionnaire (Appendix A) and a personality test, the 16PF (SA92).

6.2.1 The 16 Personality Factor Questionnaire (16PF)

According to Cattell et al. (1992), the 16PF is a set of 16 questionnaire scales, designed to make available information about an individual on the majority of primary personality factors. It covers 16 source traits (primaries) and eight derivatives thereof, called second-order factors (secondaries) (see Table 6.13).

Table 6.13 The 16 factors of the test (Prinsloo, 1992, pp. 7,8).

FACTOR	DESCRIPTION OF LOW SCORE	DESCRIPTION OF HIGH SCORE
A	Reserved, detached, cool	Outgoing, warmhearted, easy-going, participating
B	Concrete-thinking, less-intelligent	Abstract-thinking, bright
C	Affected by feelings, emotionally labile, easily upset, lower ego strength	Emotionally stable, calm, faces reality, higher ego strength
E	Humble, obedient, easily led, docile, submissive	Assertive, independent, aggressive, stubborn, dominant
G	Opportunistic, disregards rules or obligations, lower superego strength	Conscientious, persisting, moralistic, staid, higher superego strength
H	Shy, timid, restrained, sensitive to threats	Venturesome, socially bold, uninhibited, spontaneous
I	Tough-minded, self-reliant, realistic, having no illusions	Tender-minded, dependent, overprotected, sensitive
L	Trusting, adaptable, free of jealousy, easy to get on with	Suspicious, sceptical, hard to fool
M	Practical, careful, conventional, regulated by external realities, proper	Imaginative, absent-minded, wrapped up in inner urgencies, careless of practical matters
N	Forthright, natural, unpretentious, sentimental, artless	Shrewd, calculating, worldly, insightful

O	Placid, self-assured, confident, serene, unperturbed, self-sufficient	Apprehensive, self-reproaching, depressive, worrying, guilt-prone
Q ₁	Conservative, Respecting established ideas, tolerant of tradition	Experimenting, critical, liberal, analytical, free-thinking, radical
Q ₂	Group dependent, a "joiner" and sound follower	Self-sufficient, resourceful, prefers own decisions
Q ₃	Casual, careless of protocol, undisciplined, follows own urges, low self-sentiment	Controlled, socially precise, self- disciplined, compulsive, strong will- power, strong self-sentiment
Q ₄	Relaxed, tranquil, torpid, unfrustrated, low ergic tension	Tense, driven, overwrought, irritable, high ergic tension

The 16PF was developed by Cattell in 1949 after almost a decade of preliminary research and it was followed by three other editions by 1968. There are now five forms available, and in each successive edition the item content was improved and the norm base expanded. The five forms are published by the Institute for Personality and Ability Testing (IPAT). They were devised to measure the same sixteen personality dimensions, including intelligence. The five forms are shown in Table 6.14. Yet another form was designed in 1970 and incorporated into a longer test which was called the **Clinical Analysis Questionnaire**. It was designed to measure normal and pathological dimensions. In 1995 the **fifth edition** was published by IPAT. A number of factors were added, including the five global factors, the language was simplified,

and an attempt was made to revise the questions in such a manner that racial and gender bias would be eliminated.

Table 6.14 The forms of the 16PF (Cattell et al., 1992, p. 3)

Forms	N of items	Reading Grade level	Approximate Time
A	187	7,46	45-60 minutes
B	187	7,60	45-60 minutes
C	105	6,48	25-35 minutes
D	105	6,70	25-35 minutes
E	128	3,24	45-60 minutes

Two pairs of forms are available, each matched for reading level and testing time. Forms A and B are advocated for research or for accurate individual assessment. Forms C and D, which are about half the length of A and B, were designed to be used in situations where time is limited and where the group possesses lower educational qualifications. Form E employs simpler language and a less complicated format and is designed to be used with educationally disadvantaged groups. Forms B and D were designed to extend the reliability of forms A and C respectively (Cattell et al., 1992; Karson & O'Dell, 1976; Krug, 1981; Prinsloo, 1991).

6.2.1.1 The uses of the 16PF

According to Prinsloo (1991), the test has many applications. These include the following:

- a) Career counselling may be given to individuals, based on the scores of the 16PF. For greater effectiveness, this can be coupled with the results of other tests such as interest inventories and intelligence tests. It can also be used at universities to assist students in career choices, to diagnose study problems, and to select and accept students into university programmes.
- b) In industry, the results may be used for assessing individuals when recruitment, selection, placement, and promotion take place. It may also be used for the diagnosis of individual problems that might hamper productivity.
- c) In counselling the scores may be used to aid in marital and family therapy.
- d) It may be applied in clinical settings to identify personality disorders; and
- e) It may be useful in research and academic settings as it may be used as a basis when developing new instruments, and by postgraduate students when research projects are undertaken.

6.2.1.2 Interpreting the 16 PF

As stated earlier, the scores on the 16PF allow one to describe behaviour in terms of 16 primary source traits (first-order scales) and about six secondary source traits (second-order scales). Cattell et al. (1992) also started gathering data about third order patterns which they called third-order factors. These factors will now be discussed in greater detail.

6.2.1.2.1 First-order factors

To understand the descriptions below it is important to note the following: First, the high score (10) corresponds to the description at the right of the table and the low score corresponds to the opposite description on the left (see Table 6.13). Secondly, the behaviours described at the top of the source trait lists (to be discussed below) are more strongly characteristic than those lower on the list. Thirdly, the technical psychological title is given (in bipolar form) in the following order: alphabetic index, universal index (U.I.)(L) number, and popular term (Cattell et al., 1992). Fourthly, the "Q" factors are based on Q data or questionnaire data and have only been found in questionnaires till now. Because they have not been found in all forms of data, Cattell placed them at the end of the profile sheet. However, according to Karson and O'Dell these "Q" scores are very important in the interpretation of a person's profile (Cattell et al., 1992; H.B. Cattell, 1989; Karson & O'Dell, 1976).

The specific first-order traits will now be described in more detail (Cattell et al., 1992; H. B. Cattell, 1989; Karson & O'Dell, 1976):

1) Factor A (Warmth)

Table 6.15 Factor A (Cattell *et al.*, 1992, p. 80)

FACTOR A		
U.I.(L&Q) ¹		
Low Score	vs	High Score
SIZOTHYMIA, A-		AFFECTOTHYMIA, A+
(Reserved, Detached, Critical, Aloof, Stiff)		(Warmhearted, Outgoing, Easygoing, Participating)
	Critical vs	Good Natured, Easygoing
Stands by his own ideas	vs	Ready to cooperate, Likes to participate
Cool, Aloof	vs	Attentive to people
Precise, Objective	vs	Softhearted, Casual
Distrustful, Sceptical	vs	Trustful
	Rigid vs	Adaptable, Careless, "Goes along"
	Cold vs	Warmhearted
Prone to sulk	vs	Laughs Readily

Initially, Cattell believed that this factor corresponds most closely to the traditional psychiatric dichotomy between schizophrenia and manic-depressive psychosis, including the milder variations of these mood swings in less disturbed patients. It was first called "cyclothymia-vs.-schizothymia".

This appeared too extreme a description according to Cattell et al. (1992):

But the view of A as a normal psychological dimension has been so distorted by its constant discussion in connection with the pathology of cyclic, affective psychosis and schizophrenia that we finally decided to abandon use of these classical terms for this normal dichotomy of temperaments (p. 81).

Instead, the A factor is now referred to as sizothymia-vs-affectothymia, reducing pathological identification. Sizothymia refers to the flatness of the emotions in the A- person, and is derived from the Latin word *sizo*, meaning "flat". As seen in Table 6.15, a sizothyme person (low on Factor A) is inclined to be withdrawn, uncompromising, critical in outlook, and aloof. This person prefers occupations with machinery and logic, working alone, intellectual approaches, and rejects compromises (e.g. artists, electricians, research scientists). Affectothymia (Factor A+) refers directly to affective psychosis and refers to someone who is emotionally free and uncontrolled. These people are generally easygoing, display accessible emotions and are interested in people, they are natural joiners, form active groups more readily, and are less afraid of criticism. However, there is a tendency to be less dependable in precision work and more casual in meeting obligations. Suitable occupations include: social workers and business executives. Someone who shows extreme deviations at either end of the scale is likely to have troublesome traits.

This factor makes the largest contribution to the assessment of personality of all the factors and has a major influence on the personality of individuals. It largely determines whether an individual's energy will be directed toward social interaction or toward objects and the inner world of ideas. There is also a hereditary influence in the determination of a person's level on Factor A.

2) Factor B (Intelligence)

Table 6.16 Factor B (Cattell et al., 1992, p. 82)

FACTOR B		
U.I.(&Q) ²		
Low Score	vs	High Score
LOW INTELLIGENCE, B-(Crystallized, Power Measure, Dull)		HIGH INTELLIGENCE, B+ Crystallized Power Measure, Bright
Low mental capacity	vs	High general mental capacity
Unable to Handle Abstract Problems	vs	Insightful, Fast-Learning, Intellectually Adaptable
Apt to be less well organized	vs	Inclined to have more Intellectual Interests
Poorer judgement	vs	Showing better judgement
Of Lower Morale	vs	Of higher Morale
Quitting	vs	Persevering

Although not technically a personality trait according to Cattell, it was included in the 16PF to add to our understanding of human functioning (See Table 6.16). It is the only scale that does not follow a 0,1,2 or 2,1,0 scoring pattern as only one score is correct and each item adds only one point to the total score on the scale. The aim in constructing this measure was to strike a balance between emphasis on the fluid and general ability factor. It is a "power" measure and scores do not correlate well with other "speed" tests. Cattell found this factor quite adequate with the majority of vocational selection and clinical fields, but he advised caution when using it for vocational guidance, especially for high level occupations. In such instances it would probably be better to supplement the B scale with special aptitude measures.

Karson and O'Dell (1976) have certain reservations about the scale (contrary to Cattell, 1989), but acknowledge that it had proved to be valuable as an intelligence measure. It gives a good indication of the attention the test taker has paid to the test, and it can be useful in reaching conclusions about implications raised by other scales.

3) Factor C (Ego Strength)

Table 6.17 Factor C (Catell et al., 1992, p. 83)

FACTOR C		
U.I (L&Q) ³		
LOW SCORE	VS	High Score
EMOTIONAL INSTABILITY or EGO WEAKNESS, C-		HIGHER EGO STRENGTH, C+
(Affected by feelings, Emotionally less stable, Easily upset, Changeable		(Emotionally Stable, Mature, Faces reality, Calm)
Gets Emotional when frustrated	vs	Emotionally matured
Changeable in Attitudes and Interests	vs	Stable, Constant in Interests
Easily Perturbed	vs	Calm
Evasive of Responsibilities, Tending to give up	vs	Does Not Let Emotional Needs Obscure Realities of a situation, Adjusts to facts
Worrying	vs	Unruffled
Gets into fights and Problem Situations	vs	Shows Restraints in Avoiding Difficulties

Factor C is the most important factor for determining psychopathology, and it can be described as what psychoanalysts refer to as ego strength and weakness. It also serves to highlight the emotional stability of individuals. As gleaned from Table 6.17, a person with a low score on this factor is easily irritated by people and things, dissatisfied with the world, his family,

restrictions of life, his own health, and he feels unable to cope with life. Neurotic responses are in the form of phobias, psychosomatic disturbances, sleep disturbances and hysterical and obsessional behaviours. A person high on C can be considered to be free of neuroticism, emotionally stable, realistic, self-controlled, calm, patient, persevering, loyal and dependable. It is believed that, in general, such an individual's personality is coherent.

Occupations suitable for persons with high ego strength include administrators, airline pilots and administrators, while people with low ego strength would be best suited for occupations such as postman, clerk, janitor, and writers.

4) Factor D

Table 6.18 Factor D (Cattell *et al.*, 1992, p. 84)

FACTOR D		
U.I.(L&Q) ⁴		
High Score	vs	High Score
PHLEGMATIC TEMPERAMENT, D-		EXCITABILITY, D+
(Undemonstrative, Deliberate, Inactive, Stodgy)		(Excitable, Impatient, Demanding, Overactive, Unrestrained)
Stoical	vs	Demanding
Complacent	vs	Attention getting, Showing Off
Deliberate	vs	Excitable, overactive
Not Easily Jealous	vs	Prone to jealousy
Self-effacing	vs	Self-Assertive, Egotistical
Constant	vs	Distractible
Not Restless	vs	Shows many nervous symptoms

Because this source trait is found in children more clearly than in adults, it has not been included in the 16PF, but in the childhood scales (see Table 6.18). However, Cattell *et al.* (1992) discussed it for the sake of completeness.

The D factor uncovers a pattern of distractibility, coupled with irresponsibility and assertive overreaction. A person high on D is a restless sleeper, easily distracted from work by noise, reacts negatively if not given important positions, etc. It is clearly expressed in children who have been neglected or who suffer from brain damage. Although such a child is likable and affectionate in quieter moments, he/she is demanding and impulsive in restrictive situations.

5) Factor E (Dominance)

Table 6.19 Factor E (Cattell et al., 1992, p. 86)

FACTOR E		
U.I.(L&Q) ^f		
Low Score	vs	High Score
SUBMISSIVENESS, E-		DOMINANCE OR ASCENDANCE, E+
(Obedient, Mild, Easily Led, Docile, Accommodating)		(Assertive, Aggressive, Competitive, Stubborn)
Submissive	vs	Assertive
Dependent	vs	Independent-minded
Considerate, Diplomatic	vs	Stern, Hostile
Expressive	vs	Solemn
Conventional, Conforming,	vs	Unconventional, rebellious
Easily upset by authority	vs	Headstrong
Humble	vs	Administration Demanding

According to Cattell et al. (1992) Factor E appears to have a different factor loading pattern for men than for women. For women the following dominance traits have higher loadings than men: hypochondriacal, socially poised, prominent and attention-getting. Dominance appears to be positively correlated with social status and leaders. Occupationally, high Factor E scores are obtained by athletes, research scientists, and airman, and lower scores are obtained by farmers, cooks and janitors. Heredity influences this factor, and it is also one of those factors which distinguishes between the sexes.

Karson and O'Dell (1976) also described a person high on factor E as someone who enjoys dominating, controlling and criticising others, being in command, who enjoys meeting challenges, and who feels superior to others. On the other hand, someone low on E will be submissive, unsure, modest, retiring, complacent, impunitive, meek, quiet, obedient, lighthearted, cheerful, timid, conventional, frank, expressive, etc. Also, a certain amount of dominance is found in males and not females to the same degree. This agrees with past roles held by males and females. They make the following assertion about hostile women:

... if other hostile factors are present in a woman's profile (such as L+ or Q1+), one could have the classic example of the "castrating" female. Extreme dominance and aggressiveness might imply that a woman was rebelling against her conservative female role stereotype. ... should you find a male partner low on E, while his wife scored high on E, it would not be difficult to make a guess who dominates in the family...would not bode well for the marriage...there are marriages of this sort that survive because they satisfy the sado-masochistic needs of the partners (Karson & O'Dell, 1976, pp. 45-46).

H. B. Cattell (1989) also indicated that men score higher on this factor than females but she acknowledged that this was based on data collected in 1978, and that future standardisations might reflect changes on this factor. However, she feels that biological influences are important and states:

...many studies ... show that dominant behavior is influenced by hormonal factors, specifically by the amount of male hormones (Cattell, 1989, p. 69).

6) Factor F (Impulsivity)

Table 6.20 Factor F (Cattell *et al.*, 1992, p. 87)

FACTOR F			
U.I.(L&Q) ⁶			
Low Score	vs	High Score	
DESURGENCY, F-		SURGENCY, F+	
(Sober, Taciturn, Serious)		(Enthusiastic, Heedless, Happy-go-lucky)	
Silent, Introspective	vs	Talkative	
Full of cares	vs	Cheerful	
Concerned, Reflective	vs	Happy-go-lucky	
Incommunicative, Sticks to inner values	vs	Frank, Expressive, Reflects the group	
Slow, Cautious	vs	Quick and Alert	

According to Karson and O'Dell (1976), the introduction of Factor F, makes it more difficult to distinguish between factors. This factor is similar to Factor A. This is largely due to the method of factor analysis, which allows factors to be related, although there is still a definite difference between the two. Thus, a person high on Factor A is very warm and helpful, whereas a person high on F is flighty, unrestrained and not helpful (see Table 6.20).

People with high scores on Factor F have had an easier, less punishing, more-optimistic, creative upbringing or a happy-go-lucky attitude though less demanding aspirations. In neurotic individuals F+ shows hysteric symptoms and sexual anomalies, while F- shows more worrying, headaches, irritability, depressive retardation, phobias and nightmares. Although Cattell *et al.* (1970) warn that surgency should not be confused with depression, Karson and O'Dell (1976) point out that according to their experience a low F, coupled with a high O, signifies depression.

Surgency decreases quite rapidly from the age of 17 to 35 and more slowly after that. A person with this trait represents a sober person no longer young in spirit who tends to be serious in his/her approach to life. When occupational groups are considered, air hostesses and sales managers are high on this factor, and artists, university administrators and physicists are low.

7) Factor G (Conformity)

Table 6.21 Factor G (Cattell et al., 1992, p. 90)

FACTOR G		
U.I.(L&Q) ⁷		
Low Score	vs	High Score
LOW SUPEREGO STRENGTH or LACK OF ACCEPTANCE OF GROUP MORAL STANDARDS, G- (Disregards Rules, Expedient)		SUPEREGO STRENGTH or CHARACTER, G+ (Conscientious, Persistent, Moralistic, Staid)
Quitting, Fickle	vs	Persevering, Determined
Frivolous,	vs	Responsible
Self-indulgent	vs	Emotionally Disciplined
Slack, Indolent	vs	Consistently ordered
Undependable	vs	Conscientious, Dominated by Sense of Duty
Disregards Obligations to people	vs	Concerned about moral standards and rules

This factor resembles Factor C, ego strength, in its emphasis on self-controlled behaviour, but it differs as G+ also focuses on persistence. Factor G focuses on the moral concerns of what is right and wrong, and it is related to the psychoanalytic concept of superego strength. A person that is high on G+ is a very conventional, moral person who is interested in analysing

people, cautious in statements, and who prefers to be around efficient people. One should be aware that faking can take place, and extremely high and low scores should be viewed with suspicion.

Karson and O'Dell (1976) disagree with Cattell in his emphasis on the superego, and prefer to focus on the fact that someone high on this factor only pretends to accept the external trappings of conventionality and morality without having internalised parental and societal standards. It correlates negatively with sociopathic behaviour, delinquency, and homosexuality, and positively with success at school and in general life. This factor appears to be particularly prevalent amongst airline pilots and hostesses, and low amongst criminals and other individuals who disregard conventional moral standards. Low scores are also obtained by "radicals" who are persistent in terms of their frame of reference, as well as by some individuals who perform duties well in a highly regimented society or organisation.

8) Factor H (Boldness)

Table 6.22 Factor H (Cattell et al., 1992, p. 91)

FACTOR H		
U.I.(L&Q)^a		
Low Score	vs	High Score
THRECTIA, H-		PARMIA, H+
(Shy, Timid, Restrained, Threat-sensitive)		(Adventurous, "Thick skinned", Socially bold)
Shy, withdrawn	vs	Adventurous, Likes Meeting People
Retiring in Face of Opposite Sex	vs	Active, overt interest in Opposite Sex
Emotionally cautious	vs	Responsive, Genial
Apt to be bitter	vs	Friendly
Restrained, rule bound	vs	Impulsive
Restricted interest	vs	Emotional and Artistic Interests
Careful, Considerate, Quick to See Dangers	vs	Carefree, Does Not See Danger Signals

The H- individual, when in stress, shows proneness to schizoid disorders, tuberculosis, ulcers, etc., whereas an individual who obtains a high a score on this factor is associated with more heart attacks. As can be gleamed from Table 6.22, a person with low H is intensely shy and prefers to have a few close friends rather than to be involved in large groups; has an inferiority

complex; finds it difficult to express him/herself; prefers occupations with little personal contact; and finds it difficult to keep in contact with surroundings. The H+ individual is daring, venturesome, and spontaneous, willing to accept a challenge, and has a high obvious interest in the opposite sex. Although H+ and E+ seem similar, the E+ person is dominant and ruthless in the achievements of objectives, whereas the H+ person is simply bold and gregarious by nature and more diplomatic in the pursuit of objectives. This factor is an inherited personality factor and also increases with age as people tend to become less shy the older they become. When occupations are considered, high scores are found amongst airmen and administrators and low scores amongst farmers.

9) Factor I (Emotional Sensitivity)

Table 6.23 Factor I (Cattell *et al.*, 1992, p. 93)

FACTOR I		
U.I.(L&Q) ^a		
Low Score	vs	High Score
HARRIA, I-		PREMSIA, I+
(Tough-minded, Rejects Illusions)		(Tender minded, Sensitive, Dependent, Overprotected)
Unsentimental, expects little	vs	Fidgety, expecting Affection and Attention
Self-reliant, Taking Responsibility	vs	Clinging, insecure, Seeking help
Hard (point of cynicism)	vs	Kindly, Gentle, Indulgent, to Self and others
Few artistic responses (but not lacking taste)	vs	Artistically Fastidious, Affected, Theatrical
Unaffected by Fancies"	vs	Imaginative in Inner Life and Conversation
Acts on Practical, logical evidence	vs	Acts on Sensitive Intuition
Keeps to the point	vs	Attention-seeking, flighty
Does not Dwell on Physical Disabilities	vs	Hypochondriacal, Anxious about self

The individual with a high score on Premsia dislikes people who are crude, likes travelling and new experiences, is impractical in general affairs, has a somewhat uncontrolled, imaginative, aesthetic mind, and has a love for dramatics (see Table 6.23). In groups, if the majority of its

members have I+ scores, performances tend to be poorer as they appear to fuss more, makes negative remarks and hinder group decision making. Also, it is associated with psychotic and neurotic breakdown and other psychosomatic complaints. On the other hand, individuals who score low on this factor tend to be tough, masculine, practical, mature, and realistic.

This factor appears highly influenced by environment and cultural influences. Individuals with high I+ scores include employment counsellors, musicians, artists, and writers. Individuals with low I scores occupy positions such as electricians, policemen and mechanics.

10) Factor J

Table 6.24 Factor J (Cattell *et al.*, 1992, p. 95)

FACTOR J		
U.I.(L&Q)¹⁰		
Low Score	vs	High Score
ZEPPIA, + (Zestful, Liking Group Action)		COESTHENIA, J- (Circumspect Individualism, Reflective, Internally Restrained)
Likes to Go with the Group	vs	Acts individually
Likes Attention	vs	Guarded, Wrapped up in self
Sinks personality into Group Enterprises	vs	Fastidiously Obstructive
Vigorous	vs	Neurasthenically Obstructive
Accepts common Standards	vs	Evaluates coldly

This factor is not found in the 16PF, but it is included in the HSPQ and it is presented by Cattell *et al.* (1992) for completeness in terms of the description of the primary source traits. Although this factor is difficult to interpret, a person with a high J score acts reasonably in individual situations, but is often rigid or uncompromising in group situations. Also, J+ tend to be associated with delinquency (individual in nature) but such individuals respond well to treatment (see Table 6.24).

A J+ person can be described as mentally and physically fastidious; feels tired on awakening in the morning; remembers when ill-treated; differs from the group but keeps in the background to avoid arguments; and socially not popular but respected by friends who know him well.

11) Factor L (Suspiciousness)

Table 6.25 Factor L (Cattell *et al.*, 1992, p. 96)

FACTOR L		
U.I.(L&Q) ¹²		
Low Score	vs	High Score
ALAXIA, L-		PROTENSION, L+
(Trusting, Accepting Conditions)		(Suspecting, Jealous)
Accepts personal unimportance	vs	Jealous
Pliant to Change	vs	Dogmatic
Unsuspecting of hostility	vs	Suspicious of Interference
Ready to forget difficulties	vs	Dwelling upon frustrations
Understanding and permissive, tolerant	vs	Tyrannical
Lax over correcting people	vs	Demands people accept responsibility over error
Conciliatory	vs	Irritable

According to Cattell et al. (1992, p. 96) protension refers to "projection and inner tension". High scores on this factor are indicative of paranoia if found in the extreme. The individual who obtains a high L score often comes from a home which is admired, has lively intellectual interests, is contemptuous of the average, gets irritated by people who act superior, is not influenced by the viewpoints of influential people, and has a high inner tension. In a group situation this person is unpopular, and group members who are predominantly L+ usually have low morale and are less cohesive (see Table 6.25).

The L- person can be regarded as healthy even when extreme scores are obtained. In terms of occupations, social workers and school counsellors attain low scores, while time-and-motion studies engineers and accountants obtain above average scores.

12) Factor M (Imagination)

Table 6.26 Factor M (Cattell et al., 1992, p. 59)

FACTOR M		
U.C.(L&Q) ¹³		
Low Score	vs	High Score
PRAXERNIA, M-		AUTIA, M+
(Practical, Has "Down to Earth Concerns")		(Imaginative, Absent-minded)
Alert to Practical Needs	vs	Absorbed in Ideas
Concerned with Immediate Interest and Issues	vs	Interested in Art, Theory, Basic Beliefs
Prosaic, Avoids anything Far-Fetched	vs	Imaginatively Enthralled by Inner Creations
Guided by Objective Realities, Dependable in Practical Judgement	vs	Fanciful, Easily seduced from Practical Judgement
Earnest, Concerned or Worried but Steady	vs	Generally Enthused, but Occasional Hysterical swings of "Giving Up"

Cattell et al. (1992) defined the terms as follows:

The term *autia* is meant to convey this *autistic*, or, at least, "internally autonomous" thinking, while the opposite, *praxenia*, conveys the serious, "practical concern" with outer "awkward" details (p. 98).

The person with a high score on this factor has an intense subjectivity and inner mental life, is inclined to disregard practical matters, walks and talks in his/her sleep, and has periods of hysterical episodes with overwrought behaviour (see Table 6.26). They with high scores tend to pursue intellectual activities, are unaware of practical matters, and are generally creative. In a group situation, they tend to feel unaccepted but they still participate and make original leadership suggestions that are often rejected by the group because the suggestions are impractical.

A person with a low score on Factor M is definitely practical, similar to the "tough minded" person found in I-. From an occupational point of view high scores are found among artists, researchers, planning executives and editors, while individuals with M- scores are found in occupations requiring mechanical sense, realism, and alertness.

13) Factor N (Shrewdness)

Table 6.27 Factor N (Cattell *et al.*, 1992, p. 99)

FACTOR N		
U.I.(L&Q) ¹⁴		
Low Score	vs	High score
NAIVETE, N-		SHREWDNESS, N+
(Forthright, Unpretentious)		(Astute, Worldly)
Genuine, but Socially clumsy	vs	Polished, Socially Aware
Has vague and Injudicious Mind	vs	Has Exact, Calculating mind
Gregarious, Gets Warmly Emotionally involved	vs	Emotionally detached and Disciplined
Spontaneous, Natural	vs	Artful
Has simple tastes	vs	Aesthetically Fastidious
Lacking Self-insight	vs	Insightful regarding self
Unskilled in Analyzing Motives	vs	Insightful Regarding others
Content with What Comes	vs	Ambitious possibly insecure
Has blind trust in Human Nature	vs	Smart, "Cut Corners"

This trait appears to measure the socially acquired skills of poise and sophistication. In other words, a person who has a high score on Factor N avoids physical activity, likes being with polite people, knows how to manage situations in a group to get things done, and is tolerant of

people and their failings (see Table 6.27). In group work they are able to lead the group in goal-oriented discussion, obtaining constructive group solutions. People who have low H scores are inept in social relations, vague and sentimental, seek company constantly, lack independence of taste, have limited self-insight, and are naive. From a group perspective these people usually hinder group proceedings. There is also some evidence to suggest that low H scores are negatively associated with pathology i.e. both schizophrenia and neurosis.

Occupationally, people with high scores on this factor are the skilled professionals, e.g. engineers, accountants, electricians while low scores are found among missionaries, priests, nurses, cooks and convicts.

14) Factor O (Guilt Proneness)

Table 6.28 Factor O (Cattell et al., 1992, p. 100)

FACTOR O		
U.L.(L&Q) ¹⁵		
Low Score	vs	High Score
UNTROUBLED ADEQUACY, O-		GUILT PRONENESS, O+
(Self-assured, Placid, Secure, Complacent)		(Apprehensive, Self-reproaching, Insecure, Worrying, Troubled)
Self-confident	vs	Worrying, Anxious
Cheerful, Resilient	vs	Depressed, cries easily
Impenitent, Placid	vs	Easily Touched, overcome by moods
Expedient, Insensitive to People's Approval or disapproval	vs	Strong Sense of Obligation, Sensitive to People's Approval and Disapproval
Does not care	vs	Scrupulous, Fussy
Rudely Vigorous	vs	Hypochondriacal and Inadequate
No fears	vs	Phobic Symptoms
Given to simple action	vs	Lonely , Brooding

A person with a high score on this factor feels unstable, is unable to sleep as a result of worrying, feels insecure to deal with daily demands of life, gets downhearted and remorseful very easily, prefers to be alone, and is often a hypochondriac, with anxieties and phobias most

prominent. Adjectives to describe people who have low scores on this variable include self-confident, tough, spirited, self-sufficient (see Table 6.28). Clinically, it is a very important factor for two reasons. First, it is the most important contributor in the second-order anxiety factor. Secondly, high scores are found among neurotics, alcoholics, and many psychotics - particularly non-paranoid schizophrenics. There is also a relationship between G (group conformity) and O (guilt-proneness).

In group situations, people with high O scores do not feel free to participate and are shy and ineffective speakers. However, they remain task orientated in their remarks and try to maintain high standards in terms of conforming to group rules.

Occupationally, high scores occur among certain religious groups, artists, farmers, and editorial workers. Low scores occur among professional athletes, electricians, mechanics, nurses, and sales managers.

15) Factor Q₁ (Rebelliousness)Table 6.29 Factor Q₁ (Cattell *et al.*, 1992, p. 103)**FACTOR Q₁**U.I.(Q)¹⁶

Low Score	vs	High Score
CONSERVATISM OF TEMPERAMENT, Q₁- (Conservative, Respecting, Established Ideas, Tolerant of Traditional Difficulties)		RADICALISM, Q₁ (Experimenting, Liberal, analytical, Free- thinking)

According to Cattell *et al.* (1992) measures on this factor are related to several external criteria, e.g. success as a psychiatric technician. Persons who have high scores on this factor are more well informed and inclined to experiment with new ideas, and less inclined to moralize and question different viewpoints. They also express more interest in religion, analytic thought, modern essays, they oppose and break custom and tradition, and lead and persuade people. Karson and O' Dell (1976) view the person with a high Q₁ score as being much more aggressive in his actions. They make the following statement:

... it seems reasonable to assume that a Q₁ + person would not have many compunctions about trampling someone who got in the way of his reforms... has an unresolved Oedipal conflict...has not learned to handle authority figures (p. 67).

However, they concede that people with high scores can also be radical thinkers, rather than activists. Although it might appear that the need to revolt is higher amongst adolescents, high scores are more prevalent amongst middle-aged people.

In a group situation the Q_1+ person contributes more critical remarks to discussions. Occupationally, executives and university professors (especially scientific researchers) have high scores on this factor. It is low in occupations such as policemen, nurses, many skilled and unskilled workgroups, and in psychiatric technicians.

16) Factor Q_2 (self-sufficiency)

Table 6.30 Factor Q_2 (Cattell *et al.*, 1992, p. 105)

FACTOR Q_2

U.I.(Q)¹⁷

Low Score	vs	High Score
GROUP DEPENDENCY, Q_2		SELF-SUFFICIENCY, Q_2+
(Sociably Group Dependent, A "Joiner" and Sound Follower)		(Self-Sufficient, Resourceful, Prefers Own Decision)

This is a kind of introversion-extroversion factor. A person with a high score on this factor is someone who is used to making decisions on his/her own. Also, children with high scores

appear to be quite reclusive, with few friends and Q_2+ is positively related with good scholastic achievements. Individuals with low scores depend on the group to a large extent, and are conventional and fashionable (see Table 6.30).

Occupationally, this factor is very high for farmers, writers, scientists and criminals.

17) Factor Q3 (Ability to bind desire)

Table 6.31 Factor Q_3 (Cattell *et al.*, 1992, p. 107)

FACTOR Q_3

U.I.(Q)¹⁸

Low Score	vs	High Score
LOW SELF-SENTIMENT		HIGH STRENGTH OF SELF-SENTIMENT,
INTEGRATION, Q_3		Q_3+
(Uncontrolled, Lax, Follows Own Urges, Careless of Social Rules)		(Controlled, Exacting, Will Power, Socially Precise, Compulsive, Following Self-Image)

This factor represents the strength of a person's concern about his/her own self-image and social image. It measures self-control or a careful, calculated approach to life. Individuals with high scores show foresight, consideration of others, concern for etiquette and social reputation,

conscientiousness, keep their emotions in check, and they possess good work habits (see Table 6.31). Karson and O' Dell (1976) feel that this factor usually indicates how successfully a person is able to bind anxiety. However, if a person has a high score it can be problematic as flexibility and creativity may suffer, and he/she may be intolerant of disorder or ambiguity. On the other hand, a person with a low score will find it difficult to perform successfully in a large organisation that rewards compulsivity and responsibility, and may not remain long in a job. If a low score is coupled with other anxiety indicators, it can be assumed that the person is in distress.

From a group perspective, individuals with high scores are more often chosen as leaders and they are more effective in such position. They also make meaningful contributions to the group by offering workable solutions to problems. High Q_3 scores are often found in the following professions: airline pilots, university administrators, electricians, and psychiatric technicians. It is also positively related to freedom from motor car accidents and success in school.

It is an important contributor to second-order anxiety factors. According to Cattell *et al.* (1992), in the clinical sense

it represents... the extent to which the person has crystallized for himself a clear, consistent, admired pattern of socially approved behavior, to which he makes definite efforts to conform .. we are measuring the amount of concern about and regard for these standards (p. 107).

18) Factor Q₄ (Free Floating Anxiety)Table 6.31 Factor Q₄ (Cattell et al., 1992, p. 107)

FACTOR Q₄		
U.I.(Q) ¹⁹		
Low Score	vs	High Score
LOW ERGIC TENSION, Q ₄ -		HIGH ERGIC TENSION, Q ₄ +
(Relaxed, Tranquil, Torpid, Unfrustrated,		(Tense, Frustrated, Driven,
Composed)		Overwrought, Fretful)

An individual with a high score on this factor is highly tensed, finds it difficult to calm down, is irrationally worried, unable to tolerate criticism, experiences difficulty sleeping, and always speaks his/her mind (see Table 6.31). However, it is important to note (when interpreting the scores) that many of the items are very transparent and easily fakeable.

High Q₄ individuals rarely achieve leadership positions in a group, and view group unity, orderliness and quality leadership negatively. A high score is often found amongst editors, while low scores are found amongst airline pilots and hostesses. This factor is also related to accident proneness.

Clinically, it is one of the best indicators of acute neurotic trends and it is the most important contributor to the second-order anxiety scale. It is also very high amongst manic-depressives

and psychopaths, and according to Cattell et al. (1992), the best way to describe this factor is that:

... it represents a level of excitement and tension, expressing undischarged (usually frustrated) and poorly controlled "libido" (p. 108).

This is a very important factor in the determination of the personality, and particularly of personality disorders.

6.2.1.2.2 The Second-Order factors

After the determination of the 16 first-order factors described above, Cattell conducted further factor analyses of the correlations and extracted eight second-order factors (see Table 6.33). However, only the five largest are reflected in the 16PF and therefore the discussion will be limited to the following five scales: extraversion, anxiety, cortertia, independence, sociopathy. These second-order factors are viewed as being much broader and more general than the first-order factors, and provide useful information to summarise the relationship amongst the factors of the 16PF. When interpreting the data it is therefore important to consider both first and second-order factors (Cattell et al., 1992; Cattell, 1989; Karson & O'Dell, 1976).

Table 6.33 List of Second-Stratum Factors measurable by the 16PF (Cattell *et al.*, 1992, p. 116)

Standard Index	Bipolar Title	Chief Primaries involved	Equivalent in Objective O-A Factors
Q _I	Invia-vs.-Exvia	A+, E+, F+, H+, Q ₂	U.I. 32
Q _{II}	Adjustment-vs.-Anxiety	C-, H-, L+, O+, Q ₃ -, Q ₄ '	U.I. 24
Q _{III}	Pathermia-vs.-Cortertia	A-, I-, M-, (E+, L+,	U.I. 22
Q _{IV}	Subduedness-vs.-Independence	E+, L+, M+, Q ₁ +, Q ₂ +	U.I. 19
Q _V	Naturalness-vs.-Discreetness	N+, (A+, M-0-),	U.I. 30(-) or 29(-)
Q _{VI}	Cool Realism-vs.-Prodigal Subjectivity	I+, M+, L-	U.I. 28 or 18
Q _{VII}	Low Intelligence-vs.-High Intelligence	B+	U.I. 1
Q _{VIII}	Low Superego-vs.-High Superego strength	G+, Q ₃ +, F-	U.I. 29

a) Invia-vs-Exvia (Q_1) (Extraversion)

This is popularly referred to as introversion-vs-extroversion, identified by Jung and Freud many years ago, in terms of subject/object polarities. Cattell appears to vary as to what constitutes this second order factor, particularly in terms of Factor E. In the Handbook (1992) it appears as part of Q_1 , but in other publications it is excluded. However, Karson and O'Dell and H.B. Cattell (1989) exclude it from the determination of this factor. Clinically, extreme scores should be viewed carefully, especially when high scores are encountered. A moderately low score is not necessarily negative, but extreme scores (1 or 2) should be viewed with suspicion as they might indicate signs of withdrawal. When interpreting extreme scores, relevant first-order scores should be considered. Although a high score is less troublesome than a low score, an extraordinarily high score might indicate that a person has an unhealthy need to be around people. Scores tend to be above average in delinquents and psychopaths, and below average in neurotics and creative people.

b) Adjustment-vs-Anxiety (Q_{11}) (Anxiety)

According to Cattell et al. (1992) this factor in itself is not to be considered pathological, but in many instances it is high in neurotics. Also, these interpretations might also fit the classic psychoanalytic theory. Karson and O'Dell (1976) carry it much further when they assert that it is of first importance amongst the second-order factors, and that a high score should always be taken seriously. However, a low score is not necessarily a sign of good mental health and

should also be viewed with caution. This might mean that the person is hiding something, faked the score to look good, or is openly admitting to great stress.

c) Pathemia-vs.-Cortertia (Q_{III}) (Tough Poise)

Cortertia, the positive pole is an abbreviation for "cortical alertness". The descriptions that go with cortertia are cheerful, alert, and ready to handle problems at an objective level. Those individuals (pathemic) who have low scores tend to handle problems at a subjective level, and they tend to be depressed and moody. Also, they tend to "think" rather than "feel". Occupationally, pilots are inclined to have high scores on this factor.

Karson and O'Dell (1976) caution against the use of this factor in clinical situations, although they found it useful in occupational settings.

d) Subduedness-vs.Independence, Q_{IV} (Independence)

Cattell et al. (1992) describe a person with a high score as independent, radical, artistic, projective, and a law unto himself. Also, scores are significantly higher among men than among women and it is determined to a large extent by heredity. People with low scores are subdued as well as dependent, needing interpersonal support and external guidelines (Cattell, 1989).

Karson and O'Dell (1976) state that this factor is not as well established as the other factors, and they do not use this factor much.

e) Qv, Qvi, Qvii, Qviii

Although defined to a certain degree, the criterion associations have not yet been investigated thoroughly. These factors are therefore not really used in the interpretation of test results.

f) Compulsivity-vs-sociopathy

This is a factor found by Karson and O'Dell (1976), not Cattell, in 1958 in a sample of air force pilots (it is therefore not reflected in the Table 6.33). Traits that describe individuals with high scores on this factor are conforming, rigid, lack of spontaneity. Low scores indicate lack of restraint and freedom.

6.2.1.2.3 Third-Order Factors

After intercorrelating and factor analysing the second-order factors, the following third-order factors were identified: strength of the nervous system, self-criticism, responsiveness, self-concern and control, and serenity and detachment. According to Cattell *et al.*, (1992) these should not be viewed as traits, but rather as environmental or genetic influences which affect the patterns of personality traits. **Strength of the nervous system** is possibly a favourable influence that encourages exviva and cortertia. **Self-criticism** could possibly reflect excessive parental authority. **Responsiveness** refers to alertness to the environment. **Self-concern and control** is possibly indicative of an individual's values and suggests strong religious or cultural control.

Serenity and detachment is the last factor and it is possibly indicative of a higher social status effect.

However, the descriptions in the previous paragraphs should not be used for any interpretations.

As Cattell et al. (1992) state:

It is not suggested that these higher-order factors be used in practical predictions. The recent research is included here primarily for completeness of information about strata in Q-data for the researcher (p. 125).

6.2.1.3 Evaluation of the 16PF

In their handbook, Cattell et al. (1992) make the following statement:

During the two decades of growth, the reliabilities and validities of the 16PF have steadily advanced...(p. xix).

This is reflected in the test-retest reliability coefficients that range from 0,63 to 0,88 (after a two month interval) for Form A and B, and from 0,43 to 0,85 after a two-and-a-half month interval (Form A) for the general population. The lowest coefficient for both intervals was for Factor B (intelligence). Construct validity was established by means of factor analysis, and satisfactory

results were found. They stated the following:

... there is, as yet, every sign that dimensions of intelligence, surgency, ego strength, anxiety, guilt proneness, etc., measured so far by the 16PF are universal (even if expressed slightly differently in different countries...) (Cattell et al., 1992, p. xxi).

The consistency of the findings was supported by a great deal of research by Cattell and associates (e.g. Bolton, 1978; Cattell, 1986; 1980; 1972; Cattell, Knapp, Scheier, 1961; Cattell & Vogelman, 1976; Gorush & Cattell, 1967; McArdle, 1984)

However, after 1961 and, starting with Livonian's attempt to replicate Cattell's factor structure, a number of researchers have failed to find the same result. In fact, the 16PF was attacked quite vigorously from a number of quarters in term of validity, item structure and theoretical framework (e.g. Baird, 1981; Barrett and Kline, 1982; Bull, 1974, Eysenck, 1971, 1972; Howard et al. 1972; Lin, 1973; Matthews, 1989; Noller et al., 1987; Steward, 1977).

The 16PF was also reviewed several times in the Mental Measurements Yearbook from 1958 to 1983 with mixed reviews. No definite conclusion about the test can be made from the Yearbook as it appears that in each Yearbook researchers differed in there reviews.

For example, reviewers in the 1958 Yearbook made the following conclusions:

... the test could be used in a harmful way...no known validated use (Lubin, p. 87).

... the utility of the 16PF score remains to be demonstrated (Harsch, p. 87).

... as it stands is not a finished tool. It remains a worthwhile and ambitious beginning...suggests its use whenever trial approaches to the evaluation of personality are desired (Wittenborn, p. 88).

In 1985, the following conclusions were made by the reviewers:

For personality research purposes,... probably preferable to use tests like the Eysenck Personality Questionnaire, where each of the broad (secondary) factors has a firmer foundation in theory and laboratory research (Zuckerman, p. 1394).

The 16PF is most valuable...where assessment of "normal range" personality traits is important....with clinical populations it is somewhat riskier since the item pool does not sample adequately from these problem domains (Butcher, p. 1392).

Positive reviews were also given by Adcock (1965), Bolton (1978) and negative reviews by Bouchard (1972), and Walch (1972).

The 16PF was also reviewed in *Test Critiques* (1985) and again the reviewer (Wholeburn) appears to have mixed ideas about the test. He stated that:

... most of the validity and reliability analysis for all forms except Form E are based on data collected almost 15-20 years ago...criticism regarding potential misuse of the test often overshadows the real value of the test in other areas (pp. 603-604).

These published reviews range from mild criticism of the potential utility of the test under certain circumstances, to very harsh criticism which implies that the test has no use at all.

Besides the mixed reviews, there are other areas that are of concern. First, major campaigners of the test (Karson & O'Dell, 1976) disagreed with Cattell *et al.* (1976) and criticised certain aspects of the test. For example, they commented on the great overlap between scales:

With the introduction of scale F, we begin to run into difficulty in differentiating between the factors (p. 46).

They also disagreed with Cattell about Factor G and stated:

We should explicitly state here that the present writers disagree with Professor Cattell about the interpretation of the G scale (p. 49).

They also added another second-order factor, not found by Cattell which they called Compulsivity, and which they use in the interpretation of scores. The disagreement between Cattell, the developer of the test, and his associates, raises serious questions about the interpretation of the test scores. The result of this disagreement is that test users are forced to make a choice between the different interpretations, and that they are compelled to exercise judgement about the contending views. Secondly, Karson and O'Dell's (1976) description of Factor E (Dominance) appears to reinforce gender stereotypes about women (see p. 143). This has potentially serious consequences as scores on this factor might reflect a gender bias rather than a true score. Thirdly, in their handbook, Cattell et al. (1992) advocated the use of two forms of the test to increase accuracy. This point is overlooked by the vast majority of test users, as time constraints usually prevail, which makes this alternative impractical.

Despite the mixed reviews of the 16PF, it is used extensively in South Africa, with very little published research to justify its use (as discussed previously). In the next section the use of the test in South Africa will be discussed.

6.2.1.4 The 16PF In South Africa

As discussed earlier, there are various forms of the 16PF and the majority of them are used in South Africa where the distributor of the test is the HSRC. In certain cases these forms have been standardised and adapted for South African conditions, while in other cases no adaptation has taken place. The following forms are available in South Africa (Prinsloo, 1991, 1992):

a) Form A and B

These two tests have 187 items each, and they were developed for adults with an educational background of at least matric or the equivalent thereof. Both these tests have been adapted, and local norms were developed for South African conditions. In the process, Form A, similar to its American counterpart was developed for local conditions by the Institute for Psychological and Edumetric Research (IPER) of the HSRC, and it is based on the American version (Form A) published in 1962. The South African version of Form B is also based on the American Form B which was developed in 1968. Both forms have been adapted and made available in English and Afrikaans. However, a major limitation is that in the development of local norms only members of the white population group were included in the sample.

b) Form C and D

These forms of the tests have 105 items each, and they are suitable for use in Industrial settings because of their simplified language. It has, however, neither been adapted, nor standardised for South African conditions. It is not available from the HSRC.

d) **Form E**

This version contains 128 items and language usage, vocabulary and format have been simplified, making it suitable for persons who are eighteen years and older and who did not pass matric (Std 4-9). This form was adapted and standardised by the HSRC for South African use.

2) **Clinical Analysis Questionnaire (CAQ)**

This questionnaire has been developed with the aim of detecting pathological patterns amongst individuals. It has neither been adapted nor standardized for South Africa. It can, however, be purchased from the HSRC.

d) **High School Personality Questionnaire (HSPQ) and Childrens' Personality Questionnaire (CPQ)**

These two versions are suitable for children in the age groups 13 to 18 years (HSPQ) and 8 to 13 years (CPQ) respectively. It has been adapted and standardised for South African conditions. The norms for the HSPQ and CPQ are, however, based on samples from the now defunct provincial education departments (white education departments).

e) **SA92 version**

Because the most recent South African version of the 16PF (SA92) is the focus of this investigation, it will be discussed in much greater detail in the next section.

6.2.1.4.1 The 16 Personality Factor Questionnaire, South African 1992 version (16PF, SA92)

According to Prinsloo (1992), the 16PF (SA92) adheres to the format of the American tests and all the items that were used are also to be found in the original tests. He therefore assumes that the conceptualisation and rationale, as well as the background, can be transferred to the local South African situation without any alterations. This would imply that the interpretations of the scores described in detail above are equally applicable to the new version.

The new version was developed for a number of reasons. First, it had not been determined whether gender and ethnic bias existed in Form A and B as these variables were not formally investigated during the original standardisation. The new version was specifically developed to eliminate bias. Secondly, target groups are now dealt with in such a manner that the various population groups are represented in the norm groups (which was not the case with Form A and B). Thirdly, poor items were eliminated by way of item analysis, thereby increasing the factor reliability coefficients. Fourthly, there was concern about the low reliability coefficients that were found in certain scales in Form A and B.

The norm group used in standardisation of this version of the 16PF consisted of blacks, whites, coloureds and Indians. The data were then analysed to determine if group differences existed and also to establish the reliability and validity coefficients (Prinsloo, 1992). The results are reported as follows:

a) Group differences

Group differences were investigated in respect of qualification level, home language, age group, population group, gender, test language, student and employee status, study and career fields. The conclusion was drawn that differences observed for above variables were not significant enough to warrant separate norms for the various subgroups. However, statistically significant differences were found when gender scores were compared. Therefore, norms are provided for the total sample, as well as separate norm tables as for females and males.

b) Reliability

Kuder-Richardson 8 coefficients were used to assess coefficients of internal consistency is indicated for each factor (first-order), and Mosier's formula was used to estimate reliabilities for the second-order factors (see Tables 6.34 and 6.35). These figures indicate that the level of internal consistency for each factor for the relevant groups is generally higher than found in the case of Forms A and B.

Table 6.34 Reliability coefficients (KR-8) for first-order factors (adapted from Prinsloo, 1992, pp. 28-30)

Factor	Gen.Pop.	Female	Male
A	0,74	0,75	0,71
B	0,61	0,58	0,63
C	0,75	0,76	0,74
E	0,66	0,69	0,63
F	0,73	0,76	0,70
G	0,70	0,72	0,67
H	0,82	0,84	0,79
I	0,68	0,60	0,57
L	0,59	0,62	0,55
M	0,60	0,64	0,55
N	0,51	0,48	0,53
O	0,76	0,78	0,73
Q ₁	0,62	0,65	0,58
Q ₂	0,63	0,65	0,59
Q ₃	0,74	0,75	0,72
Q ₄	0,73	0,74	0,70
MD	0,72	0,72	0,70

One can gather from the above table that the coefficients appear to be quite satisfactory. If the results are compared with coefficients found with Form A, a number of factors showed improvements of between 10% and 20% (i.e. Factors A, B, E, F, H, I, L, MD). Only Factor Q₂ did not show any significant improvement. The remaining factors showed improvements of between 34% and 66%. The reliability coefficients calculated for the second-order factors also yielded high scores (Table 6.35).

Table 6.35 Reliability Coefficients (using Mosier's formula) for second-order factors (Prinsloo, 1992, p. 21)

SECOND ORDER FACTOR	COEFFICIENT
QI Extraversion	0,88
QII Anxiety	0,90
QIII Emotional Sensitivity (C,I,M,O,Q ₃ ,Q ₄)	0,89
QIII Tough Poise (A,I,M)	0,74
QIV Independence	0,80
QVIII Compulsivity	0,79

d) Validity

According to Prinsloo (1992) as indicated earlier, research from the USA regarding validity is well documented and he accepted it as applicable to South African circumstances. Factor analyses were carried out (for second-order factors), and the results showed essentially the same factor structure as found in the Forms A and B of the South African version. The factor structures of the subgroups, in respect of gender, test language, and population group, were also essentially the same. When the second-order factors were considered, the same factor structure was consistently extracted. It is, however, important to note the following trends: **Extraversion** (Q_I) did not yield the same strong factor loadings for blacks as for the other groups and this is ascribed to differences in culture.

According to Prinsloo (1992):

This is attributed to differences in culture, in particular to the fact that persons from this subgroup underwent influences of socialization in the society for long periods that had prevented them from acting participatively and assertively...disappear as the society undergoes more changes.

For **Extraversion** and **Anxiety** the Cattell's pattern was replicated almost to the finer detail, although **Tough Poise**, deviated from the known structure. A new formula for this factor is then suggested (see Table 6.35) and it is renamed **Emotional Sensitivity**.

e) Item bias

Item bias studies were also conducted in respect of gender, language, and population group. In terms of **gender**, only three items were found to show slight differences between males and females and it was viewed as quite acceptable. When the **test language** was analysed, it was found that almost no shift in construct took place between the two groups. The exact number of biased items found was not indicated. When the **race groups** were compared, 15% (24 of 160) of the items showed slight group differences. The majority of the group differences occurred amongst black participants but it was not considered large enough to view the test as significantly biased.

Prinsloo (1992) concluded with the following remarks:

The conclusion is therefore reached that the questionnaire measures the same constructs, structured in the same way, in a valid, reliable and unbiased fashion amongst testees from any relevant subgroup... The questionnaire is therefore considered appropriate for the assessment of personality (in terms of the Cattell rationale)(p.26).

This opinion was, however, disputed by Abrahams (1994) for the following reasons: First, the composition of the norm group is problematic as certain groups were under-represented i.e. it consisted of 5,9% blacks; 7,3% coloureds; 0,6% Indians; and 86,2% whites. The latest census (1993) indicates that the South African population is comprised of 70,6% blacks, 10,5% coloureds, 3,1% Indians, and 15,8% whites. The black group is clearly totally underrepresented and the white group is overrepresented. Differences were found in certain second-order factors which were attributed to the socialization process. The results must then be questioned when the norm group is taken into consideration, as the size of the black group, if increased, could quite conceivably influence the eventual results. Secondly, as the test was developed for a different cultural group in the USA, the possibility must always be considered that the constructs may have different meanings for people from other countries and/or particularly from other cultures.

6.2.2 Biographical Questionnaire

A biographical questionnaire was developed with the aim of assessing certain demographic variables that could possibly influence scores on the 16PF (see Appendix A). The questionnaire consisted of 19 questions that tapped responses in the following areas:

- surname and initials
- age
- gender
- location of high and primary school education (rural or urban)
- academic qualifications of father, mother, guardian (if applicable)
- language spoken
 - at home
 - as a second language
 - race
- occupation of mother, father and guardian.

In an attempt to identify the variables to measure socio-economic status (SES), a number of indexes were considered (e.g. Erwee, 1976; Hall & Jones, 1950; Riordan, 1981; Dohrenwend, 1973; Hollingshead & Redlich, 1958; Hollingshead, 1991). The index of Riordan (1981), guided by research from the USA, has been used by a number of South African researchers (Brown, 1991; de Jager, 1978; White 1982). To obtain an index of SES, she uses the education and occupation level of the father (mother or guardian is used where the subject has not listed

where the subject has not listed his/her father). However, this index was not validated prior to using it, and using only the father's occupation is clearly problematic as the mother is often the sole or co-breadwinner in many South African households.

For the reasons mentioned above it was decided to use an adapted version of Hollingshead's Two Factor Index of Social Position (1991). Although validated in the USA, it was necessary to validate it with South African data. It has been used by Lloyd (1995) after she unsuccessfully tried to use Riordan's index. Her data were used to validate, and to determine how best to use, the index that was chosen. The occupations were coded using **A guide to the Coding of South African Occupations** by Schlemmer and Stopforth (1979). As this was not identical to Hollingshead's coding, Lloyd's data were used and a significant positive correlation was found between the two types of coding, allowing the researcher to use Hollingshead's index.

Hollingshead's index was developed to estimate the position that individuals occupy in the status structure of our society. Occupation and education are used to determine social position. Occupation is presumed to reflect the level of skill and the earning power individuals have as a result of their performance of their duties, and education reflects knowledge with the underlying assumption that men who possess similar levels of education will tend to have similar tastes and attitudes. He also combines the factors of occupation and education and gives weights to individual scores.

These weights were determined by multiple correlation techniques and are as follows (Hollingshead & Redlich, 1958):

<u>Factor</u>	<u>Factor Weight</u>
Occupation	7
Education	4

After the validation Hollingshead's Index was adapted in the following way. It is important to note that he used an individual's social position and not that of the family. To determine the SES of the family, Hollingshead's index was adapted and the following formula was used:

$$SES = \frac{M [o (7)+e(4)] + F [o (7)+ e(4)]}{3}$$

Where:

M = mother

F = father

e = education scale

o = occupation scale

Boundaries were set and four levels were then used (where the education and occupation scale were coded in descending order):

<u>Range of scores</u>	<u>Social Class</u>
0-18	Upper
19-25	Upper Middle
26-35	Lower Middle
36-59	Low

A less important variable is the region/location of the primary and high school of the sample. This was included to determine whether rural/ urban factors influence scores on the test. In a study by Dahlstrom, Diehl and Lachar (1986), they found that scores on the MMPI were influenced by the region where a person was educated. They came to the following conclusion:

The classification that revealed the most consistently significant differences was the region where educated. Black men and women educated in the North score more deviantly on several of the basic and special scales of the MMPI (1986, p. 132).

The other descriptive variables were included as they were deemed important by many researchers (see Chapter 3) when comparability is determined.

6.3 Procedure

Testing took place between April 1994 and April 1995. The biographical questionnaire and the 16PF were administered during the same session. Testing took place at the University of the Western Cape, University of Pretoria, University of Natal and University of Durban-Westville. Except at the University of Pretoria the tests were administered by the researcher herself (aided by student assistants and lecturing staff).

6.4 Methods and Techniques

To test the hypotheses, a number of statistical techniques were employed to determine the comparability of the 16PF when used cross-culturally. Thus, in the analysis of the data the following techniques, amongst others, were used:

- a) **Means, standard deviations and frequencies** were computed for the following variables of the first and second-order factors of the 16PF i.e. race, gender, age, language, institution, and SES.
- b) **Significance tests** were conducted on the above variables and included are one and two-way analysis of variance (ANOVA).
- c) **Coefficient alpha reliabilities** of the first-order factors of the 16PF were calculated for the following variables i.e. race, age, gender, institution, and SES.
- d) **Multiple analyses of variance (MANOVA)** was used to determine the interaction effects

between the variables of race, gender, socio-economic status, language and age on the first and second-order factors of the 16PF.

- e) **Factor Analyses** were conducted by using Joreskog's (1963) factor estimation procedure, followed by the procedure developed by Browne (1972, 1973) for rotating a factor matrix to a partially specified target matrix. This procedure was only carried out on the sample divided on the basis of race.
- f) **Chi-Square analysis** was used to analyse the frequencies with which the various response categories of the items of the 16PF were endorsed to determine whether differences exist in terms of the following variables: race, age, SES, and gender.
- g) **Item analysis** was also used to determine the suitability of the items in terms of: race, age, gender, and language.

6.5 Conclusion

In this chapter the design of the study was discussed. The samples involved in the study, the measuring instruments used, the procedures followed when gathering the data, and the techniques used in the analysis of the data were described. In the next chapter the results of the study will be presented.

CHAPTER 7

RESULTS

In this chapter the results of the study will be discussed. The descriptive statistics will first be outlined, followed by discussions on the construct comparability findings and item comparability findings.

7.1. Descriptive statistics

Hypotheses 1 to 6 refer to the means and standard deviations of the various sub-samples under discussion. To test these hypotheses, one and two-way analysis of variance were used in which the significance levels for the rejection of the null hypotheses was set at as $p > 0,0001$.

The general statistics (means and standard deviations) of the first and second-order factors for the four race groups (blacks, coloureds, Indians and whites) are presented in Table 7.1. In addition, means and standard deviations of the first and second-order factors are also presented for gender, age, language, institution, and SES sub-samples (Tables 7.2 - 7.5). The Motivational Distortion (MD) factor is also included. Table 7.6 gives a summary of the significant mean differences for the different sub-samples.

7.1.1 Race

Hypothesis 1: There are no significant raw score differences between the means of the first and second-order factors of the 16PF for the black, coloured, Indian, and white students.

From Table 7.1 and Figure 7.1 it is evident that significant differences ($p < 0,0001$) between the means were obtained by the different race groups on the majority of the first-order factors. Significant differences were obtained on Factors A, B, C, F, and I, where the blacks obtained the lowest mean scores and the whites the highest. If the scores are taken at face value the blacks appeared to be more reserved, detached, stiff, sober, slow, serious, tough minded, and hard, affected by emotional instability, and less intelligent than the other groups, particularly the whites who obtained the highest score.

On Factors G, L, and O, significant differences were found where the whites obtained the lowest scores and the blacks the higher scores. Assuming that the scores are a true reflection of the traits in question, the whites appeared to be less conscientious, moralistic, jealous, dogmatic, tyrannical, apprehensive, self-reproaching, insecure and troubled than the other groups, especially the blacks, who obtained the lowest score.

On Factor M, the Indians obtained the highest mean score followed by the whites, blacks and coloureds. On Factor Q₂ the Indians also scored the highest, followed by the coloureds, whites and blacks. The Indians appeared to be more imaginative and absent-minded, enthralled by inner creations, and self-sufficient than the rest.

For the second-order factors, significant differences were also found on all the factors. For Extraversion whites obtained the highest mean score, followed by blacks, Indians and coloureds. For Anxiety, Emotional Sensitivity and Tough Poise the blacks obtained the highest mean score and the whites the lowest. For Independence the Indians obtained the highest score followed by the whites, coloureds and blacks. For compulsivity blacks obtained the highest score, followed by whites, coloureds and Indians.

The standard deviations for the first-order factors differed on the majority of factors. The greatest differences occurred between the black and white sample (on 13 factors), with differences ranging between 0,55 and 1,47. Differences of between 0,55 and 0,93 occurred on Factors A, H, I, L, N, Q₁, Q₂, Q₃, and Q₄. Differences of between 1,01 and 1,47 occurred on Factors C, G, M, O.

For the second-order factors, the greatest differences also occurred between the black and white groups with differences in deviations between the groups ranging from 0,55 to 0,91.

From the above discussion, it is evident that on the majority of the factors (10 first-order and all the second-order factors), large differences in terms of standard deviations and significant differences between means were found. Where such mean differences were found, either the black or the white participants obtained the highest or lowest mean score on the majority of the factors. The significant differences in the factor means suggest that the 16PF is less than a satisfactory measure. Hypothesis 1 is rejected.

Table 7.1. Means and standard deviations of the 16PF for blacks, coloureds, Indians and whites.

F	Blcks		Clrds		Indns		Whts		f	p
	M	SD	M	SD	M	SD	M	SD		
A	9,98	2,87	10,07	3,41	9,71	3,13	11,93	3,42	24,53	0,0000
B	7,06	1,85	7,99	1,83	7,66	1,81	9,08	1,57	57,72	0,0000
C	8,36	2,63	9,98	3,83	9,38	3,63	11,99	3,64	48,65	0,0000
E	12,76	3,34	12,87	3,92	1,70	3,70	13,55	3,89	2,76	0,0401
F	8,87	2,60	10,34	3,52	11,20	3,27	11,82	3,14	41,40	0,0000
G	12,13	3,05	10,80	3,79	10,07	3,49	10,70	4,40	13,33	0,0000
H	9,00	3,34	9,19	4,10	9,40	3,78	10,49	4,11	6,74	0,0002
I	11,62	3,35	12,88	3,74	14,23	3,44	14,28	3,99	30,09	0,0000
L	13,15	3,36	12,46	3,78	12,56	3,43	10,69	3,89	21,43	0,0000
M	12,06	2,82	11,62	3,65	13,21	3,71	12,64	4,23	8,71	0,0000
N	17,12	3,36	15,89	3,36	15,87	3,45	16,96	3,65	6,22	0,0003
O	9,07	2,67	7,98	3,88	8,80	3,62	7,47	4,14	10,33	0,0000
Q ₁	12,33	2,88	11,70	3,65	12,31	2,96	11,49	3,81	3,99	0,0077
Q ₂	6,89	4,12	9,62	3,89	9,82	3,52	9,04	4,29	28,42	0,0000
Q ₃	11,62	3,99	10,08	3,72	10,08	3,72	11,25	4,07	7,40	0,0001
Q ₄	8,03	3,03	8,24	3,68	8,28	3,25	8,00	3,84	0,41	0,7487
MD	4,81	2,05	4,70	2,48	4,02	2,33	5,37	2,53	13,15	0,0000
EXTRA	8,94	2,11	8,77	2,70	8,84	2,36	9,94	2,72	12,04	0,0000
ANX	6,45	1,90	5,97	2,95	6,43	2,62	4,97	3,06	16,30	0,0000
EMOT.	7,13	1,75	6,98	2,58	7,85	2,43	6,86	2,66	8,09	0,0000
INDEP	8,58	1,48	9,20	2,17	9,79	1,89	9,40	2,37	15,44	0,0000
COMP.	13,63	2,43	12,75	2,70	12,01	2,61	12,97	3,03	14,57	0,0000
T.POI	-0,22	1,84	-0,52	2,30	-1,39	2,06	1,95	2,38	33,90	0,0000

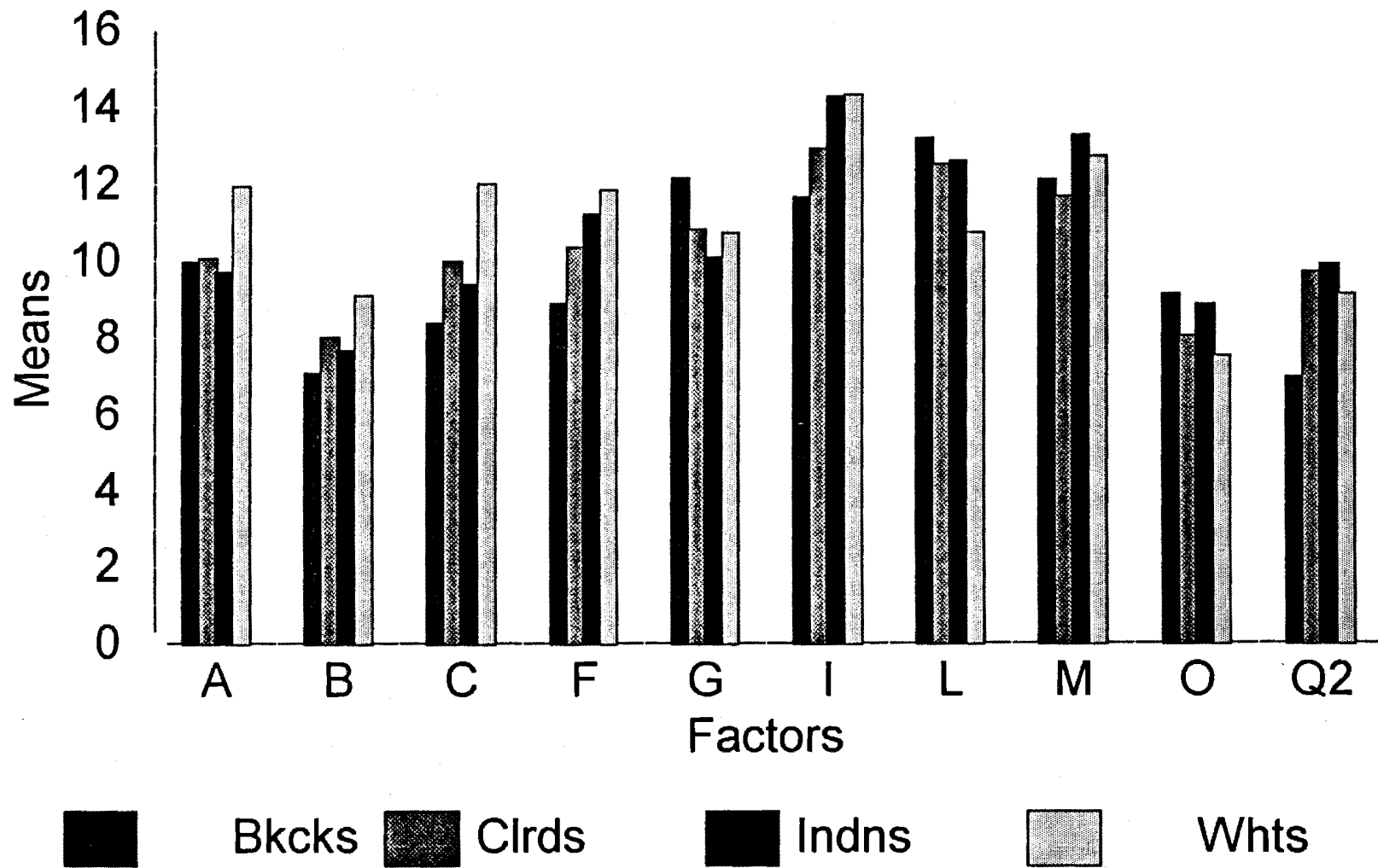


Figure 7.1 Significant means differences of the 16PF for blacks, coloureds, Indians and whites.

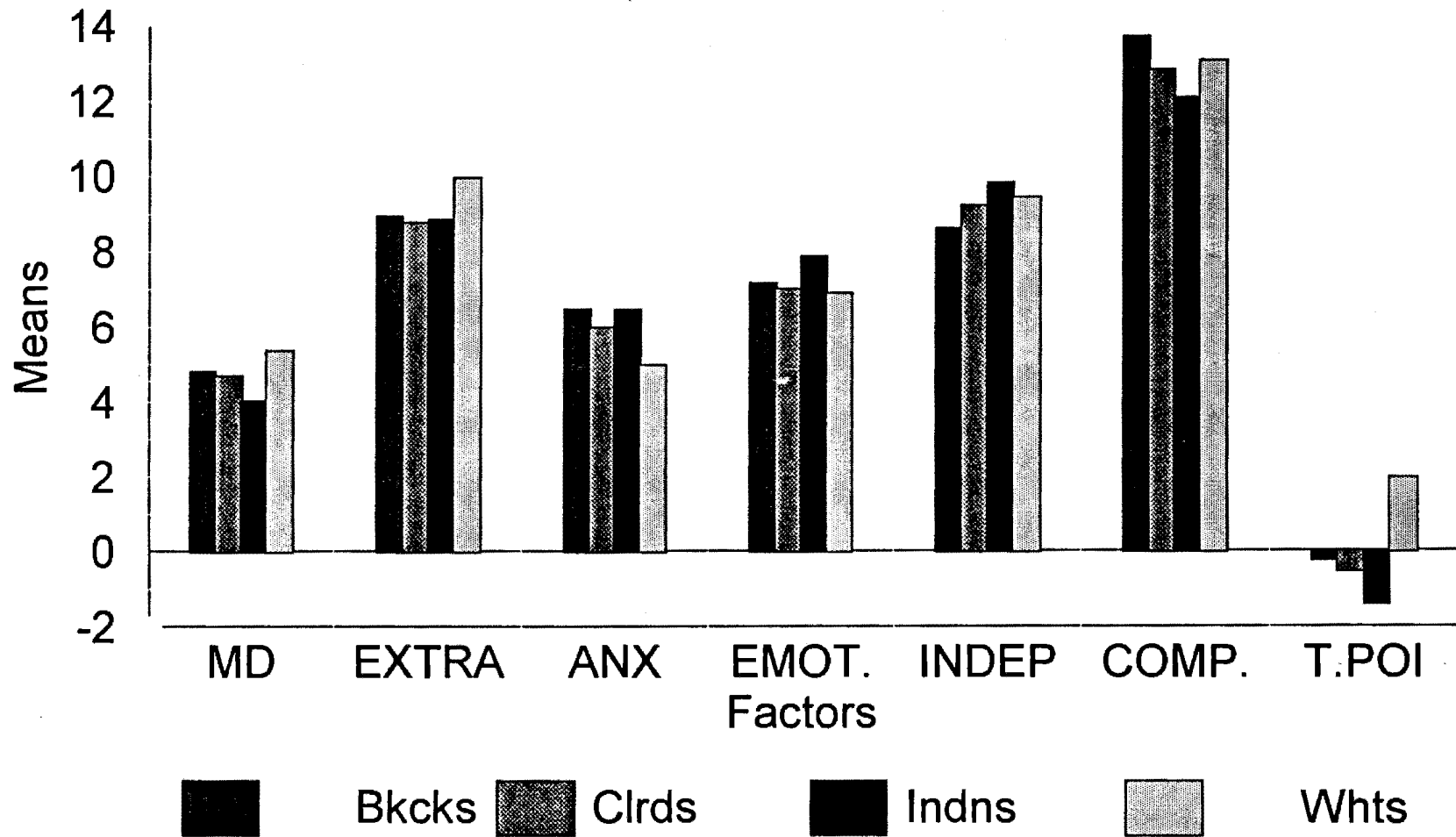


Figure 7.1 Significant means differences of the 16PF for blacks, coloureds, Indians and whites (Cont.).

7.1.2 Gender

Hypothesis 2: There are no significant raw score differences between the means of the first and second-order factors of the 16PF for male and female students.

As shown in Table 7.2 significant mean and large standard deviation differences did not occur on many of the factors. The significant mean differences are shown in Figure 7.2 as well. Significant mean differences were found on only three factors. For the first-order factors, the females obtained significantly higher scores on Factor I and Factor O, with similar standard deviations. The males scored significantly higher on Factor N with similar standard deviations. Females appeared to be more tender minded, sensitive, dependent, overprotected, apprehensive, self-reproaching, insecure and troubled, than males. Males tended to be more polished, socially aware and insightful regarding others.

On the second-order factors, the females scored higher than men on Emotional Sensitivity and lower on Tough Poise, with similar standard deviations.

To conclude, as only three first-order factors and two second-order factors showed significant differences, hypothesis 2 cannot be rejected.

Table 7.2 Means and standard deviations of the 16PF for males and females

F	Males		Females		f	p
	M	SD	M	SD		
A	9,94	3,30	10,77	3,31	14,79	0,0001
B	7,92	2,03	7,97	1,83	0,23	0,6639
C	10,00	3,75	9,89	3,67	0,24	0,6251
E	13,07	3,65	12,90	3,78	0,48	0,4866
F	10,17	3,46	10,79	3,22	8,20	0,0042
G	10,95	3,71	10,95	3,84	0,00	0,9966
H	9,61	3,81	9,43	9,23	0,48	0,4887
I	11,25	3,63	14,58	3,29	223,04	0,0000
L	12,43	3,66	12,07	3,78	2,22	0,1367
M	12,07	3,60	12,56	3,71	4,27	0,0389
N	17,22	3,39	16,27	3,38	18,34	0,0000
O	7,56	3,52	8,84	3,68	30,13	0,0000
Q ₁	12,11	3,43	11,84	3,33	1,52	0,2183
Q ₂	8,58	4,15	8,98	4,11	2,31	0,1287
Q ₃	11,52	3,61	10,60	3,87	14,06	0,0002
Q ₄	7,73	3,34	8,41	3,53	9,15	0,0025
MD	5,06	4,52	2,35	2,41	12,30	0,0005
EXTRA	9,04	2,54	9,18	2,53	0,71	0,3991
ANX	5,64	2,64	6,17	2,77	8,93	0,0028
E,SEN	6,52	2,32	7,65	2,36	55,96	0,0000
IND,	9,18	2,07	9,26	2,04	0,48	0,4890
COMP	13,28	2,69	12,61	2,78	12,07	0,0005
T,PS	-0,09	2,21	-1,64	2,07	125,91	0,0000

M = mean

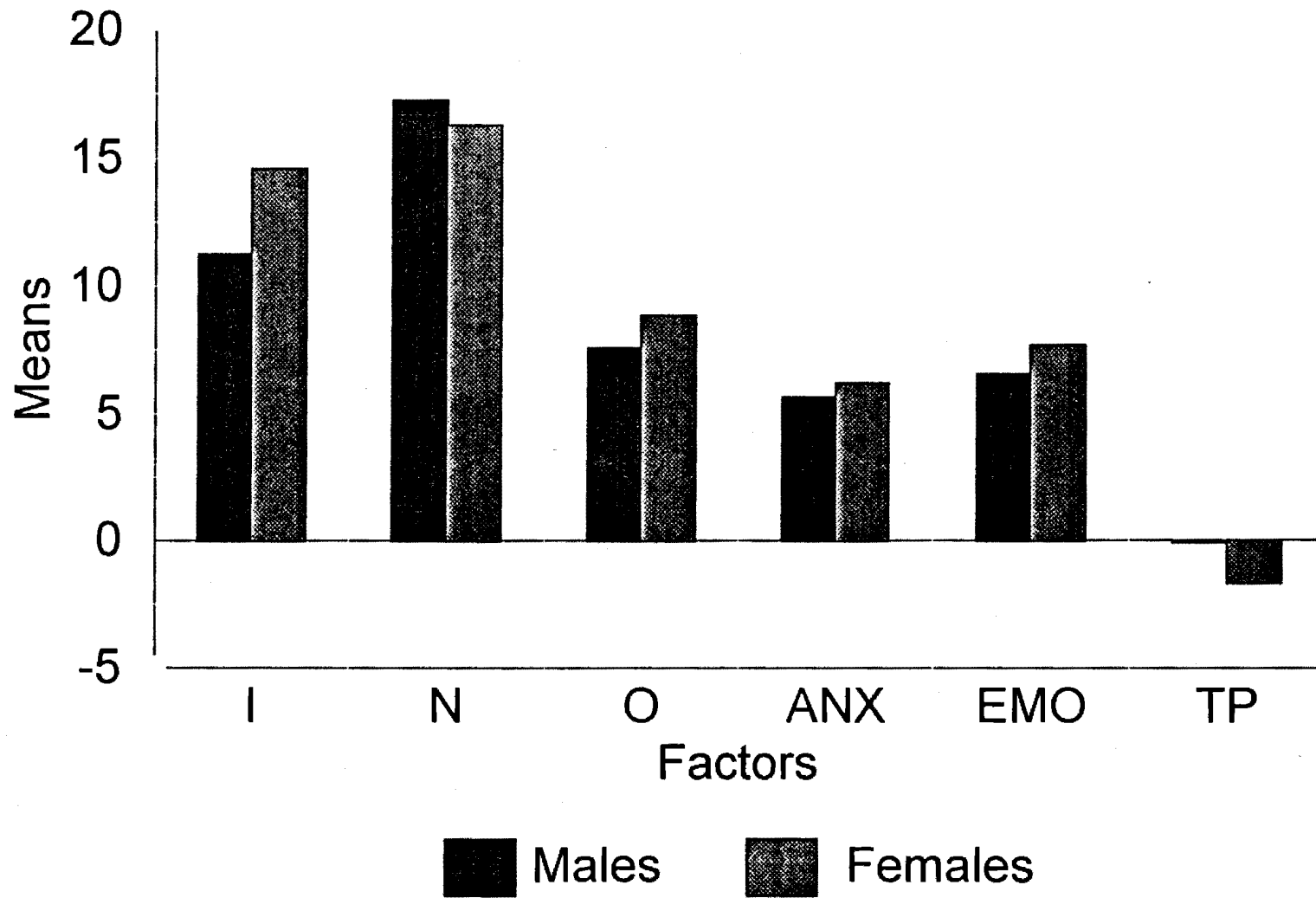


Figure 7.2 Significant mean differences of the 16PF for males and females.

7.1.3 Language

Hypothesis 3: There are no significant raw score differences between the means of the first and second-order factors of the 16PF for students speaking English, Afrikaans, Xhosa, and other black languages as their home language.

From Table 7.3 and Figure 7.3 it is evident that there were significant differences between the means obtained by the participants speaking English, Afrikaans, Xhosa or other black languages (OBL). The participants who do not speak English or Afrikaans as their home language responded in a different manner from the other participants. The Xhosa-speaking participants and the OBL participants responded very similarly on the factors.

Significant different means were obtained for Factors B and C, where the Afrikaans-speaking participants obtained the highest scores, followed by the English, the OBL, and the Xhosa-speaking participants. It appeared that the Afrikaans-speaking participants are more intelligent and emotionally stable than the others, particularly the Xhosa-speaking participants (who obtained the lowest mean score).

A similar pattern was obtained for Factors F, I, and Q₂ as the English-speaking participants obtained the highest scores, followed by the Afrikaans, OBL, and the Xhosa-speaking group. The Xhosa-speaking participants appeared to be more reserved, detached, stiff, sober, slow, serious, tough minded, hard, and socially more group-dependent than the other groups, especially the English-speaking participants who obtained the highest mean scores.

For Factor L, the participants speaking OBL obtained the highest score, followed by the Xhosa and the Afrikaans-speaking participants. In other words, the OBL participants tended to be more jealous, suspecting and tyrannical than the others. For Factor O, the Xhosa-speaking participants obtained the highest score, with the Afrikaans-speaking participants the lowest. The Xhosa-speaking participants appeared to be more apprehensive, self-reproaching, hypochondriacal and inadequate than the rest.

Significant differences were also found for Factors Q₃, N and the MD score, but no pattern could be established between the groups.

From the above discussion it is evident that on the majority of the factors (12 first-order and all the second-order factors) significant differences were found. In the majority of cases, where differences were found, either the Xhosa or the OBL-speaking participants on the one hand, or the English or Afrikaans-speaking participants, on the other, obtained the highest or lowest mean score on the majority of the factors.

For the second-order factors, significant differences were found for Independence, Tough Poise and Compulsivity. For Tough Poise and Independence the two African language speaking groups (Xhosa and the other black languages) obtained the highest scores, and the English and Afrikaans-speaking groups the lowest. For Compulsivity, the Xhosa speaking participants obtained the highest score, and the English speaking sample the lowest.

The standard deviations for the first-order and second-order factors differed between the participants on the majority of factors. The greatest differences occurred between the Xhosa-speaking and Afrikaans-speaking groups (for seven factors), with differences ranging between

1,02 (Factor Q₃) to 1,77 (Factor O).

In conclusion, the results are similar to the scores found with across the various racial groups. This is highly plausible as only four black participants indicated that English or Afrikaans is their home language. In other words, for 98,42% of the black participants, Xhosa or another black language was their home language. The significant differences in the factor means suggest that the 16PF is less than a satisfactory measure.

Table 7.3 Means and standard deviations for participants speaking different home languages

F	O.Black lang.		Xhosa		English		Afrikaans		f	p
	M	SD	M	SD	M	SD	M	SD		
A	10,04	2,85	9,87	2,88	10,27	3,36	10,98	3,5	4,15	0,0024
B	7,44	1,90	6,89	1,84	7,94	1,83	8,67	1,78	28,37	0,0000
C	8,42	2,75	8,25	2,56	10,08	3,71	11,01	3,98	20,68	0,0000
E	13,41	3,32	12,47	3,27	13,20	3,69	12,90	4,10	1,60	0,1716
F	9,24	2,80	8,61	2,51	11,40	3,16	10,74	3,56	26,68	0,0000
G	11,0	3,26	12,54	2,77	9,98	3,69	11,27	4,13	15,71	0,0000
H	9,20	3,48	8,81	3,22	9,67	3,68	9,72	4,44	1,95	1,1006
I	11,83	3,14	11,54	3,43	14,08	3,61	13,36	3,98	17,06	0,0000
L	13,44	3,44	13,12	3,18	12,04	3,61	11,74	4,09	6,45	0,0000
M	11,78	2,81	12,16	2,81	12,78	3,86	12,04	3,96	2,70	0,0295
N	16,52	3,12	17,25	2,97	15,97	3,69	17,20	3,16	7,97	0,0000
O	8,93	2,36	9,19	2,75	8,37	3,68	7,60	4,13	6,74	0,0000
Q ₁	12,55	2,87	12,08	2,80	12,45	3,08	11,10	3,92	8,32	0,0000
Q ₂	7,87	4,32	6,50	3,88	9,84	3,82	9,03	4,11	22,97	0,0000
Q ₃	10,78	3,43	11,97	3,07	10,27	3,74	11,40	4,09	7,80	0,0000
Q ₄	8,54	3,29	7,93	2,85	8,15	3,38	8,15	3,90	0,42	0,7909
MD	4,21	2,14	4,98	1,95	4,28	2,40	5,28	2,54	9,66	0,0000
EXTR	9,00	2,46	8,85	1,92	9,14	2,44	9,27	2,90	0,86	0,4901
ANX.	6,74	1,99	6,40	1,78	6,04	2,69	5,41	3,21	6,03	0,0001
EM,S	7,31	1,70	7,10	1,74	7,50	2,48	6,79	2,67	4,33	0,0018
IND.	9,12	1,43	8,34	1,37	9,86	1,98	8,96	2,32	20,63	0,0000
COMP	12,77	2,47	13,92	2,26	12,07	2,75	13,29	2,78	17,73	0,0000
T.P.	-0,21	1,84	-0,19	1,83	-1,38	2,32	-1,12	2,32	11,46	0,0000

M = mean

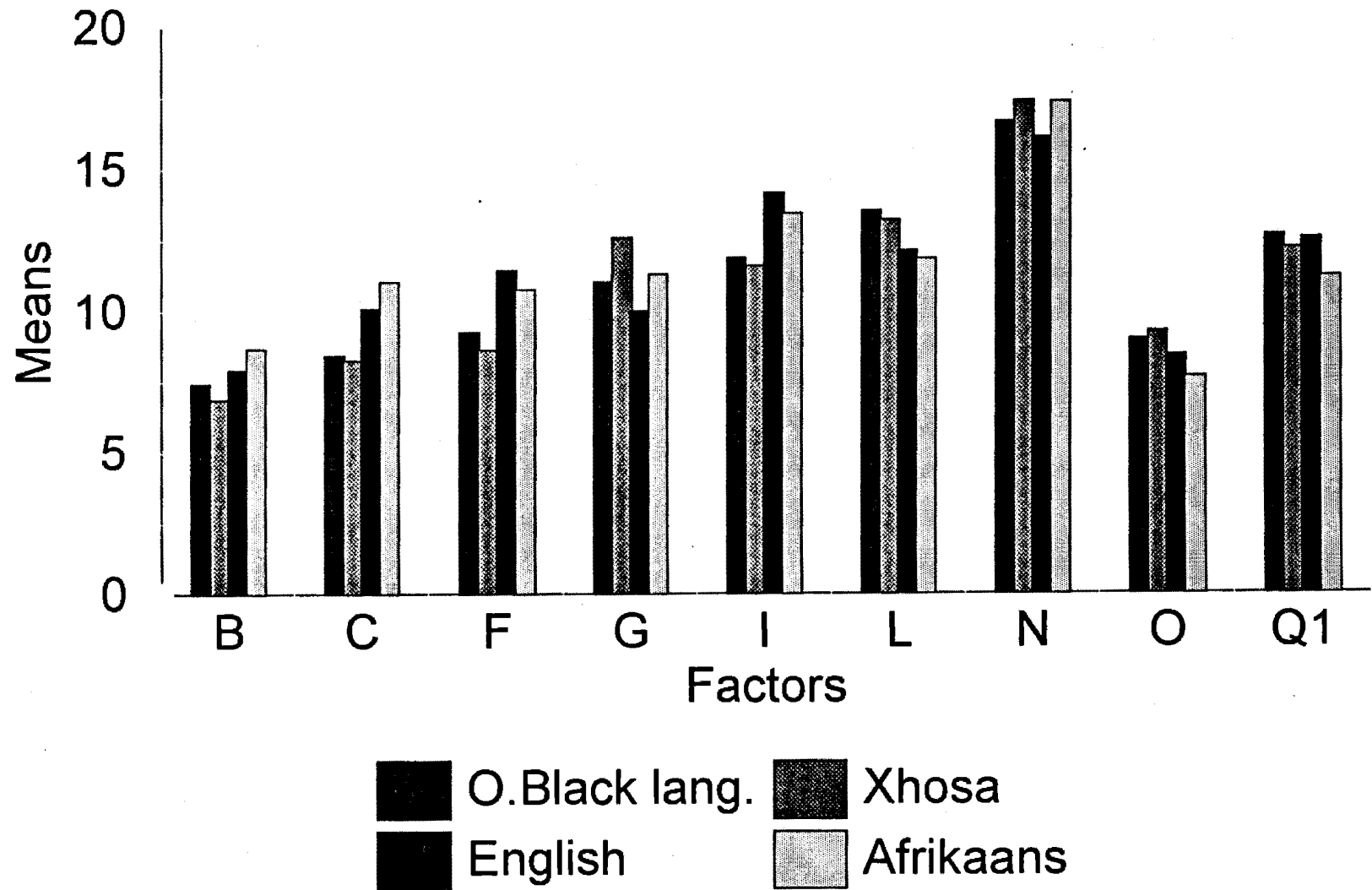


Figure 7.3 Significant mean differences of the 16PF for participants speaking other black languages, Xhosa, English, and Afrikaans.

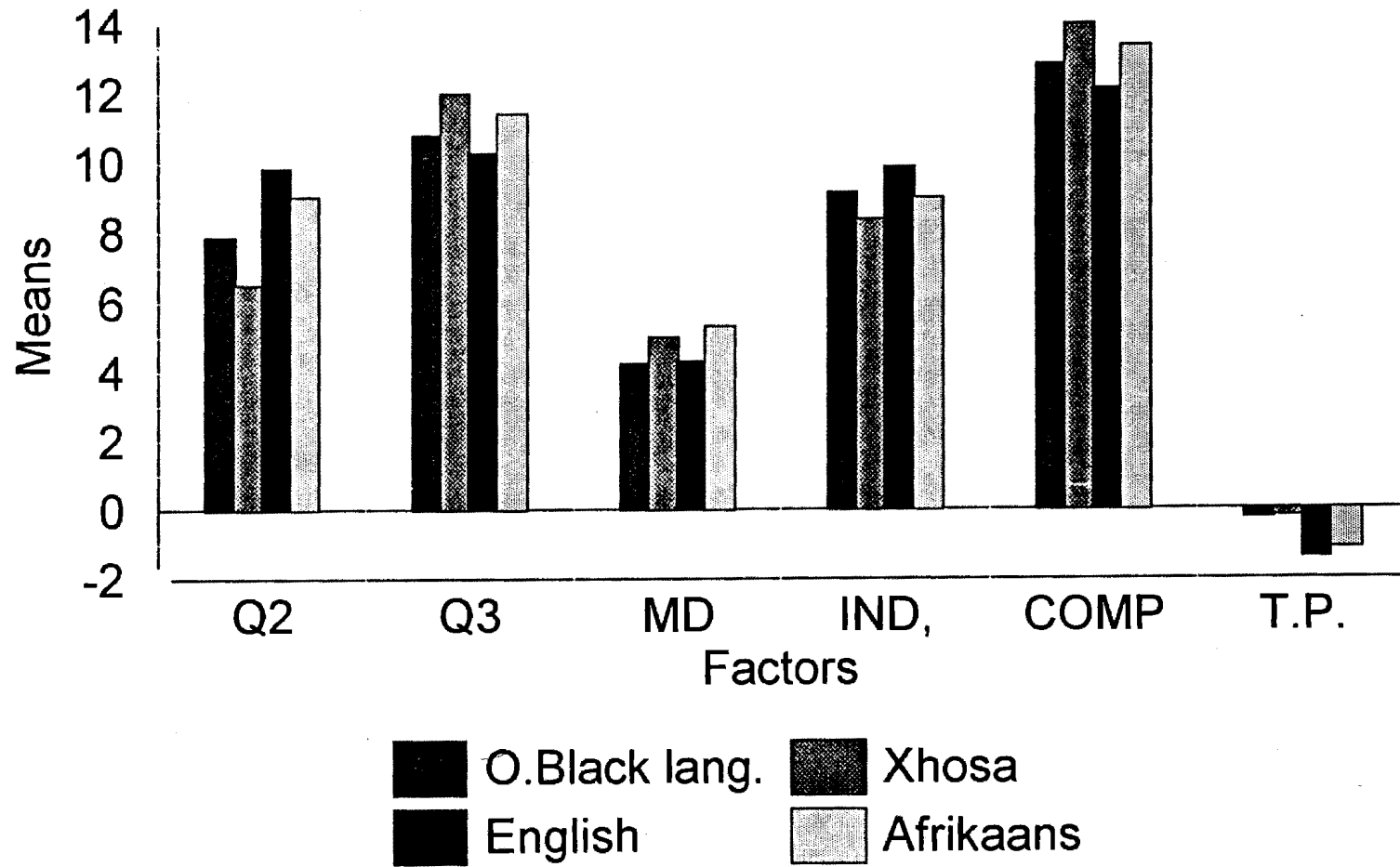


Figure 7.3 Significant mean differences of the 16PF for participants speaking other black languages, Xhosa, English, and Afrikaans (Cont.).

7.1.4 Age Groups

Hypothesis 4: There are no significant raw score differences between the means of the first and second-order factors of the 16PF for students of the following age groups: 17-18, 19, 20, 21-22, 23-29, and 30-47.

Table 7.4 shows means and standard deviations for the various age groups, with $p < 0,0001$ indicating significant differences between participants of various age groups. Significantly different means were found on the following factors: B, F, G, I, N, Q₂, Q₃, and the MD score. This is reflected in Figure 7.4.

For Factors F, I, and Q₂, the 17 to 18 year old participants had the highest mean scores while the 30 to 47 year old age participants had the lowest. For Factors N, Q₃, and the MD score the opposite occurred. In other words, 17 to 18 year old participants tended to be more enthusiastic, quick, alert, tender-minded, sensitive, overprotected and dependent than the rest. On the other hand, the 30 to 47 year old participants appeared to be more astute, worldly, self-sufficient, and resourceful than the rest.

For the following second-order factors highly significant differences were found viz. Emotional Sensitivity, Independence, Compulsivity, and Tough Poise. For Emotional Sensitivity and Independence, the 17 to 18 year old participants had the highest scores and the 30 to 47 year old participants the lowest, while the opposite occurred for Compulsivity.

The standard deviations for the first and second-order factors did not differ much between groups. For the majority of the factors differences reflected were less than 1,0, except

Factors G, Q₂, and Q₃ (with differences between 1,0 and 1,18).

To conclude, highly significant differences were found on seven first-order factors and four second-order factors which shows that age has an influence on the mean scores, and that this might have an impact on the comparability of the test for different age groups. Hypothesis 4 is rejected.

Table 7.4. Means and standard deviations of the 16PF for various age groups.

F	17-18		19		20		21-22		23-29		30-47		f	p
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD		
A	10,23	3,22	10,52	3,18	11,31	3,29	10,67	3,690	9,69	3,14	10,02	3,31	4,55	0,0004
B	7,66	1,82	8,23	2,06	8,44	1,71	8,38	1,111	7,32	1,96	7,58	2,02	10,09	0,0000
C	9,53	3,49	10,26	3,80	10,54	3,72	10,30	3,956	9,10	3,40	10,46	3,86	4,02	0,0013
D	13,05	3,65	12,91	3,93	13,00	3,91	13,12	3,759	12,70	3,48	13,08	3,74	0,28	0,9263
E	11,35	3,13	10,46	3,37	11,03	3,38	10,54	3,570	9,24	2,90	9,14	3,02	11,26	0,0000
G	10,01	3,63	10,86	3,90	11,27	3,84	10,49	4,167	12,31	3,00	12,23	3,34	9,89	0,0000
H	9,71	3,70	9,25	3,99	9,39	3,95	9,38	3,969	9,28	3,94	9,35	3,81	0,65	0,6644
I	14,15	3,56	13,68	3,81	13,98	3,74	12,51	3,909	11,58	3,47	12,14	3,60	14,00	0,0000
L	12,58	3,25	12,07	3,96	11,80	4,02	11,88	3,776	12,75	3,80	11,52	3,78	2,31	0,0422
M	12,76	3,74	12,65	3,72	12,16	3,96	12,13	3,703	12,06	3,17	11,77	3,45	1,55	0,1710
N	15,70	3,62	16,24	3,33	17,07	3,30	17,12	3,094	17,25	3,15	18,27	3,31	9,58	0,0000
O	8,73	3,48	8,27	3,74	8,52	3,94	7,77	3,925	8,37	3,36	7,34	3,37	2,26	0,0462
Q ₁	11,96	3,01	12,01	3,65	11,58	3,68	11,87	3,445	12,15	3,14	12,48	3,64	0,82	0,5335
Q ₂	9,58	3,61	9,10	4,24	8,73	4,07	8,93	4,452	7,76	4,12	7,23	4,62	5,79	0,0000
Q ₃	9,77	3,57	10,98	3,75	11,36	3,94	10,94	3,890	12,00	3,58	12,85	2,80	11,26	0,0000
Q ₄	8,55	3,23	8,24	3,74	8,14	3,32	7,96	3,670	7,91	3,27	6,90	3,85	2,35	0,0303
MD	3,96	2,33	4,75	2,28	5,13	2,41	4,73	2,465	5,21	2,19	6,02	2,37	11,28	0,0000
EXT	9,15	2,34	9,10	2,68	9,40	2,48	9,24	2,876	8,83	2,38	9,07	2,44	0,99	0,4321
ANX	6,51	2,40	5,87	2,93	5,71	2,92	5,67	2,966	5,99	2,49	4,89	2,57	4,53	0,0004
E.S	7,82	2,27	7,26	2,52	7,15	2,51	6,86	2,541	6,80	2,08	6,14	2,14	7,34	0,0000
IND	9,67	2,02	9,36	1,99	9,04	2,31	9,31	2,035	8,68	1,66	8,67	2,15	6,26	0,0000
ANX	11,82	2,67	12,69	2,67	13,23	2,64	12,85	2,851	13,85	2,47	14,45	2,37	17,31	0,0000
T.P	-1,38	2,23	-1,28	2,12	-1,48	2,21	-0,77	2,423	-0,11	1,95	-0,31	2,39	10,44	0,0000

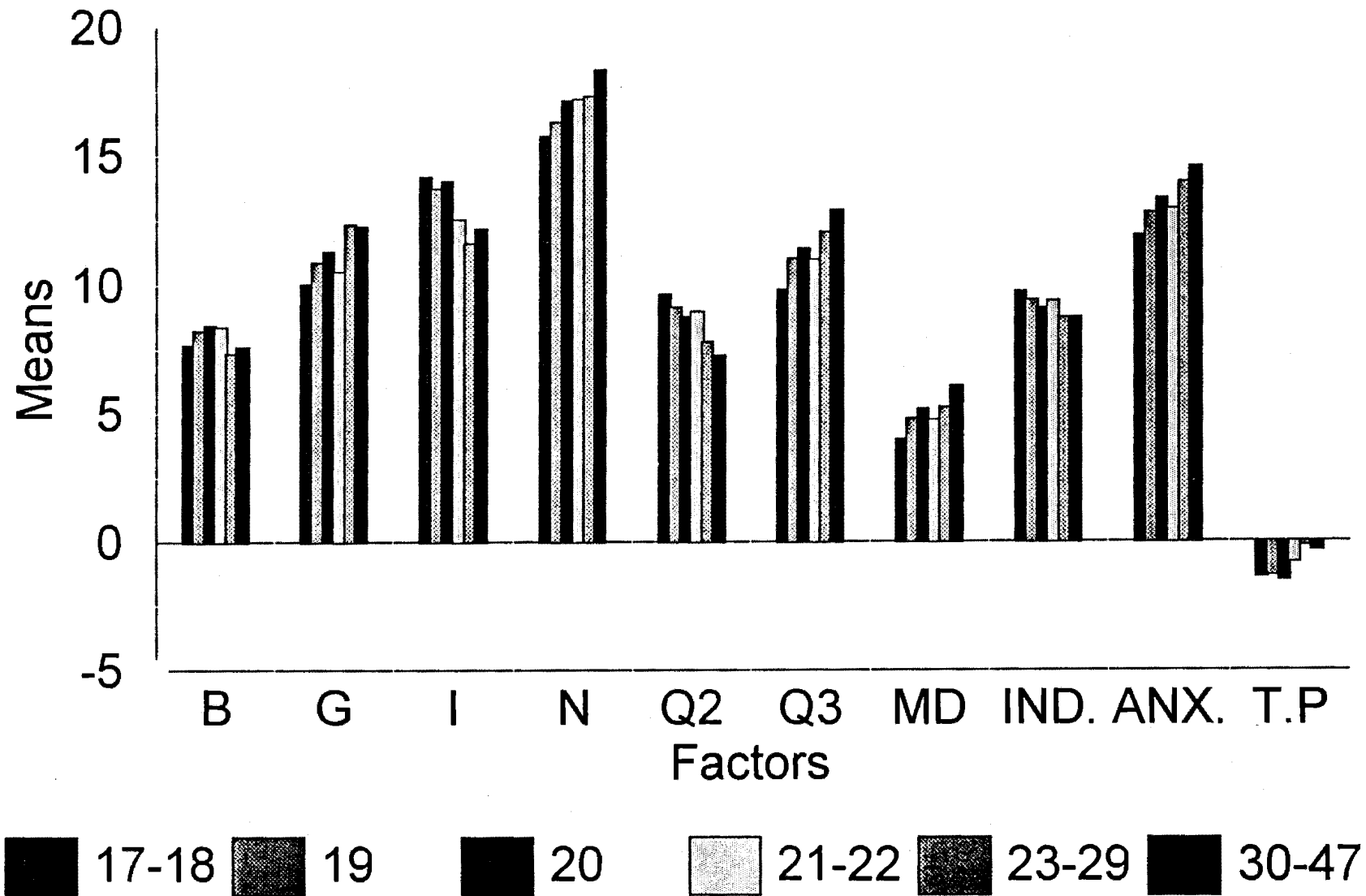


Figure 7.4 Significant mean differences of the 16PF for various age groups.

7.1.5 Institution

Hypothesis 5: There are no significant raw score differences between the means of the first and second-order factors of the 16PF between UWC, UDW, UND, and UP students.

Table 7.5 shows the means and standard deviations for the sub-sample drawn from the various institutions. The results show that for the majority of first and second order factors highly significant mean differences exist ($p < 0,0001$). This is reflected in Figure 7.5.

Significant mean differences were found on Factors A, B, C, F, and MD where the participants from UP obtained the highest score and the participants from UWC or UDW obtained the lowest score. The participants from UP tended to be more warmhearted, outgoing, cooperative, intelligent, emotionally stable, quick, alert, and enthusiastic than the other participants, particularly than the participants from UWC or UDW.

For Factors L, O, and the two second-order factors viz. Anxiety and Emotional Sensitivity, the participants from UP had the lowest score and the participants from UWC or UND the highest. The participants from UWC and/or UND appeared to be more suspecting, jealous, dogmatic, tyrannical, apprehensive, self-reproaching, hypochondriacal, and inadequate than the others. For the remaining factors with significant differences, no discernable pattern emerged.

The differences in standard deviations for the majority of the factors (first and second order) are below 1,00, except for Factor G and Independence. The greatest differences (although small) in the majority of cases occurred between participants from the University of Pretoria and the University of Durban-Westville.

In conclusion, the results are similar to the scores found for the various racial and language groups. For the majority of factors (12 first-order and all the second-order factors) significant mean differences were found. This is highly plausible as the majority of black participants (95,26%) and coloured participants (99,20%) were drawn from UWC and all white participants were drawn from UP. For this sub-sample, the significant differences appear to suggest that the 16PF should be treated with caution. Hypothesis 5 cannot be accepted.

Table 7.5 Means and standard deviations of the 16PF for the various university groups

F	UWC		UP		UND		UDW		f	p
	M	SD	M	SD	M	SD	M	SD		
A	10,12	3,17	12,19	3,39	10,23	3,18	9,12	3,01	28,57	0,0000
B	7,56	1,91	9,28	1,40	7,82	1,74	7,49	1,89	50,01	0,0001
C	9,15	3,42	12,09	3,74	10,08	3,50	9,46	3,52	36,01	0,0001
E	12,82	3,66	13,60	3,93	13,09	3,72	12,43	3,58	3,23	0,0219
F	9,77	3,23	11,89	3,16	11,18	3,11	10,84	3,40	24,31	0,0001
G	11,37	3,55	11,02	4,36	9,45	3,75	10,51	3,34	9,16	0,0001
H	9,14	3,76	10,39	4,27	9,61	3,71	9,40	3,66	5,35	0,0012
I	12,29	3,57	14,06	4,01	15,00	3,55	14,02	3,52	26,44	0,0000
L	12,81	3,59	10,63	3,97	11,91	3,48	12,67	3,37	18,97	0,0000
M	11,91	3,31	12,34	4,24	13,84	3,27	12,87	4,03	10,14	0,0000
N	16,87	3,30	17,30	3,35	15,27	3,36	16,03	3,48	11,45	0,0000
O	8,56	3,41	7,24	4,23	9,10	3,45	8,39	3,57	8,82	0,0000
Q ₁	12,02	3,34	11,34	3,90	12,24	2,80	12,39	2,94	3,40	0,0173
Q ₂	8,29	4,22	8,67	4,26	10,56	3,55	9,53	3,52	11,80	0,0000
Q ₃	11,16	3,63	11,57	4,08	9,37	3,87	10,76	3,48	9,65	0,0000
Q ₄	8,19	3,36	7,95	3,97	8,50	3,33	7,87	3,08	0,94	0,4210
MD	4,72	2,28	5,63	2,48	3,76	2,42	4,30	2,24	18,83	0,0000
EXT	8,91	2,43	10,06	2,74	8,90	2,43	8,65	2,29	13,22	0,0000
ANX	6,25	2,49	4,83	3,18	6,41	2,55	6,14	2,59	15,97	0,0000
E.S	7,11	2,23	6,66	2,70	8,17	2,36	7,48	2,33	11,21	0,0000
IND	8,94	1,91	9,19	2,36	10,26	1,82	9,54	1,92	15,26	0,0000
COM	13,13	2,62	13,30	2,89	11,36	2,68	12,43	2,66	16,93	0,0000
TP	-0,44	2,08	-1,84	2,37	-2,02	2,14	-1,00	2,13	31,18	0,0000

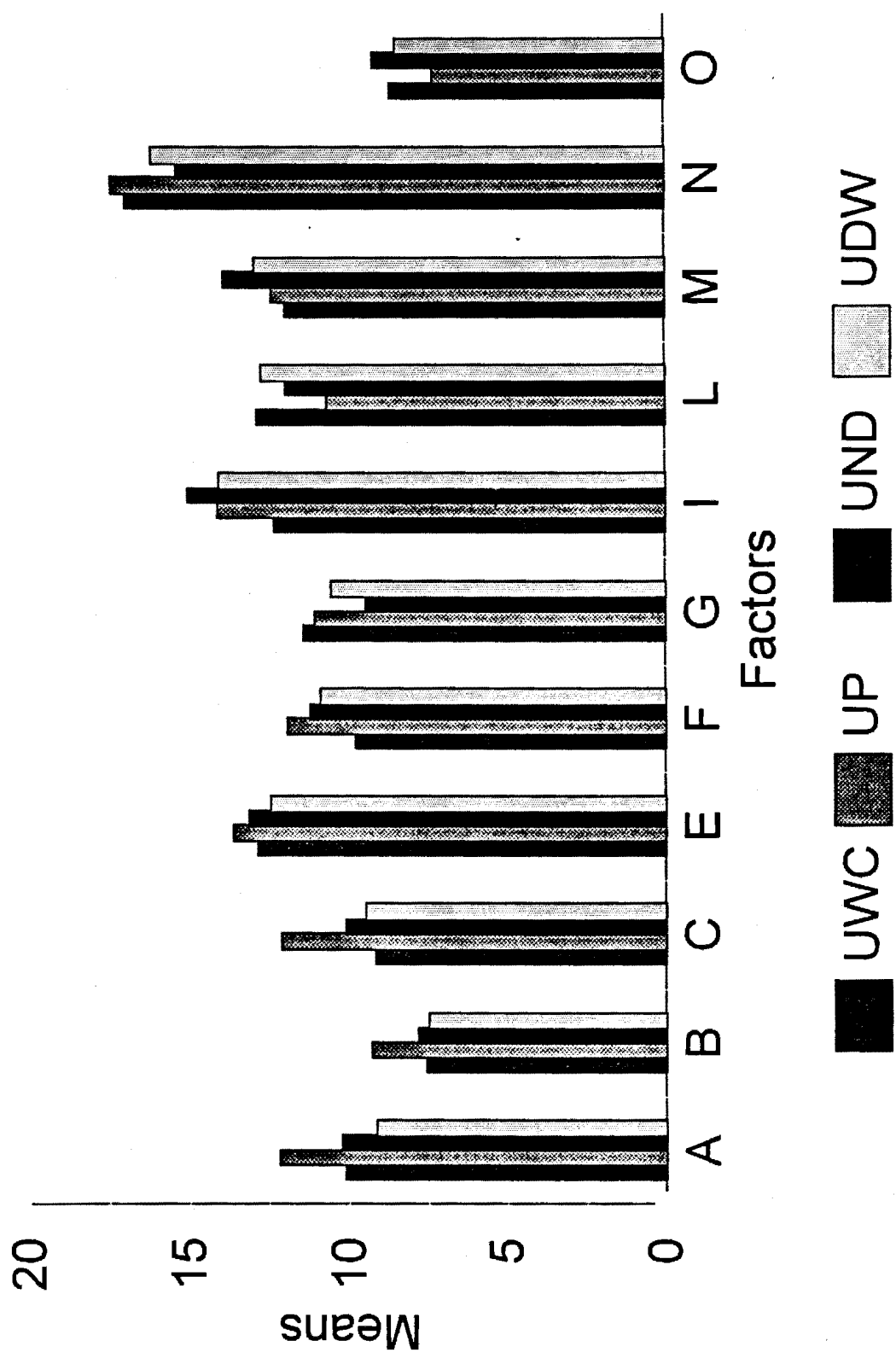


Figure 7.5 Significant mean differences of the 16PF for the various university groups.

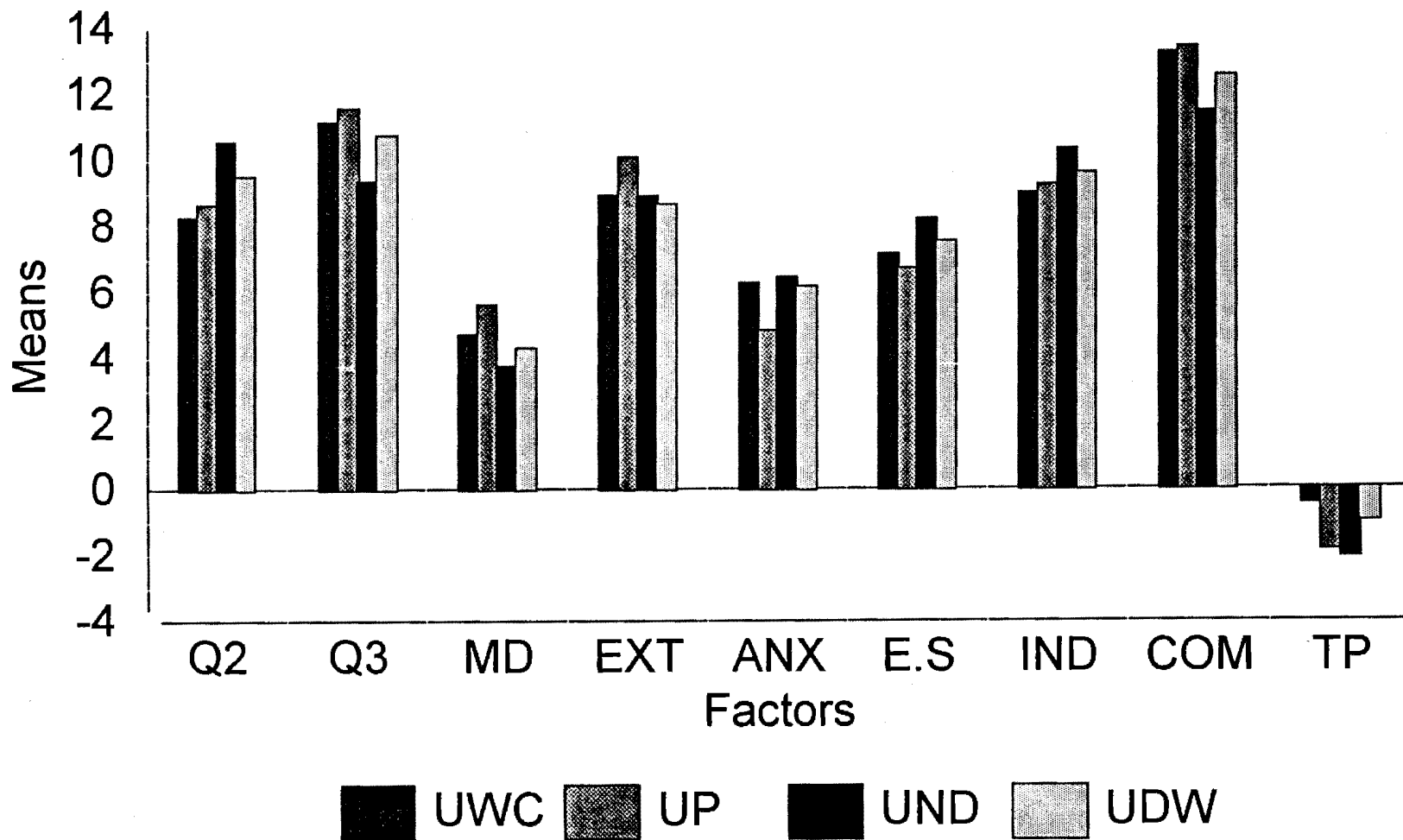


Figure 7.5 Significant mean differences of the 16PF for the various university groups (Cont.).

7.1.6 Socio-economic status

Hypothesis 6: There are no significant raw score differences between the means of the first and second-order factors of the 16PF of high, upper-middle, lower-middle, and low socio-economic status students.

Table 7.6 shows the means and standard deviations for the participants drawn from various socio-economic levels. The results showed that significant mean differences did not exist for the majority of first and second-order factors, except on Factors A, B, C, F, Extraversion and Tough Poise (where the high SES participants obtained the highest score and the low SES participants obtained the lowest). This is reflected in Figure 7.6. High SES participants, therefore, appeared to be more warmhearted, outgoing, cooperative, intelligent, emotionally stable, enthusiastic, quick, and alert, than the other participants, particularly the low SES participants who obtained the lowest scores.

The differences in standard deviations for all the factors (first and second-order) are below 1,00.

In conclusion, it does not appear as if the SES of participants influenced the scores as few significant differences were found. Hypothesis 6 is accepted.

Table 7.6 Means and standard deviations of the 16PF for the participants based on their SES

F	High		Upp. middle		Low. middle		Low		f	p
	M	SD	M	SD	M	SD	M	SD		
A	11,34	3,39	10,93	3,36	10,03	3,44	9,84	3,13	9,16	0,0000
B	8,62	1,86	8,80	1,81	7,84	1,72	7,69	1,97	9,63	0,0000
C	10,95	3,74	10,45	3,82	9,98	3,78	9,14	3,50	8,61	0,0000
E	13,78	3,79	13,02	4,02	12,86	3,65	12,47	3,75	4,14	0,0064
F	11,48	3,16	11,38	3,17	10,76	3,30	9,55	3,24	15,01	0,0000
G	10,01	4,11	10,67	3,71	10,45	3,89	11,70	3,62	7,10	0,0001
H	10,35	3,83	9,79	3,80	9,14	4,03	8,93	3,97	5,39	0,0011
I	13,83	4,00	14,02	3,89	13,51	3,44	12,49	3,84	6,48	0,0002
L	11,49	4,12	11,77	3,43	12,51	3,61	12,38	3,82	3,28	0,0205
M	12,56	3,97	12,29	3,79	12,61	3,86	12,07	3,41	0,88	0,4521
N	16,61	3,69	16,55	3,53	16,54	3,26	16,72	3,33	0,12	0,9477
O	7,77	3,80	8,23	3,78	8,42	3,70	8,42	3,76	1,30	0,2748
Q ₁	12,22	3,44	11,45	3,35	11,87	3,47	12,03	3,20	1,82	0,1426
Q ₂	8,77	4,14	9,53	4,07	9,21	3,86	8,35	4,14	3,18	0,0233
Q ₃	10,83	3,83	11,12	3,67	10,22	3,84	11,24	3,76	2,83	0,0375
Q ₄	8,03	3,45	8,09	3,70	8,33	3,45	8,21	3,42	0,26	0,8508
MD	4,75	2,50	5,02	2,38	4,37	2,39	4,73	2,38	2,36	0,0701
EXT	9,83	2,60	9,32	2,59	8,92	2,69	8,69	2,31	7,68	0,0000
ANX	5,50	2,87	5,70	2,74	6,21	2,76	6,13	2,73	2,89	0,0345
EMS	7,07	2,55	7,18	2,45	7,44	2,39	7,14	2,51	0,86	0,4624
IND	9,67	2,24	9,15	2,13	9,42	1,90	8,84	2,08	5,44	0,0010
COM	12,48	2,94	12,78	2,57	12,40	2,78	13,22	2,74	3,61	0,0131
TP	-1,58	2,24	1,42	2,43	-1,05	2,13	-0,47	2,16	9,65	0,0000

M = Means

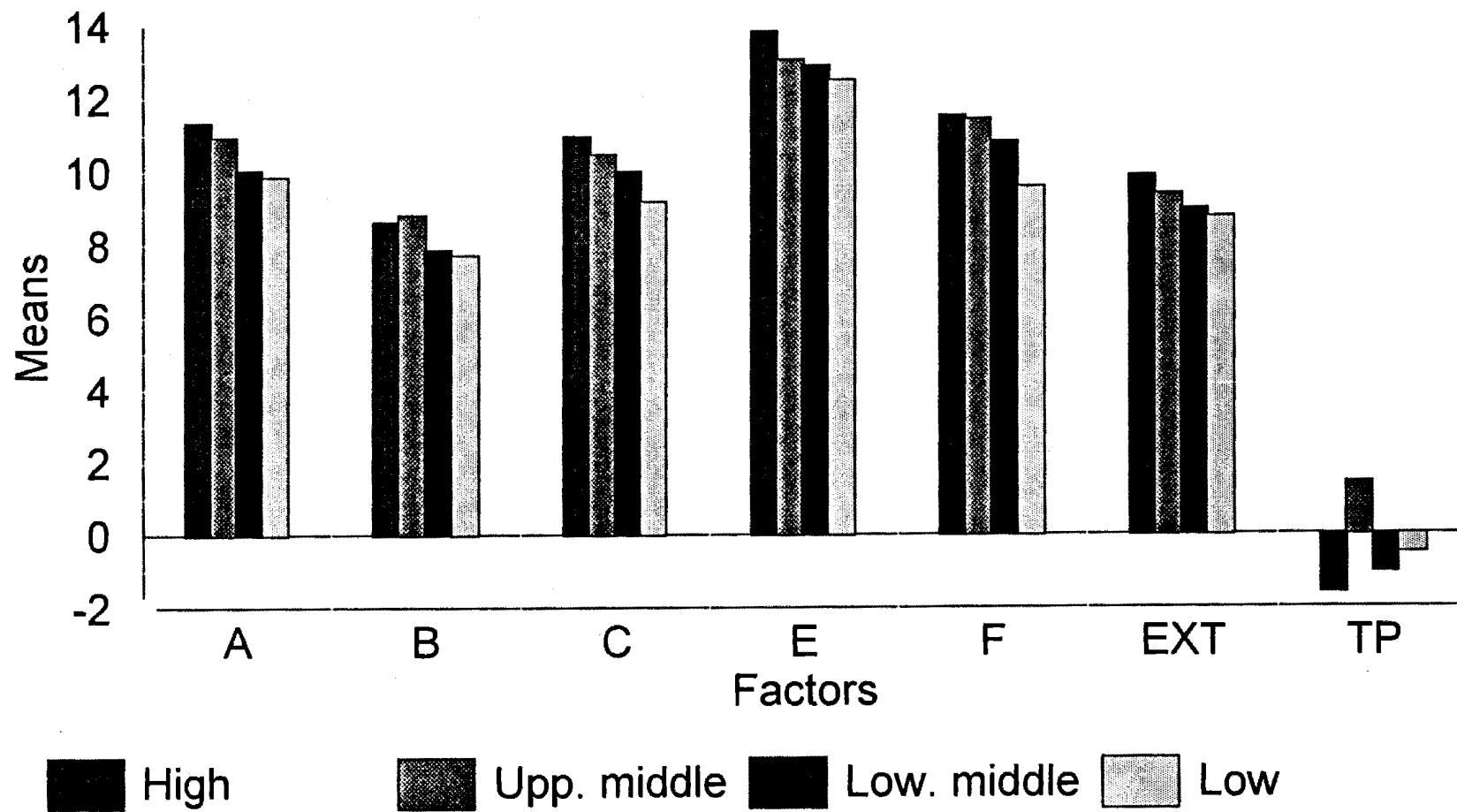


Figure 7.6 Significant mean differences of the 16PF for the participants based on their SES.

Table 7.7 Summary of significant mean differences in terms of race, language, gender, SES, and age.

Race	Inst	Language	Gender	SES	Age
A	A			A	
B	B	B		B	B
C	C	C		C	
F	F	F		F	F
G	G	G			G
I	I	I	I		I
L	L	L			
M	M				
	N	N	N		N
O	O	O	O		
		Q ₁			
Q ₂	Q ₂	Q ₂			Q ₂
	Q ₃	Q ₃			Q ₃
MD	MD	MD			MD
EXT	EX			EXT	
ANX	ANX				
EM.S	EM.S	EM.S	EM.S		EM.S
IND	IND	IND			IND
COMP	COMP	COM			COMP
TP	TP	TP	TP	TP	TP
17	19	14	4	6	12

7.2 Interactions

Hypothesis 7: There are no significant interaction effects between the variables of race, age, gender, and socio-economic status on the first and second-order factors of the 16PF. To test the hypothesis two-way analyses of variance were computed.

Only the interactions between race and age, and race and gender could be determined because of empty cells in the distributions. The results are shown in Appendix B and C. It appeared that no significant interactions exist between the variables age and gender, and race and gender on any of the factors. No further conclusions could be made. Hypothesis 7 is accepted to the extent it was possible to assess the interaction effects.

7.3 Construct Comparability

To determine whether construct comparability exists, the following was ascertained:

- reliabilities of the 16PF (first-order factors) for groups composed for race, gender, age, SES, and institution;
- factor analysis for the various race groups; and
- item analyses of the responses of the various sub-samples i.e. race, gender, SES, and age, and institution).

7.2.1 Reliabilities

Hypotheses 8 to 13 refer to the reliabilities for the various sub-samples. To test for these hypotheses, the reliabilities for each factor for the total sample and for each sub-sample were computed by using the Kuder-Richardson formula (20 and 14). The NIPR's (NP50) program was used for the computation. The results are reflected in Tables 7.8 to 7.12 (showing KR 20 reliabilities only).

Hypothesis 8: The 16PF does not have lower reliabilities for black, coloured, Indian and white students than for the norm group. Table 7.8 and Figure 7.7 shows the reliabilities of the first-order factors and the MD factor for the different race groups. For the total sample, six of the factors had coefficients smaller than 0,50. The lowest reliabilities were obtained for the black group, where 14 (82,35%) of the factors showed coefficients lower 0,50 and five showed coefficients lower than 0,30. The highest reliability coefficient is 0,63 (Factor Q4), and the lowest is 0,02 (Factor M). For the coloured, Indian and white samples, the lowest reliability coefficient was obtained for Factor N, and the highest for Factor H (where

the coloureds and Indians obtained lower coefficients than the whites).

If the results are compared with Prinsloo's reliability coefficients for the norm group, it is obvious that these scores (for all the groups, except the whites) are much lower than found for the norm group. The reliability coefficients for the white participants are the closest to the values reported for the norm group.

Table 7.8 Reliability coefficients of the 16PF for the total sample and different race groups

F	Sample	Blacks	Coloureds	Indians	Whites
A	0,53	0,31	0,54	0,46	0,64
B	0,44	0,34	0,41	0,36	0,50
C	0,69	0,26	0,69	0,69	0,71
E	0,56	0,43	0,61	0,59	0,59
F	0,63	0,29	0,68	0,68	0,69
G	0,58	0,41	0,57	0,52	0,70
H	0,74	0,56	0,79	0,76	0,80
I	0,55	0,35	0,52	0,52	0,62
L	0,47	0,32	0,50	0,41	0,50
M	0,40	0,02	0,40	0,46	0,56
N	0,36	0,22	0,32	0,39	0,47
O	0,66	0,25	0,70	0,69	0,76
Q ₁	0,48	0,30	0,55	0,41	0,58
Q ₂	0,62	0,63	0,55	0,48	0,66
Q ₃	0,64	0,56	0,67	0,61	0,71
Q ₄	0,58	0,46	0,64	0,55	0,66
MD	0,40	0,32	0,30	0,40	0,50

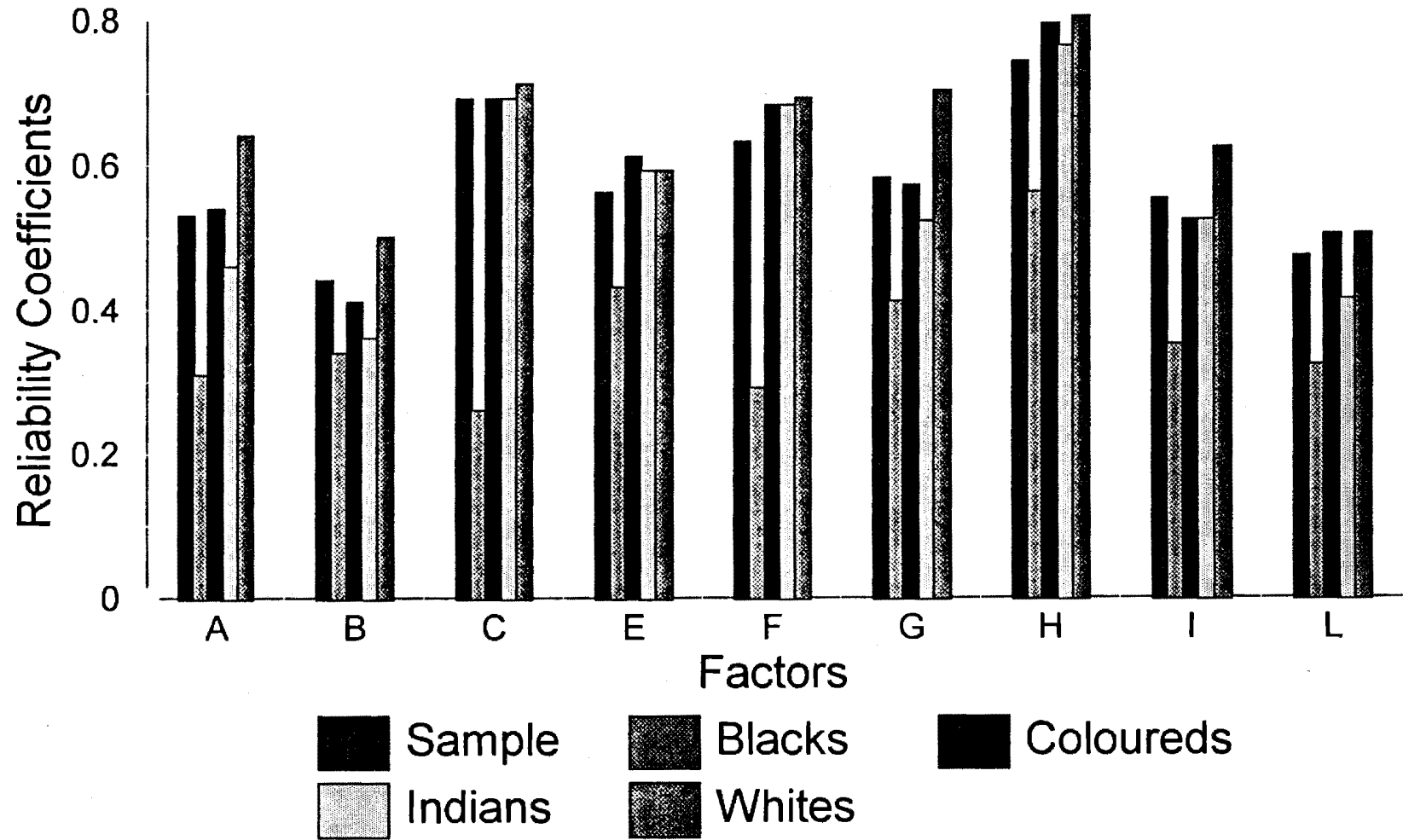


Figure 7.7 Reliability coefficients of the 16PF for the sample and different race groups.

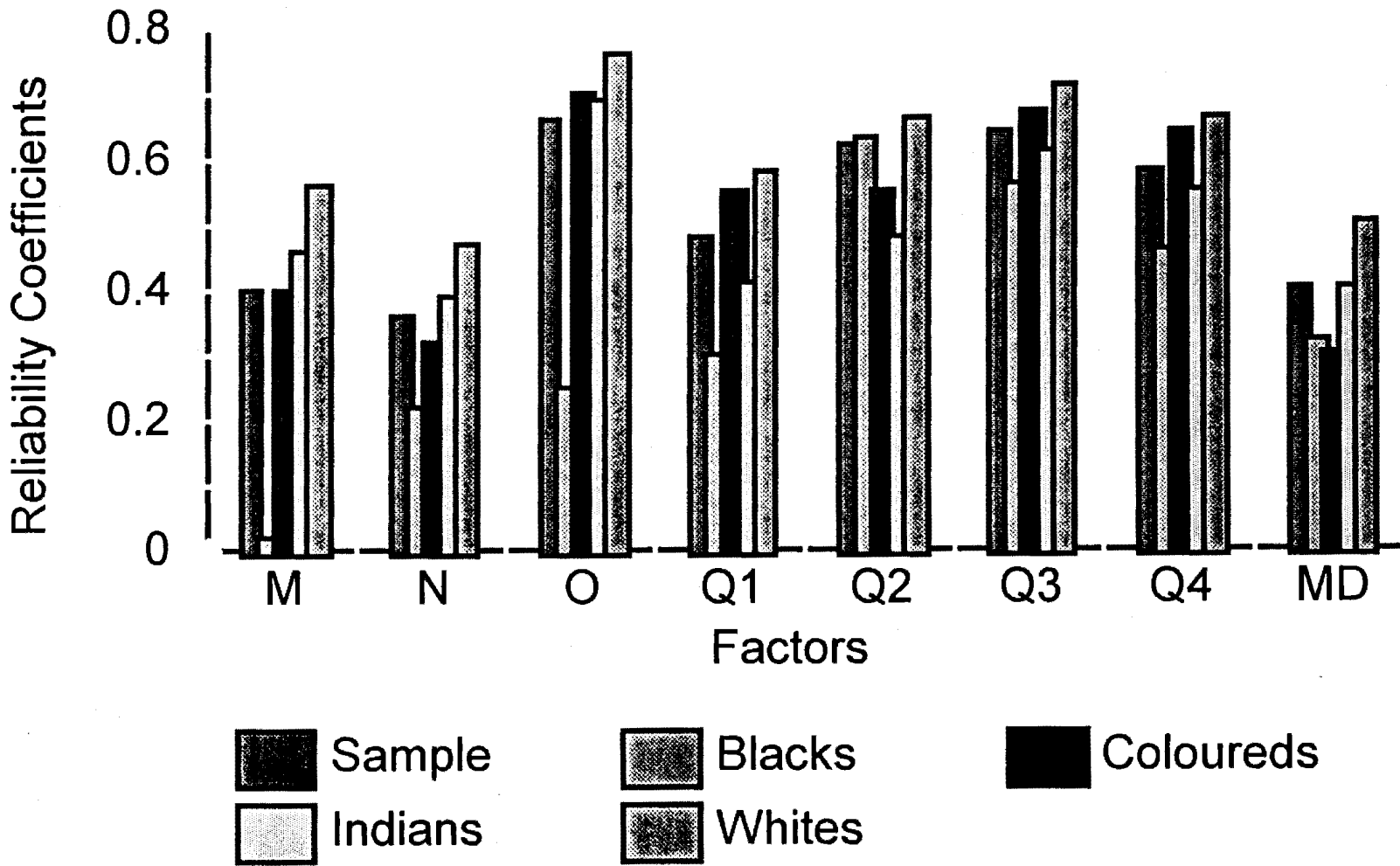


Figure 7.7 Reliability coefficients of the 16PF for the sample and different race groups (Cont.).

Hypothesis 9: The 16PF does not have lower reliabilities for male and female students than for the norm group. Table 7.9 and Figure 7.8 shows the reliability coefficients for male and female participants. Although the results were very similar, the male group had reliabilities that were somewhat lower than those of the females on the majority of the factors. For both samples, the highest reliabilities were found for factor H (males - 0,72, females - 0,75) and the lowest for factor N (males- 0,37, females - 0,34). The tables show that for the female participants seven of the factors have scores lower than 0,50 and for the males, eight have less than 0,50.

In comparison with Prinsloo's (1992) reliability coefficients, these values are much lower than found for the norm group. For males, the highest reliability coefficient was found for Factor H (0,79) and the lowest for factor N (0,53). Females showed the same trend with Factor H being the highest (0,82) and factor N the lowest score (0,48).

Table 7.9 Reliability coefficients of the 16PF for females and males

F	Females	Males
A	0,55	0,49
B	0,39	0,49
C	0,68	0,66
E	0,57	0,53
F	0,63	0,64
G	0,60	0,55
H	0,75	0,72
I	0,44	0,46
L	0,49	0,43
M	0,42	0,37
N	0,34	0,37
O	0,68	0,62
Q ₁	0,47	0,49
Q ₂	0,629	0,61
Q ₃	0,65	0,63
Q ₄	0,61	0,54
MD	0,45	0,31

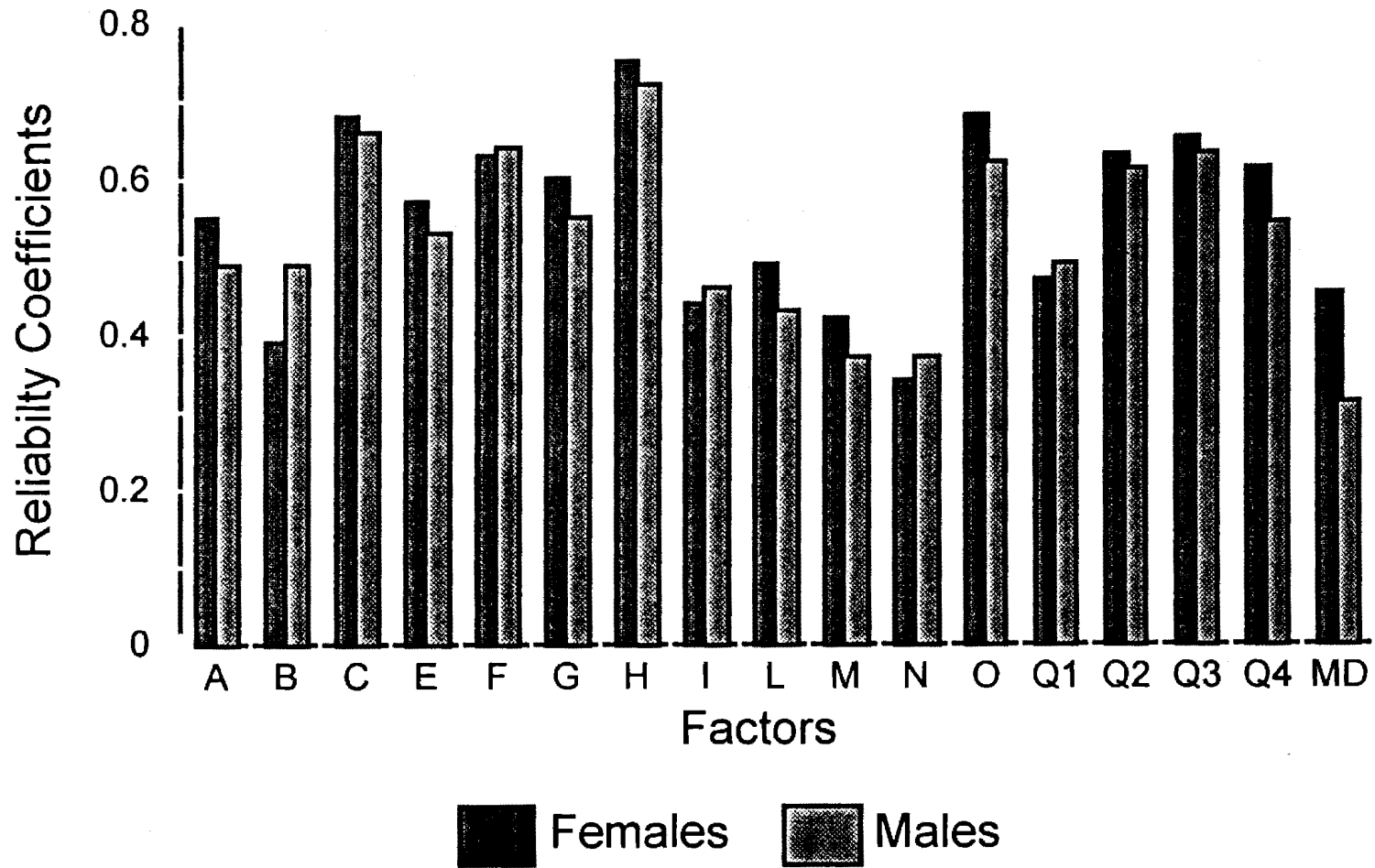


Figure 7.8 Reliability coefficients of the 16PF for females and males.

Hypothesis 10 stated: the 16PF does not have lower reliabilities for 17-18, 19, 20, 21-22, 23-29, and 30-47 year old students than for the norm group. Table 7.10 and Figure 7.9 indicates the reliability coefficients for the participants in the various age groups on the 16PF. Reliabilities for the various age groups were lower than those found by Prinsloo (1992) for the general or combined groups. He indicated reliabilities above 0,50 for all the factors. In this case many factors obtained reliability coefficients of less than 0,5. Reliability coefficients for the age groups 17 to 18; 23 to 29; and 30 to 47 were lower than 0,5 on the majority of the factors.

Table 7.10 Reliability coefficients of the 16PF for various age groups

F	17-18	19	20	21-22	23-29	30-47
A	0,50	0,48	0,55	0,64	0,42	0,51
B	0,38	0,53	0,33	0,37	0,42	0,47
C	0,65	0,68	0,69	0,72	0,60	0,68
E	0,57	0,59	0,60	0,56	0,47	0,53
F	0,65	0,64	0,67	0,69	0,44	0,46
G	0,56	0,59	0,57	0,67	0,36	0,49
H	0,74	0,75	0,75	0,76	0,73	0,67
I	0,54	0,55	0,54	0,56	0,40	0,46
L	0,35	0,52	0,52	0,47	0,48	0,42
M	0,46	0,43	0,49	0,40	0,16	0,29
N	0,43	0,28	0,31	0,24	0,28	0,39
O	0,64	0,67	0,73	0,72	0,57	0,50
Q ₁	0,39	0,56	0,54	0,49	0,40	0,54
Q ₂	0,49	0,63	0,59	0,68	0,62	0,70
Q ₃	0,57	0,63	0,69	0,69	0,64	0,39
Q ₄	0,53	0,64	0,52	0,64	0,53	0,68
MD	0,39	0,37	0,40	0,35	0,29	0,31

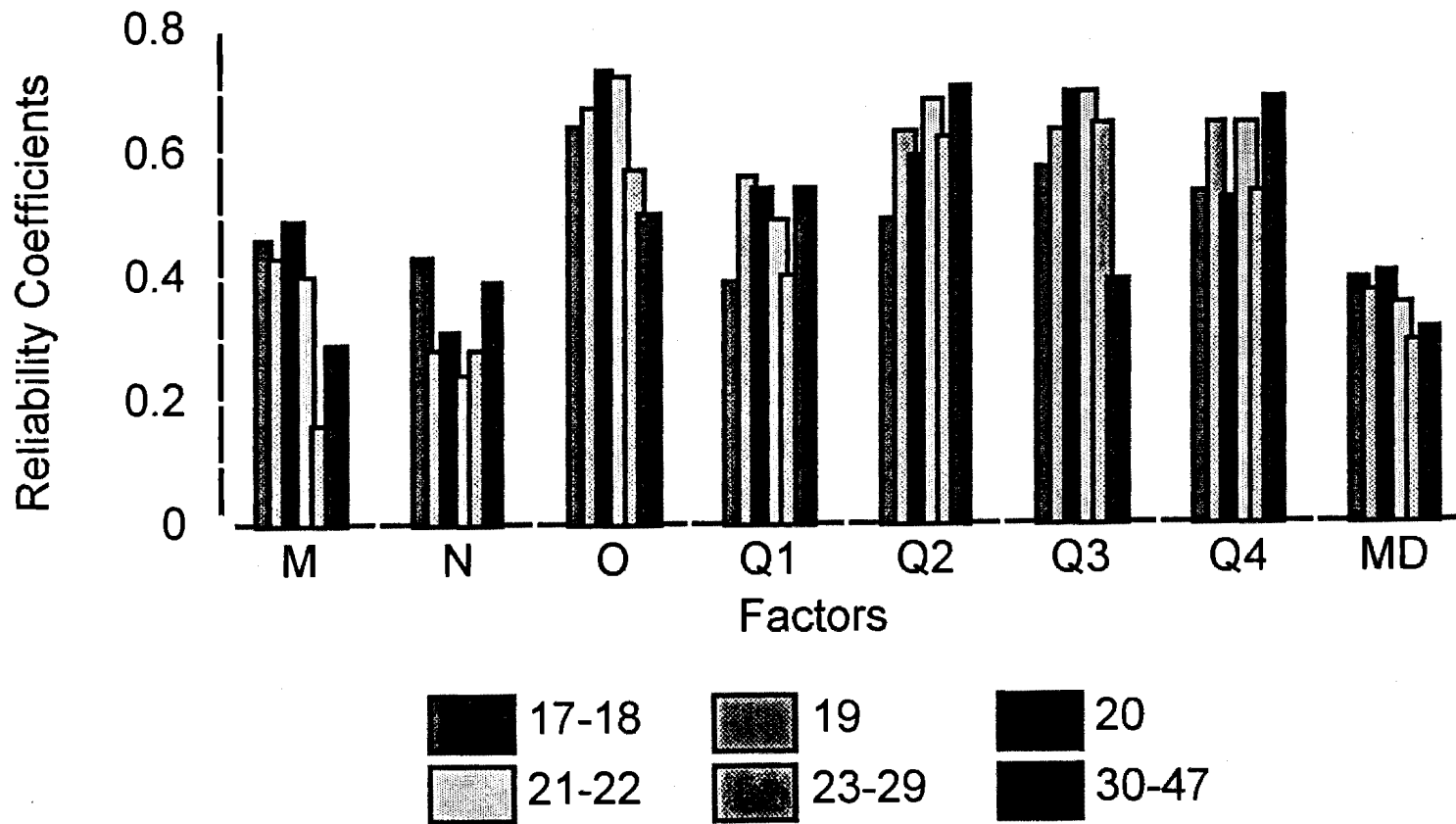


Figure 7.9 Reliability coefficients of the 16PF for various age groups.

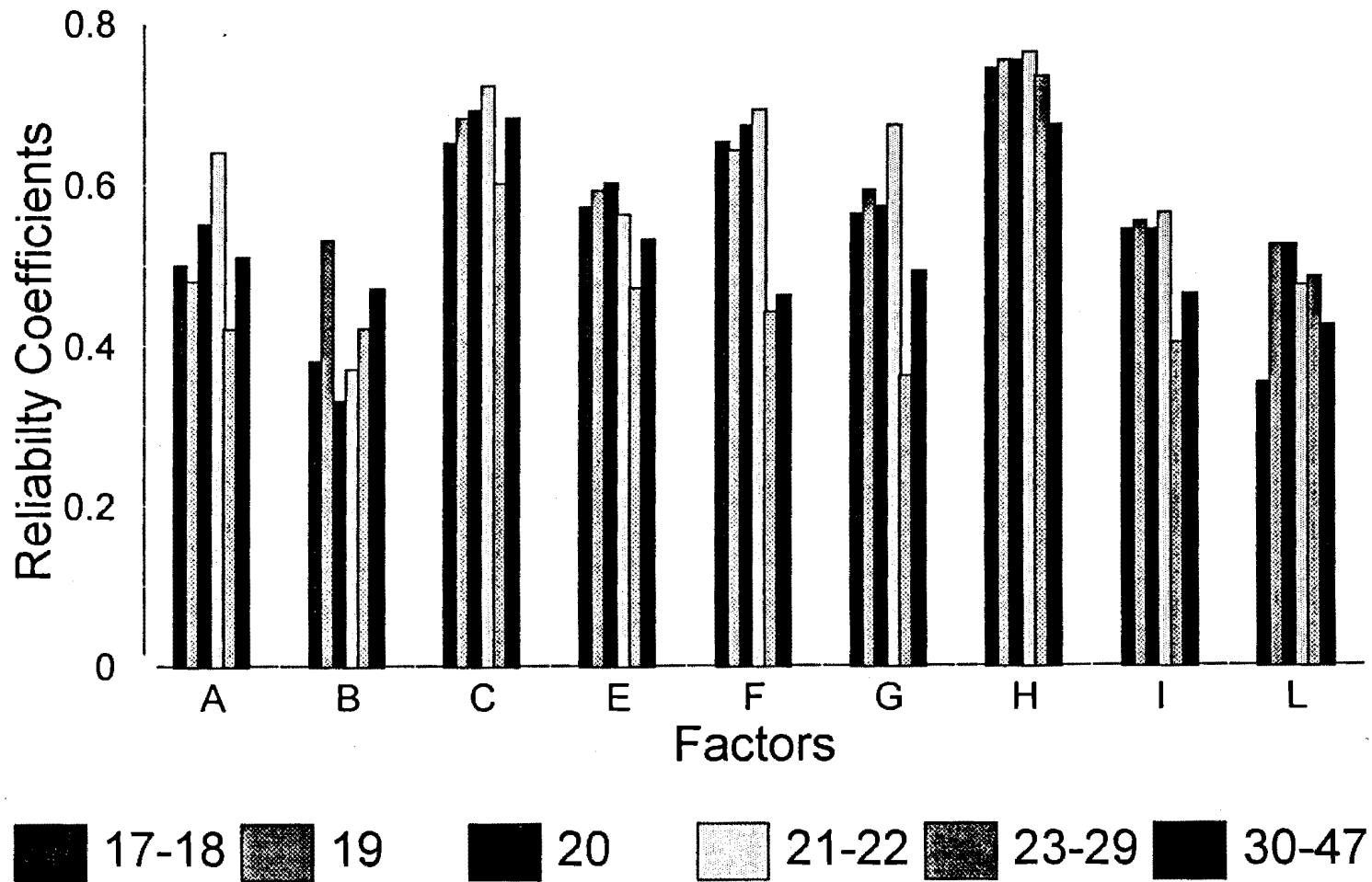


Figure 7.9 Reliability coefficients of the 16PF for various age groups (Cont.)

Hypothesis 11: The 16PF does not have lower reliabilities for students from UWC, UDW, UND, and UP, than for the norm group. A pattern similar to that of the various race groups emerged (Table 7.11 and Figure 7.10). Reliability coefficients for the UWC, UND and UDW participants are much lower than those for the norm group (a number of factors had values less than 0,5), with the exception of the UP participants whose reliabilities were a good deal higher.

Hypothesis 12: The 16PF does not have lower reliabilities for students from high, upper middle, lower middle, and low socio-economic backgrounds than the norm group. Table 7.12 and Figure 7.11 shows reliability coefficients obtained for the participants from the various SES groups. The majority of factors (for all the groups) have coefficients larger than 0,50. For all the groups the largest coefficients were found on Factor H, and the smallest coefficients were found on Factors M or N. The largest coefficients were found for the higher SES participants.

In conclusion, it appears that the lowest reliabilities were found when the sample was divided into sub-samples on the basis of race with the black participants having the lowest reliability coefficients.

Table 7.11 Reliability coefficients of the 16PF for participants from different institutions

F	UWC	UDW	UND	UP
A	0,45	0,36	0,53	0,64
B	0,42	0,39	0,31	0,15
C	0,52	0,67	0,68	0,73
E	0,53	0,57	0,60	0,59
F	0,57	0,68	0,67	0,68
G	0,52	0,47	0,61	0,69
H	0,70	0,73	0,75	0,82
I	0,44	0,55	0,59	0,61
L	0,42	0,36	0,46	0,51
M	0,26	0,55	0,34	0,55
N	0,30	0,40	0,34	0,40
O	0,58	0,68	0,64	0,78
Q ₁	0,46	0,40	0,36	0,58
Q ₂	0,63	0,49	0,49	0,65
Q ₃	0,61	0,57	0,65	0,71
Q ₄	0,55	0,50	0,58	0,69
MD	0,31	0,33	0,45	0,46

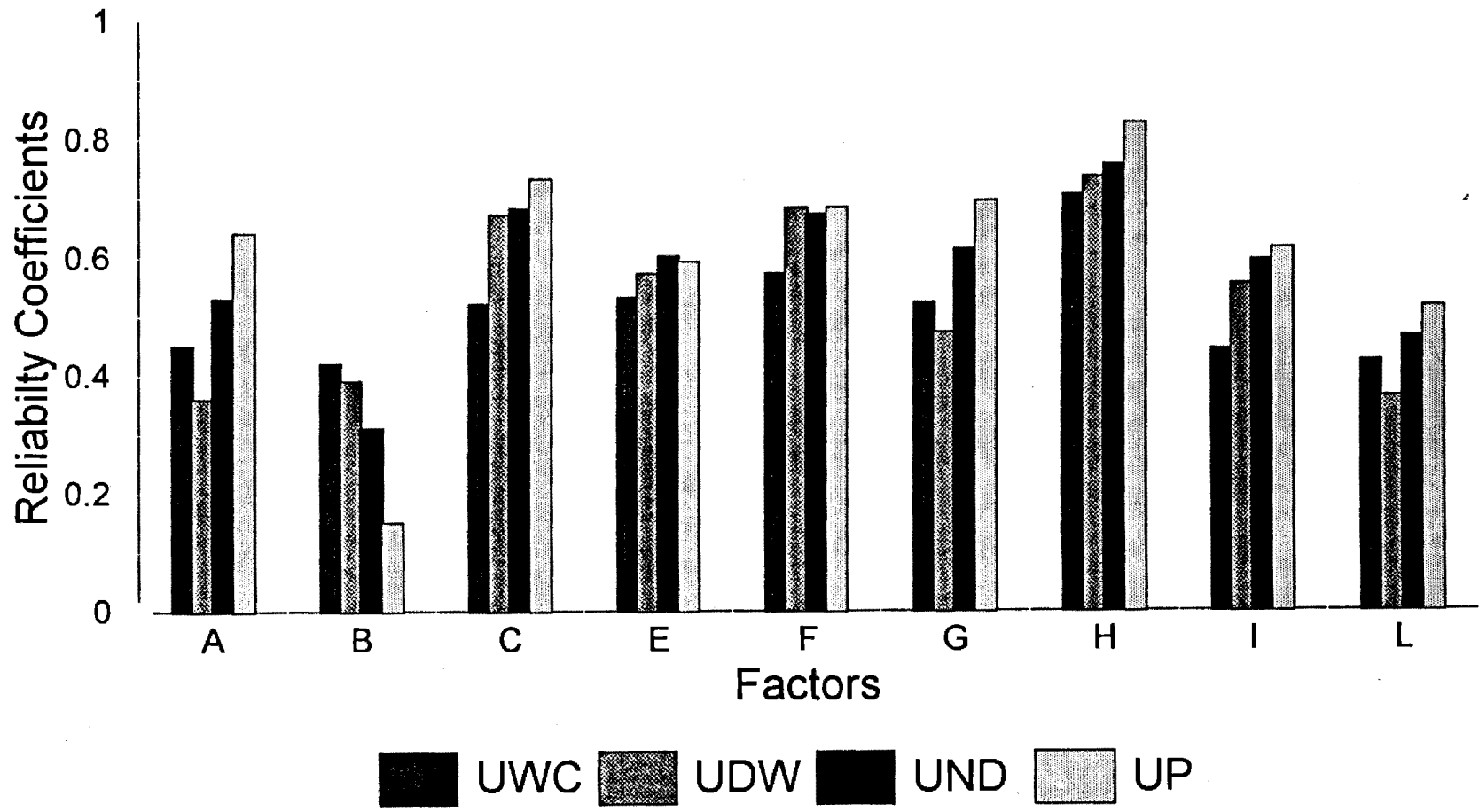


Figure 7.10 Reliability coefficients of the 16PF for participants from different institutions.

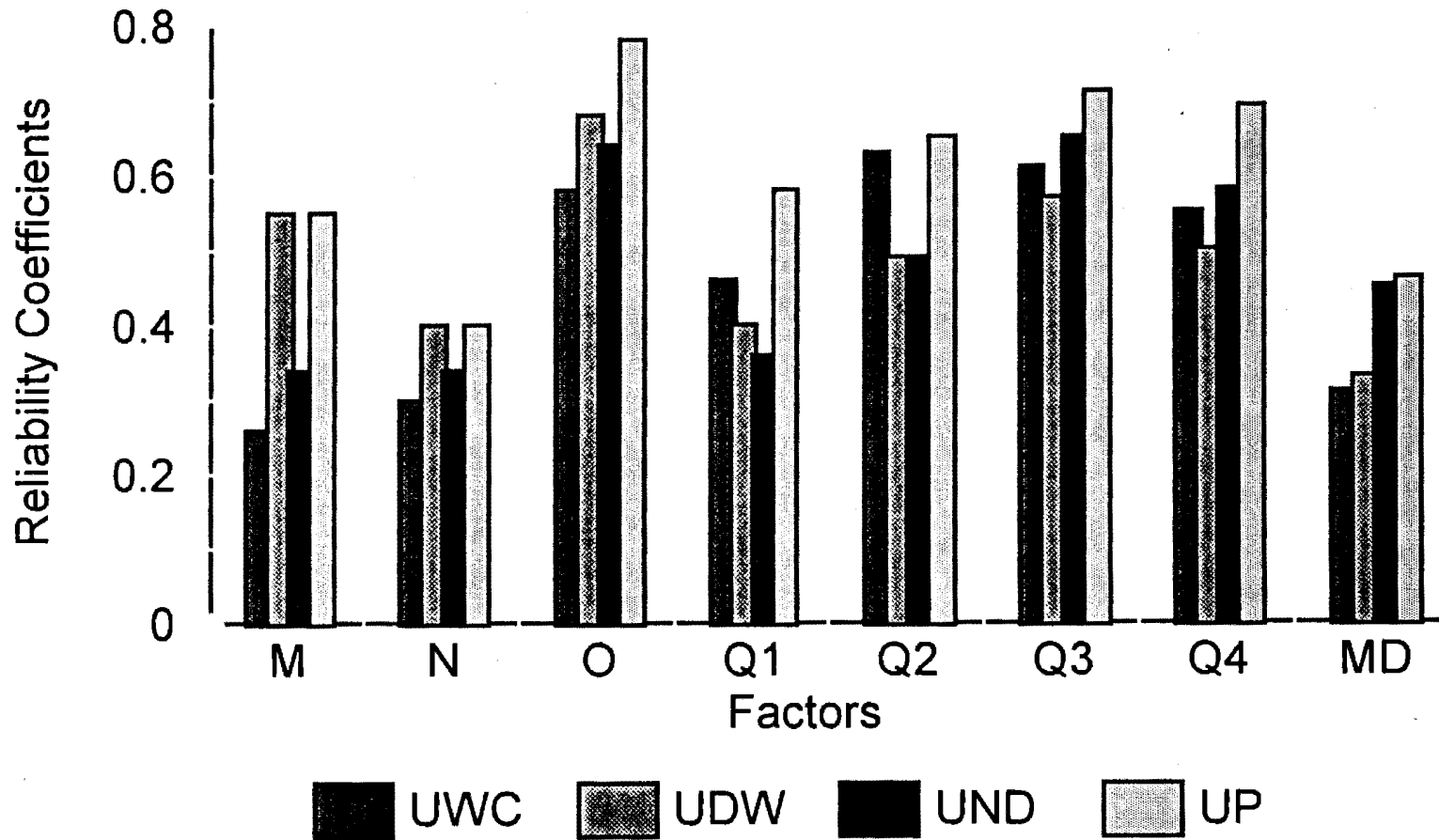


Figure 7.10 Reliability coefficients of the 16PF for participants from different institutions (Cont.).

Table 7.12 Reliability coefficients of the 16PF for participants based on their SES

F	Low	Lower middle	Upper middle	High
A	0,42	0,54	0,56	0,60
B	0,47	0,35	0,36	0,45
C	0,61	0,70	0,70	0,71
E	0,59	0,55	0,63	0,58
F	0,57	0,64	0,63	0,66
G	0,54	0,61	0,55	0,64
H	0,74	0,78	0,73	0,76
I	0,55	0,46	0,59	0,61
L	0,51	0,44	0,33	0,57
M	0,28	0,48	0,45	0,49
N	0,32	0,30	0,41	0,46
O	0,67	0,68	0,68	0,70
Q ₁	0,42	0,54	0,46	0,49
Q ₂	0,62	0,55	0,60	0,61
Q ₃	0,63	0,68	0,62	0,65
Q ₄	0,58	0,58	0,62	0,58
MD	0,35	0,39	0,37	0,48

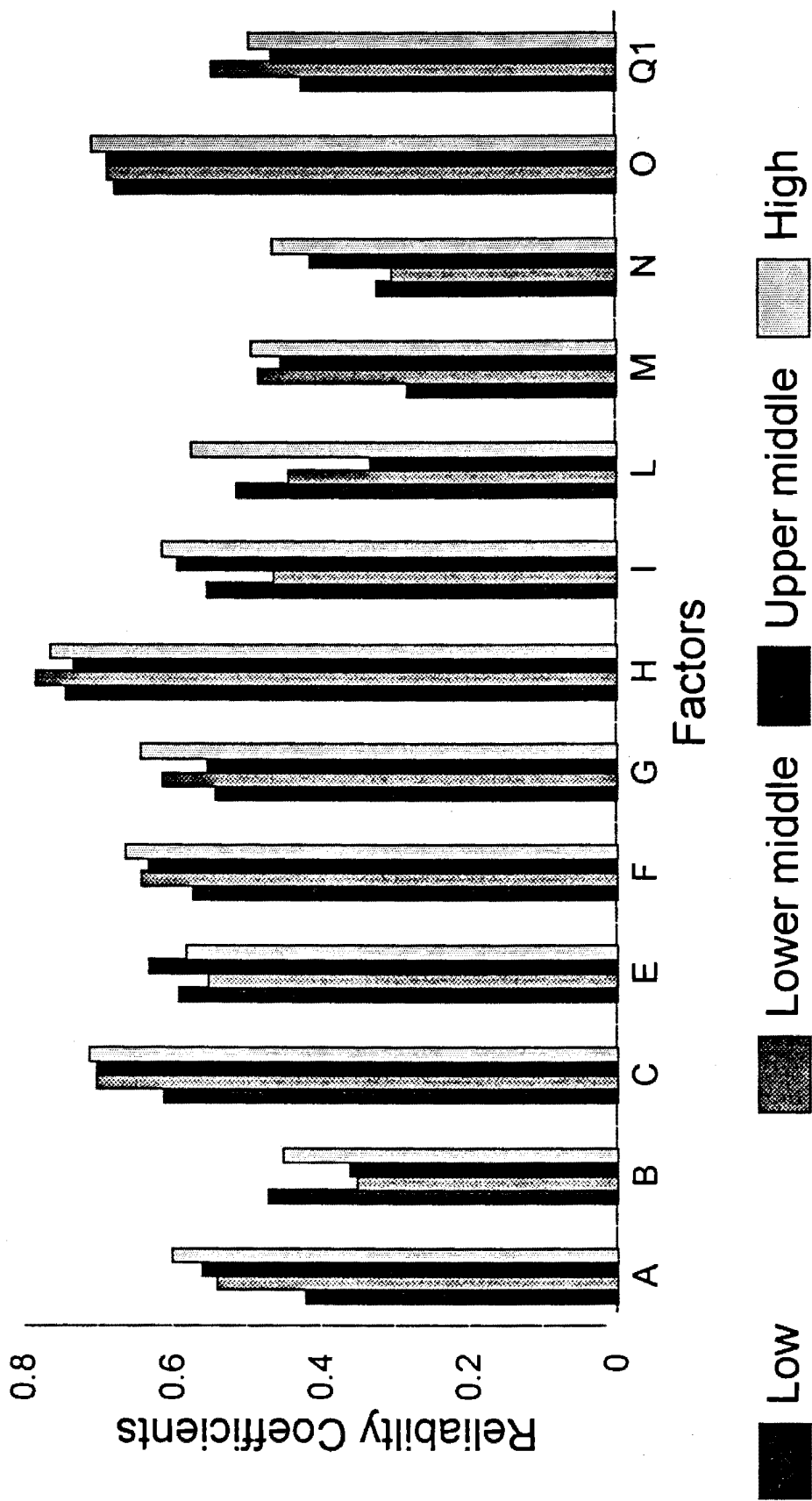


Figure 7.11 Reliability coefficients of the 16PF for participants based on their SES.

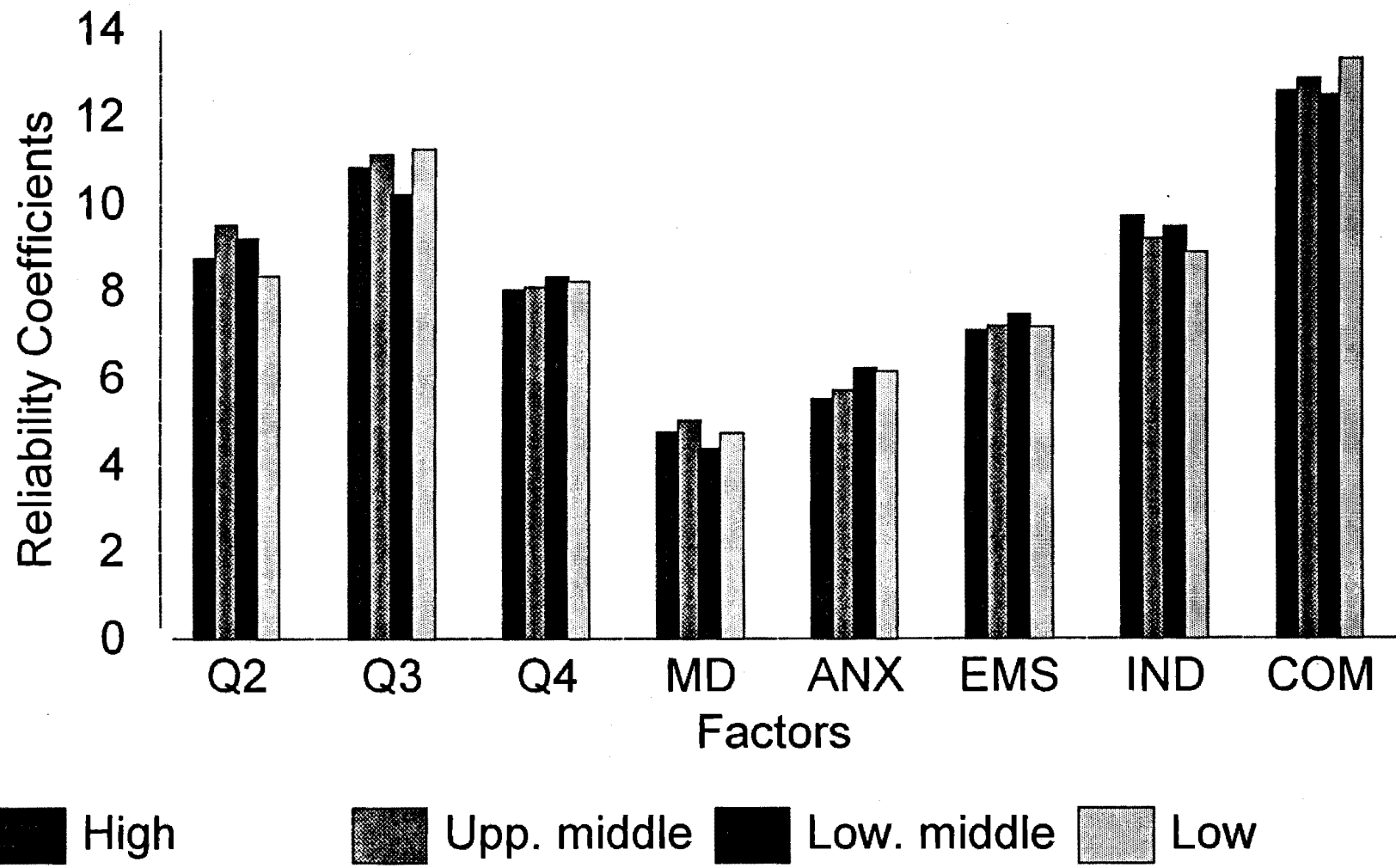


Figure 7.11 Reliability coefficients of the 16PF for participants based on their SES (Conti.).

7.3.2 Factor analysis

Hypothesis 13 refer to the factor patterns displayed on the 16PF for the sub-samples of black, coloured, Indian and white participants. To evaluate this hypotheses, Jöreskog's (1963) factor estimation procedure was used, followed by the procedure developed by Browne (1972a; 1972b) for rotating a factor matrix to a partially specified target matrix. The purpose of the technique is to establish the extent to which a data set matches a conceptual model of the structure underlying the data. The steps are as follows:

- a) A factor analysis of the data is done, where the number of factors that has to be extracted is specified;
- b) The factor matrix is rotated using the Varimax procedure;
- c) A pattern matrix is then drawn up in which those items that are expected to load on a particular factor is specified as 0,9, and those that are not expected to load are specified as 0,0; and
- d) An attempt is then made to match the empirical data as closely as possible to the target matrix, using an orthogonal rotation.

In addition, a square root of average squared deviation is also computed which provides an overall estimate of the degree to which the final matrix matches the target matrix. The smaller the index, the closer the match.

The aim of using this procedure was to determine the degree to which the theoretical factor structure of the 16PF matches the data for the four groups. The programme was run four times, and the target matrix consisted of those items which are supposed to load on the 16 Factors. The following computer programmes that were originally developed by the National

Institute for Personnel Research (NIPR) at the stage when it was a Research Institute for the Council for Scientific and Industrial Research were used:

- NC 30 Product-moment correlation coefficients;
- NF47A Joreskog's factor analysis - part 1;
- NF47B Joreskog's factor analysis - part 2; and
- NF46 Orthogonal rotation to a partially specified target matrix.

The results of the target procedure are shown in Tables 7.25 to 7.29. For the sake of completeness, the results in Table 7.25 are those of the sample as a whole, while the matrices shown in the following tables are those for the four sub-samples. To facilitate interpretation the items which had been specified in the target matrix as 0,9 - in other words those items which one would expect to load highly on the factors in terms of Cattell's model - are shown in bold type, while those that were specified as 0,0 are shown in the standard typeface.

The values of the measures of sampling adequacy (MSA) indicated that the sampling was not adequate for the subsamples, but that it was good enough for the combined sample. A loading of $\geq 0,3$ was arbitrarily set as criteria to judge whether an item (target matrix) complied with the theoretical model.

When the target matrices are inspected it is evident that there are obvious differences in the factor patterns between the black, coloured, Indian, and white students. Table 7.25 shows the target rotation for the total group. In total, 59 (36,87%) items loaded as expected. Table 7.26 shows the target rotation for the blacks and only 32,5% (52 of 160) of the items loaded

as expected. The target rotation for the coloureds is shown in Table 7.27 and 41,87% of the items loaded in the expected way. Table 7.28 shows the target rotation for Indians where 38,75% (67) of the items loaded as expected. Table 7.29 shows the target rotation for whites where the largest number of items (53,13%) loaded in the expected way.

The square roots of average squared deviations did not show much differences between the groups. They are as follows:

- total group - ,104334E+00
- blacks - ,120305E+00
- coloureds - ,12764E+00
- Indians - ,128780E+00
- whites - ,129053E+00

It shows that the best fit is for the total group and it is difficult to choose between the others as the indexes are so close. This could be as a result of unsatisfactory MSA's obtained for the subgroups.

In conclusion, it seems that the data of the whites showed the best fit and the blacks the poorest fit to the original factor structure of the 16PF. As the MSA's were acceptable for the combined group, it was expected that the results would match the theoretical model. However, this was not the case and the results showed that there were a considerable number of items for which the loadings on those factors on which they ought to load are so as to be negligible.

The fact that the MSA's for the sub-sample indicated that it was unlikely that a satisfactory factor solution would be found, it was, nevertheless, decided to continue with the process in view of the nature of the hypothesis posed for the investigation. The results for the black, coloured and Indian sub-samples displayed the same trends as those observed for the sample as a whole.

Table 7.13 Rotated factor matrix for whole sample

Items	Factors															
	A	B	C	E	F	G	H	I	L	M	N	O	Q1	Q2	Q3	Q4
1	-03	06	17	04	-02	-10	12	-01	-01	-01	07	03	-02	-21	09	03
2	25	08	08	08	-02	04	20	32	-04	-01	07	-02	02	01	-05	-03
3	-06	19	07	-01	06	11	03	09	-07	-01	14	-03	04	01	01	04
4	-06	10	07	02	02	11	01	-07	04	-02	15	05	10	01	-03	-03
5	08	12	26	22	15	02	13	-05	-16	-05	02	-07	-03	06	17	-17
6	06	02	23	04	05	-04	10	-13	-17	04	-01	-23	-02	-03	24	-23
7	02	-02	01	22	-12	-09	12	00	02	-01	-09	-06	09	05	04	13
8	19	-03	00	25	08	06	06	-06	09	05	-02	06	08	08	-03	-01
9	03	08	21	-04	30	-11	31	08	-12	-08	-02	-01	11	-02	-08	-08
10	07	17	20	04	26	-16	29	05	-18	-03	01	-08	01	-01	00	11
11	-08	07	07	-11	03	28	02	10	02	-18	15	-08	-08	-08	02	03
12	01	20	02	07	-03	44	-04	03	-02	-10	-06	01	-09	05	15	-07
13	12	00	09	29	25	-06	35	-06	-12	04	03	03	-04	-18	-01	06
14	04	01	19	19	15	-02	44	-10	-10	-04	-02	-13	14	04	05	00
15	07	01	10	-02	-02	-09	06	29	05	02	02	-02	03	05	-07	-03
16	18	-06	10	-07	10	04	01	36	-03	00	05	04	-10	01	-13	06
17	09	00	-09	08	-09	-13	00	-03	-08	-19	-06	09	-04	07	-01	05
18	13	-03	-02	15	09	-06	-10	03	17	-03	-04	-02	16	03	01	03
19	-18	-03	11	-02	-04	-09	-03	20	-10	08	-08	-02	13	24	06	-02
20	-02	02	-01	19	08	-06	06	22	-18	22	-08	03	04	00	14	-01
21	07	01	-15	23	06	02	-05	05	17	05	-05	02	03	07	-01	-03
22	-03	06	-04	-05	06	10	-10	-03	-01	-08	17	12	02	-12	19	-19
23	01	01	17	10	-15	00	14	-19	-01	-05	-04	-11	12	05	27	-09
24	00	06	-22	-08	-07	-01	-14	08	06	-11	03	38	04	07	-10	04
25	03	-06	-30	-11	-11	09	-11	01	06	06	02	10	-03	-07	-31	19
26	-05	-04	02	14	14	09	04	05	04	33	-02	03	14	03	02	-21
27	-12	-20	-20	08	-13	11	10	03	00	14	06	-02	16	-12	22	-07
28	04	-01	05	04	00	11	-18	03	-05	-05	05	01	01	42	-12	-05
29	-15	-03	08	04	-11	-15	00	-21	03	-08	10	-12	-01	35	05	-06
30	-05	-06	02	-11	-18	06	07	-11	-13	05	-02	-04	00	-01	26	-27
31	03	-17	-13	-13	00	13	-08	-04	18	02	-06	25	13	-05	-11	27
32	-01	05	-05	12	-01	-11	01	10	05	-02	-17	11	-07	09	-09	38
33	28	07	00	-03	09	06	09	15	09	-04	-02	04	02	-24	07	-04
34	33	15	15	03	06	-05	16	13	-02	-02	03	-08	-16	-06	-10	06

Table 7.13 Rotated factor matrix for whole sample (continued)

Items	A	B	C	E	F	G	H	I	L	M	N	O	Q1	Q2	Q3	Q4
35	09	35	25	07	01	04	-02	-06	-11	01	-05	10	-12	00	07	-04
36	07	22	04	07	10	-05	00	11	-07	-09	00	-07	05	12	-06	-02
37	-01	17	06	05	18	03	10	12	-12	-06	10	-18	07	-08	14	-06
38	02	-10	21	05	07	-05	17	00	-26	-07	-07	-33	-06	05	18	-20
39	-12	-04	14	38	10	-03	45	01	-08	04	-01	05	09	-12	00	-11
40	-05	-03	19	13	16	-04	13	-09	-02	03	00	00	30	-03	07	-07
41	-02	12	07	12	35	09	25	07	08	-03	-10	04	08	-11	18	-19
42	01	06	23	06	40	-22	08	15	-16	03	09	-06	-11	09	-14	03
43	-03	-01	01	13	-01	43	-06	-15	01	-06	-06	00	-03	-04	23	02
44	-12	10	01	-12	-07	15	09	06	-14	-09	11	03	-07	13	09	-01
45	12	-05	-01	05	41	-12	39	-05	-02	03	02	-04	11	-17	02	05
46	14	12	-18	-08	06	-11	-17	16	00	01	06	33	-09	-06	-08	06
47	-21	-04	-03	-08	03	03	-04	28	-08	02	-04	01	10	-03	02	-11
48	01	02	-20	-01	08	-01	02	33	00	11	-03	17	01	-04	-10	26
49	02	-02	-06	16	-09	-02	-05	01	43	01	-04	13	-07	00	-03	06
50	04	-12	-06	05	-17	-04	-05	-06	16	03	09	17	07	02	04	07
51	-04	-02	-07	-04	-02	-14	05	-01	05	36	-05	03	02	-01	-15	24
52	-12	09	02	06	11	-26	04	23	-19	20	-10	05	04	17	08	03
53	01	08	-05	16	15	15	-04	-14	08	11	-15	-02	14	00	22	-12
54	-04	02	03	22	07	10	-03	07	-07	00	02	-02	13	02	30	-07
55	-09	-09	-01	-07	-09	07	-09	-09	09	-02	11	-04	-06	41	15	-05
56	-13	-01	-03	12	05	03	-20	08	16	17	02	27	05	00	-24	19
57	-09	-09	-21	-05	-02	00	-34	04	19	14	00	19	-06	11	-04	22
58	-01	03	-09	28	09	08	19	-05	11	18	-08	01	17	-15	06	-10
59	07	05	16	03	01	00	05	-02	-06	02	06	-01	17	04	16	-02
60	05	01	-10	-01	08	-01	-12	00	09	07	-09	-02	-09	38	01	05
61	01	16	04	10	09	-12	-02	04	-13	01	-05	-04	03	33	00	02
62	-04	07	23	08	05	04	17	-04	-13	-12	03	-22	01	09	15	-21
63	03	06	-23	-14	-10	-01	-12	14	10	01	04	13	-17	-14	-23	18
64	-04	07	-08	05	00	01	-14	19	25	-02	-01	32	00	-07	-12	30
65	02	-05	08	-03	12	04	24	02	01	-02	03	-05	-04	-30	06	-05
66	25	-03	03	-04	25	-05	24	00	09	-08	08	00	-02	-16	-01	01
67	-05	25	-01	-01	01	-05	04	00	-09	11	-11	09	02	-05	11	04
68	00	22	12	12	-07	-04	06	04	-12	16	-10	01	01	07	-01	-01
69	00	20	40	00	09	-04	17	12	-18	-03	-13	-13	-03	-03	06	07

Table 7.13 Rotated factor matrix for whole sample (continued)

Items	A	B	C	E	F	G	H	I	L	M	N	O	Q1	Q2	Q3	Q4
70	-02	14	41	13	18	-13	06	16	-20	-10	-08	-10	01	08	11	03
71	-06	10	18	46	12	10	18	-02	05	02	00	01	05	-04	14	-09
72	-13	02	11	28	15	06	12	03	07	00	-11	13	11	00	26	-11
73	15	08	06	07	33	-13	15	07	02	-01	08	-09	00	-12	-01	04
74	02	-10	07	06	41	00	15	01	04	00	00	-18	08	-01	-07	-17
75	-09	17	19	-11	-04	11	11	06	-16	-13	-01	09	-15	11	07	-09
76	11	-20	-12	-02	-04	50	06	-11	02	00	-08	09	05	-14	25	00
77	05	06	11	16	-05	10	52	-05	-05	03	-06	-11	06	-02	05	-06
78	-23	-03	-08	-12	14	03	-10	36	03	-06	-03	-08	09	02	00	-01
79	-03	16	03	-04	05	02	00	24	14	08	08	07	-08	-03	03	07
80	11	-08	-20	12	09	00	-07	-03	16	-05	08	-14	-01	-01	-16	03
81	-05	-11	-18	14	13	-02	-07	-01	21	-06	-02	-08	-11	01	-20	09
82	-08	-10	00	03	-11	-09	03	-13	03	01	03	09	-01	10	00	00
83	05	-13	-12	08	10	-12	-06	-02	-07	17	17	-04	17	-12	06	-03
84	00	-04	-01	-08	-14	02	09	03	01	24	-02	03	07	-16	20	-01
85	09	19	-08	-18	03	-07	-12	08	-07	-08	30	06	-01	-08	11	-04
86	02	01	-11	-11	03	05	-13	-06	-04	-04	26	13	-03	-08	01	-08
87	13	-08	-11	06	-06	21	-03	-15	02	-06	07	11	07	-08	17	02
88	-03	-08	-29	-09	-02	14	-07	31	04	12	-01	21	-03	-10	-13	20
89	06	02	03	06	-01	-27	13	07	-14	-09	05	-01	16	12	04	-02
90	-13	-02	-30	17	17	17	-11	-02	05	12	02	-05	17	-05	22	-05
91	10	04	-06	-02	-11	01	-14	-10	11	28	04	09	01	29	08	22
92	-02	-03	-04	-08	05	-01	-03	-03	02	02	04	07	02	56	04	-05
93	06	-09	04	-01	-07	37	02	-06	-03	-19	-03	-08	07	-08	36	-02
94	02	05	03	11	11	26	05	03	03	-03	-11	-10	06	-02	33	-03
95	01	19	-05	02	00	-17	01	07	17	10	04	00	-11	20	-10	14
96	-03	-05	-05	03	-04	02	-09	02	16	23	03	18	01	06	-08	21
97	-06	08	11	08	16	-05	15	-02	-09	01	04	-07	-07	-32	-06	05
98	01	24	-12	14	06	10	-07	08	01	-09	22	-22	05	-07	06	08
99	08	15	-10	03	-02	00	04	-15	01	09	-03	02	05	12	-02	-05
100	07	36	02	-02	07	-13	09	01	-09	-09	00	00	06	05	00	01
101	-02	06	04	-12	-03	03	15	-11	-15	-31	01	-18	-04	-01	24	-31
102	04	01	36	01	13	-04	10	-08	06	06	-04	-22	-03	02	16	-06
103	-01	03	-13	27	-09	-01	06	-06	11	-06	-05	-04	40	10	09	02
104	02	13	01	31	-05	00	17	-06	00	-08	-10	-16	29	-17	11	01

Table 7.13 Rotated factor matrix for whole sample (continued)

Items	A	B	C	E	F	G	H	I	L	M	N	O	Q1	Q2	Q3	Q4
105	08	-02	-07	11	35	03	23	03	-02	01	05	00	13	-28	05	02
106	-08	09	-06	-22	-21	11	-01	06	07	00	-13	05	-09	02	03	01
107	-17	-13	-08	-07	-02	34	04	04	-01	10	09	08	12	-12	18	-09
108	10	01	03	11	40	-03	44	01	10	00	-05	-08	06	-23	03	-04
109	05	-02	06	09	03	07	38	-04	-10	-14	-09	-19	06	-13	20	-16
110	10	06	10	10	18	-12	-09	23	-08	17	10	12	02	05	-10	13
111	12	02	14	06	-18	-11	10	27	06	-05	11	06	-02	04	-20	02
112	04	-16	-15	-04	-09	-02	-04	-02	45	03	-08	15	03	08	00	11
113	01	03	-23	00	04	01	-02	-08	28	11	08	-04	-05	00	01	05
114	09	05	-05	09	-03	-11	-02	09	05	-10	01	07	-03	23	-05	15
115	-02	01	03	02	-03	-04	-03	02	03	42	-05	12	-02	08	-23	08
116	-04	12	05	05	04	-17	-02	18	00	13	00	-23	01	17	-08	09
117	00	19	-05	16	11	17	01	00	08	00	02	-07	-03	04	05	-16
118	10	08	-08	41	02	06	02	-12	05	07	-11	-09	03	-04	06	-04
119	02	-01	-04	00	-28	-04	-12	00	-18	-05	03	21	-03	00	-19	17
120	-01	-02	-05	09	-08	-03	-22	19	25	16	18	27	01	05	-17	32
121	-05	04	14	23	-02	03	16	00	-04	-08	00	-14	42	00	18	01
122	-01	11	01	07	22	03	14	04	-09	14	03	-02	23	08	12	-02
123	10	-05	00	06	-20	-16	-09	04	22	07	-21	14	-10	23	-07	08
124	01	06	00	01	-20	03	-08	-06	00	07	07	03	-05	34	-03	07
125	-04	16	12	15	06	08	14	-09	-04	-04	07	-16	01	03	41	-14
126	03	08	26	12	-03	-11	11	-13	-03	-03	12	-13	03	03	42	-23
127	01	-07	-16	-11	-09	13	-06	07	-11	-04	00	13	-01	02	-17	39
128	02	-02	-02	10	-16	-08	03	-05	-04	06	-05	10	-07	08	-04	42
129	-12	05	04	20	21	04	35	18	-12	03	13	-09	-02	-23	03	-01
130	00	23	04	00	04	02	-04	02	05	-06	15	-07	07	00	-05	-01
131	-02	10	-01	06	-01	-01	00	06	01	-08	10	-06	-02	00	03	07
132	03	33	20	10	14	00	-01	02	-11	-06	05	03	03	09	-10	-07
133	08	06	25	03	-09	-06	16	-13	-06	01	19	-31	04	-09	15	-32
134	02	08	-05	24	34	-08	19	00	04	00	03	-07	-09	-06	-07	04
135	09	02	-03	14	-06	-14	08	-10	02	-02	-03	08	03	-05	-01	01
136	08	14	-03	31	07	-07	04	02	15	16	-15	-07	-12	20	00	17
137	-12	03	-14	18	30	02	27	-07	02	11	-03	-09	01	-13	02	-09
138	01	03	-19	-03	-16	40	01	-08	05	-06	08	10	09	-07	03	02
139	13	-05	00	05	-03	47	05	01	-07	-12	07	-10	10	01	23	05

Table 7.13 Rotated factor matrix for whole sample (continued)

Items	A	B	C	E	F	G	H	I	L	M	N	O	Q1	Q2	Q3	Q4
140	-02	-03	-01	09	16	08	34	01	-01	-02	-04	-14	01	-12	13	-10
141	-09	06	12	14	05	07	58	07	03	07	01	-09	05	04	09	-11
142	15	-03	08	02	-03	00	01	53	-09	12	-03	04	09	-06	-04	-05
143	22	04	-15	02	13	00	-15	22	-09	04	-01	31	-33	14	-10	15
144	-04	-10	-16	-05	-13	-06	05	-02	26	-03	-09	07	-02	11	-02	11
145	02	01	-12	07	-20	13	-08	-02	12	04	01	17	01	-03	-05	-01
146	01	00	00	08	-01	09	-09	-06	26	28	-15	06	11	13	00	-05
147	03	-10	-12	-05	-02	-15	01	05	02	33	-05	07	18	-04	-16	-16
148	-04	06	-01	21	-03	-01	11	04	-07	-08	08	05	16	-05	34	01
149	05	08	-05	00	12	23	00	05	03	-08	19	-08	-15	-12	04	-04
150	01	17	05	05	06	-06	10	10	00	-18	20	-10	-02	12	12	-12
151	18	-05	-22	06	05	00	-16	16	-03	08	02	33	-30	06	-16	17
152	-03	06	-23	-08	-19	10	02	02	00	-10	-06	37	07	-01	-01	07
153	00	08	00	05	14	-09	05	-02	-11	11	-15	06	19	09	03	-07
154	03	09	-12	25	-04	02	09	-14	15	07	-21	-04	30	-08	-01	-03
155	-10	13	-01	-03	-09	-06	-10	16	-01	04	-04	06	05	36	-09	07
156	-18	-04	11	-10	-16	-03	-05	15	01	-13	-05	-05	06	38	-06	-04
157	-01	-04	10	02	07	18	09	-03	-03	05	07	-14	16	01	39	02
158	-01	-01	02	-01	-16	43	00	-04	00	-15	10	-05	05	-03	24	-07
159	-08	-12	11	12	02	24	08	-13	03	00	00	-06	18	-13	46	-06
160	-02	05	-07	-22	05	-09	-33	05	01	-03	02	11	-13	11	-31	17

Decimal Signs Omitted

Bold Font indicates elements with a value of 0,9 in the Target Matrix

Normal Font indicates elements with a value of 0,0 in the Target Matrix

Table 7.14 Rotated factor matrix for blacks

Items	Factors															
	A	B	C	E	F	G	H	I	L	M	N	O	Q1	Q2	Q3	Q4
1	33	-12	02	16	-04	-09	-05	-03	-12	-09	02	10	14	14	-08	07
2	-22	-09	-10	09	18	03	23	-03	04	-01	19	00	02	-09	-07	11
3	03	07	00	01	08	13	18	09	-01	01	32	02	01	-01	-05	10
4	30	11	08	01	04	-07	17	08	-04	25	13	05	10	09	-11	06
5	11	13	12	25	02	10	-04	-01	-08	-10	-06	-26	-01	10	-01	12
6	-04	-15	-09	-12	-13	10	21	-05	-09	-12	-08	-19	12	12	-10	08
7	-02	-09	-08	11	-05	-20	02	07	05	08	-13	-10	17	03	-09	-22
8	-02	08	-03	20	04	-03	10	20	20	-10	02	00	09	-06	11	-07
9	01	14	-02	11	13	-17	27	12	-32	12	09	05	07	-03	-13	-02
10	14	02	-03	-07	-15	-18	12	04	-25	-14	-05	-04	-04	13	00	02
11	17	-02	16	-02	09	23	-08	-01	07	-06	28	05	23	02	09	03
12	-12	03	-18	08	15	30	-09	-22	-08	07	-12	-12	04	07	11	13
13	-06	09	10	07	15	13	44	06	00	-02	-25	-02	-18	23	-08	-15
14	-05	17	09	11	02	02	46	01	-14	07	-06	-17	18	07	15	-04
15	-09	-09	-01	00	10	-02	01	18	01	15	02	07	20	-10	-15	18
16	-13	13	-16	-13	21	02	09	40	10	-04	04	-04	14	-01	-06	06
17	-06	-02	-08	-02	-01	-04	03	-10	-04	22	21	-17	-17	-17	-25	-22
18	-10	-10	-15	12	19	-05	-03	01	20	07	04	07	07	-03	-12	04
19	00	-07	11	01	02	-25	-04	07	-06	-04	08	-01	-01	-12	-14	12
20	11	-17	02	22	-10	04	03	-11	-14	-22	07	-02	-07	09	04	-03
21	-06	11	-02	00	05	-08	03	25	28	29	-08	19	-19	-09	-01	04
22	08	-01	-05	09	06	20	-01	-09	-14	22	-26	04	08	08	08	23
23	-04	-23	27	-06	-05	13	13	-23	05	06	-14	-23	10	04	-06	00
24	-01	20	-14	18	-05	-08	-13	-05	-06	24	01	18	07	-02	-04	-10
25	-13	15	01	-08	-13	05	-02	03	-12	00	08	20	-30	-05	06	-29
26	09	00	-10	18	05	13	08	07	13	-12	-09	14	-04	09	07	20
27	20	-06	-13	02	-03	25	25	00	16	21	10	-11	-13	01	-01	13
28	-14	03	-05	01	02	05	-17	12	04	-23	09	-07	14	-37	-02	02
29	04	-11	37	-05	04	-25	01	-22	-03	-15	04	-21	06	-18	-07	-12
30	18	-02	01	03	-08	14	10	01	-26	19	-18	-18	-11	-01	-03	00
31	-04	-14	01	03	03	11	-05	03	-02	14	-23	11	07	-11	-09	-32
32	06	-12	-10	06	-09	-22	-16	19	10	-16	05	-14	-05	-10	-04	-27
33	-03	-01	-16	12	22	06	00	00	-06	16	11	-04	12	20	-13	-08
34	-51	-13	15	-01	07	-13	11	21	-07	03	12	06	-06	03	-07	-07

Table 7.14 Rotated factor matrix for blacks (continued)

Items	A	B	C	E	F	G	H	I	L	M	N	O	Q1	Q2	Q3	Q4
35	05	25	13	06	07	13	-13	12	-12	-02	-14	-02	05	-02	-03	06
36	07	07	08	-04	17	-14	-03	-06	07	03	19	-15	18	07	11	00
37	19	03	-07	25	11	18	-07	-09	-10	12	28	12	-09	-03	05	24
38	07	03	09	00	08	05	20	02	-15	08	-02	-35	02	-09	00	01
39	00	05	03	38	-01	02	33	-05	-05	-20	01	-03	-08	13	-21	00
40	05	17	18	12	-01	17	29	05	-04	-10	19	16	05	01	-14	03
41	06	-06	-15	27	23	04	-06	-11	-04	20	00	-12	-08	20	08	27
42	-04	15	27	-03	48	-18	11	15	-06	-09	06	-08	00	-06	06	-04
43	03	-15	-01	12	-06	41	07	-01	12	16	-17	-06	-07	06	20	-05
44	06	05	-03	-01	-12	05	12	11	-27	-09	13	01	-06	-09	-19	08
45	-10	-19	02	04	11	11	40	05	-09	12	02	07	-01	13	-08	-13
46	-01	06	01	15	03	-13	-28	24	02	04	08	11	-03	-05	-15	-12
47	22	13	-26	01	19	06	-08	-40	-01	06	03	04	08	07	08	-08
48	13	-02	-07	07	01	-01	-04	30	15	08	11	08	03	04	04	-27
49	08	09	01	08	13	-07	-15	05	49	00	-26	15	-02	07	-05	-01
50	31	-01	13	04	-20	02	02	23	24	-05	06	-13	24	-02	-21	-02
51	02	-19	12	01	-25	-11	05	14	03	-23	01	26	-04	-06	09	-19
52	09	-18	-15	12	00	-33	14	-23	-10	01	18	-02	-21	-15	15	-09
53	09	-02	08	29	-01	13	06	-13	02	08	-22	11	-04	08	07	-09
54	14	-08	-21	10	06	30	11	-09	00	-04	06	-12	02	01	04	04
55	07	05	14	-11	-07	12	-14	-13	21	07	-12	-08	00	-45	-11	11
56	-03	-02	-12	-02	00	-08	-12	-05	07	-15	-12	56	-05	08	-10	-10
57	12	-11	-04	-08	00	01	-18	16	14	-18	-13	10	-02	-14	03	-10
58	-06	06	-06	18	-09	16	07	-07	15	-04	12	09	05	32	12	09
59	-09	08	02	09	-11	02	09	00	00	07	12	-19	29	01	04	-10
60	09	00	-05	00	10	-04	-14	-05	01	03	-08	06	-12	-52	00	-01
61	-12	-03	07	00	-16	-05	-13	05	-14	04	-04	-06	-04	-32	-09	15
62	-17	15	-09	08	04	06	06	-13	-13	12	08	-12	-02	-04	07	29
63	-07	-09	-14	-23	07	-05	-16	26	-01	11	-07	25	02	08	07	-10
64	02	03	-06	05	02	04	-25	11	02	-20	00	42	07	08	02	-13
65	24	-06	-04	-16	15	16	03	-09	-04	12	02	-04	00	22	-16	08
66	-15	17	-03	-16	08	14	16	25	25	02	10	-13	04	11	-08	17
67	12	05	-02	02	-05	00	-05	-02	-18	-02	04	-03	09	04	01	03
68	-01	13	09	11	-02	18	-06	-15	-03	-21	-12	04	00	00	-06	13
69	-13	01	54	10	-02	-12	04	-03	-17	04	-02	07	01	-15	07	06

Table 7.14 Rotated factor matrix for blacks (continued)

Items	A	B	C	E	F	G	H	I	L	M	N	O	Q1	Q2	Q3	Q4
70	05	16	42	07	24	-13	14	-01	15	-05	-07	-14	-01	00	-08	09
71	09	04	01	46	05	05	21	07	00	-07	-09	13	-14	08	12	24
72	09	05	05	51	17	16	-05	12	-17	-01	-06	-10	00	03	04	06
73	-05	-16	-07	-04	31	02	15	22	03	-02	02	18	08	21	-08	-05
74	-06	-02	12	-03	33	-01	15	06	12	04	-08	-01	-16	10	08	-04
75	-04	10	13	09	29	-05	07	-01	-15	-08	11	-01	12	-24	01	21
76	23	-10	-05	04	02	55	02	-07	-06	13	-13	-01	-11	08	16	-08
77	-10	02	-03	17	-09	-05	49	-15	-03	-02	-12	-06	16	-03	00	09
78	09	-06	-21	-06	23	02	-07	-29	-05	-02	16	05	28	-07	10	10
79	00	-06	-15	-03	02	04	-03	13	03	20	08	23	-02	13	-03	-12
80	-04	-05	09	01	-05	-08	03	11	33	12	00	-03	-03	16	08	-12
81	-07	15	-02	02	-01	-17	13	-01	43	-11	07	04	-26	02	18	-05
82	-07	-01	07	07	-07	-17	17	-04	-08	-16	04	-05	15	-11	11	-15
83	-02	-02	02	08	-06	09	10	07	21	49	06	00	04	08	11	07
84	00	-32	05	-08	-12	16	-01	-10	-14	04	01	01	-05	11	-03	-01
85	-06	-05	09	-24	02	07	-11	-09	10	25	30	07	10	17	-16	05
86	17	11	06	-03	-04	03	-08	00	-05	09	34	05	09	25	-02	17
87	-04	02	-13	06	-24	21	03	06	-04	09	15	05	-08	15	03	08
88	-02	-07	-07	-06	00	08	-10	19	01	11	-03	08	-19	09	14	-04
89	-07	-04	-03	-22	07	-01	28	08	-09	12	14	-13	17	-01	-10	13
90	07	-13	-07	25	00	24	00	-17	08	16	25	21	-20	08	20	-10
91	-05	-04	02	-01	-19	20	-17	-03	09	-06	-08	-06	-13	-30	-04	-28
92	-05	03	14	-06	03	01	-05	08	-04	-05	01	-05	-01	-61	-05	-07
93	08	-02	-02	-03	-10	35	-05	-16	-01	18	-09	-10	22	17	27	02
94	03	00	10	05	12	31	-07	-20	11	-03	07	04	-05	00	51	05
95	-03	-01	-07	-05	-04	-12	03	24	15	-23	-02	27	-02	-13	-08	-07
96	01	-06	06	-04	-03	06	-02	08	07	-18	-06	41	00	-10	17	-18
97	19	27	03	06	11	03	31	-15	10	-11	15	-02	-19	26	06	-08
98	-20	-07	19	12	04	15	01	-09	13	19	18	17	12	19	11	06
99	21	32	-05	-09	-13	09	12	-05	17	03	-09	-21	-07	-12	05	10
100	-10	30	11	-03	-07	-19	-08	07	-07	03	21	-04	06	-03	12	-03
101	-10	14	06	01	-13	08	-02	-14	-30	15	16	-21	17	01	-02	10
102	07	-22	21	05	10	03	00	20	05	02	-02	06	09	-14	-03	-06
103	-10	04	14	32	-05	11	10	-27	28	08	07	-05	-01	07	02	-04
104	-09	-01	02	45	-05	18	05	-11	09	23	02	-01	14	24	14	-15

Table 7.14 Rotated factor matrix for blacks (continued)

Items	A	B	C	E	F	G	H	I	L	M	N	O	Q1	Q2	Q3	Q4
105	-04	01	07	22	00	17	04	09	09	25	16	-02	-20	39	02	-09
106	09	-16	01	-10	00	-19	-17	-02	-12	25	-10	-04	20	-12	-01	08
107	18	26	-15	11	03	31	13	07	-26	09	12	17	-03	-01	05	10
108	-02	-21	-04	23	12	16	16	17	01	-05	14	-01	-05	28	07	05
109	09	01	-09	13	11	13	07	-10	-01	09	08	-28	10	15	-02	11
110	04	03	-09	08	28	-08	12	47	00	10	03	12	12	01	05	-11
111	-12	00	02	08	05	-09	05	05	06	-11	-04	13	26	-10	-28	09
112	03	-16	-15	04	01	-06	-22	-03	30	18	-06	15	17	-18	-01	-13
113	-16	-15	-03	01	-08	11	-05	10	35	05	06	01	03	17	15	13
114	-20	-15	-02	13	08	-16	01	-14	20	-07	09	-03	-09	-23	-15	10
115	02	15	-12	14	-04	-03	11	06	23	-43	-13	21	-02	-08	-09	-04
116	-03	-09	-24	-02	-13	-11	-05	16	18	-22	03	07	11	-26	09	-04
117	-06	08	-06	-08	06	05	02	01	14	-03	-20	19	-07	16	16	25
118	18	-28	-05	34	-19	01	06	01	14	00	-03	03	-06	15	20	15
119	-09	12	-08	-06	-09	-14	-08	-05	-17	-11	-09	-07	-02	04	-20	-04
120	04	-04	03	-04	06	-01	-15	18	16	-12	01	55	06	-04	-02	-10
121	16	08	12	21	-07	16	26	-16	21	18	15	-07	33	06	11	-10
122	13	02	-03	14	08	07	10	13	-12	19	-01	-06	04	04	24	-04
123	-13	00	-31	02	14	-20	-09	12	12	09	-39	-06	-02	-15	-18	-08
124	12	-01	02	-16	-10	05	01	01	02	-10	15	03	-10	-42	00	-13
125	07	-03	-04	20	07	19	23	-20	-07	-03	09	-10	16	18	30	15
126	18	00	-08	16	-07	18	13	-06	-04	03	10	-23	16	00	-34	08
127	-06	00	-16	-07	16	-03	11	-09	-04	04	02	04	01	-06	07	-50
128	04	-01	07	09	-15	-11	12	10	-08	-19	-05	-07	11	-06	-01	-44
129	-05	12	-11	11	10	-03	30	00	04	02	21	-03	02	34	11	09
130	08	19	04	-03	-05	05	-03	-07	01	13	22	25	08	03	-19	-09
131	-20	-06	12	08	12	00	-01	-09	00	03	17	01	-03	08	-01	-19
132	-14	56	01	14	12	-05	02	00	-03	04	01	08	-01	10	03	06
133	01	03	15	02	-02	00	21	-13	-09	10	16	02	21	16	07	16
134	-05	-04	02	03	13	-04	25	08	16	04	08	05	-24	10	07	08
135	-20	-13	01	13	-07	-09	10	10	03	06	-06	-04	10	09	-10	04
136	18	-12	08	21	-10	-18	-11	15	23	03	-01	-09	-34	-22	07	-04
137	-01	-05	04	12	-11	02	23	-03	-06	10	-08	11	-28	08	08	30
138	-12	03	-17	10	-27	24	00	-10	01	08	13	06	09	18	26	15
139	-19	-02	06	02	-09	54	05	01	-12	01	20	-10	06	07	01	14

Table 7.14 Rotated factor matrix for blacks (continued)

Items	A	B	C	E	F	G	H	I	L	M	N	O	Q1	Q2	Q3	Q4
140	16	-07	-07	01	13	04	11	14	-12	-04	14	-20	-17	21	25	08
141	04	-01	13	21	03	-08	38	-10	06	-03	12	-12	11	-04	05	22
142	-02	-10	-13	08	39	13	09	-03	-06	-06	02	09	04	01	-24	-01
143	-27	03	-06	-06	19	00	-33	26	-04	-13	-01	-02	-21	-12	01	-15
144	11	-10	10	13	07	03	-14	-01	-04	02	-10	04	05	-18	-17	-20
145	-06	16	-16	05	-08	09	00	-08	12	-03	08	19	15	03	03	04
146	02	-01	08	04	07	05	-06	02	18	-04	-23	06	04	-26	-04	20
147	-08	-05	-18	16	16	-16	07	11	01	12	-01	08	-03	-05	-05	11
148	05	01	-06	20	-26	26	08	09	-02	32	11	-01	17	17	03	-03
149	-13	-01	-01	22	09	27	-13	00	-04	10	44	-09	00	-01	14	19
150	-15	09	01	-01	15	02	10	-15	-03	00	28	-04	12	-12	-08	05
151	-14	-07	-18	04	21	-08	-23	25	11	-26	-08	-06	-18	02	01	-20
152	-11	19	13	19	08	05	-11	-14	-24	13	-02	-07	07	17	02	02
153	-17	17	06	16	-10	-03	13	05	08	05	-09	-34	-24	-04	-11	00
154	-14	-03	02	29	-16	12	-05	-12	02	15	02	05	-11	12	-05	09
155	-08	07	-02	-03	-02	-16	-05	06	-14	-10	-17	16	12	-42	07	07
156	-07	-03	-01	-17	-07	-30	13	-08	-02	08	-01	11	09	-40	-04	00
157	07	-06	-01	09	-10	45	14	-09	04	17	-05	-05	20	02	12	-08
158	-09	-02	12	07	05	35	-07	-27	-06	02	14	09	19	07	-28	27
159	-02	01	-01	16	-16	33	17	01	-10	08	-13	-17	12	07	28	09
160	02	02	06	-18	19	-14	-10	13	07	05	08	21	-20	-12	-24	-15

Decimal Signs Omitted

Bold Font indicates elements with a value of 0,9 in the Target Matrix

Normal Font indicates elements with a value of 0,0 in the Target Matrix

TABLE 7.15 Rotated factor matrix for coloureds

Items	Factors															
	A	B	C	E	F	G	H	I	L	M	N	O	Q1	Q2	Q3	Q4
1	04	-07	09	04	07	-06	10	17	01	-07	-02	-03	10	-02	21	00
2	38	11	16	06	-06	-03	21	36	06	-09	-12	06	06	-01	06	00
3	05	-06	-10	-20	08	10	03	09	-16	-12	-02	02	09	24	18	15
4	00	06	00	04	16	14	-12	-03	-05	-10	23	-13	-02	-04	-14	05
5	-06	11	24	16	28	03	15	-04	-06	-10	17	06	02	12	29	11
6	-01	-07	47	08	-02	02	07	-09	-17	00	-03	-27	-01	-08	04	39
7	03	-17	-11	18	-07	-02	27	06	-11	-03	01	-13	11	06	12	-07
8	05	-12	-15	45	16	04	13	04	11	-13	-06	-02	05	08	-03	12
9	19	01	03	09	24	-14	39	-11	-23	00	02	-23	00	-18	-12	-01
10	05	07	07	-01	22	-14	32	12	02	-13	02	-14	12	-11	-07	-02
11	13	-05	11	02	08	43	-07	16	-16	-25	11	-11	-23	04	-07	-04
12	-02	17	-04	-04	-11	53	01	-02	-09	-05	01	06	08	09	21	08
13	-15	-03	16	26	35	-07	40	01	-01	-03	08	10	05	-24	-02	-01
14	04	-02	21	28	08	00	51	01	-02	-06	12	-20	06	-09	14	-01
15	-06	02	-07	04	09	-05	16	47	05	05	21	-11	-13	09	-03	-02
16	25	-02	-08	01	03	17	01	34	-05	00	-01	11	-18	-04	-15	-01
17	06	26	-01	04	-10	-10	-16	-11	-02	-04	17	05	-08	-03	-01	-14
18	14	15	-22	13	00	-12	-03	-03	17	02	08	09	29	-06	12	14
19	11	-06	08	07	-13	-06	-05	16	-04	21	06	-21	14	19	25	-12
20	-14	-02	01	22	04	-18	-05	26	-01	16	-09	12	25	-03	11	24
21	03	-01	02	12	12	-06	03	02	13	02	07	16	17	16	02	12
22	-06	-01	02	-04	06	05	-24	10	-06	-18	-20	-03	02	-11	18	13
23	05	-06	17	14	-10	-05	02	-09	-19	-01	23	-17	23	13	18	27
24	14	06	-06	-14	-10	-01	-25	-03	05	00	-13	32	08	14	-06	-10
25	06	10	-34	-18	-18	05	-01	-04	01	13	00	19	-17	-08	-38	-04
26	-10	04	04	18	12	11	02	04	-18	39	-01	01	26	-11	-03	09
27	-07	-10	07	-04	-05	03	03	19	-16	01	05	03	33	-06	13	-13
28	01	11	-14	-03	02	02	-16	-07	-01	-12	-06	-02	02	40	-15	-01
29	-28	03	25	12	-11	-05	-13	-29	10	04	05	-18	05	28	-04	-01
30	-04	-01	27	-11	-31	14	-04	-09	-05	24	05	-17	-12	03	24	34
31	02	-08	-25	-08	01	08	-11	-05	21	03	-04	13	-04	-12	-17	-40
32	-04	03	-02	04	-05	-01	08	08	03	14	02	-01	-02	04	-19	-49
33	54	12	-05	-02	26	09	03	10	-16	11	18	10	04	-17	-05	03
34	38	05	13	03	09	05	05	23	-12	04	-10	-04	02	-19	-22	00

TABLE 7.15 Rotated factor matrix for coloureds (continued)

Items	A	B	C	E	F	G	H	I	L	M	N	O	Q1	Q2	Q3	Q4
35	03	31	02	-06	00	18	02	-29	-21	10	-01	-02	07	17	-01	13
36	06	25	05	12	02	-02	-05	19	18	-05	05	-04	12	14	-05	12
37	03	05	03	08	21	-08	02	12	-01	-15	13	-18	07	-16	14	10
38	07	-10	57	-05	03	-01	22	-06	-04	-06	02	-14	-01	01	18	18
39	-16	00	19	14	13	-13	51	03	-30	09	11	01	28	-06	04	01
40	03	02	14	12	15	-06	06	-13	-06	21	19	-20	40	-17	10	-04
41	22	-06	10	08	34	07	30	-09	-03	-05	-03	-08	19	-01	22	05
42	-06	-04	-02	08	48	-22	00	06	-21	09	-12	-05	-15	-04	00	-01
43	-13	-01	-12	-03	-02	34	03	-17	04	-12	11	09	09	-01	36	05
44	-15	-02	29	-19	-16	13	-09	-01	06	-08	10	-03	02	-10	12	-04
45	01	-05	-05	00	43	-17	43	-01	16	-06	-04	-09	07	-18	-04	11
46	09	17	-05	-11	11	-01	-24	08	02	-02	-08	36	-12	-09	-13	-08
47	14	-01	08	-20	11	13	-03	15	-12	19	04	08	09	17	16	06
48	-04	12	-08	13	-16	06	06	40	01	01	00	28	-03	-24	-20	-17
49	02	06	-24	10	-06	-04	-03	02	29	19	03	01	-06	02	02	-10
50	05	-06	02	-21	01	-23	-11	06	07	00	03	22	06	00	12	-15
51	04	-19	-02	03	02	-16	09	-02	06	39	13	17	-04	-04	-32	-18
52	-14	05	-03	-13	04	-29	-06	10	-08	30	-21	04	22	18	16	-20
53	-09	11	06	14	12	11	01	-19	08	-07	-19	05	25	-07	07	25
54	-24	19	02	25	12	22	-04	01	-02	-04	14	-03	09	10	31	-02
55	-19	-14	06	-01	-16	15	-12	01	13	-04	-11	-04	05	31	16	-06
56	-18	-04	-31	09	13	-03	-12	-07	-05	05	-04	24	10	04	-10	-07
57	-10	-13	-17	11	-05	04	-40	01	14	10	-02	34	01	16	-14	-20
58	03	02	04	17	-03	06	32	-03	-01	06	-21	04	48	-08	-14	11
59	05	-14	-05	08	-01	01	-04	-07	-13	-03	03	-11	24	06	14	12
60	04	12	-06	15	-02	-02	-13	-02	21	12	-20	12	-21	21	-13	12
61	-05	07	-02	10	07	-13	04	04	-07	-10	00	02	-04	41	-06	-06
62	-04	02	22	01	03	-02	25	-11	-10	-08	-01	-37	-03	19	23	09
63	-09	17	-22	-19	-10	-07	-09	07	05	-08	-13	23	-17	-20	-29	-15
64	14	02	-35	04	08	03	-18	06	-01	02	14	44	04	23	-10	-40
65	10	-04	09	-12	09	03	32	-01	-11	-14	07	11	12	-19	07	13
66	22	-03	-09	-03	16	-14	34	-05	09	-33	-04	03	-02	-23	-16	09
67	-10	28	-20	-13	-01	-11	06	-08	-03	11	-08	-03	12	-05	16	-09
68	-11	11	-16	-08	-06	-10	36	01	-03	15	03	03	-04	12	06	15
69	02	00	08	03	-06	-06	14	11	-30	-16	03	-20	03	-07	06	05

TABLE 7.15 Rotated factor matrix for coloureds (continued)

Items	A	B	C	E	F	G	H	I	L	M	N	O	Q1	Q2	Q3	Q4
70	04	-06	20	16	03	-13	08	09	-19	-22	01	-25	18	06	29	-04
71	09	14	11	32	23	01	12	-06	-02	01	10	-01	33	01	27	07
72	-13	-07	01	47	06	11	15	-08	-15	07	-07	-06	16	02	34	04
73	05	12	08	11	49	-15	22	-04	09	-06	-09	-15	01	-10	-14	-02
74	12	06	05	07	48	07	20	02	01	02	08	-17	03	05	00	17
75	-01	-05	27	-07	-22	10	-01	-02	-20	-16	-01	05	-10	04	13	01
76	12	-06	05	-10	-04	35	20	-17	10	05	-20	09	11	-22	29	-10
77	-03	25	-01	10	-05	12	61	06	-05	03	08	-11	12	-05	09	10
78	01	-13	09	-22	11	14	-05	24	03	15	-02	11	01	-16	03	-06
79	08	-17	-13	-23	02	17	-04	14	-09	01	09	30	12	03	-04	06
80	01	12	-10	-02	16	11	-01	03	32	-25	-09	05	03	06	-19	00
81	09	07	-14	-01	11	-05	02	-01	31	05	-07	07	-10	10	00	-05
82	-15	-02	-09	24	-22	-13	-10	-20	12	13	12	01	-10	-07	15	10
83	-13	-03	09	15	24	01	-17	11	00	13	-05	-03	17	-06	-09	01
84	-12	-11	-08	-04	00	-08	16	15	-09	19	19	08	-04	-14	10	20
85	02	02	01	-10	04	-15	-24	17	-18	-17	-29	09	-18	-11	13	04
86	04	04	-07	02	04	03	-20	-03	-11	06	-33	05	-12	03	00	-06
87	09	-17	-10	04	06	02	05	-15	00	-11	-20	-01	01	01	09	-12
88	01	-07	-22	02	-09	15	-07	25	-02	06	00	37	-10	-13	-23	-18
89	06	11	05	05	-11	-38	14	01	-10	-06	-03	-08	13	14	09	-03
90	-14	12	-08	22	10	19	-03	-04	-08	11	-10	18	20	-03	25	11
91	-16	-05	-18	-01	-08	-08	-14	18	29	23	06	13	03	26	02	00
92	-10	03	05	-08	-07	07	-10	00	09	-07	05	-05	01	53	06	-12
93	21	-02	11	08	-20	38	05	-11	07	-17	-17	-17	12	-16	33	-02
94	13	03	14	05	12	12	11	01	08	-03	-05	-07	16	-01	42	-02
95	04	16	-05	05	-09	-08	-03	-07	25	04	01	-03	-03	13	-14	-04
96	-07	-10	-21	-20	-03	01	-05	02	16	17	00	31	09	08	-01	-10
97	-11	09	13	09	19	-07	18	06	-10	01	-05	02	02	-25	-04	10
98	-03	24	06	06	12	12	-06	24	13	-15	22	15	-06	03	08	05
99	07	22	-12	-07	-11	-11	06	06	19	-03	-05	-02	-05	21	-11	22
100	09	67	05	02	09	-15	07	00	00	-01	00	-02	-02	-05	06	-15
101	-01	12	55	-14	-06	12	05	-11	-15	-08	08	-19	-09	-10	24	-05
102	11	-16	31	-02	15	17	17	-17	-04	01	11	-09	02	13	02	18
103	16	05	-04	11	-14	-25	21	-18	-04	-14	17	03	44	17	12	03
104	01	04	08	21	-01	-14	30	-07	-07	-13	35	-17	27	01	05	06

TABLE 7.15 Rotated factor matrix for coloureds (continued)

Items	A	B	C	E	F	G	H	I	L	M	N	O	Q1	Q2	Q3	Q4
105	-01	-01	00	00	43	09	33	08	06	08	04	04	11	-14	18	02
106	00	05	-12	-21	-17	18	00	04	-06	10	-01	-05	-18	14	-06	07
107	-19	-12	-01	-06	04	49	-01	07	-13	06	08	05	06	-04	18	12
108	09	-08	-01	05	52	-15	56	-02	09	03	05	-20	-01	-11	05	01
109	12	11	25	09	01	-01	47	-04	-15	-16	05	-12	06	-12	26	-08
110	-05	-09	-09	05	26	-22	-19	19	02	11	-30	06	15	01	-08	-12
111	06	03	-06	07	-10	-23	16	40	01	-12	18	-03	-10	03	-03	05
112	-03	-20	-15	-04	-14	-06	-03	-06	61	10	06	16	-12	-01	-03	-20
113	-06	11	03	-08	00	07	-05	-05	34	20	-01	02	-13	16	-12	-07
114	14	10	-08	-12	02	-26	-12	13	08	-08	09	12	-03	11	13	-17
115	-13	-09	-22	-13	03	-10	-03	-03	07	30	09	19	-02	08	-27	11
116	-27	-01	18	-25	05	-03	03	19	11	-27	18	-16	37	-03	-32	04
117	-03	14	-04	-16	11	05	06	-10	-16	-07	07	13	16	03	16	18
118	-02	15	25	39	17	04	15	-08	06	06	-02	17	26	10	-04	01
119	-06	07	-29	04	-36	00	-15	06	-16	-10	05	19	-03	05	-20	-09
120	03	-19	-47	14	-06	-09	-23	26	24	13	04	28	-06	05	-06	-09
121	08	-13	-01	29	-03	-03	14	-03	-05	-15	32	-27	40	-06	15	01
122	09	18	-07	00	16	11	18	-04	05	11	00	-02	26	00	22	05
123	13	-09	-13	08	-36	-28	-01	-12	23	11	09	26	-08	10	-19	10
124	-07	02	00	14	-06	-02	-06	-14	-06	-01	-08	01	-12	56	-08	-03
125	-02	09	09	03	07	-02	09	-13	-08	-06	12	-12	01	02	47	28
126	-24	09	28	07	14	-12	05	-08	-12	-02	21	-19	05	00	34	41
127	-16	-09	-21	-13	-16	08	04	21	06	-14	-03	24	-16	-07	-12	-34
128	03	-09	-17	02	-16	-25	06	07	04	07	-09	04	-17	16	-09	-25
129	-23	11	08	03	19	20	40	17	-25	04	04	14	14	-08	07	-01
130	11	23	10	-02	06	11	-05	03	-02	01	11	01	07	11	-05	18
131	00	-22	20	-03	16	10	02	-07	04	-08	13	13	-04	22	04	03
132	-03	08	04	12	21	07	-01	07	-11	-01	06	-17	01	12	-12	05
133	-10	07	25	-08	02	-06	24	06	-06	-16	02	-33	03	-03	10	43
134	05	-01	07	29	24	-09	18	01	05	-08	-15	17	04	02	-23	12
135	-05	15	-03	19	-02	-14	06	-01	04	-05	06	-01	-02	09	-06	-06
136	-04	10	-11	32	-05	-17	16	13	28	22	04	09	00	09	-17	-02
137	-17	00	-03	20	27	07	33	-08	-05	10	03	-05	05	-06	-14	10
138	04	-01	-11	00	-05	30	-15	-06	05	-14	-03	03	01	-04	-06	-08
139	10	-15	16	10	-03	41	11	09	13	-22	-03	-14	00	-14	28	-07

TABLE 7.15 Rotated factor matrix for coloureds (continued)

Items	A	B	C	E	F	G	H	I	L	M	N	O	Q1	Q2	Q3	Q4
140	13	-06	10	24	13	13	34	05	-07	05	-01	-13	14	-10	11	16
141	02	-05	12	07	04	17	62	05	-10	13	-02	-10	18	16	07	00
142	22	05	-06	-04	-10	-02	-04	56	-12	12	-26	-08	24	-01	00	-09
143	19	-02	-04	08	-08	08	-10	05	10	07	-16	66	-15	-05	-12	-08
144	00	-04	05	05	-14	-26	15	05	17	06	15	16	-15	05	-08	-01
145	-19	06	-08	-03	-15	14	-11	-07	25	-06	-08	18	14	11	01	-02
146	-03	11	-14	14	-08	15	04	03	27	26	16	15	24	01	-03	03
147	-09	23	-05	-10	04	-25	03	09	08	40	04	-11	13	-19	-26	-04
148	-06	-14	12	22	-06	-06	08	-02	-18	-27	-07	20	25	09	26	06
149	02	-12	-03	-04	18	18	-12	10	02	-13	-03	19	-15	-18	-04	18
150	08	09	26	16	11	16	-12	-05	07	-10	28	-03	-01	-16	-02	-08
151	06	-04	-02	-11	-02	-05	-09	07	22	-02	-05	69	-10	-09	-17	-14
152	07	15	04	-01	-31	01	-04	-01	08	02	-07	35	03	01	-09	-24
153	02	12	-02	01	11	-07	-09	04	00	16	04	-09	26	-03	12	09
154	03	12	00	28	08	-12	21	-05	17	-17	17	03	41	10	-08	13
155	-04	-05	01	-13	-11	-06	-14	11	-01	-03	13	08	20	24	-09	-05
156	17	-16	12	-02	-30	07	-22	22	-12	07	29	-14	-02	15	16	-02
157	-08	-10	13	13	-02	17	10	04	-01	02	-22	-17	10	-21	38	01
158	-18	09	-03	-05	-12	41	08	07	06	-26	01	-06	-04	-08	38	-06
159	-07	-10	10	14	10	24	19	-09	-06	-02	-01	-05	11	-07	51	04
160	-09	-11	-12	-21	-01	-08	-35	-02	16	05	-06	19	-27	16	-27	-16

Decimal Signs Omitted

Bold Font indicates elements with a value of 0,9 in the Target Matrix

Normal Font indicates elements with a value of 0,0 in the Target Matrix

Table 7.16 Rotated factor matrix for Indians

Items	Factors															
	A	B	C	E	F	G	H	I	L	M	N	O	Q1	Q2	Q3	Q4
1	-28	-18	-07	09	-09	-09	04	-01	-07	-08	-03	04	07	04	08	06
2	-48	16	-05	08	-11	01	18	04	-14	14	08	15	09	07	-08	-14
3	04	-11	-01	07	-03	07	08	06	-17	-01	28	09	-05	04	-03	-18
4	-08	02	00	12	00	13	-14	11	01	10	12	02	16	14	01	-03
5	-08	-08	28	15	24	-05	12	-23	-16	-07	29	-11	02	13	16	-06
6	13	05	27	11	07	-03	05	-17	-06	-09	05	-37	03	-13	25	17
7	15	29	-08	28	-10	-02	23	-10	09	03	-12	04	04	-02	00	04
8	00	-07	-04	20	-03	02	13	-25	19	-09	-15	-02	19	02	-18	-05
9	-10	-11	16	04	28	02	17	14	-13	01	01	-15	19	-13	12	07
10	-15	10	17	13	42	00	21	09	-19	01	-23	02	06	14	18	06
11	-01	00	-01	-18	-06	11	13	13	03	-15	19	02	-21	-05	05	06
12	12	00	06	02	-15	30	-08	-05	04	-17	19	05	02	03	17	-10
13	-06	09	06	17	25	-09	49	-21	05	-04	-01	-01	05	-15	-11	-06
14	01	12	22	22	15	02	34	-18	-04	-01	-03	-18	28	00	18	-08
15	-04	05	01	-01	05	-19	-06	10	-03	-06	-02	14	-06	02	-03	14
16	-12	14	19	-28	18	-10	-05	00	03	-04	-01	19	-03	-19	-11	-24
17	07	07	05	08	04	-09	05	-29	-11	-19	-26	07	-05	08	-05	02
18	-20	09	06	09	15	-10	-13	-27	01	04	19	00	11	04	-04	-10
19	16	-14	10	11	-06	-04	-05	18	-13	23	13	17	03	01	12	03
20	-03	-04	16	32	09	01	00	03	-06	21	16	17	00	-04	-08	16
21	03	11	-11	14	-03	09	15	-20	04	10	13	08	03	03	07	-08
22	10	-04	-07	-03	11	06	-12	02	-02	-04	23	-04	10	06	15	25
23	04	-17	17	28	-15	06	10	-08	01	-07	-07	-14	01	27	21	08
24	-01	-11	-13	-10	01	-08	-04	09	16	-10	-06	59	10	11	-09	-03
25	-05	21	-20	-23	-18	08	-07	07	13	07	16	30	06	-13	-27	00
26	-01	14	01	-09	12	03	-01	14	07	38	16	-25	23	14	-02	-07
27	-02	-01	-05	08	-08	11	20	03	-08	28	-04	-13	-42	-04	07	17
28	20	07	07	-11	-12	11	02	-11	-04	05	14	04	15	18	-10	02
29	02	-03	-06	04	02	-08	00	-12	-05	-03	12	-17	-01	52	18	04
30	-13	-10	12	04	-06	-01	-01	24	-15	04	05	-18	-14	33	09	28
31	02	-06	-17	-03	-11	20	00	05	09	07	-08	30	25	-10	02	-17
32	-02	-02	-02	18	-05	-07	-01	-11	13	-05	-12	28	03	-23	04	-41
33	-37	-07	05	02	12	04	-04	-03	21	-08	11	02	-09	-30	00	22
34	-35	07	-04	-06	05	-07	10	-17	21	-17	-01	04	-06	01	-07	-07

Table 7.16 Rotated factor matrix for Indians (continued)

Items	A	B	C	E	F	G	H	I	L	M	N	O	Q1	Q2	Q3	Q4
35	18	-19	07	12	-03	-10	-14	-09	-01	-16	08	05	07	02	20	-09
36	18	12	-12	01	01	-01	12	00	06	-14	09	10	10	05	-03	00
37	15	10	14	09	17	-02	19	02	-28	-12	14	06	-03	-17	18	14
38	-04	17	26	11	04	-05	14	-06	-15	-17	-13	-37	-09	-01	23	19
39	-07	-14	10	39	14	-10	48	21	-02	16	-01	-12	09	-06	04	-13
40	21	-04	23	08	17	-10	22	-08	-09	07	-08	00	21	-07	15	06
41	01	-10	-10	10	17	-02	49	05	08	21	23	-05	14	-11	25	-10
42	01	08	-01	01	51	-12	02	-02	-09	10	-20	-13	01	-03	-06	-13
43	26	-01	15	05	-16	31	15	-11	11	01	02	-10	02	-07	29	-25
44	08	14	-15	04	-29	20	03	14	-18	-21	07	11	-02	05	09	14
45	-03	13	13	03	56	-07	45	08	17	-06	-09	08	25	-05	07	12
46	-06	-11	-13	07	14	07	-25	15	01	-07	03	37	03	-12	-31	16
47	19	02	10	-13	04	-23	07	36	-01	-01	-04	15	01	-06	-02	-05
48	-13	09	-11	02	12	03	-06	21	05	16	-07	45	-16	-06	-07	-06
49	-05	-08	-04	15	-08	-04	04	01	49	16	12	03	-23	02	02	03
50	06	04	-10	12	-10	-10	-09	-03	23	-07	-10	11	-04	19	16	-13
51	-13	05	-17	-02	-04	-16	-10	06	03	34	-38	19	-11	-13	-05	00
52	23	-03	21	25	18	-14	-26	09	-05	17	-05	08	09	-06	04	08
53	17	08	-04	20	09	08	00	07	21	21	-01	-14	06	-06	24	21
54	04	09	30	27	00	16	-03	20	08	06	35	-07	15	-09	10	-01
55	17	-12	-11	-04	05	17	-28	03	17	00	11	-15	-08	18	02	02
56	13	03	-15	01	-09	-03	-07	11	15	31	-17	18	03	-01	-16	-32
57	33	-02	-17	-03	00	06	-24	08	24	03	-12	31	-09	02	-18	-15
58	07	03	00	33	07	-12	18	-07	22	23	-04	-04	11	-18	09	-05
59	-01	-13	-03	14	-01	01	-04	-11	-06	10	11	-17	09	06	07	07
60	10	06	06	05	03	12	-07	-06	26	00	00	10	11	05	07	-14
61	22	27	02	10	01	03	03	-05	-13	03	-09	03	18	09	12	10
62	07	-09	16	01	06	10	12	05	-13	-06	13	-47	01	16	06	08
63	-04	-01	-17	-13	-07	-05	-25	20	01	04	03	22	-19	-07	-31	-08
64	03	-13	-14	12	06	-14	-12	12	15	-07	10	22	08	-16	-17	-40
65	-08	-25	02	-07	05	-09	33	-01	-10	05	02	-17	-07	-25	08	03
66	-20	-06	05	-04	39	-17	17	12	20	-17	-08	-06	12	-03	06	03
67	19	-20	-13	19	10	02	-12	-09	-31	09	-04	09	-15	-18	04	03
68	04	21	07	15	-11	-14	-08	-08	-17	19	00	09	06	08	16	02
69	01	-08	66	04	03	06	25	16	-10	05	-04	03	-08	02	-04	-04

Table 7.16 Rotated factor matrix for Indians (continued)

Items	A	B	C	E	F	G	H	I	L	M	N	O	Q1	Q2	Q3	Q4
70	03	-03	79	-01	-01	-03	06	09	-05	02	11	07	03	-11	-06	04
71	-06	-14	13	40	03	15	20	17	02	03	-03	-12	-11	05	16	-11
72	-08	-21	14	31	12	00	12	41	20	-01	16	-09	11	12	04	02
73	-07	13	13	18	37	-34	20	-02	-02	-11	13	-03	-03	-09	01	07
74	-10	00	04	-04	37	04	35	02	03	01	23	-07	02	-03	03	02
75	19	-20	29	-14	-23	05	14	-02	-02	-02	00	12	-02	05	03	22
76	-12	06	-04	-01	06	67	-04	-06	07	-01	-09	06	05	00	10	04
77	-05	09	20	21	00	09	45	05	04	-03	-13	-21	-05	02	08	-06
78	07	11	-03	09	18	13	-07	60	-05	10	15	-02	02	-14	-09	-11
79	02	01	-13	05	-03	-09	-11	12	14	18	07	05	03	-10	10	-04
80	-06	23	-23	-02	10	06	02	03	16	-17	-02	-01	-03	-03	-16	-14
81	15	09	-11	00	00	-01	00	-06	39	-13	02	00	-11	-21	-18	-08
82	25	-12	-09	-08	12	-14	13	-19	10	09	-04	03	-09	28	-25	16
83	-12	13	-06	-05	16	-17	-11	19	-14	16	05	-13	06	01	-09	-12
84	-10	-18	08	20	03	13	-06	04	-09	47	08	-02	-07	02	-02	10
85	-01	02	-07	-02	04	-10	-21	12	02	-11	23	16	-08	-03	06	20
86	01	00	-09	-34	01	-16	-18	-01	-08	-02	13	17	06	-19	20	-10
87	-04	06	-02	12	-03	25	-10	-25	06	-05	21	10	06	-01	14	01
88	-20	12	-25	-08	-11	07	-04	12	02	22	16	48	02	-35	-06	-13
89	-09	02	07	17	-01	-14	-06	06	-12	-19	-12	02	13	14	-06	-02
90	26	30	-01	20	24	11	-01	07	17	15	20	13	-45	-10	16	19
91	07	04	-07	02	02	12	-24	-09	23	26	-21	10	-01	20	-04	-05
92	12	08	04	-04	-03	07	-10	-09	21	12	06	21	12	29	09	23
93	-02	-04	21	05	05	45	00	05	-13	-25	01	-09	-09	-04	17	18
94	-03	-06	-02	18	01	23	13	00	00	02	02	07	11	00	35	00
95	03	-05	-27	09	-14	-19	-07	11	18	-05	14	06	-07	03	-08	-18
96	10	-09	01	11	05	-04	-01	-18	23	30	-21	19	-10	12	-07	-03
97	-23	-05	03	-10	02	-17	12	06	-04	00	-18	-09	-05	-26	-09	-06
98	10	51	-04	19	12	07	-02	17	-08	-08	22	-03	-28	00	-06	-02
99	05	-08	-16	18	-03	05	-02	-09	01	-04	01	03	05	01	00	02
100	01	06	10	12	07	-03	03	05	-20	-05	25	07	06	11	10	14
101	18	19	01	-06	-09	-13	25	02	01	-35	22	-20	-04	-04	22	26
102	-02	01	42	00	02	-15	10	-09	05	01	-16	-31	11	00	28	04
103	02	09	00	50	12	08	01	-12	-15	11	12	03	20	-02	18	18
104	03	17	07	40	08	-05	33	07	-13	-04	04	-05	11	02	10	10

Table 7.16 Rotated factor matrix for Indians (continued)

Items	A	B	C	E	F	G	H	I	L	M	N	O	Q1	Q2	Q3	Q4
105	-10	03	13	-09	38	00	31	14	-11	-01	09	08	-03	-21	-03	11
106	06	-11	-07	03	-34	-07	00	02	10	06	-03	32	-06	-03	03	16
107	00	-07	-05	11	-01	23	-04	24	02	29	01	00	-15	-13	22	23
108	-12	-09	02	14	40	02	54	-02	10	-06	13	-15	-02	-14	-04	15
109	-01	02	07	15	00	11	48	05	-10	-13	-07	-25	-06	02	25	07
110	-08	14	16	04	18	-03	-28	02	-10	27	20	16	08	11	-12	-33
111	-33	13	-03	-02	-24	-18	01	-05	-05	-05	-01	14	01	01	-23	-06
112	-10	-07	01	04	-13	02	05	11	49	09	03	09	17	00	-09	04
113	06	-06	-20	04	18	05	05	-01	23	10	19	08	-24	00	18	-15
114	-07	-07	-05	10	12	09	-11	-26	08	-14	-11	25	00	18	-02	-08
115	06	02	-08	-09	-06	04	-06	16	14	43	-26	13	08	10	-14	-16
116	01	14	-01	17	05	-10	-15	20	-07	14	02	08	-20	14	06	00
117	-01	20	01	-01	00	02	26	-09	05	18	47	-09	06	10	06	11
118	-10	28	-06	24	-05	24	-01	-31	20	04	02	-24	02	-03	-10	01
119	-06	-16	-08	-13	-18	-03	-20	-05	-25	-02	-21	19	-06	23	-10	-08
120	01	-06	-11	11	09	04	-37	-02	04	11	-05	38	-18	11	-09	-27
121	16	09	-04	33	10	10	30	07	-20	00	09	00	32	13	17	20
122	06	06	-12	16	18	00	08	13	-26	32	14	-04	21	02	15	11
123	-03	-26	00	14	-13	-05	-11	-22	26	13	-11	09	00	08	-13	-22
124	-12	08	-18	00	-17	12	-16	-04	08	-03	-08	08	00	27	05	-10
125	07	04	03	-02	08	00	13	-12	00	-06	18	-24	-08	15	66	05
126	-09	01	13	08	04	-16	01	-12	03	-14	10	-24	03	01	65	16
127	06	13	-09	-17	01	16	-09	-02	-09	-03	-10	21	02	29	-36	-35
128	-05	16	-01	00	-06	-01	-04	-09	-07	08	-25	09	-10	16	-04	-48
129	-15	-09	03	13	37	-07	26	14	-22	10	04	-09	-21	-22	04	-03
130	05	24	-07	-13	10	-02	-02	11	04	-10	16	-09	06	05	09	-20
131	-07	17	-06	20	-08	01	08	04	03	-13	06	09	-18	-04	00	00
132	17	18	-03	07	-06	-17	-03	-08	-08	-01	09	07	04	02	08	-11
133	-10	-01	26	12	02	-06	-04	03	-01	-13	05	-60	-09	07	14	28
134	14	05	-07	10	25	-10	31	02	14	-17	07	-01	-07	-21	-02	-13
135	-07	-05	10	18	-01	-16	02	-03	10	03	-15	02	10	11	-19	19
136	-07	14	02	50	03	02	01	-13	17	09	07	-08	00	03	-01	-29
137	14	-13	-15	23	45	08	36	03	12	06	19	-13	-03	-05	-03	04
138	02	-11	-18	-12	-18	49	13	08	-10	-14	09	19	-11	08	-03	05
139	11	-03	-07	10	15	49	04	-16	-10	-08	09	05	03	06	22	00

Table 7.16 Rotated factor matrix for Indians (continued)

Items	A	B	C	E	F	G	H	I	L	M	N	O	Q1	Q2	Q3	Q4
140	-07	-07	-02	20	17	08	35	-01	04	-12	16	-16	-08	01	02	07
141	-18	-17	13	21	02	05	50	11	-14	02	05	-10	-20	00	17	00
142	-26	14	08	10	-02	-05	-08	17	-09	13	09	20	-11	-23	-20	05
143	14	-08	-15	-13	13	05	-18	-35	-07	04	04	40	-11	-03	-17	-16
144	-15	09	-09	-04	-18	-10	09	-04	39	02	-06	17	-16	20	10	-08
145	-13	04	-11	04	-11	13	-17	04	09	21	-19	16	15	16	-05	10
146	16	-13	-17	14	04	00	-16	-08	27	31	-05	-04	25	04	11	01
147	06	02	-03	-16	04	-28	10	-09	06	46	15	06	-02	14	-17	-04
148	07	-16	17	27	-04	-08	08	16	-17	-18	15	04	02	08	25	-09
149	-05	-01	06	-17	13	24	11	-02	04	-18	24	-08	-15	-01	01	-10
150	-09	07	06	13	04	-07	04	16	00	-24	47	-04	-17	20	22	10
151	-03	10	01	-03	-10	01	-17	-24	01	13	17	41	-16	04	-29	-14
152	-07	-10	-08	02	-03	25	-07	09	-03	-02	-16	47	-06	22	02	-04
153	24	-09	00	24	17	00	-04	-08	-16	13	-06	-04	32	00	00	16
154	-02	-06	-09	50	-03	16	10	00	02	06	-10	-05	21	-14	-04	07
155	12	14	-15	17	-20	-08	-10	00	-03	01	15	07	08	26	-16	-13
156	30	-13	08	-14	-14	-03	04	-07	-10	-06	12	07	11	20	06	-08
157	02	-08	07	-05	14	28	08	-04	03	21	13	-12	-07	-05	32	06
158	07	05	-02	01	-05	53	-06	-06	02	-21	-03	00	04	02	33	08
159	07	02	21	09	00	11	19	13	-07	03	04	-04	03	-08	57	-07
160	17	04	07	-16	-15	-02	-32	-13	08	-02	03	37	-05	-03	-34	08

Decimal Signs Omitted

Bold Font indicates elements with a value of 0,9 in the Target Matrix

Normal Font indicates elements with a value of 0,0 in the Target Matrix

Table 7.17 Rotated factor matrix for whites

Items	Factors															
	A	B	C	E	F	G	H	I	L	M	N	O	Q1	Q2	Q3	Q4
1	31	-07	-05	-02	12	-15	21	-18	-19	-12	-16	01	02	-21	-06	01
2	20	08	11	-04	06	11	14	34	-11	12	07	09	-06	-03	12	02
3	10	-01	-04	01	-01	13	-13	-06	-07	-04	-10	-08	07	-13	-02	02
4	-05	09	-01	11	06	16	06	-06	03	-05	01	02	-06	05	05	04
5	-10	-09	28	-20	16	04	26	-13	06	-06	02	-15	19	01	22	-21
6	-09	06	37	06	17	00	15	-14	-02	08	-11	-07	04	-02	26	-28
7	-08	-10	-23	29	-25	-12	07	-22	-05	12	07	26	14	-13	11	-15
8	01	07	-15	21	16	09	13	03	08	10	-03	-04	11	34	00	-05
9	16	05	29	02	31	00	19	11	-06	-15	19	-02	09	-14	00	00
10	22	06	13	03	42	-10	24	03	-10	-11	-10	06	18	-19	-06	10
11	17	15	09	00	-13	40	-03	03	-05	-12	-09	-05	-07	-22	-04	-02
12	-04	13	-09	08	-02	57	-04	-12	13	-04	-04	03	00	-06	15	-03
13	11	09	-03	30	18	-04	42	07	-03	-13	-05	-02	14	-18	-09	-09
14	05	-07	01	15	20	-10	50	-19	-06	07	04	00	04	01	09	-16
15	-01	07	10	09	-01	-02	-02	17	-06	26	-09	05	-16	12	-06	12
16	02	-02	00	-34	-08	-01	14	45	03	-04	06	24	08	-07	15	-06
17	-30	00	-13	29	-14	05	-02	00	01	-13	-02	02	-01	-13	-10	07
18	-09	-03	-01	25	15	-15	-08	-03	06	-12	05	-02	09	-06	19	19
19	-15	-22	22	-04	-24	03	-11	00	-06	40	-07	-03	14	08	02	07
20	06	-09	12	-07	23	05	12	12	-01	28	11	08	12	03	09	11
21	-16	-04	-11	04	13	02	-02	16	34	08	15	-05	22	01	12	19
22	06	16	08	-03	04	23	-07	11	12	-16	-45	-10	06	-11	02	-08
23	06	14	39	07	-15	00	17	-23	05	-15	08	13	19	17	25	-07
24	-12	-12	-25	-07	03	08	-25	14	07	-08	-19	17	-06	16	-20	17
25	02	-08	-33	-11	-11	02	-03	12	13	02	02	13	-12	00	-30	23
26	-15	00	-12	-04	20	00	20	02	-07	39	10	-10	31	16	15	-06
27	-02	-04	03	08	01	18	12	-03	-02	17	-02	20	24	10	13	-12
28	-19	-13	-15	03	-05	26	-28	-09	-05	09	-12	02	02	27	12	01
29	12	-05	19	-03	-30	-08	-11	-17	25	-06	00	06	07	49	00	-24
30	-21	18	19	-12	03	18	08	-02	-19	-01	06	-04	03	04	19	-33
31	04	02	-29	-06	09	-04	-01	05	12	12	-05	15	-06	01	-15	26
32	-14	-11	-23	23	-04	-04	00	07	15	00	-05	06	04	00	-09	50
33	27	04	06	-03	12	10	07	27	22	-11	15	05	14	-13	05	-03
34	30	20	-11	-04	10	-04	18	02	-14	03	05	-11	00	-11	05	-05

Table 7.17 Rotated factor matrix for whites (continued)

Items	A	B	C	E	F	G	H	I	L	M	N	O	Q1	Q2	Q3	Q4
35	-08	41	-01	-06	-02	04	04	13	09	-03	-08	00	06	-16	05	-07
36	10	37	-02	11	12	00	-05	-03	-12	09	10	-03	-04	07	-01	01
37	-07	03	11	14	26	15	17	-05	-45	08	-05	02	-09	-22	09	-14
38	-01	-04	41	04	07	05	13	-13	-14	13	-02	-18	-04	-11	12	-33
39	06	00	13	45	30	10	51	-06	00	02	02	03	-04	03	07	-09
40	10	16	00	-06	10	-21	16	-18	-03	06	11	-18	36	-02	28	13
41	10	14	-03	06	31	09	38	08	06	04	-04	-10	00	-13	30	-03
42	13	02	19	-03	42	-22	01	16	-08	-01	11	-10	06	-12	-09	-05
43	00	-02	-06	07	03	53	-12	-10	-01	-09	-05	-09	-02	02	16	-05
44	00	-04	-11	-15	-07	40	08	12	-10	-20	-14	12	-01	01	17	-10
45	33	-05	-02	10	39	-09	44	03	-01	-02	-10	-04	19	-16	-12	-18
46	-05	18	-27	10	07	-17	-18	53	-12	-15	-11	08	-20	04	-16	02
47	05	-05	22	-18	-03	09	00	23	-23	28	-21	11	-01	03	-04	06
48	11	-21	-27	04	03	-02	-07	44	-03	10	01	21	19	-24	-13	13
49	02	-04	-10	25	-13	-03	-08	02	35	-13	03	12	-04	15	-06	23
50	-18	17	-23	16	-14	-01	-02	00	06	13	-09	18	-08	10	-04	-01
51	-12	-13	-10	00	02	-15	14	04	-04	22	09	00	24	-03	-22	11
52	01	03	05	-03	-02	-16	20	26	-13	24	09	09	18	17	-03	-07
53	07	13	-08	31	07	16	01	-03	04	04	15	-16	12	19	31	-04
54	-14	03	02	22	10	-08	-03	01	-16	-10	-11	00	26	00	47	-02
55	-06	-08	08	-12	-11	10	-04	-12	04	-18	01	00	04	61	15	-06
56	04	-05	-25	18	00	-02	-22	29	16	09	06	38	-04	04	-08	24
57	02	-04	-43	03	-10	-09	-40	28	22	20	-17	00	-13	12	-04	03
58	21	09	-14	31	03	04	30	02	03	16	20	-10	30	02	09	-16
59	02	01	09	-04	-02	07	04	12	-02	00	00	-27	30	-04	19	03
60	-02	13	-17	16	-02	-01	-20	-03	-06	08	15	-07	04	34	-01	-04
61	-08	01	-07	17	03	-22	-08	05	-01	09	14	-20	14	16	15	00
62	03	01	43	01	12	09	05	-15	-07	-08	15	-03	12	06	30	-10
63	-07	07	-25	-04	03	10	-07	03	10	-18	26	23	-29	-05	-27	29
64	07	18	-21	00	-04	-07	-05	23	17	-03	-05	21	-12	-06	01	55
65	56	-14	-04	06	28	08	19	-05	-08	-03	06	03	00	-22	-11	-13
66	23	08	05	03	26	08	20	16	14	-24	-15	-03	-02	-09	-07	-16
67	-14	19	-06	11	-02	-03	18	17	-08	00	14	-06	13	00	02	-02
68	-03	01	04	21	-16	-07	-03	07	-13	17	17	-04	08	-03	-03	-05
69	14	14	30	-01	04	-11	12	18	-15	-04	04	-22	08	-29	17	04

Table 7.17 Rotated factor matrix for whites (continued)

Items	A	B	C	E	F	G	H	I	L	M	N	O	Q1	Q2	Q3	Q4
70	01	-01	33	08	23	-10	-03	12	-13	00	07	-15	20	-05	19	01
71	03	03	07	49	12	09	23	-02	12	00	03	00	05	-04	28	-06
72	09	07	-09	12	07	-01	22	-10	12	08	08	02	20	11	44	16
73	14	05	-06	01	27	01	01	00	05	02	-03	-06	-12	-18	17	00
74	11	-04	22	-08	35	-16	30	-15	07	15	-04	-25	05	06	01	-21
75	00	03	-05	-07	-19	32	10	14	-22	-22	-15	-28	00	-02	02	01
76	-05	-01	-02	-03	08	60	17	-14	06	01	03	09	-01	-01	18	04
77	-02	03	14	07	-15	14	65	03	05	03	-06	-14	15	-07	03	-05
78	08	-10	16	-01	11	09	-21	19	-11	13	-04	02	-13	12	-06	22
79	-08	16	-01	-07	-05	04	-06	25	14	-03	-02	04	10	-32	08	03
80	-05	03	04	-01	23	-06	-04	-15	32	05	01	05	-11	06	-08	-04
81	-03	-02	-08	-03	24	00	-07	-05	33	01	00	15	00	-15	-12	03
82	-08	09	-03	09	-28	-02	-06	-04	-04	-09	15	27	00	-03	08	-21
83	-22	-12	01	09	30	-24	11	-08	-07	10	-23	12	19	-05	-04	-11
84	-04	04	08	02	-12	-04	04	10	-16	-03	01	07	05	-14	18	-06
85	09	28	-03	-10	-03	07	-11	-02	-04	-12	-34	-05	-05	02	-09	-04
86	-28	11	-20	-16	15	11	00	-03	-01	-25	-18	11	06	-04	-08	-21
87	-07	-06	-05	00	-03	31	-04	-10	15	-12	-04	11	12	03	19	-10
88	-06	-26	-19	-15	01	21	-13	35	04	07	-02	30	11	-18	-21	23
89	-20	-06	13	07	16	-26	03	-05	-01	00	-22	13	30	03	05	-06
90	11	21	-16	08	19	17	-06	-23	00	11	02	-03	38	18	09	-01
91	-19	20	-24	-12	-11	-09	-13	07	14	12	04	19	17	31	09	-04
92	-19	-04	-12	12	12	-02	-13	00	-03	-02	07	-10	06	54	07	-10
93	-05	-06	13	12	-04	36	01	-01	04	-02	00	-01	-18	-06	48	-03
94	-03	12	08	08	07	24	12	00	01	-01	11	-09	10	-07	43	-07
95	-27	05	-07	-04	05	-12	03	20	26	05	05	12	13	11	-13	-02
96	-08	00	-08	05	-03	-07	-04	-01	26	26	-11	37	-13	03	-06	08
97	41	-05	-04	-06	16	-03	15	-10	-08	-04	02	-12	-05	-30	01	10
98	02	58	03	-01	06	12	-10	-10	-03	-10	-25	-12	07	-15	08	21
99	-21	-04	-13	11	12	-01	10	06	05	02	-10	-24	16	17	-04	05
100	-01	29	08	08	06	-09	16	-14	-19	-05	04	04	06	15	-26	11
101	-04	00	25	-11	-07	14	14	-21	-13	-26	-04	-38	-05	08	15	-28
102	06	13	40	07	11	-08	22	-07	04	19	03	-28	-01	-07	21	-18
103	-05	-03	06	47	-05	00	-05	-15	07	08	-02	12	11	33	-01	23
104	-06	24	23	30	-11	-06	15	00	00	-03	14	00	19	-13	02	-02

Table 7.17 Rotated factor matrix for whites (continued)

Items	A	B	C	E	F	G	H	I	L	M	N	O	Q1	Q2	Q3	Q4
105	26	00	00	30	42	-08	23	13	04	-03	-14	-01	16	-15	-09	-02
106	-06	-03	04	-01	-12	33	02	01	-17	-07	10	05	-19	06	-01	18
107	16	-25	02	01	-16	34	06	16	-11	-01	04	-08	03	04	07	-05
108	14	-01	11	23	41	01	49	05	06	-01	07	-15	-03	-32	-07	03
109	-01	-02	28	-09	20	01	49	-25	-15	-04	11	-06	09	-12	15	-07
110	-10	10	04	03	07	-07	04	31	05	16	15	01	13	01	-21	07
111	10	-04	-07	-12	03	-13	07	16	01	03	-15	34	-11	05	-04	16
112	01	-23	-14	10	-14	-09	04	03	43	03	00	14	07	21	-08	14
113	-09	09	-18	-02	19	-16	00	-05	23	02	13	14	-07	04	-06	-04
114	-05	-24	-01	-03	-03	-02	-11	05	25	-14	11	09	20	09	-10	20
115	-07	-06	-06	05	-07	-04	-01	14	-05	38	10	04	16	10	-32	-07
116	07	04	21	14	01	-21	-12	-04	06	34	02	-01	10	-09	-05	00
117	-03	18	-06	04	-01	23	-05	-05	18	-04	24	-06	25	03	20	-03
118	02	07	-11	40	03	02	00	-24	15	-03	18	-07	18	00	12	00
119	-05	03	-07	-04	-16	-04	-20	-01	-16	-12	16	43	04	-08	-26	16
120	-03	00	-16	22	-12	-14	-17	23	29	14	-03	58	-13	00	-09	13
121	02	-08	39	27	-13	-04	13	00	-09	10	04	07	28	00	21	05
122	-04	00	05	14	09	-04	12	06	02	11	-06	-15	42	02	08	-02
123	-31	04	-12	-01	-43	-20	-02	04	19	13	06	06	-06	17	14	17
124	-36	-02	04	00	-19	10	-16	-04	-05	06	-13	17	07	24	-08	07
125	00	02	04	13	04	-02	10	-03	-09	-13	14	-25	08	08	59	03
126	-06	-13	14	11	04	-13	07	-15	-10	-07	-07	-18	04	13	62	-18
127	-05	07	-16	-13	-08	23	-13	07	-13	-04	10	21	03	-03	-21	43
128	-08	-02	-25	07	-11	-05	-01	-03	16	-07	-10	11	20	04	00	40
129	23	-05	16	24	29	10	34	07	-06	-12	14	-07	-03	-22	02	-03
130	11	01	-01	-04	-03	02	-05	-02	12	-04	00	-14	07	-07	01	05
131	15	00	14	10	-10	01	-18	03	-17	-09	-06	16	22	-01	-21	-05
132	-07	26	20	18	09	04	-02	04	-18	-20	-03	-14	01	09	05	06
133	06	-02	33	-05	-06	-19	17	-17	-09	-02	-01	-19	-17	20	20	-38
134	24	18	-10	27	25	-17	15	04	05	-02	02	-10	23	-24	00	-10
135	-03	-13	-09	16	-02	-09	00	-24	17	-21	10	07	12	-22	00	-04
136	-01	08	-15	25	02	01	07	06	10	02	32	-12	14	08	11	22
137	27	10	-08	23	20	07	32	-09	-01	04	01	-18	12	-18	-08	-10
138	-07	13	-09	06	-12	32	02	06	12	-04	04	22	07	03	13	01
139	05	04	09	02	08	62	-09	-03	04	02	14	02	12	12	16	08

Table 7.17 Rotated factor matrix for whites (continued)

Items	A	B	C	E	F	G	H	I	L	M	N	O	Q1	Q2	Q3	Q4
140	20	08	29	00	04	11	47	-15	00	02	11	-16	02	-02	04	03
141	11	-01	00	15	-03	00	77	03	-06	07	03	-13	03	01	25	02
142	21	-11	18	-09	02	08	04	46	-01	32	-17	17	06	10	-01	02
143	-07	-03	-20	-01	12	03	-17	56	16	-16	05	02	-11	06	-26	04
144	-13	08	-23	09	-26	18	-03	-04	15	13	01	02	-12	14	-11	13
145	-14	-01	-11	11	-28	11	-06	15	29	-07	09	-08	-05	-13	-14	07
146	01	15	-19	07	-04	00	00	-07	18	54	06	-06	-01	08	10	-03
147	-12	-06	02	-03	01	-28	-01	15	-21	49	03	05	14	00	-04	-20
148	09	-07	13	20	05	02	13	03	00	05	-16	08	29	11	16	03
149	18	02	-04	-05	04	24	-02	-08	18	-10	22	-02	-07	-30	02	-18
150	04	-02	08	-02	02	-17	10	00	00	-27	05	-05	14	10	25	-10
151	-16	03	-34	-06	11	07	-20	46	05	-15	14	13	-07	00	-28	04
152	08	-01	-33	01	-15	12	-05	00	00	-04	-18	40	-08	21	-15	19
153	07	04	01	-01	06	-06	09	08	03	11	05	01	36	02	-10	-03
154	-07	02	-04	23	-03	-16	16	-18	14	25	23	-04	12	-04	-02	09
155	-32	-16	-01	03	-15	12	-20	24	03	14	-06	-11	08	14	-09	18
156	-32	-20	16	-07	-23	11	-04	02	-04	05	-07	06	-08	30	03	14
157	01	02	17	04	-02	08	07	-12	-10	01	02	-09	31	08	40	-07
158	-01	03	07	-10	-07	43	03	-02	-05	-05	18	00	-15	04	40	-05
159	15	00	11	17	-07	11	00	-20	00	12	-20	-14	27	-03	47	-14
160	01	17	-03	-22	05	-02	-41	00	-05	00	10	13	-15	-18	-37	25

Decimal Signs Omitted

Font indicates elements with a value of 0,9 in the Target Matrix

Normal Font indicates elements with a value of 0,0 in the Target Matrix

7.3.3 Item analysis

Hypotheses 14 to 18 refer to the correlation between the items and the factors to which they belong. To test these hypotheses, item analyses were done. Item analysis is used to determine the efficiency of items of the following:

- a) the correlation of the item with what the test is measuring, and/or with relevant external criteria;
- b) the ability of the item to discriminate between items; and
- c) the contribution to the reliability of the test as a whole.

The NIPR computer program, NP50 was used. It has the facility that allows the Kuder-Richardson Formula 20 coefficients to be calculated iteratively until satisfactory reliability coefficients are reached. With each iteration, it recalculates the item-total correlations as they necessarily change as the item pool changes.

The item-total correlation provides information on the degree to which a particular item measures the underlying construct of the trait. The program can be used with item types that generate a variety of scores on each item (e.g. free response, Likert), or when the items are scored dichotomously (e.g. true/false, correct/incorrect). The closer the correlation is to 1,00, the better the item. In other words, the more likely it is that test and the item measure the same construct. If the value of any particular item is low or negative, it should be discarded or revised.

Usually, an item should be discarded if the item-total correlation is less than 0,30. However, with tests that are very short, where each item makes a major contribution to the total test score, the majority of items tend to show a positive item-total correlation. One solution is to remove the item under study from the calculation of the test score (Aiken, 1994; Friedenber, 1995; Kaplan & Saccuzo, 1989; Murphy & Davidshofer, 1994; Thorndike, Cunningham, Thorndike & Hagen, 1991).

For this investigation, as the purpose is to compare the results with those found by Prinsloo (1992), the item-total, or in this case, the item-factor correlations, were documented.

The results are shown in Tables 7.18 to 7.29. The results are discussed in this manner so that it can be directly compared with those results obtained by Prinsloo (1992) who documented it in a similar way. All items with values less than 0,30 were regarded as poor.

In Table 7.18, the item-test correlations found for the norm group are compared with the total sample. As indicated, lower discrimination values were found on the majority of factors. However, the total number of items that failed to attain significant item-total/factor correlations is less than that of the norm group i.e. 6,25% (norm group - 9%). The MD factor performed the worst as 30% of the items had values lower than 0,30 (Table 7.19). However, different results were often found when the sample was divided into the different sub-samples.

7.18 Range of discrimination values of the items for the total sample

F	Norm group		Sample	
	Lowest value	Highest value	Lowest value	Highest value
A	0,495	0,595	0,423	0,519
B	0,280	0,473	0,297	0,512
C	0,464	0,594	0,391	0,578
E	0,362	0,507	0,355	0,539
F	0,481	0,579	0,471	0,591
G	0,423	0,522	0,351	0,541
H	0,555	0,672	0,530	0,632
I	0,366	0,541	0,355	0,510
L	0,322	0,476	0,295	0,512
M	0,324	0,483	0,255	0,480
N	0,307	0,413	0,293	0,418
O	0,471	0,623	0,415	0,607
Q ₁	0,358	0,491	0,275	0,507
Q ₂	0,354	0,521	0,373	0,590
Q ₃	0,450	0,568	0,262	0,607
Q ₄	0,464	0,566	0,401	0,527
MD	0,383	0,560	0,029	0,554

Table 7.19 Items that failed to attain significant item-total correlations for the total sample

F	N	Items
A	8	
B	12	4, 98
C	9	
E	11	
F	8	
G	10	
H	8	
I	11	
L	12	82
M	12	21, 148
N	12	
O	9	
Q ₁	10	89
Q ₂	10	
Q ₃	10	97
Q ₄	9	
MD	10	31, 64, 160

Hypothesis 14: The items on the 16PF do not correlate with what the test is measuring for students from the various race groups.

In Tables 7.20 and 7.21 the range of discrimination values for the various race groups are reflected. The results show that the values for the black participants were the lowest, where factors B, L, M, N, and MD performed the worst. Factor M was the weakest factor as 41,66% of the items failed to attain valid ($< 0,30$) item-total correlations. In total, 18,13% of all the items had values lower than 0,30. For the coloured participants, Factors B, M, N performed the worst, with 8,75% of the values below 0,30. The Indian group showed a similar trend as 10% of the items had values lower than 0,30. The results for the white participants showed that Factors B, L, and N, and MD performed the worst, and 7,5% of the items had values below 0,30. An unacceptably large amount of items (18%) for the black participants had values lower than 0,30.

Hypothesis 15 stated: The items on the 16PF do not correlate with what the test is measuring for male and female students. In Table 7.22 the discrimination values for males and females are shown. For the females, Factors A, N, and MD, performed the worst, with 7,5% of all the items lower than 0,30 (see Table 7.23). The discrimination values for males were slightly lower than those for females as 11,88% of the items had values lower than 0,30 (Factors L, M, N, and MD performed the worst).

Table 7.20 Range of discrimination values of the factors for the various race groups

F	Blacks		Coloureds		Indians		Whites	
	L	H	L	H	L	H	L	H
A	0,32	0,56	0,38	0,56	0,40	0,50	0,34	0,70
B	0,17	0,48	0,16	0,55	0,26	0,41	0,22	0,51
C	0,29	0,49	0,33	0,63	0,43	0,64	0,42	0,67
E	0,19	0,52	0,32	0,58	0,32	0,59	0,33	0,56
F	0,33	0,50	0,50	0,60	0,50	0,63	0,42	0,64
G	0,26	0,51	0,32	0,57	0,34	0,62	0,44	0,62
H	0,42	0,56	0,60	0,71	0,53	0,66	0,57	0,71
I	0,23	0,49	0,34	0,51	0,33	0,53	0,33	0,58
L	0,23	0,48	0,27	0,53	0,24	0,51	0,28	0,54
M	0,19	0,37	0,25	0,50	0,26	0,50	0,36	0,74
N	0,18	0,42	0,22	0,50	0,19	0,47	0,25	0,49
O	0,23	0,52	0,45	0,64	0,37	0,61	0,48	0,69
Q ₁	0,24	0,50	0,33	0,54	0,16	0,53	0,34	0,55
Q ₂	0,29	0,62	0,28	0,56	0,31	0,55	0,34	0,60
Q ₃	0,31	0,60	0,31	0,62	0,13	0,64	0,21	0,64
Q ₄	0,36	0,54	0,31	0,57	0,36	0,54	0,41	0,61
MD	0,01	0,51	0,04	0,55	0,01	0,57	0,06	0,63

Table 7.21 Items that failed to attain significant item-total correlations for the various race groups

F	Blacks	Coloureds	Indians	Whites
A				
B	68, 98, 99, 131	3,4, 98, 131,	36, 99	3,36,98,130
C	6, 37,			
E	7, 135			
F				
G	44, 75			
H				
I	47, 143			
L	17, 50,82, 113	18	17, 18, 113	18, 82
M	19, 83, 84, 146, 147	116, 148	21, 148	
N	55, 117, 150	117,118,216	86, 149	85, 149
O	152			
Q ₁	89		27, 89, 90,	
Q ₂	123	156		
Q ₃			97	97
Q ₄				
MD	31, 64, 61	31, 64, 160	31, 64, 160	31, 64, 160

Table 7.22 Range of discrimination values of the factors for males and females

F	Males		Females	
	Lowest	Highest	Lowest	Highest
A	0,39	0,52	0,37	0,56
B	0,27	0,51	0,15	0,51
C	0,38	0,62	0,40	0,61
E	0,27	0,56	0,35	0,54
F	0,44	0,59	0,49	0,61
G	0,30	0,55	0,37	0,54
H	0,50	0,63	0,56	0,64
I	0,29	0,48	0,32	0,44
L	0,27	0,47	0,25	0,55
M	0,28	0,45	0,22	0,50
N	0,23	0,47	0,26	0,44
O	0,47	0,53	0,43	0,55
Q ₁	0,28	0,53	0,27	0,50
Q ₂	0,37	0,63	0,37	0,52
Q ₃	0,35	0,57	0,20	0,59
Q ₄	0,40	0,51	0,41	0,56
MD	-0,03	0,57	0,66	0,58

Table 7.23 Items that failed to attain significant item-total correlations for males and females

F	Males	Females
A		3, 4, 98, 99,
B	131	
C		
E	135	
F		
G	44	
H		
I		
L	17, 18,50,113	
M	83, 84,	
N	55, 86,117	21, 148
O	89	
Q ₁		89
Q ₂		
Q ₃		97
Q ₄		
MD	31, 64, 160	31, 64, 160

Hypothesis 16: The items on the 16PF do not correlate with what the test is measuring for students from different age groups.

In Tables 7.24 and 7.25 the discrimination values for the different age groups are shown. The values for the 17 to 18 year old participants showed that Factors B, L, M, N, Q₁, and MD performed the worst with 11,87% of the items lower than 0,30. For 19 year old participants, only 5,63% of all the items failed to obtain significant item-total correlations, and Factors M, N and MD performed the worst. The range of values for the 20 year old participants, similar to the latter participants, indicated that Factors N, Q₁, and MD performed the worst with 5% of all the items lower than 0,30. For the 21 to 22 year old participants, Factors B, N, and MD performed the worst with 8,75% lower than 0,30. For the 23 to 29 year old participants, Factors B, I, L, M, N, and MD performed the worst, with 18% of all the items lower than 0,30. Factor M was the weakest factor as 58,33% of the items failed to obtain significant item-factor correlations. For the 30 to 47 year old participants, a similar trend was found. Factors B, I, L, M, N and MD performed the worst, with 18,12% of the total items less than 0,30. Therefore, three of the age groups, had a substantial number of items that failed to attain item-total correlations.

Table 7.24 Range of discrimination values of the factors for the various age groups

F	17-18		19		20		12-22		23-29		30-47	
	H	L	H	L	H	L	H	L	H	L	H	L
A	0,41	0,51	0,38	0,58	0,34	0,59	0,41	0,63	0,38	0,61	0,33	0,67
B	0,24	0,51	0,25	0,49	0,19	0,46	0,15	0,54	0,30	0,53	0,00	0,55
C	0,40	0,57	0,30	0,62	0,36	0,66	0,16	0,57	0,38	0,59	0,28	0,74
E	0,34	0,56	0,33	0,55	0,31	0,58	0,45	0,64	0,26	0,56	0,18	0,63
F	0,48	0,58	0,43	0,60	0,44	0,63	0,41	0,67	0,34	0,57	0,29	0,52
G	0,33	0,52	0,32	0,60	0,34	0,51	0,39	0,58	0,24	0,50	0,20	0,62
H	0,49	0,67	0,51	0,66	0,49	0,68	0,55	0,70	0,52	0,72	0,42	0,66
I	0,32	0,51	0,36	0,49	0,28	0,59	0,36	0,53	0,28	0,49	0,16	0,63
L	0,21	0,52	0,22	0,55	0,24	0,56	0,31	0,57	0,24	0,51	0,09	0,62
M	0,29	0,53	0,18	0,48	0,31	0,51	0,27	0,51	0,24	0,44	0,02	0,47
N	0,27	0,51	0,25	0,46	0,21	0,43	0,22	0,47	0,25	0,39	0,15	0,54
O	0,33	0,60	0,382	0,66	0,49	0,58	0,47	0,67	0,43	0,53	0,32	0,59
Q ₁	0,29	0,49	0,34	0,61	0,28	0,57	0,36	0,53	0,20	0,54	0,20	0,67
Q ₂	0,34	0,51	0,35	0,66	0,43	0,60	0,33	0,59	0,28	0,64	0,44	0,62
Q ₃	0,17	0,60	0,31	0,59	0,31	0,68	0,23	0,63	0,38	0,58	0,02	0,65
Q ₄	0,35	0,53	0,39	0,65	0,42	0,54	0,41	0,57	0,34	0,52	0,38	0,62
MD	0,13	0,54	0,06	0,60	-0,00	0,61	-0,15	0,57	0,02	0,53	0,08	0,61

Table 7.25 Items that failed to significant attain item-total correlations for the various age groups.

F	17-18	19	20	21-22	23-29	30-47
A						
B	3, 36, 68, 98,	4		98, 99, 131	67, 98,	4, 98, 131
C						5
E				135	136	7
F						1
G					44, 75,	75
H						
I					47, 143	46, 47, 48
L	17, 18, 113, 145		17		18,50, 80,82	17, 18, 82,114,
M	146, 148	21, 116, 148		84	19, 21, 83, 115, 116,	83, 84, 146, 148
N	23, 149	55, 85, 149,	55, 86	55, 85, 86, 118, 149	55, 86, 87, 150	53, 117, 149
O						
Q ₁	27, 89, 90		59, 89		89	59, 122,
Q ₂					123	
Q ₃	97			97		94, 158
Q ₄						
MD	31, 64, 160	31, 160	31, 64, 160	31, 64, 160	31, 64, 160	31, 64, 93, 160

Hypothesis 17: The items on the 16PF do not correlate with what the test is measuring for students from different institutions. Tables 7.26 and 7.27 reflect the range of discrimination values and the specific items per factor that failed to attain satisfactory item-total correlations for participants from the various institutions. For participants from UWC, Factors B, M, N, and MD performed the worst as 8,13% were lower than 0,30. For the UDW group, Factors B, L, N, and Q₁ performed the worst as 14,38% were lower than 0,30. Factors N and Q₁ were the weakest as approximately 40% of the items for each of these factors failed to show satisfactory item-total correlations. For participants from UND, Factors B, M, N, Q₁, and MD performed the worst and 14,37% of the items had item/total correlations scores lower than 0,300. Factors B and Q₁ were the weakest as approximately 40% of the items for each of these factors failed to show satisfactory item-total correlations. The UP sub-sample performed the worst on Factors B, N, and MD, where 8.75% fell below 0,30. Factor B was the weakest factor and 50% of the items failed to show satisfactory item-total correlations.

As the subjects from three of the institutions had a significant number of items that failed to attain satisfactory item-total correlations, it is evident that institutional differences exist.

Table 7.26 Range of discrimination values of the factors for the participants from the various institutions

F	UWC		UDW		UND		UP	
	H	L	H	L	H	L	H	L
A	0,36	0,52	0,32	0,60	0,29	0,55	0,35	0,57
B	0,19	0,52	0,24	0,42	0,18	0,54	0,01	0,51
C	0,31	0,58	0,44	0,58	0,37	0,72	0,42	0,68
E	0,30	0,55	0,25	0,60	0,27	0,52	0,38	0,58
F	0,42	0,55	0,49	0,67	0,49	0,65	0,38	0,64
G	0,29	0,53	0,28	0,59	0,29	0,66	0,41	0,61
H	0,51	0,63	0,56	0,64	0,45	0,68	0,59	0,73
I	0,26	0,51	0,35	0,57	0,32	0,56	0,32	0,57
L	0,29	0,50	0,18	0,48	0,28	0,47	0,26	0,59
M	0,22	0,42	0,27	0,57	0,22	0,43	0,28	0,55
N	0,22	0,49	0,19	0,51	0,17	0,44	0,21	0,45
O	0,41	0,57	0,35	0,66	0,31	0,57	0,50	0,70
Q ₁	0,27	0,52	0,21	0,60	0,19	0,50	0,38	0,56
Q ₂	0,33	0,60	0,25	0,55	0,36	0,54	0,33	0,60
Q ₃	0,38	0,60	0,17	0,64	0,16	0,62	0,21	0,67
Q ₄	0,39	0,51	0,23	0,57	0,39	0,61	0,42	0,62
MD	0,04	0,52	-0,01	0,54	0,03	0,60	0,02	0,64

Table 7.27 Items that failed to attain significant item-total correlations for participants from the various institutions

F	UWC	UDW	UND	UP
A			2	
B	98, 131	4, 99	3,36,68,98,99	3,35,36,98, 130, 131
C				
E		135	135	
F				
G		107	106	
H				
I	47			
L	50	18, 82, 113		82
M	116, 146, 148	21	21, 83, 116, 148	
N	55, 117, 150	23, 53, 55, 86, 118	86, 117, 149	85, 86, 149
O		27, 59, 89, 90		
Q ₁		27, 59, 89, 90	26, 59, 89, 90	
Q ₂		123		
Q ₃		97	97	97
Q ₄				
MD	31, 64, 160	31, 62, 64, 160	31, 64, 160	31, 64, 160

Hypothesis 18: The items on the 16PF do not correlate with what the test is measuring for students from different socio-economic backgrounds. Tables 7.28 and 7.29 reflect the discrimination values and the items that failed to attain satisfactory item-total correlations for participants divided on the basis of their SES. For the low SES participants Factors B, M, N, and MD performed the worst with 11,88% having values lower than 0,30. The lower-middle SES participants showed low values for Factors B, L, M, N, and MD, with 8,75% of the items showing values lower than 0,30. The upper-middle SES participants obtained low values for Factors B, M, and MD, and 8,75% have item-test correlations lower than 0.300. The high SES participants performed the worst on Factors B and N, and 8,13% had values lower than 0,30.

In conclusion, the black group and the 20 to 47 year old group had the greatest number of items falling below 0,30 (18,15% and 18% respectively). The weakest factors for the majority of sub-samples under discussion, were Factors B, L, M, N, and MD. Only the MD factor had the exact three items (31, 64, 160) that showed poor item-total correlations for all the sub-samples. However, the results must be viewed with caution, as the results may not reflect the true item-total correlations. Each factor only has a relatively small number of items, and this could have resulted in an inflated item-total correlations. In addition, it must be borne in mind that the test has already been refined, and that item analysis has already been conducted on the test.

Table 7.28 Range of discrimination values for the items for the different SES groups

F	Low		Lower-middle		Upper-middle		High	
	Low	High	Low	High	Low	High	Low	High
A	0,37	0,542	0,41	0,58	0,37	0,64	0,40	0,62
B	0,22	0,50	0,24	0,48	0,26	0,49	0,23	0,49
C	0,37	0,56	0,35	0,62	0,44	0,67	0,37	0,64
E	0,26	0,58	0,36	0,55	0,35	0,56	0,35	0,52
F	0,42	0,53	0,51	0,58	0,42	0,61	0,45	0,60
G	0,32	0,52	0,34	0,60	0,33	0,54	0,38	0,58
H	0,53	0,68	0,54	0,67	0,51	0,61	0,51	0,69
I	0,23	0,53	0,32	0,51	0,29	0,61	0,32	0,57
L	0,25	0,54	0,25	0,53	0,16	0,47	0,28	0,58
M	0,19	0,44	0,23	0,46	0,29	0,55	0,25	0,53
N	0,20	0,44	0,22	0,45	0,24	0,45	0,24	0,48
O	0,41	0,63	0,44	0,59	0,38	0,66	0,42	0,62
Q ₁	0,27	0,54	0,31	0,56	0,29	0,56	0,29	0,54
Q ₂	0,37	0,63	0,23	0,56	0,38	0,58	0,35	0,55
Q ₃	0,29	0,65	0,32	0,64	0,24	0,56	0,20	0,64
Q ₄	0,42	0,53	0,40	0,56	0,38	0,60	0,36	0,63
MD	0,06	0,60	-0,05	0,57	0,09	0,56	0,02	0,65

Table 7.29 Items that failed to attain significant item-total correlations for the different SES groups

F	Low SES	Lower-middle	Upper-middle	High SES
A				
B	98, 99	3, 4, 98, 131	4, 36, 98, 99	4, 99
C				
E	136			
F				
G				
H				
I	47		78	
L	18, 50	17, 82	17	17, 18
M	19, 83, 84, 146, 148	21, 148	146, 148	21, 84, 148
N	85, 149, 150	86, 117, 118	149	55, 150
O				
Q ₁	90		89	89
Q ₂				
Q ₃	97		97	
Q ₄				
MD	31, 64, 160	31, 64, 160	31, 64, 160	31, 64, 180

7.4 Item comparability

Taylor and Booyens (1992) used item bias techniques (TID and Scheuneman's Chi-squared) to evaluate item comparability between groups in the SAPQ. As these techniques were originally designed to assess item comparability in intelligence tests, which have a right-wrong answer format, it was decided not to force the responses of the 16PF data into a binary category, and rather use the original Chi-squared to determine whether significant differences existed in the way participants responded to individual items in the test. This method was also used by Lachar, Dahlstrom and Moreland (1986) when the item comparability of the MMPI was determined. Hypotheses 19 to 22 are applicable and they were tested by using the Chi-squared statistic with the level of the rejection for the null hypothesis set at $p < 0,0001$).

Tables 7.30 to 7.46 reflects the significant differences ($p < 0.0001$) in the way the different sub-samples (race, age, SES, and gender) responded to the items on the 16PF.

1) Factor A

For this factor, 75% of the items show significant differences when the sample was divided on the basis of race (Table 7.30). For the SES and age sub-samples 12,5% of the items shows significant differences and for the gender sub-sample 25%. Significant differences were found on the following items:

Race: 1, 2, 33, 34, 66, 129.

SES: 34

Age: 34

Gender: 66

2) Factor B

According to Table 7.31, the largest number of significant differences were found with the racial sub-sample where 44,44% of the items shows significant differences. Significant differences were not found between the gender sub-sample. The following items show significant differences:

Race: 35, 36, 68, 100

SES: 35, 100

Age: 35, 36

3) Factor C

Table 7.32 shows the number of items that reflects significant differences in terms of responses on Factor C. Significant differences were found on the following items:

Race: 5, 38, 69, 70, 102, 133

SES: 69, 70,

Age: 69, 70, 101

The largest number of significant differences were found with the racial sub-sample i.e. race - 66,7%, SES - 33,3%, and age - 22,2%. No significant differences were found with the SES sub-sample.

Table 7.30 Significant differences of responses to items for Factor A

Items	Race		SES		Age		Gender	
	p	χ^2	p	χ^2	p	χ^2	p	χ^2
1	0,0000	44,02	0,0470	12,76	0,0286	20,07	0,0446	6,22
2	0,0000	50,68	0,0014	21,68	0,0080	23,85	0,0001	18,95
33	0,0000	45,90	0,6733	4,03	0,2875	11,96	0,0002	16,88
34	0,0000	127,56	0,0000	42,96	0,0000	49,44	0,0129	8,70
65	0,1516	9,41	0,4236	5,60	0,1015	15,93	0,7356	0,61
66	0,0000	32,53	0,0090	17,09	0,0010	29,46	0,0000	42,32
97	0,0008	22,86	0,3176	7,03	0,3673	10,88	0,8206	0,40
129	0,0000	37,68	0,2902	7,34	0,1343	14,94	0,0026	11,92

$df=6$ for all comparisons

Table 7.31 Significant differences of responses to items for Factor B

Items	Race		SES		Age		Gender	
	p	χ^2	p	χ^2	p	χ^2	p	χ^2
3	0,0041	13,26	0,6502	1,64	0,2767	6,32	0,0150	5,92
4	0,0094	11,48	0,7349	1,28	0,2253	6,94	0,4810	0,50
35	0,0000	142,17	0,0000	34,60	0,0000	54,12	0,3040	1,06
36	0,0000	67,44	0,0038	13,45	0,0000	38,81	0,2206	1,50
67	0,0003	18,77	0,4969	2,38	0,0575	10,71	0,2235	1,48
68	0,0000	49,92	0,0027	14,16	0,0158	13,97	0,8504	0,04
98	0,0008	16,86	0,4664	2,55	0,3614	5,47	0,0070	7,29
99	0,4964	2,39	0,2417	4,19	0,8469	2,02	0,0224	5,21
100	0,0000	42,83	0,0000	22,91	0,0001	26,16	0,2763	1,19
130	0,0280	9,10	0,7462	1,23	0,1715	7,73	0,8779	0,02
131	0,1870	4,80	0,7022	1,41	0,2029	7,16	0,1325	2,26
132	0,0000	67,93	0,0335	8,70	0,0000	34,23	0,8779	0,02

$df=6$ for all comparisons

Table 7.32 Significant differences of responses to items for Factor C

Items	Race		SES		Age		Gender	
	p	χ^2	p	χ^2	p	χ^2	p	χ^2
5	0,0000	66,20	0,1216	10,07	0,0005	31,46	0,0128	8,72
6	0,0002	25,83	0,2885	7,36	0,0532	18,11	0,0009	14,04
37	0,0001	27,82	0,1307	9,86	0,6215	8,08	0,7020	0,71
38	0,0000	31,41	0,0962	10,76	0,0064	24,49	0,2305	2,94
69	0,0000	116,30	0,0000	42,55	0,0000	55,02	0,0232	7,53
70	0,0000	202,05	0,0000	50,08	0,0000	76,03	0,0002	16,88
101	0,0008	23,13	0,3589	6,61	0,0000	38,50	0,0012	13,50
102	0,0000	43,19	0,7162	3,71	0,0045	25,47	0,0032	11,47
133	0,0000	38,53	0,8699	2,49	0,0144	22,15	0,0328	6,84

$df=6$ for all comparisons

4) Factor E

According to Table 7.33, only the sub-sample divided on the basis of race shows significant differences on the following items (54,5%):

39, 71, 103, 134, 135, 136

5) Factor F

Table 7.34 shows the number of items that reflects significant differences in terms of responses on Factor F. Significant differences were found on the following items:

Race: 9, 10, 42, 73,

SES: 10, 42,

Age: 10, 42

The largest number of significant differences were found with the racial sub-sample i.e. race - 50%, SES and age - 25%. No significant differences were found with the gender sub-sample.

Table 7.33 Significant differences of responses to items for Factor E

Items	Race		SES			Age		Gender
	p	χ^2	p	χ^2	p	χ^2	p	χ^2
7	0,2753	7,52	0,7349	3,57	0,4218	10,22	0,4969	6,01
8	0,2000	15,04	0,0589	12,14	0,7553	6,68	0,4278	1,70
39	0,0000	31,78	0,0035	19,42	0,0439	18,73	0,0172	8,12
40	0,8112	2,98	0,9749	1,24	0,3722	10,81	0,0584	5,68
71	0,0000	39,64	0,0027	20,07	0,4596	9,79	0,7485	0,58
72	0,0351	13,55	0,4826	5,49	0,3493	11,11	0,2265	2,97
103	0,0000	49,85	0,1550	9,35	0,0925	16,26	0,0026	11,94
104	0,0019	20,94	0,1316	9,84	0,0709	17,16	0,8207	0,40
134	0,0000	46,58	0,0020	20,80	0,0139	22,25	0,2601	2,69
135	0,0000	49,12	0,0001	28,40	0,2186	13,09	0,5224	1,30
136	0,0000	48,55	0,1269	9,95	0,0073	24,11	0,1501	3,79

$df = 6$ for all comparisons

Table 7.34 Significant differences of responses to items for Factor F

Items	Race		SES		Age		Gender	
	p	χ^2	p	χ^2	p	χ^2	p	χ^2
9	0,0000	58,36	0,0037	19,26	0,0015	28,43	0,6367	0,90
10	0,0000	170,25	0,0000	56,46	0,0000	74,36	0,0378	6,55
41	0,0036	19,34	0,2012	8,54	0,8696	5,31	0,5745	1,11
42	0,0000	243,13	0,0000	52,00	0,0000	86,19	0,0056	40,23
73	0,0000	53,80	0,0037	19,28	0,0017	28,11	0,4279	10,36
74	0,0004	24,72	0,3338	6,86	0,0975	16,08	0,0758	1,70
105	0,0639	11,92	0,3092	7,13	0,0102	23,14	0,0037	5,16
137	0,0182	15,28	0,8414	2,73	0,0012	29,07	0,0028	11,23

$df= 6$ for all comparisons

6) Factor G

According to Table 7.35, only the sub-samples divided on the basis of race and age shows significant differences on the following items:

Race: 12, 43, 75, 76, 107, 138, 139

Age: 76, 107, 139

The percentages of items that showed significant differences are: race - 70%, and age - 30%.

7) Factor H

According to Table 7.36, only the sub-sample divided on the basis of race shows significant differences on the following items (37,5%):

13, 14, 77

Table 7.35 Significance differences in terms of responses to items for Factor G

Items	Race		SES		Age		Gender	
	p	χ^2	p	χ^2	p	χ^2	p	χ^2
11	0,0009	22,75	0,4429	5,83	0,2605	12,38	0,0055	10,40
12	0,0000	32,03	0,2708	7,58	0,0008	30,29	0,7617	0,54
43	0,0000	56,83	0,0871	11,04	0,0000	68,24	0,0001	19,34
44	0,0005	24,23	0,4217	6,01	0,3717	10,82	0,1885	3,34
75	0,0000	52,68	0,0195	15,10	0,0035	26,17	0,3201	2,28
76	0,0000	122,88	0,0118	16,40	0,0000	101,57	0,0323	6,86
106	0,0013	21,91	0,0140	15,95	0,8486	5,61	0,0141	8,52
107	0,0000	89,73	0,0012	22,08	0,0000	45,98	0,0530	5,87
138	0,0000	70,07	0,0090	17,09	0,0173	21,59	0,0162	8,25
139	0,0000	43,95	0,1534	9,38	0,0000	55,30	0,4764	1,48

df= 6 for all comparisons

Table 7.36 Significant differences of responses to items for Factor H

Items	Race		SES		Age		Gender	
	p	χ^2	p	χ^2	p	χ^2	p	χ^2
13	0,0000	60,18	0,0223	14,75	0,1712	14,04	0,0848	4,94
14	0,0000	36,99	0,3093	7,13	0,0754	16,96	0,0211	7,72
45	0,0581	12,18	0,0151	15,76	0,0002	34,26	0,3550	2,07
77	0,0000	40,04	0,0056	18,27	0,1106	15,63	0,0280	7,15
108	0,0115	16,45	0,1250	9,99	0,2390	12,73	0,8784	0,26
109	0,0031	19,72	0,6678	3,99	0,0002	34,37	0,1752	3,48
140	0,0476	12,73	0,7361	3,56	0,0848	16,56	0,3894	1,89
141	0,0005	24,02	0,0649	11,87	0,4647	9,73	0,7929	0,46

df= 6 for all comparisons

8) Factor I

Table 7.37 shows the number of items that reflects significant differences in terms of responses on Factor I. Significant differences were found on the following items:

Race: 15, 46, 48, 78, 79, 110, 111, 142, 143

Age: 16, 48, 78, 79, 110

Gender: 16, 46, 48, 78, 79, 110, 142, 143

The largest number of significant differences were found with the sample based on race i.e.

Race - 81,81%, gender - 72,72%, and age - 45,45%.

9) Factor L

According to Table 7.38, only the sub-samples divided on the basis of race and age shows significant differences on the following items:

Race: 18, 50, 81, 112, 113, 144, 145

Age: 144, 145

The percentages of the items that showed significant differences are: race - 58,3%, and age - 16,66%.

Table 7.37 Significant differences of responses to items for Factor I

Items	Race		SES		Age		Gender	
	p	χ^2	p	χ^2	p	χ^2	p	χ^2
15	0,0000	33,26	0,0162	15,58	0,0326	19,67	0,0011	13,62
16	0,0005	23,94	0,0055	18,31	0,0000	57,54	0,0000	194,05
46	0,0000	29,72	0,6250	4,38	0,0659	17,40	0,0000	20,41
47	0,0376	13,37	0,3439	6,76	0,1555	14,40	0,0002	17,02
48	0,0000	31,88	0,0518	12,50	0,0000	38,04	0,0000	30,89
78	0,0000	76,92	0,2114	8,38	0,0000	51,90	0,0000	30,01
79	0,0000	65,56	0,8283	2,84	0,0000	40,63	0,0000	27,61
110	0,0000	59,95	0,0115	16,47	0,0000	39,32	0,0000	24,55
111	0,0000	35,96	0,1432	9,59	0,0179	21,50	0,0002	17,13
142	0,0000	34,68	0,7584	3,39	0,1051	15,81	0,0000	97,43
143	0,0000	50,15	0,0015	21,48	0,0443	18,69	0,0000	23,06

df= 6 for all comparisons

Table 7.38 Significant differences of responses to items for Factor L

Items	Race		SES		Age		Gender	
	p	χ^2	p	χ^2	p	χ^2	p	χ^2
17	0,0178	15,33	0,2784	7,48	0,0209	21,03	0,3393	2,16
18	0,0000	37,01	0,0415	13,10	0,0304	19,88	0,4426	1,63
49	0,0049	18,61	0,8266	2,86	0,3839	10,67	0,7707	0,52
50	0,0000	58,34	0,3842	6,36	0,2275	12,93	0,8266	0,38
80	0,0149	15,80	0,7087	3,76	0,4103	10,35	0,0841	4,95
81	0,0000	33,06	0,0504	12,57	0,0327	19,65	0,5929	1,05
82	0,0316	13,83	0,9550	1,57	0,0115	22,81	0,0491	6,03
112	0,0000	53,49	0,2311	8,10	0,0055	24,91	0,0598	5,64
113	0,0000	41,84	0,0462	12,81	0,0130	22,45	0,0057	10,35
114	0,0003	25,41	0,0015	21,47	0,8663	5,35	0,0044	10,84
144	0,0000	80,92	0,0445	12,91	0,0000	44,84	0,7585	0,55
145	0,0000	35,26	0,0374	13,38	0,0000	44,11	0,7710	0,52

df= 6 for all comparisons

10) Factor M

Table 7.39 shows that only the sub-samples divided on the basis of race and age showed significant differences on the following items:

Race: 19, 20, 52, 83, 84, 116, 147

Age: 84, 116

The percentages of the items that showed significant differences are: race - 58,3%, and age - 16,66%.

11) Factor N

Table 7.40 shows the number of items that reflect significant differences in terms of responses on Factor M. Significant differences were found on the following items:

Race: 85, 86, 87, 150

Age: 87

Gender: 53

The largest number of significant differences were found with the racial sub-sample i.e. race - 33,33%, gender 8,33%, and age - 8,33%. No significant differences were found for the SES sub-sample.

Table 7.39 Significant differences in terms of responses to items for Factor M

Items	Race		SES		Age		Gender	
	p	χ^2	p	χ^2	p	χ^2	p	χ^2
19	0,0000	61,27	0,1487	9,47	0,1309	15,03	0,0158	5,92
20	0,0000	52,84	0,1742	8,99	0,1098	15,66	0,0011	13,62
21	0,2607	7,70	0,5482	4,97	0,1469	14,61	0,1364	3,98
51	0,0669	11,79	0,2692	7,60	0,1601	14,29	0,9427	0,12
52	0,0000	147,46	0,0002	26,18	0,0008	30,06	0,0012	13,45
83	0,0000	34,07	0,7080	3,77	0,3788	10,73	0,0535	5,86
84	0,0000	49,09	0,0002	25,80	0,0000	38,36	0,4516	1,59
115	0,1891	8,74	0,6427	4,25	0,0323	19,70	0,7497	0,58
116	0,0000	112,23	0,0016	21,31	0,0000	86,50	0,0003	16,30
146	0,0942	10,82	0,6115	4,48	0,1141	15,52	0,0033	11,43
147	0,0000	45,89	0,8501	2,66	0,1415	14,75	0,6417	0,89
148	0,0423	13,05	0,9846	1,03	0,1026	15,90	0,5877	1,06

$df= 6$ for all comparisons

Table 7.40 Significant differences of responses to items for Factor N

Items	Race		SES		Age		Gender	
	p	χ^2	p	χ^2	p	χ^2	p	χ^2
22	0,0955	10,78	0,5320	5,09	0,1144	15,51	0,0077	9,72
23	0,0003	25,11	0,0084	17,26	0,0002	34,03	0,0006	14,92
53	0,0108	16,62	0,7954	3,11	0,4939	9,41	0,0000	24,01
54	0,1082	10,42	0,1350	9,76	0,3689	10,86	0,1150	4,33
55	0,0213	14,87	0,4112	6,11	0,1999	13,45	0,2317	2,93
85	0,0000	41,25	0,1496	9,45	0,1717	14,03	0,1066	4,48
86	0,0000	40,64	0,2123	8,37	0,0056	24,86	0,0037	11,21
87	0,0000	65,74	0,1183	10,15	0,0000	48,85	0,0001	19,53
117	0,0719	11,58	0,3442	6,75	0,0442	18,70	0,4097	1,79
118	0,0484	12,68	0,6025	4,55	0,2033	13,38	0,0008	14,15
149	0,0190	15,17	0,6788	3,98	0,0633	17,54	0,8308	0,37
150	0,0000	50,72	0,0226	14,72	0,0013	28,88	0,2672	2,64

$df= 6$ for all comparisons

12) Factor O

Table 7.41 shows that only the sub-samples divided on the basis of race and gender showed significant differences on the following items:

Race: 25, 57, 88, 152

Gender: 88

The percentages of the items that showed significant differences are: race - 44,44%, and gender - 11,11%.

13) Factor Q₁

Table 7.42 shows the number of items that reflects significant differences in terms of responses on Factor Q₁. Significant differences were found on the following items:

Race: 27, 59, 90, 122, 154

Age: 27, 59

The largest number of significant differences were found with the racial sub-sample, followed by age i.e. race - 40%, and age - 20%. No significant differences were found for the racial and gender sub-sample.

Table 7.41 Significant differences of responses to items for Factor 0

Items	Race		SES		Age		Gender	
	p	χ^2	p	χ^2	p	χ^2	p	χ^2
24	0,1549	9,35	0,6707	4,04	0,5392	8,93	0,2770	2,57
25	0,0000	63,66	0,0628	11,96	0,0908	16,32	0,0234	7,51
56	0,0001	27,27	0,5151	5,23	0,0012	29,15	0,0556	5,78
57	0,0000	34,71	0,0199	15,05	0,0014	28,76	0,0955	4,70
88	0,0000	52,86	0,0893	10,97	0,0035	26,20	0,0000	125,04
119	0,1800	8,89	0,9548	1,52	0,0038	25,99	0,4726	1,50
120	0,1290	9,90	0,7534	3,43	0,1067	15,76	0,0003	16,32
151	0,7274	3,62	0,4813	5,50	0,1155	15,48	0,0002	17,22
152	0,0000	38,71	0,7929	3,13	0,0119	22,71	0,0248	7,39

$df= 6$ for all comparisons

Table 7.53 Significant differences of responses to items for Factor Q₁

Items	Race		SES		Age		Gender	
	p	χ^2	p	χ^2	p	χ^2	p	χ^2
26	0,1469	9,51	0,9214	1,98	0,0303	19,89	0,3070	2,36
27	0,0000	157,96	0,0001	29,42	0,0000	68,70	0,3339	2,19
58	0,0057	18,20	0,1273	9,94	0,2162	13,14	0,0873	4,88
59	0,0000	45,60	0,1934	8,66	0,0000	48,55	0,1409	3,92
89	0,0013	21,76	0,3641	6,55	0,0190	21,32	0,0916	4,78
90	0,0000	61,16	0,1195	10,12	0,0004	32,26	0,0148	8,43
121	0,0928	10,86	0,0457	12,84	0,6186	8,11	0,2619	2,68
122	0,0000	35,50	0,5224	5,17	0,0002	34,44	0,0506	5,97
153	0,0002	26,59	0,5396	5,03	0,4942	9,41	0,9035	0,20
154	0,0000	59,35	0,0023	20,51	0,0026	27,05	0,0003	15,99

$df= 6$ for all comparisons

14) Factor Q₂

Table 7.43 shows that the sub-samples divided on the basis of race, age, and gender showed significant differences on the following items:

Race: 28, 29, 61, 92, 155, 156

Age: 60

Gender: 155

The percentages of the items that showed significant differences are: race - 60%, age - 10%, and gender - 10%.

15) Factor Q₃

Table 7.43 shows the number of items that reflects significant differences in terms of responses on Factor Q₃. Significant differences were found on the following items:

Race: 62, 93, 126, 158, 159

SES: 30, 59

Age: 93, 158, 159

The largest number of significant differences were found with the racial sub-sample i.e. race - 50%, SES - 20%, and age - 30%. No significant differences were found for the gender sub-sample.

Table 7.43 Significant differences of responses to items for Factor Q₂

Items	Race		SES		Age		Gender	
	p	χ^2	p	χ^2	p	χ^2	p	χ^2
28	0,0000	40,66	0,7723	3,29	0,5203	9,12	0,3049	2,38
29	0,0000	33,11	0,1546	9,35	0,7837	6,37	0,0002	16,98
60	0,0001	28,64	0,0235	14,61	0,0000	46,78	0,3565	2,06
61	0,0000	95,19	0,0001	27,64	0,0001	36,77	0,6786	0,78
91	0,0046	18,74	0,4364	5,88	0,2596	12,39	0,6793	0,77
92	0,0000	31,70	0,0189	15,17	0,6359	7,93	0,5167	1,32
123	0,3423	6,77	0,8166	2,94	0,0099	23,24	0,6499	0,86
124	0,1582	9,28	0,1119	10,32	0,8123	6,04	0,9805	0,04
155	0,0000	48,09	0,0151	15,76	0,0001	36,93	0,0000	21,49
156	0,0000	77,79	0,3449	6,75	0,0434	18,76	0,0069	9,95

$df=6$ for all comparisons

Table 7.44 Significant differences of responses to items for Factor Q₃

Item	Race		SES		Age		Gender	
	p	χ^2	p	χ^2	p	χ^2	p	χ^2
30	0,0002	26,47	0,0000	30,48	0,0001	36,57	0,0155	8,34
62	0,0000	38,05	0,1686	9,09	0,5214	9,11	0,0118	8,88
93	0,0000	31,46	0,1991	8,57	0,0000	44,82	0,5999	1,02
94	0,2444	7,92	0,2461	7,89	0,0006	30,93	0,0232	7,53
97	0,0008	22,86	0,3178	7,03	0,3673	10,88	0,8206	0,40
125	0,0006	23,81	0,3497	6,70	0,0275	20,19	0,0020	12,39
126	0,0000	30,55	0,3586	6,61	0,0058	24,75	0,0020	12,40
157	0,0672	11,78	0,9851	1,01	0,0933	16,23	0,0795	5,06
158	0,0000	41,34	0,0225	14,73	0,0000	37,54	0,1384	3,96
159	0,0000	84,73	0,1029	10,39	0,0000	75,94	0,0300	7,01

$df=6$ for all comparisons

16) Factor Q₄

According to Table 7.45, only the racial sub-sample shows significant differences on the following items (55%):

31, 95, 96, 128, 160

17) MD

Table 7.46 shows that only the sub-samples divided on the basis of race and age showed significant differences on the following items:

Race: 12, 31, 62, 93, 126, 139, 159, 160

Age: 93, 139, 159,

The percentages of the items that showed significant differences are: race - 80%, and age - 30%.

In conclusion, it appears that the greatest influence on the responses to items is the racial variable. Significant differences were found for the majority of items per factor for this sub-sample, except factors B, H, N, O, and Q₁. Therefore, only hypothesis 19 is rejected and hypotheses 20-21 is accepted. Although it is might be possible for the writer to give reasons for the large differences encountered between the different race groups, interpretations will be biased by the authors world view and developmental history. To overcome this difficulty a qualitative study will be discussed in the next chapter.

Table 7.45 Significant differences of responses to items for Factor Q₄

Items	Race		SES		Age		Gender	
	p	χ^2	p	χ^2	p	χ^2	p	χ^2
31	0,0000	80,56	0,0294	14,02	0,1943	13,55	0,3110	2,34
32	0,0003	25,15	0,2780	7,49	0,4798	9,56	0,2514	2,76
63	0,0204	14,98	0,0211	14,89	0,1311	15,03	0,0008	14,34
64	0,0642	11,90	0,4178	6,05	0,0996	16,00	0,0003	16,22
95	0,0000	67,07	0,1849	8,80	0,0022	27,48	0,9922	0,02
96	0,0000	39,70	0,2280	8,14	0,0021	27,61	0,2600	2,69
127	0,1776	8,93	0,0936	10,83	0,4588	9,79	0,2864	2,50
128	0,0000	29,78	0,3096	7,12	0,7732	6,48	0,3985	1,84
160	0,0000	41,65	0,0456	12,84	0,0456	18,60	0,0032	11,47

$df=6$ for all comparisons

Table 7.46 Significant differences in responses to items for Factor MD

Items	Race		SES		Age		Gender	
	p	χ^2	p	χ^2	p	χ^2	p	χ^2
12	0,0000	32,03	0,2708	7,58	0,0008	30,29	0,7617	0,54
31	0,0000	80,56	0,2904	14,02	0,1943	13,55	0,3110	2,34
62	0,0000	38,05	0,1686	9,09	0,5214	9,11	0,0118	8,88
64	0,0642	11,90	0,4178	6,05	0,0996	16,00	0,0003	16,22
93	0,0000	31,46	0,1991	8,57	0,0000	44,82	0,5999	1,02
125	0,0006	23,81	0,3497	6,70	0,0275	20,19	0,0020	12,39
126	0,0000	30,55	0,3585	6,61	0,0058	24,75	0,0020	12,40
139	0,0000	43,95	0,1534	9,38	0,0000	55,30	0,4764	1,48
159	0,0000	84,73	0,1092	10,39	0,0000	75,94	0,3000	7,01
160	0,0000	41,65	0,0456	12,84	0,0456	18,60	0,0032	11,47

$df=6$ for all comparisons

7.5 Summary of empirical results

The major aim in supplying the summary, is to enable the reader to gain a better understanding of the overall nature of the results of the investigation. The complexity of the subject, the numerous variables which have been dealt with, and the need to discuss the findings in a sequential manner, must necessarily complicate any attempt to gain a thorough grasp of the findings. However, such a summary cannot provide an explanation of the theoretical and practical importance of the findings. This will be done in a subsequent chapter.

It is apparent from the preceding discussion that race, age, gender, and SES have a clear influence on the comparability of both items and constructs. Although home language and institution were included in the general demographic statistics it was decided to exclude the latter variables because of the degree of overlap. In the following section an attempt will be made to discuss the results, focusing on the various sub-samples.

7.5.1 Race

The results showed that this variable has the greatest influence on the manner in which items were dealt with. Significant differences in terms of the means and large differences in terms of standard deviations were found on the majority of factors. When compared with the other sub-samples, especially with the white sub-sample, the results suggested that blacks tended to be more reserved, detached, stiff, sober, slow, serious, tough minded, affected by emotional instability, moralistic, jealous, dogmatic, tyrannical, and apprehensive, and less intelligent.

The reliability coefficients were unacceptably low for the blacks on 14 of the first-order factors. Only Factors H, Q₂, and Q₃ had coefficients greater than 0,50. Factors C, F, M, N, and O performed the worst as coefficients lower than 0,30 were obtained. The coloureds, Indians and whites obtained higher reliability coefficients, where none of the coefficients were lower than 0,30. The reliability coefficients of the white participants were the highest and the closest to the coefficients reported for the norm group.

The factor analysis showed that the same factor structure was not found for the different groups. In fact, the results showed that the results of the factor rotation procedure based on the combined sample was inadequate, even though the measures of sampling adequacy were acceptable. There were a considerable number of items for which the loadings on those factors on which they ought to load are so small as to be negligible. The results of the black, Indian and coloured sub-samples displayed the same trend. The results for the white sample was substantially better than those for the other three.

The results of the item analysis showed that for the black group, 18% of the total items failed to attain satisfactory item-total correlations. Factors B, M, and N performed the worst. The other sub-groups (coloureds, Indians, and whites), obtained item-total correlations that were similar to those reported for the norm group.

Item comparability results showed highly significant differences for the majority of items per factors for this sub-sample (racial). Highly significant differences were found (more than or equal to 50% of the items per factor) for the majority of factors (12), excluding Factors B, H, N, O, and Q₁.

7.5.2 Gender

The results showed that this variable did not have such a severe influence on the scores obtained. Significant differences between means and large differences in terms of standard deviations were not found on the majority of factors. Significant differences were found on factors I, O, N, Emotional Sensitivity and Tough Poise. Females therefore, appeared to be tender-minded, sensitive, dependent, overprotected, apprehensive, self-reproaching, insecure and troubled, than males. On the other hand, males tended to be more polished, socially aware and insightful regarding others.

The reliability coefficients for the male and female sub-sample were lower than found for the norm group. For the female participants seven of the first-order factors have coefficients lower than 0,50 and for the males, eight have lower than 0,50. Although the results were similar, males obtained slightly lower coefficients than the females on the majority of the factors.

The item analysis showed that for the females, Factors A, N, and MD, performed the worst, as 7,5% of the total items failed to show acceptable item-total correlations. The values for males were slightly worse as 11,88% of the items had coefficients lower than 0,30, with Factors L, M, N, and MD performing the worst.

Item comparability results showed that significant differences were not found for the majority of items per factor. Highly significant differences were found on Factor I only, where more than 50% of the items for this factor showed statistically significant differences.

7.5.3 Age

The results showed that this variable has a certain amount of influence on the scores. Significant mean differences were obtained on seven first-order (B, F, G, I, N, Q₂, Q₃ and the MD score) and four second-order factors (Emotional Sensitivity, Independence, Compulsivity, and Tough Poise). In other words, the 17 to 18 year old participants tended to be more enthusiastic, quick, alert, tender minded, sensitive, overprotected, and dependent than the rest of the participants. The 30 to 47 year old participants, on the other hand, appeared to be astute, worldly, self-sufficient, and resourceful than the rest.

Reliability coefficients were lower than found for the general or combined norm group. Coefficients were lower than 0,50 on the majority of factors for the following age groups: 17 to 18; 23 to 29; and 30 to 47.

The results of the items analysis showed that for three age groups, more than 10% of the items failed to display acceptable item-total correlations. The values for the 17 to 18 year old participants showed that Factors B, L, M, N, Q₁, and MD performed the worst as 11,87% of the items were unacceptable. For the 23 to 29 and 30 to 47 year old participants, Factors B, I, L, M, N, and MD performed the worst, where 18% and 18,12% respectively, did were unacceptable. not achieve item-total correlations.

Item comparability results showed that significant differences did not exist for the majority of items per factor. In fact, no factor had items that showed significant differences for more than 50% of the items per factor.

7.5.4 Socio-economic status

The results showed that SES did not have an important influence on the scores obtained. Significant mean differences were not found for the majority of first and second-order factors, barring Factors A, B, C, F, Extraversion and Tough Poise. The results suggested that the high SES participants might be more outgoing, cooperative, emotionally stable, enthusiastic, quick, and alert, than the other participants, particularly the low SES participants who obtained the lowest scores.

The reliability coefficients found were very similar to those of the norm group as the majority of factors (for all the groups) have coefficients greater than 0,50.

The results of the item analysis showed that the majority of SES groups had item-total correlations similar to the norm group. However, the low SES participants performed the worst as 11,88% of the total items have unacceptable total-item correlations, where B, M, N, and MD performed the worst.

The item comparability analysis showed that significant differences could not be attributed to SES for the majority of items. In fact, on no factor were significant differences found for more than 50% of the items per factor.

7.6 Conclusion

In this chapter the results of the study was discussed. The descriptive statistics were presented for the different sub-samples, followed by discussions on the construct comparability findings and the item comparability findings.

On the whole, the results are disappointing and does not promote confidence in the 16PF. Given the claims that are made as to the culture fairness of the 16PF it would have been reasonable to have expected better results. However, the results will be discussed in greater detail in the final chapter (Chapter 9).

In the next chapter an attempt will be made to interpret and present possible reasons for the differences that occurred when the item comparability study was done, focusing on the racial sub-sample, particularly the black-white differences.

CHAPTER 8

QUALITATIVE EXPLORATIONS

The findings which were discussed in the previous chapter indicate very clearly that there are substantial differences between the manner in which the black and white research participants react to the items that are presented in the 16PF. While it is easy enough to speculate on the reasons for the observed differences, it would appear that a far greater contribution could be made to understanding the phenomenon. The best manner in which to approach this issue must necessarily be by means of a qualitative approach. Such an approach amounts to trying to answer the question: Why do white and black South African students provide responses to the 16PF which differ to such an extent that the item statistics that have been generated would lead one to surmise that it is impossible to compare two individuals from the two groups on the basis of the instrument?

As the greatest differences were found between black and white South Africans, the study reported below will focus on these differences, rather than on other possible pairs of sub-samples.

8.1 Incomparability categories

Taylor (1990) classified incomparability into five categories. They are:

a) Differences in mores

This refers to accepted cultural practices that are usually socially enforced. A member of a particular culture defies these cultural practices at his/her own peril. When incomparability occurs, and a certain cultural practice is referred to in an item, there are usually inter-group differences regarding this practice.

b) Situational and Experiential Factors

The lives of the different race groups in South Africa differ in a number of ways. Often one group experiences situations that the other seldom encounters. If an individual is expected to respond to an item that depicts a situation that she has never been exposed to, it could possibly lead to a response that is unlikely to reflect the trait which is supposedly being measured.

c) Cultural differences in word meaning

Cultural differences in word meaning refer to different concepts or activities in different cultures, including words that may have subtle differences or different connotations. If such words appear in any item, the responses are likely to be incomparable.

d) Cultural beliefs

The test constructor might assume that all participants have a certain belief that has universal or near universal acceptance. However, this belief might only have acceptance in the constructor's own culture and not in other cultures. If the "universality of belief" assumption is not met across cultures, an item containing this kind of question will be incomparable.

e) Social Desirability

This refers to the tendency for respondents to endorse a particular alternative because it represents an activity, emotion, or interpretation of reality that is socially approved of or rewarded, not that it is necessarily true. Cultures differ in terms of the desirability they attach to various personality characteristics.

f) Syntactical and word connotation problems

This is not included in Taylor's categories but because the vast majority of blacks speak English as their second, or sometimes third, or fourth language, they could endorse an item differently simply because they did not understand the sentence construction or certain words.

In an attempt to determine the reason/s for the incomparability, focusing on black-white differences, two qualitative approaches were used. These approaches will be discussed in the next section.

8.2 Qualitative Approaches

8.2.1 Questionnaire

In order to test the understanding of the words, a questionnaire was developed in which 136 words that are found in the 16PF were listed and participants were asked to give synonym/s for each word. The words were derived by using MS Word. This program has the facility to select words from a document and to list them in alphabetical order or in terms of the frequency of occurrence of each word. For this exercise only nouns and adjectives were selected for the questionnaire (see Appendix D) and it was then administered to 71 second-year Industrial Psychology Students at UWC. None of the students had English as a home language. All nouns and adjectives derived in this manner were included in the questionnaire which was designed. The participants were asked to write down one or two synonyms for each of the words. The synonyms generated in this manner were coded as correct or incorrect on the basis of whether they appeared in *Webster's comprehensive dictionary* (1992), *Collins pocket reference* (1988) and the *Reader's Digest dictionary* (1985). The participants responses are reflected in Table 8.1.

Table 8.1 Number and percentage of participants who gave the correct synonyms.

Words	Number	Percentage
absentminded	12	17
accuracy	44	62
activities	21	30
admire	23	32
afraid	61	86
aid	64	90
angry	39	55
appliances	20	28
argument	48	68
artistic	17	24
assistants	64	90
attention	38	53
attractive	36	51
avoid	22	31
background	44	62
basic	22	31
battles	66	93
beach	65	92
beauty	53	75
betrays	17	24
bookkeeper	35	49
bossy	3	4
brag	21	30
calculated	36	50
calm	55	77
candle	58	82
care	39	55
career	38	54
challenge	16	23

characteristics	36	51
children	61	86
citizens	37	52
clumsy	2	3
committee	30	42
composed	38	54
concerned	29	41
confused	10	14
consequences	49	69
convenient	9	13
conversations	50	70
coordination	9	13
criticism	7	10
danger	24	34
depressed	32	45
diligence	4	6
discouraged	8	11
dishonest	20	28
disloyal	22	31
downhearted	30	42
dreamer	15	21
efficient	10	14
electrical	20	28
embarrassed	22	31
emotional	37	52
entertaining	19	27
enthusiastic	13	18
excitement	48	68
exercise	54	76
factory	16	23
flame	58	81
forgive	25	35

functions	56	79
gathering	46	65
guests	58	81
happy-go-lucky	4	6
headline	16	23
honesty	29	41
imagination	10	14
immediately	34	48
impractical	37	52
independent	32	45
influence	42	59
intellectual	20	28
interesting	26	37
interruptions	56	79
invention	30	42
jealousy	28	39
levelheaded	3	4
logical	11	16
lovestory	12	17
machines	38	54
manners	42	59
military	57	66
mishaps	11	16
modern	48	68
neighbours	44	62
nerves	8	11
obeying	26	37
occasionally	36	51
opinion	45	63
opportunities	53	75
outgoing	29	41
overexcited	14	20

peculiar	29	41
persuade	38	54
photographic	3	4
queue	62	87
reaction	20	28
rejected	22	31
repairing	47	66
reporter	41	58
routine	16	23
scent	52	73
scientist	20	28
self-centred	23	32
sensitive	28	39
setbacks	16	23
spirited	2	3
social	14	18
statue	12	17
stranger	50	70
strict	17	24
superior	27	38
talent	44	62
temptations	5	7
thorn	4	6
accept	54	76
cheerful	38	54
depressed	35	49
familiar	37	52
firm	34	48
hire	35	49
hotel	39	55
mechanical	2	3
organised	21	30

serious	14	20
seaside	52	73
sufficient	50	70
abroad	42	59
ability	48	68
court	22	46
explore	18	25
nasty	11	16
salaries	59	83
sheltered	47	66

8.2.2 Detailed analysis

In an attempt to understand whether the second language participants understood the items in terms of sentence construction, such as represented by words within an item, and whether they viewed the items as offensive or biased in any way, 10 Industrial Psychology Honours students at UWC, who do not speak English as their first language, were requested to participate in the study. They were asked to scrutinise each item of the 16PF and answer the following questions for each item:

- a) Write a sentence or two explaining what you think this item means?
- b) Explain (in a sentence or two) why you are convinced this is the meaning.
- c) Would you ever ask another person a question like this?
- d) If yes or no, explain the reason for your answer.

In the next section, an attempt will be made to explain the reasons for item incomparability on the basis of the findings derived from these two approaches

8.3 Reasons for item incomparability

After analysing the responses, it was decided to use only two categories, instead of the six described in section 8.1 to understand differences. They are the cultural factors category (incorporating the mores, situational and experiential factors, cultural beliefs, and social desirability categories) on the one hand, and the syntactical and word connotation problem category (incorporating the cultural differences in word meaning category) on the other. This was done as it was difficult to place them into the culture-related and specific categories outlined by Taylor as too many assumptions about culture would have had to be made. The responses to the questionnaire (by the second-year students, referred to as participants in the next section) and the detailed analysis (by the honours students) were used to place the items into the different categories. When differences did occur and problems were experienced with the words or the construction of sentences, and the items was viewed as offensive or biased in any way, the item was placed into the language problem category. If not, it was placed into the cultural factors category.

a) Factor A (warmth)

Of the six items that were identified as incomparable, items 1, 2, 33 and 34 fall into the syntactical and word connotation problem category (hereafter referred to as the language-problem category) and the others (66, 129) into the cultural-factors category.

Item 1 deals with the development of a useful invention and whether the participant would prefer to work alone in a laboratory or to sell the invention to people. The majority of blacks and whites endorsed option c (selling) but many more whites endorsed this option than blacks. Only 42% of the participants(second-year students) gave the correct synonym for the word "invention" and four of the honours students responded that it was difficult to understand the question. An example of their responses (direct quotations for all responses):

- *I found it difficult to understand the question.*
- *I would never ask this question from another person whose first language is not English because he will not understand the question.*
- *No, because maybe the person I ask would not even understand the meaning of inventing.*

Item 2 refers to job preference in a factory where the options are to be involved in mechanical activities or to interview and hire people. Only 30% of the participants gave correct synonyms for the words "mechanical" and "activities", although the honours group had no problems with this item. The majority of blacks and whites endorsed option c (interview and hire people) but many more whites endorsed this option than blacks.

Item 33 refers to which kind of book one prefers to read i.e. entertaining people (a) ; uncertain (b); or travelling in outer space (c). Although the majority of both groups endorsed option c, only 27% of the participants gave correct synonyms for the word "entertaining".

Item 34 refers to job preference if the salaries were the same, with the options of being a scientist doing research or managing a hotel. The majority of blacks and whites endorsed option c (hotel management) but more whites endorsed this option than blacks. Only 28% of the participants understood the word "scientist" and 55% "hotel".

In addition, one honours student misunderstood the item as follows:

- If all jobs were paying out similar amounts of money, I would change my job. It means that where most people usually work it is not 100% percent satisfactory one is only doing that to get money.

Items 66 refers to the type of club one would like to belong to. The options are a photographic or art club, on the one hand, and dance or social club, on the other hand. There seems to be no problem understanding the words (although only 20% gave correct synonyms for "social", they would probably have no problem understanding "dance"), or sentence construction. The majority of blacks and whites endorsed option c (dance or social club), but more whites endorsed this option than blacks.

Item 192 refers to the reason why one would talk to people. The options are because one loves to do so (a); in between (b); or only when one has something say (c). The majority of blacks and whites endorsed option c but much more whites endorsed this option than blacks.

b) Factor C (ego strength)

Of the six items that were identified as incomparable, items 102 and 133 fall into the language-problem category and the others (5, 38, 69, 70) fall into the cultural-factors category.

The items that fall into the cultural-factors category were endorsed differently by the two groups. Item 5 refers to doubting one's ability to do ordinary things as well as other people. The majority of blacks endorsed option c (generally) and the majority of whites endorsed option a (almost never). Item 38 refers to whether one worries about small and unimportant things and having to make a special effort to put them out of one's mind. The majority of blacks endorsed option b (in between) and the majority of whites endorsed option a (true). Item 69 refers to whether one would plan one's life differently or want it the same, if given another chance at it. The majority of blacks endorsed option c (plan it differently) and the majority of whites endorsed option a (want it much the same). Item 70 refers to whether one would prefer the life one is leading currently (a); uncertain (b); or a life that is more sheltered or has fewer difficulties (c). The majority of blacks endorsed option c and the majority of whites endorsed option a.

Item 102 refers to getting over disappointments. The majority of blacks endorsed option b (in between) and the majority of whites endorsed option a (easily). Although no problem was experienced with the understanding of words (in terms of providing the correct synonyms for words contained in this item), three honours students misunderstood the question as follows:

- *Do you get disappointed more. Because the item ask whether a person get disappointed. Not clear to understand.- Is it hard or easy for you to get disappointed. It asks how fast do you become disappointed.*
- *Do you ever get disappointments. How often a person get disappointed.*

Item 133 refers to whether a person gets upset by events much quicker than other people. The majority of blacks and whites endorsed option c (no) but more whites endorsed this option than blacks. Although no problem was experienced with the understanding of words, five honours students misunderstood the question as follows:

- *Do you get easily angry by events or other people. To be quiet is to be angry and I think the question has to do with what makes one angry between events and people.*
- *Do events upset you more than people. Because the question ask whether the person get upset more by the event or the people.*
- *I become angry so quickly by events more than people. No. Because they cannot understand the question.*
- *What makes you upset? events or people?*

c) Factor E (Dominance)

The results showed that six items were identified as incomparable. They are items 39, 71, 103, 134, 135, 136. All these items fall into the culture category as few problems were experienced with the understanding of the words or sentence construction (item 134 contained the word persuade and 54% of the participants gave correct synonyms). The majority of blacks and whites endorsed the same options for most the items (except item 135), but either many more whites or blacks endorsed a particular option.

Item 135 refers to driving behaviour. The options are: remaining behind the other cars (a); in between (b); only once reaching the front of the queue (c). The majority of blacks endorsed option a) and the majority of whites endorsed option c.

e) Factor F (Impulsivity)

Of the four items that were identified as incomparable, items 9 and 10 fall into the cultural-factors and items 42 and 43 fall into the language-problem category.

Item 9 refers to the number of friends one has and item 10 refers the attendance of social functions. The majority of blacks and whites endorsed the same options for item 9, but the blacks endorsed it more consistently. For item 10 the majority of whites endorsed option a (only attends social functions when necessary) and the blacks endorsed option c (does not only attend

social functions when necessary).

Item 42 refers to whether you believe that people should laugh and be merry (a); in between (b); or daily life should be approached with responsibility and seriousness (c). The majority of blacks endorsed option a and the majority of whites endorsed option c. Although there seems not to be a problem in understanding the words, two honours students had problems understanding the item and responded that:

- *the question is not clear*
- *this item is not easy to understand*

Item 73 refers to whether a person likes being in the middle of great excitement and fun. The majority of blacks and whites endorsed the same options (likes being in the middle of excitement) but the blacks endorsed it much stronger. The words appeared to be understood by the majority of participants but one honours student had problems in understanding the item as follows:

- *where would you like to be when you are having fun? It would like to establish where the person would like to be when he is having fun.*

f) Factor G (group conformity)

The results showed that seven items were identified as incomparable. They are items 12, 43, 75, 76, 107, 138, 139. Items 12 and 43 fall into the language-problem category and the rest in the cultural-factors category.

Item 12 reads as follows: I am a strict person, always doing things as correctly as possible. The majority of whites agreed with the statement and the majority of blacks did not. However, only 24% of the participants gave the correct synonym for the word "strict".

Item 43 refers to whether one enjoys work that requires high levels of diligence and accuracy. Both groups responded positively to the statement but many more blacks endorsed this option. However, only 6% of the participants gave correct synonyms for the word "diligence" and 62% for "accuracy".

The majority of the honours students (seven) had problems with the item. Their responses are as follows:

- *Do you enjoy /like work that needs accuracy and hard-work/effort. Because the word diligence means hard work.*
- *I enjoy work that is routine and always accurate. It asks what work environment do you understand. It is not easy to understand.*
- *I like work that is neat and clean and which have no mistakes. Accuracy - no mistakes.*

It is not clear.

- *Do you like work that is accurate and neatly done. The item asks whether you like to do work neatly and accurately. ... the words in the item are difficult to understand.*
- *I feel comfortable when giving commitment and doing my work as accurate as possible, with no mistakes. Because of the words diligent and accurate which explains how one is committed to his/her work.*
- *I think the other person might not understand diligence.*
- *The question is asking one who likes work which require high level of accuracy in fact enjoy more responsible work. I believe this is the meaning as more responsible work needs to be accurate. Because a person whose home language is not English may not understand the key words like accuracy and especially diligence.*

Items 75, 76, 107, 138, and 139 fall into the cultural-factors category as the blacks and whites endorse very different options in the majority of items (except items 75 and 139). Item 76 states: I plan my day well to avoid wasting time between tasks. The majority of whites agreed with the statement and the majority of blacks did not. Item 107 refers to what one would do if income was more than enough for ordinary daily needs. The majority of whites chose option a, which states that the rest of the money would be given to a church or a needy organization. The majority of blacks chose option c which states that the rest of the money would be spent on oneself.

Item 138 states: When I have to stay at home with a bad cold I...

- a) enjoy it as a short holiday
- b) uncertain
- c) worry about getting behind with my work

The majority of blacks endorsed option c and the majority of whites endorsed option a.

g) Factor H (boldness)

Of the three items that were identified as incomparable, items 13 and 77 fall into the cultural-factors category and item 14 into the language category.

Both groups endorsed the same options for items 13 and 17, although the whites endorsed them more strongly in both cases.

Item 14 states: I get embarrassed if I suddenly become the focus of attention in a social group. The majority of blacks agreed with the statement and the majority of whites disagreed. However, only 31% of the participants gave the correct synonym for the word "embarrassed" and there is a possibility that they did not understand the question.

h) Factor I (Emotional Sensitivity)

The results show that nine items were identified as incomparable i.e. 15, 46, 48, 78, 79, 110, 111, 142, 143. Items 15, 79, 110, and 111 appear to fall into the language-problem category and items 46, 48, 78, 142 and 143 fall into the cultural-factors category.

Item 15 refers to whether a person preferred music (a), or a subject requiring hand coordination (c). The majority of blacks endorsed option a while the majority of whites endorsed option c. Only 13% of the participants gave the correct synonym for the word "coordination" and many of the Honours students also had problems with the item. Their responses were as follows:

- *When at school, did you preferred music or hand requiring subjects. The item need you to choose between music and hand requiring subjects. No. Unless I know that any ordinary person at school they did have this subject. Because at some population groups these subjects were not available.*
- *School activities and interests that one is attracted to, extra mural activities. Music, hand co-ordination are one of the activities that one can be involved in at school (beside studying books).*
- *Did you prefer music or hand-craft at school? Because I think the main thing focuses on music and hand-craft.*
- *The question is asking whether you like singing or using your hand. No. Because one would not understand the phrase subject requiring hand co-ordination.*

Item 79 states: I am often hurt more by the way people say things than by what they say. Both groups agreed with the statement but six honours students had problems understanding the statement. Their responses were as follows:

- *The question is asking whether you are more concerned with how people approach things. I can't get the logic behind this question.*
- *I get easily emotional by how people take things simple as they do. The item would like to know how one person interprets how people say things than what they say. No.*
- *Do you usually get hurt by the way people talk to you. Because the question asks whether the things that people talk about you make you feel hurt.*
- *It asks if you worry about people's manners. It might confuse the ordinary person.*
- *It is the approach more than the object that hurts me most. Because "way" is the approach and "what" is the object itself. Yes. Only if somebody is aware of such a thing.*
- *What hurts you most, the way people say things or how they say them. It establishes what makes this person hurt between people that are around him or things that he/she come across. Yes. In order to find out what actually hurts individuals between things and people.*

Item 110 asks whether one enjoys daydreaming. Both groups endorsed the statement. Although the word "daydreaming" was not included in the list of words, only 15% of the participants understood a similar word i.e. "dreamer". Also, two of the honours students had problems

with the statement as follows:

- *The question is asking whether I have a vision or not. I am convinced that this is the meaning because people who enjoy daydreaming are people who have vision.*
- *I think the question has to do with daydreaming and I don't know another meaning of daydreaming. I'm not sure another person would understand clearly the meaning of daydreaming.*

Item 11 states: I enjoy working with my hands, if I can use good tools or machines. The majority of whites agreed with the statement and the majority of blacks disagreed with the statement. Although 38% of the participants gave the correct synonym for the word "machine", three honours student misunderstood the question. Their responses were as follows:

- *Would you prefer working with your hands than working with machines or good tools. Because the item ask what would a person prefer to work with.*
- *Do you prefer working with hand tools or machines. In order to establish whether he prefers doing things or machines do for him.*
- *I enjoy everything to do with art. Tools and machines related to art.*

The majority of participants for both groups endorsed the same options for items 46, 48 and 78. In all the cases many more blacks or whites endorsed a particular option. It appears that a certain degree of language problems occurred. As with item 42 and 78 fewer than 50% (above

40%) of the participants understood certain words in the items. However, it falls into the cultural-factors category as the honours group experienced no problems with these items.

Item 142 asks whether one would prefer the job of writing children's books or repairing electrical appliances. The majority of whites chose to repair electrical appliances and the majority of blacks were uncertain. Item 143 states: It upsets me when my friends criticize me. The whites chose the "not too much" option and the blacks chose the "not at all" option.

h) Factor L

The results show that seven items were identified as incomparable i.e. 18, 50, 81, 112, 113, 144, 145. Items 18, 50, 112, 144 and fall into the language-problem. Items 81, 113, and 145 fall into the cultural-factors category.

Item 18 stated: When bossy people try to "push me around", I do just the opposite of what they want. The majority of blacks agreed with the statement and the majority of whites were uncertain. The word "bossy" was understood by 30% of the participants who gave the correct synonyms. The item was not understood by one honours student and the response was as follows:

- Do you get angered by the other people. Because the question ask about what do you do when people to be obstacles on the way. The item is a bit vague.

Item 50 states: Nobody would like to see me in trouble. The majority of whites agreed with the statement and the majority of blacks were uncertain. There appeared to be no problem understanding the words but one honours student seemed to have problems with understanding the item as follows:

- Would anyone love to see you in trouble. The item ask whether people likes you or not.

Because it is not easy to understand the meaning of the item.

Item 144 asks whether the world has more nice people or more nasty people. Although both groups felt that the world has more nice people, only 15% of the participants understood the word "nasty".

Item 112 states: I suspect that people who are friendly to me could be disloyal behind my back. The majority of blacks chose option b (sometimes) and the majority of whites chose option a (no, rarely). Also, only 31% of the participants gave correct synonyms for the word "disloyal."

Both groups endorsed the same option for items 81, 113, and 145. In all the cases, either the blacks or the whites endorsed the option much more strongly than the other group.

i) Factor M

The item comparability study showed that seven items were identified as incomparable. They were items 19, 20, 52, 83, 84, 116, and 147. The majority of items (except item 20) fall into the language-problems category.

Item 19 asks whether one would rather be married to someone who is socially admired (a), or has talent for arts or writing (c). Although both groups endorsed option a, and 62 % of the participants understood the word "talent", three honours students had problems with understanding the item. Their responses are as follows:

- *I better be married to one who likes writing and who is admired by most people. Social admired means to be like or love by most of the people.*
- *What kind of person would you like to get married to. Because the item ask whether would you like to marry someone who is socially desirable or someone who is an artisan.*
- *I better be married to one who like writing and who is admired by most of the people. Social admired means to like or love by most of the people.*

Item 83 asks whether the world needs more level-headed, firm citizens (a), or more imaginative people planning a better (c) future. Although both groups endorsed the same option (c), only 4% of the participants understood the word "level-headed" and four honours students had

problems with the item. Their responses were as follows:

- *The world needs citizens who are firm and straight or more creative people to plan for the better future. It asks what type of people do you think can plan for the future.*
- *The world want many people thinking and planning their future. The question is not clear, not everybody will be able to understand the question.*
- *The world likes people with backbone, well organized and one who can think. Because it is looking for how people take things in this world, what are their expectations.*
- *I really don't understand the difference between a level headed and an imaginative person because one can have both characteristics. No. The question is not easily understandable to people whose first language is not English.*

Item 84 states: It is more important to be concerned ...

- a) about the basic meaning of life.
- b) uncertain
- c) taking care that one's family has everything it needs to live well.

The majority of whites endorsed option a and the majority of blacks endorsed c. Although there seems to be no problem with the particular words in the item, four honours students had problems understanding the items.

Their responses were as follows:

- *One should seriously consider the meaning of life or taking care of one's family well being. It asks what is important to consider in life. No. Because the choices that are given in the item are similar. For example, when you consider the meaning of life you can be taking care of your family.*
- *Should we only be concerned about basic needs of life?. Basic meaning of life means to be concerned with basic needs. Because basic is where everyone starts for establishing him/herself.*
- *What is the basic meaning of life. It is not specific.*
- *The question is asking whether you are concerned with the meaning of life or just to have everything you need in life. I am convinced that this is the meaning because one just want to have everything she/he needs is concerned about taking care that one's family has everything it needs to live.*

Item 116 asks whether one likes friends who are efficient or practical (a), in between (b), or do what they think is important although others say they are a bit odd (c). The majority of whites endorsed option c and the majority of blacks option a. Only 14% of the participants understood the word "efficient".

The majority of honours students (seven) had problems understanding the question as follows:

- *The question is asking whether do you prefer people who are considerate of other people's feelings. I am convinced this is the meaning because ethical and practical people do consider other people. Yes. Because you can get an idea of what type of person is this and he will react to issues coming up.*
- *Do you like friends who are practical and efficient or those do what they think is important. No. It does not specify what a practical person is like.*
- *Do you prefer people who can do work thoroughly and who are realistic or do you prefer people who do what they think is good. Yes. Because to be efficient is to work thoroughly and practical means realistic.*
- *What kind of friends do you prefer, is it friends who are realistic or those who just do what they think is important even though people think it's not.*
- *I like people who believe in themselves and feel confident of what they are doing. Opposition always come from all directions whether you acted good or bad.*
- *I prefer friends who do what is correct for themselves and who thinks they are good. efficient - good, bit odd - don't do what others expect or want.*
- *I like people who are efficient and practical or people who do what they think is important.*

Item 147 states: My friends say that I ...

- a) have both feet firmly planted on the ground.
- b) In between
- c) am artistic and a dreamer

The majority of whites endorsed option a and the majority of blacks endorsed option c. Only 24% and 21% of the participants gave the correct synonyms for the words "artistic" and "dreamer" respectively. In addition, five honours students misunderstood the question as follows:

- *My friends say that I am artistic and a dreamer. No. What does it mean to have both feet firmly planted on the ground. It is not specific and clear.*
- *Do your friends think you are stubborn or artistic and a dreamer. I'm not really sure but I think having both feet planted on the ground means stubborn and the question has to do with being stubborn or a dreamer.*
- *I guess I'm unique because I always have my ways of doing things differently from others. It means that this person can just carry own his/her work and is a creative, innovative person.*
- *My friends mention that I'm a lazy person or I'm someone who is always having something to think and do. Feet firmly planted means that you are lazy, you are not moving, you just stay where you are. A dreamer - having something to think and do. No. Others might find it difficult to understand the question.*
- *My friends say that I'm a strong person who do not change easily, or that I'm the dreamer and creative.*

Item 52 asks whether one would prefer the life of an artist (a), uncertain (b), or an accountant or a bookkeeper (c). The majority of blacks endorsed option a and the majority of whites endorsed option c. The possibility exists that language could have been a problem as only 49% gave the correct synonyms for the word "bookkeeper". Many of them gave the synonym "librarian" instead.

Item 20 states: I would love to be a reporter for a newspaper. The majority of blacks were uncertain and the majority of whites did not agree with the statement.

j) Factor N (shrewdness)

Of the four items that were identified as incomparable, item 85 fall into the language-problem category and the others (85, 86, and 150) into the cultural-factors categories.

Item 85 states: If I feel like telling people just what I think of them, I ...

- a) go ahead and tell them the truth.
- b) in between
- c) first consider the consequences of doing so.

Both groups endorsed option c, but four honours students appeared to have problems with the item.

Their responses were as follows:

- *What do you first do when you want to tell people what they should do. I think the item ask what does a person do when he or she has to tell people of what they should do.*
- *Don't like telling people my feelings about them. How do you see people around you.*
- *What do you do when you want to tell people what you think about. how an individual does when he/she wants to convey a message to them. Yes. In order to see what people do when they want to convey a message to the world of what they think.*

For items 86, 87, and 150 both groups endorsed the same option. In all cases, either the blacks or the whites endorsed the option much more strongly than the other group.

k) Factor O

The item comparability study showed that four items were identified as incomparable i.e. items 25, 57, 88, and 152. Item 25 and 57 fall into the language-problem category, and items 88 and 152 into the cultural-factors category.

Item 25 stated: I often get discouraged when I land before ordinary difficulties. Although both groups endorsed option b (sometimes), there appear to have been some language difficulties. Only 11% of the participants understood the word "discouraged" and five Honours students

experienced problems with the item. Their responses were as follows:

- *The question is asking whether I like discouraging work or not. I believe this is the meaning because people who likes to so challenging work get discouraged when they land before ordinary difficulties whereas people who like to do easy work are not discouraged.*
- *Do you lose courage when you come across ordinary hard times. Because discourage means to lose courage and ordinary hard times means normal difficulties. Yes. Because its something common to lose courage during difficult times.*
- *Gets miserable when faced with some difficult normal situations, that cannot be solved. It is upsetting to have difficulty in solving simple things that can be easily sorted out. Yes. It is boring to face a situation whereby it is simple but can't get through it.*
- *Do you feel useless when given simple problem to solve. When you are discouraged you feel useless.*
- *I'm not encouraged when I have to do difficult things. I land - to move to something more difficult, discourage - not motivate.*
- *Do you feel angry when you don't get what you want. Because the item ask whether you are feeling hopeless when you don't achieve something. No. Because the question is not clear.*

Item 57 states: Even amongst a group of people, I am nevertheless sometimes feeling rejected and lonely. The majority of whites agreed with the statement and the majority of blacks

disagreed with it. Also, only 31% of the participants gave the correct synonym for the word "rejected".

Item 152 stated: I can always disregard the small, unimportant mistakes that I have made. The majority of whites agreed with the statement and the majority of blacks did not.

Both groups responded the same way to item 88, but many more blacks endorsed the item.

1) Factor Q₁

The study showed that five items were identified as incomparable i.e. 27, 59, 90, 122, 154. Items 27 and 154 fall into the language-problem category and items 59, 90 and 122 fall into the cultural-factors category.

Item 27 states: In my newspaper I would like to read ...

- a) the local news about my area
- b) in between
- c) a discussion of solutions to the basic social problems of our modern world.

The majority of whites chose option a and the majority of blacks chose option c. Only 20% of the participants gave correct synonyms for the word "social". In addition, three honours students appeared to have problems understanding the item.

Their responses were as follows:

- *The question is asking whether do you prefer reading or discussion. I think this is the meaning because one who prefer reading would like to read newspaper. Yes. Because you would see if the person in question really like to be in involved in discussion.*
- *After buying a newspaper, do you read news happening around you or around the world. Newspaper include both local and international news. Yes. To know if the person is only concerned about his area where he lives.*
- *In your local newspaper would you like to read local news or worldwide news. Because to read about your area means local news and world means the world that we live in. Yes. Because international and local news is what we listen to everyday.*

Item 154 states: To get an interesting argument going, I tell people what is wrong with their ideas. The majority of whites chose option a (often) and the majority of blacks chose option b (sometimes). It appears that only 37% of the participants give correct synonyms for the word "interesting". In addition, five honours students had problems understanding the question. They responded as follows:

- *I enjoy telling people what is wrong in their ideas. How would you let and interesting argument not stop. Because the item ask how a person can keep and interesting conversation to continue. Yes. It is easy to understand.*

- *I always criticize people's opinions to get the discussion hot. To see if one can lead and exciting group and get it going.*
- *Do you correct people in the meetings to get the meeting going. Telling people what is wrong with their ideas means correcting, i think the question has to do with correcting people in the meeting.*
- *Do you like criticising people so as to keep argument going. Because to tell people what is wrong with their ideas means to criticize them.*
- *In order to make an interesting argument continuing, do you tell people what is wrong with their ideas.*

Item 54 asks whether more problems arise because of people who are constantly changing methods that already work well (a) or refuse to use the newest methods (c). The majority of blacks chose option c and the majority of whites chose option a.

For both items 90 and 122 the majority of participants in both groups chose the same option, but in both cases, either many more whites or blacks endorsed a particular item.

m) Factor Q_2

For this factor, six items were incomparable i.e. items 28, 29, 61, 92, 155, 156. The majority of items fall into the cultural-factors category as the honours students seem to have no problem understanding the items and only two words were identified with incorrect synonyms by less

than 50% of the participants. For items 28, 29, 92, and 156, the majority of blacks and whites endorsed the same option, but many more whites or blacks endorsed a particular item.

For item 61 the majority of blacks endorsed option a and majority of whites endorsed option c. The item asks whether a person, when travelling abroad, would prefer to decide on his/her own which places to visit (a) or travel with and organized group (c).

Item 155 state: A seaside beach would be more attractive to me if ...

- a) there were no people around.
- b) in between
- c) it was filled with people.

The majority of blacks chose option a and the majority of whites chose option c.

n) Factor Q_3

For this factor five items were identified as incomparable i.e. items 62, 93, 126, 158, 159. Items 62 and 126 seem to fall into the language-problem category and the rest into the cultural-factors category.

Item 62 states: There are times when I can't stop pitying myself. The majority of both groups chose option b (sometimes). However, six honours students had problems understanding the item.

They responded as follows:

- *the question ask whether do you pity yourself. I'm not quite sure of the meaning of pity. No. Because one would not understand the meaning of the keyword pity.*
- *Would you ever feel sorry for yourself. Because pitying is to be sorry. No. Because it is an unusual thing to do.*
- *Sometimes I feel ashamed of myself. Pitying means being ashamed of. No. A sensitive question.*
- *There are times when I can't stop pitying myself. To feel pity is to feel sorry. No. It might be misunderstood by other people.*
- *I sometimes can feel regretted. Stop pitying- feel regretted. Yes. To see who will feel regretted and who will not.*
- *Are there times that you feel pity for yourself. No. Because it was not easy for me to understand the question.*

Item 126 asks whether one gets over-excited and confused in tense decisions. Although both groups responded negatively to the question, the possibility exist that some might not have understood the question, as only 20% and 14% of the participants gave correct synonyms for the words "over-excited" and "confused" respectively.

Item 158 asks whether one find excuses to put work aside for a while in order to have a little fun. The majority of blacks chose option b (sometimes) and the majority of whites chose option c (often).

Both groups endorsed the same options for items 93 and 159. In all cases, either the blacks or the whites endorsed the option much more strongly than the other group.

o) Factor Q₄

Items 31, 95, 96, 128, and 160 were incomparable. Items 31, 96, and 128 fall into the language-problem category. The others (95 and 160) fall into the cultural-factors category.

Item 31 asks whether one becomes very tense when one thinks about what happened during the day. The majority of whites endorsed option a (very seldom) and the majority of blacks endorsed option b (sometimes). Although no words seem to be problematic, three honours students seem to have problems with their understanding of the item. They responded as follows:

- *The question is asking whether you feel not happy when you think about what happened during the day. I believe this is the meaning because I think you are tense when you are not happy.*
- *If something happened during the day, do you feel anxious during the night.*
- *I feel very uneasy when I think of the past. Because tense means to be uneasy and what has happened in the past.*

Item 96 states: I sometimes become dizzy or lightheaded for no apparent reason. Although the majority of both groups endorsed the same option (yes), it appears that four honours students had problems with the item as follows:

- *Do you sometime feel drowsy for no apparent reason. Drowsy refers to being dizzy.*
- *Do you loose balance at certain times for no valid reason.*
- *Do you often feel dizzy or lightheaded for no reason. Do you or does the person feel a bit stupid when he/she wakes up.*
- *Do you ever experience dizziness or lightheaded for no reason. I think the question has to do with dizziness. No. I am not sure the other person would understand the word dizziness.*

Item 128 states: I guess I am less irritable than most people. Both groups endorsed option a (true) but four honours students misunderstood the question as follows:

- *I don't become angry easily. Because the person shows to be less emotional compared to others.*
- *Do you consider yourself getting angry slowly that other people. I think irritable means angry and I think the question has to do with whether one gets angry easily or not. ... Maybe the other person may nor even understand the word irritable.*
- *I am not easily angered compared to other people. Because "nor easily angered" means less irritable.*

- The question is asking whether are you a less sensitive person or not. I am convinced this is the meaning because one who is most irritable is one who is most sensitive.

Item 95 asks whether one feels quite tired when waking up in the morning. The majority of blacks endorsed option a (no) and the majority of whites endorsed option c (yes).

For item 160 both groups endorsed the same option, although many more blacks chose that option than whites.

8.4 Conclusion

As shown in the preceding discussion and also in the previous chapter, many items were shown to be incomparable. An attempt was made to give reasons for the incomparability. The findings showed that language (i.e. misunderstanding words and the construction of sentences) was an important reason why the racial groups responded so differently in many cases. It appears that 48 items were flawed on the basis of cultural issues and 34 items were flawed on the basis of language problems. No item was viewed as offensive or biased by the Honours group. Even those items that were not shown to be incomparable had words that were not fully understood. Seventeen (10.7%) items did not show incomparability but included words that were not understood by 35% (and less) of the participants. In other words, even though the responses appeared to be more or less the same, the possibility exists that many blacks did not fully understand the item when choosing a particular option.

CHAPTER 9

CONCLUSION AND RECOMMENDATIONS

The major objective of this study was to contribute to the essential information which is required by test users when choosing personality tests to assess individuals. More specifically, the aims were: to determine whether the scores of the 16PF are comparable in a cross-cultural setting in South Africa; the influence of race, gender and socio-economic status, language, and age on the scores obtained; whether differences exist between races, genders, socio-economic status, age and languages in terms of their responses to the items of the 16PF; and to establish some of the reasons for the differences in responses to items between the racial groups.

In this final chapter the results will be discussed and recommendations will be made. A summary of the results will be presented, followed by some of the implications of the study in the light of new legislation. Finally, certain recommendations will be made and a number of options will be presented, taking the results of the study into account.

9.1 Major Findings

To achieve the aims outlined, construct comparability studies and item comparability studies were conducted. In addition, descriptive statistics were also calculated to provide a general picture of the performance of the different sub-samples when the 16PF was used. Finally, a qualitative study was conducted to establish some of the reasons for the differences in responses to items between the racial groups.

To obtain a descriptive picture of the 16PF, the means and standard deviations of the first and second-order factors for the various sub-samples were calculated. One and two-way analyses of variance were used in which the significance level for the rejection of the null hypothesis was set at $p < 0,0001$.

To determine whether construct comparability existed, the following procedures were used:

- reliabilities of the 16PF for groups composed for race, gender, age, SES, and institution;
- item analyses of the responses of the various sub-samples; and
- factor analyses of the test data for the various race groups.

To determine whether item comparability was present, the Chi-squared statistic was used in which the responses of the participants of the various sub-samples were compared.

Finally, a qualitative study, using two approaches, was conducted to determine the possible reasons for the occurrence of item incomparability of the racial sub-sample. The first approach concentrated on the understanding of words and a questionnaire was developed that contained 136 nouns and adjectives from the 16PF. Participants were instructed to give synonym/s for each word. The second approach concentrated on the understanding of each item in terms of sentence construction, and to determine whether the items were viewed as biased or offensive. With both approaches, English was not the home language of the participants.

The results showed that the variables race, age, gender, and SES had an influence when construct comparability and item comparability were investigated. However, this influence

differed between the various sub-samples and the following section will attempt to discuss the results, focusing on the various sub-samples. The variables of home language and institution were included in the general descriptive statistics for analysis but because of the large overlap, it was decided to concentrate on four sub-samples only (race, age, gender, SES).

In the discussion of the results, the present findings will be linked to similar studies. Unfortunately, very few studies have investigated the impact that gender might have on the scores of the 16PF. Even fewer studies have focused on the influence of SES, language and age.

9.1.1 Race

The results showed that this variable had the greatest influence on the scores obtained. Significant differences between means and large differences in terms of standard deviations were found on the majority of factors. In fact, the results showed that blacks tended to be more reserved, detached, stiff, sober, slow, serious, tough minded, affected by emotional instability, moralistic, jealous, dogmatic, tyrannical, apprehensive, and less intelligent than the other groups, particularly the whites. Differences in means and standard deviations on the 16PF were also found in cross-cultural studies conducted by De Andrade *et al.* (1969), Cattell and Warburton (1967), Mcquaid (1967), Mehryar (1976), Meredith (1966), Thompson and Dayries (1975), and Vaughn and Cattell (1972). Other studies on various other personality tests have also shown cross-cultural differences (Chiu, 1990; Irfani, 1977;

Iwawaki et al.; Kline, 1975; 1977; Khatena et al., 1975; Loo & Shiomi, 1982; Nagelschmidt & Jacob, 1977; Niles, 1981; Parsons & Schneider, 1974; Ryckman et al.; 1978; Reimanis, 1977; Stetson & Wagner, 1980; Wohl et al., 1970) when means and standard deviations were compared.

The reliability coefficients were unacceptably low for the blacks on 14 of first-order factors. Only Factors H, Q₂, and Q₃ had coefficients greater than 0,5. Factors C, F, M, N, O performed the worst as coefficients lower than 0,3 were obtained. The coloureds, Indians and whites obtained higher reliability coefficients, where none of the coefficients were lower than 0,3. The reliability coefficients of the white participants were the highest and the closest to the coefficients of the norm group.

The factor analyses showed that the same factor structure was not found when the sample was compared to the structure proposed by Cattell. The factor structure of the white group best matched the structure and the blacks matched it the least. This is in line with studies by a number of researchers who conducted cross-cultural research by comparing the factor structures of the 16PF (Adcock, 1974; Cattell & Warburton, 1966; Golden, 1978; and Phillip, 1972). Factor analysis conducted on other personality tests also found similar results when cross-cultural comparisons were made (Horch & Marchioni, 1986; Iwawaki, 1977; Loo & Shiomi, 1982; Nagelschmidt & Jacob, 1977; Niles, 1981; Rychman, 1978). However, studies conducted by Abdul-Khalek et al. (1986), Tsujioka and Cattell (1965), and Zak (1976) found the same or similar factor patterns when different cultural groups were compared on the 16PF. Prinsloo and Van Eeden (1995) found similar factor structures when they compared English and Afrikaans-speaking participants on the one hand, and African

language participants on the other, on the 16PF (SA92) in South Africa. However, her factor analysis only focused on the second-order factors. Taylor (1982) also indicated a moderate or fair amount of similarity in terms of factor structure when he compared white and black South Africans on the South African Personality Questionnaire. Forbes et al. (1974), Hanin et al. (1988) and Noller et al. (1987) found similar factor structures when cross-cultural comparisons were made on other personality tests.

Similar results emerged when item analyses was conducted. The results of the item analysis showed that for the black group, 18% of the total items failed to yield significant item-total correlations. Factors B, M, and N performed the worst. The data of the other participants (coloureds, Indians, and whites), resulted in item-total correlations that were similar to the scores reported by the norm group.

Item comparability results showed that highly significant differences were obtained for the majority of items per factors for this sample (racial). Highly significant differences were obtained (more than or equal to 50% of the items per factor) for the majority of factors (12), with Factors B, H, N, O, and Q₁ being the only exceptions. This is line with similar studies conducted by Miller, Knap and Daniels (1968), Edberg, (1969); and White (1974)(in Dahlstrom & Gynther, 1986) in the USA, in which the responses of whites and blacks were compared on the MMPI.

The results of the qualitative study showed that participants whose home language was not English or Afrikaans had difficulty in understanding many of the words and the construction of sentences contained in the 16PF.

9.1.2 Gender

The results showed that this variable did not have such a great influence on the scores. Significant differences between means and large differences in terms of standard deviations were not found on the majority of factors. This differs from the studies by De Andrade (1969), Mehryar (1972), Meredith (1966), and Vaughn and Cattell (1976) who found mean and standard deviation differences between males and females. Significant differences were found on factors I, O, N, Emotional Sensitivity and Tough Poise. Females appeared to be more tender-minded, sensitive, dependent, overprotected, apprehensive, self-reproaching, insecure and troubled, than males. Males tended to be more polished, socially aware and insightful regarding others.

The reliability coefficients for males and females were lower than those reported for the norm group. For the female participants seven of the first-order factors have coefficients of lower than 0,5 and for the males, eight were less than 0,5. Although the results were similar, males obtained slightly lower coefficients than the females on the majority of the factors.

The item analyses showed that for the females, Factors A, N, and MD, performed the worst, where 7,5% of the items failed to yield acceptable item-total correlations. The values for males were slightly worse as 11,88% of the items had item-total correlations lower than 0,3, and Factors L, M, N, and MD performed the worst.

Item comparability results showed that highly significant differences were not found for the

majority of items in each of the factors. Significant differences were found for Factor I only, where more than 50% of the items for this factor showed differences.

9.1.3 Age

The results showed that this variable had a certain degree of influence on the scores. Significant mean differences were obtained on seven first-order (B, F, G, I, N, Q₂, Q₃ and the MD score) and four second-order factors (Emotional Sensitivity, Independence, Compulsivity, and Tough Poise). In other words, the 17 to 18 year old participants tended to be more enthusiastic, quick, alert, tender minded, sensitive, overprotected, and dependent than the rest of the participants. The 30 to 47 year old participants appeared to be more astute, worldly, self-sufficient, and resourceful than the rest. Differences were also found by Dahlstrom *et al.* (1986) when they analysed studies conducted on the MMPI focusing on age differences, in which black and white Americans were compared.

Reliability coefficients for the various age groups were lower than reported for the general or combined norm group. Coefficients were lower than 0,5 on the majority of factors for the following age groups: 17 to 18; 23 to 29; and 30 to 47.

The results of the items analyses showed that for three age groups, more than 10% of the items failed to yield acceptable item-total correlations. The values for the 17 to 18 year old participants showed that Factors B, L, M, N, Q₁, and MD performed the worst with 11,87% of the items failing to yield acceptable item-total correlations. For the 23 to 29 and 30 to 47 year old participants, Factors B, I, L, M, N, and MD performed the worst, where 18% and 18,12% respectively, did not yield acceptable item-total correlations.

Item comparability results showed that significant differences did not exist for the majority of items in each factor. In fact, no factor had items that showed significant differences for more than 50% of the items for each factor.

9.1.4 Socio-economic status

The results showed that SES did not have a major influence on the observed scores. Significant mean differences were not found for the majority of first and-second order factors, with the exception of Factors A, B, C, F, Extraversion and Tough Poise. The results showed that the high SES participants appeared to be more outgoing, cooperative, emotionally stable, enthusiastic, quick, and alert, than the other participants, particularly the low SES participants who obtained the lowest scores. Dahlstrom (1986) analysed a number of studies, in which the influence of education and occupation separately were investigated and concluded that level of education influenced the scores to a greater extent than did level of occupation on the MMPI.

The reliability coefficients found were very similar to those of the norm group as the majority of factors (for all the groups) have coefficients greater than 0,5.

The results of the item analysis showed that the majority of SES groups had item-total correlations similar to the norm group. However, the low SES participants performed the worst as 11.88% of the items had unacceptable total-item correlations, where items B, M, N, and MD performed the worst.

The item comparability analysis showed that significant differences did not exist for the majority of items for each factor. In fact, no factor had items that showed significant differences for more than 50% of the items per factor.

9.2 Implications of the study

After an in-depth analysis of the MMPI, Dahlstrom *et al.* (1986) posed the following questions in their concluding chapter.

Do the reported characteristics manifested by virtually all black subjects reflect pervasive features of some common cultural origin in individuals identified as members of an ethnic subgroup? Are these features, instead more circumscribed within this ethnic group and hence more reasonably attributed to the selective effects of the obvious inequities to which most black Americans have been exposed? Are the origins of the differences that appear in MMPI scores, alternatively, features of the test stimuli or other aspects of the assessment process per se, rather than the identifiable characteristics of the men and women completing the inventory? Do the differences between white and black test patterns reflect some serious forms of test score error that may attenuate the usefulness of MMPI-based personality assessments of black subjects, or are these components of variance valid and relevant to such criteria (p. 188)?

The above questions are the same as those that need to be asked about the 16PF. After the various analyses of the 16PF, a clear pattern emerged. Race played a major role in terms

of the responses to the 16PF. For the majority of factors, the results did not show support for construct and item comparability when the different race groups were compared. After analysing the item responses of participants whose home language was not English, it was clear that the differences in responses occurred due to language problems experienced by the participants as well as cultural differences. Therefore, there is great possibility that the test does not reflect identifiable characteristics of all the groups and the differences reflect serious forms of test score error. Retief (1994) postulated that differences in personality test scores could indicate fruitful differences rather than bias. This could only be possible if the test itself measured the true identifiable characteristics of people.

It is clear that the 16PF does not measure what it is supposed to do and the advisability of using it in South Africa, with its multicultural population, is highly questionable. The other versions of the 16PF (Form A and B) should also be used with caution as there is a great possibility that similar results would be found. The 16PF (SA92) was based on the local A and B forms, the American version of these forms, the American C and D forms, the South African experimental form E, and the American E and F forms (Prinsloo, 1992). In fact, Prinsloo claimed that:

This new South African version of the 16PF adheres strictly to the existing Cattellian (American) instrument, and only items taken from the existing 16PF questionnaires were used (p. 1).

Using the 16PF to make selection decisions in industry must be highly questionable in the light of these findings and the ethics of taking such decisions should be seriously considered.

The results clearly demonstrate that it is necessary to conduct research on all tests imported from other countries, or developed in South Africa but based on a single group of people, to ensure that the use of the test does not constitute an unfair discriminatory labour practice when used as the basis for selection decisions. In addition, with the adoption of the new labour employment legislation pertaining to selection i.e. the new Constitution (adopted by the Constitutional Assembly on 8 May 1996), and the new Labour Relations Act (Act 66 of 1995 to be implemented on 11 November 1996), unfair discrimination is forbidden. Using the 16PF might result in court action by individuals if used for selection and promotion decisions, especially on groups who have been previously disadvantaged. The findings indicate that such an individual will have a very strong chance of winning such an action. The new Labour Relations Act has been expanded to include prospective employees and tests used in selection will now have to be supported by research findings which demonstrate that they do not discriminate unfairly against any employee on the basis of provable criteria and valid assessment techniques. The new Labour Relations Act also places the onus on the employer to prove that unfair discrimination did not take place, and not the individual or group which accuses the employer of unfair discrimination (Bendix, 1996). Schedule 7, of the new Labour Relations Act states:

- 1) For the purpose of this item, an unfair labour practice means any unfair act or omission that arises between an employer and *employee*, involving-
 - a) The unfair discrimination, either directly or indirectly, against an *employee* on any arbitrary ground, including, but not limited to race, gender, sex, ethnic or social origin, colour, sexual orientation, age, disability, religion, conscience, belief, political opinion, culture, language, marital status or family responsibility;

- b) the unfair conduct of the employer relating to the promotion, demotion or training of an *employee* or relating to the provision of benefits to an *employee*;
 - c) the unfair suspension of an *employee* or any disciplinary action short of *dismissal* in respect of an *employee*;
 - d) the failure or refusal of an employee to reinstate or re-employ a former *employee* in terms of any agreement.
- 2) For the purpose of sub item (1) (a), "employee" includes an applicant for employment;

In addition, the Government Green Paper of Employment Equity (1996) discourages the use of psychological tests because of the possibility that they might lead to unfair labour practices. The relevant sections are:

- 4.5.3.2 As far as possible, employers should define criteria in terms of skills rather than formal educational requirements, in order to avoid building on past disadvantage...
- 4.5.3.5 Employers should avoid psychometric tests unless they can demonstrate that they respect diversity.
- 4.5.4 Decisionmaking procedures. Above all, employers will have to give reasons for their decisions about employees in terms of explicit, fair criteria. Employers should avoid letting other factors creep in.

In the USA the use of personality inventories to predict job performance have undergone a complete cycle. Personality inventories such as the MMPI were used for many years in personnel selection to predict job success. They were used indiscriminately to assess the personality of an applicant even if no relationship was proven between the test and job success (Muchinsky, 1993). Furthermore, Guion and Gottier's (1965) attack on the use of these tests, criticizing it for the lack of empirical validation, led to a marked curtailment of these tests.

However, psychologists, particularly Industrial/ Organisational (I/O) Psychologists continued to discover that certain personality variables were influential in job performance. Previously, the conventional personality tests that were intended for clinical use were adapted for industry. More recently, I/O Psychologists have begun developing new personality inventories tailored and designed exclusively for use in industry and the results have been more promising. For example, Day and Silverman (1989) concluded that personality tests, that are carefully constructed and measure such factors as orientation towards the job and quality of interpersonal orientation, are significant predictors of job success.

Honesty or integrity tests are also increasing in popularity and the paper-and-pencil tests are among the fastest growing means of personnel selection in the USA (Muchinsky, 1993). Sackett and Harris (1984) reviewed a number of related studies and concluded that positive correlations and high reliabilities were generally reported, and test score comparison by race and sex generally reported no differences. However, he questions the use of these tests on ethical grounds and cautions the use of these tests indiscriminately.

9.3 Recommendations

From the above discussion, it is clear that in its present form the 16PF (SA92) is unsuitable to be used in South Africa with its multicultural society. A number of options face test users, and users of the 16PF in particular.

The first option is to translate the test into the home language of the target population, and then to conduct a thorough analysis. This is bound to be an expensive exercise as there are eleven official languages in South Africa. It might be more cost-effective to focus on those languages with the largest number of users. Alternatively, those words and sentences identified as problematic could be replaced and/or rephrased and a thorough investigation to ensure cross-cultural comparability could then be conducted. However, the results indicate that language problems were not the only reason for the large differences found. When using a test it must be demonstrated that the same constructs are being measured when individuals from different cultural groups are compared (e.g. for selection purpose). If not, cross-cultural comparison is not possible.

Another option is to discontinue using the 16PF and to construct tests in South Africa, based on the South African population. When the qualitative study was conducted and participants whose home language was not English were asked to explain what they think an item meant, a wealth of information was gained. It is necessary to ask people about themselves and then to develop a personality test on that basis in the home languages of the people that are going to use the test. Failing that, one has to ensure that all the words and items are understood by all. Taylor (1992) and Jones and Zoppel (1979) recommended that questionnaires be

based on all cultures. The first step should be to identify personality constructs that are relevant in all population groups. This can be done by using small group discussions or the Repertory Grid Technique proposed by Kelly (1955). Small group discussions can take place in groups of about six people from a given culture and asking them to identify the traits that they like and dislike that other significant people with whom they have relationships possess. This procedure should be conducted on a number of groups from a variety of cultures, after which a short-list of common character traits should be compiled. The following step would be to list the core traits that were frequently identified by all cultures. Additional traits could be included that are relevant to one or a few cultures and this list would serve as the basis of the personality test. (The repertory grid technique works on a similar principle but only one person is interviewed at a time). The third step would be to develop a large pool of items to measure the constructs identified. After adequate item-total correlation criteria and comparability have been established for the items, a smaller pool of items could be used in the final test.

A third option is to use work-related variables to assess individuals within the workplace. Competency-based assessment is an example of a method that focuses on job-related criteria. According to Spencer and Spencer (1993), competencies, identified through the competency process are context sensitive; predict superior job performance without race, gender, or demographic bias; provide a method applicable for selection, career pathing, performance appraisal, and development; and measures potential and not current ability. By 1991, this approach was used by over 100 practitioners in more than 24 countries. It has been introduced in South Africa and is currently gaining popularity in the selection arena. It seems a particularly relevant approach to use with the selection and promotion of affirmative action candidates (Christie, 1993; Cofsky, 1993; Spencer and Spencer, 1993). Beardwell and

Holden (1994) also argue that this method aids to reduce the cost selection decisions by using criteria that are relevant. This will help organisations to uphold the new legislation and to ensure that discrimination does not take place in terms of selection (as it focuses on job related criteria) and it provides proof that discrimination has not taken place (in the event of a court action).

The success of the competency approach hinges on identifying the correct competencies required to perform a particular job successfully. The most common methods for such identification includes the use of behavioural event interviews (BEI) and expert panels. The BEI method was developed by McClelland (1976) and is derived from Flannagan's (1954) Critical Incident Method. It focuses on the comparison of people who are very successful in their jobs and those who are not successful. The people in each category describe a number of outstanding successes and failures that occurred in their jobs, emphasising the behaviours and thoughts related to the outcomes. The person conducting the interviews asks each interviewee to describe the particular situation or task, name the other person involved, explain the behaviour of the interviewee, and relay the outcome or result. BEI transcripts are thematically analysed to determine which core characteristics differ between the effective and ineffective performers. The rationale behind this method is that the best predictor of future performance of a person is past behaviour in similar situations (McClelland & Dailey, 1972; Mitrani, Dalziel and Fitt, 1992; Spencer & Spencer, 1993).

With the use of the expert panels, a number of individuals, who know a particular job very well, is asked to brainstorm personal characteristics employees need to perform the job at an adequate level and at a superior level. These experts could include supervisors for the

positions under study, outside experts, outstanding performers on the job, and/or human resource professionals who know the job well. The panel then prioritises the characteristics according to job success. This method allows data to be collected quickly and efficiently, panel members become knowledgeable in competency concepts, and this can develop support for findings and possible recommendations (Spencer & Spencer, 1993).

Once the competencies have been identified, selection and promotion can take place, based on the competencies identified. Methods include the competency-based selection interview, biodata, assessment centres, ratings by superiors, peers, and subordinates, and/or tests that measure one or more competencies (Spencer & Spencer, 1993). The competency based selection interview is like the BEI but the focus is on giving the interviewee an opportunity to demonstrate a specific competency required by the job, while asking questions that probe certain pertinent competencies identified earlier. This method can be used with other methods such as assessment centres. In fact, multiple methods should be used to ensure that the behaviours identified according to one method exist with the other methods as well (Fear & Chiron, 1990; Muchinsky, 1993; Van Clieaf, 1991). Currently, some South African human resource practitioners are adapting the assessment centre exercises such as role plays and leaderless group exercises, to identify the required competencies with much less time and costs involved.

To conclude, in view of the findings of the investigation that have been reported in this thesis, it would be fair to say that the time has come in which test users, particularly users of the 16PF, will no longer be able to make decisions on the basis of tests that they use under the pretext that they have assumed that the tests yield results in which members of

various population groups in this country may be compared on a fair and reasonable basis. There can be no doubt that the results of the 16PF - especially when they refer to members of the black, coloured and Indian groups of the South African population - are not sufficiently reliable to make decisions which are likely to influence the lives of people, and that the measurements they represent only resemble dimensions postulated by Cattell in the vaguest possible way.

The moral and ethical burden of making decisions based on such poor information - in the guise of scientific measurement - must surely be overwhelming for any psychologist. The notion of influencing the lives of other individuals on such poor information is completely incompatible with the standards of professional conduct demanded of psychologists in their professional code of ethics, and by the literal text and spirit of the whole of, and especially Section 37, of the Medical, Dental and Supplementary Health Service Professions Act (Act 56 of 1974) and the various Regulations promulgated in terms of this Act.

Yet another factor which militates against the mindless application of the 16PF - and quite conceivably to similar instruments - is to be found in the legislation that forbids unfair discrimination. Promotion, placement and selection decisions, which represent a major component of the work of many Industrial Psychologists, will be challenged in the Labour Courts where the burden of proof will rest on such psychologists to demonstrate that their actions did not constitute unfair discrimination against individuals affected by such decisions. Given the parlous state of affairs of the scientific merit of the 16PF which have been so clearly demonstrated in this thesis, it is highly unlikely that the Labour Courts will find in favour of psychologists who base their decisions and recommendations on the data yielded

the 16PF.

When the factors that have been highlighted are taken into account it becomes more than obvious that new and innovative approaches will have to be developed - and shown to be scientifically viable - to enable psychologists to distinguish between the merits of people who are competing for increasingly scarce job opportunities in a manner which will not be regarded as legally culpable. There can be little doubt that, at least as far as South Africa is concerned, many of the certainties which appeared to exist in the past have been stripped away. The instrumentation at the disposal of psychologists - at the very least - on the basis of the evidence presented here regarding the 16PF is no longer acceptable.

All these arguments should not be taken to imply that it is recommended that psychologists abandon their roles as advisors and decision makers. It is important that the lead should be taken and psychologists shoulder the burden of balancing the good of the individual with the effective and efficient functioning of organisations which employ people. With sufficient dedication, South African psychologists may rise to the demands of the situation which has developed and demonstrate that they have a role to play. If not, the need is likely to be filled by even less professionals which may - in the long run - result in even greater harm done to the individual. These findings do not spell disaster: they are merely a challenge.

One is reminded of Tennyson's lines in the poem on **The passing of Arthur in The Idylls of the King.**

He wrote:

And slowly answer'd Arthur from the barge:

The old order changeth, yielding place for the new,

And God fulfills himself in many ways,

Lest one good custom should corrupt the world.

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APPENDIX A

BIOGRAPHICAL QUESTIONNAIRE (ENGLISH AND AFRIKAANS)

6.2 as a second language?

Zulu	
Xhosa	
Venda	
Tswana	
Tsonga	

S.Sotho	
N.Sotho	
English	
Afrikaans	
Other	

7. How were you classified according to the now repealed Population Registration Act. (Please note!!! This is only for research purposes).

Black	
Coloured	

Indian	
White	

8. What is the occupation of your mother?

.....

9. Briefly list the duties pertaining to your mother's job.

.....
.....
.....

10. What is the occupation of your father?

.....

11. Briefly list the duties pertaining to your father's job.

.....
.....
.....

<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	
<input type="checkbox"/>	
<input type="checkbox"/>	

12. What is the occupation of your guardian (if applicable)

.....

13. Briefly list the duties pertaining guardian's job (if applicable).

.....
.....
.....

<input type="checkbox"/>

6.2 as 'n tweede taal

Zulu	
Xhosa	
Venda	
Tswana	
Tsonga	

S.Sotho	
N.Sotho	
Engels	
Afrikaans	
Ander	

7. Hoe was u volgens die ou Bevolkings Registrasie Wet geklassifiseer? (Let wel!!! Hierdie inligting is net navorsing doeleindes).

Swart	
Kleurling	

Indiër	
Blank	

8. Wat is u moeder se beroep?

.....

9. Lys kortliks die take wat betrekking het op u moeder se werk.

.....

10. Wat is u vader se beroep?

.....

11. Lys kortliks die take wat betrekking het op u vader se werk.

.....

<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>

12. Wat is die beroep van u voog? (indien van toepassing).

.....

13. Lys kortliks die take wat betrekking het op u voog se werk (indien van toepassing).

.....

<input type="checkbox"/>	<input type="checkbox"/>
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APPENDIX B
INTERACTIONS BETWEEN RACE AND GENDER

F	Bkck male		Blk Fml		Clrd male		Clrd fml		Indn male		Indn fml		Wht male		Wht fml		P
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	
A	9,9	2,8	10,1	3,0	9,4	3,2	10,8	3,5	9,1	3,5	9,9	3,0	11,4	3,6	12,2	3,3	0,2368
B	7,1	2,0	7,0	1,7	8,1	1,8	7,9	1,9	7,4	2,2	7,7	1,7	9,2	1,6	9,0	1,6	0,4115
C	8,4	2,5	8,3	2,7	10,3	3,8	9,6	3,8	9,7	3,7	9,3	3,6	12,2	4,0	11,9	3,4	0,7565
E	12,8	3,3	12,7	3,4	12,9	3,9	12,8	4,0	11,9	3,5	13,0	3,7	14,4	3,5	13,1	4,0	0,0208
F	8,7	2,6	9,0	2,6	10,2	3,6	10,4	3,4	10,8	3,3	11,3	3,3	11,9	3,6	11,8	2,9	0,7401
G	12,1	3,1	12,2	3,0	10,7	3,6	11,0	4,0	10,4	2,8	10,0	3,7	9,9	4,7	11,1	4,2	0,1990
H	9,1	3,4	8,8	3,3	9,4	4,2	9,0	4,1	9,5	3,4	9,4	3,9	10,7	4,0	10,3	4,2	0,9651
I	10,7	3,2	12,7	3,2	11,2	3,6	14,5	3,1	11,6	3,4	15,1	3,1	11,9	4,4	15,5	3,2	0,0324
L	13,2	3,4	13,1	3,4	12,3	3,9	12,6	3,7	12,6	3,2	12,5	3,5	11,3	3,7	10,4	3,9	0,3110
M	11,7	2,8	12,4	2,8	12,0	3,7	11,3	3,6	12,3	3,4	13,5	3,8	12,6	4,6	12,6	4,0	0,0448
N	17,7	2,8	16,5	3,2	16,8	3,5	16,3	3,2	16,6	3,8	15,7	3,3	17,4	3,6	16,7	3,7	0,6423
O	8,9	2,4	9,3	2,9	7,0	3,8	8,9	3,8	7,4	2,9	9,2	3,7	6,4	4,3	8,0	4,0	0,0833
Q ₁	12,6	2,9	12,1	2,9	11,7	3,7	11,7	3,7	12,3	3,4	12,3	2,8	11,8	3,9	11,3	3,8	0,7999
Q ₂	6,8	4,0	7,0	4,3	9,5	4,1	9,8	3,7	9,8	3,4	9,8	3,6	9,2	4,2	8,9	4,3	0,8467
Q ₃	12,1	3,1	11,2	3,3	11,2	3,8	10,5	4,0	11,0	3,6	9,8	3,7	11,4	4,0	11,2	4,1	0,6701
Q ₄	7,7	3,0	8,4	3,0	8,0	3,6	8,4	3,8	7,8	2,9	8,4	3,4	7,3	3,7	8,4	3,9	0,7872
MD	5,0	1,9	4,6	2,2	5,1	2,5	4,3	2,4	4,6	2,3	3,9	2,3	5,5	2,6	5,3	2,5	0,4890
EX	9,0	2,1	8,9	2,1	8,7	2,7	8,8	2,7	8,5	2,2	8,9	2,4	10,0	2,8	9,9	2,7	0,6464
AN	6,3	1,8	6,7	2,0	5,6	2,9	6,4	2,9	5,8	2,4	6,6	2,7	4,7	3,1	5,2	3,0	0,7779

ES	6,8	1,7	7,6	1,8	6,4	2,5	7,5	2,6	6,7	2,3	8,2	2,4	6,1	2,8	7,3	2,5	0,5970
IN	8,6	1,5	8,6	1,5	9,3	2,2	9,1	2,1	9,4	1,9	9,9	1,9	9,8	2,5	9,2	2,3	0,0347
CO	13,9	2,4	13,3	2,4	12,9	2,7	12,6	2,7	12,7	2,3	11,8	2,7	12,9	3,2	13,0	2,9	0,3274
TP	0,2	1,8	-0,7	1,8	0,2	2,2	-1,2	2,3	-0,0	2,0	-1,8	1,9	-1,0	2,7	-2,4	2,0	0,2670

M = mean

APPENDIX C
INTERACTIONS BETWEEN RACE AND AGE

F	B 17+18		B 19		B 20		B 21+22		B 23-29		B 30-47		C 17+18		C 19	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
A	10,0	3,1	10,9	2,6	10,6	2,8	9,6	2,2	9,6	3,1	10,2	3,2	10,5	3,4	9,5	3,1
B	7,3	1,5	7,2	1,8	7,9	1,8	7,0	1,9	6,7	1,8	7,1	2,0	8,1	1,8	7,8	2,0
C	8,5	2,5	8,4	2,9	8,4	2,6	8,3	3,0	8,3	2,3	8,7	3,2	10,0	3,7	9,5	3,9
E	12,2	3,1	13,5	3,7	12,9	4,0	12,3	3,6	12,7	2,9	12,9	3,5	13,8	3,5	12,0	4,6
F	9,2	2,8	9,5	3,1	8,9	2,3	8,8	2,7	8,6	2,4	8,7	2,7	11,6	3,1	9,2	3,7
G	11,7	2,9	11,8	3,2	12,1	3,6	11,6	3,1	12,5	2,7	12,6	3,4	9,9	3,8	11,6	4,1
H	9,0	3,8	9,6	3,0	8,2	3,2	9,1	3,1	9,0	3,5	9,3	3,0	10,2	3,5	7,4	4,4
I	12,2	3,4	11,9	2,4	13,3	2,9	10,7	3,6	11,2	3,3	11,6	3,9	12,9	3,8	13,7	4,3
L	14,0	3,0	12,4	3,6	13,1	3,7	12,7	3,1	13,6	3,3	12,6	3,4	12,6	3,3	13,5	3,8
M	12,0	2,6	12,6	3,0	12,6	3,4	11,8	2,5	12,0	2,6	11,4	3,1	11,6	3,9	11,7	3,3
N	16,6	3,6	16,3	3,4	16,7	2,9	17,7	2,4	17,2	3,1	18,1	3,0	16,1	3,8	16,7	2,9
O	9,7	2,2	8,7	2,8	10,1	2,8	8,6	2,9	9,1	2,5	8,3	2,7	8,1	3,7	8,9	4,0
Q1	11,7	3,1	12,1	3,6	12,6	2,8	12,6	2,6	12,2	2,7	12,9	3,1	11,8	3,3	11,4	4,1
Q2	8,5	3,6	6,6	4,1	8,4	4,5	6,7	4,2	6,6	4,0	5,2	3,4	9,5	4,0	10,5	3,8
Q3	9,8	3,1	11,7	3,4	11,0	3,5	11,9	3,0	12,0	3,2	12,0	3,1	10,2	3,5	10,6	4,2
Q4	8,5	2,9	8,2	3,0	8,6	3,1	7,1	3,0	8,2	2,9	7,5	3,5	8,6	3,7	8,5	3,5
MD	4,1	1,8	5,0	1,9	4,4	2,1	4,9	2,3	4,9	1,9	5,2	2,4	4,3	2,5	4,6	2,3
EX	8,6	2,3	9,6	2,1	8,6	1,8	8,8	2,1	8,9	2,1	9,4	2,2	9,5	2,3	7,7	2,8
AN	7,2	1,7	6,2	1,9	6,9	2,2	6,0	2,2	6,5	1,6	5,9	1,9	6,2	2,7	6,6	3,1

ES	7,7	1,6	7,2	1,8	7,9	2,0	6,7	2,0	7,0	1,4	6,7	2,1	7,2	2,5	7,4	2,8
IN	8,7	1,4	8,8	1,6	9,1	1,9	8,6	1,6	8,4	1,2	8,2	1,7	9,5	2,3	9,0	2,0
CO	12,7	2,3	13,3	2,7	13,3	2,8	13,7	2,2	13,9	2,3	14,2	2,4	12,1	2,6	13,0	2,7
TP	-0,4	1,9	-0,8	1,5	-1,2	1,9	0,3	1,6	0,1	1,8	-0,1	2,2	-0,7	2,4	-0,6	2,2

F	C 20		C 21+22		C 23-29		C 30-47		I 17+18		I 19		I 20		I 21+22	
	M	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M
A	11,0	3,3	9,1	3,8	9,9	3,4	10,2	3,1	9,8	3,1	9,8	3,1	8,8	3,6	11,2	3,1
B	7,4	1,6	8,1	1,5	8,1	1,9	8,1	2,1	7,5	1,8	7,8	2,0	8,2	1,6	7,9	1,7
C	9,6	4,0	9,9	3,4	9,8	4,1	12,2	4,0	9,0	3,4	10,5	3,9	9,9	3,1	8,5	3,4
E	12,4	2,9	12,5	4,0	12,3	4,2	13,2	3,8	12,7	3,7	12,9	3,1	13,1	4,6	12,8	4,0
F	10,0	3,7	9,5	3,8	10,1	3,3	10,1	3,2	11,4	3,1	11,3	3,2	12,0	3,8	10,1	3,6
G	11,2	3,4	10,0	3,7	11,7	3,7	11,8	2,7	10,1	3,4	9,8	3,7	10,4	2,8	8,7	4,4
H	9,1	3,3	8,5	4,4	9,2	4,4	10,4	4,3	9,3	3,8	9,8	3,3	9,5	4,7	9,5	4,0
I	13,3	3,5	12,7	3,3	12,3	3,6	12,1	3,5	15,0	3,0	13,5	3,8	13,1	4,2	13,0	3,2
L	12,2	4,1	12,6	3,5	11,8	4,4	10,7	3,8	12,5	3,2	12,4	3,4	13,3	4,4	12,7	4,4

M	10,7	3,7	12,0	3,8	11,3	3,3	13,0	3,9	13,3	3,6	12,9	3,6	13,9	4,1	12,2	4,0
N	16,2	2,9	16,6	2,8	17,3	3,6	17,3	3,5	15,5	3,4	16,0	3,4	17,4	3,4	15,8	3,8
O	8,3	4,2	7,6	4,1	7,8	3,8	6,3	3,6	9,1	3,5	8,4	3,7	7,8	3,6	9,7	4,1
Q1	12,0	3,1	11,4	3,6	11,6	3,9	12,5	4,4	12,1	2,8	12,5	3,1	13,5	3,5	11,6	2,9
Q2	8,6	3,5	10,7	4,3	9,3	3,1	8,3	4,3	9,8	3,3	9,5	3,6	10,1	4,2	9,9	3,3
Q3	11,5	3,9	10,4	4,0	11,4	4,4	13,2	2,5	9,6	3,6	10,7	3,6	12,0	3,9	9,0	3,9
Q4	8,0	2,7	8,6	3,8	7,8	4,0	6,5	3,9	8,5	3,1	7,8	3,7	7,5	3,2	8,9	2,7
MD	4,8	2,5	3,9	2,2	5,3	2,6	6,4	2,2	3,7	2,3	4,4	2,3	5,0	2,3	3,2	2,2
EX	9,0	2,4	8,0	3,3	8,6	2,5	9,3	2,6	8,9	2,3	9,1	2,2	8,8	2,8	8,9	2,6
AN	5,9	3,0	6,1	3,0	5,6	3,2	4,0	2,5	6,7	2,4	5,9	2,9	5,7	2,8	7,2	2,6
ES	6,8	2,6	7,1	2,4	6,7	2,8	5,7	2,0	8,2	2,2	7,2	2,7	7,1	2,7	8,1	2,2
IN	8,7	1,8	9,5	2,2	8,8	2,1	9,2	2,3	9,7	1,8	9,8	2,0	10,3	2,2	9,8	1,9
CO	13,0	2,4	12,3	2,6	13,5	2,9	14,1	2,1	11,7	2,6	12,1	2,6	13,3	1,9	11,2	3,3
TP	-0,7	1,9	-0,3	2,5	-0,2	2,2	-0,7	2,6	-1,7	2,0	-1,0	1,8	-0,9	2,5	-1,2	2,3

F	I 23-29		I 30-47		W 17-18		W 19		W 20		W 21-22		W 23-29		W 30-47		p
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	
A	7,7	3,0	12,0	0,0	11,9	3,0	12,0	3,2	12,3	3,0	11,9	4,0	10,6	2,6	8,7	4,6	0,0568
B	8,4	1,7	9,0	0,0	7,5	2,2	9,8	1,3	9,0	1,5	9,3	1,2	9,1	1,0	7,9	1,6	0,0001
C	8,1	6,0	12,0	0,0	11,9	2,5	12,0	3,4	11,9	3,7	11,9	4,1	13,4	2,8	11,9	3,7	0,4693
E	9,7	3,3	10,0	0,0	13,2	3,8	13,4	4,2	13,2	4,0	13,9	3,6	15,0	3,6	13,7	5,1	0,2082
F	7,3	2,9	8,0	0,0	12,2	3,0	11,4	2,9	12,0	3,1	12,1	3,3	11,9	2,6	8,3	3,6	0,0034
G	12,6	1,6	14,0	0,0	8,3	4,0	10,6	4,1	11,2	4,3	10,4	4,7	13,1	2,7	12,0	5,4	0,2914
H	8,0	4,6	8,0	0,0	11,0	3,4	10,3	4,4	9,9	4,1	10,8	4,0	12,4	3,8	6,9	4,5	0,0148
I	12,0	3,7	11,0	0,0	15,8	3,7	15,0	3,7	14,7	3,9	13,3	4,2	12,0	3,8	14,1	2,5	0,1699
L	12,1	2,4	6,0	0,0	11,3	3,4	10,0	4,2	10,8	3,8	10,9	4,0	10,1	3,8	10,7	4,5	0,2935
M	14,4	4,6	10,0	0,0	14,6	3,8	13,4	4,5	12,0	4,1	12,4	4,2	13,6	4,6	10,3	3,2	0,0743
N	16,6	3,1	22,0	0,0	14,3	4,0	16,0	3,7	17,4	3,5	17,3	3,4	18,1	2,3	20,9	2,7	0,0822
O	9,0	5,3	4,0	0,0	8,3	3,6	7,3	4,0	8,1	4,2	7,0	4,2	4,9	3,8	7,4	4,5	0,2389
Q1	13,1	2,9	15,0	0,0	12,3	3,2	12,0	3,8	10,6	3,9	11,7	3,8	13,1	3,5	10,4	3,0	0,1770
Q2	12,7	4,4	6,0	0,0	9,9	3,7	8,9	4,8	8,5	4,0	9,2	4,4	8,7	4,1	11,9	5,6	0,0131
Q3	10,4	2,6	17,0	0,0	9,2	3,7	11,2	3,7	11,3	4,2	11,0	4,2	14,4	2,7	14,0	1,5	0,1293
Q4	8,7	4,5	5,0	0,0	8,5	2,8	8,5	4,5	8,2	3,6	7,9	4,0	5,9	1,9	6,3	5,4	0,5704
MD	4,7	2,1	9,0	0,0	3,7	2,4	5,1	2,4	5,6	2,5	5,3	2,6	7,1	2,0	7,4	1,5	0,0338
EX	6,2	2,7	8,6	0,0	9,9	2,5	9,8	3,0	10,0	2,5	10,1	2,8	10,5	2,2	7,3	2,6	0,0010
AN	6,7	3,7	1,6	0,0	5,8	2,0	4,9	3,1	5,2	3,1	5,0	3,2	3,0	2,5	4,1	3,6	0,1716
ES	7,9	3,7	3,8	0,0	8,0	2,1	7,2	2,5	6,7	2,6	6,6	2,9	5,1	2,0	5,7	2,6	0,1455

IN	9,7	1,5	7,6	0,0	10,5	2,2	9,6	2,1	8,8	2,6	9,6	2,1	9,7	2,5	9,1	3,2	0,1210
CO	13,2	1,8	17,7	0,0	10,6	3,2	12,6	2,7	13,3	2,8	12,9	3,1	15,2	1,8	15,6	2,7	0,0474
TP	-0,4	2,3	0,0	0,0	-3,1	1,9	-2,5	2,2	-2,0	2,2	-1,5	2,5	-1,1	2,2	-0,1	2,7	0,2202

M = mean

APPENDIX D
QUESTIONNAIRE (SYNONYMS)

QUESTIONNAIRE

SURNAME

INITIALS

HOME LANGUAGE

STUDENT NUMBER

INSTRUCTIONS:

Write down one or two synonyms (words that are similar) for the following words. Do not spend too much time thinking over any one word. Write down the first synonym that comes to mind. Be sure not to skip any words. Marks will be awarded for synonyms attempted. Please write as neatly as possible.

For example:

WORD	SYNONYM
LITTLE	SMALL
MERRY	HAPPY

WORD	SYNONYM/S
ABSENTMINDED	
ACCURACY	
ACTIVITIES	
ADMIRE	
AFRAID	
AID	
ANGRY	
APPLIANCES	
ARGUMENT	

ARTISTIC	
ASSISTANTS	
ATTENTION	
ATTRACTIVE	
AVOID	
BACKGROUND	
BASIC	
BATTLES	
BEACH	
BEAUTY	
BETRAYS	
BOOKKEEPER	
BOSSY	
BRAG	
CALCULATED	
CALM	
CANDLE	
CARE	
CAREER	
CHALLENGE	
CHARACTERISTI C	
CHILDREN	
CITIZENS	
CLUMSY	
COMMITTEE	
COMPOSED	
CONCERNED	
CONFUSED	
CONSEQUENCES	

CONVENIENT	
CONVERSATIONS	
COORDINATION	
CRITICISM	
DANGER	
DEPRESSED	
DILIGENCE	
DISCOURAGED	
DISHONEST	
DISLOYAL	
DOWNHEARTED	
DREAMER	
EFFICIENT	
ELECTRICAL	
EMBARRASSED	
EMOTIONAL	
ENTERTAINING	
ENTHUSIASTIC	
EXCITEMENT	
EXERCISE	
FACTORY	
FLAME	
FORGIVE	
FUNCTIONS	
GATHERING	
GUESTS	
HAPPY-GO- LUCKY	
HEADLINE	
HONESTY	

IMAGINATION	
IMMEDIATELY	
IMPRACTICAL	
INDEPENDENT	
INFLUENCE	
INTELLECTUAL	
INTERESTING	
INTERRUPTIONS	
INVENTION	
JEALOUSY	
LEVELHEADED	
LOGICAL	
LOVESTORY	
MACHINES	
MANNERS	
MILITARY	
MISHAPS	
MODERN	
NEIGHBOURS	
NERVES	
OBEYING	
OCCASIONALLY	
OPINION	
OPPORTUNITIES	
OUTGOING	
OVEREXCITED	
PECULIAR	
PERSUADE	
PHOTOGRAPHIC	
QUEUE	

REACTION	
REJECTED	
REPAIRING	
REPORTER	
ROUTINE	
SCENT	
SCIENTIST	
SELF-CENTERED	
SENSITIVE	
SETBACKS	
SOCIAL	
SPIRITED	
STATUE	
STRANGER	
STRICT	
SUPERIOR	
TALENT	
TEMPTATIONS	
THORN	
ACCEPT	
CHEERFUL	
COLD	
DEPRESSED	
FAMILIAR	
FIRM	
HIRE	
HOTEL	
MECHANICAL	
ORGANIZED	
SERIOUS	

SEASIDE	
SUFFICIENT	
ABROAD	
ABILITY	
COURT	
EXPLORE	
NASTY	
SALARIES	
SHELTERED	